FINAL DRAINAGE REPORT

FALCON MEADOWS AT BENT GRASS
FILING NO. 2
PCD Filing No.: SF2134

El Paso County, Colorado

PREPARED FOR:
Challenger Communities
8605 Explorer Dr., Suite 250
Colorado Springs, CO 80920

PREPARED BY:
Galloway & Company, Inc.
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920

DATE:
December 2021

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 reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____ _____

Grant Dennis, PE 51622 Date
For and on behalf of Galloway & Company, Inc.

DEVELOPER'S CERTIFICATION

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

By:_____ _____

Date

Address: Challenger Communities, LLC
8605 Explorer Dr., Suite 250
Colorado Springs, CO 80920

EL PASO COUNTY CERTIFICATION

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. Date
County Engineer/ECM Administrator

Conditions:

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I. Purpose

The intent of the developer is to develop the residential portion of the Bent Grass Subdivision. The purpose of this Final Drainage Report is to identify on and offsite drainage patterns, locate and identify tributary or downstream drainage features and facilities that impact the site, and to identify which types of drainage facilities will be needed and where they will be located. This report will remain in general compliance with the MDDP for the site, prepared by Galloway & Company.

II. General Description

The Falcon Meadows at Bent Grass Filing No. 2 is approximately 21.37 acres within the Bent Grass development. It is located north and west of Bent Grass Meadows Drive and west of the existing West Tributary of the Falcon Basin. The project is a single-family residential development of 108 lots, located in the Falcon area of El Paso County, Colorado. The site is located in the Northwest ¼ and Southwest ¼ of Section 1, Township 13S, Range 65W, of the Sixth Principal Meridian, County of El Paso, State of Colorado. The subject property is located to the south of The Meadows Filing No. 3; west of Bent Grass Residential Filing No. 2 and northwest of Falcon Meadows at Bent Grass Filing No. 1; north of Latigo Business Center Filing No 1, undeveloped property, and the Mountain View Electric Association; and east of The Meadows Filing No. 2. A Vicinity Map is included in Appendix A.

A Planned Unit Development Plan Amendment was approved for the site, PUD-14-002 (July 2014). An additional Amendment to this PUD has also been approved (PUD-SP-205). The overall Bent Grass site consisted of approximately 103.4 acres and included 309 dwelling units.

The existing soil types within the proposed site as determined by the NRCS Web Soil Survey for El Paso County Area consist of Columbine gravelly sandy loam, Blakeland-Fluvaquentic Haplaquolls, and Blakeland loamy sand. All soils are defined as having a hydrologic soil group of A. See the soils map included in Appendix A.

III. Previous Reports

The proposed site has been included in multiple drainage studies in the past. The following is a composite list of the existing reports pertaining to this site analysis.

1. *Falcon Drainage Basin Planning Study*, by Matrix Design Group, September 2015.
2. *Master Development Drainage Plan – Bent Grass Residential Subdivision*, by Galloway & Company, September 2021.
3. *Master Development Drainage Plan and Preliminary Drainage Plan – Bent Grass Subdivision*, by Kiowa Engineering Corporation, December 2006.
4. *Final Drainage Report for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2014.
5. *Final Drainage Report Addendum for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2015.
6. *Master Development Drainage Plan for The Ranch*, by Classic Consulting Engineers & Surveyors, LLC, November 2018.
7. *Falcon Highlands Master Development Drainage Plan & Preliminary Drainage Report & Final Drainage Report for Filing 1*, by URS, January 2005.

8. *Final Drainage Report and Erosion Control Plan – Latigo Business Center Filing No. 1 A Re-subdivision of a Portion of Latigo Business and Research Center Filing No. 1*, by Kiowa Engineering Corporation, November 2004.
9. *Final Drainage Letter Report for Lot 1, Latigo Business Center Filing No. 1*, by Colorado Design Concepts, April 2005.
10. *Final Drainage and Erosion Control for The Meadows Filing Three Subdivision,* by LADD Engineering, July 2000.
11. *Final Drainage Report Bent Grass Residential Subdivision, Filing No. 2,* Galloway & Company, March 2020.
12. *Preliminary Drainage Report Falcon Meadows at Bent Grass,* by Galloway & Company, February 2021.
13. *Final Drainage Report for Falcon Meadows at Bent Grass Filing No. 1,* by Galloway & Company, under review.

IV. Drainage Criteria

Hydrology calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 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 and the El Paso County Engineering Criteria Manual (ECM) as revised in July 2019.

The drainage calculations were based on the criteria manual Figure 6-5 and IDF equations to determine the intensity and are listed in Table 1 below.

Table 1 - Precipitation Data

Return Period	One Hour Depth (in).	Intensity (in/hr)
5-year	1.50	5.17
100-year	2.52	8.68

The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. The rational method has been proven to be accurate for basins of this size and is based on the following formula:

$$Q = CIA$$

Where:

Q = Peak Discharge (cfs)
C = Runoff Coefficient
I = Runoff intensity (inches/hour)
A = Drainage area (acres)

The runoff coefficients are calculated based on land use, percent imperviousness, and design storm for each basin, as shown in the drainage criteria manual (Table 6-6). Composite percent impervious and C values were calculated using the residential, streets, roofs, and lawns coefficients found in Table 6-6 of the manual.

The 100-year event was used as the major storm event for pipes and inlets. The 5-year event was used as the minor event.

The UD-Detention spreadsheet was utilized for sizing the water quality orifices on the proposed water quality portion of the regional detention pond. This spreadsheet was also utilized for the design of the proposed on-site water quality ponds, Pond (North) and Pond (South).

UD-Inlet was utilized to calculate both the street capacities and the inlet capacities.

StormCAD was utilized to size the storm sewer systems.

V. Historic Drainage Conditions

The site is contained fully within one major drainage basin, the West Falcon Tributary. The site generally drains from north to south with an average slope of 2%. The rational method was used to analyze the individual basins within the site as the proposed drainage basins are less than 100 acres. The project site was studied in the Falcon Basin Drainage Basin Planning Study (DBPS) and in the Master Development and Drainage Plan (MDDP) for Bent Grass.

Per the Falcon DBPS by Matrix, the site lies within the basins, WT200, WT210, and WT220. These basins connect to channel reaches RWT202, RWT204, and RWT210. Both the RWT204 and RWT210 sections of channel currently exist and appear as a drainageway when visiting the site. Reach RWT202 appears to be a shallow overland flow through the project site. It is nearly unrecognizable through the site from a visual standpoint.

A historic basin map has been prepared for this site to analyze the historic basins as well as the offsite basins contributing to the site. Historic basins have been discussed in the Bent Grass Residential Filing No. 2 Final Drainage Report, El Paso County Project # SF-19-014. Copies of the hydrology calculations have been included in Appendix A and a copy of the historic map is included in Appendix E. Efforts have been made to comply with the recommendations set forth in the approved DBPS and MDDP.

VI. Existing Drainage Conditions

An existing/current conditions basin map has been prepared for the development site, Falcon Meadows at Bent Grass Filing No. 2. Under this scenario, it is assumed that Bent Grass Residential Filing No. 2 and Falcon Meadows at Bent Grass Filing No. 1 are developed. This should be very similar to the proposed conditions from the Falcon Meadows at Bent Grass Filing No. 1 drainage report. An existing drainage map is included in Appendix E and the basins are described below.

Basin OS-1 (32.28 AC, Q5 = 15.1 cfs, Q100 = 65.1 cfs) is associated with The Meadows Filing No. 3 lots 14, 15, 16, and 17. Runoff from this basin sheet flows to the northern property line of the Bent Grass Residential Filing No. 2 site and then flows, via an existing drainage swale, into the existing channel reach RWT204 from the Falcon DBPS at **DP 21**.

Basin OS-4 (4.46 AC, Q5 = 5.6 cfs, Q100 = 14.0 cfs) is associated with The Bent Grass Residential Filing No. 2, lots 152-160, lots 163-168, Tract D, and portions of Thedford Court & Willmore Drive. Runoff from this basin flows via curb & gutter south on Thedford Court then continues flowing west along the northern curb & gutter along Willmore Drive before discharging into Basin EX-2 at **DP 1**.

Basin OS-5 (0.46 AC, Q5 = 1.1 cfs, Q100 = 2.3 cfs): is associated with The Bent Grass Residential Filing No. 2, lots 161 & 162 along with a portion of Silky Thread Road. Runoff from this basin generally flows to the west via curb & gutter along Silky Thread Road before discharging into Basin EX-2 at **DP 2**.

Basin OS-6 (1.17 AC, Q5 = 2.0 cfs, Q100 = 4.3 cfs): is associated with The Bent Grass Residential Filing No. 2, the northern halves of Lots 170-178 and a portion of the southern side of Willmore Drive. Runoff from this basin generally flows to the west via curb & gutter along Willmore Drive before discharging into Basin EX-2 at **DP 3**.

Basin EX-1 (1.19 AC, Q_5 = 0.4 cfs, Q_{100} = 2.5 cfs): is associated with the northwestern portion of the Bent Grass Residential Filing No. 2 site east of the existing channel. The basin is currently undeveloped. Runoff from the basin generally flows to the southwest, into Basin EX-2**.**

Basin EX-2 (1.60 AC, Q_5 = 0.5 cfs, Q_{100} = 3.8 cfs): is along the western boundary portion of the Bent Grass Residential Filing No. 2 site and is south of Basin EX-1, east of the existing channel. The basin is currently undeveloped and receives flows from Basins OS-4 & OS-5. Runoff from the basin generally flows to the southeast into Basin EX-3 at **DP 5** combined with flows from **DP 1, & 2**.

Basin EX-3 (0.66 AC, Q_5 = 0.2 cfs, Q_{100} = 1.6 cfs): is along the western boundary portion of the Bent Grass Residential Filing No. 2 site south of Basin EX-2 and east of the existing channel. The basin currently contains an existing WQCV pond created as part of Bent Grass Residential Filing No. 2 (North Pond). This basin receives flows from **DP 5** and **DP 3**.

Basin EX-4 (15.41 AC, Q_5 = 4.7 cfs, Q_{100} = 31.8 cfs): is located along the northern boundary, just south of the channel Reach RWT202, built with Bent Grass Residential Filing No. 2 and west of the existing channel. The basin is currently undeveloped. Runoff from the basin generally flows to the south onto Bent Grass Meadows Drive at **DP 6**. From there, it flows via curb & gutter to the east into an existing sump inlet, ultimately discharging into the existing WQCV pond in Bent Grass Residential Filing No. 2, located in Basin EX-3.

Basin EX-5 (0.06 AC, Q_5 = 0.0 cfs, Q_{100} = 0.2 cfs): is west of Basin EX-4 and north of Bent Grass Meadows Drive. The basin is currently undeveloped. Runoff from the basin generally flows to the south onto Bent Grass Meadows Drive. From there, it flows via curb & gutter to the east into an existing sump inlet at **DP 8**, ultimately discharging into the existing WQCV pond from Bent Grass Residential Filing No. 2, located in Basin EX-3.

Basin EX-6 (4.78 AC, Q_5 = 1.4 cfs, Q_{100} = 9.5 cfs): is along the west boundary of the site. The basin is currently undeveloped and receives off-site flows from Basins OS-2 & OS-3. Runoff from the basin generally flows to the south into the existing drainage ditch entering an existing area inlet at **DP 11**. This inlet is part of Storm System A, which eventually releases into the existing south WQVC facility built with Falcon Meadows at Bent Grass Filing No. 1 at **DP 31**.

Basin EX-7 (12.18 AC, Q_5 = 3.5 cfs, Q_{100} = 23.3 cfs): is north & west of Bent Grass Meadows Drive, between Basins EX-5 & EX-6. The basin is currently undeveloped. Runoff from the basin generally flows to the southeast to the existing area inlet at **DP 11**. This inlet is part of Storm System A, which eventually releases into the existing south WQVC facility built with Falcon Meadows at Bent Grass Filing No. 1 at **DP 31**.

Basin EX-8 (1.63 AC, Q_5 = 0.7 cfs, Q_{100} = 4.7 cfs): is a portion of Bent Grass Meadows Drive, along the western half of the road. The basin is currently undeveloped. Flows will enter the roadway and be conveyed to the south via curb and gutter to an existing at-grade inlet at **DP 24.** Intercepted flows will be conveyed via an existing storm system to the existing Swale F at **DP 26**. The existing swale will then continue carrying flows to the east to the existing south WQVC facility built with Falcon Meadows at Bent Grass Filing No. 1 at **DP 30**.

Basin B-1 (6.78 AC, Q5 = 1.8 cfs, Q100 = 12.2 cfs): a basin that is in the center of the site along the north property boundary and encompasses the existing rerouted channel RWT202 and channel RWT204. Flows will continue south in the existing channel and twin 16' x 6' RCBC's where they will then be conveyed to **DP AA**.

Basin OS-2 (20.07 AC, Q5 = 9.0 cfs, Q100 = 43.4 cfs): is associated with The Meadows Filing No. 1 lots 1, 2, 3, 4, 5, and 6. Runoff from this basin sheet flows from the northwest to the southeast, crossing the west property line of the site at **DP 9**. Flows will then be conveyed to the south where it will enter Basin EX-6 and tie-into the existing drainage swale (Swale E) along the southern boundary. It will then continue flowing east before entering an existing area inlet at **DP 11** where it will be piped, ultimately outfalling into the existing south WQCV pond at **DP 31**.

Basin OS-3 (10.61 AC, Q5 = 4.7 cfs, Q100 = 22.6 cfs): is associated with The Meadows Filing No. 1 lot 11 and The Meadows Filing No. 2 Lots 1 & 2. Runoff from this basin sheet flows from the northwest to the southeast, crossing the west property line of the site into Basin EX-6 at **DP 10**. Flows will then be conveyed via an existing drainage swale (Swale E) to the east where it will enter an existing area inlet at **DP 11** where it will be piped, ultimately outfalling into the existing south WQCV pond at **DP 31**.

Below is a description of the basins which were developed as part of Falcon Meadows at Bent Grass Filing No. 1:

Basin D-4a (0.98 AC, Q5 = 2.1 cfs, Q100 = 4.4 cfs): a basin in Falcon Meadows at Bent Grass Filing No. 1 that is east of Bent Grass Meadows Drive. It encompasses single-family residential lots, north half of Rowena Way, & a portion of the west half of Nico Way. Runoff will flow from each lot onto the public R.O.W. where existing mountable curb and gutter will convey flows to **DP 17a**. Flow will continue as gutter flow in Nico Way, Linley Way and Jayla Trail to **DP 17b.**

Basin D-4b (0.95 AC, Q5 = 2.5 cfs, Q100 = 4.9 cfs): a basin in Falcon Meadows at Bent Grass Filing No. 1 that is east of Bent Grass Meadows Drive. It encompasses single-family residential lots, Rowena Way, & portions of Linley Way and Jayla Trail. Runoff will flow from each lot onto the public R.O.W. where existing mountable curb and gutter will convey flows to **DP 17b**, which is the combined flow from the south side of **DP 17**.

Basin D-4c (1.22 AC, Q5 = 2.4 cfs, Q100 = 5.0 cfs): a basin in Falcon Meadows at Bent Grass Filing No. 1 that is east of Henzlee Place and Jayla Trail and south of Bent Grass Meadows Drive. It encompasses single-family residential lots, & portions of Nico Way, Jayla Trail, and Henzlee Place. Runoff will flow from each lot onto the public R.O.W. where existing mountable curb and gutter will convey flows to **DP 17c**, the north side of **DP 17**. Flows at **DP 17** (combined flows from **DP 17b** & **DP 17c** with bypass from **DP 18**) will then enter an existing sump CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**. Overflow from this inlet would be to overtop the curb and then continue via an existing swale, following the same path as the existing pipe, to the east until flows are released into the existing south water quality pond, built with Falcon Meadows Filing No. 1.

Basin D-5 (1.08 AC, Q5 = 2.2 cfs, Q100 = 4.6 cfs): a basin that is located at the southwest corner of Bent Grass Meadows Drive and Henzlee Place. It includes residential lots, as well as a portion of the north half of Nico Way and west half of Henzlee Place. Flows will be directed towards the public R.O.W. where existing curb and gutter will convey flows to the south along Henzlee Place to **DP 18**. Flows will then enter an existing CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the existin south WQCV pond at **DP 31**.

Basin D-6a (1.33 AC, Q5 = 3.8 cfs, Q100 = 7.5 cfs): a basin in Falcon Meadows at Bent Grass Filing No. 1 that is south of Basin D-6b & east of Basin D-4a. It encompasses single-family residential lots & half of Linley Way, Jayla Trail, Henzlee Place, & Nico Way. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 18.**

Basin D-6b (2.69 AC, Q5 = 5.6 cfs, Q100 = 11.4 cfs): a basin in Falcon Meadows at Bent Grass Filing No. 1 that is south of Basin D-5 & east of Basin D-4a. It encompasses single-family residential lots & half of Linley Way, Jayla Trail, Henzlee Place, & Nico Way. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 18**, along with flows from Basin D-6a. Flows will then enter an existing sump CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**.

Basin D-7 (7.65 AC, Q5 = 4.3 cfs, Q100 = 18.2 cfs): a basin that is in the south end of the site, east of Bent Grass Meadows Drive & west of the existing channel. It encompasses the back half of several single-family residential lots as well as existing south WQCV pond and an existing drainage swale. Runoff will flow, via sheet flow, until it enters the existing drainage swale (Swale F) and is conveyed to the existing south WQCV pond or will directly flow into the south WQCV pond at **DP 30**.

Basin D-8 (1.69 AC, Q5 = 2.6 cfs, Q100 = 6.0 cfs): a basin that is west of the existing channel & south of Bent Grass Meadows Drive. It encompasses the back half of single-family residential lots. Runoff will flow from each lot and discharge into an existing drainage swale. The drainage swale (Swale C) will then convey flows to the south, ultimately discharging into the existing south WQCV pond at **DP 32**.

Basin B-2 (4.16 AC, Q5 = 1.3 cfs, Q100 = 8.6 cfs): a basin that is located along the eastern property line of Falcon Meadows at Bent Grass Filing No. 1, south of Bent Grass Meadows Drive and encompasses channel reach RWT204/ RWT210. Flows will sheet flow into the channel where they will then be conveyed to **DP CC**, combining with other on-site flows, prior to exiting the site.

Basins E-1 thru E-5 and I-1 will be developed as part of Bent Grass Residential Filing No. 2 development. Information for those basins were taken from the accompanying Final Drainage Report for Filing No. 2.

Basin RWT202 (1574.4 AC,Q5 = 200 cfs, Q100 = 1000 cfs), RWT204 (38.4 AC, Q5 = 7 cfs, Q100 = 43 cfs) and WT200 (192 AC, Q5 = 52 cfs, Q100 = 190 cfs) represent larger offsite basins to the north of the proposed project. These areas were studied as part of the Falcon Basin DBPS prepared by Matrix and were also part of the Bent Grass MDDP, approved September 21, 2021. There have been no changes to these basins as they are offsite and existing.

Design Point CC is the location in channel reach RWT210, where flows exit the Falcon Meadows development, including the offsite flows from RWT202, RWT204 and WT200. The minor flows are 314.8 cfs and the major flows are 1360.1 cfs.

VII. Four Step Process

The Four Step Process is used to minimize the adverse impacts of urbanization and is a vital component of developing a balanced, sustainable project. Below identifies the approach to the four-step process:

1. Employ Runoff Reduction Practices

The proposed development uses Low Impact Development (LID) practices to reduce runoff at the source. Rather than creating point discharges that are directly connected to impervious areas, runoff is routed through pervious areas to promote infiltration and minimize directly connected impervious areas (MDCIA). Grass buffers and swales are used where practical.

2. Stabilize Drainageways

This step implements stabilization to channels to accommodate developed flows while protecting infrastructure and controlling sediment loading from erosion in the drainageways. Erosion protection in the form of riprap pads at all outfall points to the channel to prevent scouring of the channel from point discharges. A HEC-RAS model was created and used to evaluate the stability of the existing channels. The HEC-RAS results are included in previous reports. It was determined that given the channel is stable in its current state and the proposed velocities and Froude numbers are similar to those in the existing channel, no improvements will be made to the channel with this filing. This will be further discussed later in this report, see Section XI Channels and Swales.

3. Provide Water Quality Capture Volume (WQCV)

This step utilizes formalized water quality capture volume to slow the release of runoff from the site. The WQCV will release in no less than 40 hours. On-site water quality control volume detention ponds will provide water quality treatment prior to the runoff being released into the channel.

4. Consider Need for Industrial and Commercial BMPs

Industrial and Commercial BMP's are not applicable to this proposed site. Source control BMPs for homeowners include the use of garages as the primary area where pollutants can be stored. The single-family detached homes provide garages which can act as storage areas. The proposed development does not include outdoor storage or the potential for introduction of contaminants to the Counties' MS4, thus no targeted source control BMPs are necessary. The biggest source control BMP is public education which can be found on the El Paso County website and discuss topics such as: pet waste, car washing, lawn care, fall leaves, and snow melt and deicer.

VIII. Proposed Drainage Conditions

The site will provide WQCV Detention Ponds to provide water quality treatment prior to discharging the runoff directly into the West Tributary channel RWT204/RWT210. There are 2 total basins, within the proposed development, which are not routed to any of the WQ facilities. Basins B-1 (6.06 acres) & B-2 (4.16 acres), although larger than 1 acre, do not count towards the allowable area of 1 acre or less to be released from a site, untreated, as these basins represent the channel reaches RWT204/210, and are described as undeveloped land remaining undeveloped. All on site flows eventually release into West Tributary of Falcon Basin, where flows will continue to the south, exiting the site at Design Point CC.

As mentioned previously, the site is proposed to be single family residential. The site is designed to provide a large lot buffer between the existing large lots to the north and west of the site and the proposed site. Beyond this buffer the majority of the site is smaller approximately 1/8 acre lots.

Basin OS-1 (32.28 AC, Q5 = 15.1 cfs, Q100 = 65.1 cfs) is associated with The Meadows Filing No. 3 lots 14, 15, 16, and 17. Runoff from this basin sheet flows to the northern property line of the site and then flows, via an existing drainage swale, into the existing channel reach RWT204 from the Falcon DBPS at **DP 21**.

Basin OS-4 (4.46 AC, Q5 = 5.6 cfs, Q100 = 14.0 cfs) is associated with The Bent Grass Residential Filing No. 2, lots 152-160, lots 163-168, Tract D, and portions of Thedford Court & Willmore Drive. Runoff from this basin flows via curb & gutter south on Thedford Court then continues flowing west along the northern curb & gutter along Willmore Drive before discharging into Basin A-1 at **DP 1**.

Basin OS-5 (0.46 AC, Q5 = 1.1 cfs, Q100 = 2.3 cfs): is associated with The Bent Grass Residential Filing No. 2, lots 161 & 162 along with a portion of Silky Thread Road. Runoff from this basin generally flows to the west via curb & gutter along Silky Thread Road before discharging into Basin A-1 at **DP 2**.

Basin OS-6 (1.17 AC, Q5 = 2.0 cfs, Q100 = 4.3 cfs): is associated with The Bent Grass Residential Filing No. 2, the northern halves of Lots 170-178 and a portion of the southern side of Willmore Drive. Runoff from this basin generally flows to the west via curb & gutter along Willmore Drive before discharging into Basin A-1 at **DP 3**.

Basin EX-1 (1.19 AC, Q_5 = 0.4 cfs, Q_{100} = 2.5 cfs): is associated with the northwestern portion of the Bent Grass Residential Filing No. 2 site east of the existing channel. The basin is currently undeveloped. Runoff from the basin generally flows to the southwest, into Basin EX-2**.**

Basin EX-2 (1.60 AC, Q_5 = 0.5 cfs, Q_{100} = 3.8 cfs): is along the western boundary portion of the Bent Grass Residential Filing No. 2 site and is south of Basin EX-1, east of the existing channel. The basin is currently undeveloped and receives flows from Basins OS-4 & OS-5. Runoff from the basin generally flows to the southeast into Basin EX-3 at **DP 5** combined with flows from **DP 1, & 2**.

Basin EX-3 (0.66 AC, Q_5 = 0.2 cfs, Q_{100} = 1.6 cfs): is along the western boundary portion of the Bent Grass Residential Filing No. 2 site south of Basin EX-2 and east of the existing channel. The basin currently contains an existing WQCV pond created as part of Bent Grass Residential Filing No. 2 (North Pond). This basin receives flows from **DP 5** and **DP 3**.

Basin C-6 (0.94 AC, Q5 = 1.0 cfs, Q100 = 3.4 cfs): a basin for this proposed development that will include mostly open area and some small areas of back residential lots. The basin is located on the west side of Bent Grass Meadows Drive. The basin drains towards the existing roadway. Flows will be conveyed via curb and gutter to the east to **DP 8**, an existing CDOT type R sump inlet, which releases into the existing WQCV pond in Bent Grass Residential Filing No. 2.

Basin B-1 (6.06 AC, Q5 = 1.6 cfs, Q100 = 10.9 cfs): a basin that is along the north boundary of the site and through the center of the site, encompassing the existing rerouted channel RWT202 and channel RWT204. Flows will continue south in the existing channel where they will then be conveyed through the existing twin 16’ x 6’ RCBC’s to **DP AA**.

Basin C-1a (0.38 AC, Q5 = 1.0 cfs, Q100 = 2.2 cfs): a basin located near the eastern edge of this filing. It contains the south half of Daelyn Drive, east of Kittrick Place, includes a temporary turnaround and residential lots adjacent to the roadway. A temporary drainage swale (Swale B) will collect flows at **DP 40**, a low spot at the end of the temporary turnaround, and convey flows to the south, where they will be intercepted by a proposed 15’ at grade CDOT Type R inlet at **DP 41,** which is part of Storm System B. Bypass flows will be conveyed to the south to **DP 15**.

Basin C-1b (0.45 AC, Q5 = 1.3 cfs, Q100 = 2.5 cfs): a basin that encompasses the proposed temporary Swale B. Flows will be conveyed to the south to **DP 41**.

Basin C-1c (1.77 AC, Q5 = 5.6 cfs, Q100 = 11.0 cfs): a basin for a future Falcon Meadows filing that will include a portion of the west half of Henzlee Place, north portion of Kittrick Place, and encompasses single-family residential lots. Runoff will flow towards the future road and will be directed towards the proposed 15' at-grade CDOT Type R inlet at **DP 41**.

Basin C-1d (1.72 AC, Q5 = 4.6 cfs, Q100 = 9.5 cfs): a basin that will include the north half of Kittrick Place and encompasses single-family residential lots. Runoff will flow from each lot onto the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 43.** Flows will continue to the south via curb and gutter to **DP 15**, where they will be intercepted by a 15' at grade CDOT Type R inlet, part of Storm System B and ultimately release into the proposed WQCV (North Pond), located north of Bent Grass Meadows Drive at **DP 13**. Bypass flows will continue to the south to **DP 45** and then eventually reaching **DP 8**, an existing CDOT sump Type R inlet, which releases into the existing WQCV pond in Bent Grass Filing No. 2.

Basin C-1e (0.29 AC, Q5 = 1.3 cfs, Q100 = 2.4 cfs): a basin that will include the east half of Henzlee Place. Runoff will flow from the R.O.W. into the proposed mountable curb and gutter where it will be conveyed to **DP 12.** Flows will then enter a proposed 15' at grade CDOT Type R inlet, part of Storm System B, where it will be piped to the proposed north WQCV pond at **DP 13**. Bypass flows will travel to the south then east in Bent Grass Meadows Drive to **DP 8**, an existing CDOT sump Type R inlet, which releases into the existing WQCV pond in Bent Grass Filing No. 2.

Basin C-1f (0.08 AC, Q5 = 0.4 cfs, Q100 = 0.7 cfs): a basin that includes the west half of Henzlee Place between Kittrick Place and the centerline of Henzlee Place. Runoff will flow from the proposed R.O.W. into the proposed mountable curb and gutter which will convey flows to **DP 15.** Flows will then enter a proposed 15' at grade CDOT Type R, part of Storm System B, inlet where it will be ultimately piped to the proposed north WQCV pond at **DP 13**. Bypass flows will continue to the south to DP 45 and ultimately to **DP 8**, existing sump CDOT Type R inlet, releasing into the existing WQCV pond in Bent Grass Filing No. 2.

Basin C-2 (3.98 AC, Q5 = 10.1 cfs, Q100 = 21.1 cfs): Is a basin for a future Falcon Meadows filing which will encompass single-family residential lots including the east half of Henzlee Place. Runoff will flow from each lot onto the future public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 12.** Flows will then enter a proposed 15' at grade CDOT Type R inlet, part of Storm System B, where it will be piped to the proposed north WQCV pond at **DP 13**. Bypass flows will continue towards the south, eventually reaching, an existing sump CDOT Type R inlet, releasing into the existing WQCV pond in Bent Grass Filing No. 2. A storm stub has been provided at **DP19** for a future swale and area inlet to be constructed with the future development.

Basin C-3 (0.18 AC, Q5 = 0.7 cfs, Q100 = 1.2 cfs): Is a basin that includes a south portion of Daelyn Drive between a high point and Kittrick Place. Flows will be conveyed as gutter flow to the east and then south along Kittrick Place to **DP 44**.

Basin C-4 (2.67 AC, Q5 = 4.2 cfs, Q100 = 9.7 cfs): Is a basin which will encompass residential lots and open space easy of Henzlee Place. Runoff will flow from the open space onto the lots, eventually releasing into the public R.O.W. of Kittrick Place, where proposed mountable curb and gutter will convey flows to **DP 44.** Flows will then enter a proposed 15' at grade CDOT Type R inlet, part of Storm System B, where it will ultimately be released into the proposed north WQCV pond at **DP 13**. Bypass flow will travel to the south to be intercepted at **DP 15**.

Basin C-7 (0.52 AC, Q5 = 1.4 cfs, Q100 = 2.9 cfs): Is a basin encompassing the west half of Henzlee Place and residential lots west, located between Kittrick Place and Bent Grass Meadows Drive. Flows will be directed towards Henzlee Place, where it will enter the proposed public R.O.W. and be conveyed as gutter flow to the south to **DP 45** at Bent Grass Meadows Drive. From here, flows will continue to the east to **DP 8**, where they will be intercepted by an existing CDOT Type R inlet, releasing into the existing WQCV pond in Bent Grass Filing No. 2.

Basin C-5 (0.60 AC, Q5 = 0.3 cfs, Q100 = 1.9 cfs): Is a basin which will encompass the proposed north WQCV pond area. The stormwater within the proposed north WQCV pond will be released at a controlled rate, via an outlet structure with orifice holes, into the existing channel RWT204.

Basin OS-2 (20.07 AC, Q5 = 9.0 cfs, Q100 = 43.4 cfs): is associated with The Meadows Filing No. 1 lots 1, 2, 3, 4, 5, and 6. Runoff from this basin sheet flows from the northwest to the southeast, crossing the west property line of the site at **DP 9**. Flows will then be conveyed via a drainage swale (Swale D) to the south where it will tie-into the existing drainage swale (Swale E) along the southern boundary of Basin D-3. It will then continue flowing east before entering an existing area inlet, which is part of Storm System A, at **DP 11** where it will be piped, ultimately outfalling into the existing south WQCV pond at **DP 31**.

Basin OS-3 (10.61 AC, Q5 = 4.7 cfs, Q100 = 24.3 cfs): is associated with The Meadows Filing No. 1 lot 11 and The Meadows Filing No. 2 Lots 1 & 2. Runoff from this basin sheet flows from the northwest to the southeast, crossing the west property line of the site into Basin D-3 at **DP 10**. Flows will be conveyed via an existing drainage swale (Swale E) to the east where it will enter an existing area inlet at **DP 11** where it will be piped, ultimately outfalling into the existing south WQCV pond at **DP 31**.

Basin D-1a (2.97 AC, Q5 = 6.3 cfs, Q100 = 14.4 cfs): a basin for a future Falcon Meadows filing at the northeast corner of the future intersection of Isabel Place and Daelyn Drive. It encompasses single-family residential lots, a portion of Kittrick Place (future), & a portion of the north half of Daelyn Drive. Runoff will flow to the south to the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 51** where flows will be intercepted by a proposed 15' at grade CDOT Type R inlet, which is part of Storm System B**.** Bypass flows will continue to the east, releasing into the proposed temporary swale (Swale B) at **DP 40**.

Basin D-1f (1.61 AC, Q5 = 3.1 cfs, Q100 = 6.7 cfs): a basin for a future Falcon Meadows filing east of Basin D-1a and north of Daelyn Place. It encompasses single-family residential lots, & a portion of the north half of Daelyn Drive. Runoff will flow into the proposed public R.O.W. of Daelyn Drive where proposed mountable curb and gutter will convey flows across the temporary turnaround to a low point at **DP 40,** where flows will be released into a proposed temporary swale (Swale B)**.**

Basin D-1b (2.54 AC, Q5 = 4.7 cfs, Q100 = 10.1 cfs): a basin for a future Falcon Meadows filing along the west property line of the site. It encompasses single-family residential lots & the remaining west half of Daelyn Drive. Runoff will flow into the proposed public R.O.W. of Daelyn Drive, at **DP 16a.** From here, flows will be released into proposed mountable curb and gutter which will deliver flows to the south to **DP 16.** Flows will then enter an existing CDOT at grade Type R inlet, which is part of Storm System A, where captured flows will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**. Bypass flows from the inlet will continue to the south in Bent Grass Meadows Drive to be intercepted by the existing CDOT Type R inlet at **DP 24**.

Basin D-1c (4.34 AC, Q5 = 5.9 cfs, Q100 = 13.1 cfs): a basin along the west property line of the site. It encompasses single-family residential lots & the remaining west half of Daelyn Drive. Runoff will flow from

each lot onto the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 16**, along with flows from **DP16a.** Flows will then enter an existing CDOT at grade Type 'R' inlet where captured flows will be piped and ultimately outfall in the existing south WQCV pond at **DP 31**. Bypass flows from the inlet will continue to the south in Bent Grass Meadows Drive to be intercepted by the existing CDOT Type R inlet at **DP 24**.

Basin D-2a (0.50 AC, Q5 = 1.9 cfs, Q100 = 3.6 cfs): a basin south of Basin D-1a. It encompasses a portion of the south half of Daelyn Drive. Runoff will flow from the proposed public R.O.W., where proposed mountable curb and gutter will convey flows to **DP 14a.**

Basin D-2b (0.74 AC, Q5 = 1.4 cfs, Q100 = 3.2 cfs): a basin south of Basin D-2a. It encompasses single-family residential lots and the north half of Raylan Way. Runoff will flow from each lot onto the proposed public R.O.W, in Raylan Drive. where proposed mountable curb and gutter will convey flows to **DP 14a.**

Basin D-2c (0.31 AC, Q5 = 1.1 cfs, Q100 = 2.1 cfs): a basin south of Basin D-2b. It encompasses the south half of Raylan Way. Runoff will be conveyed as gutter flow to **DP 14a.** Combined flows from DP 14a will continue south, as gutter flow, in the east side of Daelyn Drive to **DP 14b**.

Basin D-2d (0.24 AC, Q5 = 0.8 cfs, Q100 = 1.6 cfs): a basin east of Basin D-1c. It encompasses the east half of Daelyn Drive, between Raylan Way and Isabel Place. Runoff will be conveyed as gutter flow to **DP 14b.**

Basin D-2e (1.41 AC, Q5 = 3.3 cfs, Q100 = 6.7 cfs): a basin east of Basin D-2d and south of D-2c. It encompasses single-family residential lots and the west half of Isabel Place. Runoff will flow from each lot onto the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 14d,** a low point on the west side of Isabel Place**.** Flows will be intercepted by a proposed 5' sump CDOT Type R inlet. These flows will be a part of Storm System A, which was built partially in Falcon Meadows at Bent Grass Filing No. 1 (**DP 14 & DP16**). This system ultimately outfalls into the existing south WQCV pond at **DP 31.**

Basin D-2f (2.43 AC, Q5 = 6.0 cfs, Q100 = 12.2 cfs): a basin east of Basin D-2e. It encompasses single-family residential lots, east half of Isabel Place and Jolie Court. Runoff will flow from each lot onto the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 14e**, a low point on the east side of Isabel Place. Flows will be intercepted by a proposed 10' sump CDOT Type R inlet, as part of Storm System A. Flows will ultimately outfall into the existing south WQCV pond at **DP 31.**

Basin D-2g (1.81 AC, Q5 = 2.9 cfs, Q100 = 6.5 cfs): a basin south of Basin D-2f. It encompasses single-family residential lots, east half of Daelyn Drive and north half of Rowena Way. Runoff will flow from each lot onto the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 14,** which combines with the flow from **DP 14b.** Flows will then enter an existing at grade CDOT Type R inlet where captured flows will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**. Bypass flows from the inlet would overtop Rowena Way to **DP 16**.

Basin D-2h (0.23 AC, Q5 = 0.3 cfs, Q100 = 0.8 cfs): a basin south of Basin D-2d and east of Bent Grass Meadows Drive, containing residential lots which will flow into Bent Grass Meadows Drive. Flows will be conveyed via existing curb and gutter to the existing CDOT Type R inlet at **DP 24**.

Basin D-3 (2.26 ac, Q5 = 2.6 cfs, Q100 = 6.3 cfs): a basin along the southwest property line adjacent to Basins OS-2 and OS-3. It encompasses the backs of several residential lots as well as Swales D and E.

Runoff will flow from basins OS-2 and OS-3 into Swale D and convey flows east through Swale E to an existing area inlet at **DP11**. From there, flows will be piped and ultimately outfall at the south WQCV pond at **DP31**. Bypass flows will spill into Basin E-4 and flow to the existing inlet at **DP24**.

The following basins were all developed as part of Falcon Meadows at Bent Grass Filing No. 1.

Basin D-4a (0.98 AC, Q5 = 2.1 cfs, Q100 = 4.4 cfs): a basin that is east of Bent Grass Meadows Drive. It encompasses single-family residential lots, north half of Rowena Way, & a portion of the west half of Nico Way. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 17a**. Flow will continue as gutter flow in Nico Way, Linley Way and Jayla Trail to **DP 17b.**

Basin D-4b (0.95 AC, Q5 = 2.5 cfs, Q100 = 4.9 cfs): a basin that is east of Bent Grass Meadows Drive. It encompasses single-family residential lots, Rowena Way, & portions of Linley Way and Jayla Trail. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 17b**, which is the combined flow from the south side of **DP 17**.

Basin D-4c (1.22 AC, Q5 = 2.4 cfs, Q100 = 5.0 cfs): a basin that is east of Henzlee Place and south of Bent Grass Meadows Drive. It encompasses single-family residential lots, & portions of Nico Way, Jayla Trail, and Henzlee Place. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 17c**, the north side of **DP 17**. Flows at **DP 17** (combined flows from **DP 17b** & **DP 17c** with bypass from **DP 18**) will then enter an existing sump CDOT Type R inlet, part of Storm System A, where it will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**. Overflow from this inlet would be to overtop the curb and then continue via an existing swale, following the same path as the existing pipe, to the east until flows are released into the existing south water quality pond.

Basin D-5 (1.08 AC, Q5 = 2.8 cfs, Q100 = 6.0 cfs): a basin that is located at the southwest corner of Bent Grass Meadows Drive and Henzlee Place. It includes residential lots, as well as a portion of the north half of Nico Way and west half of Henzlee Place. Flows will be directed towards the public R.O.W. where existing curb and gutter will convey flows to the south along Henzlee Place to **DP 18**. Flows will then enter an existing CDOT Type R inlet, part of Storm System A, where it will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**.

Basin D-6a (1.33 AC, Q5 = 3.8 cfs, Q100 = 7.5 cfs): a basin filing that is south of Basin D-6b & east of Basin D-4a. It encompasses single-family residential lots & half of Linley Way, Jayla Trail, Henzlee Place, & Nico Way. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 18.**

Basin D-6b (2.69 AC, Q5 = 5.6 cfs, Q100 = 11.4 cfs): a basin that is south of Basin D-5 & east of Basin D-4a. It encompasses single-family residential lots & half of Linley Way, Jayla Trail, Henzlee Place, & Nico Way. Runoff will flow from each lot onto public R.O.W. where existing mountable curb and gutter will convey flows to **DP 18**, along with flows from Basin D-6a. Flows will then enter an existing sump CDOT Type R inlet where it will then be piped and ultimately outfall in the existing south WQCV pond at **DP 31**.

Basin D-7 (7.65 AC, Q5 = 4.3 cfs, Q100 = 18.2 cfs): a basin that is in the south end of the site, east of Bent Grass Meadows Drive & west of the existing channel. It encompasses the back half of several single-family residential lots as well as the existing south WQCV pond and an existing drainage swale

(Swale F). Runoff will flow, via sheet flow, until it enters the existing swale and is conveyed to the existing south WQCV pond or will directly flow into the existing south WQCV pond at **DP 30**.

Basin D-8 (1.69 AC, Q5 = 2.6 cfs, Q100 = 6.0 cfs): a basin that is west of the existing channel & south of Bent Grass Meadows Drive. It encompasses the back half of single-family residential lots. Runoff will flow from each lot and discharge into an existing drainage swale (Swale C). The swale will convey flows to the south, ultimately discharging into the existing south WQCV pond at **DP 32**.

Basin D-9 (0.72 AC, Q5 = 0.8 cfs, Q100 = 2.7 cfs): a basin that is east of Basin D-2f & west of Bent Grass Meadows Drive. It encompasses the back half of single-family residential lots. Runoff will flow from each lot and release into Bent Grass Meadows Drive. This flow will be conveyed as gutter flow to the south in the roadway, where it will be intercepted by an existing at grade inlet at **DP 24**.

Basin B-2 (4.16 AC, Q5 = 1.3 cfs, Q100 = 8.6 cfs): a basin that is in the south area of the site and encompasses channel reach RWT204/ RWT210. Flows will sheet flow into the channel where they will then be conveyed to **DP CC**, combining with other on-site flows, prior to exiting the site.

Basins E-1 thru E-5 are the same as discussed under the Existing Conditions Section, as they represent the already built Bent Grass Meadows Drive through the proposed site.

Basin RWT202 (1574.4 AC,Q5 = 200 cfs, Q100 = 1000 cfs), RWT204 (38.4 AC, Q5 = 7 cfs, Q100 = 8 cfs) and WT200 (192 AC, Q5 = 52 cfs, Q100 = 190 cfs) represent larger offsite basins to the proposed project. These areas were studied as part of the Falcon Basin DBPS prepared by Kiowa. They were also part of the Bent Grass MDDP, submitted for review in January. There have been no changes to these basins as they are offsite and existing.

Design Point CC is the location in channel reach RWT210, where flows exit the Bent Grass Site, including the offsite flows from RWT202, RWT204 and WT200. The minor flows are 336.3 cfs and the major flows are 1384.7 cfs. The MDDP Amendment, form the HEC-HMS model, has flows of 191.8 cfs and 1075.3 cfs for the 5- and 100-year flows under proposed/future conditions analysis. The FEMA FIS report has a total flow of 1400 cfs in channel reach RWT210.

Review 1 comment: Per the approved drainage report for filing 1 the flow in these basins is less. Please provide an explanation for the increase in flows in these basins. Are the existing swales/pond adequate for the increase in flows?

Review 2: Please provide a statement indicating whether or not the existing swales and pond are still adequate due to this increase in flow.

Statements regarding swale & pond capacities provided in sections X & XI "Proposed Water Quality Detention Ponds" & "Channels & Swales"

IX. Storm Sewer System

All development is anticipated to be urban and will include storm sewer & street inlets. Storm sewers collect storm water runoff and convey the stormwater to water quality facilities prior to discharging. Storm sewer systems will be designed to the 100-year storm and checked with the 5-year storm. Inlets will be placed at sump areas and intersections where street flow is larger than street capacity. UDFCD Inlet spreadsheet will be used to determine the size of all at-grade and sump inlets. There will be a minimum of 2 proposed storm systems and two existing systems within the site. There will be two future storm system with subsequent filings of Falcon Meadows, as the area develops north of Bent Grass Meadows Drive.

There are two future storm systems. The first future storm system will collect the north and west portion of the site, intercepting flows prior to entering Bent Grass Meadows Drive. These flows will be released into the North water quality pond. Any flows bypassed from the storm system will enter Bent Grass Meadows Drive and travel east to an existing storm sewer system. The second future storm system will consist of an area inlet to collect flows before entering the existing channel. This system will release directly into the proposed north WQCV pond. The stub will be installed with this filing along with the pond construction.

The first proposed system has been designed for the area west of Bent Grass Meadows Drive and south of Daelyn Drive. The system is proposed to tie to the existing system (Storm System A), which was designed with Falcon Meadows at Bent Grass Filing No. 1. The system will connect to the existing stub from the manhole connecting existing inlets at **DP 16 and DP 14**. Flows intercepted by inlets will be released into the existing South water quality pond. All design calculations (StormCAD, inlet design & street capacity spreadsheets, etc.) have been included in Appendix C for this system.

The second proposed storm system (Storm System B) collects flows north of Bent Grass Meadows Drive, over to a "ridge line" located between Henzlee Place and the western property boundary. These flows are routed through the proposed development, with captured flows releasing into the proposed North water quality pond. Flows not intercepted from this area, reach the existing sump inlet at DP 8, which releases into the existing WQCV pond in Bent Grass Filing No. 2.

The inlets located within Bent Grass Meadows Drive (DP-8, DP-24, and DP-25) were all designed under the FDR for Bent Grass Residential Filing No. 2. The inlets were "rechecked" based on updated flows reaching each of these design points. The analysis of these inlets is included in Appendix C.

Final drainage reports for future filings will include details concerning inlet location, street capacity, storm sewer sizing, outlet protection and location for the future storm systems.

X. Proposed Water Quality Detention Ponds

One Water Quality Capture Volume Detention Ponds will be provided for the Falcon Meadows Filing No. 2 site. There are two additional existing ponds built to help treat flows from this and future development, WQCV pond North in Bent Grass Filing No. 2 and existing south WQCV pond in Falcon Meadows at Bent Grass Filing No. 1. All ponds are private. These detention ponds will only provide water quality. The EURV and 100-year volumes will be conveyed via the emergency overflow weir, which will be lined. The water quality volume release will be controlled with an orifice plate that will release in 40 hours. The north water quality pond will release into RWT204 and the south will release into RWT210. Final design of the north pond and its components are provided in Appendix D. Analysis of the existing South pond has also been included in Appendix D.

two basins as revised above.

Revised to reflect two basins instead of three

There are ~~three~~ basins which are not provided with on-site water quality, as stated previously. Basins B-1 and B-2 (combined area of 8.87 acres) represents the area of the West Tributary Channel (RWT204/RWT210) for the Falcon Basin as it traverses the project site. As these areas are undeveloped, will remain undeveloped, and release onto undeveloped land (continuation of channel reach RWT210), they do not "count" towards the 1 acre of area being able to be released untreated from the site.

Total area which will not be treated via on-site facilities is less than 1.0 acre, as required.

XI. Channel and Swales

Swales

There are 5 swales associated with the proposed development, 3 existing (Swale C, E & F), 1 proposed (Swale D) and 1 temporary (Swale B). The swales have been designed to meet the 100-year design storm. Appendix C contains the analysis of these facilities. Swale E was designed in the FDR for Bent Grass Residential Filing No. 2 and Swales C & F were designed in the FDR for Falcon Meadows at Bent Grass Filing No. 1. Flows were analyzed based on the existing swale configuration.

Swale D is located along the west boundary of the site and will convey flows to the south towards existing Swale E. The swale will be a trapezoidal ditch with a bottom width of 2', minimum depth of 2.5' and 4:1 side slope. Longitudinal slope will be 2.0%, generating a flow depth of 1.58' and a velocity of 4.81 fps. Flows ultimately reach the existing South water quality pond.

Swale B connects the temporary turnaround for Daelyn Drive to the temporary turnaround for Henzlee Place. This swale is a temporary facility, until Falcon Meadows at Bent Grass Filing No. 3 is constructed. The swale will be a v-ditch with a minimum depth of 3.5' and 4:1 side slope. Longitudinal slope will be 1.0%, generating a flow depth of 1.27' and a velocity of 3.08 fps. Flows ultimately reach the proposed North water quality pond.

Refer to Appendix C for swale design calculations.

Channel

With the proposed development of Falcon Meadows at Bent Grass Filing No. 2, there is no encroachment (50' undisturbed buffer from FEMA floodplain) into the existing channel reaches RWT204/RWT210. It is intended to leave the channel in its existing condition, until development occurs adjacent to the channel (Future filing). Reach RWT204 does not lie within the FEMA 100-year floodplain. This development will define the 100-year floodplain into Tract H. Future development will reroute RWT204 into this tract.

Riprap protection will be provided at the north pond outfall from the site into the channel to prevent scouring from the point discharge.

The MDDP identifies the use of check structures for the RWT210 channel downstream of the site. Again, due to the existing stability of the channel and the minor increase in flows, velocities and Froude numbers have only slightly changed, but channel remains stable. Design of the channel will under a separate cover.

XII. Maintenance

The channel is to be a private facility until all DBPS identified improvements are complete. Once the DBPS improvements are completed, maintenance for the channel will transition to El Paso County. The proposed water quality pond is to be privately maintained. Private facilities will be maintained by the Bent Grass Metropolitan District. After completion of construction and upon the Board of County Commissioners acceptance, all public drainage facilities within easements and public Right-of-Way will be owned and maintained by El Paso County. Channel improvements will be considered under the final drainage report for the channel improvement design package.

XIII. Wetlands Mitigation

No wetlands are located on site.

XIV. Floodplain Statement

A portion of the project site lies within Zone AE Special Flood Hazard Area as defined by the FIRM Map number 08041C0553G effective December 7, 2018. A copy of the FIRM Panel is included in Appendix A.

The portion of channel that has a floodplain designation is only the RWT210 and RWT204 portions of the channel. It is unknown why the western channel, RWT202 is unmapped since it is the larger contributor

regarding flow rates. Discussions have occurred with PPRBD and a no rise certificate will be required for the existing channel. Models have been obtained from FEMA which show that the FEMA discharges are higher than the DBPS. Therefore, the culvert crossing at Bent Grass Meadows Parkway was sized per the FEMA flows and not the DBPS. The no rise certification will be provided under a separate report, when channel improvements are addressed with future filings.

XV. Drainage/Bridge Fees and Credits/Reimbursements

The site lies within the Falcon Drainage Basin. The DBPS was approved in 2013 and has drainage and bridge fees associated with the basin.

The project site has a total area of 36.40 acres. The tracts account for a total of 20.46 acres, 108 residential lots are 11.30 acres and 4.64 acres of right-of-way. The following calculations for the imperviousness of this development have been computed as follows:

Average Residential lot size: 11.30 acres / 108 lots = 4560 sf/lot

Average lot imperviousness = 2000 sf

Average Residential imperviousness: 2000/4560 = 43.86%

ROW area is 100% impervious
Open Space is 0% impervious

Average imperviousness for developed area:
(0.4386 x 11.30) + (1.0 x 4.64) + (0 x 20.46) / 36.40 = 0.2636

36.40 acres x 26.36% = 9.60 Impervious Acres

Therefore, the drainage and bridge fees (2021) are:

Drainage: $31,885 x 9.60 Imp. Acres = $306,096.00

Bridge: $4,380 x 9.60 Imp. Acres = $42,048.00

Per discussions with El Paso County the fees will be offset by the cost of regional improvements. These regional improvements include the construction of Pond WU ($489,284.78) and the construction of the channel ($948,491.50). From the construction of the channel improvements

Bent Grass Residential Subdivision Filing No. 2 Final Drainage Report 2019 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/ Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Falcon Drainage Fee Basin						
Drainage Fee	23.45	$29,622	$694,635.90	$489,284.78	$205,351.12	$0.00
Bridge Fee	23.45	$4,069	$95,418.05	$0.00	$95,418.05	$0.00
				$489,284.78	***$300,769.17***	***$0.00***

Falcon Meadows at Bent Grass Filing No. 1 Final Drainage Report 2021 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/ Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Falcon Drainage Fee Basin						
Drainage Fee	5.73	$31,885	$182,701.05	$948,491.50	$0.00	$765,790.45
Bridge Fee	5.73	$4,380	$25,097.40	$0.00	$0.00	$740,693.05
				$948,491.50	***$0.00***	***$740,693.05***

Falcon Meadows at Bent Grass Filing No. 2 Final Drainage Report 2021 Original Drainage and Bridge Fees						
	Impervious Area (Ac.)	Fee/ Platted Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Falcon Drainage Fee Basin						
Drainage Fee	9.60	$31,885	$306,096.00	$0.00	$0.00	$434,597.05
Bridge Fee	9.60	$4,380	$42,048.00	$0.00	$0.00	$392,549.05
				$0.00	***$0.00***	***$392,549.05***

Below is a cost estimate for the improvements proposed with this filing.

Item	Quantity	Unit	Unit Cost	Cost
Storm Drain Improvements (Public)				
5' CDOT Type R Inlet (Public)	1	EA	$ 6,500.00	$ 6,500.00
10' CDOT Type R Inlet (Public)	1	EA	$ 8,000.00	$ 8,000.00
15' CDOT Type R Inlet (Public)	4	EA	$ 9,800.00	$ 39,200.00
4' Manhole - Type II (Public)	8	EA	$ 3,000.00	$ 24,000.00
5' Manhole - Type II (Public)	2	EA	$ 3,500.00	$ 7,000.00
6' Manhole - Type II (Public)	1	EA	$ 4,000.00	$ 4,000.00
7' Manhole - Type II (Public)	1	EA	$ 4,500.00	$ 4,500.00
18" RCP Storm Drain (Public)	268	LF	$ 60.00	$ 16,080.00
24" RCP Storm Drain (Public)	997	LF	$ 70.00	$ 69,790.00
30" RCP Storm Drain (Public)	137	LF	$ 95.00	$ 13,015.00
36" RCP Storm Drain (Public)	44	LF	$ 135.00	$ 5,940.00
42" RCP Storm Drain (Public)	60	LF	$ 160.00	$ 9,600.00
18" FES	1	EA	$ 750.00	$ 750.00
Subtotal				$ 208,375.00
WQCV Detention Ponds (Private)				
Pond (North)	1	EA	$ 80,000.00	$ 80,000.00
Subtotal				$ 80,000.00
Total				$ 288,375.00
Contingency			10%	$ 28,837.50
Grand Total				$ 317,212.50

XVI. Conclusion

The Bent Grass Residential Subdivision lies within the West Tributary of the Falcon Area Watershed. Detention for the site is provided in two existing and one proposed on-site WQCV ponds to provide water quality for the entire tributary area. The proposed development will not have any adverse impacts on downstream developments or existing drainageways.

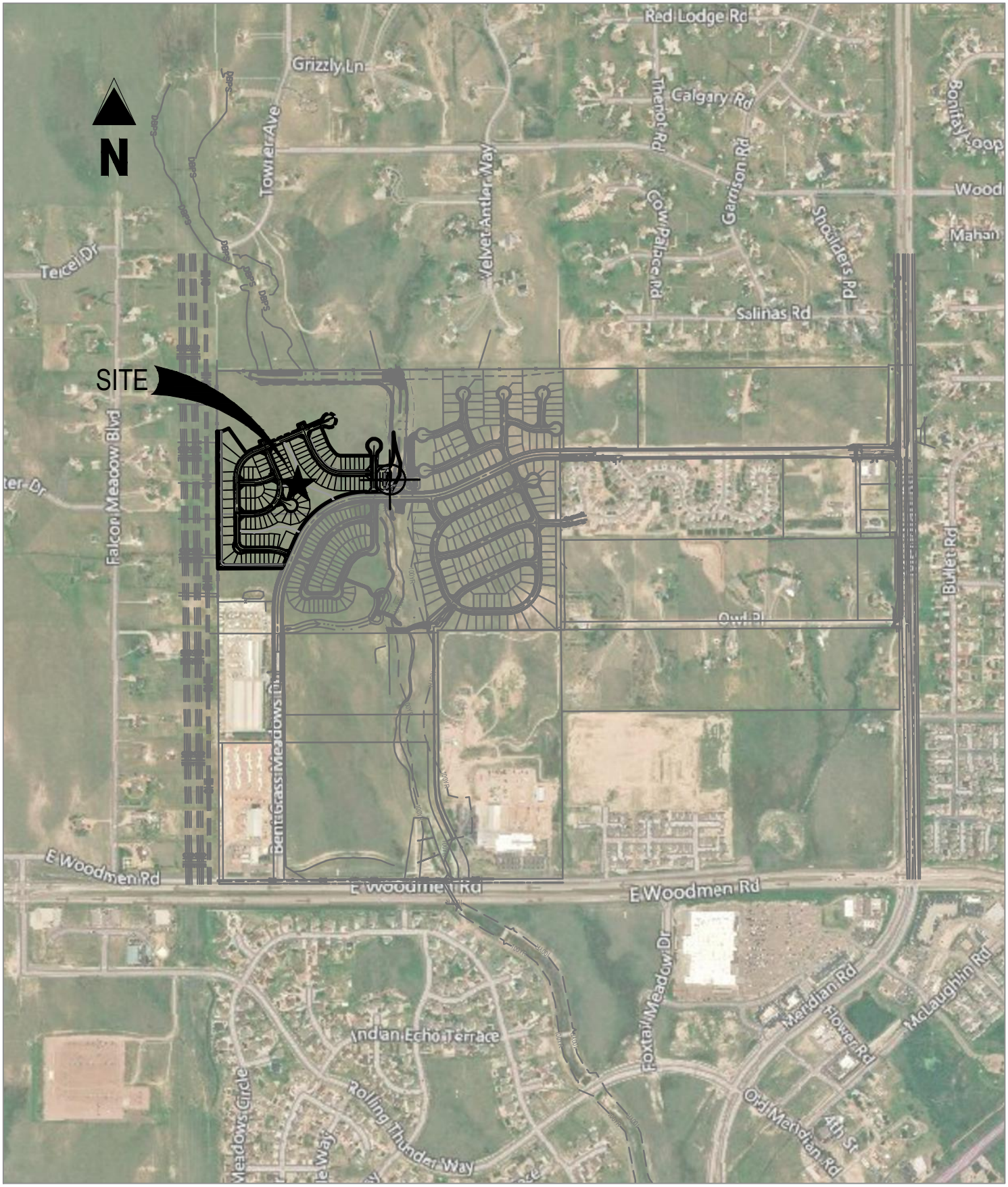
All drainage facilities within this report were sized according to the Drainage Criteria Manuals. Bent Grass Metropolitan District will own and maintain the channels until such a time that all final improvements have been constructed. At that time, channel corridors will become publicly owned and maintained and shall be the responsibility of El Paso County. Upon development of future filings within the Bent Grass Residential Subdivision, separate Final Drainage Reports will be required to be submitted and approved by El Paso County.

XVII. References

1. *City of Colorado Springs/County of El Paso Drainage Criteria Manual*, October 1991.
2. *Drainage Criteria Manual, Volume 2*, City of Colorado Springs, November 2002.
3. *Urban Storm Drainage Criteria Manual*, Urban Drainage and Flood Control District, January 2016 (with current revisions).
4. *Falcon Drainage Basin Planning Study*, by Matrix Design Group, September 2015.
5. *Master Development Drainage Plan and Preliminary Drainage Plan – Bent Grass Subdivision*, by Kiowa Engineering Corporation, December 2006.
6. *Final Drainage Report for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2014.
7. *Final Drainage Report Addendum for Bent Grass Residential (Filing No. 1)*, by Classic Consulting Engineers & Surveyors, LLC, August 2015.
8. *Master Development Drainage Plan for The Ranch*, by Classic Consulting Engineers & Surveyors, LLC, November 2018.
9. *Falcon Highlands Master Development Drainage Plan & Preliminary Drainage Report & Final Drainage Report for Filing 1*, by URS, January 2005.
10. *Final Drainage Report and Erosion Control Plan – Latigo Business Center Filing No. 1 A Re-subdivision of a Portion of Latigo Business and Research Center Filing No. 1*, by Kiowa Engineering Corporation, November 2004.
11. *Final Drainage Report for Bent Grass Residential (Filing No. 2),* by Galloway & Company, May 2020.
12. *Preliminary Drainage Report-Falcon Meadows at Bent Grass,* by Galloway & Company, February 2021.
13. *Final Drainage Report for Falcon Meadows at Bent Grass Filing No. 1,* by Galloway & Company, under review.

APPENDIX A

Exhibits and Figures



FALCON MEADOWS AT BENT GRASS
FILING NO. 2

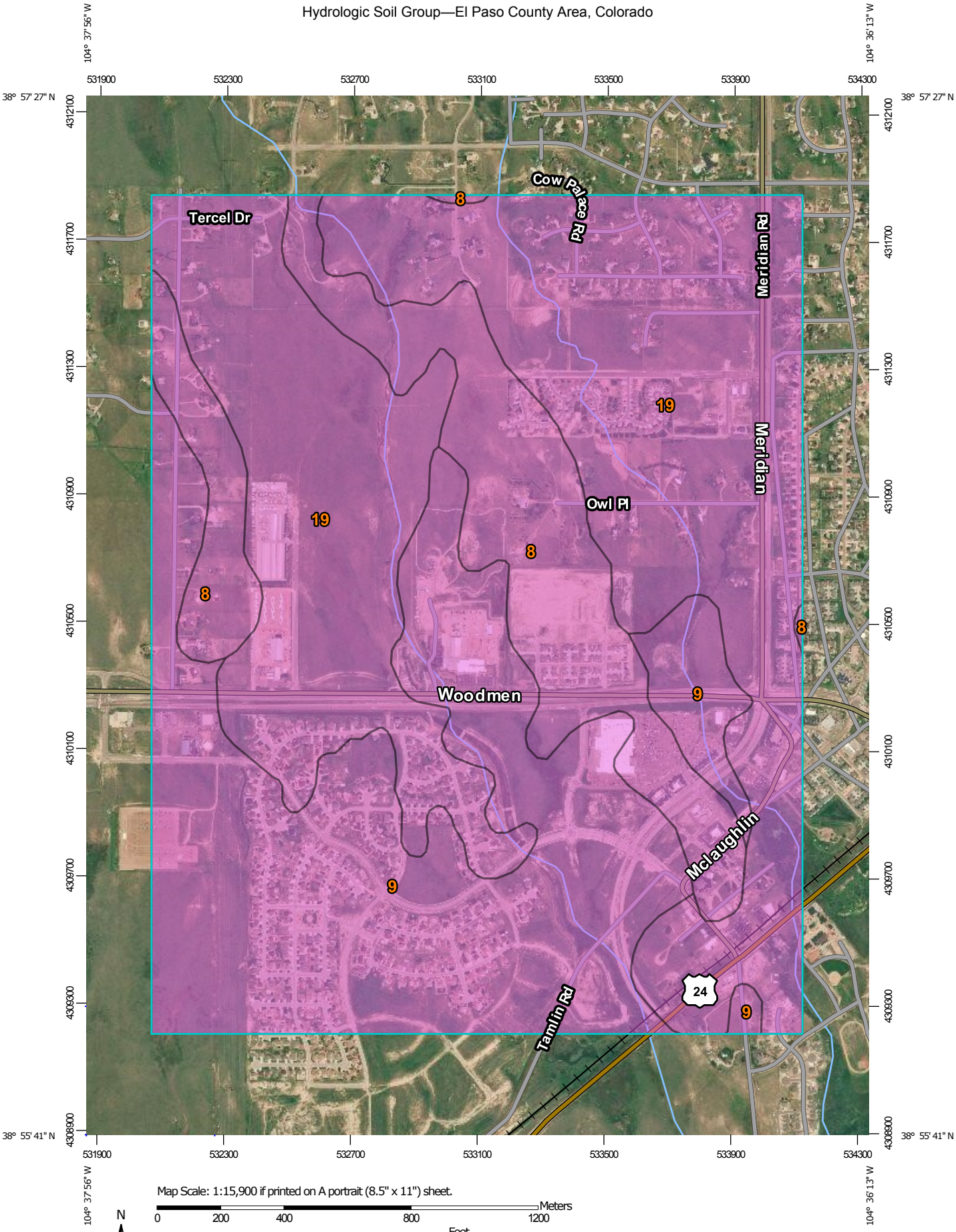
BENT GRASS MEADOWS DRIVE
SCALE: 1"=1,000'

VICINITY MAP

Project No:	CLH000018.20
Drawn By:	TJE
Checked By:	CMD
Date:	06/19/2020

Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220 • GallowayUS.com

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:15,900 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 16, Sep 10, 2018

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

Date(s) aerial images were photographed: Jun 7, 2016—Aug 17, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	214.3	16.0%
9	Blakeland-Fluvaquentic Haplaquolls	A	465.8	34.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	662.6	49.3%
Totals for Area of Interest			**1,342.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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

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

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

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

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

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

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

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

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

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

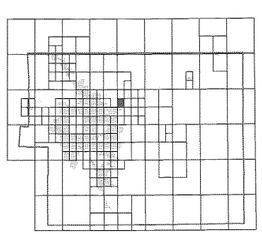
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

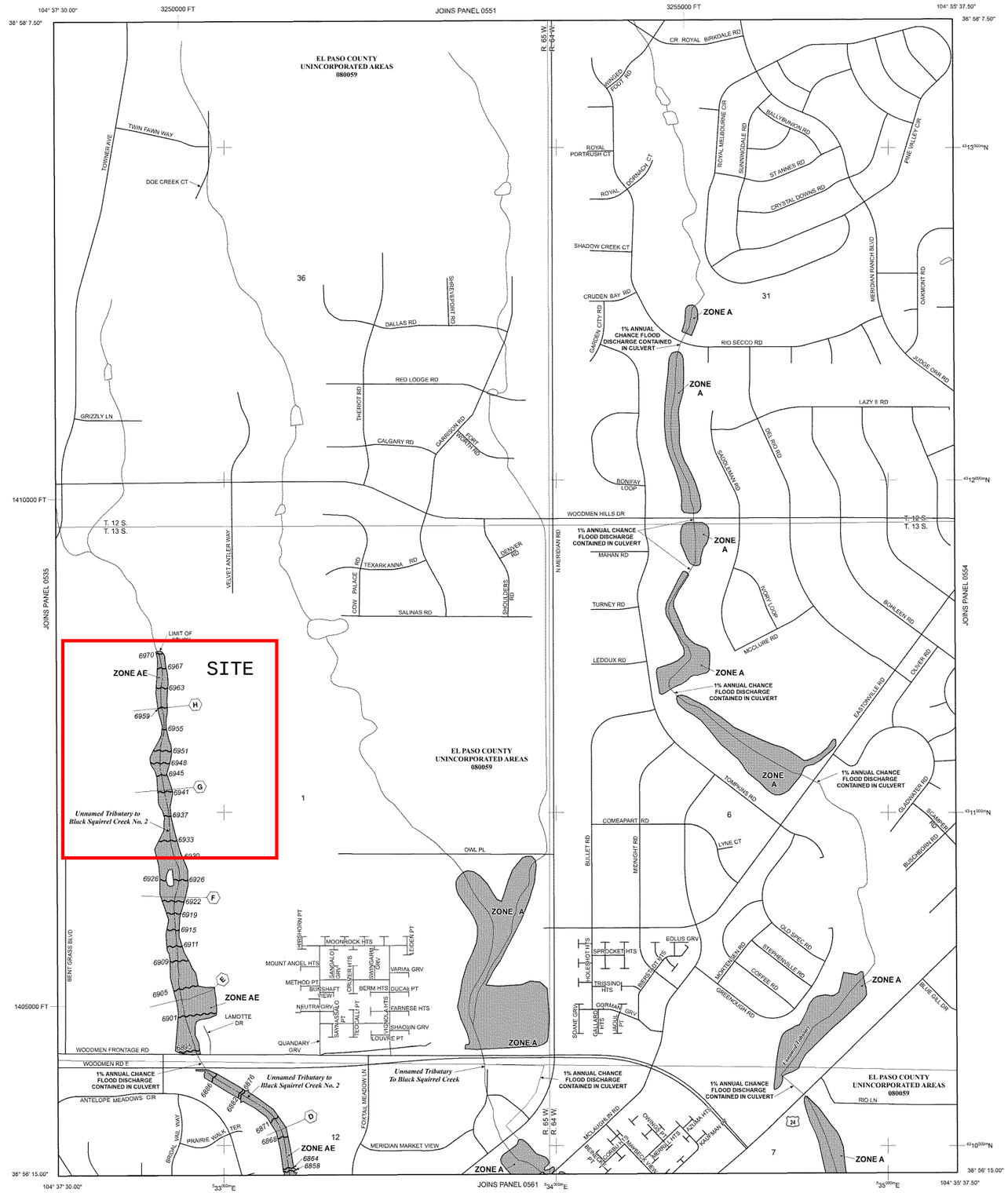
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

A — A	Cross section line
23 - - - - 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0553G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 553 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0553	G

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

MAP NUMBER
08041C0553G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B

Hydrologic Computations

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer:	CMWJ
Company:	Galloway & Co.
Date:	May 27, 2021
Project:	Falcon Meadows at Bent Grass Filing No. 2
Location:	North WQ Pond

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	C-1a	C-1b	C-1c	C-1d	C-1e	C-1f	C-2	C-3	C-4	C-5	D-1a	D-1f		
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam		
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.380	0.450	1.770	1.720	0.290	0.080	3.980	0.180	2.670	0.600	2.970	1.610		
Directly Connected Impervious Area (DCIA, acres)	0.150	0.100	0.630	1.720	0.290	0.080	0.000	0.140	2.670	0.000	0.110	0.110		
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Separate Pervious Area (SPA, acres)	0.230	0.350	1.140	0.000	0.000	0.000	3.980	0.040	0.000	0.600	2.860	1.500		
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	V	C	C		

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.380	0.450	1.770	1.720	0.290	0.080	3.980	0.180	2.670	0.600	2.970	1.610		
Directly Connected Impervious Area (DCIA, %)	39.5%	22.2%	35.6%	100.0%	100.0%	100.0%	0.0%	77.8%	100.0%	0.0%	3.7%	6.8%		
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
Separate Pervious Area (SPA, %)	60.5%	77.8%	64.4%	0.0%	0.0%	0.0%	100.0%	22.2%	0.0%	100.0%	96.3%	93.2%		
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
I_a Check	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7		
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00		
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	39.5%	22.2%	35.6%	100.0%	100.0%	100.0%	0.0%	77.8%	100.0%	0.0%	3.7%	6.8%		
Effective Imperviousness for WQCV Event:	39.5%	22.2%	35.6%	100.0%	100.0%	100.0%	0.0%	77.8%	100.0%	0.0%	3.7%	6.8%		
Effective Imperviousness for 5-Year Event:	39.5%	22.2%	35.6%	100.0%	100.0%	100.0%	0.0%	77.8%	100.0%	0.0%	3.7%	6.8%		
Effective Imperviousness for 100-Year Event:	39.5%	22.2%	35.6%	100.0%	100.0%	100.0%	0.0%	77.8%	100.0%	0.0%	3.7%	6.8%		
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	0.0%	0.0%	N/A	0.0%	0.0%	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.2%	0.0%	0.0%	0.1%	0.3%	N/A	0.1%	0.0%	N/A	0.4%	0.2%	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	35.9%
Total Site Effective Imperviousness for WQCV Event:	35.9%
Total Site Effective Imperviousness for 5-Year Event:	35.9%
Total Site Effective Imperviousness for 100-Year Event:	35.9%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

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

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

Historic Computations

COMPOSITE % IMPERVIOUS CALCULATIONS: HISTORIC

Subdivision: Falcon Meadows at Bent Grass
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019.20
Calculated By: CMWJ
Checked By:
Date: 4/15/21

Basin ID	Total Area (ac)	Paved/Dirt Roads			Lawns			Roofs			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
A-1	5.42	100	0.16	3.00	2	5.26	1.90	90	0.00	0.00	4.9
A-2	18.00	100	0.00	0.00	2	18.00	2.00	90	0.00	0.00	2.0
A-3	19.59	100	0.00	0.00	2	19.59	2.00	90	0.00	0.00	2.0
A-4	23.81	100	0.57	2.40	2	23.12	1.90	90	0.12	0.50	4.8
B-1	32.53	100	0.00	0.00	2	32.53	2.00	90	0.00	0.00	2.0
B-2	4.51	100	0.00	0.00	2	4.51	2.00	90	0.00	0.00	2.0
B-3	16.18	100	1.00	6.20	2	15.18	1.90	90	0.00	0.00	8.1
OS-1	13.06	100	0.84	6.40	2	11.65	1.80	90	0.57	3.90	12.1
OS-2	17.81	100	2.00	11.20	2	15.18	1.70	90	0.63	3.20	16.1
OS-4	30.69	100	1.42	4.60	2	28.41	1.90	90	0.86	2.50	9.0
OS-5	14.13	100	0.17	1.20	2	13.74	1.90	90	0.22	1.40	4.5
OS-6	5.81	100	0.00	0.00	2	5.81	2.00	90	0.00	0.00	2.0

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS: HISTORIC

Subdivision: Falcon Meadows at Bent Grass
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019.20
Calculated By: CMWJ
Checked By:
Date: 4/15/21

Basin ID	Total Area (ac)	Paved Roads			Lawns/Undeveloped			Roofs			Composite	Composite
		C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}
A-1	5.42	0.90	0.96	0.16	0.09	0.36	5.26	0.73	0.81	0.00	0.11	0.38
A-2	18.00	0.90	0.96	0.00	0.09	0.36	18.00	0.73	0.81	0.00	0.09	0.36
A-3	19.59	0.90	0.96	0.00	0.09	0.36	19.59	0.73	0.81	0.00	0.09	0.36
A-4	23.81	0.90	0.96	0.57	0.09	0.36	23.12	0.73	0.81	0.12	0.11	0.38
B-1	32.53	0.90	0.96	0.00	0.09	0.36	32.53	0.73	0.81	0.00	0.09	0.36
B-2	4.51	0.90	0.96	0.00	0.09	0.36	4.51	0.73	0.81	0.00	0.09	0.36
B-3	16.18	0.90	0.96	1.00	0.09	0.36	15.18	0.73	0.81	0.00	0.14	0.40
OS-1	13.06	0.90	0.96	0.84	0.09	0.36	11.65	0.73	0.81	0.57	0.17	0.42
OS-2	17.81	0.90	0.96	2.00	0.09	0.36	15.18	0.73	0.81	0.63	0.20	0.44
OS-4	30.69	0.90	0.96	1.42	0.09	0.36	28.41	0.73	0.81	0.86	0.15	0.40
OS-5	14.13	0.90	0.96	0.17	0.09	0.36	13.74	0.73	0.81	0.22	0.11	0.37
OS-6	5.81	0.90	0.96	0.00	0.09	0.36	5.81	0.73	0.81	0.00	0.09	0.36

C values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. (Referencing UDFCD 2001)

STANDARD FORM SF-2: HISTORIC
TIME OF CONCENTRATION

Subdivision: Falcon Meadows at Bent Grass
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019.20
Calculated By: CMWJ
Checked By:
Date: 4/15/21

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_{100}	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	Urbanized T_c (MIN)	T_c (MIN)
A-1	5.42	A	4.90	0.38	0.11	300	2.5	23.0	466	2.5	15.0	2.4	3.3	26.3	766.0	14.3	14.3
A-2	18.00	A	2.00	0.36	0.09	300	2.4	23.9	1130	2.0	15.0	2.1	8.9	32.8	1430.0	17.9	17.9
A-3	19.59	A	2.00	0.36	0.09	300	2.7	23.0	760	2.7	15.0	2.5	5.1	28.1	1060.0	15.9	15.9
A-4	23.81	A	4.80	0.38	0.11	300	2.0	24.9	1500	2.0	15.0	2.1	11.8	36.6	1800.0	20.0	20.0
B-1	32.53	A	2.00	0.36	0.09	300	2.6	23.3	1100	2.6	15.0	2.4	7.6	30.9	1400.0	17.8	17.8
B-2	4.51	A	2.00	0.36	0.09	300	3.0	22.2	323	5.0	15.0	3.4	1.6	23.8	623.0	13.5	13.5
B-3	16.18	A	8.10	0.40	0.14	300	2.9	21.4	780	2.9	15.0	2.6	5.1	26.4	1080.0	16.0	16.0
OS-1	13.06	A	12.10	0.42	0.17	300	2.5	21.7	1420	2.5	15.0	2.4	10.0	31.7	1720.0	19.6	19.6
OS-2	17.81	A	16.10	0.44	0.20	300	2.3	21.6	1370	2.3	15.0	2.3	10.0	31.6	1670.0	19.3	19.3
OS-4	30.69	A	9.00	0.40	0.15	300	2.3	22.9	2600	2.3	15.0	2.3	19.0	42.0	2900.0	26.1	26.1
OS-5	14.13	A	4.50	0.37	0.11	300	2.5	23.1	1400	3.0	15.0	2.6	9.0	32.1	1700.0	19.4	19.4
OS-6	5.81	A	2.00	0.36	0.09	300	2.0	25.4	400	2.0	15.0	2.1	3.1	28.6	700.0	13.9	13.9

NOTES:

T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33), S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

Tc Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

STANDARD FORM SF-3: HISTORIC

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Falcon Meadows at Bent Grass
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019.20
Calculated By: CMWJ
Checked By:
Date: 4/15/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
		OS-1	13.06	0.17	19.6	2.22	3.12	6.9													
		A-1	5.42	0.11	14.3	0.62	3.60	2.2													
	1								19.6	2.84	3.12	8.9									Total flow going offsite to Bent Grass F1 Residential
		OS-2	17.81	0.20	19.3	3.63	3.14	11.4													
		A-2	18.00	0.09	17.9	1.62	3.25	5.3													
	2								19.3	5.25	3.14	16.5									Total Flow entering Junction of RWT202&204
	3	A-3	19.59	0.09	15.9	1.76	3.43	6.0													
		OS-4	30.69	0.15	26.1	4.46	2.69	12.0													
		A-4	23.81	0.11	20.0	2.68	3.09	8.3													
	4								26.1	7.14	2.69	19.2									
	5	B-1	32.53	0.09	17.8	2.93	3.27	9.6													
	6	B-2	4.51	0.09	13.5	0.41	3.68	1.5													
	7	B-3	16.18	0.14	16.0	2.27	3.42	7.8													
	8							29.0													Reach RWT204 & Basin WT200 - Per Matrix DBPS Existing Hydrology
	9							14.0													RWT202 - Per Matrix DBPS Existing Hydrology
	10							32.0													RWT210 - Per Matrix DBPS Existing Hydrology
	20							98.1													Flows into Basin OS-5 from Bent Grass Filing No. 3
		OS-5	14.13	0.11	19.4	1.55	3.13	4.9													
	11											103.0									Flows into Basin OS-6
		OS-6	5.81	0.09	13.9	0.52	3.64	1.9													
	12											104.8									Existing Sediment Pond in Basin and then flows to Bent Grass Meadows Drive

STANDARD FORM SF-3: HISTORIC

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Falcon Meadows at Bent Grass
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019.20
Calculated By: CMWJ
Checked By:
Date: 4/15/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
		OS-1	13.06	0.42	19.6	5.46	5.24	28.6													
		A-1	5.42	0.38	14.3	2.05	6.04	12.4													
	1								19.6	7.51	5.24	39.4									Total flow going offsite to Bent Grass F1 Residential
		OS-2	17.81	0.44	19.3	7.90	5.28	41.7													
		A-2	18.00	0.36	17.9	6.48	5.46	35.4													
	2								19.3	14.38	5.28	75.9									Total Flow entering Junction of RWT202&204
	3	A-3	19.59	0.36	15.9	7.05	5.77	40.7													
		OS-4	30.69	0.40	26.1	12.29	4.51	55.4													
		A-4	23.81	0.38	20.0	8.97	5.19	46.6													
	4								26.1	21.26	4.51	95.9									
	5	B-1	32.53	0.36	17.8	11.71	5.48	64.2													
	6	B-2	4.51	0.36	13.5	1.62	6.18	10.0													
	7	B-3	16.18	0.40	16.0	6.42	5.75	36.9													
	8							233.0													Reach RWT204 & Basin WT200 - Per Matrix DBPS Existing Hydrology
	9							770													RWT202 - Per Matrix DBPS Existing Hydrology
	10							880													RWT210 - Per Matrix DBPS Existing Hydrology
	20							226													Flows into Basin OS-5 from Bent Grass Filing No. 3
		OS-5	14.13	0.37	19.4	5.29	5.26	27.8													
	11											253.8									Flows into Basin OS-6
		OS-6	5.81	0.36	13.9	2.09	6.10	12.7													
	12											266.6									Existing Sediment Pond in Basin and then flows to Bent Grass Meadows Drive

Existing Computations

COMPOSITE % IMPERVIOUS CALCULATIONS: CURRENT/EXISTING CONDITIONS

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

1	2	3	4	5	6	7	8	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
		Paved/Gravel Roads			Lawns/Undeveloped			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Basins Total
Basin ID	Total Area (ac)	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	Weighted % Imp.
B-1	6.78	100	0.00	0.0	2	6.78	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
B-2	4.16	100	0.00	0.0	2	4.16	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
D-4a	0.98	100	0.21	21.4	2	0.00	0.0	65.0	0.77	51.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	72.5
D-4b	0.95	100	0.43	45.3	2	0.00	0.0	65.0	0.52	35.6	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	80.9
D-4c	1.22	100	0.43	35.2	2	0.24	0.4	65.0	0.55	29.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	64.9
D-5	1.08	100	0.22	20.4	2	0.11	0.2	65.0	0.75	45.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.7
D-6a	1.33	100	0.44	33.1	2	0.00	0.0	65.0	0.89	43.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	76.6
D-6b	2.69	100	0.59	21.9	2	0.00	0.0	65.0	2.10	50.7	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	72.6
D-7	7.65	100	0.00	0.0	2	6.22	1.6	65.0	1.43	12.2	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	13.8
D-8	1.69	100	0.00	0.0	2	0.11	0.1	65.0	1.58	60.8	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	60.9
E-1	1.71	100	0.78	45.6	2	0.23	0.3	65.0	0.00	0.0	40	0.70	16.4	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	62.3
E-2	0.68	100	0.56	82.4	2	0.12	0.4	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	82.8
E-3	0.78	100	0.69	88.5	2	0.09	0.2	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	88.7
E-4	0.91	100	0.73	80.2	2	0.18	0.4	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	80.6
E-5	0.89	100	0.79	88.8	2	0.10	0.2	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	89.0
I-1	0.31	100	0.22	71.0	2	0.09	0.6	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	71.6
OS-1	32.28	100	2.15	6.7	2	29.25	1.8	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	11.0
OS-2	20.07	80	0.90	3.6	2	18.62	1.9	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	8.0
OS-3	10.61	80	0.48	3.6	2	9.84	1.9	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	8.0
OS-4	4.46	100	0.00	0.0	2	0.00	0.0	65.0	2.28	33.2	40	1.46	13.1	30	0.00	0.0	25	0.00	0.0	20	0.72	3.2	49.5
OS-5	0.46	100	0.00	0.0	2	0.00	0.0	65.0	0.46	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
OS-6	1.17	100	0.00	0.0	2	0.00	0.0	65.0	1.17	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
EX-1	1.19	100	0.00	0.0	2	1.19	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-2	1.60	100	0.00	0.0	2	1.60	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-3	0.66	100	0.00	0.0	2	0.66	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-4	15.41	100	0.00	0.0	2	15.41	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-5	0.06	100	0.00	0.0	2	0.06	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-6	4.78	100	0.00	0.0	2	4.78	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-7	12.18	100	0.00	0.0	2	12.18	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-8	1.63	100	0.00	0.0	2	1.63	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0

Lot Type Identification:	
Lot Size (SF)	*Lot Size (Acre)*
0 - 8,167	1/8 Acre
8,168 - 12,704	1/4 Acre
12,705 - 18,149	1/3 Acre
18,150 - 32,670	1/2 Acre
32,671 - 43,560	1 Acre

NOTES:
% Impervious values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001)

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS: CURRENT/EXISTING CONDITIONS

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Basin ID	**Total Area (ac)**	**Paved/Gravel Roads**			**Lawns/Undeveloped**			**Roofs**			**Residential - 1/8 Acre**			**Residential - 1/4 Acre**			**Residential - 1/3 Acre**			**Residential - 1/2 Acre**			**Residential - 1 Acre**			**Composite C_5**	**Composite C_{100}**
		C_5	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**		
B-1	6.78	0.90	0.96	0.00	0.09	0.36	6.78	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
B-2	4.16	0.90	0.96	0.00	0.09	0.36	4.16	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
D-4a	0.98	0.90	0.96	0.21	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.77	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.55	0.67
D-4b	0.95	0.90	0.96	0.43	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.52	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.65	0.76
D-4c	1.22	0.90	0.96	0.43	0.09	0.36	0.24	0.73	0.81	0.00	0.45	0.59	0.55	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.54	0.68
D-5	1.08	0.90	0.96	0.22	0.09	0.36	0.11	0.73	0.81	0.00	0.45	0.59	0.75	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.51	0.64
D-6a	1.33	0.90	0.96	0.44	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.89	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.60	0.71
D-6b	2.69	0.90	0.96	0.59	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.10	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.55	0.67
D-7	7.65	0.90	0.96	0.00	0.09	0.36	6.22	0.73	0.81	0.00	0.45	0.59	1.43	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.16	0.40
D-8	1.69	0.90	0.96	0.00	0.09	0.36	0.11	0.73	0.81	0.00	0.45	0.59	1.58	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.43	0.58
E-1	1.71	0.90	0.96	0.78	0.09	0.36	0.23	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.70	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.55	0.69
E-2	0.68	0.90	0.96	0.56	0.09	0.36	0.12	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.76	0.85
E-3	0.78	0.90	0.96	0.69	0.09	0.36	0.09	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.81	0.89
E-4	0.91	0.90	0.96	0.73	0.09	0.36	0.18	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.74	0.84
E-5	0.89	0.90	0.96	0.79	0.09	0.36	0.10	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.81	0.89
I-1	0.31	0.90	0.96	0.22	0.09	0.36	0.09	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.66	0.79
OS-1	32.28	0.90	0.96	2.15	0.09	0.36	29.25	0.73	0.81	0.88	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.16	0.41
OS-2	20.07	0.90	0.96	0.90	0.09	0.36	18.62	0.73	0.81	0.56	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.14	0.40
OS-3	10.61	0.90	0.96	0.48	0.09	0.36	9.84	0.73	0.81	0.30	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.14	0.40
OS-4	4.46	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.28	0.30	0.50	1.46	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.72	0.36	0.54
OS-5	0.46	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.46	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.45	0.59
OS-6	1.17	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.17	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.45	0.59
EX-1	1.19	0.90	0.96	0.00	0.09	0.36	1.19	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-2	1.60	0.90	0.96	0.00	0.09	0.36	1.60	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-3	0.66	0.90	0.96	0.00	0.09	0.36	0.66	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-4	15.41	0.90	0.96	0.00	0.09	0.36	15.41	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-5	0.06	0.90	0.96	0.00	0.09	0.36	0.06	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-6	4.78	0.90	0.96	0.00	0.09	0.36	4.78	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-7	12.18	0.90	0.96	0.00	0.09	0.36	12.18	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-8	1.63	0.90	0.96	0.00	0.09	0.36	1.63	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36

Lot Type Identification:

Lot Size (SF)	*Lot Size (Acre)*
0 - 8,167	<= 1/8 Acre
8,168 - 12,704	1/4 Acre
12,705 - 18,149	1/3 Acre
18,150 - 32,670	1/2 Acre
32,671 - 43,560	1 Acre

NOTES:
C values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001)
Coeffficients use HSG A&B soils - Refer to "Appendix A: Exhibits and Figures" for soil map

STANDARD FORM SF-2: CURRENT/EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					Tc CHECK			
DATA						(T_i)			(T_t)					(URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT	Urbanized T_c (MIN)	T_c (MIN)
B-1	6.78	A	2.0	0.09	0.36	90	6.4	9.5	2000	1.7	15	2.0	17.0	26.5	2090.0	21.6	21.6
B-2	4.16	A	2.0	0.09	0.36	160	11.0	10.5	920	1.6	15	1.9	8.1	18.6	1080.0	16.0	16.0
D-4a	0.98	A	72.5	0.55	0.67	100	2.3	7.6	420	1.0	20	2.0	3.5	11.1	520.0	12.9	11.1
D-4b	0.95	A	80.9	0.65	0.76	75	1.5	6.2	480	1.0	20	2.0	4.0	10.2	555.0	13.1	10.2
D-4c	1.22	A	64.9	0.54	0.68	70	0.5	10.8	690	1.0	20	2.0	5.8	16.6	760.0	14.2	14.2
D-5	1.08	A	65.7	0.51	0.64	100	2.0	8.6	300	1.1	20	2.1	2.4	11.0	400.0	12.2	11.0
D-6a	1.33	A	76.6	0.60	0.71	20	2.0	3.2	385	1.0	20	2.0	3.2	6.5	405.0	12.3	6.5
D-6b	2.69	A	72.6	0.55	0.67	45	2.0	5.4	870	1.0	20	2.0	7.3	12.6	915.0	15.1	12.6
D-7	7.65	A	13.8	0.16	0.40	200	7.5	12.4	665	1.0	15	1.5	7.4	19.8	865.0	14.8	14.8
D-8	1.69	A	60.9	0.43	0.58	125	3.7	8.9	600	1.0	15	1.5	6.7	15.5	725.0	14.0	14.0
E-1	1.71	A	62.3	0.55	0.69	25	2.0	4.0	940	1.0	20	2.0	7.8	11.8	965.0	15.4	11.8
E-2	0.68	A	82.8	0.76	0.85	25	2.0	2.5	665	1.6	20	2.5	4.4	6.9	690.0	13.8	6.9
E-3	0.78	A	88.7	0.81	0.89	25	2.0	2.1	632	1.0	20	2.0	5.3	7.4	657.0	13.7	7.4
E-4	0.91	A	80.6	0.74	0.84	25	2.0	2.6	913	2.0	20	2.8	5.4	8.0	938.0	15.2	8.0
E-5	0.89	A	89.0	0.81	0.89	25	2.0	2.1	903	2.1	20	2.9	5.2	7.3	928.0	15.2	7.3
I-1	0.31	A	71.6	0.66	0.79	25	2.0	3.2	135	2.0	20	2.8	0.8	4.0	160.0	10.9	5.0
OS-1	32.28	A	11.0	0.16	0.41	100	2.4	12.9	2100	2.2	15	2.2	15.7	28.6	2200.0	22.2	22.2
OS-2	20.07	A	8.0	0.14	0.40	100	2.3	13.3	1400	2.3	15	2.3	10.3	23.6	1500.0	18.3	18.3
OS-3	10.61	A	8.0	0.14	0.40	100	2.0	14.0	1500	2.0	15	2.1	11.8	25.7	1600.0	18.9	18.9
OS-4	4.46	A	49.5	0.36	0.54	100	2.0	10.8	910	1.2	20	2.2	6.9	17.7	1010.0	15.6	15.6
OS-5	0.46	A	65.0	0.45	0.59	15	2.0	3.7	190	1.0	20	2.0	1.6	5.2	205.0	11.1	5.2
OS-6	1.17	A	65.0	0.45	0.59	85	0.2	18.7	430	0.9	20	1.9	3.8	22.5	515.0	12.9	12.9
EX-1	1.19	A	2.0	0.09	0.36	300	2.7	23.0	690	2.7	15	2.5	4.7	27.7	990.0	15.5	15.5
EX-2	1.60	A	2.0	0.09	0.36	200	2.7	18.8	100	2.7	15	2.5	0.7	19.5	300.0	11.7	11.7
EX-3	0.66	A	2.0	0.09	0.36	100	5.0	10.8	30	2.7	15	2.5	0.2	11.0	130.0	10.7	10.7
EX-4	15.41	A	2.0	0.09	0.36	300	2.6	23.3	800	2.6	15	2.4	5.5	28.8	1100.0	16.1	16.1
EX-5	0.06	A	2.0	0.09	0.36	10	2.0	4.6	350	2.6	15	2.4	2.4	7.1	360.0	12.0	7.1
EX-6	4.78	A	2.0	0.09	0.36	300	2.3	24.3	1050	2.1	15	2.2	8.1	32.3	1350.0	17.5	17.5
EX-7	12.18	A	2.0	0.09	0.36	300	2.2	24.6	1300	2.0	15	2.1	10.2	34.8	1600.0	18.9	18.9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN						**INITIAL/OVERLAND**			**TRAVEL TIME**					**Tc CHECK**			
DATA						**(T_i)**			**(T_t)**					**(URBANIZED BASINS)**			**FINAL**
BASIN ID	**D.A. (AC)**	**Hydrologic Soils Group**	**Impervious (%)**	**C_5**	**C_{100}**	**L (FT)**	**S (%)**	**T_i (MIN)**	**L (FT)**	**S (%)**	**Cv**	**VEL. (FPS)**	**T_t (MIN)**	**COMP. T_c (MIN)**	**TOTAL LENGTH(FT**	**Urbanized T_c (MIN)**	**T_c (MIN)**
EX-8	1.63	A	2.0	0.09	0.36	10	2.0	4.6	295	2.8	15	2.5	2.0	6.6	305.0	11.7	6.6

NOTES:

T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33), S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

Tc Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

Type of Land Surface	Cv
Heavy Meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

STANDARD FORM SF-3: CURRENT/EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
		RWT202	1574.40						46.6	120.88	1.82	220.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.37	1.78	3.94	7.0									From Falcon DBPS by Matrix
		WT200	192.00						37.8	24.41	2.13	52.0									From Falcon DBPS by Matrix
	21	OS-1	32.28	0.16	22.2	5.16	2.93	15.1	46.6	152.23	1.82	277.1									Flows obtained from Bent Grass Filing No. 2 FDR. Q=65.1 CFS Cumulation of northern off-site flows entering Basin B-1
	1	OS-4	4.46	0.36	15.6	1.61	3.46	5.6					1.2	5.6				910	2.2	6.9	Flows from Basin B-1 of Bent Grass Filing No. 2 FDR into Basin EX-2
	2	OS-5	0.46	0.45	5.2	0.21	5.10	1.1					1	1.1				190	2.0	1.6	Flows from Basin B-2 of Bent Grass Filing No. 2 FDR into Basin EX-2
	3	OS-6	1.17	0.45	12.9	0.53	3.75	2.0					0.9	2.0				430	1.9	3.8	Flows from Basin B-3 of Bent Grass Filing No. 2 FDR into Basin EX-2
		EX-1	1.19	0.09	15.5	0.11	3.47	0.4													Flows to Basin EX-2
	5	EX-2	1.60	0.09	11.7	0.14	3.90	0.5	22.5	2.60	2.91	7.6									Flows to Basin EX-3
	7	E-3	0.78	0.81	7.4	0.63	4.59	2.9													
	6	EX-4	15.41	0.09	16.1	1.39	3.41	4.7					1	4.7				240	2.0	2.0	
		EX-5	0.06	0.09	7.1	0.01	4.65	0.0					1	0.0				475	2.0	4.0	
		E-2	0.68	0.76	6.9	0.52	4.70	2.4	18.1	1.92	3.24	6.2									Combination of EX-4, EX-5, E-2
	8	E-1	1.71	0.55	11.8	0.94	3.88	3.6	18.1	3.49	3.24	11.3									Combination of EX-4, EX-5, E-1, E-2, E-3. Flows to Basin EX-3
Existing Water Quality Detention Pond 1	15a	EX-3	0.66	0.09	10.7	0.06	4.02	0.2	22.5	6.15	2.91	17.9									Flows to Basin B-1
	AA	B-1	6.78	0.09	21.6	0.61	2.97	1.8	46.6	158.99	1.82	289.4									Passes through culvert under Bent Grass Meadows Dr to Basin B-2
		D-5	1.08	0.51	11.0	0.55	3.99	2.2					1.1	2.2				300	2.1	2.4	Overland flow into Basin D-6b
		D-6a	1.33	0.60	6.5	0.80	4.79	3.8													
	18	D-6b	2.69	0.55	12.6	1.48	3.78	5.6	13.3	2.83	3.70	10.5									
	17a	D-4a	0.98	0.55	11.1	0.54	3.97	2.1					1	2.1				650	2.0	5.4	Overland flow into Basin D-4b
	17b	D-4b	0.95	0.65	10.2	0.62	4.09	2.5	16.5	1.16	3.37	3.9									
	17c	D-4c	1.22	0.54	14.2	0.66	3.60	2.4	16.5	4.65	3.37	15.7									
	9	OS-2	20.07	0.14	18.3	2.81	3.22	9.0					2.5	9.0				700	3.2	3.7	Overland flow into Basin EX-6. Flow obtained from Bent Grass Filing No. 2 FDR Flow to DP10
	10	OS-3	10.61	0.14	18.9	1.49	3.18	4.7	22.0	4.30	2.94	12.6									Offsite flow into Basin EX-6. Flow obtained from Bent Grass Filing No. 2 FDR
		EX-6	4.78	0.09	17.5	0.43	3.29	1.4	22.0	4.73	2.94	13.9	0.5	1.4				450	1.4	5.3	Flow to DP11
	11	EX-7	12.18	0.09	18.9	1.10	3.18	3.5	22.0	5.83	2.94	17.1			17.1	1.0	42	942	2.0	7.9	Pipe flow to DP17
	17								22.0	10.48	2.94	30.8									Combination of DP17c and DP11, discharges into Basin D-7

STANDARD FORM SF-3: CURRENT/EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
	12	EX-8	1.63	0.09	6.6	0.15	4.75	0.7					2	0.7				550	2.8	3.2	Flow to DP24, Basin E-4
	24	E-4	0.91	0.74	8.0	0.67	4.46	3.0	9.8	0.82	4.15	3.4									Flow into Ex inlet.
	25 26	E-5	0.89	0.81	7.3	0.72	4.60	3.3	9.8	1.54	4.15	6.4									Flow into Ex inlet. Flow in Swale F to pond in Basin D-7
	32	D-8	1.69	0.43	14.0	0.73	3.62	2.6													Flow in Swale C (Basin D-8) into proposed south pond
Pond South - Water Quality Detention Pond	30	D-7	7.65	0.16	14.8	1.22	3.54	4.3	22.0	13.97	2.94	41.1									Discharge to channel
	CC	B-2	4.16	0.09	16.0	0.37	3.42	1.3	46.6	172.96	1.82	314.8									Flows existing site in channel
		I-1	0.31	0.66	5.0	0.20	5.17	1.0													Flows offsite south along Bent Grass Meadows Drive

STANDARD FORM SF-3: CURRENT/EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
		RWT202	1574.40						46.6	327.87	3.05	1000.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.37	6.51	6.61	43.0									From Falcon DBPS by Matrix
		WT200	192.00						37.8	53.07	3.58	190.0									From Falcon DBPS by Matrix
	21	OS-1	32.28	0.41	22.2	13.23	4.92	65.1	46.6	400.68	3.05	1222.1									Flows obtained from Bent Grass Filing No. 2 FDR. Q=65.1 CFS Cumulation of northern off-site flows entering Basin B-1
	1	OS-4	4.46	0.54	15.6	2.41	5.81	14.0					1.2	14.0				910	2.2	6.9	Flows from Basin B-1 of Bent Grass Filing No. 2 FDR into Basin EX-2
	2	OS-5	0.46	0.59	5.2	0.27	8.56	2.3					1	2.3				190	2.0	1.6	Flows from Basin B-2 of Bent Grass Filing No. 2 FDR into Basin EX-2
	3	OS-6	1.17	0.59	12.9	0.69	6.30	4.3					0.9	4.3				430	1.9	3.8	Flows from Basin B-3 of Bent Grass Filing No. 2 FDR into Basin EX-2
		EX-1	1.19	0.36	15.5	0.43	5.83	2.5													Flows to Basin EX-2
	5	EX-2	1.60	0.36	11.7	0.58	6.54	3.8	22.5	4.38	4.89	21.4									Flows to Basin EX-3
	7	E-3	0.78	0.89	7.4	0.69	7.70	5.3													
	6	EX-4	15.41	0.36	16.1	5.55	5.73	31.8					1	31.8				240	2.0	2.0	
		EX-5	0.06	0.36	7.1	0.02	7.81	0.2					1	0.2				475	2.0	4.0	
		E-2	0.68	0.85	6.9	0.58	7.89	4.6	18.1	6.15	5.44	33.5									Combination of EX-4, EX-5, E-2
	8	E-1	1.71	0.69	11.8	1.18	6.51	7.7	18.1	8.02	5.44	43.6									Combination of EX-4, EX-5, E-1, E-2, E-3. Flows to Basin EX-3
Existing Water Quality Detention Pond 1	15a	EX-3	0.66	0.36	10.7	0.24	6.76	1.6	22.5	12.64	4.89	61.8									Flows to Basin B-1
	AA	B-1	6.78	0.36	21.6	2.44	4.99	12.2	46.6	415.76	3.05	1268.1									Passes through culvert under Bent Grass Meadows Dr to Basin B-2
		D-5	1.08	0.64	11.0	0.69	6.70	4.6					1.1	4.6				300	2.1	2.4	Overland flow into Basin D-6b
		D-6a	1.33	0.71	6.5	0.94	8.03	7.5													
	18	D-6b	2.69	0.67	12.6	1.80	6.35	11.4	13.3	3.43	6.21	21.3									
	17a	D-4a	0.98	0.67	11.1	0.66	6.66	4.4					1	4.4				650	2.0	5.4	Overland flow into Basin D-4b
	17b	D-4b	0.95	0.76	10.2	0.72	6.87	4.9	16.5	1.38	5.66	7.8									
	17c	D-4c	1.22	0.68	14.2	0.83	6.04	5.0	16.5	5.64	5.66	31.9									
	9	OS-2	20.07	0.40	18.3	8.03	5.41	43.4					2.5	43.4				700	3.2	3.7	Overland flow into Basin EX-6. Flow obtained from Bent Grass Filing No. 2 FDR Flow to DP10
	10	OS-3	10.61	0.40	18.9	4.24	5.33	22.6	22.0	12.27	4.94	60.6									Offsite flow into Basin EX-6. Flow obtained from Bent Grass Filing No. 2 FDR
		EX-6	4.78	0.36	17.5	1.72	5.52	9.5	22.0	13.99	4.94	69.1	0.5	9.5				450	1.4	5.3	Flow to DP11
	11	EX-7	12.18	0.36	18.9	4.38	5.33	23.3	22.0	18.37	4.94	90.7			90.7	1.0	42	942	2.0	7.9	Pipe flow to DP17
	17								22.0	24.01	4.94	118.6									Combination of DP17c and DP11, discharges into Basin D-7
	12	EX-8	1.63	0.36	6.6	0.59	7.98	4.7													

STANDARD FORM SF-3: CURRENT/EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
													2	4.7				550	2.8	3.2	Flow to DP24, Basin E-4
	24	E-4	0.91	0.84	8.0	0.76	7.50	5.7	9.8	1.35	6.97	9.4									Flow into Ex inlet.
	25	E-5	0.89	0.89	7.3	0.79	7.73	6.1	9.8	2.14	6.97	14.9									Flow into Ex inlet. Flow in Swale F to pond in Basin D-7
	32	D-8	1.69	0.58	14.0	0.98	6.08	6.0													Flow in Swale C (Basin D-8) into proposed south pond
Pond South - Water Quality Detention Pond	30	D-7	7.65	0.40	14.8	3.06	5.94	18.2	22.0	30.19	4.94	149.1									Discharge to channel
	CC	B-2	4.16	0.36	16.0	1.50	5.75	8.6	46.6	445.95	3.05	1360.1									Flows existing site in channel
		I-1	0.31	0.79	5.0	0.24	8.68	2.1													Flows offsite south along Bent Grass Meadows Drive

Proposed Computations

COMPOSITE % IMPERVIOUS CALCULATIONS: PROPOSED

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
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Date: 12/3/21

1	2	3	4	5	6	7	8	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
		Paved/Gravel Roads			Lawns/Undeveloped			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Basins Total
Basin ID	Total Area (ac)	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	Weighted % Imp.
OFFSITE																							
OS-1	32.28	100	2.15	6.7	2	29.25	1.8	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	11.0
OS-2	20.07	80	0.90	3.6	2	18.62	1.9	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	8.0
OS-3	10.61	80	0.48	3.6	2	9.84	1.9	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	8.0
BENT GRASS FILING NO. 2 & FALCON MEADOWS AT BENT GRASS FILING NO. 1																							
EX-1	1.19	100	0.00	0.0	2	1.19	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-2	1.60	100	0.00	0.0	2	1.60	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
EX-3	0.66	100	0.00	0.0	2	0.66	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
B-1	6.06	100	0.00	0.0	2	6.06	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
B-2	4.16	100	0.00	0.0	2	4.16	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
D-4a	0.98	100	0.21	21.4	2	0.00	0.0	65.0	0.77	51.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	72.5
D-4b	0.95	100	0.43	45.3	2	0.00	0.0	65.0	0.52	35.6	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	80.9
D-4c	1.22	100	0.43	35.2	2	0.24	0.4	65.0	0.55	29.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	64.9
D-5	1.08	100	0.22	20.4	2	0.11	0.2	65.0	0.75	45.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.7
D-6a	1.33	100	0.44	33.1	2	0.00	0.0	65.0	0.89	43.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	76.6
D-6b	2.69	100	0.59	21.9	2	0.00	0.0	65.0	2.10	50.7	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	72.6
D-7	7.65	100	0.00	0.0	2	6.22	1.6	65.0	1.43	12.2	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	13.8
D-8	1.69	100	0.00	0.0	2	0.11	0.1	65.0	1.58	60.8	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	60.9
E-1	1.71	100	0.78	45.6	2	0.23	0.3	65.0	0.00	0.0	40	0.70	16.4	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	62.3
E-2	0.68	100	0.56	82.4	2	0.12	0.4	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	82.8
E-3	0.78	100	0.69	88.5	2	0.09	0.2	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	88.7
E-4	0.91	100	0.73	80.2	2	0.18	0.4	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	80.6
E-5	0.89	100	0.79	88.8	2	0.10	0.2	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	89.0
OS-4	4.46	100	0.00	0.0	2	0.00	0.0	65.0	2.28	33.2	40	1.46	13.1	30	0.00	0.0	25	0.00	0.0	20	0.72	3.2	49.5
OS-5	0.46	100	0.00	0.0	2	0.00	0.0	65.0	0.46	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
OS-6	1.17	100	0.00	0.0	2	0.00	0.0	65.0	1.17	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
FALCON MEADOWS FILING NO. 2																							
C-1a	0.38	100	0.16	41.1	2	0.14	0.7	65.0	0.09	14.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	56.7
C-1c	1.77	100	0.63	35.6	2	0.00	0.0	65.0	1.14	41.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	77.5
C-1d	1.72	100	0.40	23.3	2	0.00	0.0	65.0	1.32	49.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	73.2
C-1e	0.29	100	0.29	100.0	2	0.00	0.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	100.0
C-1f	0.08	100	0.08	100.0	2	0.00	0.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	100.0
C-3	0.18	100	0.14	77.8	2	0.02	0.3	65.0	0.02	7.6	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	85.7
C-4	2.67	100	0.41	15.4	2	0.84	0.6	65.0	1.41	34.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	50.3
C-5	0.60	100	0.00	0.0	2	0.60	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
C-6	0.94	100	0.00	0.0	2	0.65	1.4	65.0	0.29	20.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	21.5
C-7	0.52	100	0.15	29.4	2	0.00	0.0	65.0	0.37	46.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	75.7
D-9	0.72	100	0.00	0.0	2	0.46	1.3	65.0	0.26	23.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	24.8
D-1c	4.34	100	0.33	7.6	2	0.00	0.0	65.0	3.06	45.8	40	0.95	8.8	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	62.2
D-2a	0.50	100	0.33	66.0	2	0.00	0.0	65.0	0.17	22.7	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	88.7
D-2b	0.74	100	0.18	24.3	2	0.14	0.4	65.0	0.42	37.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	61.8
D-2c	0.31	100	0.15	50.0	2	0.00	0.0	65.0	0.16	33.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	83.5
D-2d	0.24	100	0.10	43.4	2	0.00	0.0	65.0	0.14	37.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	81.3
D-2e	1.41	100	0.41	29.3	2	0.00	0.0	65.0	1.00	46.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	75.4
D-2f	2.43	100	0.70	28.8	2	0.07	0.1	65.0	1.67	44.7	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	73.6
D-2g	1.81	100	0.48	26.5	2	0.57	0.6	65.0	0.76	27.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	54.4
D-2h	0.23	100	0.00	0.0	2	0.00	0.0	65.0	0.23	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
D-3	2.26	100	0.00	0.0	2	0.28	0.2	65.0	1.74	50.0	40	0.13	2.3	30	0.11	1.5	25	0.00	0.0	20	0.00	0.0	54.0
FUTURE FILINGS																							
C-1b	0.45	100	0.10	22.2	2	0.00	0.0	65.0	0.35	50.6	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	72.8
C-2	3.98	100	0.75	18.8	2	0.00	0.0	65.0	3.23	52.8	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	71.6
D-1a	2.97	100	0.11	3.7	2	0.42	0.3	65.0	2.44	53.4	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	57.4
D-1b	2.54	100	0.56	22.0	2	0.42	0.3	65.0	1.56	39.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	62.2
D-1f	1.61	100	0.11	6.8	2	0.00	0.0	65.0	1.50	60.6	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	67.4

Lot Type Identification:

Lot Size (SF)	*Lot Size (Acre)*
0 - 8,167	1/8 Acre
8,168 - 12,704	1/4 Acre
12,705 - 18,149	1/3 Acre
18,150 - 32,670	1/2 Acre
32,671 - 43,560	1 Acre

NOTES:
% Impervious values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001)

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS: PROPOSED

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

Basin ID	Total Area (ac)	Paved/Gravel Roads			Lawns/Undeveloped			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Composite C_5	Composite C_{100}
		C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)		
OFFSITE																		
OS-1	32.28	0.90	0.96	2.15	0.09	0.36	29.25	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.16	0.41
OS-2	20.07	0.90	0.96	0.90	0.09	0.36	18.62	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.14	0.40
OS-3	10.61	0.90	0.96	0.48	0.09	0.36	9.84	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.14	0.40
BENT GRASS FILING NO. 2 & FALCON MEADOWS AT BENT GRASS FILING NO. 1																		
EX-1	1.19	0.90	0.96	0.00	0.09	0.36	1.19	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.09	0.36
EX-2	1.60	0.90	0.96	0.00	0.09	0.36	1.60	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.09	0.36
EX-3	0.66	0.90	0.96	0.00	0.09	0.36	0.66	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.09	0.36
B-1	6.06	0.90	0.96	0.00	0.09	0.36	6.06	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.09	0.36
B-2	4.16	0.90	0.96	0.00	0.09	0.36	4.16	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.09	0.36
D-4a	0.98	0.90	0.96	0.21	0.09	0.36	0.00	0.45	0.59	0.77	0.30	0.50	0.00	0.25	0.47	0.00	0.55	0.67
D-4b	0.95	0.90	0.96	0.43	0.09	0.36	0.00	0.45	0.59	0.52	0.30	0.50	0.00	0.25	0.47	0.00	0.65	0.76
D-4c	1.22	0.90	0.96	0.43	0.09	0.36	0.24	0.45	0.59	0.55	0.30	0.50	0.00	0.25	0.47	0.00	0.54	0.68
D-5	1.08	0.90	0.96	0.22	0.09	0.36	0.11	0.45	0.59	0.75	0.30	0.50	0.00	0.25	0.47	0.00	0.51	0.64
D-6a	1.33	0.90	0.96	0.44	0.09	0.36	0.00	0.45	0.59	0.89	0.30	0.50	0.00	0.25	0.47	0.00	0.60	0.71
D-6b	2.69	0.90	0.96	0.59	0.09	0.36	0.00	0.45	0.59	2.10	0.30	0.50	0.00	0.25	0.47	0.00	0.55	0.67
D-7	7.65	0.90	0.96	0.00	0.09	0.36	6.22	0.45	0.59	1.43	0.30	0.50	0.00	0.25	0.47	0.00	0.16	0.40
D-8	1.69	0.90	0.96	0.00	0.09	0.36	0.11	0.45	0.59	1.58	0.30	0.50	0.00	0.25	0.47	0.00	0.43	0.58
E-1	1.71	0.90	0.96	0.78	0.09	0.36	0.23	0.45	0.59	0.00	0.30	0.50	0.70	0.25	0.47	0.00	0.55	0.69
E-2	0.68	0.90	0.96	0.56	0.09	0.36	0.12	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.76	0.85
E-3	0.78	0.90	0.96	0.69	0.09	0.36	0.09	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.81	0.89
E-4	0.91	0.90	0.96	0.73	0.09	0.36	0.18	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.74	0.84
E-5	0.89	0.90	0.96	0.79	0.09	0.36	0.10	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.81	0.89
OS-4	4.46	0.90	0.96	0.00	0.09	0.36	0.00	0.45	0.59	2.28	0.30	0.50	1.46	0.25	0.47	0.00	0.36	0.54
OS-5	0.46	0.90	0.96	0.00	0.09	0.36	0.00	0.45	0.59	0.46	0.30	0.50	0.00	0.25	0.47	0.00	0.45	0.59
OS-6	1.17	0.90	0.96	0.00	0.09	0.36	0.00	0.45	0.59	1.17	0.30	0.50	0.00	0.25	0.47	0.00	0.45	0.59
FALCON MEADOWS FILING NO. 2																		
C-1a	0.38	0.90	0.96	0.16	0.09	0.36	0.14	0.45	0.59	0.09	0.30	0.50	0.00	0.25	0.47	0.00	0.51	0.66
C-1c	1.77	0.90	0.96	0.63	0.09	0.36	0.00	0.45	0.59	1.14	0.30	0.50	0.00	0.25	0.47	0.00	0.61	0.72
C-1d	1.72	0.90	0.96	0.40	0.09	0.36	0.00	0.45	0.59	1.32	0.30	0.50	0.00	0.25	0.47	0.00	0.55	0.68
C-1e	0.29	0.90	0.96	0.29	0.09	0.36	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.90	0.96
C-1f	0.08	0.90	0.96	0.08	0.09	0.36	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.90	0.96
C-3	0.18	0.90	0.96	0.14	0.09	0.36	0.02	0.45	0.59	0.02	0.30	0.50	0.00	0.25	0.47	0.00	0.76	0.86
C-4	2.67	0.90	0.96	0.41	0.09	0.36	0.84	0.45	0.59	1.41	0.30	0.50	0.00	0.25	0.47	0.00	0.41	0.57
C-5	0.60	0.90	0.96	0.00	0.09	0.36	0.60	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.09	0.36
C-6	0.94	0.90	0.96	0.00	0.09	0.36	0.65	0.45	0.59	0.29	0.30	0.50	0.00	0.25	0.47	0.00	0.20	0.43
C-7	0.52	0.90	0.96	0.15	0.09	0.36	0.00	0.45	0.59	0.37	0.30	0.50	0.00	0.25	0.47	0.00	0.58	0.70
D-9	0.72	0.90	0.96	0.00	0.09	0.36	0.46	0.45	0.59	0.26	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.44
D-1c	4.34	0.90	0.96	0.33	0.09	0.36	0.00	0.45	0.59	3.06	0.30	0.50	0.95	0.25	0.47	0.00	0.45	0.60
D-2a	0.50	0.90	0.96	0.33	0.09	0.36	0.00	0.45	0.59	0.17	0.30	0.50	0.00	0.25	0.47	0.00	0.75	0.84
D-2b	0.74	0.90	0.96	0.18	0.09	0.36	0.14	0.45	0.59	0.42	0.30	0.50	0.00	0.25	0.47	0.00	0.49	0.64
D-2c	0.31	0.90	0.96	0.15	0.09	0.36	0.00	0.45	0.59	0.16	0.30	0.50	0.00	0.25	0.47	0.00	0.68	0.78
D-2d	0.24	0.90	0.96	0.10	0.09	0.36	0.00	0.45	0.59	0.14	0.30	0.50	0.00	0.25	0.47	0.00	0.65	0.76
D-2e	1.41	0.90	0.96	0.41	0.09	0.36	0.00	0.45	0.59	1.00	0.30	0.50	0.00	0.25	0.47	0.00	0.58	0.70
D-2f	2.43	0.90	0.96	0.70	0.09	0.36	0.07	0.45	0.59	1.67	0.30	0.50	0.00	0.25	0.47	0.00	0.57	0.69
D-2g	1.81	0.90	0.96	0.48	0.09	0.36	0.57	0.45	0.59	0.76	0.30	0.50	0.00	0.25	0.47	0.00	0.46	0.62
D-2h	0.23	0.90	0.96	0.00	0.09	0.36	0.00	0.45	0.59	0.23	0.30	0.50	0.00	0.25	0.47	0.00	0.45	0.59
D-3	2.26	0.90	0.96	0.00	0.09	0.36	0.28	0.45	0.59	1.74	0.30	0.50	0.13	0.25	0.47	0.11	0.39	0.55
FUTURE FILINGS																		
C-1b	0.45	0.90	0.96	0.10	0.09	0.36	0.00	0.45	0.59	0.35	0.30	0.50	0.00	0.25	0.47	0.00	0.55	0.67
C-2	3.98	0.90	0.96	0.75	0.09	0.36	0.00	0.45	0.59	3.23	0.30	0.50	0.00	0.25	0.47	0.00	0.53	0.66
D-1a	2.97	0.90	0.96	0.11	0.09	0.36	0.42	0.45	0.59	2.44	0.30	0.50	0.00	0.25	0.47	0.00	0.42	0.57
D-1b	2.54	0.90	0.96	0.56	0.09	0.36	0.42	0.45	0.59	1.56	0.30	0.50	0.00	0.25	0.47	0.00	0.49	0.63
D-1f	1.61	0.90	0.96	0.11	0.09	0.36	0.00	0.45	0.59	1.50	0.30	0.50	0.00	0.25	0.47	0.00	0.48	0.62

Lot Type Identification:

Lot Size (SF)	*Lot Size (Acre)*
0 - 8,167	1/= 1/8 Acre
8,168 - 12,704	1/4 Acre
12,705 - 18,149	1/3 Acre
18,150 - 32,670	1/2 Acre
32,671 - 43,560	1 Acre

NOTES:
C values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001)
Coeffficients use HSG A&B soils - Refer to "Appendix A: Exhibits and Figures" for soil map

STANDARD FORM SF-2: PROPOSED TIME OF CONCENTRATION

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					Tc CHECK			
DATA						(T_i)			(T_t)					(URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	Urbanized T_c (MIN)	T_c (MIN)
OFFSITE																	
OS-1	32.28	A	11.0	0.16	0.41	100	2.4	12.9	2100	2.2	15	2.2	15.7	28.6	2200.0	22.2	22.2
OS-2	20.07	A	8.0	0.14	0.40	100	2.3	13.3	1400	2.3	15	2.3	10.3	23.6	1500.0	18.3	18.3
OS-3	10.61	A	8.0	0.14	0.40	100	2.0	14.0	1500	2.0	15	2.1	11.8	25.7	1600.0	18.9	18.9
BENT GRASS FILING NO. 2 & FALCON MEADOWS AT BENT GRASS FILING NO. 1																	
EX-1	1.19	A	2.0	0.09	0.36	300	2.7	23.0	690	2.7	15	2.5	4.7	27.7	990.0	15.5	15.5
EX-2	1.60	A	2.0	0.09	0.36	200	2.7	18.8	100	2.7	15	2.5	0.7	19.5	300.0	11.7	11.7
EX-3	0.66	A	2.0	0.09	0.36	100	5.0	10.8	30	2.7	15	2.5	0.2	11.0	130.0	10.7	10.7
B-1	6.06	A	2.0	0.09	0.36	90	6.4	9.5	2000	1.7	15	2.0	17.0	26.5	2090.0	21.6	21.6
B-2	4.16	A	2.0	0.09	0.36	160	11.0	10.5	920	1.6	15	1.9	8.1	18.6	1080.0	16.0	16.0
D-4a	0.98	A	72.5	0.55	0.67	100	2.3	7.6	420	1.0	20	2.0	3.5	11.1	520.0	12.9	11.1
D-4b	0.95	A	80.9	0.65	0.76	75	1.5	6.2	480	1.0	20	2.0	4.0	10.2	555.0	13.1	10.2
D-4c	1.22	A	64.9	0.54	0.68	70	0.5	10.8	690	1.0	20	2.0	5.8	16.6	760.0	14.2	14.2
D-5	1.08	A	65.7	0.51	0.64	10	2.0	2.7	300	1.1	20	2.1	2.4	5.1	310.0	11.7	5.1
D-6a	1.33	A	76.6	0.60	0.71	20	2.0	3.2	385	1.0	20	2.0	3.2	6.5	405.0	12.3	6.5
D-6b	2.69	A	72.6	0.55	0.67	45	2.0	5.4	870	1.0	20	2.0	7.3	12.6	915.0	15.1	12.6
D-7	7.65	A	13.8	0.16	0.40	200	7.5	12.4	665	1.0	15	1.5	7.4	19.8	865.0	14.8	14.8
D-8	1.69	A	60.9	0.43	0.58	125	3.7	8.9	600	1.0	15	1.5	6.7	15.5	725.0	14.0	14.0
E-1	1.71	A	62.3	0.55	0.69	25	2.0	4.0	940	1.0	20	2.0	7.8	11.8	965.0	15.4	11.8
E-2	0.68	A	82.8	0.76	0.85	25	2.0	2.5	665	1.6	20	2.5	4.4	6.9	690.0	13.8	6.9
E-3	0.78	A	88.7	0.81	0.89	25	2.0	2.1	632	1.0	20	2.0	5.3	7.4	657.0	13.7	7.4
E-4	0.91	A	80.6	0.74	0.84	25	2.0	2.6	913	2.0	20	2.8	5.4	8.0	938.0	15.2	8.0
E-5	0.89	A	89.0	0.81	0.89	25	2.0	2.1	903	2.1	20	2.9	5.2	7.3	928.0	15.2	7.3
OS-4	4.46	A	49.5	0.36	0.54	100	2.0	10.8	910	1.2	20	2.2	6.9	17.7	1010.0	15.6	15.6
OS-5	0.46	A	65.0	0.45	0.59	15	2.0	3.7	190	1.0	20	2.0	1.6	5.2	205.0	11.1	5.2
OS-6	1.17	A	65.0	0.45	0.59	85	0.2	18.7	430	0.9	20	1.9	3.8	22.5	515.0	12.9	12.9
FALCON MEADOWS FILING NO. 2																	
C-1a	0.38	A	56.7	0.51	0.66	10	2.0	2.7	220	1.0	20	2.0	1.8	4.5	230.0	11.3	5.0
C-1c	1.77	A	77.5	0.61	0.72	10	2.0	2.3	370	3.0	20	3.5	1.8	4.0	380.0	12.1	5.0
C-1d	1.72	A	73.2	0.55	0.68	10	2.0	2.5	620	2.0	20	2.8	3.7	6.2	630.0	13.5	6.2
C-1e	0.29	A	100.0	0.90	0.96	10	2.0	0.9	275	1.7	20	2.6	1.8	2.7	285.0	11.6	5.0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	Urbanized T_c (MIN)	T_c (MIN)
C-1f	0.08	A	100.0	0.90	0.96	10	2.0	0.9	130	1.7	20	2.6	0.8	1.8	140.0	10.8	5.0
C-3	0.18	A	85.7	0.76	0.86	10	2.0	1.6	580	1.0	20	2.0	4.8	6.4	590.0	13.3	6.4
C-4	2.67	A	50.3	0.41	0.57	100	3.0	8.8	600	2.0	20	2.8	3.5	12.3	700.0	13.9	12.3
C-5	0.60	A	2.0	0.09	0.36	5	2.0	3.3		1.0	15	1.5	0.0	3.3	5.0	10.0	5.0
C-6	0.94	A	21.5	0.20	0.43	20	3.3	5.0	90	5.0	15	3.4	0.4	5.4	110.0	10.6	5.4
C-7	0.52	A	75.7	0.58	0.70	100	6.8	5.0	165	1.3	15	1.7	1.6	6.7	265.0	11.5	6.7
D-9	0.72	A	24.8	0.22	0.44	10	2.0	4.0	250	3.6	15	2.8	1.5	5.5	260.0	11.4	5.5
D-1c	4.34	A	62.2	0.45	0.60	100	2.6	8.7	1900	1.3	20	2.3	13.9	22.5	2000.0	21.1	21.1
D-2a	0.50	A	88.7	0.75	0.84	10	2.0	1.6	495	1.3	20	2.3	3.6	5.2	505.0	12.8	5.2
D-2b	0.74	A	61.8	0.49	0.64	100	1.7	9.4	189	1.0	20	2.0	1.6	10.9	289.0	11.6	10.9
D-2c	0.31	A	83.5	0.68	0.78	5	2.0	1.4	275	1.0	20	2.0	2.3	3.7	280.0	11.6	5.0
D-2d	0.24	A	81.3	0.65	0.76	5	2.0	1.5	200	1.3	20	2.3	1.5	2.9	205.0	11.1	5.0
D-2e	1.41	A	75.4	0.58	0.70	100	1.9	7.7	340	0.8	20	1.8	3.2	10.9	440.0	12.4	10.9
D-2f	2.43	A	73.6	0.57	0.69	75	2.0	6.7	175	0.5	20	1.4	2.1	8.7	250.0	11.4	8.7
D-2g	1.81	A	54.4	0.46	0.62	35	2.0	5.5	1355	1.3	20	2.3	9.9	15.4	1390.0	17.7	15.4
D-2h	0.23	A	65.0	0.45	0.59	35	2.0	5.6	1355	1.3	20	2.3	9.9	15.5	1390.0	17.7	15.5
D-3	2.26	A	54.0	0.39	0.55	25	8.0	3.3	1960	1.0	15	1.5	21.8	25.0	1985.0	21.0	21.0
FUTURE FILINGS																	
C-1b	0.45	A	72.8	0.55	0.67	10	2.0	2.5	365	1.9	15	2.1	2.9	5.5	375.0	12.1	5.5
C-2	3.98	A	71.6	0.53	0.66	10	2.0	2.6	650	2.0	20	2.8	3.8	6.4	660.0	13.7	6.4
D-1a	2.97	A	57.4	0.42	0.57	5	1.0	2.8	360	2.4	15	2.3	2.6	5.4	365.0	12.0	5.4
D-1b	2.54	A	62.2	0.49	0.63	100	3.2	7.6	540	1.3	15	1.7	5.3	12.8	640.0	13.6	12.8
D-1f	1.61	A	67.4	0.48	0.62	100	2.7	8.2	380	2.0	15	2.1	3.0	11.1	480.0	12.7	11.1

NOTES:

T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33), S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

Tc Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

Type of Land Surface	Cv
Heavy Meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

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

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
		RWT202	1574.40						46.6	120.88	1.82	220.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.37	1.78	3.94	7.0									From Falcon DBPS by Matrix
		WT200	192.00						37.8	24.41	2.13	52.0									From Falcon DBPS by Matrix
	21	OS-1	32.28	0.16	22.2	5.16	2.93	15.1	46.6	152.23	1.82	277.1									Flows obtained from Bent Grass Filing No. 2 FDR. Q=65.1 CFS Cumulation of northern off-site flows entering Basin B-1
	1	OS-4	4.46	0.36	15.6	1.61	3.46	5.6					1.2	5.6				910	2.2	6.9	Flows from Basin B-1 of Bent Grass Filing No. 2 FDR into Basin EX-2
	2	OS-5	0.46	0.45	5.2	0.21	5.10	1.1					1	1.1				190	2.0	1.6	Flows from Basin B-2 of Bent Grass Filing No. 2 FDR into Basin EX-2
	3	OS-6	1.17	0.45	12.9	0.53	3.75	2.0					0.9	2.0				430	1.9	3.8	Flows from Basin B-3 of Bent Grass Filing No. 2 FDR into Basin EX-2
		EX-1	1.19	0.09	15.5	0.11	3.47	0.4													Flows to Basin EX-2
	5	EX-2	1.60	0.09	11.7	0.14	3.90	0.5	22.5	2.60	2.91	7.6									Flows to Basin EX-3
	7	E-3	0.78	0.81	7.4	0.63	4.59	2.9													
		C-6	0.94	0.20	5.4	0.19	5.05	1.0					1	1.0				216	2.0	1.8	
	45	C-7	0.52	0.58	6.7	0.30	4.74	1.4					1	1.4				216	2.0	1.8	
		E-2	0.68	0.76	6.9	0.52	4.70	2.4	8.5	1.01	4.38	4.4									Combination of C-6, C-7, E-2
	8	E-1	1.71	0.55	11.8	0.94	3.88	3.6	11.8	2.58	3.88	10.0									Ex Basin from Filing No. 2(East side of BGMD) Combination of EX-4, EX-5, E-1, E-2, E-3. Flows to Basin EX-3
	15a	EX-3	0.66	0.09	10.7	0.06	4.02	0.2	22.5	5.24	2.91	15.2									Flows to Basin B-1
	51	D-1a	2.97	0.42	5.4	1.25	5.06	6.3							6.3	1.2	18	217	2.2	1.7	
		D-1f	1.61	0.48	11.1	0.77	3.97	3.1													
	40	C-1a	0.38	0.51	5.0	0.19	5.17	1.0	11.1	2.21	3.97	8.8									Flows to Swale B
		C-1b	0.45	0.55	5.5	0.25	5.03	1.3	11.1	2.46	3.97	9.8	1	9.8				175	2.0	1.5	Flows exiting Swale B towards DP41
	41	C-1c	1.77	0.61	5.0	1.08	5.17	5.6	11.1	3.54	3.97	14.1			14.1	1.3	30	180	2.2	1.3	Flow into inlet at DP41
		C-3	0.18	0.76	6.4	0.14	4.80	0.7					1	0.7				660	2.0	5.5	Gutter flow through C-4 to DP44
	44	C-4	2.67	0.41	12.3	1.09	3.82	4.2	12.3	1.23	3.82	4.7			4.7	1.3	24	70	2.2	0.5	Flow into inlet at DP44
	42	C-1f	0.08	0.90	5.0	0.07	5.17	0.4					1	0.4				185	2.0	1.5	Gutter flow to DP15
	43 15	C-1d	1.72	0.55	6.2	0.95	4.85	4.6	6.5	1.02	4.77	4.9									Flow into inlet at DP15
	12 13	C-1e	0.29	0.90	5.0	0.26	5.17	1.3	12.8	6.05	3.76	22.7			22.7	1.0	42	33	2.0	0.3	Flow into inlet at DP12 Combination of flow from DP12, DP15, DP41, DP44 into North Pond
	19	C-2	3.98	0.53	6.4	2.11	4.79	10.1													Flow into Pond North
	13a	C-5	0.60	0.09	5.0	0.05	5.17	0.3	13.1	8.21	3.72	30.5									North Pond Flows to Basin B-1

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

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
	AA	B-1	6.06	0.09	21.6	0.55	2.97	1.6	46.6	166.23	1.82	302.5									Total flow under BGMD into Basin B-2
		D-2b	0.74	0.49	10.9	0.36	4.00	1.4													
		D-2a	0.50	0.75	5.2	0.38	5.10	1.9													
	14a	D-2c	0.31	0.68	5.0	0.21	5.17	1.1	10.9	0.95	4.00	3.8	1.3	3.8				230	2.3	1.7	Gutter flow through D-2d to DP14b
	14b	D-2d	0.24	0.65	5.0	0.16	5.17	0.8	12.6	1.11	3.78	4.2	1.3	4.2				625	2.3	4.6	Gutter flow through D-2d to DP14b
	14	D-2g	1.81	0.46	15.4	0.83	3.48	2.9	17.2	1.94	3.32	6.4									Flow into existing inlet at DP14
	9	OS-2	20.07	0.14	18.3	2.81	3.22	9.0													Overland flow into Basin D-3. Flow obtained from Bent Grass Filing No. 2 FDR
	10	OS-3	10.61	0.14	18.9	1.49	3.18	4.7													Offsite flow into Basin D-3. Flow obtained from Bent Grass Filing No. 2 FDR
	11	D-3	2.26	0.39	21.0	0.88	3.01	2.6	21.0	5.18	3.01	15.6			15.6	1.0	42	100	2.0	0.8	Flows conveyed via existing ditch into proposed area inlet.
	14e	D-2f	2.43	0.57	8.7	1.39	4.33	6.0													
	14d	D-2e	1.41	0.58	10.9	0.82	4.01	3.3	10.9	2.21	4.01	8.9			8.9	1.0	42	100	2.0	0.8	Flows conveyed storm sewer to DP16
	16a	D-1b	2.54	0.49	12.8	1.24	3.75	4.7					1.3	4.7				1300	2.3	9.5	Gutter flow through Basin D-1c to DP16
	16	D-1c	4.34	0.45	21.1	1.95	3.01	5.9	22.3	10.58	2.92	30.9			30.9	2.0	48	835	2.8	4.9	Combination of flows to existing inlets at DP14 and DP16. Flows to DP 17
		D-5	1.08	0.51	5.1	0.55	5.14	2.8					1	2.8				600	2.0	5.0	Gutter flow through Basin D-6b to DP18
		D-6b	2.69	0.55	12.6	1.48	3.78	5.6													
	18	D-6a	1.33	0.60	6.5	0.80	4.79	3.8	12.6	2.83	3.78	10.7			10.7	2.0	24	38	2.8	0.2	Flow to existing inlet. Flow out of inlet to DP17c
	17a	D-4a	0.98	0.55	11.1	0.54	3.97	2.1					1	2.1				700	2.0	5.8	Gutter flow through Basin D-4b to DP17b
	17b	D-4b	0.95	0.65	10.2	0.62	4.09	2.5	17.0	1.16	3.34	3.9									Gutter flow to DP17c
	17c	D-4c	1.22	0.54	14.2	0.66	3.60	2.4	17.0	3.99	3.34	13.3			13.3	2.0	24	8	2.8	0.0	Flows from Basin B-3 of Bent Grass Filing No. 2 FDR. Flows at existing inlet. Flow out to DP17
	17								27.3	14.57	2.62	38.2									Storm system entering existing pond at Basin D-7
		D-9	0.72	0.22	5.5	0.16	5.02	0.8					1.5	0.8				625	2.4	4.3	Gutter flow through Basin E-4 to DP24
		D-2h	0.23	0.45	15.5	0.10	3.47	0.3					1.5	0.3				550	2.4	3.7	Gutter flow through Basin E-4 to DP24
	24	E-4	0.91	0.74	8.0	0.67	4.46	3.0	19.2	0.93	3.15	2.9									Flow to existing inlet at DP24
	25 26	E-5	0.89	0.81	7.3	0.72	4.60	3.3	19.2	1.65	3.15	5.2									Flow to existing inlet at DP25 Flow into existing pond via Swale F at DP26
	32	D-8	1.69	0.43	14.0	0.73	3.62	2.6													Flow in Swale C (Basin D-8) into existing pond
	30	D-7	7.65	0.16	14.8	1.22	3.54	4.3	27.3	18.17	2.62	47.6									Exisitng Water quality pond Outlet to existing channel Basin B-2
	CC	B-2	4.16	0.09	16.0	0.37	3.42	1.3	46.6	184.77	1.82	336.3									

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

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
		RWT202	1574.40						46.6	327.87	3.05	1000.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.37	6.51	6.61	43.0									From Falcon DBPS by Matrix
		WT200	192.00						37.8	53.07	3.58	190.0									From Falcon DBPS by Matrix
	21	OS-1	32.28	0.41	22.2	13.23	4.92	65.1	46.6	400.68	3.05	1222.1									Flows obtained from Bent Grass Filing No. 2 FDR. Q=65.1 CFS Cumulation of northern off-site flows entering Basin B-1
	1	OS-4	4.46	0.54	15.6	2.41	5.81	14.0					1.2	14.0				910	2.2	6.9	Flows from Basin B-1 of Bent Grass Filing No. 2 FDR into Basin EX-2
	2	OS-5	0.46	0.59	5.2	0.27	8.56	2.3					1	2.3				190	2.0	1.6	Flows from Basin B-2 of Bent Grass Filing No. 2 FDR into Basin EX-2
	3	OS-6	1.17	0.59	12.9	0.69	6.30	4.3					0.9	4.3				430	1.9	3.8	Flows from Basin B-3 of Bent Grass Filing No. 2 FDR into Basin EX-2
		EX-1	1.19	0.36	15.5	0.43	5.83	2.5													Flows to Basin EX-2
	5	EX-2	1.60	0.36	11.7	0.58	6.54	3.8	22.5	4.38	4.89	21.4									Flows to Basin EX-3
	7	E-3	0.78	0.89	7.4	0.69	7.70	5.3													
		C-6	0.94	0.43	5.4	0.40	8.49	3.4					1	3.4				216	2.0	1.8	
	45	C-7	0.52	0.70	6.7	0.36	7.95	2.9					1	2.9				216	2.0	1.8	
		E-2	0.68	0.85	6.9	0.58	7.89	4.6	8.5	1.34	7.35	9.8									Combination of C-6, C-7, E-2
	8	E-1	1.71	0.69	11.8	1.18	6.51	7.7	11.8	3.21	6.51	20.9									Ex Basin from Filing No. 2(East side of BGMD) Combination of EX-4, EX-5, E-1, E-2, E-3. Flows to Basin EX-3
	15a	EX-3	0.66	0.36	10.7	0.24	6.76	1.6	22.5	7.83	4.89	38.3									Flows to Basin B-1
	51	D-1a	2.97	0.57	5.4	1.69	8.50	14.4							14.4	1.2	18	217	2.2	1.7	
		D-1f	1.61	0.62	11.1	1.00	6.66	6.7													
	40	C-1a	0.38	0.66	5.0	0.25	8.68	2.2	11.1	2.94	6.66	19.6									Flows to Swale B
		C-1b	0.45	0.67	5.5	0.30	8.45	2.5	11.1	3.24	6.66	21.6	1	21.6				175	2.0	1.5	Flows exiting Swale B towards DP41
	41	C-1c	1.77	0.72	5.0	1.27	8.68	11.0	11.1	4.51	6.66	30.0			30.0	1.3	30	180	2.2	1.3	Flow into inlet at DP41
		C-3	0.18	0.86	6.4	0.15	8.06	1.2					1	1.2				660	2.0	5.5	Gutter flow through C-4 to DP44
	44	C-4	2.67	0.57	12.3	1.52	6.41	9.7	12.3	1.67	6.41	10.7			10.7	1.3	24	70	2.2	0.5	Flow into inlet at DP44
	42	C-1f	0.08	0.96	5.0	0.08	8.68	0.7					1	0.7				185	2.0	1.5	Gutter flow to DP15
	43 15	C-1d	1.72	0.68	6.2	1.17	8.14	9.5	6.5	1.25	8.00	10.0									Flow into inlet at DP15
	12 13	C-1e	0.29	0.96	5.0	0.28	8.68	2.4	12.8	7.71	6.31	48.7			48.7	1.0	42	33	2.0	0.3	Flow into inlet at DP12 Combination of flow from DP12, DP15, DP41, DP44 into North Pond
	19	C-2	3.98	0.66	6.4	2.63	8.04	21.1													Flow into Pond North
	13a	C-5	0.60	0.36	5.0	0.22	8.68	1.9	13.1	10.56	6.25	66.0									North Pond Flows to Basin B-1
	AA	B-1	6.06	0.36	21.6	2.18	4.99	10.9	46.6	421.25	3.05	1284.8									Total flow under BGMD into Basin B-2
		D-2b	0.74	0.64	10.9	0.47	6.71	3.2													

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

Subdivision: Falcon Meadows
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
		D-2a	0.50	0.84	5.2	0.42	8.57	3.6													
	14a	D-2c	0.31	0.78	5.0	0.24	8.68	2.1	10.9	1.13	6.71	7.6	1.3	7.6				230	2.3	1.7	Gutter flow through D-2d to DP14b
	14b	D-2d	0.24	0.76	5.0	0.18	8.68	1.6	12.6	1.31	6.35	8.3	1.3	8.3				625	2.3	4.6	Gutter flow through D-2d to DP14b
	14	D-2g	1.81	0.62	15.4	1.12	5.84	6.5	17.2	2.43	5.57	13.5									Flow into existing inlet at DP14
	9	OS-2	20.07	0.40	18.3	8.03	5.41	43.4													Overland flow into Basin D-3. Flow obtained from Bent Grass Filing No. 2 FDR
	10	OS-3	10.61	0.40	18.9	4.24	5.33	22.6													Offsite flow into Basin D-3. Flow obtained from Bent Grass Filing No. 2 FDR
	11	D-3	2.26	0.55	21.0	1.24	5.06	6.3	21.0	13.51	5.06	68.4			68.4	1.0	42	100	2.0	0.8	Flows conveyed via existing ditch into proposed area inlet.
	14e	D-2f	2.43	0.69	8.7	1.68	7.27	12.2													
	14d	D-2e	1.41	0.70	10.9	0.99	6.73	6.7	10.9	2.67	6.73	18.0			18.0	1.0	42	100	2.0	0.8	Flows conveyed storm sewer to DP16
	16a	D-1b	2.54	0.63	12.8	1.60	6.30	10.1					1.3	10.1				1300	2.3	9.5	Gutter flow through Basin D-1c to DP16
	16	D-1c	4.34	0.60	21.1	2.60	5.05	13.1	22.3	20.38	4.91	100.1			100.1	2.0	48	835	2.8	4.9	Combination of flows to existing inlets at DP14 and DP16. Flows to DP 17
		D-5	1.08	0.64	5.1	0.69	8.63	6.0					1	6.0				600	2.0	5.0	Gutter flow through Basin D-6b to DP18
		D-6b	2.69	0.67	12.6	1.80	6.35	11.4													
	18	D-6a	1.33	0.71	6.5	0.94	8.03	7.5	12.6	3.43	6.35	21.8			21.8	2.0	24	38	2.8	0.2	Flow to existing inlet. Flow out of inlet to DP17c
	17a	D-4a	0.98	0.67	11.1	0.66	6.66	4.4					1	4.4				700	2.0	5.8	Gutter flow through Basin D-4b to DP17b
	17b	D-4b	0.95	0.76	10.2	0.72	6.87	4.9	17.0	1.38	5.60	7.7									Gutter flow to DP17c
	17c	D-4c	1.22	0.68	14.2	0.83	6.04	5.0	17.0	4.81	5.60	26.9			26.9	2.0	24	8	2.8	0.0	Flows from Basin B-3 of Bent Grass Filing No. 2 FDR. Flows at existing inlet. Flow out to DP17
	17								27.3	25.19	4.40	110.8									Storm system entering existing pond at Basin D-7
		D-9	0.72	0.44	5.5	0.32	8.44	2.7					1.5	2.7				625	2.4	4.3	Gutter flow through Basin E-4 to DP24
		D-2h	0.23	0.59	15.5	0.14	5.83	0.8					1.5	0.8				550	2.4	3.7	Gutter flow through Basin E-4 to DP24
	24	E-4	0.91	0.84	8.0	0.76	7.50	5.7	19.2	1.22	5.28	6.4									Flow to existing inlet at DP24
	25 26	E-5	0.89	0.89	7.3	0.79	7.73	6.1	19.2	2.01	5.28	10.6									Flow to existing inlet at DP25 Flow into existing pond via Swale F at DP26
	32	D-8	1.69	0.58	14.0	0.98	6.08	6.0													Flow in Swale C (Basin D-8) into existing pond
	30	D-7	7.65	0.40	14.8	3.06	5.94	18.2	27.3	31.24	4.40	137.5									Exisitng Water quality pond Outlet to existing channel Basin B-2
	CC	B-2	4.16	0.36	16.0	1.50	5.75	8.6	46.6	453.99	3.05	1384.7									

APPENDIX C

Hydraulic Computations

Swales

Worksheet for Swale - B (Temporary)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.01000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	0.00	ft
Discharge	19.60	ft^3/s

Results

Normal Depth	1.26	ft
Flow Area	6.40	ft^2
Wetted Perimeter	10.43	ft
Hydraulic Radius	0.61	ft
Top Width	10.12	ft
Critical Depth	1.08	ft
Critical Slope	0.02280	ft/ft
Velocity	3.06	ft/s
Velocity Head	0.15	ft
Specific Energy	1.41	ft
Froude Number	0.68	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.26	ft
Critical Depth	1.08	ft
Channel Slope	0.01000	ft/ft

Worksheet for Swale - D

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.02000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	66.00	ft^3/s

Results

Normal Depth	1.61	ft
Flow Area	13.58	ft^2
Wetted Perimeter	15.27	ft
Hydraulic Radius	0.89	ft
Top Width	14.88	ft
Critical Depth	1.53	ft
Critical Slope	0.02526	ft/ft
Velocity	4.86	ft/s
Velocity Head	0.37	ft
Specific Energy	1.98	ft
Froude Number	0.90	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.61	ft
Critical Depth	1.53	ft
Channel Slope	0.02000	ft/ft

Worksheet for Swale - E (Existing)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00500	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	68.40	ft^3/s

Results

Normal Depth	1.83	ft
Flow Area	18.95	ft^2
Wetted Perimeter	18.12	ft
Hydraulic Radius	1.05	ft
Top Width	17.67	ft
Critical Depth	1.46	ft
Critical Slope	0.01415	ft/ft
Velocity	3.61	ft/s
Velocity Head	0.20	ft
Specific Energy	2.04	ft
Froude Number	0.61	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.83	ft
Critical Depth	1.46	ft
Channel Slope	0.00500	ft/ft

Galloway

Date:

Subject: SWALE BEND CALCULATIONS

$$H = \frac{C v^2 W}{g R}$$

=> FROM EL PASO COUNTY DCM 10.5.6
- ADDITIONAL FREEBOARD FOR CHANNEL BEND

C = 0.5 (SUBCRITICAL FLOW)
v = AVERAGE VELOCITY = 3.61 fps
W = CHANNEL WIDTH AT WATER SURFACE = 17.67'
g = GRAVITY = 32.2 ft/s²
R = RADIUS OF CURVATURE = 12'
H = ADDITIONAL HEIGHT OF FREEBOARD

$$H = \frac{0.5(3.61)^2(17.67)}{(32.2)(12)} = 0.29'$$

FLOW DEPTH = 1.83'

=> FLOW DEPTH THROUGH BEND = 2.12'

Inlets-Proposed Design

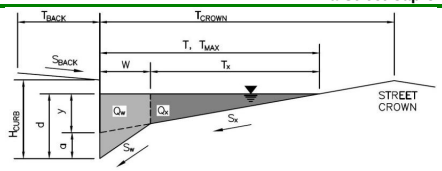
Version 4.06 Released August 2018

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

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

Project: Falcon Meadows at Bent Grass Filing No. 2

Inlet ID: DP 14a-Street Cap Check



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 =	0.013	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

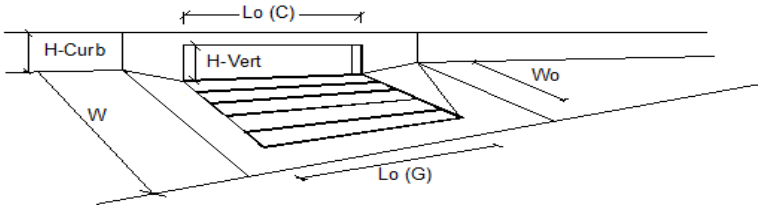
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.4**	**12.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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

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

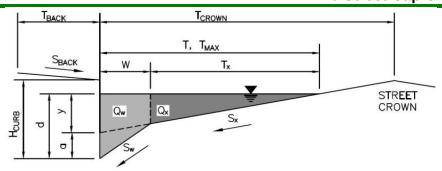
Version 4.06 Released August 2018

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

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

Project: Falcon Meadows at Bent Grass Filing No. 2

Inlet ID: DP 14b-Street Cap Check



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 =	0.013	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} =**	**12.4**	**12.4**	**cfs**

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

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

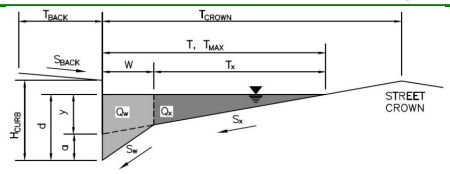
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 14d**



Gutter Geometry (Enter data in the blue cells)

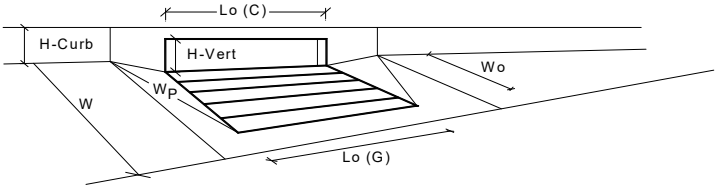
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 4.06 Released August 2018



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 =	5.6	8.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	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} =	0.30	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.72	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 =**	**4.6**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	3.3	6.7	cfs

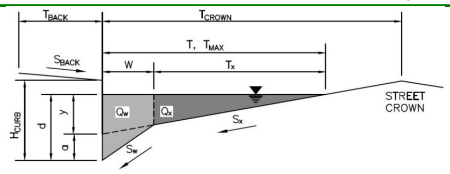
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 14e**



Gutter Geometry (Enter data in the blue cells)

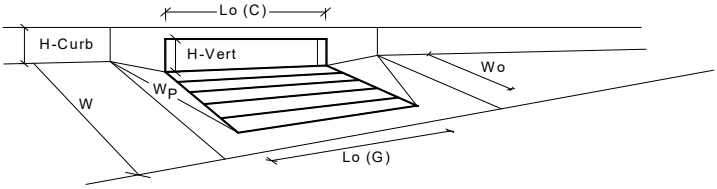
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
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 4.06 Released August 2018



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 =	5.6	8.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	10.00	10.00	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} =	0.30	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.53	0.75	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.91	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 =**	**6.9**	**16.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	6.0	12.2	cfs

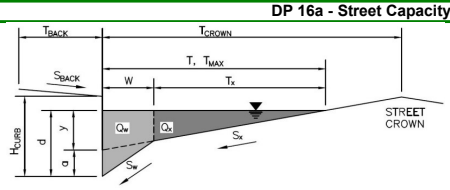
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 16a - Street Capacity Check**



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 =	0.013	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

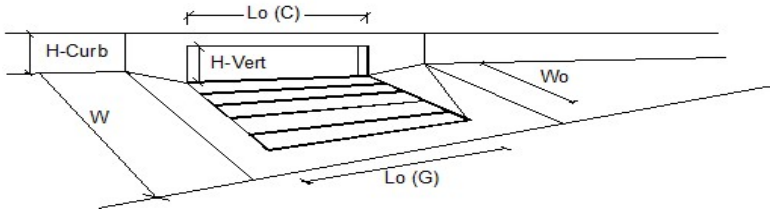
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.4**	**12.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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

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

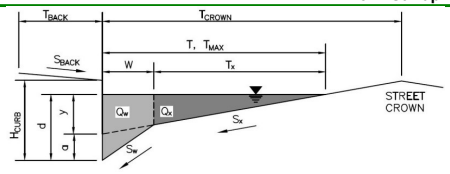
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 51 - St Cap**



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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	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

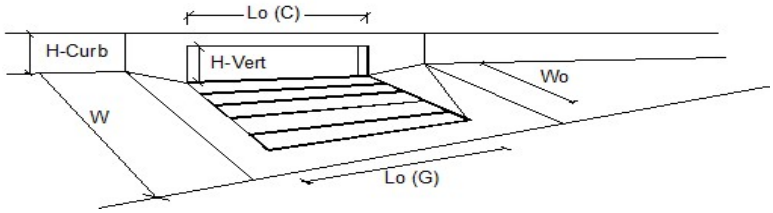
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.9**	**10.9**	**cfs**

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 4.06 Released August 2018



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')		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 =**	**6.3**	**11.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**2.9**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**80**	**%**

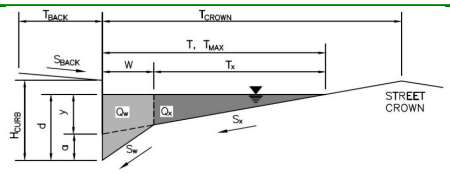
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 41**



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	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

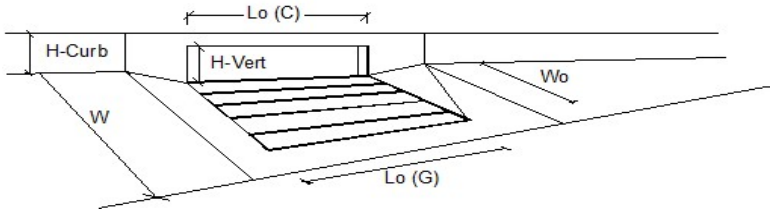
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**18.1**	**18.2**	**cfs**

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 4.06 Released August 2018



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')		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 =**	**11.5**	**17.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**2.6**	**13.0**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**82**	**57**	**%**

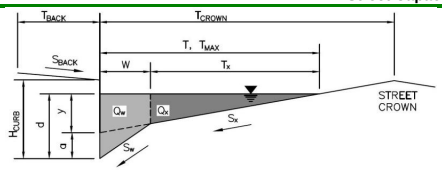
Version 4.06 Released August 2018

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

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

Project: Falcon Meadows at Bent Grass Filing No. 2

Inlet ID: DP 42-Street Capacity



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 =	0.030	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

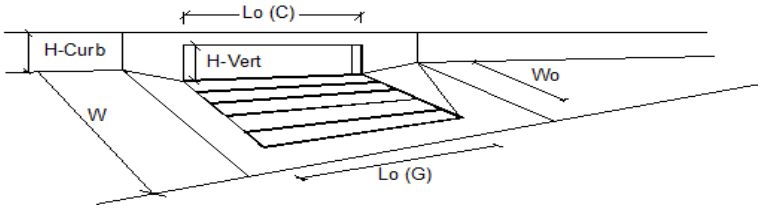
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**17.7**	**18.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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

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

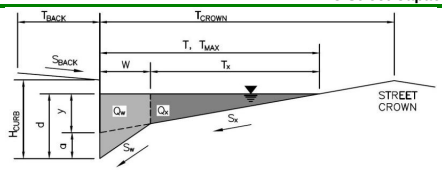
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 43-Street Capacity**



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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	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} =**	**10.9**	**10.9**	**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'

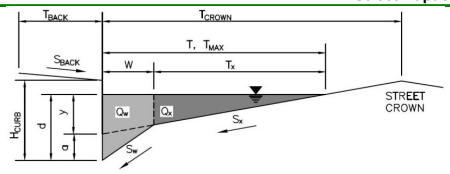
Version 4.06 Released August 2018

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

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

Project: Falcon Meadows at Bent Grass Filing No. 2

Inlet ID: DP 44-Street Capacity



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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	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

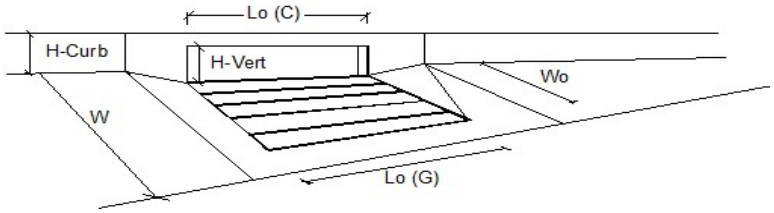
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.9**	**10.9**	**cfs**

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 4.06 Released August 2018



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')		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 =**	**4.7**	**9.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**90**	**%**

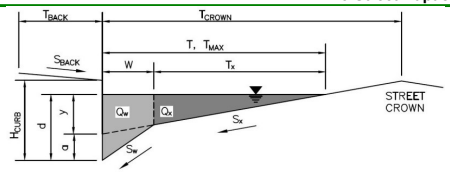
Version 4.06 Released August 2018

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

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

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Inlet ID: **DP 15-Street Capacity**



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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	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

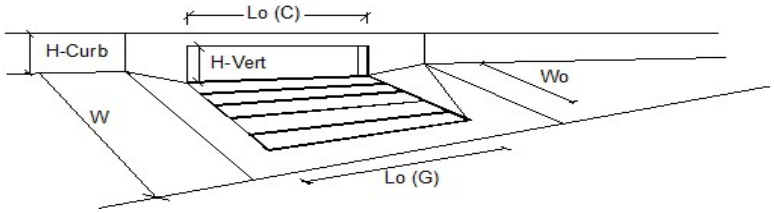
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.9**	**10.9**	**cfs**

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 4.06 Released August 2018



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')		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 =**	**4.9**	**15.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**9.0**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**100**	**63**	**%**

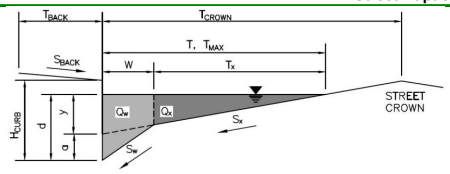
Version 4.06 Released August 2018

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

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

Project: Falcon Meadows at Bent Grass Filing No. 2

Inlet ID: DP 12-Street Capacity



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 =	0.030	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

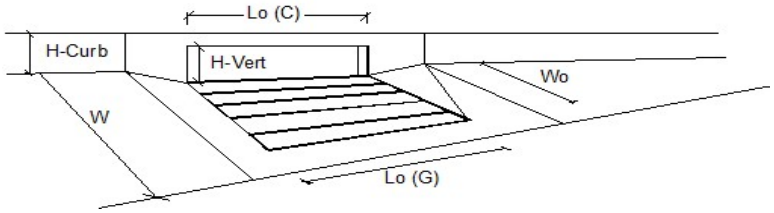
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**17.7**	**18.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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')		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	

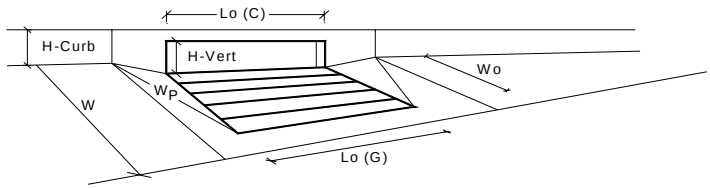
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**10.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

Inlets – Existing Analysis

Inlet DP 8 - Existing Sump Inlet

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



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	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	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) =	10.00	10.00	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	$RF_{Combination}$ =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	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 =	**14.4**	**52.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.7	28.7	cfs

Inlet DP 11 - Existing Area Inlet

Version 4.06 Released August 2018

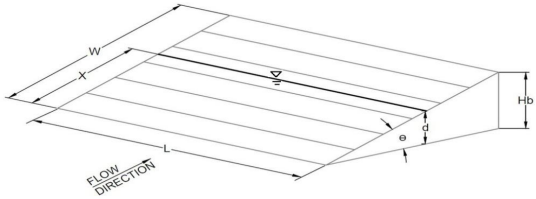
AREA INLET IN A SWALE

Falcon Meadows at Bent Grass Filing No. 2 - Existing Inlet Analysis
DP 11 - Type D Area Inlet (Relocated)

Inlet Design Information (Input)

Type of Inlet: CDOT TYPE D (Parallel & Depressed)

Inlet Type = CDOT TYPE D (Parallel & Depressed)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	25.00	degrees
Width of Grate	W =	6.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	1.27	feet
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.63	
Orifice Coefficient	C_o =	0.42	
Weir Coefficient	C_w =	1.34	

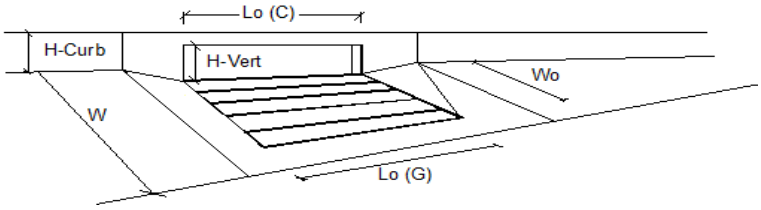
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.89	2.77	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**44.4**	**57.1**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**6.5**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**90**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

Inlet DP 16 - Existing At-Grade Inlet

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



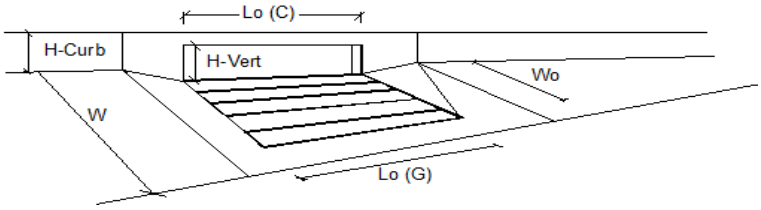
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.1**	**11.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**3.1**	**15.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**70**	**42**	**%**

Inlet DP 14 - Existing At-Grade Inlet

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



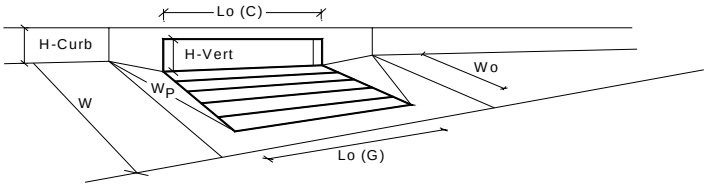
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.6**	**8.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.9**	**5.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**85**	**59**	**%**

Inlet DP 17 - Existing Sump Inlet

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018

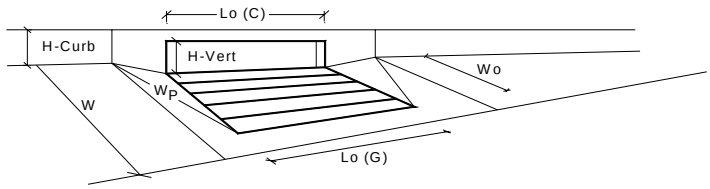


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	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) =	15.00	15.00	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} =	0.30	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	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 =**	**8.0**	**39.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Minor Storm	$Q_{PEAK\ REQUIRED}$ =	8.4	12.7	cfs

Inlet DP 18 - Existing Sump Inlet

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018

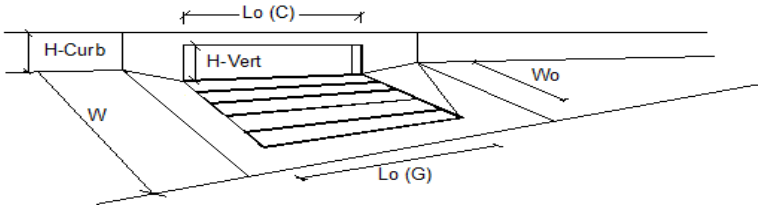


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	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) =	15.00	15.00	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} =	0.30	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	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 =**	**8.0**	**39.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Minor Storm	$Q_{PEAK\ REQUIRED}$ =	10.4	21.9	cfs

Inlet DP 24 - Existing At-Grade Inlet

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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 =	25.00	25.00	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 =**	**7.1**	**22.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**88**	**%**

Review 1 comment: Please discuss in the narrative the flow bypassing this inlet. Where is this developed flow being conveyed to and treated.

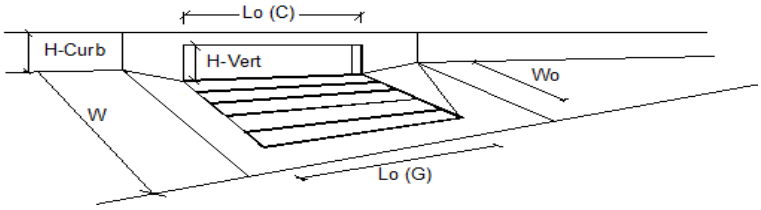
Review 2: Unresolved

Narrative revised to reflect discussion of flow bypassing Inlet @ DP 24 in Basin E-4

Inlet DP 25 - Existing At-Grade Inlet

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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 =	25.00	25.00	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	

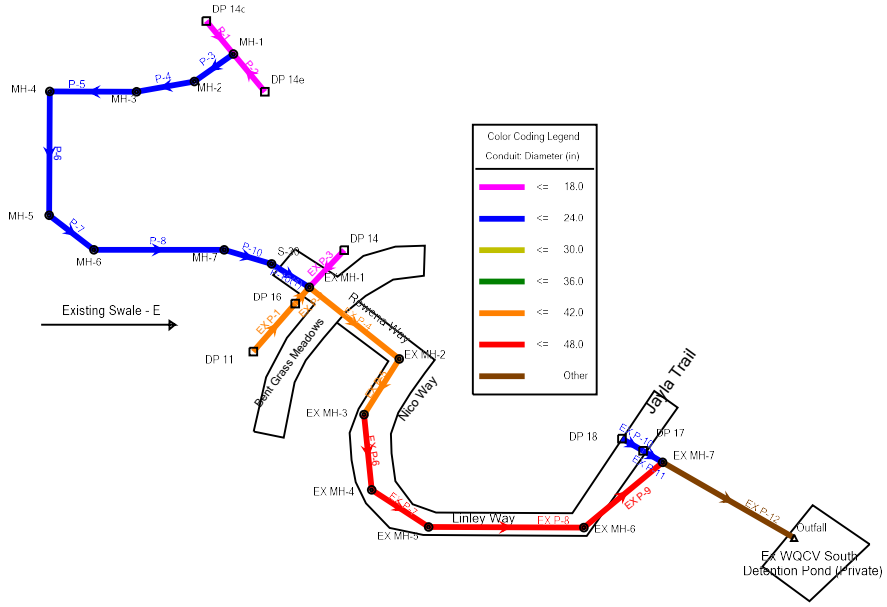
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.8**	**8.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

StormCAD

Falcon Meadows at Bent Grass Filing No. 2

Scenario: 5 YR

Active Scenario: 5 YR



Falcon Meadows at Bent Grass Filing No. 2

FlexTable: Conduit Table

Active Scenario: 100 YR

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Capacity (Full Flow) (cfs)	Flow (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Slope (Calculated) (ft/ft)
EX P-1	DP 11	DP 16	99.5	42.0	0.013	152.97	57.03	5.93	6,946.03	6,940.50	6,944.06	6,948.24	6,938.20	6,943.74	0.023
EX P-2	DP 16	EX MH-1	7.5	42.0	0.013	201.21	79.06	8.22	6,948.24	6,937.90	6,943.22	6,948.02	6,937.60	6,943.17	0.040
EX P-3	DP 14	EX MH-1	27.5	18.0	0.013	10.41	11.78	6.67	6,948.30	6,939.57	6,943.52	6,948.02	6,939.30	6,943.17	0.010
EX P-4	EX MH-1	EX MH-2	211.5	42.0	0.013	100.50	101.84	10.59	6,948.02	6,937.30	6,941.95	6,946.72	6,935.19	6,939.78	0.010
EX P-5	EX MH-2	EX MH-3	132.1	42.0	0.013	100.95	101.05	10.50	6,946.72	6,934.89	6,938.58	6,945.39	6,933.56	6,937.25	0.010
EX P-6	EX MH-3	EX MH-4	75.2	48.0	0.013	143.41	100.55	12.35	6,945.39	6,933.06	6,936.35	6,944.74	6,932.31	6,936.31	0.010
EX P-7	EX MH-4	EX MH-5	61.2	48.0	0.013	120.39	100.31	10.72	6,944.74	6,932.01	6,935.50	6,944.31	6,931.58	6,935.35	0.007
EX P-8	EX MH-5	EX MH-6	235.3	48.0	0.013	122.08	100.08	10.84	6,944.31	6,931.28	6,934.31	6,942.08	6,929.58	6,933.33	0.007
EX P-9	EX MH-6	EX MH-7	119.8	48.0	0.013	149.66	99.22	12.73	6,942.08	6,929.28	6,932.30	6,941.78	6,927.98	6,932.23	0.011
EX P-10	DP 18	DP 17	35.0	24.0	0.013	48.52	18.25	5.81	6,941.57	6,931.85	6,934.94	6,941.57	6,930.24	6,934.71	0.046
EX P-11	DP 17	EX MH-7	9.2	24.0	0.013	50.53	41.50	13.21	6,941.57	6,929.94	6,932.54	6,941.78	6,929.48	6,932.23	0.050
EX P-12	EX MH-7	Outfall	253.3	54.0	0.013	150.31	134.16	10.68	6,941.78	6,927.48	6,930.89	6,932.00	6,926.00	6,929.31	0.006
P-1	DP 14d	MH-1	6.3	18.0	0.013	15.08	7.48	8.52	6,955.22	6,950.84	6,952.19	6,954.90	6,950.71	6,952.19	0.021
P-2	DP 14e	MH-1	28.7	18.0	0.013	10.56	10.34	6.81	6,955.22	6,951.00	6,952.42	6,954.90	6,950.71	6,952.19	0.010
P-3	MH-1	MH-2	68.5	24.0	0.013	32.79	16.92	10.52	6,954.90	6,950.21	6,951.69	6,955.44	6,948.77	6,950.38	0.021
P-4	MH-2	MH-3	84.1	24.0	0.013	35.40	16.86	11.13	6,955.44	6,948.47	6,949.95	6,956.29	6,946.41	6,949.01	0.024
P-5	MH-3	MH-4	133.9	24.0	0.013	20.22	16.80	5.35	6,956.29	6,946.11	6,948.74	6,956.38	6,945.04	6,948.00	0.008
P-6	MH-4	MH-5	260.9	24.0	0.013	20.49	16.57	5.27	6,956.38	6,944.74	6,947.66	6,953.14	6,942.60	6,946.26	0.008
P-7	MH-5	MH-6	49.0	24.0	0.013	20.18	16.12	5.13	6,953.14	6,942.30	6,945.97	6,952.59	6,941.91	6,945.72	0.008
P-8	MH-6	MH-7	218.3	24.0	0.013	18.63	16.04	5.11	6,952.59	6,941.61	6,945.44	6,949.80	6,940.13	6,944.34	0.007
P-10	MH-7	S-30	66.8	24.0	0.013	19.96	15.65	4.98	6,949.80	6,939.83	6,944.07	6,948.86	6,939.31	6,943.75	0.008
P-10(1)	S-30	EX MH-1	66.8	24.0	0.013	19.77	15.53	4.94	6,948.86	6,939.31	6,943.48	6,948.02	6,938.80	6,943.17	0.008

Falcon Meadows at Bent Grass Filing No. 2

FlexTable: Manhole Table

Active Scenario: 100 YR

Label	Elevation (Rim) (ft)	Headloss Method	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Diameter (in)
EX MH-1	6,948.02	Standard	1.22	6,943.17	6,941.95	6,943.86	6,943.69	84.0
EX MH-2	6,946.72	Standard	1.20	6,939.78	6,938.58	6,941.53	6,940.30	84.0
EX MH-3	6,945.39	Standard	0.90	6,937.25	6,936.35	6,938.97	6,937.64	84.0
EX MH-4	6,944.74	Standard	0.81	6,936.31	6,935.50	6,937.30	6,936.65	84.0
EX MH-5	6,944.31	Standard	1.04	6,935.35	6,934.31	6,936.39	6,935.80	84.0
EX MH-6	6,942.08	Standard	1.03	6,933.33	6,932.30	6,934.37	6,933.78	84.0
EX MH-7	6,941.78	Standard	1.34	6,932.23	6,930.89	6,933.20	6,932.56	96.0
MH-1	6,954.90	Standard	0.50	6,952.19	6,951.69	6,952.73	6,952.41	48.0
MH-2	6,955.44	Standard	0.43	6,950.38	6,949.95	6,950.98	6,950.66	48.0
MH-3	6,956.29	Standard	0.27	6,949.01	6,948.74	6,949.45	6,949.18	48.0
MH-4	6,956.38	Standard	0.35	6,948.00	6,947.66	6,948.45	6,948.09	48.0
MH-5	6,953.14	Standard	0.29	6,946.26	6,945.97	6,946.69	6,946.38	48.0
MH-6	6,952.59	Standard	0.28	6,945.72	6,945.44	6,946.13	6,945.84	48.0
MH-7	6,949.80	Standard	0.27	6,944.34	6,944.07	6,944.75	6,944.46	48.0
S-30	6,948.86	Standard	0.27	6,943.75	6,943.48	6,944.14	6,943.86	48.0

Falcon Meadows at Bent Grass Filing No. 2
FlexTable: Outfall Table
Active Scenario: 100 YR

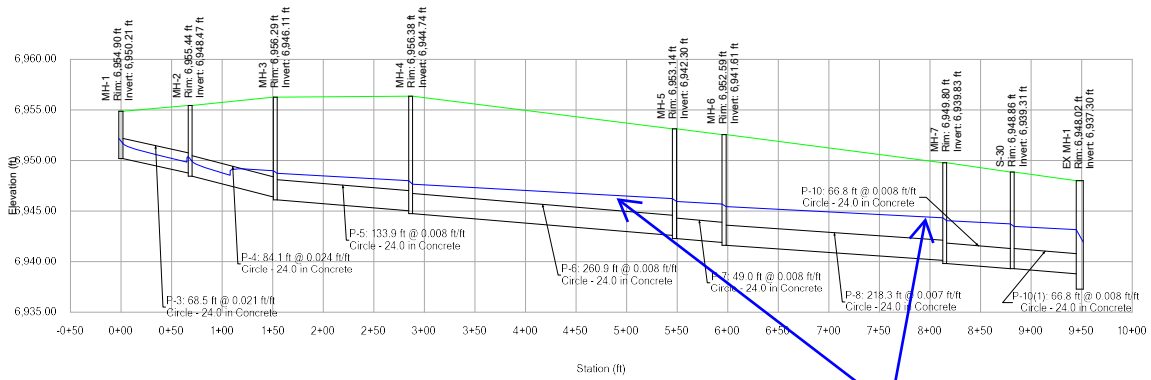
Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
Outfall	6,932.00	6,926.00	User Defined Tailwater	6,927.87	6,929.31	6,929.31	132.89

Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Mainline Storm Sys (FM Filing 2 System A.stsw)

Active Scenario: 100 YR



Per email from Daniel Torres @ 02.08.2022, watertight joints will be required on the CDs. Verbiage to this effect has been added within the IX. Storm Sewer System section of the narrative.

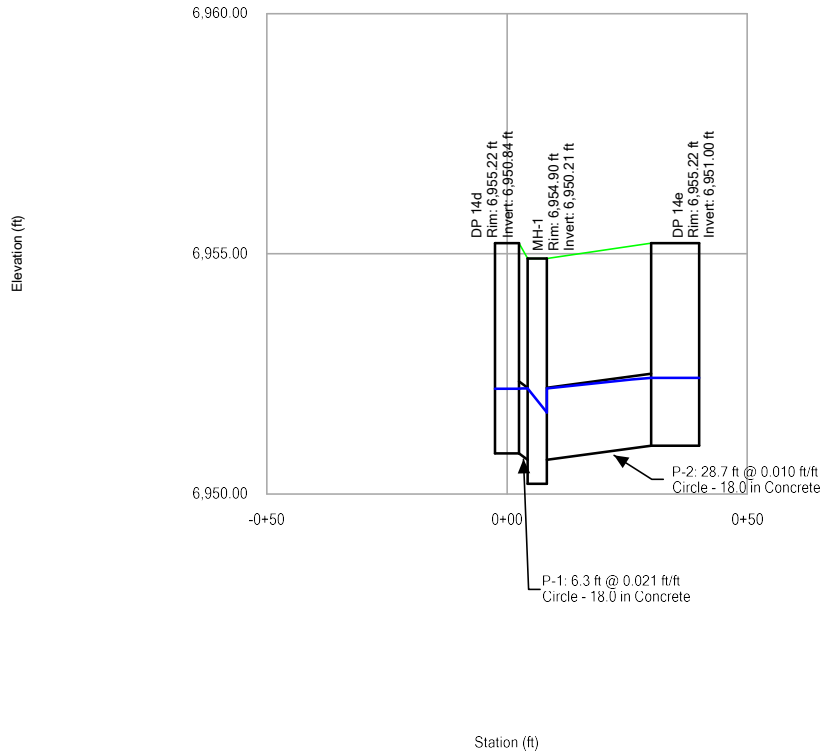
Per ECM 3.3.1.D pipes shall be design free of pressure heads except for short runs where it cannot be avoided. It does not appear that this criteria is met. please revise the storm pipes (p5-p10) as necessary

Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Laterals (FM Filing 2 System A.stsw)

Active Scenario: 100 YR

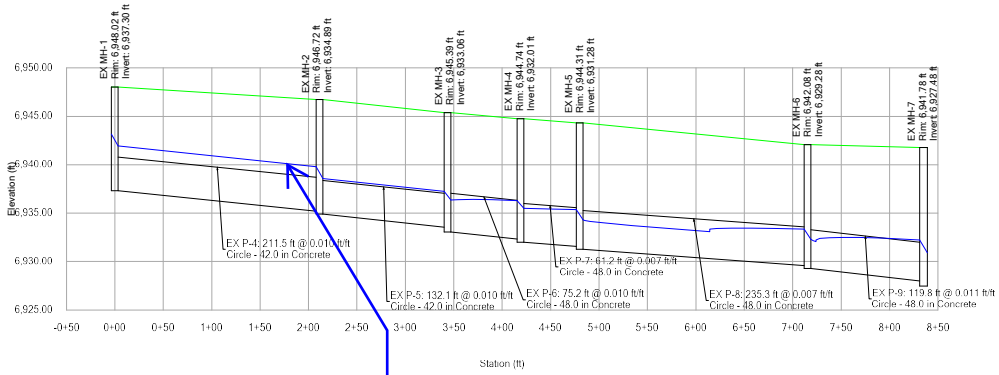


Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Ex Mainline (FM Filing 2 System A.stsw)

Active Scenario: 100 YR



This does not meet ECM 3.3.1.D. Please identify whether watertight joints were used at the existing pipe. The situation with this existing pipe run will be discussed with the engineering manager/ECM administrator. I will relay any comments/direction provided.

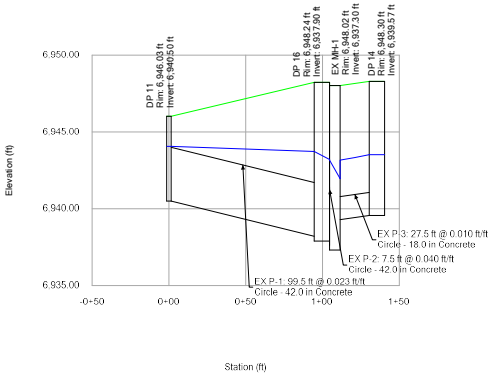
Per email from Daniel Torres @ 02.08.2022, watertight joints will be required on the CDs. Verbiage to this effect has been added within the IX. Storm Sewer System section of the narrative.

Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Ex Rowena Way Laterals (FM Filing 2 System A.stsw)

Active Scenario: 100 YR

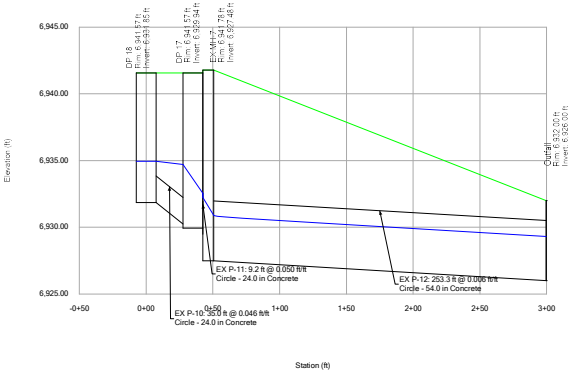


Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Ex Jayla Laterals & Outlet (FM Filing 2 System A.stsw)

Active Scenario: 100 YR



Falcon Meadows at Bent Grass Filing No. 2

FlexTable: Conduit Table

Active Scenario: 5 YR

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Capacity (Full Flow) (cfs)	Flow (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Slope (Calculated) (ft/ft)
EX P-1	DP 11	DP 16	99.5	42.0	0.013	152.97	11.46	9.34	6,946.03	6,940.50	6,941.53	6,948.24	6,938.20	6,939.49	0.023
EX P-2	DP 16	EX MH-1	7.5	42.0	0.013	201.21	19.13	13.18	6,948.24	6,937.90	6,939.24	6,948.02	6,937.60	6,939.38	0.040
EX P-3	DP 14	EX MH-1	27.5	18.0	0.013	10.41	4.93	5.81	6,948.30	6,939.57	6,940.42	6,948.02	6,939.30	6,940.04	0.010
EX P-4	EX MH-1	EX MH-2	211.5	42.0	0.013	100.50	28.27	8.97	6,948.02	6,937.30	6,938.94	6,946.72	6,935.19	6,936.96	0.010
EX P-5	EX MH-2	EX MH-3	132.1	42.0	0.013	100.95	28.01	8.98	6,946.72	6,934.89	6,936.52	6,945.39	6,933.56	6,934.83	0.010
EX P-6	EX MH-3	EX MH-4	75.2	48.0	0.013	143.41	27.85	8.84	6,945.39	6,933.06	6,934.62	6,944.74	6,932.31	6,933.98	0.010
EX P-7	EX MH-4	EX MH-5	61.2	48.0	0.013	120.39	27.76	7.78	6,944.74	6,932.01	6,933.57	6,944.31	6,931.58	6,933.24	0.007
EX P-8	EX MH-5	EX MH-6	235.3	48.0	0.013	122.08	27.67	7.86	6,944.31	6,931.28	6,932.84	6,942.08	6,929.58	6,931.23	0.007
EX P-9	EX MH-6	EX MH-7	119.8	48.0	0.013	149.66	27.35	9.06	6,942.08	6,929.28	6,930.83	6,941.78	6,927.98	6,929.80	0.011
EX P-10	DP 18	DP 17	35.0	24.0	0.013	48.52	7.89	11.37	6,941.57	6,931.85	6,932.85	6,941.57	6,930.24	6,931.74	0.046
EX P-11	DP 17	EX MH-7	9.2	24.0	0.013	50.53	13.64	13.66	6,941.57	6,929.94	6,931.27	6,941.78	6,929.48	6,930.44	0.050
EX P-12	EX MH-7	Outfall	253.3	54.0	0.013	150.31	38.67	7.92	6,941.78	6,927.48	6,929.27	6,932.00	6,926.00	6,927.56	0.006
P-1	DP 14d	MH-1	6.3	18.0	0.013	15.08	2.42	6.26	6,955.22	6,950.84	6,951.43	6,954.90	6,950.71	6,951.36	0.021
P-2	DP 14e	MH-1	28.7	18.0	0.013	10.56	4.48	5.73	6,955.22	6,951.00	6,951.81	6,954.90	6,950.71	6,951.40	0.010
P-3	MH-1	MH-2	68.5	24.0	0.013	32.79	6.51	8.13	6,954.90	6,950.21	6,951.11	6,955.44	6,948.77	6,949.38	0.021
P-4	MH-2	MH-3	84.1	24.0	0.013	35.40	6.48	8.58	6,955.44	6,948.47	6,949.37	6,956.29	6,946.41	6,946.99	0.024
P-5	MH-3	MH-4	133.9	24.0	0.013	20.22	6.45	5.72	6,956.29	6,946.11	6,947.01	6,956.38	6,945.04	6,945.82	0.008
P-6	MH-4	MH-5	260.9	24.0	0.013	20.49	6.37	5.76	6,956.38	6,944.74	6,945.63	6,953.14	6,942.60	6,943.37	0.008
P-7	MH-5	MH-6	49.0	24.0	0.013	20.18	6.21	5.65	6,953.14	6,942.30	6,943.18	6,952.59	6,941.91	6,942.67	0.008
P-8	MH-6	MH-7	218.3	24.0	0.013	18.63	6.18	5.33	6,952.59	6,941.61	6,942.49	6,949.80	6,940.13	6,940.92	0.007
P-10	MH-7	S-30	66.8	24.0	0.013	19.96	6.04	5.57	6,949.80	6,939.83	6,940.70	6,948.86	6,939.31	6,940.41	0.008
P-10(1)	S-30	EX MH-1	66.8	24.0	0.013	19.77	5.99	5.52	6,948.86	6,939.31	6,940.18	6,948.02	6,938.80	6,939.56	0.008

Falcon Meadows at Bent Grass Filing No. 2
FlexTable: Manhole Table
Active Scenario: 5 YR

Label	Elevation (Rim) (ft)	Headloss Method	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Diameter (in)
EX MH-1	6,948.02	Standard	0.44	6,939.38	6,938.94	6,939.62	6,939.57	84.0
EX MH-2	6,946.72	Standard	0.44	6,936.96	6,936.52	6,937.48	6,937.15	84.0
EX MH-3	6,945.39	Standard	0.41	6,935.03	6,934.62	6,936.27	6,935.21	84.0
EX MH-4	6,944.74	Standard	0.41	6,933.98	6,933.57	6,934.47	6,934.15	84.0
EX MH-5	6,944.31	Standard	0.41	6,933.24	6,932.84	6,933.73	6,933.42	84.0
EX MH-6	6,942.08	Standard	0.40	6,931.23	6,930.83	6,931.73	6,931.40	84.0
EX MH-7	6,941.78	Standard	0.54	6,929.80	6,929.27	6,930.18	6,929.94	96.0
MH-1	6,954.90	Standard	0.24	6,951.36	6,951.11	6,951.53	6,951.46	48.0
MH-2	6,955.44	Standard	0.21	6,949.58	6,949.37	6,950.59	6,949.72	48.0
MH-3	6,956.29	Standard	0.21	6,947.22	6,947.01	6,948.36	6,947.35	48.0
MH-4	6,956.38	Standard	0.27	6,945.91	6,945.63	6,946.42	6,945.98	48.0
MH-5	6,953.14	Standard	0.24	6,943.42	6,943.18	6,943.93	6,943.52	48.0
MH-6	6,952.59	Standard	0.23	6,942.72	6,942.49	6,943.22	6,942.82	48.0
MH-7	6,949.80	Standard	0.23	6,940.93	6,940.70	6,941.37	6,941.03	48.0
S-30	6,948.86	Standard	0.23	6,940.41	6,940.18	6,940.59	6,940.50	48.0

Falcon Meadows at Bent Grass Filing No. 2
FlexTable: Outfall Table
Active Scenario: 5 YR

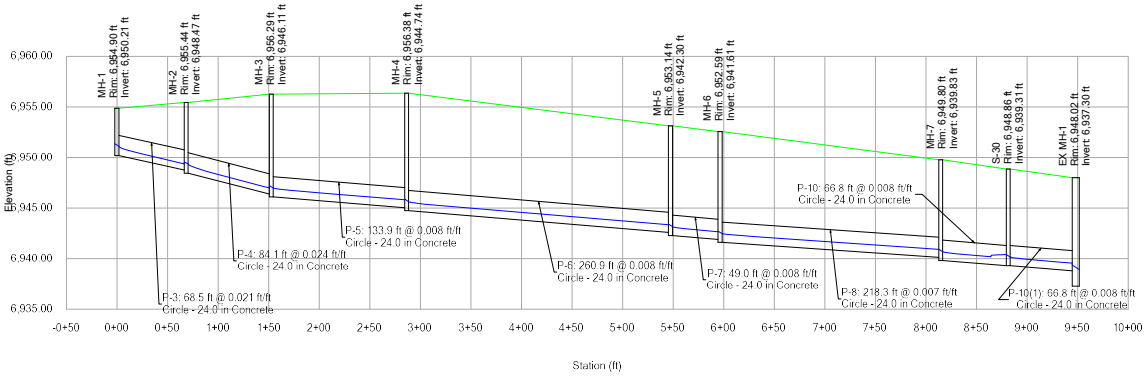
Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
Outfall	6,932.00	6,926.00	User Defined Tailwater	6,926.56	6,927.56	6,927.56	38.18

Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Mainline Storm Sys (FM Filing 2 System A.stsw)

Active Scenario: 5 YR

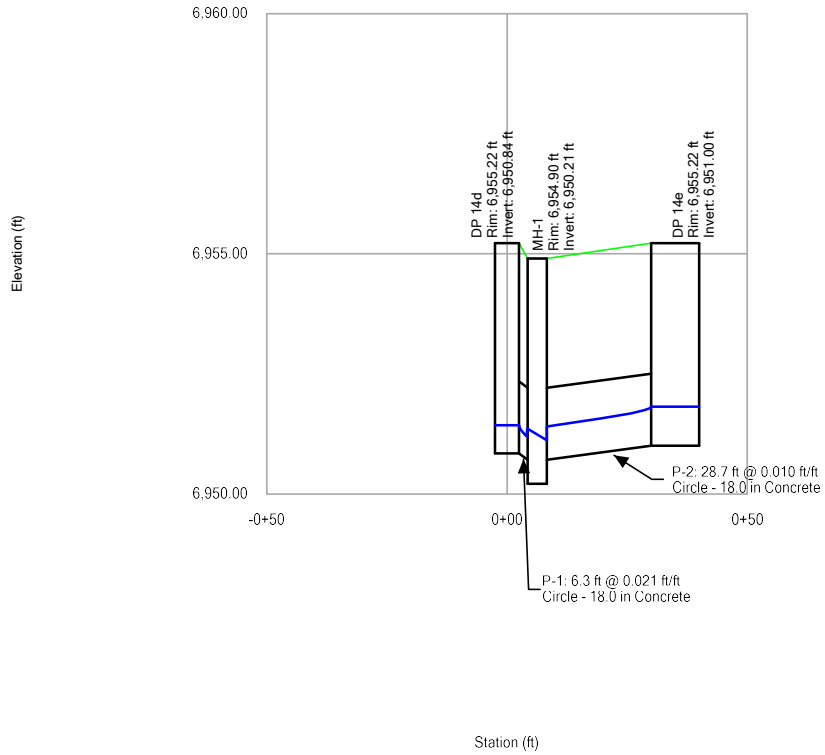


Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Laterals (FM Filing 2 System A.stsw)

Active Scenario: 5 YR

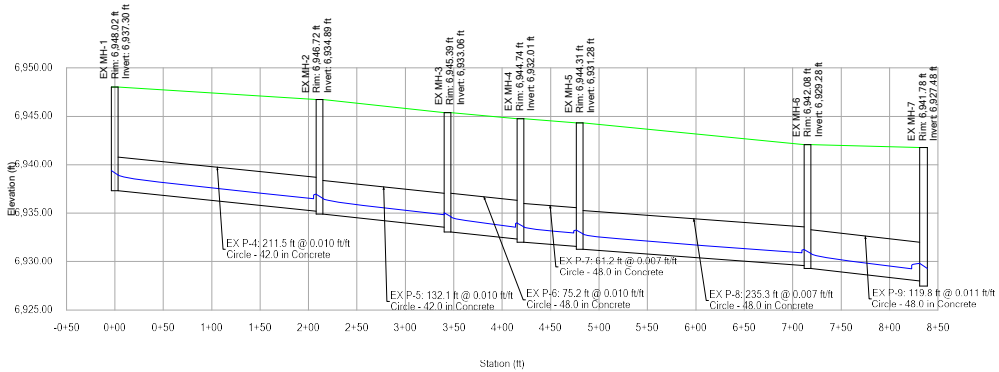


Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Ex Mainline (FM Filing 2 System A.stsw)

Active Scenario: 5 YR

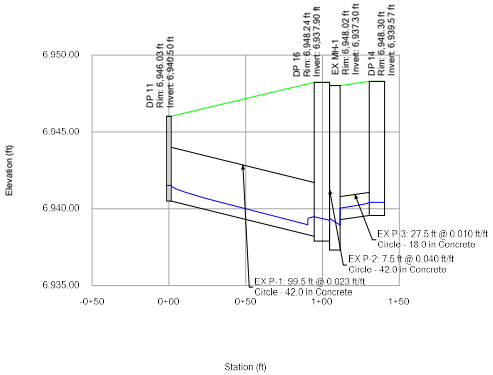


Falcon Meadows at Bent Grass Filing No. 2

Profile Report

Engineering Profile - Ex Rowena Way Laterals (FM Filing 2 System A.stsw)

Active Scenario: 5 YR

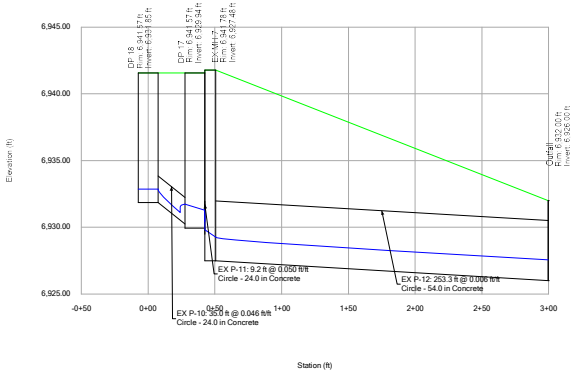


Falcon Meadows at Bent Grass Filing No. 2

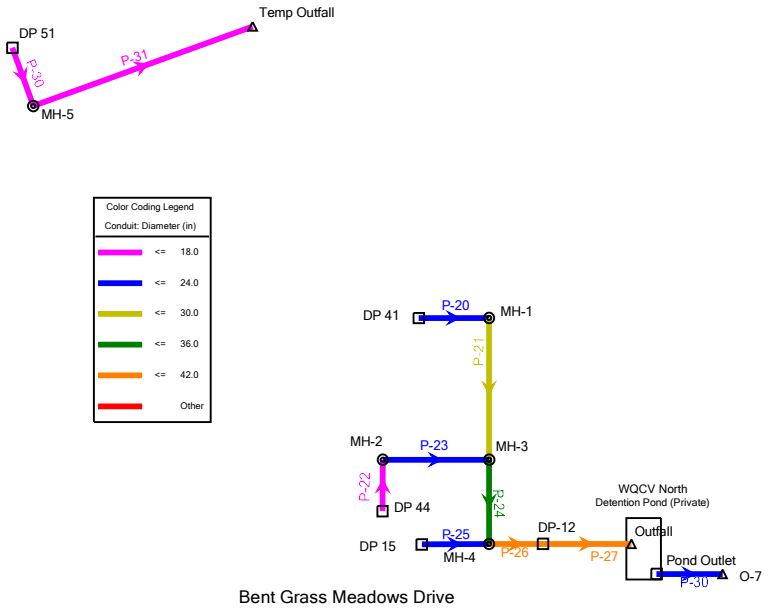
Profile Report

Engineering Profile - Ex Jayla Laterals & Outlet (FM Filing 2 System A.stsw)

Active Scenario: 5 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
Scenario: 100 YR
Active Scenario: 100 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
FlexTable: Conduit Table
Active Scenario: 100 YR

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Capacity (Full Flow) (cfs)	Flow (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Slope (Calculated) (ft/ft)
P-20	DP 41	MH-1	6.4	24.0	0.013	17.84	22.78	7.25	6,952.21	6,946.36	6,948.18	6,951.95	6,946.32	6,948.02	0.006
P-21	MH-1	MH-3	136.7	30.0	0.013	45.73	22.76	9.30	6,951.95	6,945.82	6,947.44	6,949.54	6,944.12	6,946.93	0.012
P-22	DP 44	MH-2	7.5	18.0	0.013	10.85	11.36	6.43	6,949.87	6,945.66	6,947.27	6,949.58	6,945.58	6,947.18	0.011
P-23	MH-2	MH-3	36.8	24.0	0.013	25.30	11.36	7.84	6,949.58	6,945.08	6,947.01	6,949.54	6,944.62	6,946.93	0.013
P-24	MH-3	MH-4	43.8	36.0	0.013	74.10	30.92	4.37	6,949.54	6,943.62	6,946.66	6,949.05	6,943.08	6,946.57	0.012
P-25	DP 15	MH-4	7.5	24.0	0.013	23.36	17.02	5.42	6,949.27	6,944.16	6,946.61	6,949.05	6,944.08	6,946.57	0.011
P-26	MH-4	DP-12	27.5	42.0	0.013	101.51	46.30	4.81	6,949.05	6,942.58	6,946.28	6,949.29	6,942.30	6,946.22	0.010
P-27	DP-12	Outfall	32.8	42.0	0.013	100.96	61.44	6.39	6,949.29	6,942.20	6,945.71	6,948.20	6,941.87	6,945.59	0.010
P-30	Pond Outlet	O-7	27.8	24.0	0.013	22.69	32.80	10.44	6,946.00	6,940.33	6,942.59	6,942.00	6,940.05	6,941.95	0.010
P-30	DP 51	MH-5	7.5	18.0	0.013	10.85	11.98	6.78	6,963.48	6,959.19	6,960.81	6,963.25	6,959.11	6,960.71	0.011
P-31	MH-5	Temp Outfall	217.1	18.0	0.013	11.29	11.97	7.21	6,963.25	6,958.81	6,960.14	6,958.41	6,956.30	6,957.61	0.012

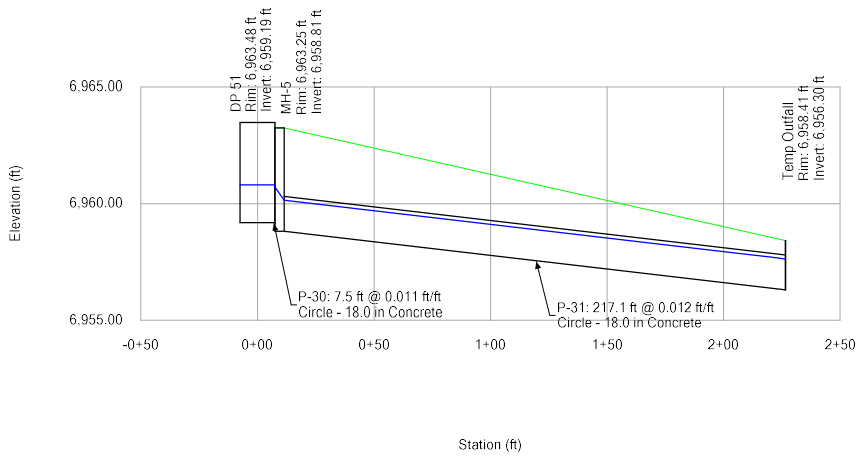
Falcon Meadows at Bent Grass Fililng No. 2
System B
FlexTable: Manhole Table
Active Scenario: 100 YR

Label	Elevation (Rim) (ft)	Headloss Method	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Diameter (in)
MH-1	6,951.95	Standard	0.57	6,948.01	6,947.44	6,949.01	6,948.15	60.0
MH-2	6,949.58	Standard	0.17	6,947.18	6,947.01	6,947.82	6,947.22	60.0
MH-3	6,949.54	Standard	0.27	6,946.93	6,946.66	6,947.13	6,946.96	72.0
MH-4	6,949.05	Standard	0.29	6,946.57	6,946.28	6,946.86	6,946.64	84.0
MH-5	6,963.25	Standard	0.57	6,960.71	6,960.14	6,961.42	6,960.95	48.0

Falcon Meadows at Bent Grass Fililng No. 2
System B
FlexTable: Outfall Table
Active Scenario: 100 YR

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
Outfall	6,948.20	6,941.87	User Defined Tailwater	6,945.59	6,945.59	6,945.59	61.33
O-7	6,942.00	6,940.05	Free Outfall		6,941.95	6,941.95	32.80
Temp Outfall	6,958.41	6,956.30	Free Outfall		6,957.61	6,957.61	11.73

Falcon Meadows at Bent Grass Fililng No. 2
System B
Profile Report
Engineering Profile - Temp Outfall (FM Filing 2 System B.stsw)
Active Scenario: 100 YR



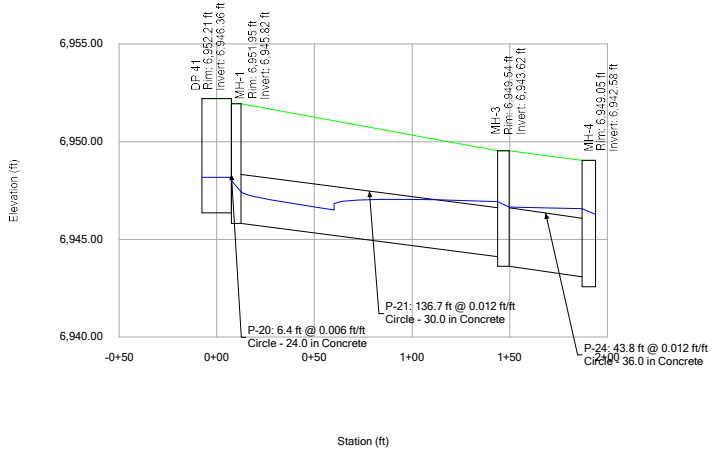
Falcon Meadows at Bent Grass Fililng No. 2

System B

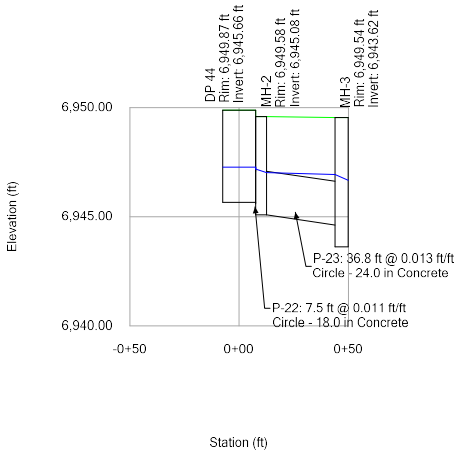
Profile Report

Engineering Profile - Mainline (FM Filing 2 System B.stsw)

Active Scenario: 100 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
Profile Report
Engineering Profile - Laterals - DP 44 (FM Filing 2 System B.stsw)
Active Scenario: 100 YR



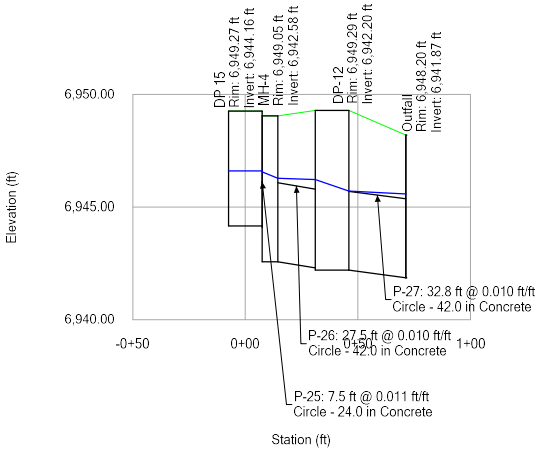
Falcon Meadows at Bent Grass Fililng No. 2

System B

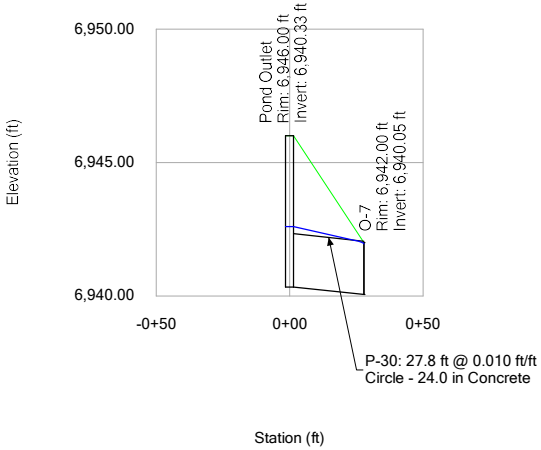
Profile Report

Engineering Profile - Laterals and Outfall to Pond (FM Filing 2 System B.stsw)

Active Scenario: 100 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
Profile Report
Engineering Profile - Pond Outlet (FM Filing 2 System B.stsw)
Active Scenario: 100 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
FlexTable: Conduit Table
Active Scenario: 5 YR

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Capacity (Full Flow) (cfs)	Flow (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Slope (Calculated) (ft/ft)
P-20	DP 41	MH-1	6.4	24.0	0.013	17.84	9.37	5.75	6,952.21	6,946.36	6,947.45	6,951.95	6,946.32	6,947.37	0.006
P-21	MH-1	MH-3	136.7	30.0	0.013	45.73	9.36	7.32	6,951.95	6,945.82	6,946.84	6,949.54	6,944.12	6,945.24	0.012
P-22	DP 44	MH-2	7.5	18.0	0.013	10.85	4.38	5.81	6,949.87	6,945.66	6,946.46	6,949.58	6,945.58	6,946.29	0.011
P-23	MH-2	MH-3	36.8	24.0	0.013	25.30	4.38	6.04	6,949.58	6,945.08	6,945.81	6,949.54	6,944.62	6,945.19	0.013
P-24	MH-3	MH-4	43.8	36.0	0.013	74.10	12.47	7.79	6,949.54	6,943.62	6,945.04	6,949.05	6,943.08	6,945.13	0.012
P-25	DP 15	MH-4	7.5	24.0	0.013	23.36	3.78	5.46	6,949.27	6,944.16	6,945.12	6,949.05	6,944.08	6,945.13	0.011
P-26	MH-4	DP-12	27.5	42.0	0.013	101.51	15.62	7.64	6,949.05	6,942.58	6,945.08	6,949.29	6,942.30	6,945.08	0.010
P-27	DP-12	Outfall	32.8	42.0	0.013	100.96	21.72	8.36	6,949.29	6,942.20	6,945.00	6,948.20	6,941.87	6,945.00	0.010
P-30	Pond Outlet	O-7	27.8	24.0	0.013	22.69	6.20	6.15	6,946.00	6,940.33	6,941.21	6,942.00	6,940.05	6,940.78	0.010
P-30	DP 51	MH-5	7.5	18.0	0.013	10.85	4.64	5.90	6,963.48	6,959.19	6,960.02	6,963.25	6,959.11	6,959.84	0.011
P-31	MH-5	Temp Outfall	217.1	18.0	0.013	11.29	4.63	6.07	6,963.25	6,958.81	6,959.64	6,958.41	6,956.30	6,956.97	0.012

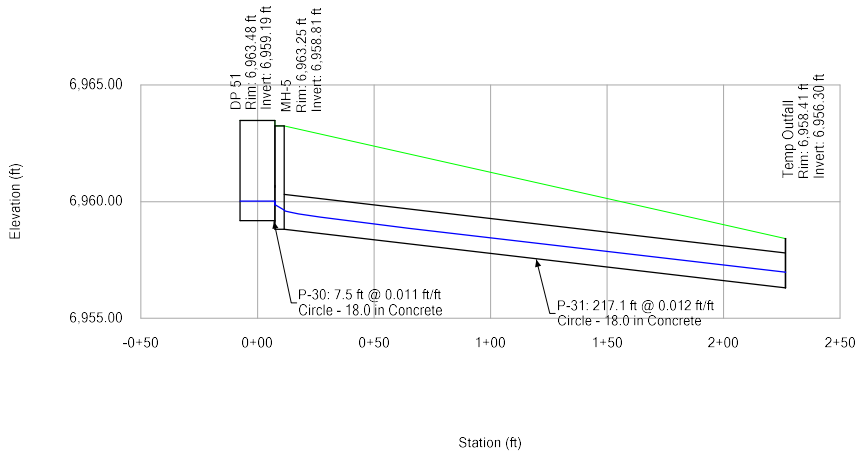
Falcon Meadows at Bent Grass Fililng No. 2
System B
FlexTable: Manhole Table
Active Scenario: 5 YR

Label	Elevation (Rim) (ft)	Headloss Method	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Diameter (in)
MH-1	6,951.95	Standard	0.31	6,947.15	6,946.84	6,947.64	6,947.22	60.0
MH-2	6,949.58	Standard	0.22	6,946.03	6,945.81	6,946.47	6,946.09	60.0
MH-3	6,949.54	Standard	0.20	6,945.24	6,945.04	6,945.78	6,945.26	72.0
MH-4	6,949.05	Standard	0.06	6,945.13	6,945.08	6,945.22	6,945.15	84.0
MH-5	6,963.25	Standard	0.23	6,959.87	6,959.64	6,960.32	6,959.97	48.0

Falcon Meadows at Bent Grass Fililng No. 2
System B
FlexTable: Outfall Table
Active Scenario: 5 YR

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
Outfall	6,948.20	6,941.87	User Defined Tailwater	6,945.00	6,945.00	6,945.00	21.69
O-7	6,942.00	6,940.05	Free Outfall		6,940.78	6,940.78	6.20
Temp Outfall	6,958.41	6,956.30	Free Outfall		6,956.97	6,956.97	4.52

Falcon Meadows at Bent Grass Fililng No. 2
System B
Profile Report
Engineering Profile - Temp Outfall (FM Filing 2 System B.stsw)
Active Scenario: 5 YR



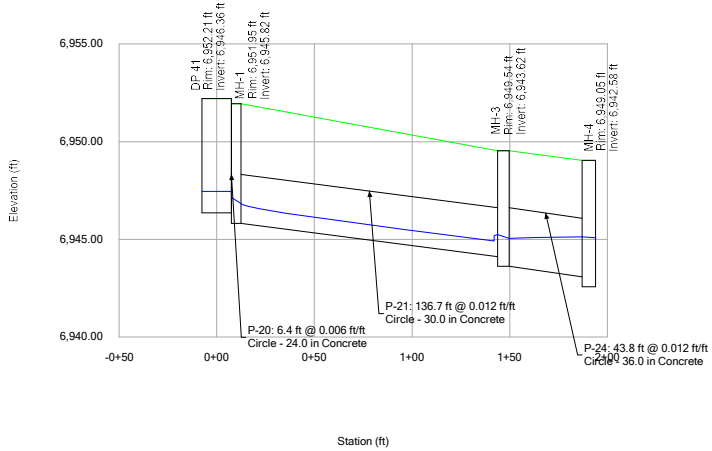
Falcon Meadows at Bent Grass Fililng No. 2

System B

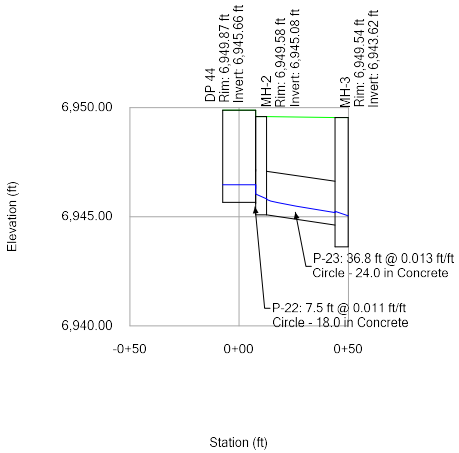
Profile Report

Engineering Profile - Mainline (FM Filing 2 System B.stsw)

Active Scenario: 5 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
Profile Report
Engineering Profile - Laterals - DP 44 (FM Filing 2 System B.stsw)
Active Scenario: 5 YR



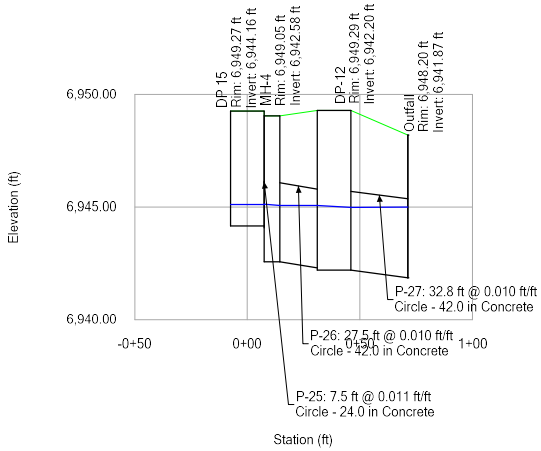
Falcon Meadows at Bent Grass Fililng No. 2

System B

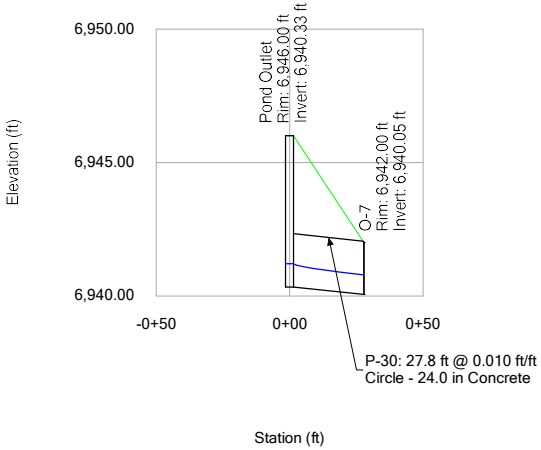
Profile Report

Engineering Profile - Laterals and Outfall to Pond (FM Filing 2 System B.stsw)

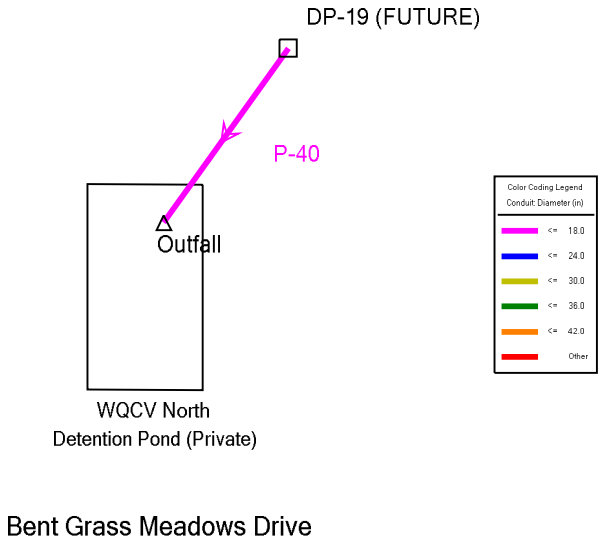
Active Scenario: 5 YR



Falcon Meadows at Bent Grass Fililng No. 2
System B
Profile Report
Engineering Profile - Pond Outlet (FM Filing 2 System B.stsw)
Active Scenario: 5 YR



Falcon Meadows at Bent Grass Filing No. 2
Storm System C (Future)
Active Scenario: 100 YR



Falcon Meadows at Bent Grass Filing No. 2

Storm System C (Future)

Active Scenario: 100 YR

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Capacity (Full Flow) (cfs)	Flow (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Slope (Calculated) (ft/ft)
P-40	DP-19 (FUTURE)	Outfall	38.6	18.0	0.013	23.49	17.90	10.13	6,950.90	6,943.93	6,946.71	6,948.20	6,942.00	6,945.59	0.050

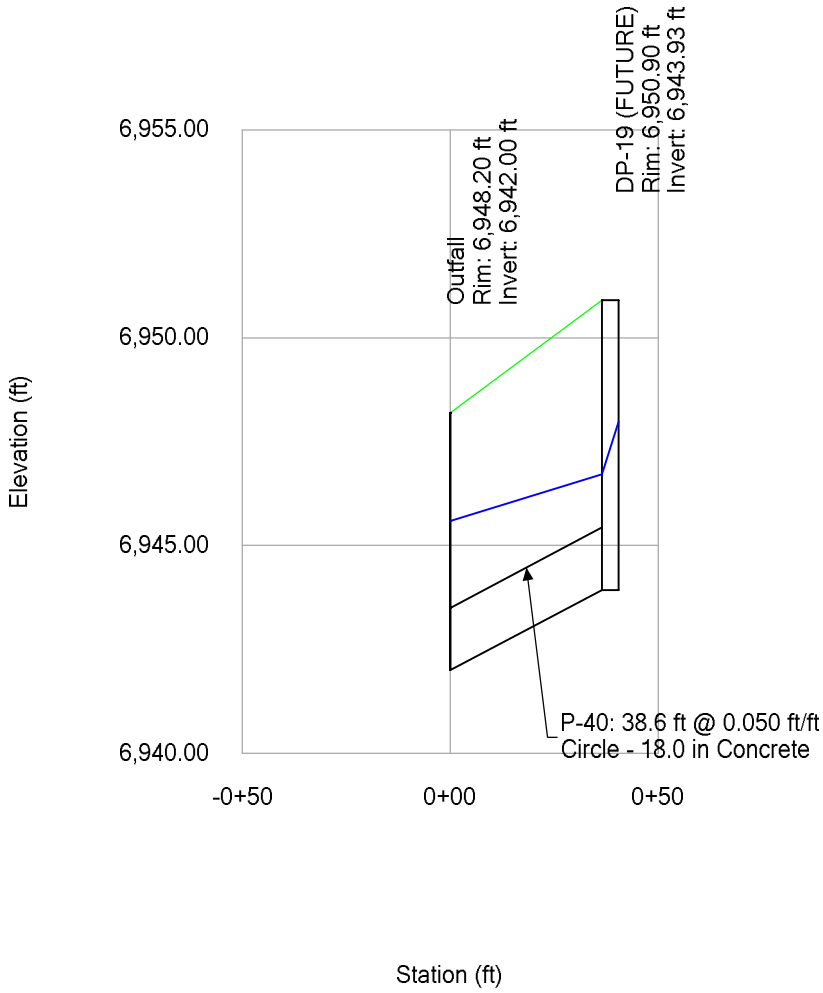
Falcon Meadows at Bent Grass Filing No. 2

Storm System C (Future)

Active Scenario: 100 YR

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
Outfall	6,948.20	6,942.00	User Defined Tailwater	6,945.59	6,945.59	6,945.59	17.85

Falcon Meadows at Bent Grass Filing No. 2
Storm System C (Future)
Active Scenario: 100 YR



Falcon Meadows at Bent Grass Filing No. 2

Storm System C (Future)

Active Scenario: 5 YR

Label	Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Manning's n	Capacity (Full Flow) (cfs)	Flow (cfs)	Velocity (ft/s)	Elevation Ground (Start) (ft)	Invert (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (Out) (ft)	Slope (Calculated) (ft/ft)
P-40	DP-19 (FUTURE)	Outfall	38.6	18.0	0.013	23.49	7.52	11.82	6,950.90	6,943.93	6,944.99	6,948.20	6,942.00	6,945.00	0.050

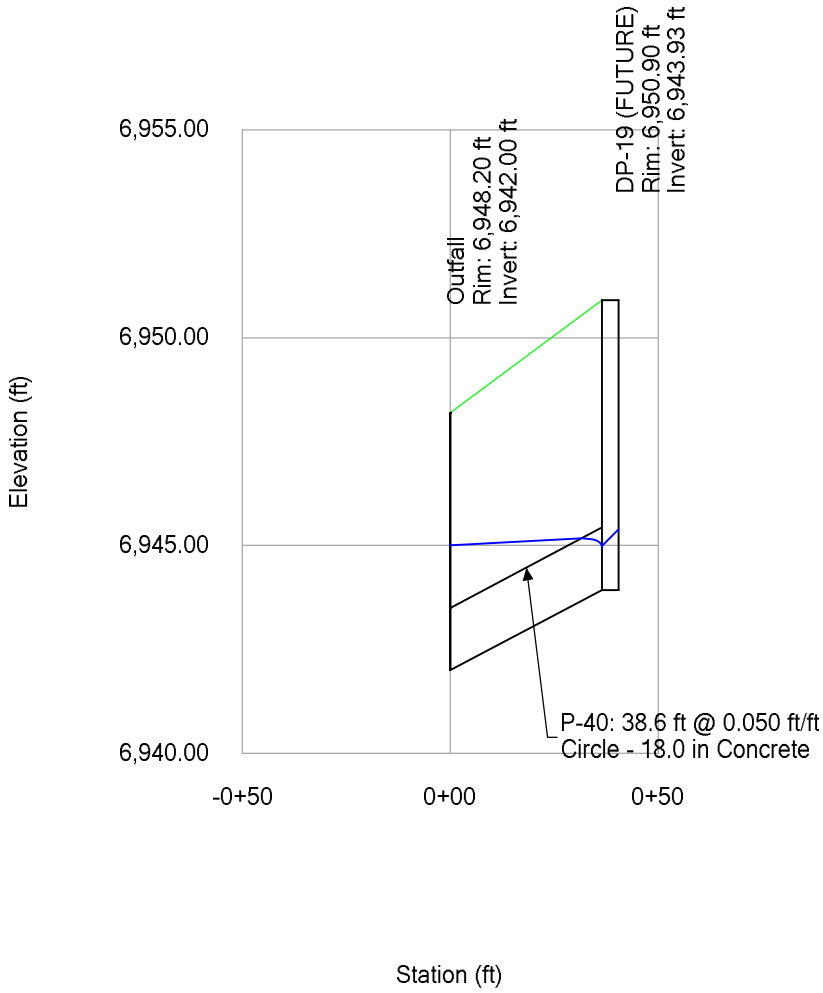
Falcon Meadows at Bent Grass Filing No. 2

Storm System C (Future)

Active Scenario: 5 YR

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
Outfall	6,948.20	6,942.00	User Defined Tailwater	6,945.00	6,945.00	6,945.00	7.50

Falcon Meadows at Bent Grass Filing No. 2
Storm System C (Future)
Active Scenario: 5 YR



PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows at Bent Grass Filing N
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

	Storm Drain System				
	Temp Outfall Stm B	Pond Outfall	Forebay A	Forebay B	
Q_{100} (cfs)	19.6	38.7	61.5	23.5	
D or H (in)	18	24	42	18	
W (ft)					
Slope (%)	1.16	1.00	2.00	5.00	
Yn (in)	14.04	15.72	44.64	43.08	
Y_t (ft)	Unknown	Unknown	1.06	2.39	*If "Unknown" Yt/D=0.4*
$Y_{t/D}$, $Y_{t/H}$	0.40	0.40	0.30	1.59	
Supercritical	Yes	No	No	No	*Based on Froud Number >/< 1*
Q/D^2.5, Q/WH^1.5	7.11	6.84	2.68	8.53	
Q/D^1.5, Q/WH^0.5		13.68	9.39	12.79	
Da, Ha (in) *	16.02				*Da=0.5(D+Yn), Ha=0.5(H+Yn)*
Q/Da^1.5, Q/WHa^0.5 *	12.71				
d_{50} (in), Required	10.99	11.34	10.87	2.02	
Required Riprap Size	M	M	M	L	
Use Riprap Size	**L**	**M**	**M**	**L**	*Found using Figure 9-38 (USDCM)*
d_{50} (in)	9	12	12	9	
1/(2 tan θ)	2.20	1.90	5.30	1.00	*Found using Figure 9-35/9-36 (USDCM)*
Erosive Soils	Yes	No	No	No	
A_t	3.56	5.03	7.99	3.05	*A_t=Q/5.5*
L	9.8	8.1	21.4	-0.2	*L=(1/(2 tan θ))(A_t/Yt - D)*
Min L	4.5	6.0	10.5	4.5	*Min L=3D or 3H*
Max L	15.0	20.0	35.0	15.0	*Max L=10D or 10H*
Length (ft)	10.0	9.0	22.0	4.5	
Bottom Width (ft)	4.5	6.0	10.5	4.5	*Width=3D (Minimum)*
Riprap Depth (in)	18	24	24	18	*Depth=2(d_{50})*
Type II Base Depth (in)	6	6	6	6	
Cutoff Wall	No	No	No	No	
Cutoff Wall Depth (ft)					*Depth of Riprap and Base*
Cutoff Wall Width (ft)					

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).
** This is a temporary minor storm culvert and the riprap has been sized for minor storm flows

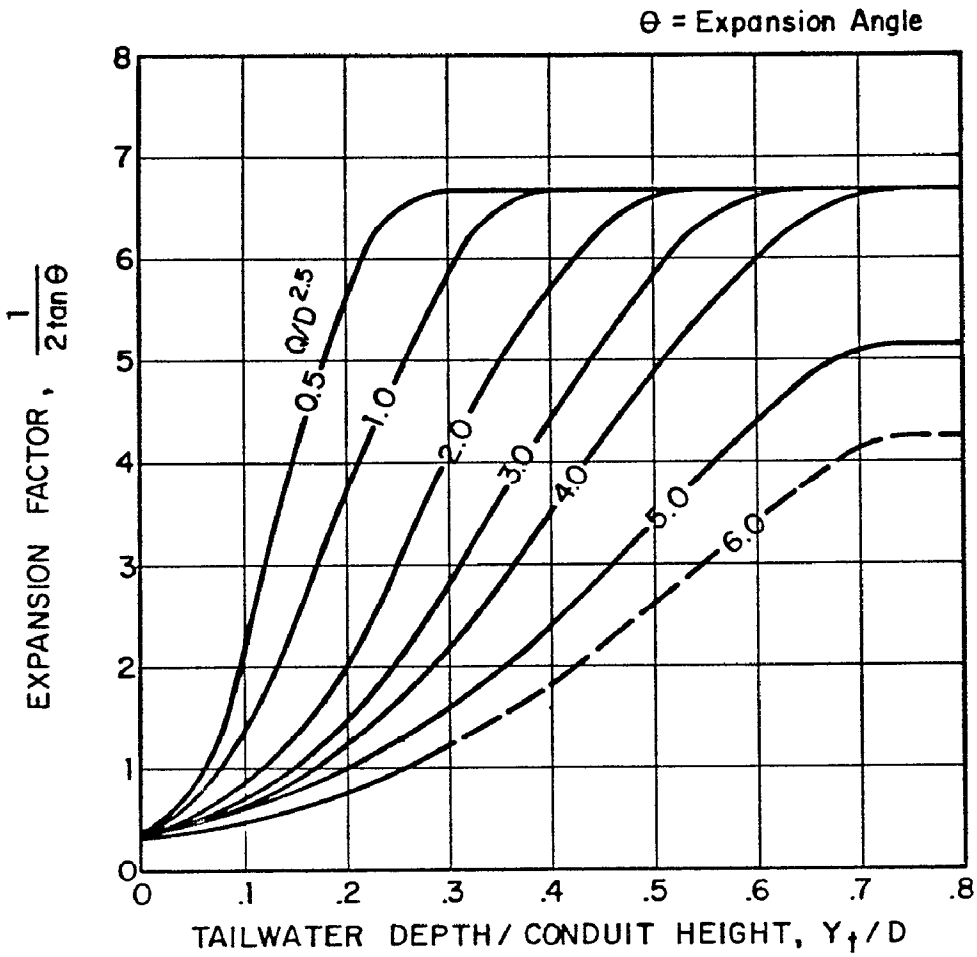


Figure 9-35. Expansion factor for circular conduits

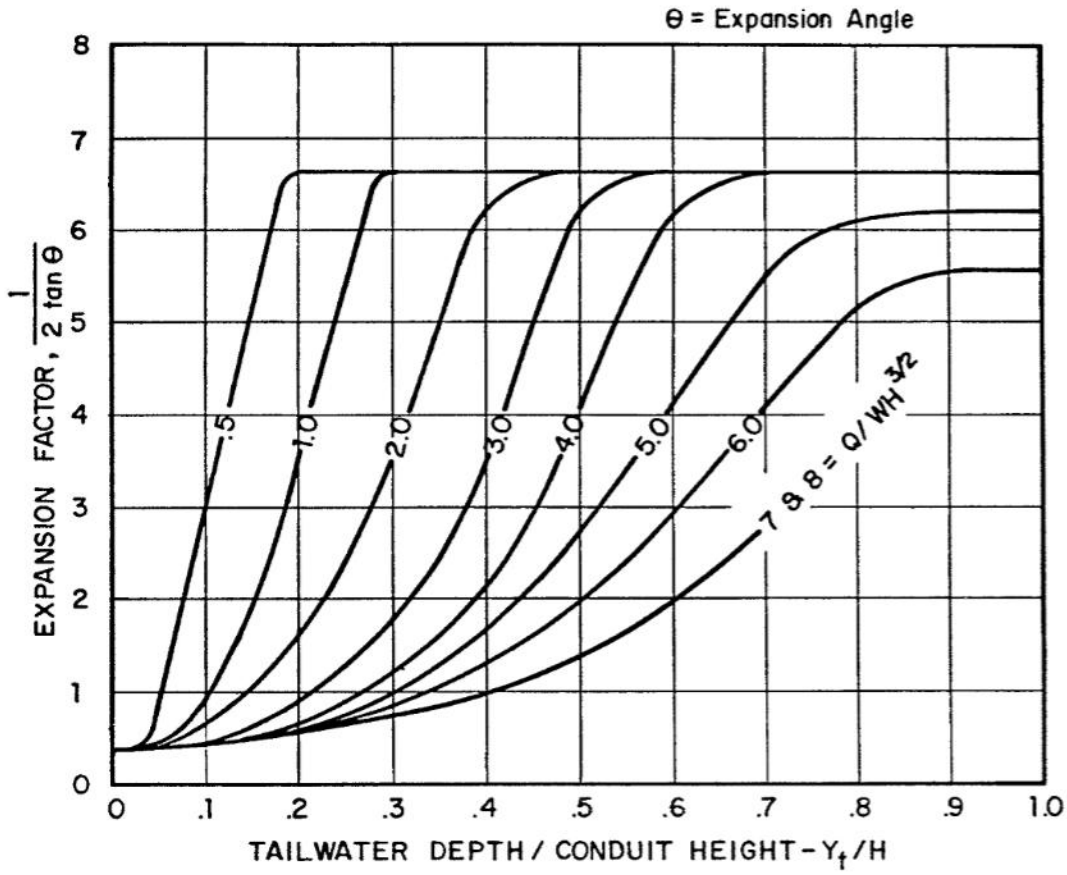


Figure 9-36. Expansion factor for rectangular conduits

APPENDIX D

On-Site Pond Calculations

Detention Pond Tributary Areas

Subdivision: Falcon Meadows
Location: CO, Colorado Springs

Project Name: Falcon Meadows
Project No.: CLH000019
Calculated By: TJE
Checked By: CMD
Date: 12/3/21

Pond (North)

Basin	Area	% Imp
C-1a	0.38	56.7
C-1b	0.45	72.8
C-1c	1.77	77.5
C-1d	1.72	73.2
C-1e	0.29	100
C-1f	0.08	100
C-2	3.98	71.6
C-3	0.18	85.7
C-4	2.67	50.3
C-5	0.60	2
D-1a	2.97	57.4
D-1f	1.61	67.4
Total	**16.70**	**64.0**

Pond (South-Existing)

Basin	Area	% Imp
D-1b	2.54	62.2
D-2a	0.50	88.7
D-2b	0.74	61.8
D-2c	0.31	83.5
D-2d	0.24	81.3
D-2e	1.41	75.4
D-2f	2.43	73.6
D-2g	1.81	54.4
D-2h	0.23	65
D-3	2.26	54
D-4a	0.98	72.5
D-4b	0.95	80.9
D-4c	1.22	64.9
D-5	1.08	65.7
D-6a	1.33	76.6
D-6b	2.69	72.6
D-7	7.65	13.8
D-8	1.69	60.9
D-9	0.72	24.8
E-4	0.91	80.6
E-5	0.89	89
OS-2	20.07	8
OS-3	10.61	8
Total	**63.26**	**32.1**

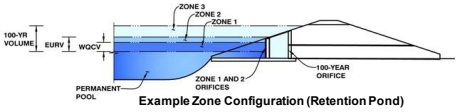
Pond (North) Calculations – Proposed Design

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Basin ID: **WQCV Pond - North**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	16.70	acres
Watershed Length =	1,275	ft
Watershed Length to Centroid =	750	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	65.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.354	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.347	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.000	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.000	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.000	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.000	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.000	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.000	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	0.000	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.876	acre-feet		
Approximate 5-yr Detention Volume =	1.146	acre-feet		
Approximate 10-yr Detention Volume =	1.381	acre-feet		
Approximate 25-yr Detention Volume =	1.662	acre-feet		
Approximate 50-yr Detention Volume =	1.831	acre-feet		
Approximate 100-yr Detention Volume =	2.007	acre-feet		

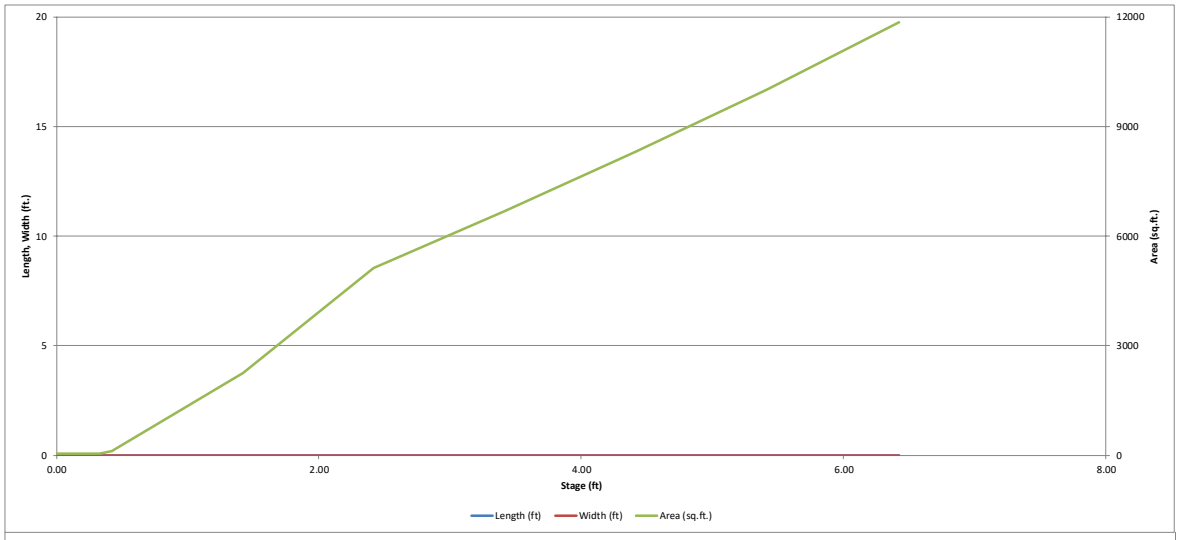
Define Zones and Basin Geometry

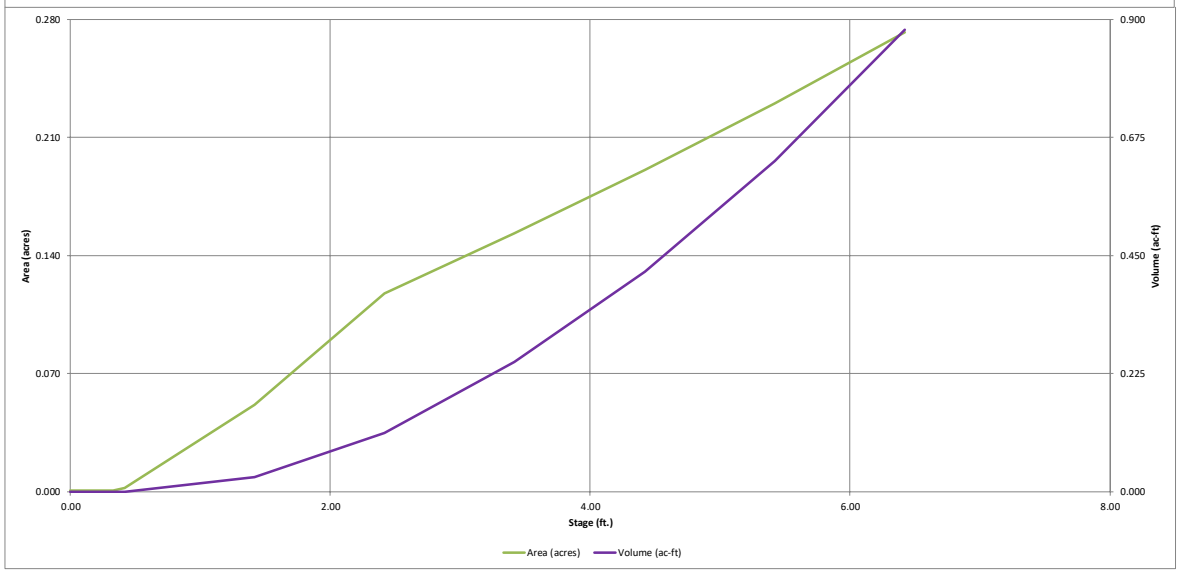
Zone 1 Volume (WQCV) =	0.354	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.354	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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

Total detention volume is less than 100-year volume.

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)
6940.58	**Top of Micropool**	--	0.00	--	--	--	40	0.001		
6940.91	**Trickle Channel Inv**	--	0.33	--	--	--	40	0.001	13	0.000
	6941	--	0.42	--	--	--	102	0.002	20	0.000
	6942	--	1.42	--	--	--	2,246	0.052	1,194	0.027
	6943	--	2.42	--	--	--	5,126	0.118	4,880	0.112
	6944	--	3.42	--	--	--	6,678	0.153	10,782	0.248
	6945	--	4.42	--	--	--	8,308	0.191	18,275	0.420
	6946	--	5.42	--	--	--	10,025	0.230	27,441	0.630
6947.00	**Top of Bank**	--	6.42	--	--	--	11,873	0.273	38,390	0.881


20
15
10
5
0
Length, Width (ft.)
12000
9000
6000
3000
0
Area (sq.ft.)
0.00
2.00
4.00
6.00
8.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

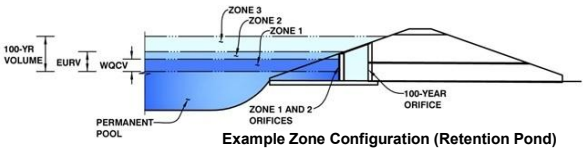

0.280
0.210
0.140
0.070
0.000
Area (acres)
0.900
0.675
0.450
0.225
0.000
Volume (ac-ft)
0.00
2.00
4.00
6.00
8.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **Falcon Meadows at Bent Grass Filing No. 2**

Basin ID: **WQCV Pond - North**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.07	0.354	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.354	

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

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

Calculated Parameters for Underdrain

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)	WQ Orifice Area per Row =	7.014E-03	ft^2
Depth at top of Zone using Orifice Plate =	4.07	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.01	sq. inches (diameter = 1-1/8 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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	1.10	2.20					
Orifice Area (sq. inches)	1.01	1.01	1.01					

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.08		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	3.00		feet
Overflow Grate Open Area % =	70%		%, grate open area/total area
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =	4.08		feet
Overflow Weir Slope Length =	3.00		feet
Grate Open Area / 100-yr Orifice Area =	4.01		
Overflow Grate Open Area w/o Debris =	12.60		ft^2
Overflow Grate Open Area w/ Debris =	6.30		ft^2

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	0.25		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	24.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =	3.14		ft^2
Outlet Orifice Centroid =	1.00		feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.92	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	25.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	0.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.66	feet
Stage at Top of Freeboard =	5.58	feet
Basin Area at Top of Freeboard =	0.24	acres
Basin Volume at Top of Freeboard =	0.67	acre-ft

Routed Hydrograph Results

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

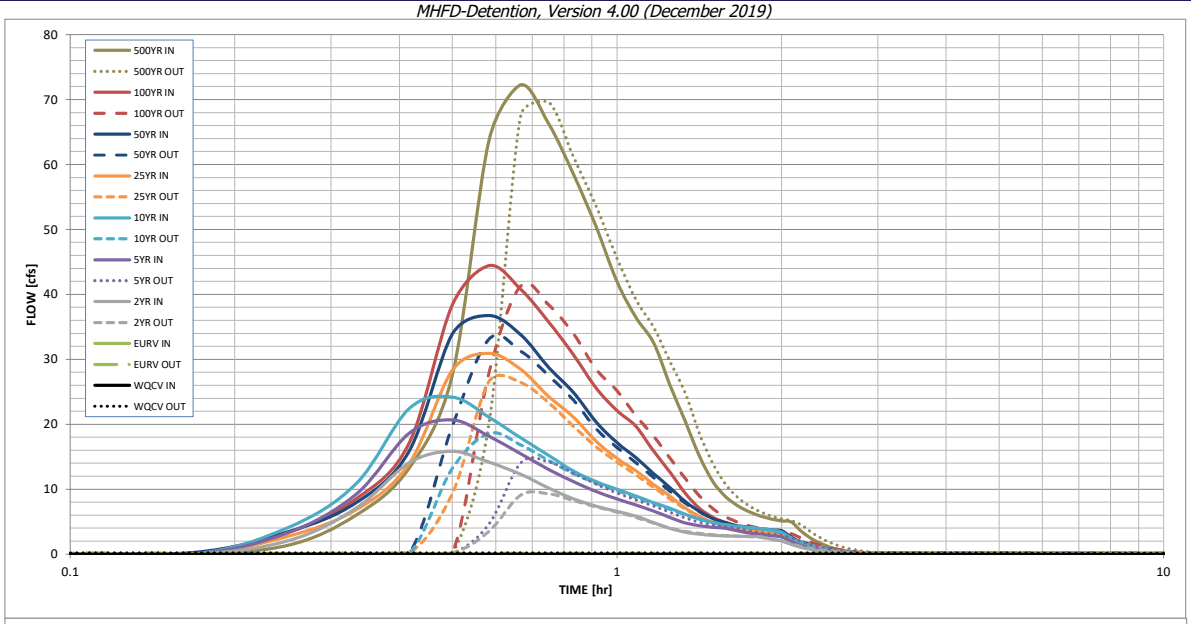
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.354	1.347	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.978	1.283	1.526	1.845	2.158	2.538	4.122
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Peak Inflow Q (cfs) =	N/A	N/A	15.8	20.7	24.2	30.9	36.8	44.4	72.3
Peak Outflow Q (cfs) =	0.2	155.3	9.3	14.2	18.6	26.6	33.1	41.3	69.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Structure Controlling Flow =	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.71	1.1	1.5	2.1	2.5	2.5	2.6
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	28	36	34	33	32	30	28	23
Time to Drain 99% of Inflow Volume (hours) =	**40**	33	41	40	39	39	38	37	34
Maximum Ponding Depth (ft) =	4.07	3.61	4.46	4.59	4.69	4.87	5.01	5.17	5.51
Area at Maximum Ponding Depth (acres) =	0.18	0.16	0.19	0.20	0.20	0.21	0.21	0.22	0.23
Maximum Volume Stored (acre-ft) =	0.355	0.276	0.427	0.453	0.472	0.507	0.537	0.571	0.651

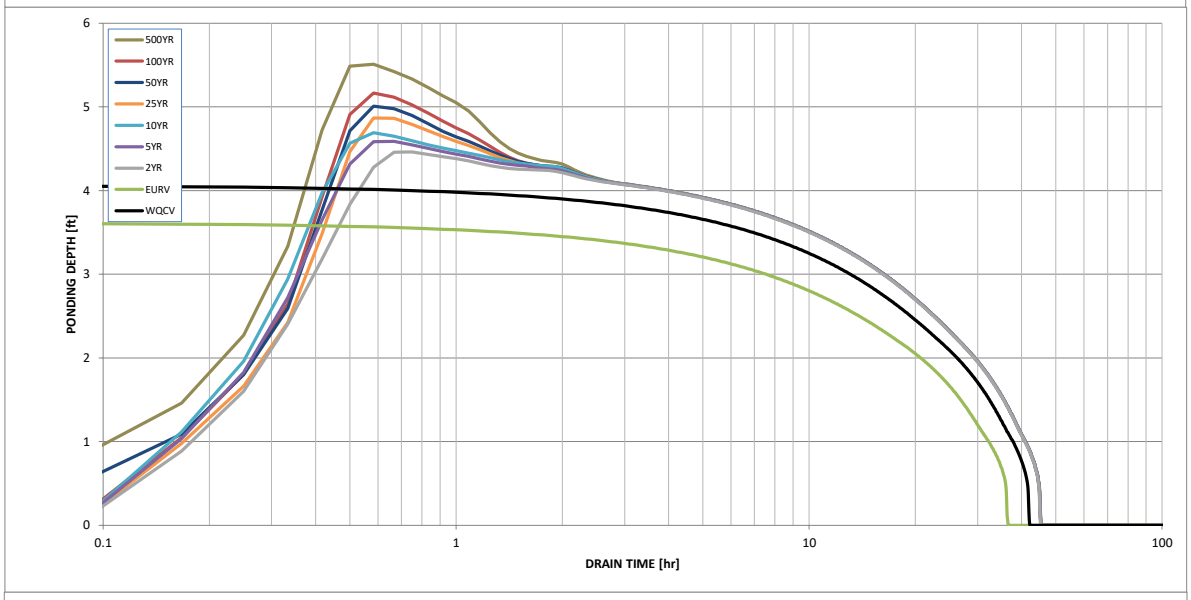
Revised to reflect existing condition

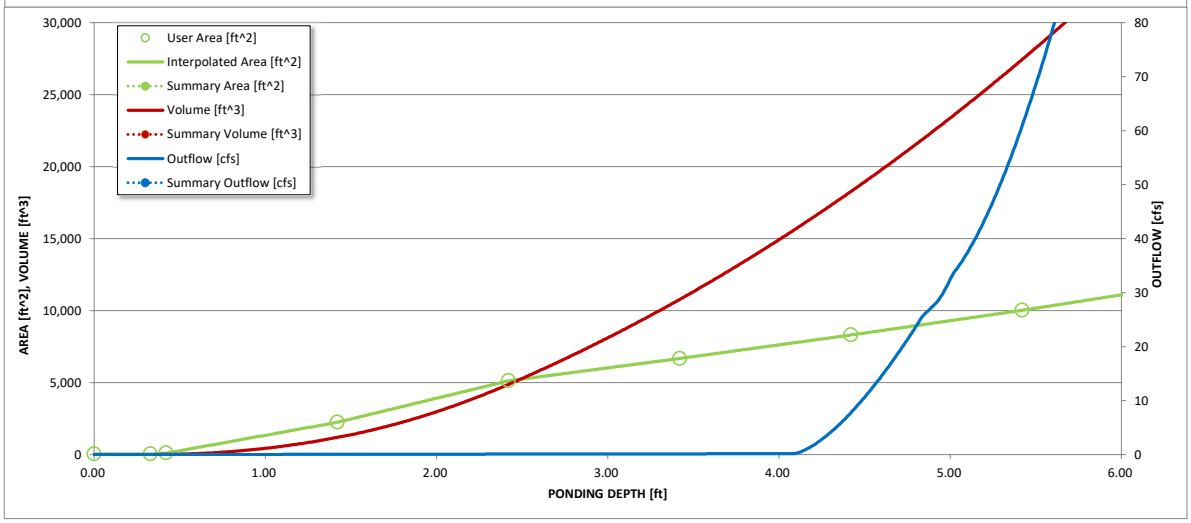
Why was no data inputted for the existing condition??
There are Q's calc'd for existing condition on pdf pg 43 above...

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.02	1.36
	0:15:00	0.00	0.00	2.03	3.30	4.09	2.75	3.41	3.35	5.99
	0:20:00	0.00	0.00	7.07	9.21	10.81	6.81	7.91	8.50	13.23
	0:25:00	0.00	0.00	14.06	18.60	22.40	13.91	15.85	17.06	27.51
	0:30:00	0.00	0.00	15.82	20.66	24.19	28.31	33.86	38.38	63.75
	0:35:00	0.00	0.00	14.15	18.14	21.08	30.90	36.75	44.42	72.26
	0:40:00	0.00	0.00	12.30	15.44	17.89	28.44	33.80	40.78	66.29
	0:45:00	0.00	0.00	10.18	13.05	15.22	24.29	28.78	35.78	58.47
	0:50:00	0.00	0.00	8.50	11.14	12.78	21.09	24.88	30.68	50.40
	0:55:00	0.00	0.00	7.38	9.62	11.16	17.35	20.32	25.56	41.96
	1:00:00	0.00	0.00	6.57	8.53	10.00	14.74	17.17	22.11	36.44
	1:05:00	0.00	0.00	5.86	7.56	8.94	12.82	14.87	19.67	32.57
	1:10:00	0.00	0.00	4.85	6.64	7.92	10.74	12.41	15.87	26.03
	1:15:00	0.00	0.00	3.98	5.64	7.06	8.92	10.25	12.62	20.45
	1:20:00	0.00	0.00	3.38	4.81	6.15	7.10	8.10	9.40	15.04
	1:25:00	0.00	0.00	3.07	4.37	5.37	5.80	6.56	7.05	11.14
	1:30:00	0.00	0.00	2.90	4.13	4.86	4.85	5.47	5.65	8.81
	1:35:00	0.00	0.00	2.81	3.97	4.50	4.25	4.78	4.84	7.43
	1:40:00	0.00	0.00	2.75	3.56	4.25	3.85	4.33	4.29	6.48
	1:45:00	0.00	0.00	2.70	3.25	4.07	3.59	4.03	3.92	5.85
	1:50:00	0.00	0.00	2.67	3.02	3.94	3.41	3.83	3.66	5.41
	1:55:00	0.00	0.00	2.31	2.85	3.74	3.29	3.69	3.49	5.11
	2:00:00	0.00	0.00	2.03	2.64	3.39	3.20	3.60	3.40	4.96
	2:05:00	0.00	0.00	1.49	1.94	2.47	2.35	2.64	2.49	3.63
	2:10:00	0.00	0.00	1.06	1.38	1.75	1.67	1.88	1.78	2.59
	2:15:00	0.00	0.00	0.75	0.97	1.24	1.19	1.33	1.27	1.84
	2:20:00	0.00	0.00	0.52	0.67	0.87	0.83	0.93	0.89	1.29
	2:25:00	0.00	0.00	0.35	0.45	0.59	0.56	0.63	0.60	0.87
	2:30:00	0.00	0.00	0.23	0.30	0.40	0.39	0.43	0.41	0.60
	2:35:00	0.00	0.00	0.14	0.19	0.25	0.25	0.28	0.27	0.38
	2:40:00	0.00	0.00	0.07	0.11	0.14	0.14	0.16	0.15	0.22
	2:45:00	0.00	0.00	0.03	0.05	0.06	0.07	0.07	0.07	0.10
	2:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	
Company:	**Galloway**
Date:	**July 20, 2021**
Project:	**Falcon Meadows at Bent Grass Filing No. 2**
Location:	**WQCV - North Pond**

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 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 = 48 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 1.19 inches
E) Total Outlet Area	A_{ot} = 3.33 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 46 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 16.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 115 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.)	*S.S. Well Screen with 60% Open Area*
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} = 191 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 3.72 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 72.64 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

NORTH POND - NORTH FOREBAY CALCULATIONS (FALCON MEADOWS FILING NO. 2)

1) WQCV (inches) = $a(.91I^3 - 1.19I^2 + .78I)$

I = impervious percentage = 72%

a = Coefficient corresponding to WQCV drain time = 1 (40 hours)

WQCV (inches) = 0.28 inches

2) WQCV (ac-ft) = (WQCV (inches))/12 x A

Area = tributary area = 3.98 acres

WQCV (ac-ft) = 0.09

WQCV (cubic feet) = 4,108

3) Forebay Volume

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Volume = 2% of WQCV and be 18" max depth since watershed is under 5 impervious acres

Forebay Volume = 2% of WQCV = 82 cubic feet

with pond depth at 1.0', Forebay Area = 82.2 sq-ft (minimum)

4) Forebay Discharge

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Discharge = 2% of 100-yr Flow into pond

Q100 = 21.1 cfs

Forebay discharge = 0.42 cfs

Worksheet for North Forebay Release Slots

Project Description

Solve For	Crest Length

Input Data

Discharge	0.42	ft^3/s
Headwater Elevation	1.25	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.00	US
Number Of Contractions	0	

Results

Crest Length	0.10	ft
Headwater Height Above Crest	1.25	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.13	ft^2
Velocity	3.35	ft/s
Wetted Perimeter	2.60	ft
Top Width	0.10	ft

Minimum slot size is 3"

Worksheet for North Trickle Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50000	ft/ft
Bottom Width	2.00	ft
Discharge	0.42	ft^3/s

Results

Normal Depth	0.03	ft
Flow Area	0.06	ft^2
Wetted Perimeter	2.06	ft
Hydraulic Radius	0.03	ft
Top Width	2.00	ft
Critical Depth	0.11	ft
Critical Slope	0.00589	ft/ft
Velocity	7.36	ft/s
Velocity Head	0.84	ft
Specific Energy	0.87	ft
Froude Number	7.69	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.03	ft
Critical Depth	0.11	ft
Channel Slope	0.50000	ft/ft
Critical Slope	0.00589	ft/ft

NORTH POND - WEST FOREBAY CALCULATIONS (FALCON MEADOWS FILING NO. 2)

1) WQCV (inches) = $a(.91I^3 - 1.19I^2 + .78I)$

I = impervious percentage = 62%

a = Coefficient corresponding to WQCV drain time = 1 (40 hours)

WQCV (inches) = 0.24 inches

2) WQCV (ac-ft) = (WQCV (inches))/12 x A

Area = tributary area = 12.72 acres

WQCV (ac-ft) = 0.26

WQCV (cubic feet) = 11,222

3) Forebay Volume

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Volume = 3% of WQCV and be 18" max depth since watershed is over 5 impervious acres

Forebay Volume = 3% of WQCV = 337 cubic feet

with pond depth at 1.5', Forebay Area = 224.4 sq-ft (minimum)

4) Forebay Discharge

Per Table EDB-4, Section T-5 of USDCM Volume 3 - Forebay Discharge = 2% of 100-yr Flow into pond

Q100 = 44.4 cfs

Forebay discharge = 0.89 cfs

Worksheet for West Forebay Release Slots

Project Description

Solve For	Crest Length

Input Data

Discharge	0.89	ft^3/s
Headwater Elevation	1.25	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Weir Coefficient	3.00	US
Number Of Contractions	0	

Results

Crest Length	0.21	ft
Headwater Height Above Crest	1.25	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	0.27	ft^2
Velocity	3.35	ft/s
Wetted Perimeter	2.71	ft
Top Width	0.21	ft

Minimum slot size is 3"

Worksheet for West Trickle Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.50000	ft/ft
Bottom Width	2.00	ft
Discharge	0.89	ft^3/s

Results

Normal Depth	0.04	ft
Flow Area	0.09	ft^2
Wetted Perimeter	2.09	ft
Hydraulic Radius	0.04	ft
Top Width	2.00	ft
Critical Depth	0.18	ft
Critical Slope	0.00543	ft/ft
Velocity	9.94	ft/s
Velocity Head	1.53	ft
Specific Energy	1.58	ft
Froude Number	8.28	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.04	ft
Critical Depth	0.18	ft
Channel Slope	0.50000	ft/ft
Critical Slope	0.00543	ft/ft

POND RIPRAP EMBANKMENT SIZING - North Pond

Subdivision: Bent Grass
Location: El Paso County

Project Name: Falcon Meadows at Bent Grass Filing No. 2
Project No.: CLH000019
Calculated By: CMD
Checked By: CD
Date: 5/3/21

Pond	Riprap Type	D50*	Slope, S	Concentration Factor	Unit discharge	Spillway Flow***	Spillway Width
		(in)	(ft/ft)	(1.0 to 3.0)	(cfs/ft)**	(cfs)	(ft)
North Pond	M	9.3	50.00%	2	1.78	44.4	25

*From DCM Chapter 13 Eqn 13-9
** Spillway Flow/Spillway Width
***Peak Inflow Q100

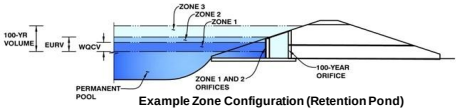
Pond (South) Calculations – Existing Analysis

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Falcon Meadows at Bent Grass Filing No. 2

Basin ID: WQCV Pond - South (Analysis)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	63.22	acres
Watershed Length =	3,600	ft
Watershed Length to Centroid =	1,500	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	31.20%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.817	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.993	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.410	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.935	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.372	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.443	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.443	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.780	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	11.410	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	1.255	acre-feet		
Approximate 5-yr Detention Volume =	1.673	acre-feet		
Approximate 10-yr Detention Volume =	2.087	acre-feet		
Approximate 25-yr Detention Volume =	2.630	acre-feet		
Approximate 50-yr Detention Volume =	3.031	acre-feet		
Approximate 100-yr Detention Volume =	3.666	acre-feet		

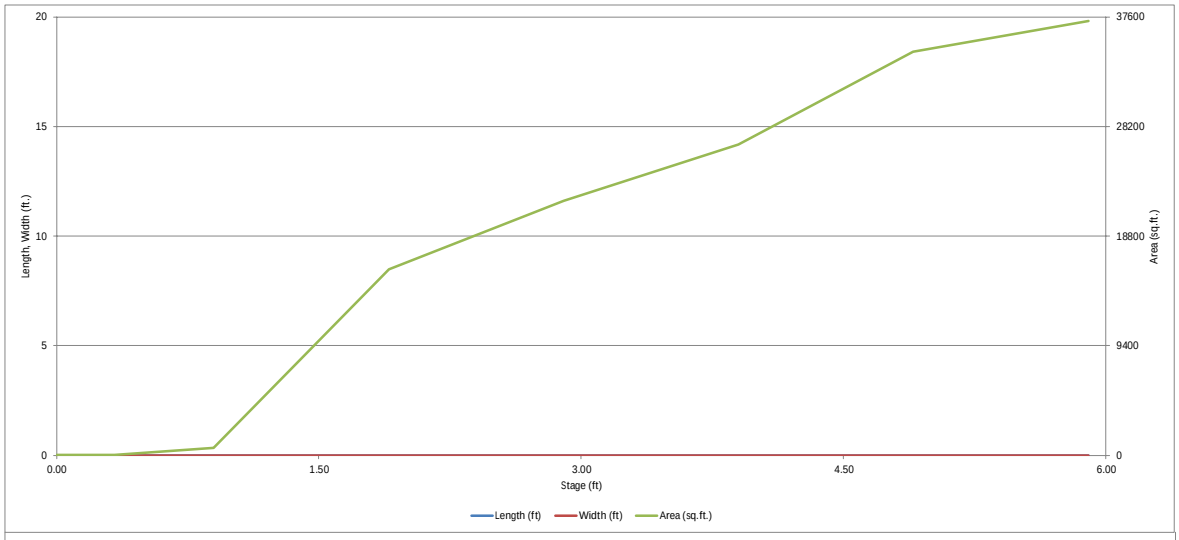
Define Zones and Basin Geometry

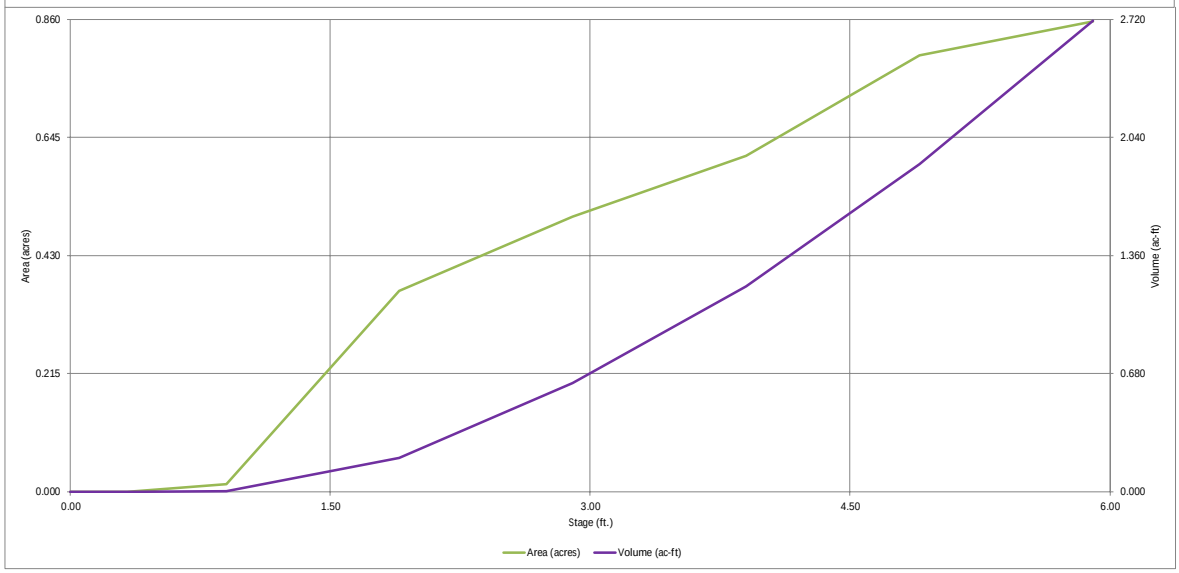
Zone 1 Volume (WQCV) =	0.817	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.817	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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

Total detention volume is less than 100-year volume.

Depth Increment = 1.00 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)
6923.1	Top of Micropool	--	0.00	--	--	--	35	0.001		
(Trickle Channel Inv) 6923.43		--	0.33	--	--	--	35	0.001	12	0.000
6924		--	0.90	--	--	--	593	0.014	191	0.004
6925		--	1.90	--	--	--	15,946	0.366	8,460	0.194
6926		--	2.90	--	--	--	21,804	0.501	27,335	0.628
6927		--	3.90	--	--	--	26,657	0.612	51,565	1.184
(Spillway Invert) 6928		--	4.90	--	--	--	34,630	0.795	82,209	1.887
(Top of Bank) 6929		--	5.90	--	--	--	37,309	0.856	118,178	2.713


20
15
10
5
0
Length, Width (ft.)
37600
28200
18800
9400
0
Area (sq.ft.)
0.00
1.50
3.00
4.50
6.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

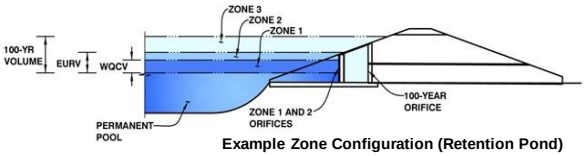

0.860
0.645
0.430
0.215
0.000
Area (acres)
2.720
2.040
1.360
0.680
0.000
Volume (ac-ft)
0.00
1.50
3.00
4.50
6.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Falcon Meadows at Bent Grass Filing No. 2

Basin ID: WQCV Pond - South (Analysis)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.27	0.817	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.817	

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

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

Calculated Parameters for Underdrain

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)	WQ Orifice Area per Row =	1.670E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.41	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.41	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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	1.14	2.27					
Orifice Area (sq. inches)	2.41	2.41	2.41					

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

Calculated Parameters for Vertical Orifice

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.50		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.50		feet
Overflow Weir Front Edge Length =	6.00		feet	Overflow Weir Slope Length =	6.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	5.87		
Horiz. Length of Weir Sides =	6.00		feet	Overflow Grate Open Area w/o Debris =	28.80		ft^2
Overflow Grate Open Area % =	80%		%, grate open area/total area	Overflow Grate Open Area w/ Debris =	14.40		ft^2
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	2.50		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91		ft^2
Circular Orifice Diameter =	30.00		inches	Outlet Orifice Centroid =	1.25		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.93	feet
Spillway Crest Length =	24.00	feet	Stage at Top of Freeboard =	5.83	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.85	acres
Freeboard above Max Water Surface =	0.00	feet	Basin Volume at Top of Freeboard =	2.65	acre-ft

Calculated Parameters for Spillway

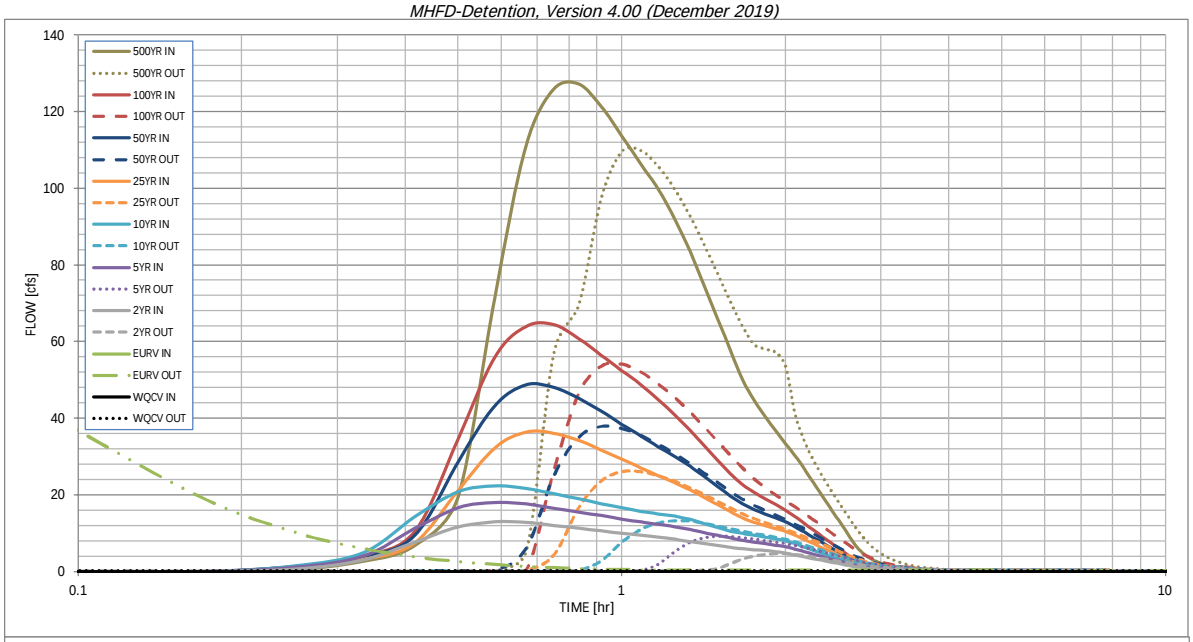
Routed Hydrograph Results

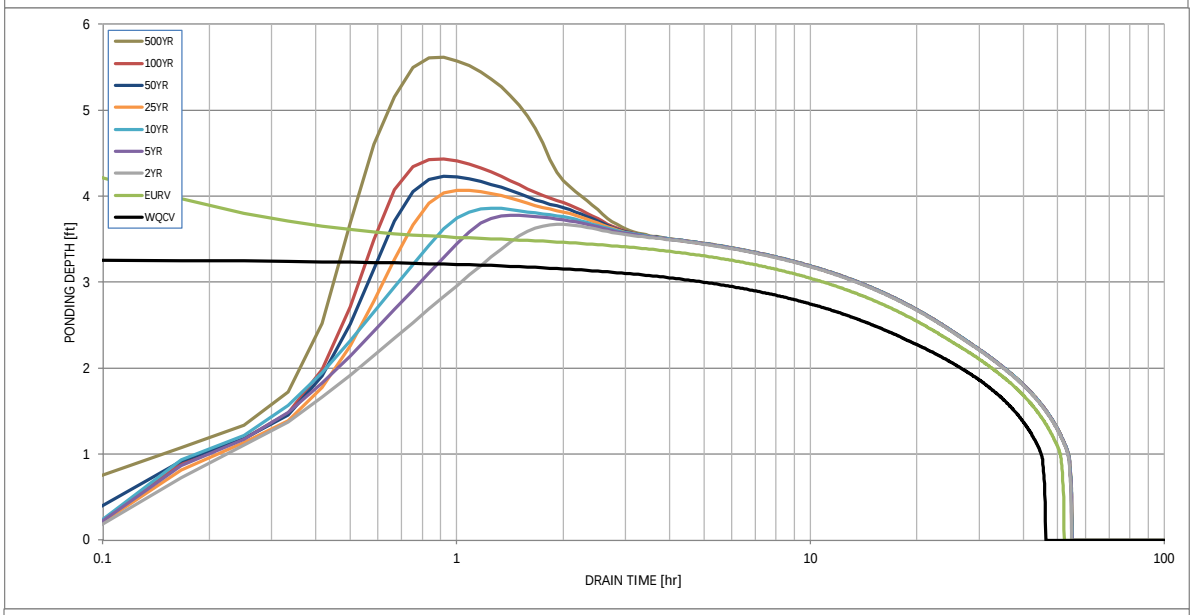
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

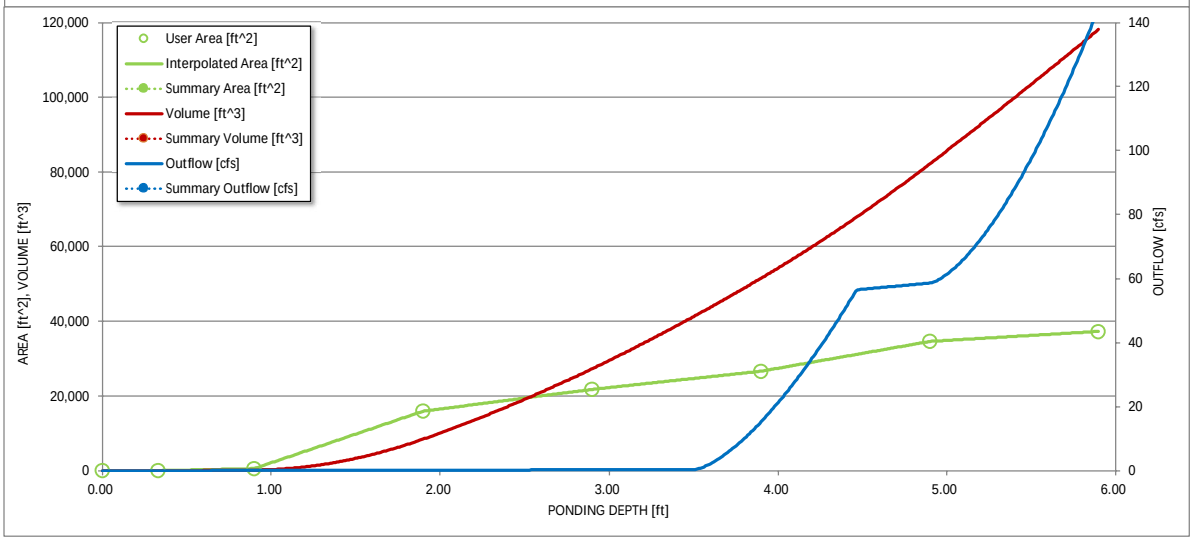
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.817	1.993	1.410	1.935	2.372	3.443	4.443	5.780	11.410
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.410	1.935	2.372	3.443	4.443	5.780	11.410
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.7	1.0	9.1	18.4	30.5	79.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.14	0.29	0.48	1.26
Peak Inflow Q (cfs) =	N/A	N/A	13.0	18.1	22.4	36.4	48.7	64.4	127.2
Peak Outflow Q (cfs) =	0.3	58.0	4.7	9.3	13.3	26.1	37.9	54.2	109.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	13.1	13.4	2.9	2.1	1.8	1.4
Structure Controlling Flow =	Plate	Spillway	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	2.04	0.16	0.3	0.4	0.9	1.3	1.9	2.1
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) =	43	46	49	48	47	44	42	39	29
Time to Drain 99% of Inflow Volume (hours) =	45	49	52	52	51	50	49	48	44
Maximum Ponding Depth (ft) =	3.27	5.04	3.68	3.78	3.86	4.07	4.24	4.44	5.62
Area at Maximum Ponding Depth (acres) =	0.54	0.80	0.59	0.60	0.61	0.64	0.67	0.71	0.84
Maximum Volume Stored (acre-ft) =	0.820	1.999	1.046	1.111	1.159	1.290	1.396	1.534	2.467

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

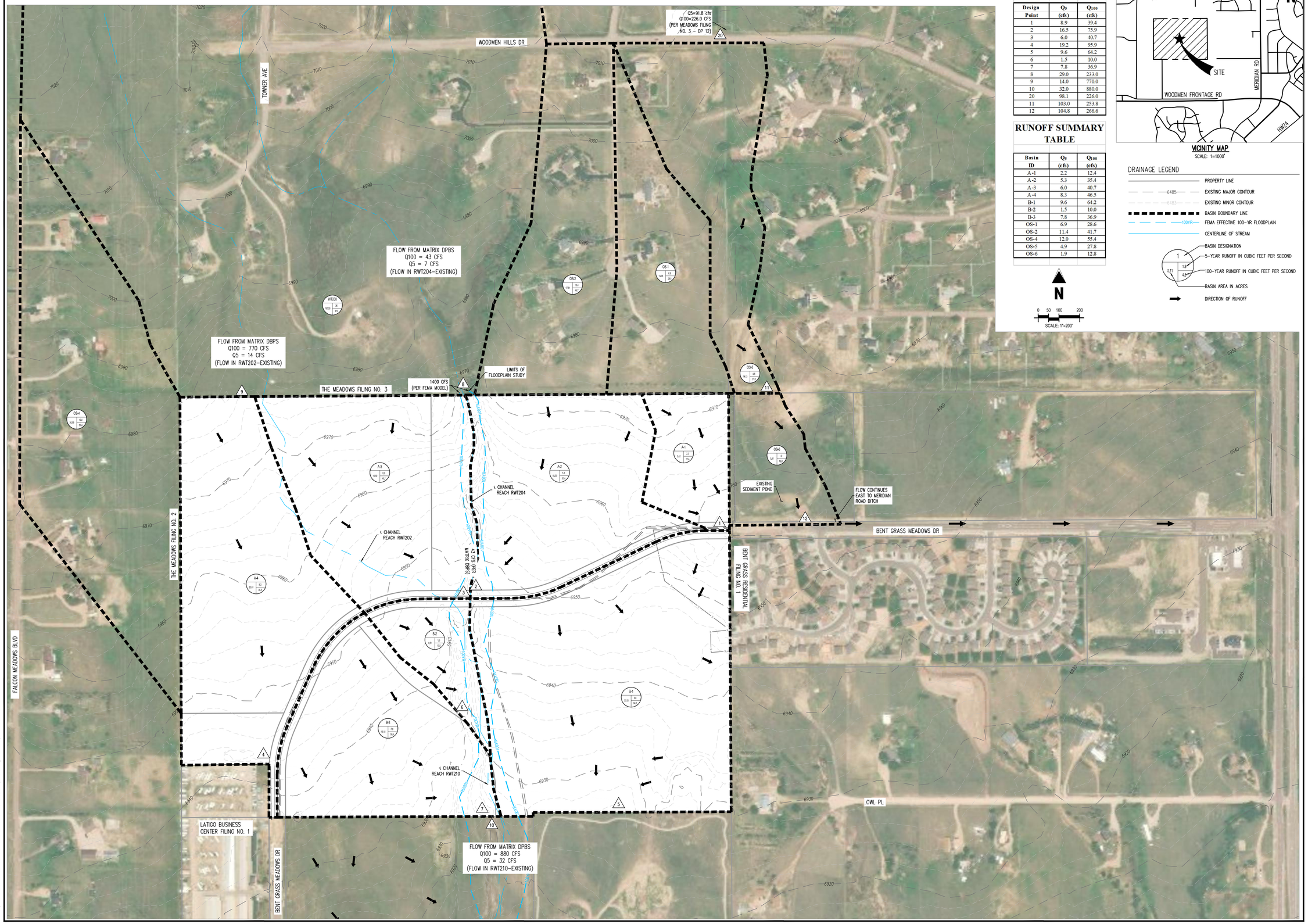
Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.54
	0:15:00	0.00	0.00	0.75	1.22	1.53	1.05	1.36	1.31	2.68
	0:20:00	0.00	0.00	3.02	4.07	4.91	3.17	3.80	4.02	6.87
	0:25:00	0.00	0.00	7.76	11.28	14.32	7.60	9.54	10.60	19.74
	0:30:00	0.00	0.00	11.74	16.73	20.86	21.29	28.73	34.77	71.56
	0:35:00	0.00	0.00	12.96	18.08	22.40	32.32	43.28	55.91	111.29
	0:40:00	0.00	0.00	12.85	17.66	21.78	36.44	48.73	64.03	126.00
	0:45:00	0.00	0.00	12.10	16.54	20.31	36.14	48.10	64.45	127.22
	0:50:00	0.00	0.00	11.32	15.55	18.97	34.23	45.21	60.82	121.38
	0:55:00	0.00	0.00	10.65	14.62	17.77	31.80	41.85	56.52	113.81
	1:00:00	0.00	0.00	10.03	13.71	16.64	29.35	38.47	52.49	106.32
	1:05:00	0.00	0.00	9.53	12.97	15.78	27.12	35.40	48.81	99.91
	1:10:00	0.00	0.00	9.00	12.37	15.10	25.07	32.64	44.85	92.01
	1:15:00	0.00	0.00	8.45	11.72	14.47	23.22	30.10	40.91	83.60
	1:20:00	0.00	0.00	7.89	10.98	13.63	21.32	27.49	36.86	74.73
	1:25:00	0.00	0.00	7.33	10.20	12.58	19.40	24.86	32.89	65.99
	1:30:00	0.00	0.00	6.80	9.45	11.51	17.48	22.26	29.12	57.77
	1:35:00	0.00	0.00	6.32	8.78	10.56	15.63	19.75	25.58	50.18
	1:40:00	0.00	0.00	5.98	8.21	9.95	14.05	17.71	22.76	44.74
	1:45:00	0.00	0.00	5.75	7.74	9.48	12.92	16.25	20.70	40.52
	1:50:00	0.00	0.00	5.55	7.32	9.04	12.03	15.07	19.01	36.82
	1:55:00	0.00	0.00	5.24	6.92	8.59	11.24	14.02	17.49	33.46
	2:00:00	0.00	0.00	4.88	6.51	8.07	10.50	13.02	16.07	30.32
	2:05:00	0.00	0.00	4.41	5.90	7.28	9.49	11.71	14.37	26.81
	2:10:00	0.00	0.00	3.90	5.23	6.41	8.38	10.30	12.59	23.26
	2:15:00	0.00	0.00	3.42	4.58	5.57	7.30	8.92	10.89	19.90
	2:20:00	0.00	0.00	2.96	3.96	4.78	6.27	7.61	9.25	16.64
	2:25:00	0.00	0.00	2.54	3.39	4.05	5.29	6.36	7.67	13.51
	2:30:00	0.00	0.00	2.14	2.84	3.37	4.35	5.16	6.15	10.48
	2:35:00	0.00	0.00	1.76	2.33	2.73	3.47	4.02	4.69	7.62
	2:40:00	0.00	0.00	1.41	1.86	2.17	2.65	2.98	3.36	5.30
	2:45:00	0.00	0.00	1.12	1.47	1.76	1.94	2.17	2.39	3.88
	2:50:00	0.00	0.00	0.91	1.21	1.47	1.49	1.67	1.78	2.91
	2:55:00	0.00	0.00	0.77	1.02	1.24	1.19	1.33	1.38	2.19
	3:00:00	0.00	0.00	0.65	0.86	1.04	0.96	1.07	1.08	1.64
	3:05:00	0.00	0.00	0.55	0.72	0.88	0.78	0.87	0.84	1.23
	3:10:00	0.00	0.00	0.46	0.61	0.74	0.65	0.71	0.66	0.93
	3:15:00	0.00	0.00	0.39	0.51	0.62	0.53	0.58	0.53	0.71
	3:20:00	0.00	0.00	0.33	0.42	0.51	0.44	0.47	0.43	0.57
	3:25:00	0.00	0.00	0.27	0.35	0.41	0.35	0.38	0.35	0.46
	3:30:00	0.00	0.00	0.22	0.28	0.33	0.28	0.31	0.28	0.36
	3:35:00	0.00	0.00	0.18	0.22	0.26	0.22	0.24	0.22	0.28
	3:40:00	0.00	0.00	0.14	0.17	0.20	0.17	0.18	0.17	0.21
	3:45:00	0.00	0.00	0.10	0.13	0.15	0.13	0.14	0.12	0.15
	3:50:00	0.00	0.00	0.07	0.09	0.11	0.09	0.09	0.08	0.10
	3:55:00	0.00	0.00	0.05	0.06	0.07	0.06	0.06	0.05	0.06
	4:00:00	0.00	0.00	0.03	0.04	0.04	0.04	0.04	0.03	0.03
	4:05:00	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.01	0.01
	4:10:00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX E

Drainage Maps



DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	8.9	39.4
2	16.5	75.9
3	6.0	40.7
4	19.2	95.9
5	9.6	64.2
6	1.5	10.0
7	7.8	36.9
8	29.0	233.0
9	14.0	770.0
10	32.0	880.0
20	98.1	226.0
11	103.0	253.8
12	104.8	266.6

RUNOFF SUMMARY TABLE

Basin ID	Q_5 (cfs)	Q_{100} (cfs)
A-1	2.2	12.4
A-2	5.3	35.4
A-3	6.0	40.7
A-4	8.3	46.5
B-1	9.6	64.2
B-2	1.5	10.0
B-3	7.8	36.9
OS-1	6.9	28.6
OS-2	11.4	41.7
OS-4	12.0	55.4
OS-5	4.9	27.8
OS-6	1.9	12.8

N

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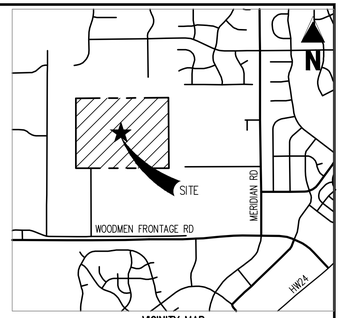
SCALE: 1"=200'



VICINITY MAP
SCALE: 1=1000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- BASIN BOUNDARY LINE
- 100YR FEMA EFFECTIVE 100–YR FLOODPLAIN
- CENTERLINE OF STREAM
- BASIN DESIGNATION
- 5–YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100–YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DIRECTION OF RUNOFF

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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

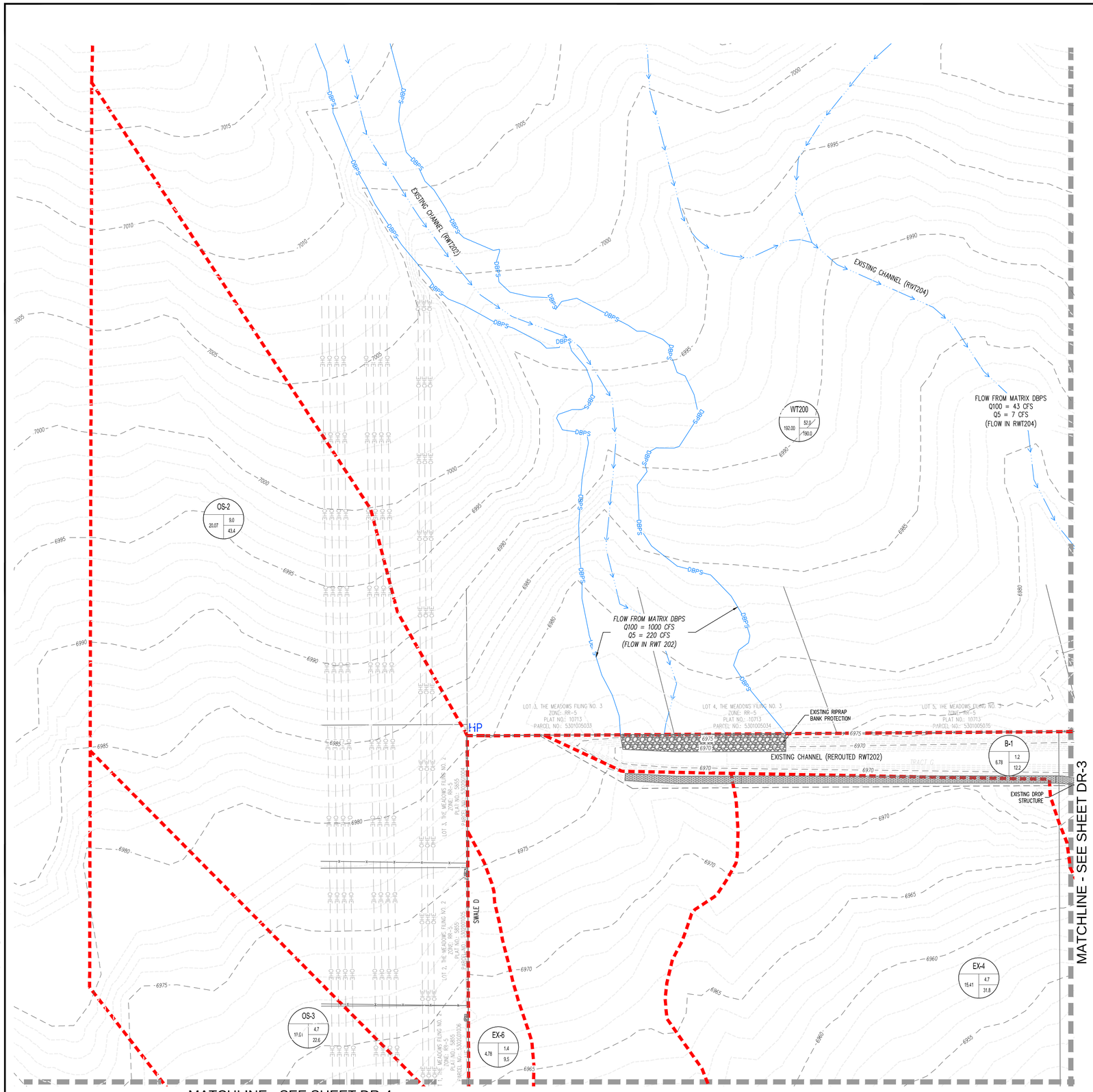
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

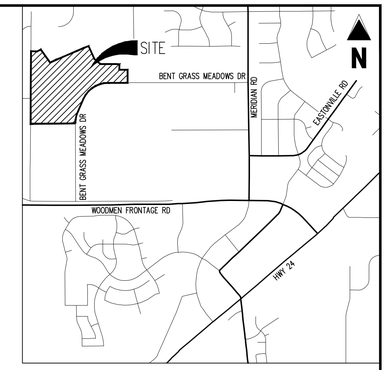
#	Date	Issue / Description	Init.

Project No:	CLH000014.20
Drawn By:	CMWJ
Checked By:	SMB
Date:	OCTOBER 2019

HISTORIC DRAINAGE MAP

DR-1
Sheet 1 of x





VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6482 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6482 PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
EX-4	15.41	4.7	31.8
EX-5	0.06	0.0	0.2
EX-6	4.78	1.4	9.5
EX-7	12.18	3.5	23.3
EX-8	1.63	0.7	4.7
B-1	6.78	1.8	12.2
B-2	4.16	1.3	8.6
D-4a	0.98	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.2	4.6
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1
I-1	0.31	1.0	2.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
6	4.7	31.8
7	2.9	5.3
8	11.3	43.6
9	9.0	43.4
10	12.6	60.6
11	17.1	90.7
12	0.7	4.7
17a	2.1	4.4
17b	3.9	7.8
17c	15.7	31.9
17	30.8	118.6
18	10.5	21.3
15A	17.9	61.8
AA	289.4	1268.1
30	41.1	149.1
31	30.8	118.6
32	2.6	6.0
24	3.4	9.4
25	3.3	6.1
26	6.4	14.9
CC	314.8	1360.1

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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNTIES, LLC

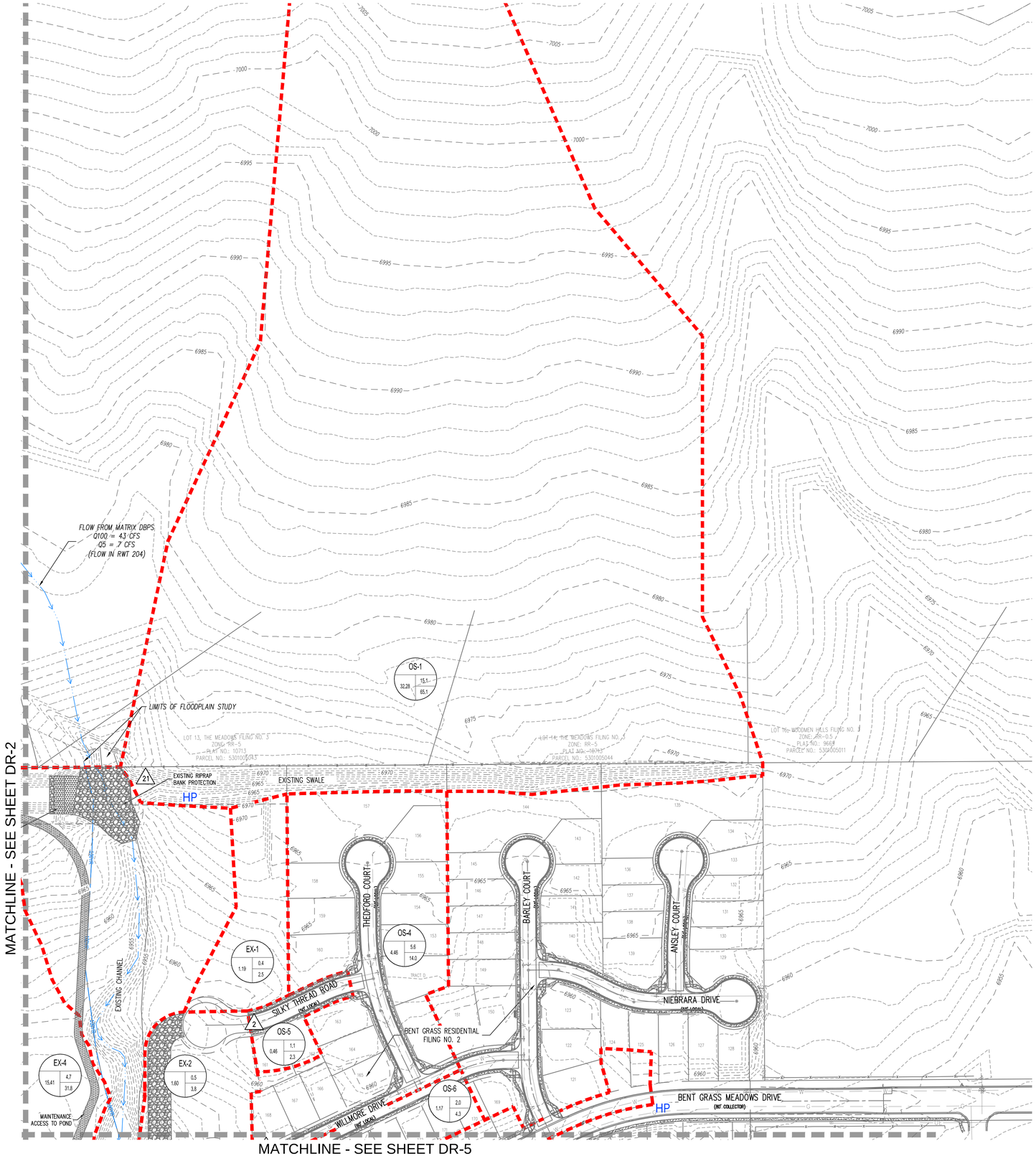
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

EXISTING DRAINAGE MAP

DR-2



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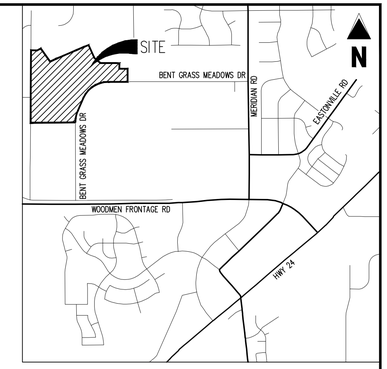
SCALE: 1"=100'



VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6482 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6482 PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- 1 BASIN DESIGNATION
- 0.71 / 1.9 / 4.6 5-YEAR RUNOFF IN CUBIC FEET PER SECOND; 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- 1 DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
EX-4	15.41	4.7	31.8
EX-5	0.06	0.0	0.2
EX-6	4.78	1.4	9.5
EX-7	12.18	3.5	23.3
EX-8	1.63	0.7	4.7
B-1	6.78	1.8	12.2
B-2	4.16	1.3	8.6
D-1a	0.98	2.1	4.4
D-1b	0.95	2.5	4.9
D-1c	1.22	2.4	5.0
D-5	1.08	2.2	4.6
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1
I-1	0.31	1.0	2.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
6	4.7	31.8
7	2.9	5.3
8	11.3	43.6
9	9.0	43.4
10	12.6	60.6
11	17.1	90.7
12	0.7	4.7
17a	2.1	4.4
17b	3.9	7.8
17c	15.7	31.9
17	30.8	118.6
18	10.5	21.3
15A	17.9	61.8
AA	289.4	1268.1
30	41.1	149.1
31	30.8	118.6
32	2.6	6.0
24	3.4	9.4
25	3.3	6.1
26	6.4	14.9
CC	314.8	1360.1

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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNTIES, LLC

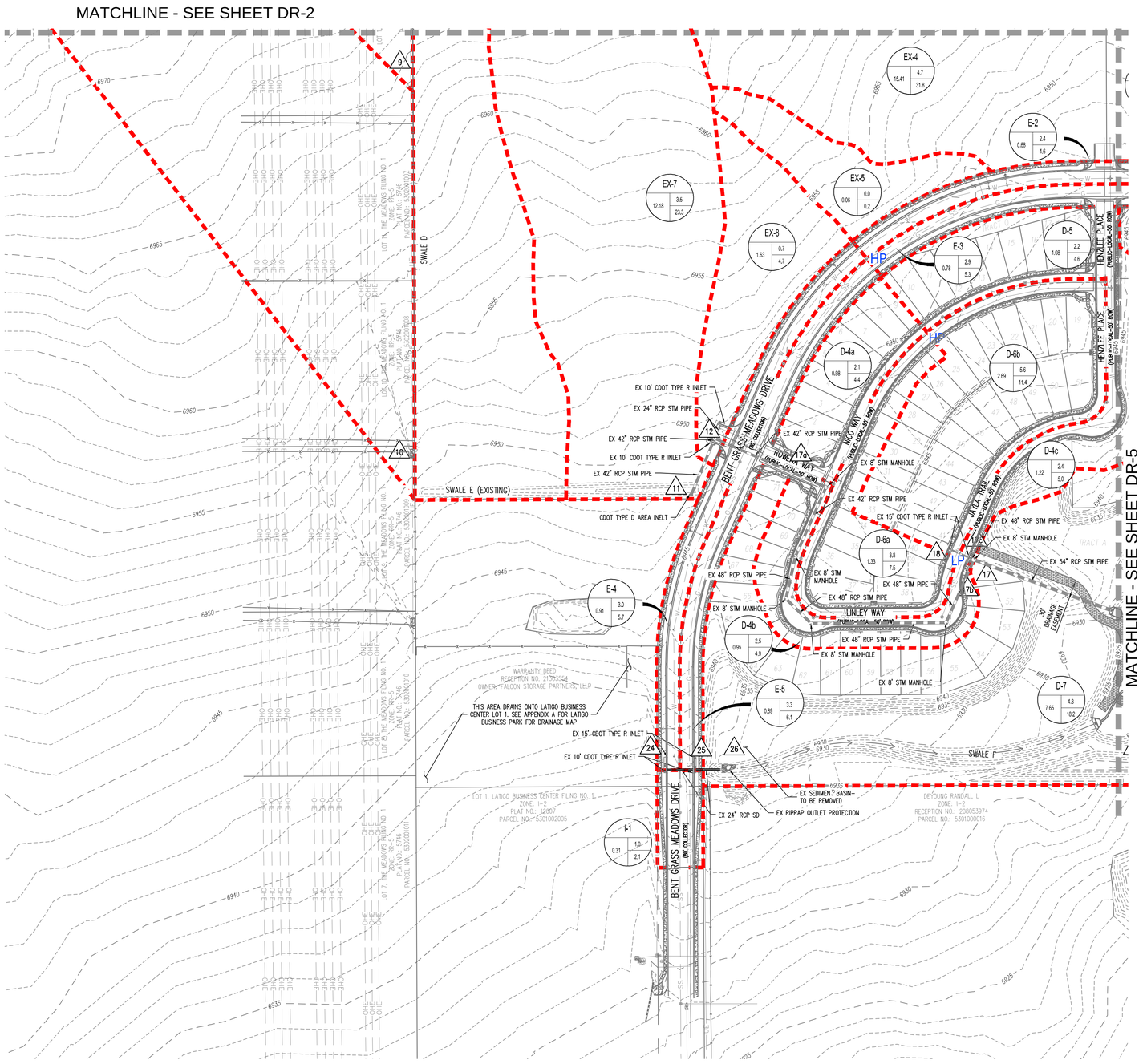
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

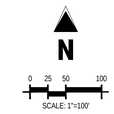
#	Date	Issue / Description	Init.

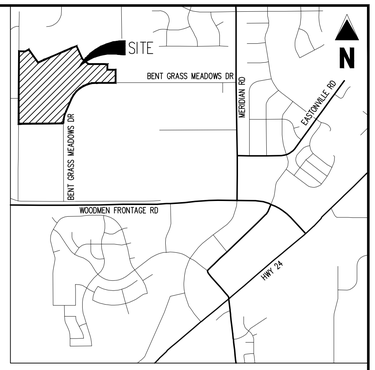
Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

EXISTING DRAINAGE MAP

DR-3







VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 — EXISTING MAJOR CONTOUR
- 6482 — EXISTING MINOR CONTOUR
- 6480 — PROPOSED MAJOR CONTOUR
- 6482 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR — FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS — DBPS — 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- 1 — BASIN DESIGNATION
- 1.9 — 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 4.6 — 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 0.71 — BASIN AREA IN ACRES
- 1 — DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
EX-4	15.41	4.7	31.8
EX-5	0.06	0.0	0.2
EX-6	4.78	1.4	9.5
EX-7	12.18	3.5	23.3
EX-8	1.63	0.7	4.7
B-1	6.78	1.8	12.2
B-2	4.16	1.3	8.6
D-4a	0.98	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.2	4.6
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1
I-1	0.31	1.0	2.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
6	4.7	31.8
7	2.9	5.3
8	11.3	43.6
9	9.0	43.4
10	12.6	60.6
11	17.1	90.7
12	0.7	4.7
17a	2.1	4.4
17b	3.9	7.8
17c	15.7	31.9
17	30.8	118.6
18	10.5	21.3
15A	17.9	61.8
AA	289.4	1268.1
30	41.1	149.1
31	30.8	118.6
32	2.6	6.0
24	3.4	9.4
25	3.3	6.1
26	6.4	14.9
CC	314.8	1360.1

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FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNTIES, LLC

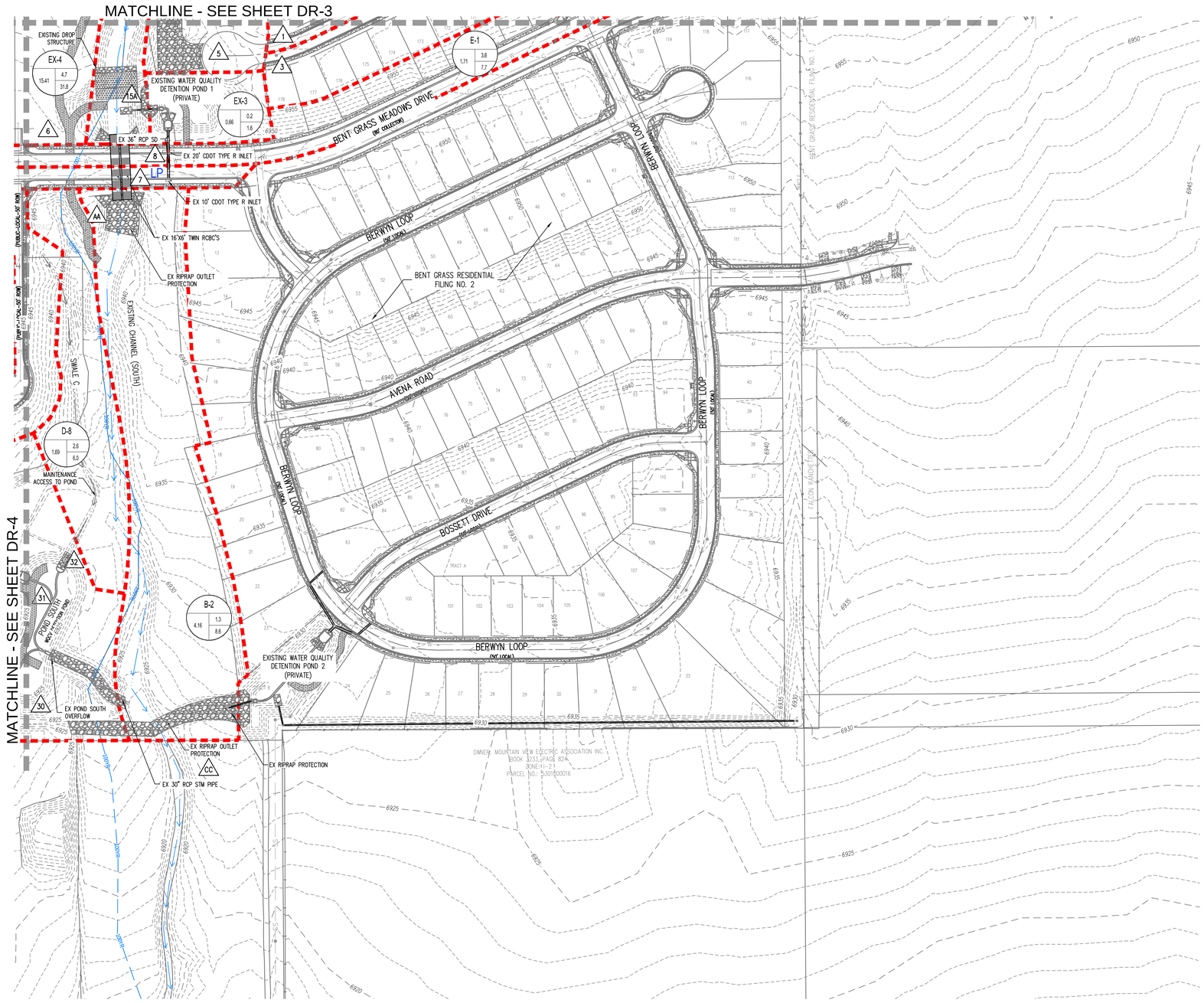
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

EXISTING DRAINAGE MAP

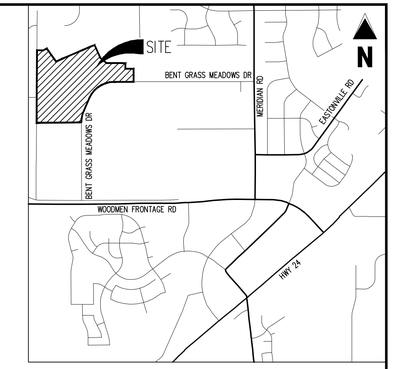
DR-4



N

0 25 50 100

SCALE: 1"=100'



VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 — EXISTING MAJOR CONTOUR
- 6482 — EXISTING MINOR CONTOUR
- 6480 — PROPOSED MAJOR CONTOUR
- 6482 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR — FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS — DBPS — 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- 1 / 0.71 / 1.8 / 4.6 — BASIN DESIGNATION; 5-YEAR RUNOFF IN CUBIC FEET PER SECOND; 100-YEAR RUNOFF IN CUBIC FEET PER SECOND; BASIN AREA IN ACRES
- 1 — DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
EX-4	15.41	4.7	31.8
EX-5	0.06	0.0	0.2
EX-6	4.78	1.4	9.5
EX-7	12.18	3.5	23.3
EX-8	1.63	0.7	4.7
B-1	6.78	1.8	12.2
B-2	4.16	1.3	8.6
D-4a	0.98	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.2	4.6
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1
I-1	0.31	1.0	2.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
6	4.7	31.8
7	2.9	5.3
8	11.3	43.6
9	9.0	43.4
10	12.6	60.6
11	17.1	90.7
12	0.7	4.7
17a	2.1	4.4
17b	3.9	7.8
17c	15.7	31.9
17	30.8	118.6
18	10.5	21.3
15A	17.9	61.8
AA	289.4	1268.1
30	41.1	149.1
31	30.8	118.6
32	2.6	6.0
24	3.4	9.4
25	3.3	6.1
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CC	314.8	1360.1

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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNTIES, LLC

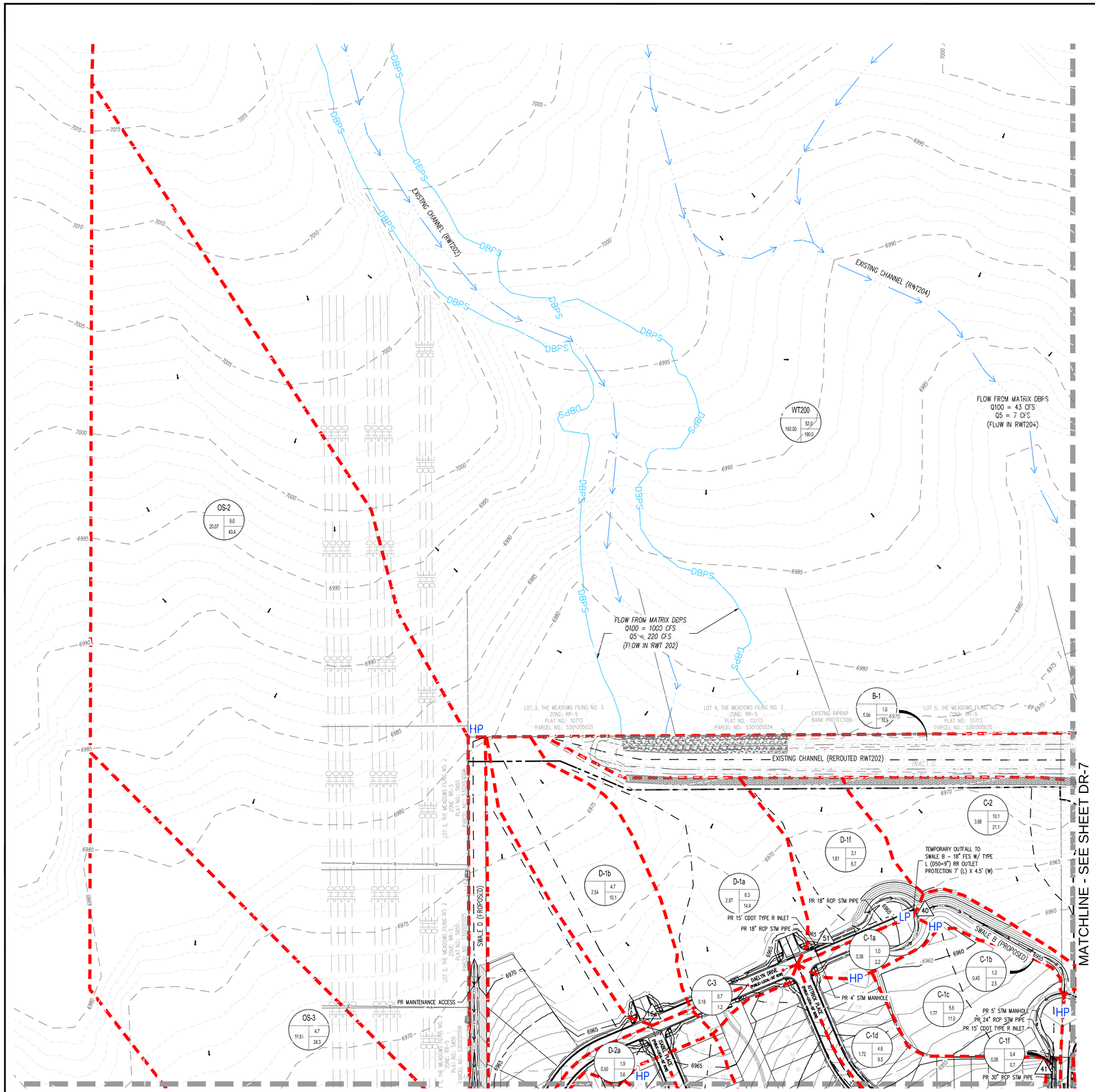
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

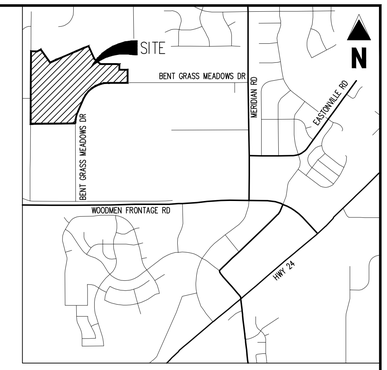
#	Date	Issue / Description	Init.

Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

EXISTING DRAINAGE MAP

DR-5





VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6482 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6482 PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
B-1	6.06	1.6	10.9
B-2	4.16	1.3	8.6
C-1a	0.38	1.0	2.2
C-1b	0.45	1.3	2.5
C-1c	1.77	5.6	11.0
C-1d	1.72	4.6	9.5
C-1e	0.29	1.3	2.4
C-1f	0.08	0.4	0.7
C-2	3.98	10.1	21.1
C-3	0.18	0.7	1.2
C-4	2.67	4.2	9.7
C-5	0.60	0.3	1.9
C-6	0.94	1.0	3.4
C-7	0.52	1.4	2.9
D-1a	2.97	6.3	14.4
D-1b	2.54	4.7	10.1
D-1c	4.34	5.9	13.1
D-1f	1.61	3.1	6.7
D-2a	0.50	1.9	3.6
D-2b	0.74	1.4	3.2
D-2c	0.31	1.1	2.1
D-2d	0.24	0.8	1.6
D-2e	1.41	3.3	6.7
D-2f	2.43	6.0	12.2
D-2g	1.81	2.9	6.5
D-2h	0.23	0.3	0.8
D-3	2.26	2.6	6.3
D-4a	0.98	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.8	6.0
D-6a	1.33	3.8	7.5
D-9b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
D-9	0.72	0.8	2.7
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.9	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
15A	15.2	38.3
51	6.3	14.4
40	8.8	19.6
41	14.1	30.0
42	0.4	0.7
43	4.6	9.5
44	4.7	10.7
19	10.1	21.1
15	4.9	10.0
12	1.3	2.4
45	1.4	2.9
13	22.7	48.7
13A	30.5	66.0
7	2.9	5.3
8	10.0	20.9
AA	302.5	1284.8
9	9.0	43.4
10	4.7	22.6
11	15.6	68.4
14a	3.8	7.6
14d	3.3	6.7
14e	6.0	12.2
14b	4.2	8.3
14	6.4	13.5
16a	4.7	10.1
16	30.9	100.1
18	10.7	21.8
17a	2.1	4.4
17b	3.9	7.7
17c	13.3	26.9
17	38.2	110.8
24	2.9	6.4
25	3.3	6.1
26	5.2	10.6
30	47.6	137.5
32	2.6	6.0
CC	338.3	1384.7

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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

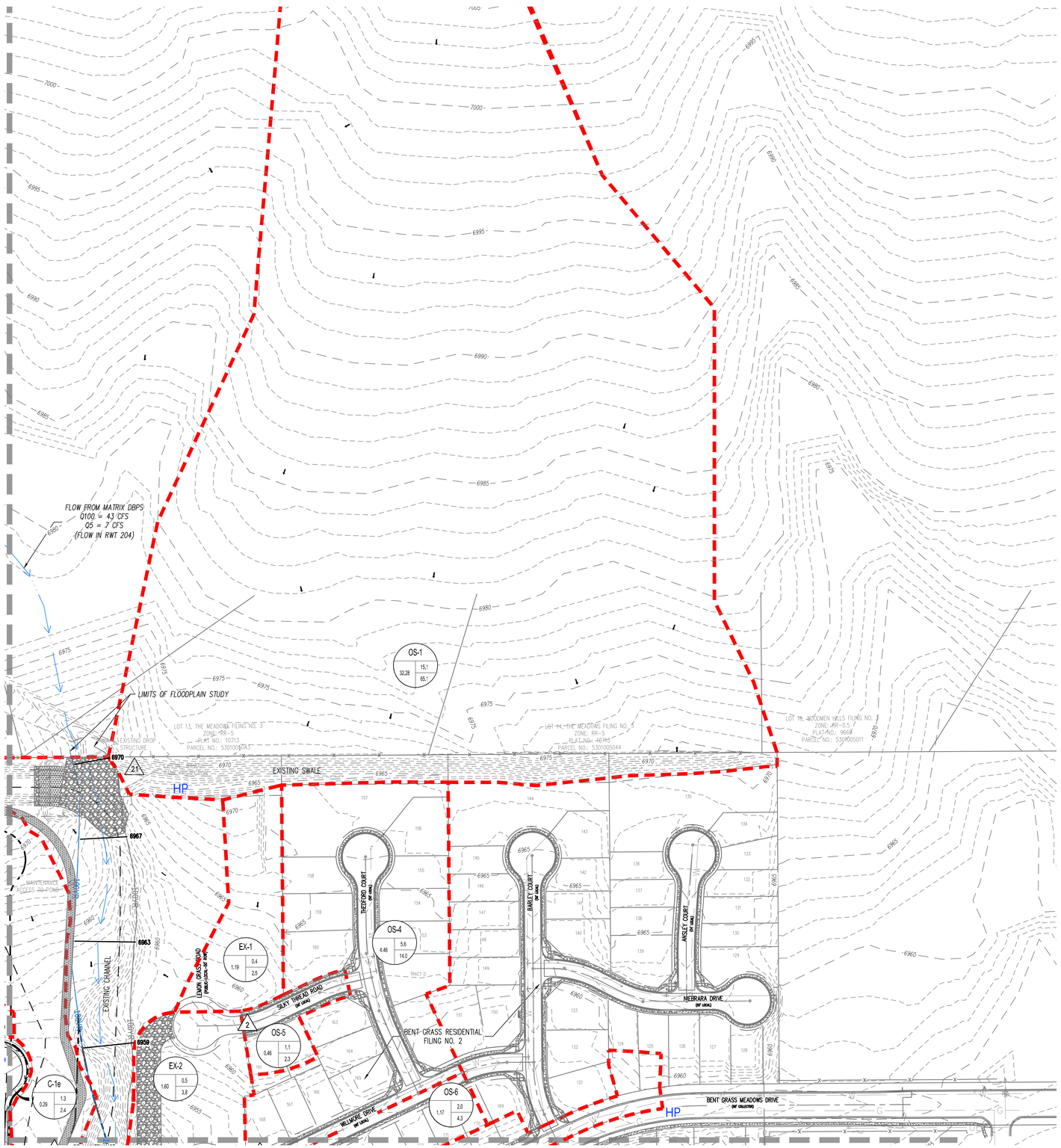
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

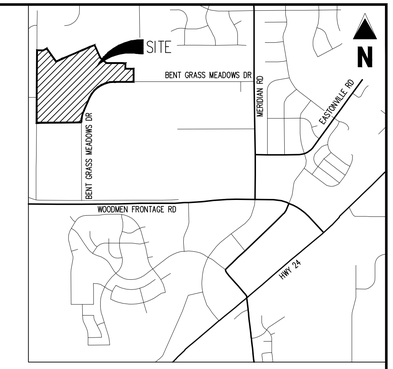
#	Date	Issue / Description	Init.

Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

PROPOSED DRAINAGE MAP

DR-6





VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6482 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6482 PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- 1 / 0.71 / 1.9 / 4.6 — BASIN DESIGNATION; 5-YEAR RUNOFF IN CUBIC FEET PER SECOND; 100-YEAR RUNOFF IN CUBIC FEET PER SECOND; BASIN AREA IN ACRES
- 1 DESIGN POINT
- DIRECTION OF RUNOFF
- 6970 FEMA BASE FLOOD ELEVATION (BFE)

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
B-1	6.06	1.6	10.9
B-2	4.16	1.3	8.6
C-1a	0.38	1.0	2.2
C-1b	0.45	1.3	2.5
C-1c	1.77	5.6	11.0
C-1d	1.72	4.6	9.5
C-1e	0.29	1.3	2.4
C-1f	0.08	0.4	0.7
C-2	3.98	10.1	21.1
C-3	0.18	0.7	1.2
C-4	2.67	4.2	9.7
C-5	0.60	0.3	1.9
C-6	0.94	1.0	3.4
C-7	0.52	1.4	2.9
D-1a	2.97	6.3	14.4
D-1b	2.54	4.7	10.1
D-1c	4.34	5.9	13.1
D-1f	1.61	3.1	6.7
D-2a	0.50	1.9	3.6
D-2b	0.74	1.4	3.2
D-2c	0.31	1.1	2.1
D-2d	0.24	0.8	1.6
D-2e	1.41	3.3	6.7
D-2f	2.43	6.0	12.2
D-2g	1.81	2.9	6.5
D-2h	0.23	0.3	0.8
D-3	2.26	2.6	6.3
D-4a	0.98	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.8	6.0
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
D-9	0.72	0.8	2.7
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
15A	15.2	38.3
51	6.3	14.4
40	8.8	19.6
41	14.1	30.0
42	0.4	0.7
43	4.6	9.5
44	4.7	10.7
19	10.1	21.1
15	4.9	10.0
12	1.3	2.4
45	1.4	2.9
13	22.7	48.7
13A	30.5	66.0
7	2.9	5.3
8	10.0	20.9
AA	302.5	1284.8
9	9.0	43.4
10	4.7	22.6
11	15.6	68.4
14a	3.8	7.6
14d	3.3	6.7
14e	6.0	12.2
14b	4.2	8.3
14	6.4	13.5
16a	4.7	10.1
16	30.9	100.1
18	10.7	21.8
17a	2.1	4.4
17b	3.9	7.7
17c	13.3	26.9
17	38.2	110.8
24	2.9	6.4
25	3.3	6.1
26	5.2	10.6
30	47.6	137.5
32	2.6	6.0
CC	336.3	1384.7

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FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

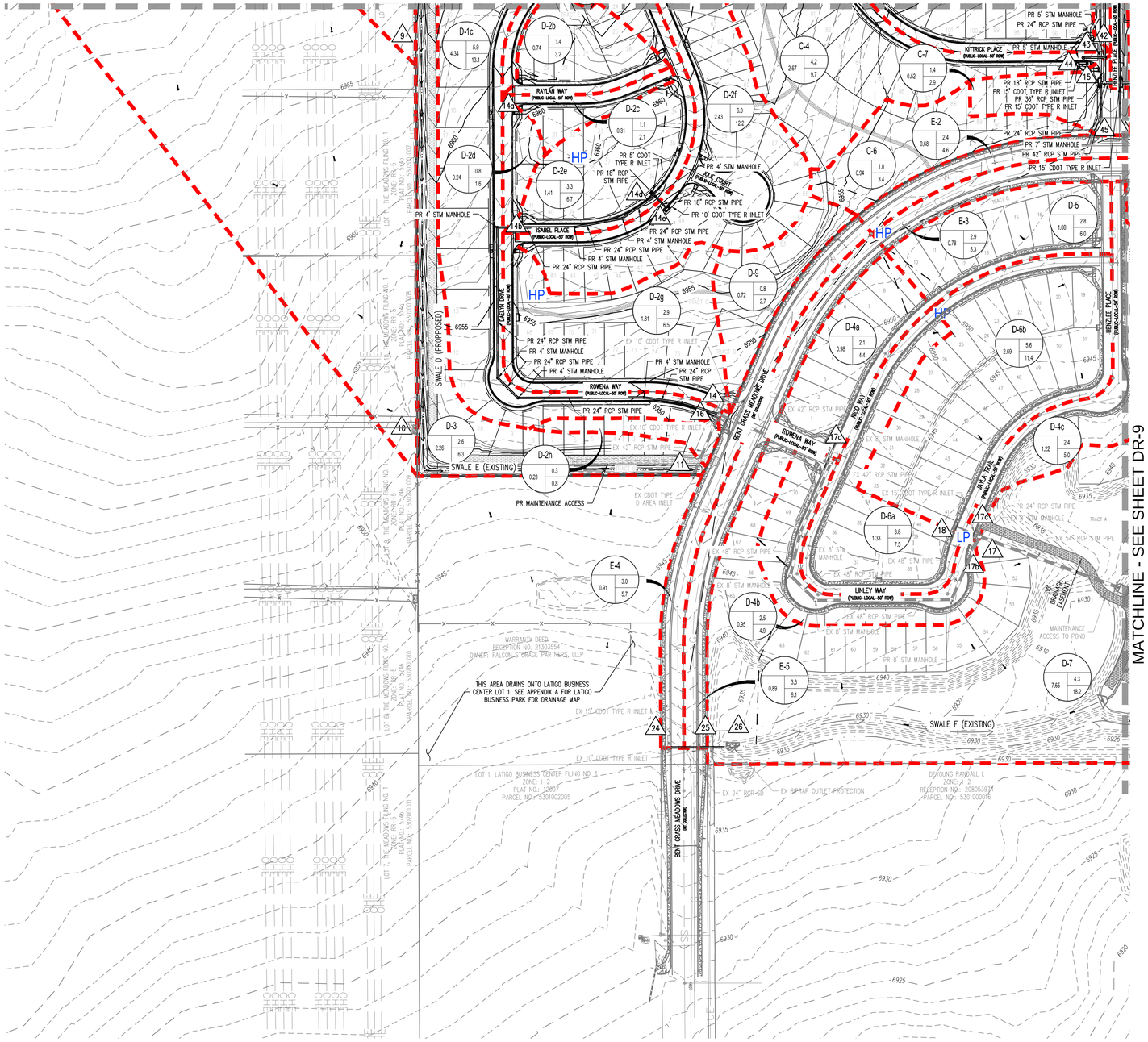
#	Date	Issue / Description	Init.

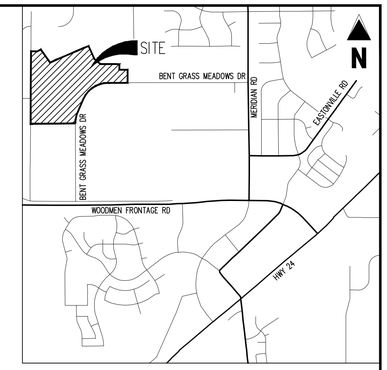
Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

PROPOSED DRAINAGE MAP

DR-7

MATCHLINE - SEE SHEET DR-6





VICINITY MAP
1"=2,000'

N
0 25 50 100
SCALE: 1"=100'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 — EXISTING MAJOR CONTOUR
- 6482 — EXISTING MINOR CONTOUR
- 6480 — PROPOSED MAJOR CONTOUR
- 6482 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR — FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS — 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
B-1	8.06	1.6	10.9
B-2	4.16	1.3	8.6
C-1a	0.38	1.0	2.2
C-1b	0.45	1.3	2.5
C-1c	1.77	5.6	11.0
C-1d	1.72	4.6	9.5
C-1e	0.29	1.3	2.4
C-1f	0.08	0.4	0.7
C-2	3.98	10.1	21.1
C-3	0.18	0.7	1.2
C-4	2.67	4.2	9.7
C-5	0.60	0.3	1.9
C-6	0.94	1.0	3.4
C-7	0.52	1.4	2.9
D-1a	2.97	6.3	14.4
D-1b	2.54	4.7	10.1
D-1c	4.34	5.9	13.1
D-1f	1.61	3.1	6.7
D-2a	0.50	1.9	3.6
D-2b	0.74	1.4	3.2
D-2c	0.31	1.1	2.1
D-2d	0.24	0.8	1.6
D-2e	1.41	3.3	6.7
D-2f	2.43	6.0	12.2
D-2g	1.81	2.9	6.5
D-2h	0.23	0.3	0.8
D-3	2.26	2.6	6.3
D-4a	0.98	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.8	6.0
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
D-9	0.72	0.8	2.7
OB-1	32.28	15.1	65.1
OB-2	20.07	9.0	43.4
OB-3	10.61	4.7	22.6
OB-4	4.46	5.6	14.0
OB-5	0.46	1.1	2.3
OB-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
15A	15.2	38.3
51	6.3	14.4
40	8.8	19.6
41	14.1	30.0
42	0.4	0.7
43	4.6	9.5
44	4.7	10.7
19	10.1	21.1
15	4.9	10.0
12	1.3	2.4
45	1.4	2.9
13	22.7	48.7
13A	30.5	66.0
7	2.9	5.3
8	10.0	20.9
AA	302.5	1284.8
9	9.0	43.4
10	4.7	22.6
11	15.6	68.4
14a	3.8	7.6
14d	3.3	6.7
14e	6.0	12.2
14b	4.2	8.3
14	6.4	13.5
16a	4.7	10.1
16	30.9	100.1
18	10.7	21.8
17a	2.1	4.4
17b	3.9	7.7
17c	13.3	26.9
17	38.2	110.8
24	2.9	6.4
25	3.3	6.1
26	5.2	10.6
30	47.6	137.5
32	2.6	6.0
CC	336.3	1384.7

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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNTIES, LLC

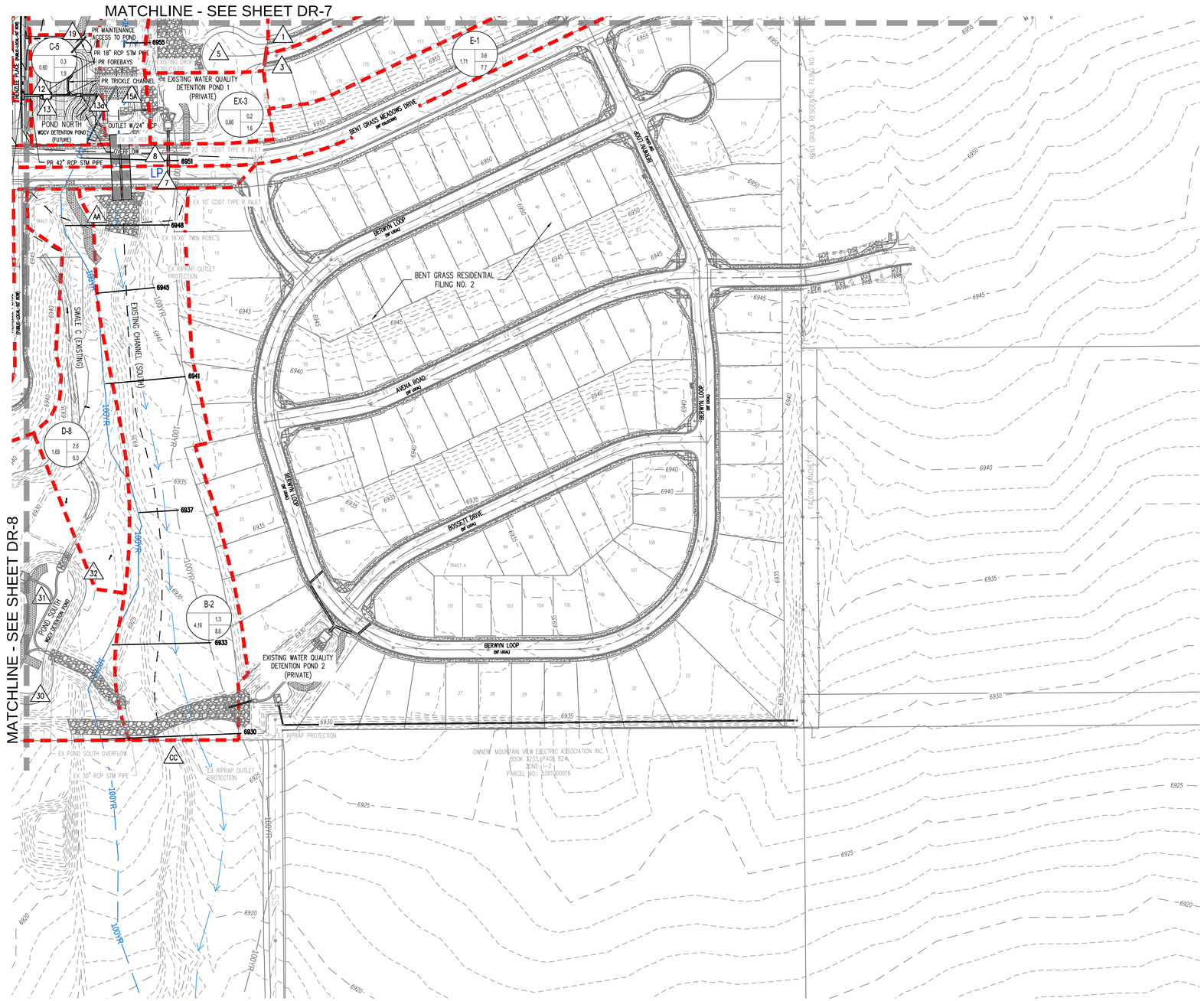
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

PROPOSED DRAINAGE MAP

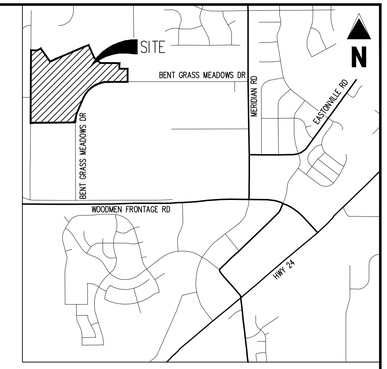
DR-8



N

0 25 50 100

SCALE: 1"=100'



VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 — EXISTING MAJOR CONTOUR
- 6482 — EXISTING MINOR CONTOUR
- 6480 — PROPOSED MAJOR CONTOUR
- 6482 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- 100YR — FEMA EFFECTIVE 100-YR FLOODPLAIN
- DBPS — 100-YR FLOODPLAIN PER MATRIX DBPS
- CENTERLINE OF STREAM
- EXISTING RIPRAP
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- BASIN DESIGNATION (1)
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND (1.9)
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND (4.8)
- BASIN AREA IN ACRES (0.71)
- DESIGN POINT (1)
- DIRECTION OF RUNOFF
- 6970 — FEMA BASE FLOOD ELEVATION (BFE)

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
EX-1	1.19	0.4	2.5
EX-2	1.60	0.5	3.8
EX-3	0.66	0.2	1.6
B-1	6.06	1.6	10.9
B-2	4.16	1.3	8.6
C-1a	0.38	1.0	2.2
C-1b	0.45	1.3	2.5
C-1c	1.77	5.6	11.0
C-1d	1.72	4.6	9.5
C-1e	0.29	1.3	2.4
C-1f	0.08	0.4	0.7
C-2	3.98	10.1	21.1
C-3	0.18	0.7	1.2
C-4	2.97	4.2	9.7
C-5	0.60	0.3	1.9
C-6	0.94	1.0	3.4
C-7	0.52	1.4	2.9
D-1a	2.97	6.3	14.4
D-1b	2.54	4.7	10.1
D-1c	4.34	5.9	13.1
D-1f	1.61	3.1	6.7
D-2a	0.50	1.9	3.8
D-2b	0.74	1.4	3.2
D-2c	0.31	1.1	2.1
D-2d	0.24	0.8	1.6
D-2e	1.41	3.3	6.7
D-2f	2.43	6.0	12.2
D-2g	1.81	2.9	6.5
D-2h	0.23	0.3	0.8
D-3	2.26	2.6	6.3
D-4a	0.96	2.1	4.4
D-4b	0.95	2.5	4.9
D-4c	1.22	2.4	5.0
D-5	1.08	2.8	6.0
D-6a	1.33	3.8	7.5
D-6b	2.69	5.6	11.4
D-7	7.65	4.3	18.2
D-8	1.69	2.6	6.0
D-9	0.72	0.8	2.7
OS-1	32.28	15.1	65.1
OS-2	20.07	9.0	43.4
OS-3	10.61	4.7	22.6
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
21	277.1	1222.1
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
5	7.6	21.4
15A	15.2	38.3
51	6.3	14.4
40	8.8	19.6
41	14.1	30.0
42	0.4	0.7
43	4.6	9.5
44	4.7	10.7
19	10.1	21.1
15	4.9	10.0
12	1.3	2.4
45	1.4	2.9
13	22.7	48.7
13A	30.5	66.0
7	2.9	5.3
8	10.0	20.9
AA	302.5	1284.8
9	9.0	43.4
10	4.7	22.6
11	15.6	68.4
14a	3.8	7.6
14d	3.3	6.7
14e	6.0	12.2
14b	4.2	8.3
14	6.4	13.5
16a	4.7	10.1
16	30.9	100.1
18	10.7	21.8
17a	2.1	4.4
17b	3.9	7.7
17c	13.3	26.9
17	38.2	110.8
24	2.9	6.4
25	3.3	6.1
26	5.2	10.6
30	47.6	137.5
32	2.6	6.0
CC	336.3	1384.7

Galloway
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Colorado Springs, CO 80920
719.900.7220
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CHALLENGER HOMES

FINAL DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

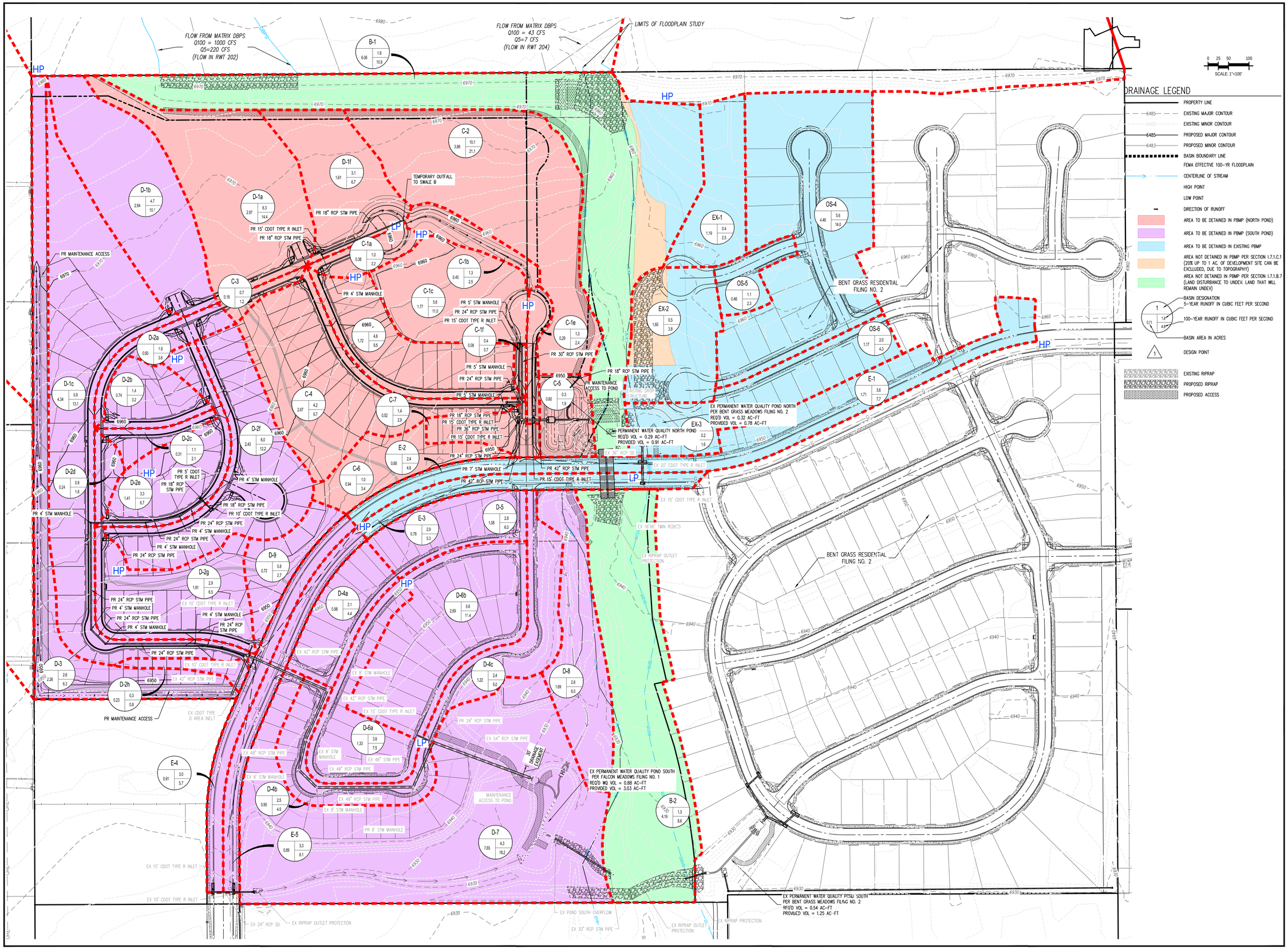
BENT GRASS MEADOWS DRIVE
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

PROPOSED DRAINAGE MAP

DR-9



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#	Date	Issue / Description	Init.

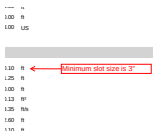
Project No:	CLH000019
Drawn By:	DDJ
Checked By:	GD
Date:	12/03/2021

WQ PLAN

DR-10

Drainage _V2.pdf Markup Summary [PrimarySort] 2-7-2022

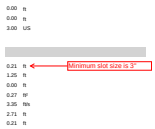
5/19/2021 8:48:57 AM (1)



Subject: Engineer
Page Label: 151
Author: Charlene_Durham
Date: 5/19/2021 8:48:57 AM
Status:
Color:
Layer:
Space:

Minimum slot size is 3"

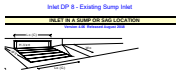
5/19/2021 8:50:42 AM (1)



Subject: Engineer
Page Label: 154
Author: Charlene_Durham
Date: 5/19/2021 8:50:42 AM
Status:
Color:
Layer:
Space:

Minimum slot size is 3"

5/20/2021 4:46:44 PM (1)



Subject: Engineer
Page Label: 86
Author: Charlene_Durham
Date: 5/20/2021 4:46:44 PM
Status:
Color:
Layer:
Space:

Inlet DP 8 - Existing Sump Inlet

5/20/2021 4:47:34 PM (1)

Subject: Engineer
Page Label: 87
Author: Charlene_Durham
Date: 5/20/2021 4:47:34 PM
Status:
Color:
Layer:
Space:

Inlet DP 11 - Existing Area Inlet

5/20/2021 4:48:03 PM (1)

Subject: Engineer
Page Label: 89
Author: Charlene_Durham
Date: 5/20/2021 4:48:03 PM
Status:
Color:
Layer:
Space:

Inlet DP 14 - Existing At-Grade Inlet

5/20/2021 4:48:41 PM (1)

Subject: Engineer
Page Label: 88
Author: Charlene_Durham
Date: 5/20/2021 4:48:41 PM
Status:
Color:
Layer:
Space:

Inlet DP 16 - Existing At-Grade Inlet

5/20/2021 4:49:18 PM (1)

Subject: Engineer
Page Label: 90
Author: Charlene_Durham
Date: 5/20/2021 4:49:18 PM
Status:
Color:
Layer:
Space:

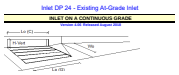
Inlet DP 17 - Existing Sump Inlet

5/20/2021 4:49:41 PM (1)

Subject: Engineer
Page Label: 91
Author: Charlene_Durham
Date: 5/20/2021 4:49:41 PM
Status:
Color:
Layer:
Space:

Inlet DP 18 - Existing Sump Inlet

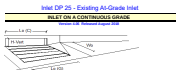
5/20/2021 4:50:24 PM (1)



Subject: Engineer
Page Label: 92
Author: Charlene_Durham
Date: 5/20/2021 4:50:24 PM
Status:
Color:
Layer:
Space:

Inlet DP 24 - Existing At-Grade Inlet

5/20/2021 4:50:49 PM (1)



Subject: Engineer
Page Label: 93
Author: Charlene_Durham
Date: 5/20/2021 4:50:49 PM
Status:
Color:
Layer:
Space:

Inlet DP 25 - Existing At-Grade Inlet

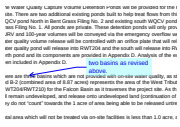
2/3/2022 4:17:10 PM (1)

Subject: Callout
Page Label: 16
Author: Daniel Torres
Date: 2/3/2022 4:17:10 PM
Status:
Color:
Layer:
Space:

Review 1 comment: Per the approved drainage report for filing 1 the flow in these basins is less. Please provide an explanation for the increase in flows in these basins. Are the existing swales/pond adequate for the increase in flows?

Review 2: Please provide a statement indicating whether or not the existing swales and pond are still adequate due to this increase in flow.

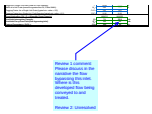
2/3/2022 4:19:15 PM (1)



Subject: Callout
Page Label: 17
Author: Daniel Torres
Date: 2/3/2022 4:19:15 PM
Status:
Color:
Layer:
Space:

two basins as revised above.

2/3/2022 4:38:55 PM (1)

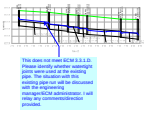


Subject: Callout
Page Label: 92
Author: Daniel Torres
Date: 2/3/2022 4:38:55 PM
Status:
Color:
Layer:
Space:

Review 1 comment: Please discuss in the narrative the flow bypassing this inlet. Where is this developed flow being conveyed to and treated.

Review 2: Unresolved

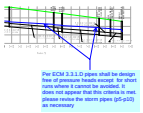
2/3/2022 6:06:34 PM (1)



Subject: Callout
Page Label: 102
Author: Daniel Torres
Date: 2/3/2022 6:06:34 PM
Status:
Color:
Layer:
Space:

This does not meet ECM 3.3.1.D. Please identify whether watertight joints were used at the existing pipe. The situation with this existing pipe run will be discussed with the engineering manager/ECM administrator. I will relay any comments/direction provided.

2/3/2022 6:08:03 PM (1)



Subject: Callout
Page Label: 100
Author: Daniel Torres
Date: 2/3/2022 6:08:03 PM
Status:
Color:
Layer:
Space:

Per ECM 3.3.1.D pipes shall be design free of pressure heads except for short runs where it cannot be avoided. It does not appear that this criteria is met. please revise the storm pipes (p5-p10) as necessary

2/4/2022 5:01:23 PM (1)

Subject: SW - Rectangle
Page Label: 145
Author: EPC Stormwater - Glenn Reese
Date: 2/4/2022 5:01:23 PM
Status:
Color:
Layer:
Space:

2/4/2022 5:09:02 PM (1)

Subject: SW - Rectangle
Page Label: 145
Author: EPC Stormwater - Glenn Reese
Date: 2/4/2022 5:09:02 PM
Status:
Color:
Layer:
Space:

2/4/2022 5:12:58 PM (1)

Subject: SW - Textbox with Arrow
Page Label: 145
Author: EPC Stormwater - Glenn Reese
Date: 2/4/2022 5:12:58 PM
Status:
Color:
Layer:
Space:

Why was no data inputted for the existing condition??
There are Q's calc'd for existing condition on pdf pg 43 above...