MDDP & DBPS AMENDMENT

BENT GRASS DEVELOPMENT

El Paso County, Colorado

PREPARED FOR:
Challenger Communities, LLC
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:
January 2021
Revised: March 2021

PUDSP-20-005

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.

Charlene Durham, P.E. #36727
For and on behalf of Galloway & Company, Inc.

Date

DEVELOPER'S CERTIFICATION

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

By: _____

2/19/21
Date

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

By: _____

2/19/21
Date

Address: Better Land 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.
County Engineer/ECM Administrator

Date

Conditions:

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I. Purpose

This document is to serve as an amendment to the previously approved Master Development Drainage Plan (MDDP) for Bent Grass Meadows, submitted in 2019, and to the Falcon Drainage Basin Planning Study (DBPS). The changes to the MDDP include the analysis of the flow from Meadows Filing 3 subdivision, which is now routed to the east and through the Middle Tributary of the Falcon Basin, as opposed to the West Tributary as previously studied. Drainage calculations, including an update to the HEC-HMS from the approved DBPS has been included as a portion of this report.

II. General Description

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. This report will incorporate the improvements previously approved with Bent Grass Residential Filing No. 2 FDR, the Meridian Road/Bent Grass Meadows FDR, and the proposed development known as Bent Grass West. A Vicinity Map is included in Appendix A.

The existing soil type within the proposed site as determined by the NRCS Web Soil Survey for El Paso County Area consists of Columbine gravelly sandy loam which is defined as having a hydrologic soil group 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 and adjacent sites.

1. *Falcon Drainage Basin Planning Study*, by Matrix Design Group, September 2015.
2. *Master Development Drainage Plan and Preliminary Drainage Plan – Bent Grass Subdivision*, by Kiowa Engineering Corporation, December 2006.
3. *Final Drainage and Erosion Control for The Meadows Filing 3 Subdivision,* by LADD Engineering, July 2000.
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. *Final Drainage Report for Bent Grass Residential Filing No. 2,* by Galloway & Company, April 2020.
7. *Meridian Road & Bent Grass Meadows Drive,* by Galloway & Company, September 2020.
8. *Preliminary Drainage Report Falcon Meadows at Bent Grass,* by Galloway & Company, December 2020.

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.

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 and the 5-year event was used as the minor event.

For the analysis of the existing channel adjacent to Meridian Road and the preliminary design of the proposed channel, Bentley Flowmaster was utilized. Flowmaster was used to evaluate velocity, Froude number, and channel depth. A Manning's n value of 0.035 was utilized for the channel which is appropriate for the existing native grass that comprises the channel section. The proposed channel was designed to have a maximum depth of 5' per the criteria manual and have a maximum velocity of 5 ft/s with a maximum Froude number of 0.6.

The West Tributary channel will be designed to meet the following criteria, maximum depth of 5' per the criteria manual and have a maximum velocity of 5 ft/s with a maximum Froude number of 0.9. The West Tributary channel is comprised of channel reaches RWT202, RWT204 and RWT210 in the HEC-HMS models. A preliminary HEC-RAS analysis has been done for the channel. Per the DBPS, reaches RWT202 and RWT204 will require small drop structures, while Reach RWT210 is a natural channel design. If RWT210 cannot meet the design requirements, small grade control structures may be used to reach those requirements.

V. Current Drainage Conditions

A historic/existing conditions drainage map has been prepared for this area to analyze the area prior to any of the new Bent Grass residential development. This scenario resembles the existing conditions

shown in the previous FDR for Bent Grass Residential Filing No. 2. Hydrology calculations for this scenario have been provided in Appendix B.

A Current Conditions drainage basin map has also been provided. This scenario includes the development of Bent Grass residential Filing No. 2. Hydrology Calculations for this scenario have been provided in Appendix B. This was also provided as the existing conditions map and calculations in the Bent Grass West PDR.

Individual basin descriptions have not been included here, as they have been addressed in previously stated reports. General overall descriptions of the drainage patterns have been provided.

The Bent Grass development will impact the West Tributary and the Middle Tributary of the Falcon Basin. All development from the west of side of Bent Grass Residential Filing No. 1 and west will be contained within the West Tributary. Everything east of that property line, including the Bent Grass Meadows/Meridian Road intersection, will impact the Middle Tributary.

MIDDLE TRIBUTARY

The Middle Tributary drainage begins at Design Point 30.

Design Point 30 (225.0 AC, Q_5 = 2.7 cfs, Q_{100} = 72.6 cfs): is the release rate of the existing Meadows Pond #3, located in Meadows Filing No. 3, just north of Woodmen Hills Drive. The flows are based on the revised HEC-HMS, which is located in Appendix B. Flows will cross under Woodmen Hills Drive via an existing culvert, then sheet flow to the southeast, passing through Basin OS-25 to DP 31. The DBPS by Matrix had 160 cfs at this location under the “Do Nothing Analysis” and 99 cfs under the “Regional” and “Sub-Regional” design alternatives. Minor flows were not provided in the report. The flows are lower in the current HEC-HMS report, as more accurate design data and as-built information for the existing Meadows Pond 2 was utilized in the pond stage/storage and storage/discharge tables.

Design Point 30 will combine with offsite basins OS-25 & OS-26, until they reach an existing sedimentation pond at DP-32, located north of Bent Grass Meadows Drive, on what’s referred to as the “school” site. The current configuration of the pond has release rates of 85.4 and 166.5 cfs for the 5 and 100-year storm events. These flows will continue south to Bent Grass Meadows Drive. Curb and gutter in the roadway is able to handle 7.4 and 33.2 cfs in the minor and major storms. It is assumed that the max gutter flow will continue to the east and the remaining flow, of 133 cfs, will be directed to the south through the Bent Grass Filing No. 1 development. Flow will travel through curb and gutter and existing storm systems within Bent Grass Filing No. 1, ultimately out falling to Bent Grass Pond 1. Based on the local street section and slopes, flows were routed through the development based on overtopping and flows splitting at intersections. The routing of the storm flow can be found in Appendix B, under Surface Routing.

The existing detention pond, Pond 1 Bent Grass Filing No. 1, was analyzed with the additional flow and contributing area. From the FDR for Bent Grass Residential, Pond 1 had a 5-year release rate of 0.4 cfs and a 100-year release rate of 6.8 cfs. The 100-year water surface elevation was 6937.61. With the additional flow being re-routed to Pond 1, the current release rates for Pond 1 are 0.5 cfs for the 5-year event and 22.0 cfs for the 100-year event. The pond will have a 100-year water surface elevation of 6938.08. The spillway elevation for the pond is 6939.61.

Flows in Bent Grass Meadows will continue east, on the north side of the roadway, where they will combine with offsite flows from BG 50 (5-year flow is 280 cfs, 100-year flow=850 cfs), which is the flow obtained from the Falcon DBPS. There are 3 existing 45” x 29” elliptical rcp’s. For the current condition, the approved FDR for Meridian Road is allowing 2 additional elliptical rcp’s, which will handle the flow from Bent Grass Meadows at Design Point 15n (5-year flow = 13.4 cfs, 100-year flow=62.2 cfs). Design Point 20 (5-year flow=304.8, 100-year flow=961.8 cfs) combines the roadside flow from offsite with the flow from Bent Grass Meadows Drive. Flows will then continue south in a roadside ditch along Meridian Road, on the west side. The Meridian Road ditch also captures flows from the Bent Grass East

Commercial developments. Existing water quality facilities intercept the runoff and treat it, prior to being released into the ditch. Flows will eventually be intercepted by a set of existing twin 36" cmp's at Owl Place, at Design Point BG 25 (Q100=837.4, Q5=256.3 cfs). From the Meridian Road/Bent Grass Meadows FDR, it is shown that the existing culverts at Bent Grass Meadows Drive and Owl Place and the channel connecting the culverts are undersized and will need to be improved in the future to properly convey the flows outlined in the DBPS. Flow will continue through an existing channel and release into Pond SR-4.

including?

Basin MT060, which is the remaining area of the DBPS Basin MT060 minus the "School Site" which has been re-routed along Bent Grass Meadows Drive. The basin is 101.1 acres and flows through an existing channel to the south. MT060 generates 60.1 cfs for the 5-year storm and 196.8 cfs for the 100-year storm. These flows are released directly into Pond SR-4.

WEST TRIBUTARY

For the West Tributary of Falcon Basin, the hydrology analysis has the Bent Grass Residential Filing No. 2 as being constructed, as it is currently underway. The basins for this development are part of the hydrology calculations which are provided in Appendix B, but a complete description of each of these basins has not been provided, as they can be referenced in the approved FDR for Bent Grass Residential Filing No. 2. With this development, there were 2 water quality ponds built, which release into the West Tributary channel. The offsite basins have also been discussed in the Bent Grass Filing No. 2 FDR.

The currently undeveloped portion of the Bent Grass site, referred to as Bent Grass West, is comprised of 8 undeveloped basins. Below is a brief description of them.

Basin EX-1 (1.19 AC, Q_5 = 0.4 cfs, Q_{100} = 2.5 cfs): is associated with the northeastern portion of the Bent Grass West site east of the existing channel. The basin is currently undeveloped. Runoff from the basin generally flows to the southwest, into Basin EX-2 at **DP 10.**

Basin EX-2 (1.56 AC, Q_5 = 0.5 cfs, Q_{100} = 3.7 cfs): is along the eastern boundary portion of the proposed 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 14** combined with flows from **DP 11 & 12**.

Basin EX-3 (0.62 AC, Q_5 = 0.2 cfs, Q_{100} = 1.5 cfs): is along the eastern boundary of the proposed 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. This basin receives flows from **DP 14** and **DP 8**.

Basin EX-4 (12.49 AC, Q_5 = 3.7 cfs, Q_{100} = 25.1 cfs): is located along the northern boundary, just south of the swale built with Bent Grass Meadows Drive 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 located in Basin EX-3.

Basin EX-5 (5.15 AC, Q_5 = 1.6 cfs, Q_{100} = 10.6 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 at **DP 7**. From there, it flows via curb & gutter to the east into an existing sump inlet, ultimately discharging into the existing WQCV pond located in Basin EX-3.

Basin EX-6 (9.53 AC, Q_5 = 2.7 cfs, Q_{100} = 17.8 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 inlet at **DP 22** and flowing under Bent Grass Meadows Drive and discharging into an existing drainage swale in Basin EX-8.

Basin EX-7 (9.16 AC, Q_5 = 2.8 cfs, Q_{100} = 18.9 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 into Bent Grass Meadows Drive at **DP 21**. From there, it flows via curb & gutter to the south into an existing sump inlet, ultimately discharging into the existing sediment pond located in Basin EX-8.

Basin EX-8 (21.3 AC, Q_5 = 6.6 cfs, Q_{100} = 43.9 cfs): is a portion of the site south and east of Bent Grass Meadows Drive, north of the south property line and west of Bent Grass Filing No. 2. The basin is currently undeveloped and contains two drainage ditches, a sediment pond, and a portion of the creek associated with Basin WT200 from the Falcon DBPS. Runoff from the basin generally flows to the southeast into the existing channel.

Overall flows exiting the Bent Grass Site at **DP CC** are 67.0 cfs for the minor storm and 1117.9 cfs for the major storm. This flow will continue south through an existing leg of the West Tributary channel of the Falcon Basin.

This paragraph is not enough detail, and needs to correspond to a plan

South of the Bent Grass development, there are two basins (WT210 and WT220) which still contribute flows to the channel reach RWT210 prior to Woodmen Road. Basin WT210 is on the west side of the channel and is 172.8 acres. Future flows from this basin are 183 and 1113 cfs for the minor and major storm events. Basin WT220 is on the east side of the channel and is 121.6 acres. Flows from this basin are 85 cfs for the 5-year storm and 250 cfs for the 100-year storm. Flows from both basins are from the HEC-HMS model in the appendix.

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VI. 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. Generally, rather than creating point discharges that are directly connected to impervious areas, runoff is routed through pervious areas to promote infiltration. In general, single family developments are good at promoting LID practices. The project site has incorporated open and vegetates areas throughout the area to help disconnect pervious areas. Grass buffers and swales are used where practical, specifically around the property boundary. These items will help in reducing runoff volumes.

2. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release

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. WQCV facilities will be designed as Extended Detention Basins.

The Bent Grass development, west of Bent Grass Residential, Filing No. 1, will include several water quality ponds throughout the site to ensure flows will be treated prior to being released into the West Tributary Channel, running through the site.

Currently, the existing roadside ditch, ultimately conveys runoff to the existing detention and water quality pond MN, as shown and discussed in the Falcon DBPS. The Falcon DBPS also shows a

future detention and water quality pond SR-4 that is to receive flows from basin MT060 and discharge into basin MT070, ultimately routing to existing Pond MN. Flows from Bent Grass Meadows Drive are listed in basin MT060 but are being routed to the existing roadside ditch along Meridian Road, which is in basin MT070. The flows from the "School Site" and upstream basins will release into the east side of Pond SR-4 (west of Falcon Market Place). Pond SR-4 is currently under construction. The proposed improvements impact on the existing drainage basin and both Pond MN and Pond SR-4 are discussed later in the report.

3. Stabilize Drainageways

This step implements stabilization to the channel 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 stability analysis on the existing roadside ditch along Meridian Road was conducted with results shown in Appendix C. From the analysis, it was determined that the existing ditch is not in stable condition with existing DBPS flows. Improvements are anticipated to be made in the future, per recommendations from the Falcon DBPS, when additional land is obtained to expand the ROW along the southbound portion of Meridian Road.

In the interim condition, it has been proposed to add a temporary lining to the existing channel to handle the excess velocities and depth associated with the DBPS flows and Bent Grass development re-routed flows. This analysis has been included in the Appendix.

The West Tributary Channel will be natural, vegetated facility, helping to ensure that the overall velocities will be reduced, flow depth will not exceed 5' and minimize any potential for scour. If needed, grade control structures may be designed to ensure these criteria are met.

4. Implement Site Specific and Other Source Control BMPs

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 City of Colorado Springs website and discuss topics such as: pet waste, car washing, lawn care, fall leaves, and snow melt and deicer.

Bent Grass East Commercial Filing No. 1 contains commercial development. This area will need to consider the need for Industrial & Commercial BMPs. No industrial uses or outside storage is proposed for this area. Drainage will be routed through water quality ponds prior to leaving the site to minimize contaminants into the public system.

VII. Future Drainage Conditions

MIDDLE TRIBUTARY

Design Point 30 and Basins OS-25 and OS-26 are as described under Existing Drainage Conditions. However, Basins OS-25 and OS-26 now route through proposed "future" detention pond, on what's been previously referred to as the "School Site", north of Bent Grass Meadows Drive and just west of Bent

Grass Filing No. 2. This “future” pond will replace the current sedimentation pond on the “School Site”. Upon any additional development within the Middle Tributary area of the Bent Grass Development and north of Bent Grass Meadows Drive, this pond will need to be constructed to accommodate the re-routed flows from the Meadows Pond #2 at DP 30.

This future facility will need to provide 2.76 ac-ft of water quality, 6.26 ac-ft for EURV and 11.98 ac-ft for 100-year storage volume. Preliminary release rates for the 5 and 100-year storms are 3.8 cfs and 32.2 cfs. These flows were then routed to Bent Grass Meadows to the south. With the decrease in flows, flows will not overtop Bent Grass Meadows Drive and continue east to the future box culvert under Bent Grass Meadows Drive at DP BG20 (5-year flow=291.7 cfs, 100-year flow=914.3 cfs). Flows were still checked against street capacity on the north and south side of Bent Grass Meadows Drive, as it continues to the east. With the construction of the future pond, Bent Grass Meadows Drive will be able to adequately handle the flows and no additional storm infrastructure would need to be built to carry these future developed flows. Any area north of Bent Grass Meadows Drive that will develop in the future will need to provide its own on-site detention. Should future development not be able to release flows into Bent Grass Meadows Drive, a 42” RCP would be able to convey the flows of DP 15n (Q100=40.9 cfs, Q5=8.0 cfs) to the northwest corner of the Bent Grass Meadows Drive and Meridian Road intersection. Analysis for this culvert sizing has been included in the appendix.

At the Bent Grass Meadows Drive/Meridian Road intersection, the elliptical rcp’s will need to be replaced with a double 16’ x 4’ rcbc. The future roadside ditch will have a 15’ wide bottom channel with 4:1 side slope, 6.5’ deep and a longitudinal slope of 0.30%. This will result is a flow depth of 5.15’ and velocity of 5.04 fps. This channel will direct flows to Owl Place where the existing twin cmp’s will be replaced with a 20’ x 4’ rcbc or equivalent. This structure will need to be built when any development west of Meridian Road at the intersection of Owl Place happens. With future development, it is anticipated that the existing channel conveying flows to the south will be removed to accommodate the new development. The new channel will need to be a 35’ wide bottom channel with 4:1 sides, 5’ deep and a longitudinal slope of 0.30%. This will produce a flow depth of 3.7’ and a velocity of 4.6 fps. If the channel option is not viable, twin 78” rcp’s at a minimum 0.50% slope would be able to handle this future flow. Analysis for this design option has been included in the appendix.

Calculations are provided in Appendix C for the future culverts and roadside channel.

WEST TRIBUTARY

Offsite flows entering the west tributary location of Bent Grass have not changed from what was discussed under Current Conditions. Reach RWT202 at the northwest corner of the development has a 100-year flow of 1000 cfs and Reach RWT204 has a flow of 43 cfs. These were obtained from the DBPS by Matrix. The Flood Insurance Study (FIS) by FEMA does not have flows evaluated this far north. The have a flow of 1482 cfs beginning at RWT210. The 8 undeveloped on-site basins for Bent Grass West have been replaced with 17 developed basins. These basins are found in the Falcon Meadows for Bent Grass PDR. A summary of these basins is provided below and are part of the hydrology analysis provided in Appendix B.

Basin AA-1 (2.57 AC, Q5 = 4.2 cfs, Q100 = 9.9 cfs): a basin that includes residential lots & east half of Lemon Grass Road. It 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 4**. Flows will then enter a proposed CDOT Type ‘R’ inlet and will be piped into the existing Bent Grass Filing No. 2 WQCV pond located in Basin A-2 at **DP 6**.

Basin AA-2 (2.28 AC, Q5 = 4.2 cfs, Q100 = 9.3 cfs): a basin that includes the west half of Lemon Grass Road 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 5**. Flows will then enter a proposed CDOT Type 'R' inlet where it will be piped into the existing Bent Grass Filing No. 2 WQCV pond located in the south end of the basin.

From the existing WQCV in Bent Grass Filing No. 2, flows will be released into the West Tributary Channel, combining with the channel flows at **DP AA.** This design point corresponds to the upstream side of a twin set of box culverts crossing beneath Bent Grass Meadows Drive. Combined flows at this location are 259.6 cfs and 1141.2 cfs for the minor and major storm events. Design of these structures was part of the FDR for Bent Grass Residential Filing No. 1.

Basin B-1 (5.43 AC, Q5 = 2.6 cfs, Q100 = 10.8 cfs): a basin that is in the center of the site and encompasses the existing rerouted channel RWT202 and existing improved channel RWT204. Flows will sheet flow into the existing channel where they will then be conveyed to **DP 22**.

not found on plan

Basin CC-1 (9.07 AC, Q5 = 16.9 cfs, Q100 = 36.0 cfs): a basin that includes Sophia Lane, the west half of Sarin Trail, north portion 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 15.** Flows will then enter a proposed CDOT Type 'R' inlet where it will be piped to the proposed north WQCV pond at **DP 13**.

rear lots?

Basin CC-2 (1.35 AC, Q5 = 4.1 cfs, Q100 = 9.0 cfs): It encompasses single-family residential lots including the east half of Sarin Trail. Runoff will flow from each lot onto the proposed public R.O.W. where proposed mountable curb and gutter will convey flows to **DP 12.** Flows will then enter a proposed CDOT Type 'R' inlet where it will be piped to the proposed north WQCV pond at **DP 13**.

Basin CC-3 (1.88 AC, Q5 = 6.4 cfs, Q100 = 12.1 cfs): It encompasses Kittrick Place between Sarin Trail & Daelyn Drive, as well as 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 8.** Flows will then enter an existing CDOT Type 'R' inlet on the north side of Bent Grass Meadows Drive, where it will then be released into the existing Filing No. 2 North WQCV Pond.

needs to be described better - isn't there another inlet?

Basin CC-4 (4.34 AC, Q5 = 6.5 cfs, Q100 = 17.8 cfs): It encompasses residential lots and open space between Sarin Trail & Bent Grass Meadows Drive. Runoff will flow from each lot onto the proposed open space, eventually releasing into the public R.O.W. of Bent Grass Meadows Drive, where existing curb and gutter will convey flows to **DP 8.** Flows will then enter an existing CDOT Type 'R' inlet where it will then be released into the existing Filing No. 2 North WQCV Pond.

Basin CC-5 (0.45 AC, Q5 = 0.2 cfs, Q100 = 1.4 cfs): It encompasses 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 D-1 (9.07 AC, Q5 = 11.2 cfs, Q100 = 26.6 cfs): a basin along the west property line of the site. It encompasses single-family residential lots, Isabel Place, & 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.** Flows will then enter a proposed CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the proposed south WQCV pond at **DP 31**.

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Basin D-2 (6.72 AC, Q5 = 14.3 cfs, Q100 = 29.6 cfs): a basin east of Basin D-1. It encompasses single-family residential lots, Isabel Place, Raylan Loop, Jolie Court, as well as the east 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 14.** Flows will then enter a proposed CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the proposed south WQCV pond at **DP 31**.

Basin D-3 (2.03 AC, Q5 = 0.8 cfs, Q100 = 2.3 cfs): a basin that is in the southwest corner of the site, south of Basin D-1. It encompasses the backs of several proposed residential lots as well as proposed Swale D, along the west property line and Swale E (existing) along the south property line. Runoff will flow from basin OS-2 and OS-3 into Swale D and convey flows to the existing drainage swale (Swale E) which will convey flows to an existing area inlet at **DP 11**. This inlet will connect to a propose storm system which will route flows through the development and ultimately outfall at the south WQCV pond at **DP 31**.

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Basin D-4 (4.38 AC, Q5 = 7.8 cfs, Q100 = 16.6 cfs): a basin that is east of Bent Grass Meadows Drive. It encompasses single-family residential lots, Rowena Way, & portions of Linley Way, Jayla Trail, and Henzlee 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 17.** Flows will then enter a proposed CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the proposed south WQCV pond at **DP 31**.

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 proposed curb and gutter will convey flows to the south along Henzlee Place to **DP 18**. Flows will then enter a proposed CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the proposed south WQCV pond at **DP 31**.

Basin D-6 (4.01 AC, Q5 = 8.2 cfs, Q100 = 17.2 cfs): a basin that is south of Basin D-5 & east of Basin D-4. It encompasses single-family residential lots & half of Linley Way, Jayla Trail, Henzlee Place, & Nico 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 18.** Flows will then enter a proposed CDOT Type 'R' inlet where it will then be piped and ultimately outfall in the proposed south WQCV pond at **DP 31**.

Basin D-7 (6.39 AC, Q5 = 3.2 cfs, Q100 = 14.8 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 proposed south WQCV pond, an existing sediment basin, and an existing drainage ditch. Runoff will flow, via sheet flow, until it enters the existing drainage ditch and is conveyed to the proposed south WQCV pond or will directly flow into the proposed south WQCV pond.

Swale F?

Basin D-8 (1.69 AC, Q5 = 1.3 cfs, Q100 = 4.5 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 a proposed drainage ditch. The drainage ditch (Swale C) will then convey flows, ultimately discharging into the proposed south WQCV pond at **DP 32**.

Basin B-2 (4.16 AC, Q5 = 1.4 cfs, Q100 = 9.1 cfs): a basin that is in the south area of the site and encompasses the existing channel RWT210. Flows will sheet flow into the existing channel where they will then be conveyed to **DP CC** exiting the site.

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

doesn't make sense - needs further explanation

The Bent Grass West development accounts for 2 additional water quality facilities to be built. These items were preliminarily designed in the Falcon Meadows for Bent Grass PDR and will be final designed with the FDR for Bent Grass Meadows Filing No. 3.

Final flows exiting the site from the West Tributary at **DP CC** for the future design analysis are 260.0 cfs for the 5-year storm and 1187.4 cfs for the 100-year storm. This does take into account flows from RWT202 and RWT 204. These flows are less than the current conditions (Q100=269.3 cfs, Q5=269.3 cfs) at this location, due to the additional WQ ponds being built and storm infrastructure with this "future" development. Flows will continue offsite through the West Tributary, eventually reaching the existing Pond WU.

1040?

South of the Bent Grass development, there are two basins (WT210 and WT220) which still contribute flows to the channel reach RWT210 prior to Woodmen Road. Basin WT210 is on the west side of the channel and is 172.8 acres. Future flows from this basin are 183 and 1113 cfs for the minor and major storm events. Basin WT220 is on the east side of the channel and is 121.6 acres. Flows from this basin are 85 cfs for the 5-year storm and 250 cfs for the 100-year storm. Flows from both basins are from the HEC-HMS model in the appendix.

more detail is needed

A future conditions drainage map has been prepared for this area. The proposed map is included in Appendix D.

VIII. Proposed Channel Improvements

MIDDLE TRIBUTARY

Although the existing channel and culverts are undersized and improvements will need to be made in the future, minimal channel improvements are being proposed at this time, along Meridian Road. With the construction of the right turn lane on Bent Grass Meadows Drive, the three RCP culverts will be extended approximately 15' to span the extended width of the roadway. Additionally, two more 45"x29" Elliptical RCP pipes will be installed under Bent Grass Meadows Drive to convey the flows for DP 20. The existing channel will need to lined with a temporary turf reinforcement mat (TRM) due to the excessive velocities (9.91 fps), high shear stress (5.11lbs/ft^2) & high Froude Number (1.12). With the TRM added to the channel sides, the allowable velocity is 25 fps and permissible shear stress is 12 lbs/ft^2. An analysis of the channel with the TRM is provided in the Appendix.

In the future, El Paso County will need to improve the existing culverts and channel to adequately convey the flow outlined in the DBPS. These necessary improvements and associated calculations are described further below. A preliminary grading exhibit has been prepared showing these improvements and included in Appendix C.

Similar to the existing channel, Bentley Flowmaster was also used to design the future proposed channel section. The future channel was designed to have a maximum depth of 5' per the criteria manual and have a maximum velocity of 5 ft/s with a maximum Froude number of 0.6. The flow rate used for the design, 925 cfs, was taken from the Falcon DBPS flow combined with the additional off-site drainage coming from the "School Site" and

The future channel section was designed as trapezoidal shape with a 15' bottom width, 4:1 side slope, and 0.3% longitudinal slope. The total depth of the channel will be 6', providing 1' of freeboard for the 5' of water depth. The velocity of the proposed channel is 4.93 ft/s.

The Federal Highway Administration's HY-8 program was also utilized to design the future culverts that will run beneath Bent Grass Meadows Drive. The calculations included in Appendix C show that in order to adequately convey the 915 cfs in the future conditions, two 16'x4' concrete box culverts will need to replace the existing elliptical RCP's. In order to construct the box culverts, the channel will need to be flattened from downstream to create roughly 5' of additional clearance below the road.

WEST TRIBUTARY

The Falcon Area DBPS made recommendations for the channels as they run through the project site. RWT202 was rerouted on the north property lone to convey flows to RWT204. Improvements were designed as part of the Bent Grass Residential Filing No. 2 development.

include flow cfs

The RWT204 is grossly oversized for the actual flows expected through it. Improvements to this section of the channel will adhere and be equivalent to the recommendations in the Falcon Basin DBPS.

RWT204 will generally stay in a location similar to where it is in existing conditions but will have new designed channel sections. The channels will have longitudinal slopes flattened to below 1% in order to reduce the scour potential of the channel. Grouted Sloping Boulder Drops may be utilized within the channel as grade controls (maximum height of 4' with 4:1 slope). It is anticipated that 7 grade control structures will be utilized within the channel. This may change when final design of the channel is completed.

RWT210 is the section of the channel south of Bent Grass Meadows Drive and continues south to Woodmen Road. The channel location will shift slightly to the east and "straighten" out the overall flow path. It will be located within a drainage easement. The channel will have a design with a longitudinal slope less than 1.5%, bottom width of 38', and 4:1 side slopes. The Falcon DBPS recommendations for the channel are to remain as a natural drainage channel. Grade control structures may be utilized within the channel to meet design requirements.

discuss the proposed design and number of grade control structures

The West Trib Channel (RWT202, RWT204 & RWT210) will be maintained by the Bent Grass Metropolitan District. Property Owners of which any of these reaches cross will be responsible for the channel improvements when development occurs on those parcels. Property south of Bent Grass development contains the south portion of RWT210, and it is anticipated that development will occur on these parcels between 2022 to 2025.

improvements are required based on each development's impacts

IX. Proposed & Future Hydrology Modeling (HEC-HMS)

The updated Falcon Basin DBPS by Matrix looked at several design alternatives for the area to help with undersized ponds throughout the area. The preferred method for dealing with this deficiency was the design and construction of sub-regional ponds throughout the area. The Bent Grass development site impacts one of these ponds, SR4.

The HEC-HMS model, which was used in the Falcon DBPS, was updated. Updates to the model included:

Address funding of the channel improvements, responsibilities of each development parcel and metro district and proposed timing/phasing of construction.

If you're using the old data vs. the updated DBPS data explain the discrepancies.

- Modifying the Meadows Pond #2 stage/storage & stage/elevation data based on Meadows Filing No. 3 FDR data
- Adding in existing sedimentation pond at “school site” location
- Breaking up Basin MT060 into 2 basins (MT060a & MT060) to account “school site” pond
- Updated Pond SR4 based on approved construction drawing information
- Basin MT070 updated to show future improvements within the basin

As previously mentioned, the DBPS identified a pond named SR3 at the junction of RWT202 and RWT204 near the south end of the Bent Grass Residential Subdivision. Per the approved FDR for Bent Grass Filing No. 2 and the PDR for Falcon Meadows at Bent Grass, 4 separate water quality ponds will be situated through the Bent Grass site to in lieu of the SR3 pond. The 4 ponds were small enough in volume that they were not incorporated into the HMS model, but are accounted for in the rational modeling within the site.

These on-site water quality pond will treat runoff prior to releasing it into the channel. The two water quality ponds associated with the Bent Grass Filing No. 2 have a volume of approximately 1 acre-foot just for water quality and therefore eliminating the SR3 pond, which never provided detention. The existing channel will remain in place.

X. Proposed Water Quality

The Middle Tributary site does not include the addition of any proposed water quality or detention ponds, under the current scenario. Under future conditions, additional water quality facilities will be necessary for any new development and detention will be required for new development north of Bent Grass Meadows Drive. Also, in the future conditions scenario, Pond SR-4 and existing Pond MN from the Falcon DBPS will receive flows from the improved school site. The HEC-HMS has been updated and is included in Appendix B. As discussed previously, the “School Site” have been added as an additional Basin MT060a, which is routed to the regional detention facility SR-4.

Basin MT070, described in the Falcon DBPS, was analyzed to include the improvements made to the site within Basin MT070 and the effects it has on existing Pond MN.

From the analysis, Pond SR-4’s 100-yr. receiving flows decreased from 1,000 cfs to 952.3 cfs. Based on the increase in impervious area, Basin MT070’s Curve Number increased from 67 to 68. Subsequently, the 100-yr. receiving flows entering existing Pond MN decreased to 825.8 cfs from 850 cfs.

Release rates for SR-4 are 24.3 cfs for the 2-year storm and 696.4 cfs for the 100-year storm. Falcon DBPS has 2-year storm listed as 27 cfs and 100-year storm as 730 cfs. This gives a decrease of 2.7 cfs and 33.6 cfs for the 2 and 100-year events respectively.

Pond MN release rates 30.5 for the 2-year storm and 799.4 cfs for the 100-year storm. The DBPS has release rates listed as 32 cfs for the 2-year storm and 820 cfs for the 100-year storm. This gives a decrease of 1.5 cfs and 20.6 cfs for the 2 and 100-year events respectively.

Address water quality in the West Tributary

XI. Maintenance

The proposed channels are to be private facilities. They will be maintained by the Bent Grass Metropolitan district. When completion of future DBPS construction improvements and upon the Board of County Commissioners acceptance the channels, Reaches RWT 204 & RWT210, will then be owned and maintained by El Paso County along with all drainage facilities within the public Right-of-Way.

XII. Wetlands Mitigation

No wetlands are located on site.

XIII. Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map number 08041C0553G, effective December 7, 2018, there is a floodplain in a portion of the project area. 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. Since there is a discrepancy between the DPBS and FEMA maps, the RWT202 channel has been rerouted to follow the north Bent Grass property line and connect to the RWT204 channel. No-rise certifications are complete, and permit issued. No LOMR is anticipated or proposed at this time.

XIV. Fee Development

At this time, it is being requested to add the improvement of the culverts at the Bent Grass Meadows Drive/Meridian Road intersection to the reimbursable list of storm facilities presented in the Falcon DBPS. The cost of the current additional elliptical pipes and then the future box culverts would be added to the bridge fees. Based on the estimate shown below, the box culvert would add $429,749.00 to the overall bridge construction costs.

temporary culverts will not be added to bridge fees

Item	Quantity	Unit	Unit Cost	Cost
Culvert (Concrete Box Culvert) (Public)				
4' x 16' Concrete Box Culvert	190	LF	$ 1,600.00	$ 304,000.00
30" Grouted Boulders	164	SY	$ 190.00	$ 31,160.00
Soil Rip Rap - Type M	52.44	CY	$ 100.00	$ 5,244.00
Headwalls - Concrete	35	CY	$ 850.00	$ 29,750.00
Wingwalls - Concrete	60	CY	$ 850.00	$ 51,000.00
Headwalls - Steel Reinforcement	1300	LBS	$ 1.50	$ 1,950.00
Wingwalls - Steel Reinforcement	4430	LBS	$ 1.50	$ 6,645.00
Total				$ 429,749.00

double

In Section 7.0 Fee Development of the Falcon Basin DBPS, it was shown that the Development Cost for Bridge Improvements was $2,058,474. With the addition of the box culvert at Bent Grass Meadows Drive/Meridian Road, this estimate would raise to $2,488,223. The Drainage Improvement costs shown in the DBPS for Development were $14,988,251. The DBPS fees were based off 645.58 impervious acres. (Refer to DBPS for detailed information on area breakdown).

see comment letter

The Bridge Fee per Impervious acre was $3,189 and Drainage Fee was $23,217. There are no improvements to facilities falling under the Drainage Fee criteria. The Bridge fee will increase. Based on the new overall bridge development fee of $2,488,223, the fee per impervious acre will be $3,793, an increase of $604 per impervious acre.

(needs to be verified based on platted areas)

(if channel improvements south of Bent Grass residential projects remain the same.)

It is requested that the Drainage Board will approve the above increase to the Falcon Basin Bridge Fees.

Below is a table summarizing the approximate costs of channel improvements per land parcel contributing flows to Reach RWT210.

WEST TRIBUTARY CHANNEL IMPROVEMENT COST SHARING BY OWNERS

OWNER	OVERALL AREA (ACRES)	CONTRIBUTING AREA (ACRES)	% OF CONTRIBUTING AREA	% COST
CHALLENGER COMMUNITIES, LLC	120.04	85.75	52.63%	$1,025,671.15
BETTER LAND, LLC	14.34	14.34	8.80%	$171,523.32
RANDY DEYOUNG	17.35	17.35	10.65%	$207,526.47
LENA CASE (PARCEL 1)	8.05	8.05	4.94%	$96,287.50
LENA CASE (PARCEL 2)	29.34	29.34	18.01%	$350,941.01
FALCON STORAGE PARTNERS, LLP	8.1	8.1	4.97%	$96,885.56
TOTALS	197.22	162.93		

TOTAL CHANNEL COST *$1,948,835*

176?

5?

XV. Conclusion

This report has been prepared using the criteria and methods as described in the El Paso County Drainage Criteria Manual. For the Middle Tributary portion of the site, it has been shown that under current conditions, existing facilities will function. Recommendations for future facilities have been provided for an EURV pond on the “school site”, Bent Grass Meadows Drive/Meridian Road intersection and the Owl Place crossing. Also, it has been noted that any new development in this area will need to provide their own on-site water quality and detention. Under the current conditions, there are no adverse impacts to the sub-regional SR4 pond or the Regional Pond MN, further downstream.

For the West Tributary areas, several water quality facilities are being proposed/constructed. These items will treat developed flows prior to being released into the channel for the West Tributary. The West Tributary Channel will meet the design requirements of the Falcon DBPS. Bent Grass Metropolitan District will maintain the channel. Downstream property owners, south of Bent Grass to Woodmen Road, will be responsible for channel improvements when development occurs on the corresponding parcels. Upon entering the channel, flows will leave the Bent Grass property and continue south, eventually reaching the Regional Pond WU. There are no adverse impacts to this facility.

address the channel design and district/developer construction and maintenance commitments

XVI. 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 – Bent Grass Residential Subdivision*, by Galloway & Company, May 2019.
9. *Final Drainage and Erosion Control for The Meadows Filing 3 Subdivision,* by LADD Engineering, July 2000.
10. *Final Drainage Report for Bent Grass Residential Filing No. 2,* by Galloway & Company, April 2020.
11. *Meridian Road & Bent Grass Meadows Drive,* by Galloway & Company, September 2020.
12. *Preliminary Drainage Report Falcon Meadows at Bent Grass,* by Galloway & Company, December 2020.
13. *Preliminary Drainage Report for Bent Grass East Commercial-Phase 1 (Preliminary Plan) -Final Drainage Report for Bent Grass East Commercial Filing No. 1-Lot 1 (Final Plat) & Addendum No. 1 (7-11 Development),* by Classic Consulting Engineers & Surveyors, LLC, April 2013.
14. *Final Drainage Report for Bent Grass East Commercial Filing No. 2,* by Classic Consulting Engineers & Surveyors, July 2014.
15. *Drainage Letter Report for Falcon Dental Lot 2A, Bent Grass East Commercial Filing No. 2A,* by JPS Engineering, April 2016.

APPENDIX A

Exhibits and Figures

FALCON MEADOWS AT BENT GRASS

-

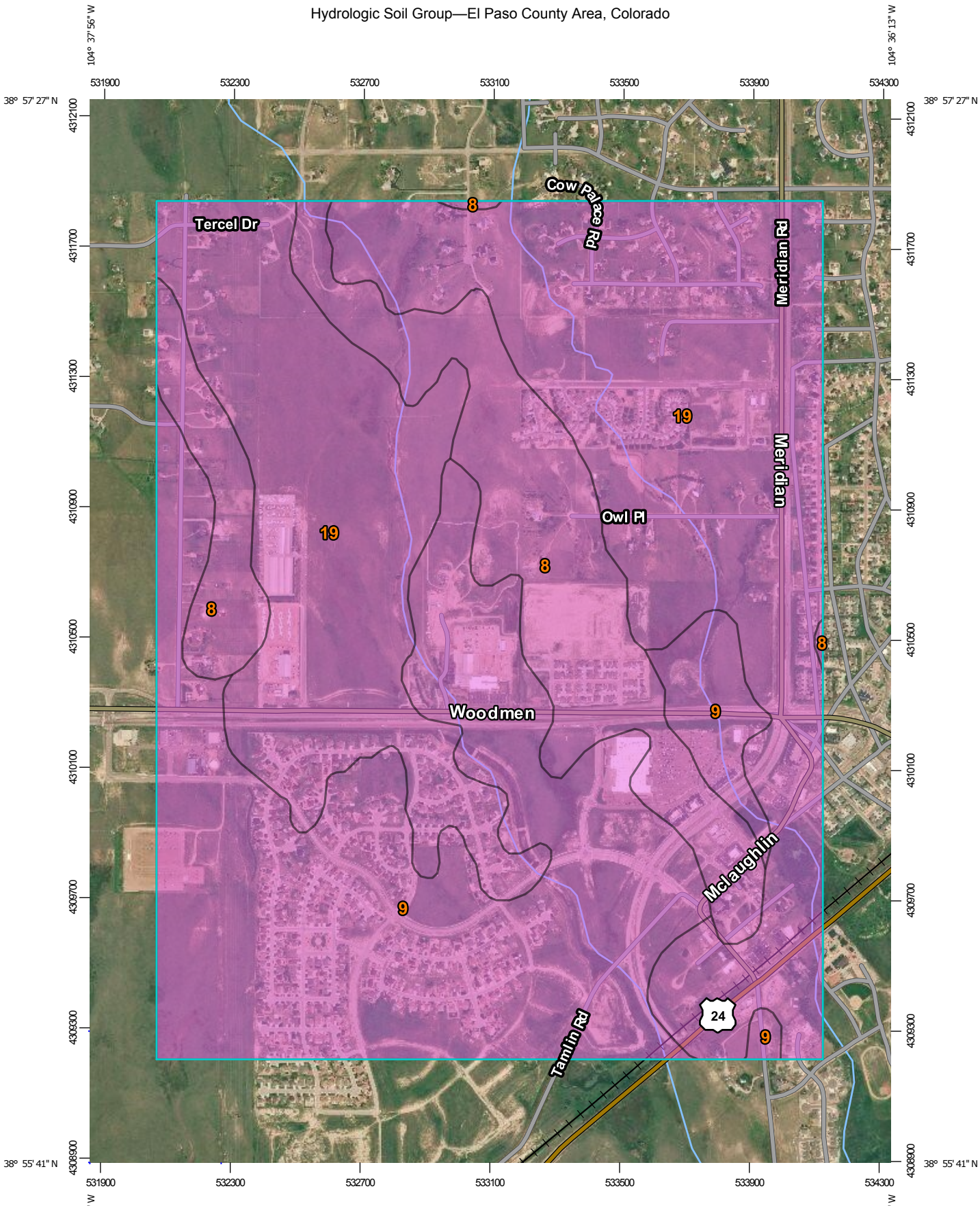
BENT GRASS MEADOWS DRIVE
SCALE: 1"=2,000'

VICINITY MAP

Project No:	CLH000017.20
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



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.

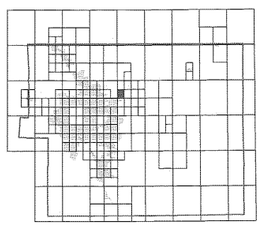
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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

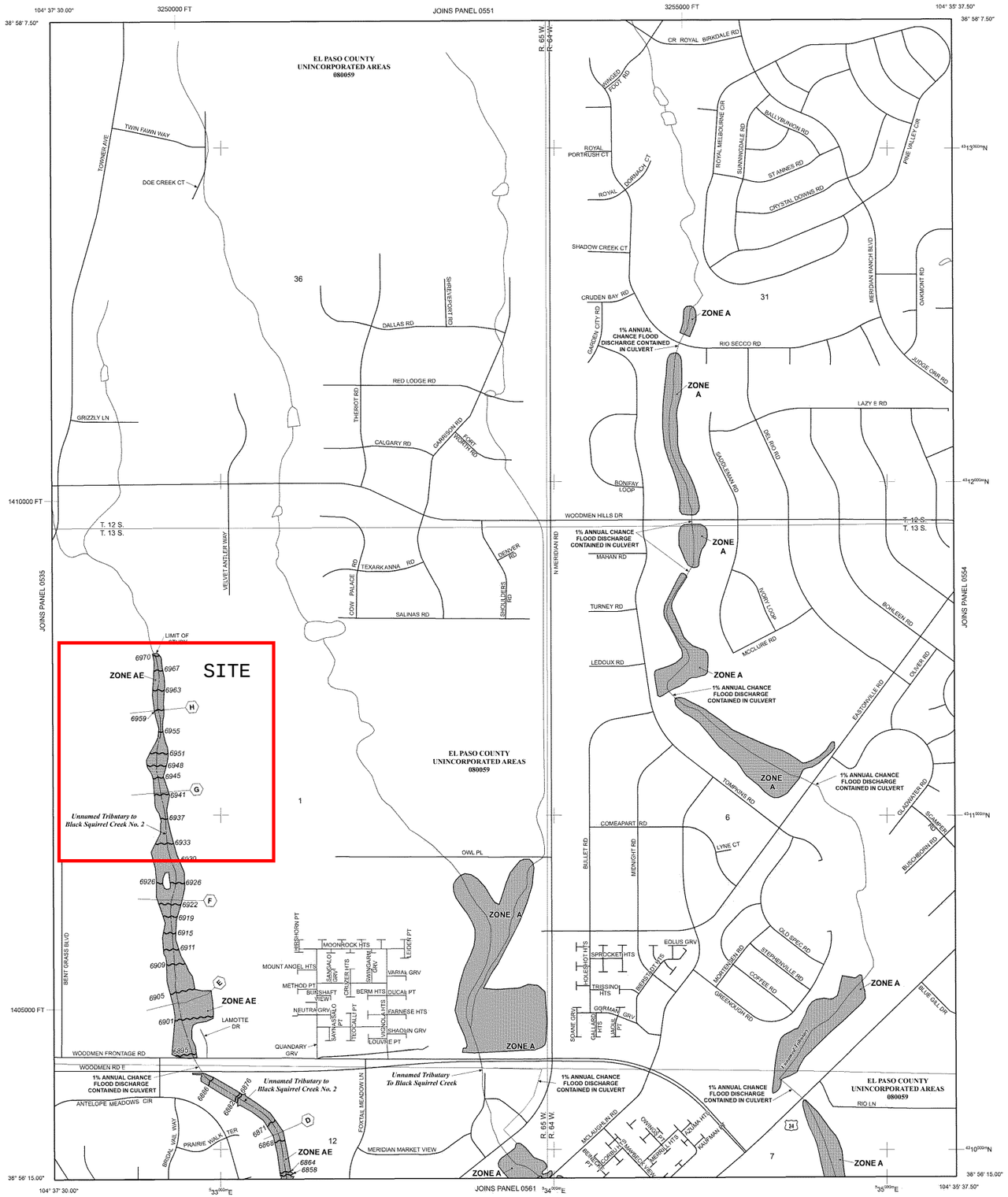
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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)

4275000mN — 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

PANEL 0553G

NATIONAL FLOOD INSURANCE PROGRAM

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

FALCON DRAINAGE BASIN PLANNING STUDY

SELECTED PLAN REPORT

FINAL - SEPTEMBER 2015

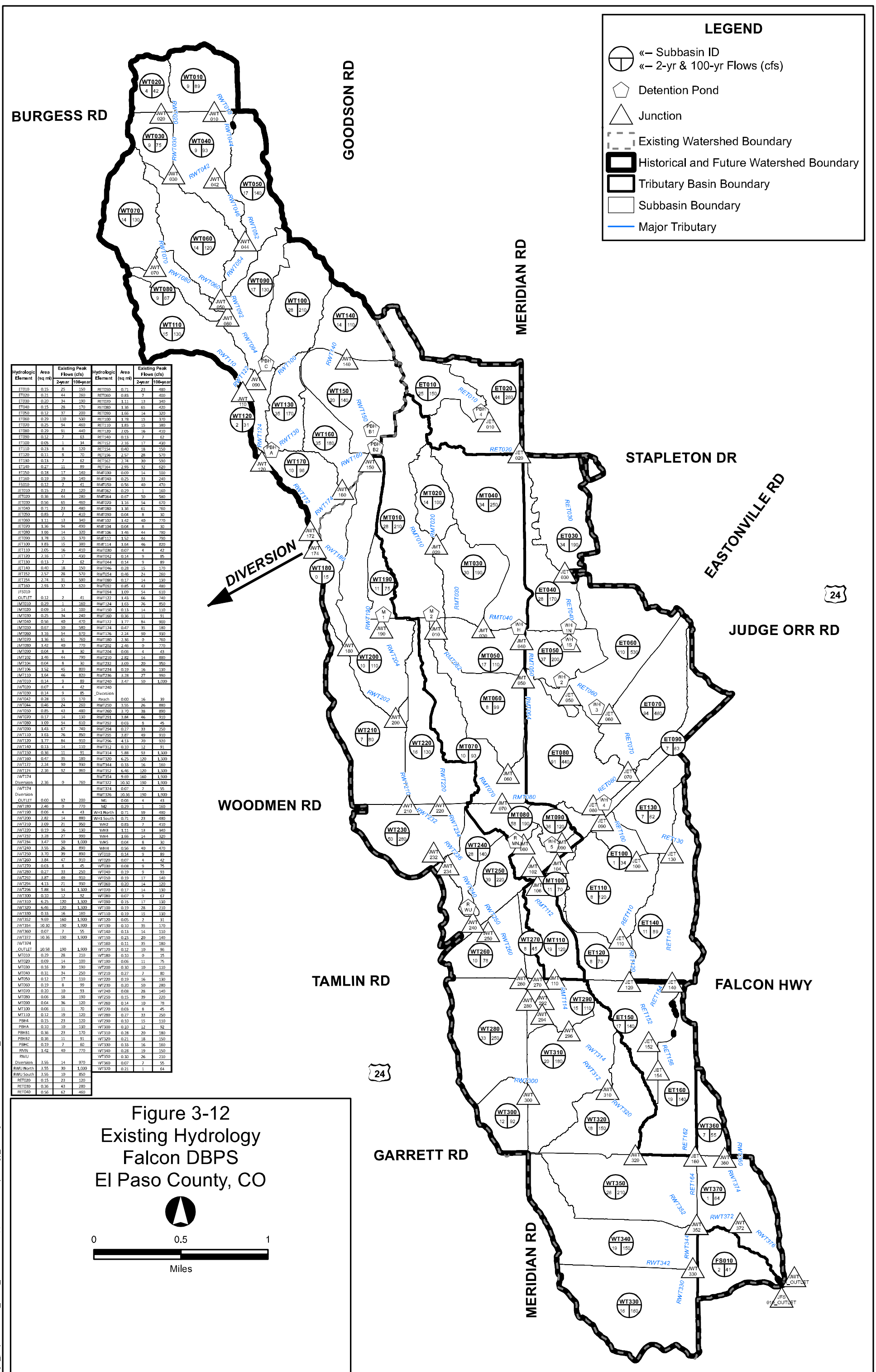
Prepared for:

El Paso County Public Services Department
3275 Akers Drive
Colorado Springs, CO 80922

Prepared By:

Matrix Design Group
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920

Matrix Project No. 10.122.003



Hydrologic Element	Area (sq mi)	Existing Peak Flows (cfs) 2-year	100-year
ET010	0.15	25	150
ET020	0.21	44	260
ET030	0.20	34	190
ET040	0.15	28	170
ET050	0.12	37	200
ET060	0.29	110	530
ET070	0.25	94	460
ET080	0.29	91	440
ET090	0.12	7	63
ET100	0.05	1	34
ET110	0.23	8	120
ET120	0.11	8	70
ET130	0.13	7	62
ET140	0.27	11	89
ET150	0.18	17	140
ET160	0.19	19	140
FS010	0.12	2	41
JET010	0.15	23	120
JET020	0.36	44	280
JET030	0.56	65	460
JET040	0.71	23	480
JET050	0.83	7	410
JET060	1.11	13	340
JET070	1.36	94	490
JET080	1.66	14	320
JET090	1.78	15	370
JET100	1.83	15	380
JET110	2.05	16	410
JET120	2.16	17	430
JET130	0.13	7	62
JET140	0.40	18	150
JET152	2.57	28	570
JET154	2.74	31	590
JET160	2.93	32	620
JFS010 _OUTLET	0.12	2	41
JMT010	0.29	1	160
JMT020	0.09	14	100
JMT030	0.25	34	240
JMT040	0.56	40	470
JMT050	0.67	50	580
JMT060	1.16	54	670
JMT070	1.36	61	760
JMT080	1.42	40	770
JMT090	0.04	8	30
JMT102	1.46	44	790
JMT104	0.04	8	30
JMT106	1.52	45	800
JMT110	1.64	46	820
JWT010	0.14	9	89
JWT020	0.07	4	42
JWT030	0.14	9	85
JWT042	0.28	15	170
JWT044	0.46	24	260
JWT050	0.85	43	480
JWT070	0.17	14	130
JWT080	1.09	54	610
JWT090	1.43	67	740
JWT110	1.63	76	850
JWT120	1.77	84	910
JWT140	0.13	14	110
JWT150	0.36	11	91
JWT160	0.47	35	180
JWT172	2.24	90	930
JWT174	2.36	92	960
JWT174 Diversion	2.36	0	760
JWT174 Diversion _OUTLET	0.00	92	200
JWT180	2.46	0	770
JWT190	0.06	4	43
JWT200	2.82	14	880
JWT210	3.09	21	950
JWT220	0.19	16	130
JWT232	3.28	27	990
JWT234	3.47	50	1,000
JWT240	3.55	26	890
JWT250	3.70	39	890
JWT260	3.84	47	910
JWT270	0.03	8	45
JWT280	0.27	33	250
JWT292	3.87	49	910
JWT294	4.13	71	930
JWT296	5.88	94	1,300
JWT300	0.10	12	92
JWT310	6.25	120	1,300
JWT320	6.46	120	1,300
JWT330	0.33	16	160
JWT352	9.69	160	1,900
JWT354	10.30	190	1,900
JWT360	0.07	7	55
JWT372	10.36	190	1,900
JWT374 OUTLET	10.58	190	1,900
MT010	0.29	28	210
MT020	0.09	14	100
MT030	0.16	30	190
MT040	0.31	34	250
MT050	0.12	17	110
MT060	0.19	8	99
MT070	0.20	10	93
MT080	0.06	58	190
MT090	0.04	36	120
MT100	0.06	11	70
MT110	0.12	19	120
PBH4	0.15	23	120
PBHA	0.10	10	130
PBHB1	0.36	23	170
PBHB2	0.36	11	91
PBHC	0.19	7	60
RMN	1.42	40	770
RWU Diversion	3.55	14	970
RWU North	3.55	30	1,000
RWU South	3.55	10	850
RET020	0.15	23	120
RET030	0.36	43	280
RET040	0.56	62	460
RET050	0.71	23	480
RET060	0.83	7	400
RET070	1.11	13	340
RET080	1.36	65	420
RET090	1.66	14	320
RET100	1.78	15	370
RET110	1.83	15	380
RET120	2.05	16	410
RET140	0.13	7	62
RET152	2.16	17	430
RET154	0.40	18	150
RET156	2.57	28	570
RET162	2.74	28	590
RET164	2.93	32	620
RMT030	0.09	14	100
RMT040	0.25	33	240
RMT050	0.56	40	470
RMT062	0.29	1	160
RMT064	0.67	50	580
RMT070	1.16	54	670
RMT080	1.36	61	760
RMT090	0.04	8	30
RMT102	1.42	40	770
RMT104	0.04	8	30
RMT106	1.46	44	780
RMT112	1.52	44	790
RMT114	1.64	46	820
RWT030	0.07	4	42
RWT042	0.14	9	85
RWT044	0.14	9	89
RWT046	0.28	15	170
RWT054	0.46	24	260
RWT080	0.17	14	130
RWT092	0.85	43	480
RWT094	1.09	54	610
RWT122	1.43	66	740
RWT124	1.63	76	850
RWT150	0.13	14	110
RWT160	0.36	11	91
RWT172	1.77	84	900
RWT174	0.47	35	180
RWT176	2.24	90	930
RWT180	2.36	0	760
RWT202	2.46	0	770
RWT204	0.06	4	43
RWT210	2.82	14	880
RWT232	3.09	20	950
RWT234	0.19	16	130
RWT236	3.28	27	990
RWT240	3.47	50	1,000
RWT240 _Diversion Reach	0.00	16	39
RWT250	3.55	26	880
RWT260	3.70	38	890
RWT291	3.84	46	910
RWT292	0.03	8	45
RWT294	0.27	33	250
RWT295	3.87	49	910
RWT296	4.13	70	920
RWT312	0.10	12	91
RWT314	5.88	93	1,300
RWT320	6.25	120	1,300
RWT344	0.33	16	160
RWT352	6.46	120	1,300
RWT354	9.69	160	1,900
RWT372	10.30	190	1,900
RWT374	0.07	7	55
RWT376	10.36	190	1,900
M1	0.06	1	43
M2	0.29	1	160
WH1 North	0.71	59	480
WH1 South	0.71	23	480
WH2	0.83	7	410
WH3	1.11	13	340
WH4	1.66	14	320
WH5	0.04	8	30
WHH	0.56	40	470
WT010	0.14	9	89
WT020	0.07	4	42
WT030	0.08	9	75
WT040	0.19	9	93
WT050	0.19	17	140
WT060	0.20	14	120
WT070	0.17	14	130
WT080	0.07	9	67
WT090	0.15	17	130
WT100	0.19	28	210
WT110	0.19	15	130
WT120	0.05	2	31
WT130	0.10	35	170
WT140	0.13	14	110
WT150	0.23	20	140
WT160	0.19	35	180
WT170	0.12	10	96
WT180	0.06	0	15
WT190	0.06	11	75
WT200	0.30	10	110
WT210	0.27	7	80
WT220	0.19	16	130
WT230	0.20	50	280
WT240	0.08	28	140
WT250	0.15	39	220
WT260	0.14	10	78
WT270	0.03	8	45
WT280	0.27	33	250
WT290	0.10	15	110
WT300	0.10	12	92
WT310	0.28	20	180
WT320	0.21	18	150
WT330	0.33	16	160
WT340	0.28	19	150
WT350	0.30	26	210
WT360	0.07	7	55
WT370	0.21	1	64

Figure 3-12
Existing Hydrology
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20110613\hydrology_existing.mxd, 12/22/2011, wilson_wheeler

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)		Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)	
		2-year	100-year			2-year	100-year
ET010	0.15	38	200	RET050	0.71	27	570
ET020	0.21	73	360	RET060	0.83	11	530
ET030	0.20	45	240	RET070	1.11	13	430
ET040	0.15	28	170	RET080	1.36	65	420
ET050	0.12	37	200	RET090	1.66	15	350
ET060	0.29	110	530	RET100	1.78	26	390
ET070	0.25	94	460	RET110	1.83	27	390
ET080	0.29	110	520	RET120	2.05	39	430
ET090	0.12	26	130	RET140	0.13	11	85
ET100	0.05	11	72	RET152	2.16	49	450
ET110	0.23	24	200	RET154	0.40	26	200
ET120	0.11	11	89	RET156	2.57	50	650
ET130	0.13	11	85	RET162	2.74	59	680
ET140	0.27	16	120	RET164	2.93	66	710
ET150	0.18	17	140	RMT030	0.09	25	140
ET160	0.19	19	140	RMT040	0.25	49	290
FS010	0.12	6	75	RMT050	0.56	110	750
JET010	0.15	29	150	RMT062	0.29	1	160
JET020	0.36	74	390	RMT064	0.67	120	850
JET030	0.56	97	580	RMT070	1.16	130	1,000
JET040	0.71	27	570	RMT080	1.36	150	1,200
JET050	0.83	11	530	RMT090	0.04	9	32
JET060	1.11	13	430	RMT102	1.42	86	1,200
JET070	1.36	94	480	RMT104	0.04	9	32
JET080	1.66	15	350	RMT106	1.46	91	1,200
JET090	1.78	26	390	RMT112	1.52	92	1,200
JET100	1.83	27	390	RMT114	1.64	94	1,200
JET110	2.05	40	440	RWT030	0.07	4	42
JET120	2.16	49	450	RWT042	0.14	9	85
JET130	0.13	11	85	RWT044	0.14	9	89
JET140	0.40	26	200	RWT046	0.28	15	170
JET152	2.57	51	650	RWT054	0.46	24	260
JET154	2.74	62	680	RWT080	0.17	14	130
JET160	2.93	66	710	RWT092	0.85	43	480
JFS010 _OUTLET	0.12	6	75	RWT094	1.09	54	610
JMT010	0.29	1	160	RWT122	1.43	68	730
JMT020	0.09	26	140	RWT124	1.63	77	840
JMT030	0.25	50	290	RWT150	0.13	32	180
JMT040	0.56	110	750	RWT160	0.36	15	170
JMT050	0.67	120	850	RWT172	1.77	85	920
JMT060	1.16	130	1,000	RWT174	0.47	35	180
JMT070	1.36	150	1,200	RWT176	2.24	98	960
JMT080	1.42	86	1,200	RWT180	2.36	100	990
JMT090	0.04	9	32	RWT202	2.46	100	1,000
JMT102	1.46	91	1,200	RWT204	0.06	4	43
JMT104	0.04	9	32	RWT210	2.82	110	1,200
JMT106	1.52	92	1,200	RWT232	3.09	120	1,300
JMT110	1.64	94	1,200	RWT234	0.19	47	250
JWT010	0.14	9	89	RWT236	3.28	120	1,400
JWT020	0.07	4	42	RWT240 _Diversion			
JWT030	0.14	9	85	Reach	0.00	30	39
JWT042	0.28	15	170	RWT250	3.55	83	1,100
JWT044	0.46	24	260	RWT260	3.70	85	1,100
JWT050	0.85	43	480	RWT291	3.84	86	1,100
JWT070	0.17	14	130	RWT292	0.03	11	57
JWT080	1.09	54	610	RWT294	0.27	33	250
JWT090	1.43	68	730	RWT295	3.87	86	1,100
JWT110	1.63	77	840	RWT296	4.13	94	1,100
JWT120	1.77	85	920	RWT312	0.10	12	91
JWT140	0.13	32	180	RWT314	5.88	160	1,700
JWT150	0.36	15	170	RWT320	6.25	160	1,700
JWT160	0.47	35	190	RWT344	0.33	32	250
JWT172	2.24	99	960	RWT352	6.46	160	1,700
JWT174	2.36	100	990	RWT354	9.69	210	2,400
JWT180	2.46	100	1,000	RWT372	10.30	230	2,500
JWT190	0.06	4	43	RWT374	0.07	7	55
JWT200	2.82	110	1,200	RWT376	10.36	230	2,500
JWT210	3.09	120	1,300	M1	0.06	4	43
JWT220	0.19	47	250	M2	0.29	1	160
JWT232	3.28	120	1,400	WH1 North	0.71	88	570
JWT234	3.47	130	1,400	WH1 South	0.71	27	570
JWT240	3.55	83	1,100	WH2	0.83	11	530
JWT250	3.70	85	1,100	WH3	1.11	13	430
JWT260	3.84	86	1,100	WH4	1.66	15	350
JWT270	0.03	11	57	WH5	0.04	9	32
JWT280	0.27	33	250	WHH	0.56	110	750
JWT292	3.87	86	1,100	WT010	0.14	9	89
JWT294	4.13	96	1,100	WT020	0.07	4	42
JWT296	5.88	160	1,700	WT030	0.08	9	75
JWT300	0.10	12	92	WT040	0.19	9	93
JWT310	6.25	160	1,700	WT050	0.19	17	140
JWT330	0.33	32	250	WT060	0.20	14	120
JWT352	9.69	210	2,400	WT070	0.17	14	130
JWT354	10.30	230	2,500	WT080	0.07	9	67
JWT360	0.07	7	55	WT090	0.15	22	160
JWT372	10.36	230	2,500	WT100	0.19	56	300
JWT374 _OUTLET	10.58	230	2,500	WT110	0.19	22	170
MT010	0.29	28	210	WT120	0.05	8	55
MT020	0.09	26	140	WT130	0.10	35	170
MT030	0.16	39	230	WT140	0.13	32	180
MT040	0.31	95	460	WT150	0.23	49	250
MT050	0.12	17	110	WT160	0.11	35	180
MT060	0.19	30	200	WT170	0.12	21	140
MT070	0.20	25	170	WT180	0.10	8	66
MT080	0.06	62	190	WT190	0.06	11	75
MT090	0.04	40	130	WT200	0.30	25	190
MT100	0.06	17	88	WT210	0.27	32	190
MT110	0.12	19	120	WT220	0.20	71	350
PBH4	0.15	29	150	WT240	0.08	36	160
PBHA	0.10	10	130	WT250	0.15	63	290
PBHB1	0.36	51	270	WT260	0.14	10	78
PBHB2	0.36	15	170	WT270	0.03	11	57
PBHC	0.19	11	160	WT280	0.27	33	250
RMN	1.42	86	1,200	WT290	0.10	15	110
RWU _Diversion	3.55	83	1,300	WT300	0.10	12	92
RWU North	3.55	110	1,400	WT310	0.28	31	250
RWU South	3.55	55	1,000	WT320	0.21	27	200
RET020	0.15	29	150	WT330	0.33	32	250
RET030	0.36	71	380	WT340	0.28	19	150
RET040	0.56	95	580	WT350	0.30	38	280
				WT360	0.07	7	55
				WT370	0.21	7	120

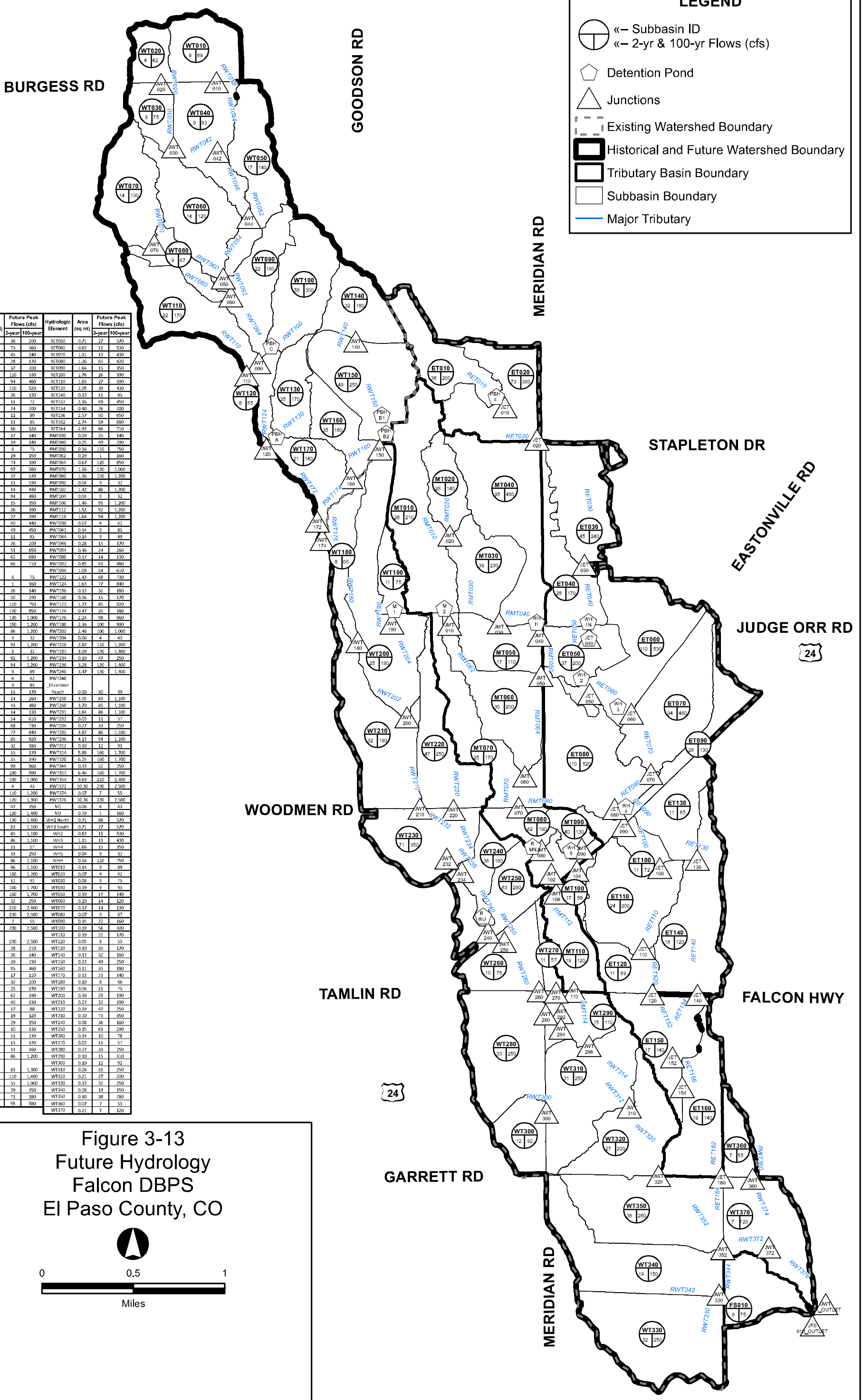


Figure 3-13
Future Hydrology
Falcon DBPS
El Paso County, CO

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20110613\hydrology_future.mxd, 12/22/2011, wilson_wheeler

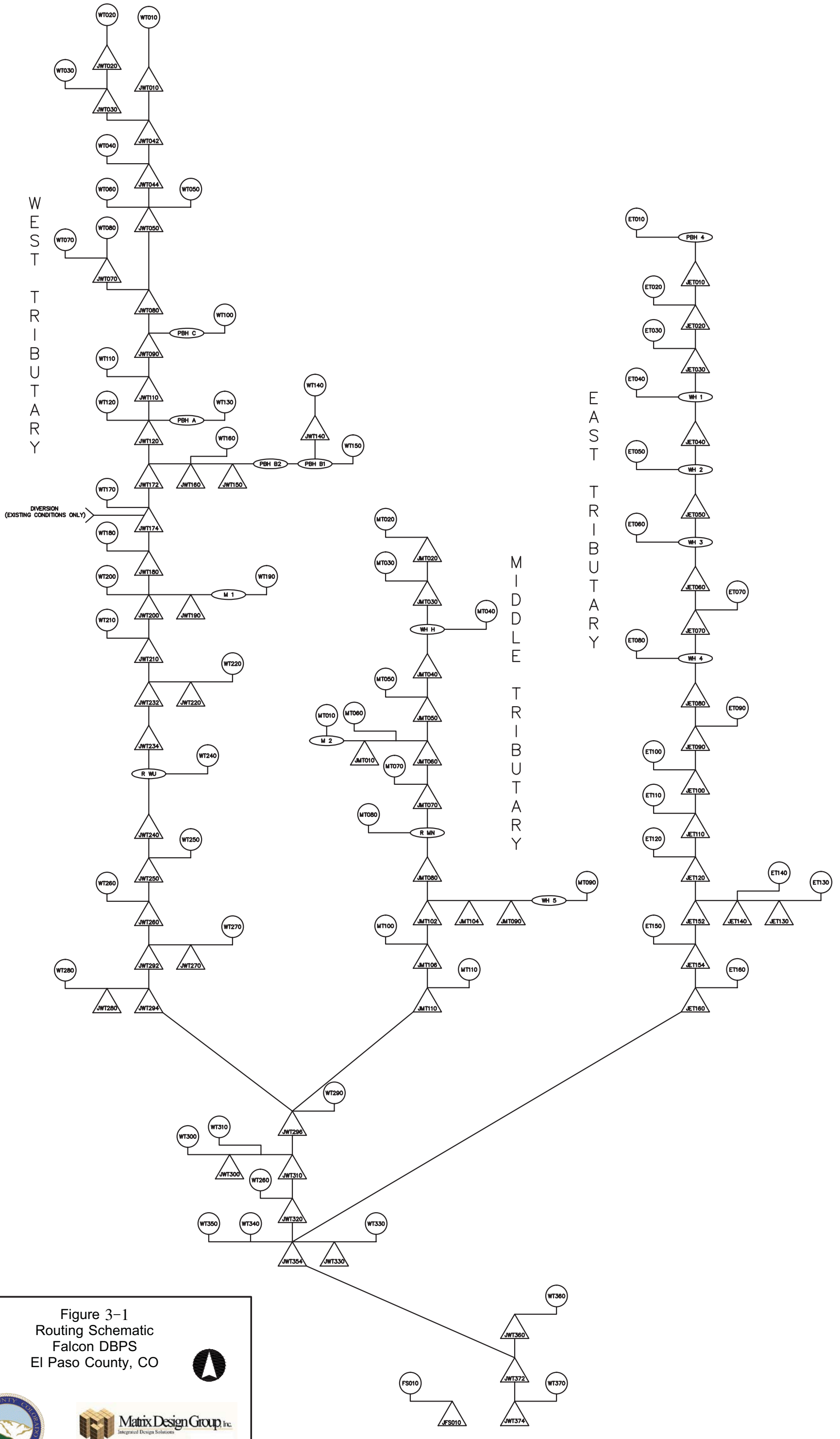


Figure 3-1
Routing Schematic
Falcon DBPS
El Paso County, CO

DRAWING NOT TO SCALE

Sub Regional Detention Alternative[1]						
Pond		Q_2 In (cfs)	Q_2 Out (cfs)	Q_{100} In (cfs)	Q_{100} Out (cfs)	Required Volume (AF)[2]
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,100	2,100	7.90
Regional Pond WU South	R WU	47	22	1,070	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	75	2	3.25
The Meadows Pond #2	M 2	28	5	210	99	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	105	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	19	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes
1: Represents future hydrology with retrofit existing detention ponds and 5 new subregional detention ponds
2: Required volume to highest WSE

Reach Alternative	Total (ft)
Protect In Place	30,066
Natural Channel Design	32,359
Small Drop Structures w/ Toe Protection	76,812
Large Drop Structures w/ Toe Protection	0

BURGESS RD
GOODSON RD
STAPLETON DR
EASTONVILLE RD
JUDGE ORR RD
WOODMEN RD
TAMLIN RD
FALCON HWY
GARRETT RD
MERIDIAN RD
24

DIVERSION

CHANGE DUE TO BENT GRASS R2 (RWT200)

DELETE POND WITH WQCV REPLACEMENTS & CHANNEL IMPROVEMENTS

CHANGE DUE TO BENT GRASS R1 (RMT063)

LEGEND

Detention Pond
- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary
- Immediate Action Required to Preserve Existing Condition

Reach Alternative
- Protect In Place
- Natural Channel Design
- Small Drop Structures w/ Toe Protection

Figure 5-3
Sub-Regional Detention Alternative
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20111215_alternatives\subregional_detention_alt.mxd, 12/19/2011, ron_ramold

Falcon DBPS
Peak Flow Results

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
ET010	0.15	38	67	90	140	170	200
ET020	0.21	73	130	170	260	310	360
ET030	0.20	45	81	110	170	210	240
ET040	0.15	28	53	72	120	140	170
ET050	0.12	37	67	89	140	170	200
ET060	0.29	110	190	250	380	450	530
ET070	0.25	94	160	220	330	400	460
ET080	0.29	110	190	250	380	450	520
ET090	0.12	26	46	61	95	110	130
ET100	0.05	11	22	31	50	61	72
ET110	0.23	24	53	76	130	160	200
ET120	0.11	11	24	34	59	74	89
ET130	0.13	11	23	33	57	71	85
ET140	0.27	16	33	48	82	100	120
ET150	0.18	17	37	53	91	110	140
ET160	0.19	19	39	55	92	110	140
FS010	0.12	6	17	26	48	61	75
JET010	0.15	29	49	64	110	130	150
JET020	0.36	74	130	170	270	330	390
JET030	0.56	97	180	250	410	500	580
JET040	0.71	27	85	140	380	500	570
JET050	0.83	11	38	88	210	380	530
JET060	1.11	13	32	68	210	300	430
JET070	1.36	94	170	220	350	420	480
JET080	1.66	15	38	61	200	270	350
JET090	1.78	26	47	81	200	290	390
JET100	1.83	27	49	83	200	290	390
JET110	2.05	40	85	120	210	320	440
JET120	2.16	49	110	160	270	340	450
JET130	0.13	11	23	33	57	71	85
JET140	0.40	26	55	80	140	170	200
JET152	2.57	51	120	180	350	500	650
JET154	2.74	62	140	200	370	530	680
JET160	2.93	66	150	230	410	550	710
JFS010_OUTLET	0.12	6	17	26	48	61	75
JMT010	0.29	1	11	25	62	120	160
JMT020	0.09	26	47	64	100	120	140
JMT030	0.25	50	94	130	200	250	290
JMT040	0.56	110	240	330	520	620	750
JMT050	0.67	120	280	380	590	710	850
JMT060	1.16	130	310	430	700	850	1,000
JMT070	1.36	150	350	490	800	980	1,200
JMT080	1.42	86	330	490	810	980	1,200
JMT090	0.04	9	15	18	25	29	32
JMT102	1.46	91	330	500	820	1,000	1,200
JMT104	0.04	9	15	18	25	29	32
JMT106	1.52	92	320	490	820	1,000	1,200
JMT110	1.64	94	320	500	830	1,000	1,200
JWT010	0.14	9	21	32	58	73	89
JWT020	0.07	4	10	15	27	34	42
JWT030	0.14	9	20	30	55	69	85
JWT042	0.28	15	37	57	110	140	170
JWT044	0.46	24	59	89	170	210	260
JWT050	0.85	43	110	170	310	390	480
JWT070	0.17	14	33	49	87	110	130
JWT080	1.09	54	140	210	400	500	610
JWT090	1.43	68	160	250	480	610	730
JWT110	1.63	77	170	280	530	690	840
JWT120	1.77	85	190	300	570	730	920
JWT140	0.13	32	59	80	130	150	180
JWT150	0.36	15	19	39	97	140	170
JWT160	0.47	35	64	85	130	160	190
JWT172	2.24	99	210	320	600	760	960
JWT174	2.36	100	210	330	610	780	990

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
ET010	0.15	38	0	0	0	0	200
ET020	0.21	73	0	0	0	0	360
ET030	0.20	45	0	0	0	0	240
ET040	0.15	28	0	0	0	0	170
ET050	0.12	37	0	0	0	0	200
ET060	0.29	110	0	0	0	0	530
ET070	0.25	94	0	0	0	0	460
ET080	0.29	110	0	0	0	0	520
ET090	0.12	26	0	0	0	0	130
ET100	0.05	11	0	0	0	0	72
ET110	0.23	24	0	0	0	0	200
ET120	0.11	11	0	0	0	0	89
ET130	0.13	11	0	0	0	0	85
ET140	0.27	16	0	0	0	0	120
ET150	0.18	17	0	0	0	0	140
ET160	0.19	19	0	0	0	0	140
FS010	0.12	6	0	0	0	0	75
JET010	0.15	29	0	0	0	0	150
JET020	0.36	74	0	0	0	0	390
JET030	0.56	97	0	0	0	0	580
JET040	0.71	14	0	0	0	0	620
JET050	0.83	10	0	0	0	0	540
JET060	1.11	14	0	0	0	0	510
JET070	1.36	94	0	0	0	0	660
JET080	1.66	14	0	0	0	0	400
JET090	1.78	30	0	0	0	0	410
JET100	1.83	32	0	0	0	0	410
JET110	2.05	42	0	0	0	0	440
JET120	2.16	50	0	0	0	0	470
JET130	0.13	11	0	0	0	0	85
JET140	0.40	26	0	0	0	0	200
JET152	2.57	55	0	0	0	0	660
JET154	2.74	62	0	0	0	0	690
JET160	2.93	67	0	0	0	0	720
JFS010_OUTLET	0.12	6	0	0	0	0	75
JMT010	0.29	5	0	0	0	0	99
JMT020	0.09	26	0	0	0	0	140
JMT030	0.25	50	0	0	0	0	290
JMT040	0.56	110	0	0	0	0	750
JMT050	0.67	120	0	0	0	0	850
JMT060	1.16	130	0	0	0	0	1,000
JMT070	1.36	150	0	0	0	0	1,200
JMT080	1.42	140	0	0	0	0	1,100
JMT090	0.04	1	0	0	0	0	19
JMT102	1.46	140	0	0	0	0	1,100
JMT104	0.04	1	0	0	0	0	19
JMT106	1.52	140	0	0	0	0	1,100
JMT110	1.64	140	0	0	0	0	1,100
JWT010	0.14	9	0	0	0	0	89
JWT020	0.07	4	0	0	0	0	42
JWT030	0.14	9	0	0	0	0	85
JWT042	0.28	15	0	0	0	0	170
JWT044	0.46	24	0	0	0	0	260
JWT050	0.85	43	0	0	0	0	480
JWT070	0.17	14	0	0	0	0	130
JWT080	1.09	54	0	0	0	0	610
JWT090	1.43	60	0	0	0	0	770
JWT110	1.63	69	0	0	0	0	880
JWT120	1.77	73	0	0	0	0	950
JWT140	0.13	32	0	0	0	0	180
JWT150	0.36	10	0	0	0	0	180
JWT160	0.47	35	0	0	0	0	190
JWT172	2.24	79	0	0	0	0	980
JWT174	2.36	81	0	0	0	0	1,000

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Sub Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
ET010	0.15	38	0	0	0	0	200
ET020	0.21	73	0	0	0	0	360
ET030	0.20	45	0	0	0	0	240
ET040	0.15	28	0	0	0	0	170
ET050	0.12	37	0	0	0	0	200
ET060	0.29	110	0	0	0	0	530
ET070	0.25	94	0	0	0	0	460
ET080	0.29	110	0	0	0	0	520
ET090	0.12	26	0	0	0	0	130
ET100	0.05	11	0	0	0	0	72
ET110	0.23	24	0	0	0	0	200
ET120	0.11	11	0	0	0	0	89
ET130	0.13	11	0	0	0	0	85
ET140	0.27	16	0	0	0	0	120
ET150	0.18	17	0	0	0	0	140
ET160	0.19	19	0	0	0	0	140
FS010	0.12	6	0	0	0	0	75
JET010	0.15	29	0	0	0	0	150
JET020	0.36	9	0	0	0	0	200
JET030	0.56	45	0	0	0	0	270
JET040	0.71	10	0	0	0	0	260
JET050	0.83	10	0	0	0	0	250
JET060	1.11	13	0	0	0	0	360
JET070	1.36	94	0	0	0	0	640
JET080	1.66	15	0	0	0	0	260
JET090	1.78	30	0	0	0	0	300
JET100	1.83	32	0	0	0	0	300
JET110	2.05	42	0	0	0	0	360
JET120	2.16	50	0	0	0	0	400
JET130	0.13	11	0	0	0	0	85
JET140	0.40	26	0	0	0	0	200
JET152	2.57	55	0	0	0	0	560
JET154	2.74	62	0	0	0	0	590
JET160	2.93	67	0	0	0	0	640
JFS010_OUTLET	0.12	6	0	0	0	0	75
JMT010	0.29	5	0	0	0	0	99
JMT020	0.09	26	0	0	0	0	140
JMT030	0.25	50	0	0	0	0	290
JMT040	0.56	110	0	0	0	0	750
JMT050	0.67	120	0	0	0	0	850
JMT060	1.16	27	0	0	0	0	730
JMT070	1.36	31	0	0	0	0	840
JMT080	1.42	32	0	0	0	0	820
JMT090	0.04	1	0	0	0	0	19
JMT102	1.46	33	0	0	0	0	840
JMT104	0.04	1	0	0	0	0	19
JMT106	1.52	33	0	0	0	0	840
JMT110	1.64	34	0	0	0	0	860
JWT010	0.14	9	0	0	0	0	89
JWT020	0.07	4	0	0	0	0	42
JWT030	0.14	9	0	0	0	0	85
JWT042	0.28	15	0	0	0	0	170
JWT044	0.46	24	0	0	0	0	260
JWT050	0.85	43	0	0	0	0	480
JWT070	0.17	14	0	0	0	0	130
JWT080	1.09	42	0	0	0	0	510
JWT090	1.43	47	0	0	0	0	620
JWT110	1.63	51	0	0	0	0	680
JWT120	1.77	55	0	0	0	0	710
JWT140	0.13	32	0	0	0	0	180
JWT150	0.36	10	0	0	0	0	180
JWT160	0.47	35	0	0	0	0	190
JWT172	2.24	63	0	0	0	0	830
JWT174	2.36	65	0	0	0	0	840

Falcon DBPS
Peak Flow Results

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
JWT180	2.46	100	220	330	620	800	1,000
JWT190	0.06	4	7	12	26	35	43
JWT200	2.82	110	230	360	690	890	1,200
JWT210	3.09	120	250	400	760	990	1,300
JWT220	0.19	47	85	110	180	210	250
JWT232	3.28	120	260	410	790	1,000	1,400
JWT234	3.47	130	270	420	810	1,000	1,400
JWT240	3.55	83	200	380	770	940	1,100
JWT250	3.70	85	210	390	780	950	1,100
JWT260	3.84	86	210	390	790	970	1,100
JWT270	0.03	11	20	27	41	49	57
JWT280	0.27	33	70	100	170	210	250
JWT292	3.87	86	210	390	790	970	1,100
JWT294	4.13	96	210	400	800	990	1,100
JWT296	5.88	160	410	620	1,100	1,400	1,700
JWT300	0.10	12	26	36	62	76	92
JWT310	6.25	160	420	640	1,100	1,400	1,700
JWT320	6.46	160	410	630	1,100	1,400	1,700
JWT330	0.33	32	68	98	170	210	250
JWT352	9.69	210	530	820	1,400	2,000	2,400
JWT354	10.30	230	560	870	1,500	2,000	2,500
JWT360	0.07	7	15	21	37	46	55
JWT372	10.36	230	560	860	1,500	2,000	2,500
JWT374_OUTLET	10.58	230	560	860	1,500	2,000	2,500
MT010	0.29	28	58	82	140	170	210
MT020	0.09	26	47	64	100	120	140
MT030	0.16	39	73	100	160	190	230
MT040	0.31	95	160	220	330	390	460
MT050	0.12	17	33	46	76	92	110
MT060	0.19	30	59	83	140	170	200
MT070	0.20	25	50	69	110	140	170
MT080	0.06	62	92	110	150	170	190
MT090	0.04	40	59	73	100	110	130
MT100	0.06	17	30	40	63	75	88
MT110	0.12	19	36	50	81	99	120
Paint Brush Hills Pond #4	0.15	29	49	64	110	130	150
Paint Brush Hills Pond A	0.10	10	18	24	64	97	130
Paint Brush Hills Pond B1	0.36	51	100	140	190	210	270
Paint Brush Hills Pond B2	0.36	15	19	39	97	140	170
Paint Brush Hills Pond C	0.19	11	14	23	56	74	160
Regional Pond MN	1.42	86	330	490	810	980	1,200
Regional Pond WU Diversion	3.55	83	230	380	770	1,000	1,300
Regional Pond WU North	3.55	110	270	420	810	1,100	1,400
Regional Pond WU South	3.55	55	170	340	730	900	1,000
RET020	0.15	29	49	64	100	130	150
RET030	0.36	71	130	170	270	320	380
RET040	0.56	95	180	250	400	490	580
RET050	0.71	27	85	140	370	490	570
RET060	0.83	11	38	88	210	370	530
RET070	1.11	13	32	68	210	300	430
RET080	1.36	65	120	170	270	340	420
RET090	1.66	15	38	61	200	270	350
RET100	1.78	26	47	81	200	290	390
RET110	1.83	27	49	83	200	290	390
RET120	2.05	39	84	120	210	320	430
RET140	0.13	11	23	33	57	70	85
RET152	2.16	49	110	150	270	340	450
RET154	0.40	26	55	80	140	170	200
RET156	2.57	50	120	180	350	500	650
RET162	2.74	59	130	200	360	530	680
RET164	2.93	66	150	230	410	550	710
RMT030	0.09	25	47	63	100	120	140
RMT040	0.25	49	93	130	200	250	290
RMT050	0.56	110	240	330	520	620	750

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
JWT180	2.46	83	0	0	0	0	1,000
JWT190	0.06	0	0	0	0	0	2
JWT200	2.82	89	0	0	0	0	1,200
JWT210	3.09	97	0	0	0	0	1,300
JWT220	0.19	47	0	0	0	0	250
JWT232	3.28	100	0	0	0	0	1,400
JWT234	3.47	100	0	0	0	0	1,400
JWT240	3.55	50	0	0	0	0	1,200
JWT250	3.70	65	0	0	0	0	1,200
JWT260	3.84	70	0	0	0	0	1,200
JWT270	0.03	11	0	0	0	0	57
JWT280	0.27	33	0	0	0	0	250
JWT292	3.87	73	0	0	0	0	1,200
JWT294	4.13	95	0	0	0	0	1,300
JWT296	5.88	79	0	0	0	0	1,700
JWT300	0.10	12	0	0	0	0	92
JWT310	6.25	81	0	0	0	0	1,700
JWT320	6.46	82	0	0	0	0	1,700
JWT330	0.33	32	0	0	0	0	250
JWT352	9.69	110	0	0	0	0	2,300
JWT354	10.30	140	0	0	0	0	2,400
JWT360	0.07	7	0	0	0	0	55
JWT372	10.36	140	0	0	0	0	2,400
JWT374_OUTLET	10.58	140	0	0	0	0	2,400
MT010	0.29	28	0	0	0	0	210
MT020	0.09	26	0	0	0	0	140
MT030	0.16	39	0	0	0	0	230
MT040	0.31	95	0	0	0	0	460
MT050	0.12	17	0	0	0	0	110
MT060	0.19	30	0	0	0	0	200
MT070	0.20	25	0	0	0	0	170
MT080	0.06	62	0	0	0	0	190
MT090	0.04	40	0	0	0	0	130
MT100	0.06	17	0	0	0	0	88
MT110	0.12	19	0	0	0	0	120
Paint Brush Hills Pond #4	0.15	29	0	0	0	0	150
Paint Brush Hills Pond A	0.10	7	0	0	0	0	140
Paint Brush Hills Pond B1	0.36	51	0	0	0	0	270
Paint Brush Hills Pond B2	0.36	10	0	0	0	0	180
Paint Brush Hills Pond C	0.19	3	0	0	0	0	140
Regional Pond MN	1.42	140	0	0	0	0	1,100
Regional Pond R1	5.88	79	0	0	0	0	1,700
Regional Pond R2	10.36	140	0	0	0	0	2,400
Regional Pond WU Diversion	3.55	68	0	0	0	0	1,300
Regional Pond WU North	3.55	97	0	0	0	0	1,400
Regional Pond WU South	3.55	27	0	0	0	0	1,200
RET020	0.15	29	0	0	0	0	150
RET030	0.36	71	0	0	0	0	380
RET040	0.56	95	0	0	0	0	580
RET050	0.71	14	0	0	0	0	620
RET060	0.83	10	0	0	0	0	540
RET070	1.11	14	0	0	0	0	510
RET080	1.36	65	0	0	0	0	560
RET090	1.66	14	0	0	0	0	400
RET100	1.78	30	0	0	0	0	410
RET110	1.83	32	0	0	0	0	410
RET120	2.05	42	0	0	0	0	440
RET140	0.13	11	0	0	0	0	85
RET152	2.16	49	0	0	0	0	470
RET154	0.40	26	0	0	0	0	200
RET156	2.57	55	0	0	0	0	660
RET162	2.74	59	0	0	0	0	690
RET164	2.93	66	0	0	0	0	720
RMT030	0.09	25	0	0	0	0	140

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Sub Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
JWT180	2.46	66	0	0	0	0	850
JWT190	0.06	0	0	0	0	0	2
JWT200	2.82	72	0	0	0	0	910
JWT210	3.09	81	0	0	0	0	1,000
JWT220	0.19	47	0	0	0	0	250
JWT232	3.28	85	0	0	0	0	1,100
JWT234	3.47	89	0	0	0	0	1,100
JWT240	3.55	42	0	0	0	0	970
JWT250	3.70	64	0	0	0	0	980
JWT260	3.84	70	0	0	0	0	1,000
JWT270	0.03	11	0	0	0	0	57
JWT280	0.27	33	0	0	0	0	250
JWT292	3.87	73	0	0	0	0	1,000
JWT294	4.13	95	0	0	0	0	1,000
JWT296	5.88	77	0	0	0	0	1,500
JWT300	0.10	12	0	0	0	0	92
JWT310	6.25	79	0	0	0	0	1,500
JWT320	6.46	80	0	0	0	0	1,500
JWT330	0.33	32	0	0	0	0	250
JWT352	9.69	130	0	0	0	0	2,100
JWT354	10.30	140	0	0	0	0	2,100
JWT360	0.07	7	0	0	0	0	55
JWT372	10.36	140	0	0	0	0	2,100
JWT374_OUTLET	10.58	140	0	0	0	0	2,100
MT010	0.29	28	0	0	0	0	210
MT020	0.09	26	0	0	0	0	140
MT030	0.16	39	0	0	0	0	230
MT040	0.31	95	0	0	0	0	460
MT050	0.12	17	0	0	0	0	110
MT060	0.19	30	0	0	0	0	200
MT070	0.20	25	0	0	0	0	170
MT080	0.06	62	0	0	0	0	190
MT090	0.04	40	0	0	0	0	130
MT100	0.06	17	0	0	0	0	88
MT110	0.12	19	0	0	0	0	120
Paint Brush Hills Pond #4	0.15	29	0	0	0	0	150
Paint Brush Hills Pond A	0.10	7	0	0	0	0	140
Paint Brush Hills Pond B1	0.36	51	0	0	0	0	270
Paint Brush Hills Pond B2	0.36	10	0	0	0	0	180
Paint Brush Hills Pond C	0.19	3	0	0	0	0	140
Regional Pond MN	1.42	32	0	0	0	0	820
Regional Pond R1	5.88	77	0	0	0	0	1,500
Regional Pond R2	10.36	140	0	0	0	0	2,100
Regional Pond WU Diversion	3.55	47	0	0	0	0	1,100
Regional Pond WU North	3.55	71	0	0	0	0	1,100
Regional Pond WU South	3.55	22	0	0	0	0	930
RET020	0.15	29	0	0	0	0	150
RET030	0.36	9	0	0	0	0	190
RET040	0.56	45	0	0	0	0	270
RET050	0.71	10	0	0	0	0	260
RET060	0.83	10	0	0	0	0	250
RET070	1.11	13	0	0	0	0	360
RET080	1.36	65	0	0	0	0	520
RET090	1.66	15	0	0	0	0	260
RET100	1.78	30	0	0	0	0	300
RET110	1.83	32	0	0	0	0	300
RET120	2.05	42	0	0	0	0	350
RET140	0.13	11	0	0	0	0	85
RET152	2.16	49	0	0	0	0	400
RET154	0.40	26	0	0	0	0	200
RET156	2.57	55	0	0	0	0	560
RET162	2.74	59	0	0	0	0	590
RET164	2.93	66	0	0	0	0	630
RMT030	0.09	25	0	0	0	0	140

Falcon DBPS
Peak Flow Results

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
RMT062	0.29	1	11	25	62	110	160
RMT064	0.67	120	270	370	590	710	850
RMT070	1.16	130	310	430	690	840	1,000
RMT080	1.36	150	350	490	800	980	1,200
RMT090	0.04	9	15	18	25	29	32
RMT102	1.42	86	320	490	800	980	1,200
RMT104	0.04	9	15	18	25	29	32
RMT106	1.46	91	320	490	810	990	1,200
RMT112	1.52	92	310	490	810	990	1,200
RMT114	1.64	94	320	500	830	1,000	1,200
RWT030	0.07	4	10	15	27	34	42
RWT042	0.14	9	20	30	54	69	85
RWT044	0.14	9	21	32	57	73	89
RWT046	0.28	15	37	57	110	140	170
RWT054	0.46	24	59	89	170	210	260
RWT080	0.17	14	33	48	87	110	130
RWT092	0.85	43	110	170	310	390	480
RWT094	1.09	54	140	210	400	500	610
RWT122	1.43	68	160	250	480	610	730
RWT124	1.63	77	170	280	530	690	840
RWT150	0.13	32	59	79	130	150	180
RWT160	0.36	15	19	39	97	140	170
RWT172	1.77	85	190	300	570	730	920
RWT174	0.47	35	63	84	130	160	180
RWT176	2.24	98	210	320	600	760	960
RWT180	2.36	100	210	330	610	780	990
RWT202	2.46	100	220	330	620	800	1,000
RWT204	0.06	4	7	12	26	34	43
RWT210	2.82	110	230	360	690	890	1,200
RWT232	3.09	120	250	400	760	990	1,300
RWT234	0.19	47	84	110	180	210	250
RWT236	3.28	120	260	410	790	1,000	1,400
RWT240	3.47	130	270	420	810	1,000	1,400
RWT240_Diversion Reach	0.00	30	37	38	38	39	39
RWT250	3.55	83	200	380	770	940	1,100
RWT260	3.70	85	210	380	780	950	1,100
RWT291	3.84	86	210	390	790	970	1,100
RWT292	0.03	11	20	26	41	49	57
RWT294	0.27	33	70	100	170	210	250
RWT295	3.87	86	210	390	790	970	1,100
RWT296	4.13	94	210	400	800	990	1,100
RWT312	0.10	12	25	36	61	76	91
RWT314	5.88	160	400	620	1,100	1,400	1,700
RWT320	6.25	160	400	620	1,100	1,400	1,700
RWT344	0.33	32	68	97	170	210	250
RWT352	6.46	160	400	620	1,100	1,400	1,700
RWT354	9.69	210	530	820	1,400	2,000	2,400
RWT372	10.30	230	560	860	1,500	2,000	2,500
RWT374	0.07	7	15	21	36	45	55
RWT376	10.36	230	550	850	1,500	2,000	2,500
The Meadows Pond #1	0.06	4	7	12	26	35	43
The Meadows Pond #2	0.29	1	11	25	62	120	160
Woodmen Hills Pond #1 North	0.71	88	180	260	420	500	570
Woodmen Hills Pond #1 South	0.71	27	85	140	380	500	570
Woodmen Hills Pond #2	0.83	11	38	88	210	380	530
Woodmen Hills Pond #3	1.11	13	32	68	210	300	430
Woodmen Hills Pond #4	1.66	15	38	61	200	270	350
Woodmen Hills Pond #5	0.04	9	15	18	25	29	32
Woodmen Hills Pond H	0.56	110	240	330	520	620	750
WT010	0.14	9	21	32	58	73	89
WT020	0.07	4	10	15	27	34	42
WT030	0.08	9	20	29	50	62	75
WT040	0.19	9	22	33	60	76	93
WT050	0.19	17	37	54	93	120	140

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
RMT040	0.25	49	0	0	0	0	290
RMT050	0.56	110	0	0	0	0	750
RMT062	0.29	5	0	0	0	0	99
RMT064	0.67	120	0	0	0	0	850
RMT070	1.16	130	0	0	0	0	1,000
RMT080	1.36	150	0	0	0	0	1,200
RMT090	0.04	1	0	0	0	0	19
RMT102	1.42	140	0	0	0	0	1,100
RMT104	0.04	1	0	0	0	0	19
RMT106	1.46	140	0	0	0	0	1,100
RMT112	1.52	140	0	0	0	0	1,100
RMT114	1.64	140	0	0	0	0	1,100
RWT030	0.07	4	0	0	0	0	42
RWT042	0.14	9	0	0	0	0	85
RWT044	0.14	9	0	0	0	0	89
RWT046	0.28	15	0	0	0	0	170
RWT054	0.46	24	0	0	0	0	260
RWT080	0.17	14	0	0	0	0	130
RWT092	0.85	43	0	0	0	0	480
RWT094	1.09	54	0	0	0	0	610
RWT122	1.43	60	0	0	0	0	770
RWT124	1.63	68	0	0	0	0	880
RWT150	0.13	32	0	0	0	0	180
RWT160	0.36	10	0	0	0	0	180
RWT172	1.77	73	0	0	0	0	950
RWT174	0.47	35	0	0	0	0	190
RWT176	2.24	79	0	0	0	0	980
RWT180	2.36	81	0	0	0	0	1,000
RWT202	2.46	83	0	0	0	0	1,000
RWT204	0.06	0	0	0	0	0	2
RWT210	2.82	89	0	0	0	0	1,200
RWT232	3.09	97	0	0	0	0	1,300
RWT234	0.19	47	0	0	0	0	250
RWT236	3.28	100	0	0	0	0	1,400
RWT240	3.47	100	0	0	0	0	1,400
RWT240_Diversion Reach	0.00	28	0	0	0	0	39
RWT250	3.55	50	0	0	0	0	1,200
RWT260	3.70	62	0	0	0	0	1,200
RWT291	3.84	70	0	0	0	0	1,200
RWT292	0.03	11	0	0	0	0	57
RWT294	0.27	33	0	0	0	0	250
RWT295	3.87	73	0	0	0	0	1,200
RWT296	4.13	93	0	0	0	0	1,300
RWT312	0.10	12	0	0	0	0	91
RWT314	5.88	79	0	0	0	0	1,700
RWT320	6.25	81	0	0	0	0	1,700
RWT344	0.33	32	0	0	0	0	250
RWT352	6.46	82	0	0	0	0	1,700
RWT354	9.69	110	0	0	0	0	2,300
RWT372	10.30	140	0	0	0	0	2,400
RWT374	0.07	7	0	0	0	0	55
RWT376	10.36	140	0	0	0	0	2,400
The Meadows Pond #1	0.06	0	0	0	0	0	2
The Meadows Pond #2	0.29	5	0	0	0	0	99
Woodmen Hills Pond #1 North	0.71	65	0	0	0	0	670
Woodmen Hills Pond #1 South	0.71	14	0	0	0	0	620
Woodmen Hills Pond #2	0.83	10	0	0	0	0	540
Woodmen Hills Pond #3	1.11	14	0	0	0	0	510
Woodmen Hills Pond #4	1.66	14	0	0	0	0	400
Woodmen Hills Pond #5	0.04	1	0	0	0	0	19
Woodmen Hills Pond H	0.56	110	0	0	0	0	750
WT010	0.14	9	0	0	0	0	89
WT020	0.07	4	0	0	0	0	42
WT030	0.08	9	0	0	0	0	75

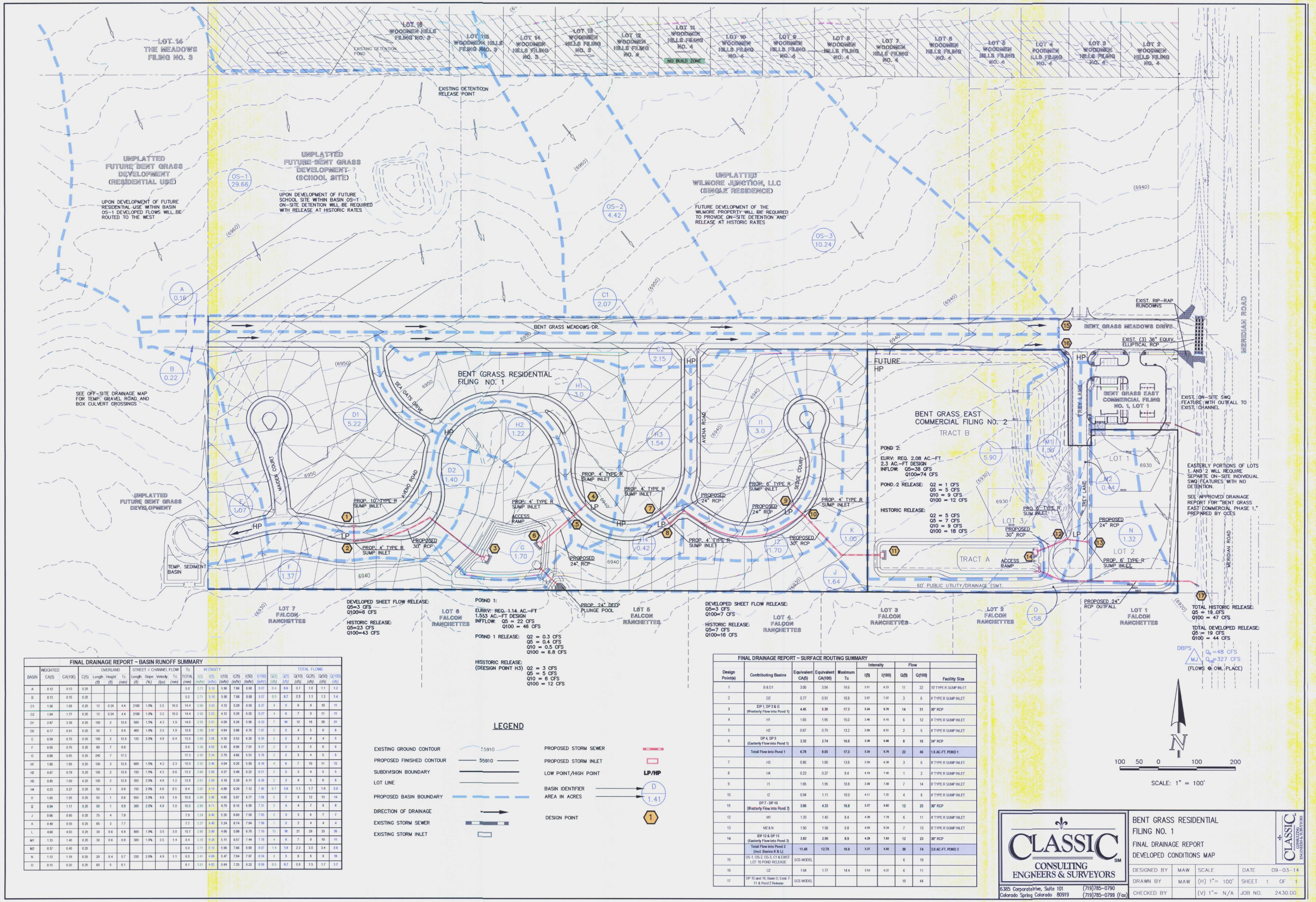
Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Sub Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
RMT040	0.25	49	0	0	0	0	290
RMT050	0.56	110	0	0	0	0	750
RMT062	0.29	5	0	0	0	0	99
RMT064	0.67	120	0	0	0	0	850
RMT070	1.16	27	0	0	0	0	730
RMT080	1.36	31	0	0	0	0	840
RMT090	0.04	1	0	0	0	0	19
RMT102	1.42	32	0	0	0	0	820
RMT104	0.04	1	0	0	0	0	19
RMT106	1.46	33	0	0	0	0	830
RMT112	1.52	33	0	0	0	0	840
RMT114	1.64	34	0	0	0	0	860
RWT030	0.07	4	0	0	0	0	42
RWT042	0.14	9	0	0	0	0	85
RWT044	0.14	9	0	0	0	0	89
RWT046	0.28	15	0	0	0	0	170
RWT054	0.46	24	0	0	0	0	260
RWT080	0.17	14	0	0	0	0	130
RWT092	0.85	43	0	0	0	0	480
RWT094	1.09	42	0	0	0	0	510
RWT122	1.43	47	0	0	0	0	620
RWT124	1.63	51	0	0	0	0	680
RWT150	0.13	32	0	0	0	0	180
RWT160	0.36	10	0	0	0	0	180
RWT172	1.77	54	0	0	0	0	710
RWT174	0.47	35	0	0	0	0	190
RWT176	2.24	63	0	0	0	0	830
RWT180	2.36	65	0	0	0	0	840
RWT202	2.46	66	0	0	0	0	850
RWT204	0.06	0	0	0	0	0	2
RWT210	2.82	71	0	0	0	0	910
RWT232	3.09	81	0	0	0	0	1,000
RWT234	0.19	47	0	0	0	0	250
RWT236	3.28	85	0	0	0	0	1,100
RWT240	3.47	86	0	0	0	0	1,100
RWT240_Diversion Reach	0.00	24	0	0	0	0	39
RWT250	3.55	42	0	0	0	0	970
RWT260	3.70	62	0	0	0	0	980
RWT291	3.84	70	0	0	0	0	1,000
RWT292	0.03	11	0	0	0	0	57
RWT294	0.27	33	0	0	0	0	250
RWT295	3.87	73	0	0	0	0	1,000
RWT296	4.13	93	0	0	0	0	1,000
RWT312	0.10	12	0	0	0	0	91
RWT314	5.88	77	0	0	0	0	1,500
RWT320	6.25	79	0	0	0	0	1,500
RWT344	0.33	32	0	0	0	0	250
RWT352	6.46	80	0	0	0	0	1,500
RWT354	9.69	130	0	0	0	0	2,100
RWT372	10.30	140	0	0	0	0	2,100
RWT374	0.07	7	0	0	0	0	55
RWT376	10.36	140	0	0	0	0	2,100
Sub Regional Pond SR1	1.09	42	0	0	0	0	510
Sub Regional Pond SR2	2.36	65	0	0	0	0	840
Sub Regional Pond SR3	2.82	72	0	0	0	0	910
Sub Regional Pond SR4	1.16	27	0	0	0	0	730
Sub Regional Pond SR6	0.36	9	0	0	0	0	200
The Meadows Pond #1	0.06	0	0	0	0	0	2
The Meadows Pond #2	0.29	5	0	0	0	0	99
Woodmen Hills Pond #1 North	0.71	61	0	0	0	0	260
Woodmen Hills Pond #1 South	0.71	10	0	0	0	0	260
Woodmen Hills Pond #2	0.83	10	0	0	0	0	250
Woodmen Hills Pond #3	1.11	13	0	0	0	0	360
Woodmen Hills Pond #4	1.66	15	0	0	0	0	260

Falcon DBPS
Peak Flow Results

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)					
		2-year	5-year	10-year	25-year	50-year	100-year
WT060	0.20	14	30	44	77	96	120
WT070	0.17	14	33	49	87	110	130
WT080	0.07	9	19	27	45	56	67
WT090	0.15	22	46	65	110	140	160
WT100	0.19	56	100	140	210	260	300
WT110	0.19	22	47	67	110	140	170
WT120	0.05	8	16	22	37	46	55
WT130	0.10	35	61	81	120	150	170
WT140	0.13	32	59	80	130	150	180
WT150	0.23	49	86	110	180	210	250
WT160	0.11	35	64	85	130	160	180
WT170	0.12	21	43	60	99	120	140
WT180	0.10	8	17	25	43	54	66
WT190	0.06	11	23	31	51	63	75
WT200	0.30	25	52	74	130	160	190
WT210	0.27	32	60	81	130	160	190
WT220	0.19	47	85	110	180	210	250
WT230	0.20	71	120	160	250	300	350
WT240	0.08	36	61	79	120	140	160
WT250	0.15	63	110	140	210	250	290
WT260	0.14	10	21	30	52	64	78
WT270	0.03	11	20	27	41	49	57
WT280	0.27	33	70	100	170	210	250
WT290	0.10	15	31	44	75	92	110
WT300	0.10	12	26	36	62	76	92
WT310	0.28	31	67	96	170	210	250
WT320	0.21	27	56	80	140	170	200
WT330	0.33	32	68	98	170	210	250
WT340	0.28	19	40	57	98	120	150
WT350	0.30	38	79	110	190	230	280
WT360	0.07	7	15	21	37	46	55
WT370	0.21	7	23	38	76	99	120

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
WT040	0.19	9	0	0	0	0	93
WT050	0.19	17	0	0	0	0	140
WT060	0.20	14	0	0	0	0	120
WT070	0.17	14	0	0	0	0	130
WT080	0.07	9	0	0	0	0	67
WT090	0.15	22	0	0	0	0	160
WT100	0.19	56	0	0	0	0	300
WT110	0.19	22	0	0	0	0	170
WT120	0.05	8	0	0	0	0	55
WT130	0.10	35	0	0	0	0	170
WT140	0.13	32	0	0	0	0	180
WT150	0.23	49	0	0	0	0	250
WT160	0.11	35	0	0	0	0	180
WT170	0.12	21	0	0	0	0	140
WT180	0.10	8	0	0	0	0	66
WT190	0.06	11	0	0	0	0	75
WT200	0.30	25	0	0	0	0	190
WT210	0.27	32	0	0	0	0	190
WT220	0.19	47	0	0	0	0	250
WT230	0.20	71	0	0	0	0	350
WT240	0.08	36	0	0	0	0	160
WT250	0.15	63	0	0	0	0	290
WT260	0.14	10	0	0	0	0	78
WT270	0.03	11	0	0	0	0	57
WT280	0.27	33	0	0	0	0	250
WT290	0.10	15	0	0	0	0	110
WT300	0.10	12	0	0	0	0	92
WT310	0.28	31	0	0	0	0	250
WT320	0.21	27	0	0	0	0	200
WT330	0.33	32	0	0	0	0	250
WT340	0.28	19	0	0	0	0	150
WT350	0.30	38	0	0	0	0	280
WT360	0.07	7	0	0	0	0	55
WT370	0.21	7	0	0	0	0	120

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) - Sub Regional Detention					
		2-year	5-year	10-year	25-year	50-year	100-year
Woodmen Hills Pond #5	0.04	1	0	0	0	0	19
Woodmen Hills Pond H	0.56	110	0	0	0	0	750
WT010	0.14	9	0	0	0	0	89
WT020	0.07	4	0	0	0	0	42
WT030	0.08	9	0	0	0	0	75
WT040	0.19	9	0	0	0	0	93
WT050	0.19	17	0	0	0	0	140
WT060	0.20	14	0	0	0	0	120
WT070	0.17	14	0	0	0	0	130
WT080	0.07	9	0	0	0	0	67
WT090	0.15	22	0	0	0	0	160
WT100	0.19	56	0	0	0	0	300
WT110	0.19	22	0	0	0	0	170
WT120	0.05	8	0	0	0	0	55
WT130	0.10	35	0	0	0	0	170
WT140	0.13	32	0	0	0	0	180
WT150	0.23	49	0	0	0	0	250
WT160	0.11	35	0	0	0	0	180
WT170	0.12	21	0	0	0	0	140
WT180	0.10	8	0	0	0	0	66
WT190	0.06	11	0	0	0	0	75
WT200	0.30	25	0	0	0	0	190
WT210	0.27	32	0	0	0	0	190
WT220	0.19	47	0	0	0	0	250
WT230	0.20	71	0	0	0	0	350
WT240	0.08	36	0	0	0	0	160
WT250	0.15	63	0	0	0	0	290
WT260	0.14	10	0	0	0	0	78
WT270	0.03	11	0	0	0	0	57
WT280	0.27	33	0	0	0	0	250
WT290	0.10	15	0	0	0	0	110
WT300	0.10	12	0	0	0	0	92
WT310	0.28	31	0	0	0	0	250
WT320	0.21	27	0	0	0	0	200
WT330	0.33	32	0	0	0	0	250
WT340	0.28	19	0	0	0	0	150
WT350	0.30	38	0	0	0	0	280
WT360	0.07	7	0	0	0	0	55
WT370	0.21	7	0	0	0	0	120



FINAL DRAINAGE REPORT - BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(10) (cfs)	Q(25) (cfs)	Q(50) (cfs)	Q(100) (cfs)
A	0.12	0.13	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	0.4	0.6	0.7	1.0	1.1	1.2
B	0.13	0.15	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	0.5	0.7	0.8	1.1	1.3	1.4
C1	1.56	1.68	0.25	12	0.24	4.4	2100	1.0%	3.5	10.0	14.4	2.56	3.52	4.12	5.29	6.00	6.27	4	5	6	9	10	11
C2	1.64	1.77	0.25	12	0.24	4.4	2100	1.0%	3.5	10.0	14.4	2.56	3.52	4.12	5.29	6.00	6.27	4	6	7	9	11	11
D1	2.87	3.39	0.25	100	2	12.6	500	1.5%	4.3	1.9	14.6	2.55	3.51	4.09	5.26	5.96	6.23	7	10	12	16	20	21
D2	0.72	0.91	0.25	50	1	8.9	400	1.0%	3.5	1.9	10.8	2.93	3.97	4.64	5.96	6.76	7.07	2	3	4	5	6	6
E	0.59	0.70	0.25	100	2	12.6	100	2.0%	4.9	0.4	13.0	2.68	3.63	4.30	5.52	6.26	6.55	2	2	3	4	4	5
F	0.55	0.75	0.25	80	7	6.9					6.9	3.36	4.55	5.43	6.98	7.91	8.27	2	3	3	5	6	6
G	0.68	0.85	0.25	240	7	17.3					17.3	2.35	3.24	3.78	4.86	5.51	5.76	2	2	3	4	5	5
H1	1.65	1.95	0.25	100	2	12.6	600	1.5%	4.3	2.3	15.0	2.52	3.41	4.04	5.20	5.88	6.16	4	5	7	10	11	12
H2	0.67	0.79	0.25	100	2	12.6	150	1.5%	4.3	0.6	13.2	2.66	3.60	4.27	5.49	6.22	6.51	2	3	3	4	5	5
H3	0.85	1.00	0.25	100	2	12.6	350	2.0%	4.9	1.2	13.8	2.61	3.54	4.19	5.39	6.11	6.38	2	3	4	5	6	6
H4	0.23	0.27	0.25	50	1	8.9	150	2.0%	4.9	0.5	9.4	3.05	4.13	4.89	6.29	7.12	7.45	0.7	1.0	1.1	1.7	1.9	2.0
I1	1.65	1.95	0.25	50	1	8.9	550	2.0%	4.9	1.9	10.8	2.89	3.90	4.65	5.97	6.77	7.08	3	4	5	7	8	8
I2	0.94	1.11	0.25	50	1	8.9	300	2.0%	4.9	1.0	10.0	2.99	4.11	4.79	6.16	6.99	7.31	3	4	4	7	8	8
J	0.66	0.90	0.25	75	4	7.9					7.9	3.24	4.46	5.20	6.69	7.58	7.93	2	3	3	5	6	7
K	0.40	0.55	0.25	65	3	7.7					7.7	3.27	4.49	5.24	6.74	7.64	7.99	1	2	2	4	4	4
L	4.60	4.93	0.25	30	0.6	6.9	800	1.0%	3.5	3.8	10.7	2.90	3.90	4.66	5.99	6.78	7.10	13	18	21	29	33	35
M1	1.33	1.40	0.25	30	0.6	6.9	300	1.0%	3.5	1.4	8.4	3.18	4.28	5.11	6.57	7.44	7.78	5	6	7	9	10	11
M2	0.37	0.40	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	1.4	1.9	2.2	3.0	3.4	3.6
N	1.12	1.19	0.25	20	0.4	5.7	330	2.0%	4.9	1.1	6.8	3.41	4.59	5.47	7.04	7.97	8.34	4	5	6	8	9	10
O	0.15	0.20	0.25	60	5	6.1					6.1	3.51	4.73	5.64	7.25	8.22	8.59	0.5	0.7	0.8	1.5	1.7	1.7

FINAL DRAINAGE REPORT - SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
1	B & D1	3.00	3.54	14.6	3.51	4.33	11	22	10' TYPE R SUMP INLET
2	D2	0.77	0.91	10.8	3.97	7.07	3	6	4' TYPE R SUMP INLET
3	DP 1, DP 2 & G (Westerly Flow into Pond 1)	4.45	5.30	17.3	3.34	5.78	14	31	30" RCP
4	H1	1.65	1.95	15.0	3.46	6.16	6	12	4' TYPE R SUMP INLET
5	H2	0.67	0.79	13.2	3.66	6.51	2	5	4' TYPE R SUMP INLET
6	DP 4, DP 5 (Easterly Flow into Pond 1)	2.32	2.74	16.0	3.36	5.98	8	16	24" RCP
	Total Flow into Pond 1	6.78	8.05	17.3	3.34	5.78	22	46	1.6 AC-FT. POND 1
7	H3	0.85	1.00	13.8	3.59	6.38	3	6	4' TYPE R SUMP INLET
8	H4	0.23	0.27	9.4	4.19	7.45	1	2	4' TYPE R SUMP INLET
9	I1	1.65	1.95	10.8	3.98	7.08	7	14	6' TYPE R SUMP INLET
10	I2	0.94	1.11	10.0	4.11	7.31	4	8	4' TYPE R SUMP INLET
11	DP 7 - DP 10 (Westerly Flow into Pond 2)	3.66	4.33	16.9	3.27	5.82	12	25	30" RCP
12	M1	1.33	1.40	8.4	4.38	7.78	6	11	4' TYPE R SUMP INLET
13	M2 & N	1.50	1.58	6.8	4.69	8.34	7	13	6' TYPE R SUMP INLET
14	DP 12 & DP 13 (Easterly Flow into Pond 2)	2.82	2.99	8.9	4.29	7.63	12	23	30" RCP
	Total Flow into Pond 2 (incl. Basins K & L)	11.48	12.79	16.9	3.27	5.82	38	74	2.0 AC-FT. POND 2
15	OS-1, OS-2, OS-3, C1 & EXIST LOT 15 POND RELEASE	SCS MODEL					6	19	
16	C2	1.64	1.77	14.4	3.53	6.27	6	11	
17	DP 15 and 16, Basin O, Exist. 7, 11 & Pond 2 Release	SCS MODEL					19	44	

CLASSIC SM CONSULTING ENGINEERS & SURVEYORS
6385 Corporate Drive, Suite 101 Colorado Spring Colorado 80919
(719)785-0790 (719)785-0799 (Fax)

BENT GRASS RESIDENTIAL
FILING NO. 1
FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS MAP

CLASSIC CONSULTING ENGINEERS & SURVEYORS

DESIGNED BY	MAW	SCALE		DATE	09-03-14
DRAWN BY	MAW	(H) 1"= 100'		SHEET	1 OF 1
CHECKED BY		(V) 1"= N/A		JOB NO.	2430.00

Project Summary	
Title	BENT GRASS RESIDENTIAL FILING NO.1
Engineer	MAW
Company	CLASSIC CONSULTING
Date	7/10/2014

Notes	POND 1 2 YEAR

Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Basins	Post-Development 2 Year	2	0.411	0.300	14.96

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Post-Development 2 Year	2	0.335	0.650	0.32

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Pond 1 (IN)	Post-Development 2 Year	2	0.411	0.300	14.96	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 2 Year	2	0.335	0.650	0.32	6,934.59	0.402

Subsection: I-D-F Table
Label: CO SPRINGS

Return Event: 2 years
Storm Event: CO SPRINGS - 2 Year

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	3.710
0.167	2.980
0.250	2.520
0.333	2.190
0.417	1.950
0.500	1.760
0.583	1.610
0.667	1.490
0.750	1.380
0.833	1.290
0.917	1.220
1.000	1.150

Subsection: Elevation-Area Volume Curve
Label: Pond 1

Return Event: 2 years
Storm Event: CO SPRINGS - 2 Year

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,932.00	0.0	0.005	0.000	0.000	0.000
6,934.00	0.0	0.292	0.335	0.223	0.223
6,936.00	0.0	0.367	0.986	0.658	0.881
6,938.00	0.0	0.451	1.225	0.817	1.698
6,940.00	0.0	0.545	1.492	0.995	2.692

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,932.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,940.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,937.00	6,940.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,933.00	6,940.00
Culvert-Circular	Culvert - 1	Forward	TW	6,932.00	6,940.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,937.00 ft
Orifice Area	10.2 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	60.00 ft
Length (Computed Barrel)	60.03 ft
Slope (Computed)	0.033 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.181
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,932.00 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,934.36 ft	T2 Flow	17.77 ft³/s

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	12
Elevation	6,933.00 ft
Orifice Area	0.0 ft²
Top Elevation	6,937.00 ft
Datum Elevation	6,933.00 ft
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.50	0.00	0.00	0.00	6,932.15	0.00	0.00	(N/A)	0.00
6,934.00	0.00	0.00	0.00	6,932.21	0.00	0.00	(N/A)	0.00
6,934.50	0.00	0.00	0.00	6,932.26	0.00	0.00	(N/A)	0.00
6,935.00	0.00	0.00	0.00	6,932.30	0.00	0.00	(N/A)	0.00
6,935.50	0.00	0.00	0.00	6,932.34	0.00	0.00	(N/A)	0.00
6,936.00	0.00	0.00	0.00	6,932.38	0.00	0.00	(N/A)	0.00
6,936.50	0.00	0.00	0.00	6,932.40	0.00	0.00	(N/A)	0.00
6,937.00	0.00	0.00	0.00	6,932.43	0.00	0.00	(N/A)	0.00
6,937.50	4.24	6,937.50	Free Outfall	6,933.15	0.00	0.00	(N/A)	0.00
6,938.00	12.00	6,938.00	Free Outfall	6,933.96	0.00	0.00	(N/A)	0.00
6,938.50	22.05	6,938.50	Free Outfall	6,935.01	0.00	0.00	(N/A)	0.00
6,939.00	33.94	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00
6,939.50	47.43	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00
6,940.00	62.35	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.5ft
Weir: H =1ft
Weir: H =1.5ft
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2ft
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2.5ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =3ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
6,932.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
6,932.50	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
6,933.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
6,933.50	0.10	6,932.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,934.00	0.20	6,932.21	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,934.50	0.30	6,932.26	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,935.00	0.40	6,932.30	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,935.50	0.50	6,932.34	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,936.00	0.61	6,932.38	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,936.50	0.69	6,932.40	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,937.00	0.79	6,932.43	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,937.50	5.07	6,933.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,938.00	12.79	6,933.96	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,938.50	22.77	6,935.01	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
6,939.00	34.46	6,937.16	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
6,939.50	43.77	6,939.50	Free Outfall	Free Outfall	0.00	3.67	(N/A)	0.00
6,940.00	45.51	6,940.00	Free Outfall	Free Outfall	0.00	16.84	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .036ft Dcr= .107ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .083ft Dcr= .242ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft^3/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .099ft Dcr= .286ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .106ft Dcr= .306ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .557ft Dcr= 1.287ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =3.01
INLET CONTROL... Submerged: HW =5.16
INLET CONTROL... Submerged: HW =7.50
INLET CONTROL... Submerged: HW =8.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.50	0.10	6,933.50	Free Outfall	6,932.15	0.00	0.00	(N/A)	0.00
6,934.00	0.20	6,934.00	Free Outfall	6,932.21	0.00	0.00	(N/A)	0.00
6,934.50	0.30	6,934.50	Free Outfall	6,932.26	0.00	0.00	(N/A)	0.00
6,935.00	0.40	6,935.00	Free Outfall	6,932.30	0.00	0.00	(N/A)	0.00
6,935.50	0.50	6,935.50	Free Outfall	6,932.34	0.00	0.00	(N/A)	0.00
6,936.00	0.60	6,936.00	Free Outfall	6,932.38	0.00	0.00	(N/A)	0.00
6,936.50	0.69	6,936.50	Free Outfall	6,932.40	0.00	0.00	(N/A)	0.00
6,937.00	0.79	6,937.00	Free Outfall	6,932.43	0.00	0.00	(N/A)	0.00
6,937.50	0.83	6,937.50	6,933.15	6,933.15	0.00	0.00	(N/A)	0.00
6,938.00	0.80	6,938.00	6,933.96	6,933.96	0.00	0.00	(N/A)	0.00
6,938.50	0.74	6,938.50	6,935.01	6,935.01	0.00	0.00	(N/A)	0.00
6,939.00	0.54	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00
6,939.50	0.00	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00
6,940.00	0.00	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00

Message
WS below an Invert; no flow.
WS below an Invert; no flow.
WS below an Invert; no flow.
Hi=.50; Ht=4.00; Qt=.07
Hi=1.00; Ht=4.00; Qt=.07
Hi=1.50; Ht=4.00; Qt=.07
Hi=2.00; Ht=4.00; Qt=.07
Hi=2.50; Ht=4.00; Qt=.07
Hi=3.00; Ht=4.00; Qt=.07
Hi=3.50; Ht=4.00; Qt=.07
H =4.00
H =4.35
H =4.04
H =3.49
H =1.84
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

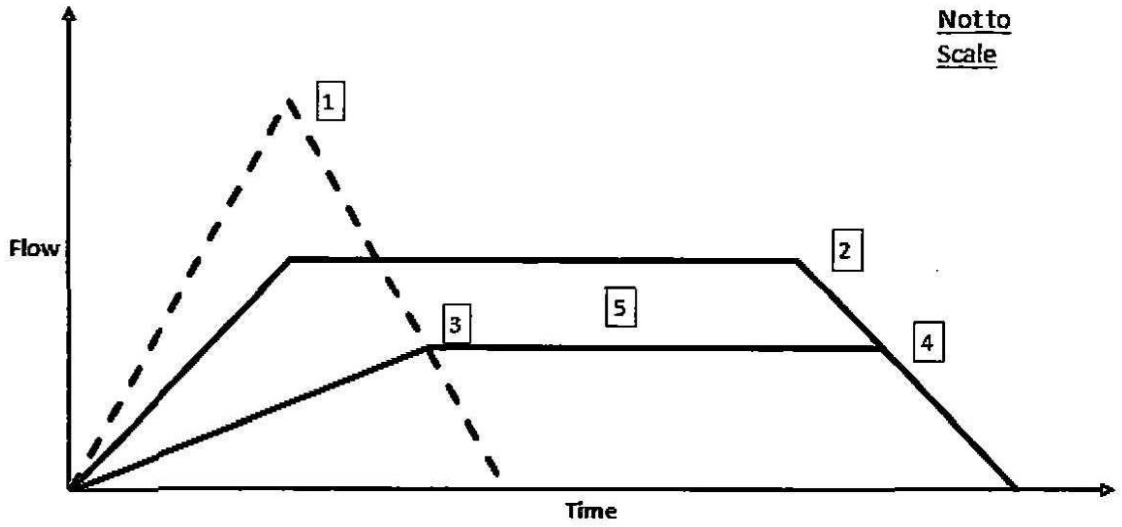
Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Subsection: Modified Rational Graph
Label: Basins

Return Event: 2 years
Storm Event: CO SPRINGS - 2 Year

Method Type	Method T
Time of Duration (Modified Rational, Critical)	0.333 hours



[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.288	hours	Time of Duration (Modified Rational, Critical)	0.333	hours
Intensity (Modified Rational, Peak)	2.368	in/h	Intensity (Modified Rational, Critical)	2.190	in/h
Flow (Modified Rational, Peak)	16.18	ft³/s	Flow (Modified Rational, Critical)	14.96	ft³/s

[3]	
First Outflow Breakpoint (Modified Rational, Method T)	0.390 hours
Flow (Modified Rational, Allowable)	12.00 ft³/s

[4]			[5]		
Second Outflow Breakpoint (Modified Rational)	0.363	hours	Storage (Modified Rational, Estimated)	0.090	ac-ft
Flow (Modified Rational, Allowable)	12.00	ft³/s			

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Project Summary	
Title	BENT GRASS RESIDENTIAL FILING NO.1
Engineer	MAW
Company	CLASSIC CONSULTING
Date	7/10/2014

Notes	POND 1 5 YEAR

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Basins	Post-Development 5 Year	5	0.582	0.300	20.11

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Post-Development 5 Year	5	0.470	0.650	0.42

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Pond 1 (IN)	Post-Development 5 Year	5	0.582	0.300	20.11	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 5 Year	5	0.470	0.650	0.42	6,935.11	0.569

Subsection: I-D-F Table
Label: CO SPRINGS

Return Event: 5 years
Storm Event: CO SPRINGS - 5 Year

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	5.100
0.167	4.100
0.250	3.460
0.333	3.010
0.417	2.680
0.500	2.420
0.583	2.210
0.667	2.040
0.750	1.900
0.833	1.780
0.917	1.670
1.000	1.580

Subsection: Elevation-Area Volume Curve
Label: Pond 1

Return Event: 5 years
Storm Event: CO SPRINGS - 5 Year

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,932.00	0.0	0.005	0.000	0.000	0.000
6,934.00	0.0	0.292	0.335	0.223	0.223
6,936.00	0.0	0.367	0.986	0.658	0.881
6,938.00	0.0	0.451	1.225	0.817	1.698
6,940.00	0.0	0.545	1.492	0.995	2.692

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,932.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,940.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,937.00	6,940.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,933.00	6,940.00
Culvert-Circular	Culvert - 1	Forward	TW	6,932.00	6,940.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,937.00 ft
Orifice Area	10.2 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	60.00 ft
Length (Computed Barrel)	60.03 ft
Slope (Computed)	0.033 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.079
T2 ratio (HW/D)	1.181
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,934.16 ft	T1 Flow	15.55 ft^3/s
T2 Elevation	6,934.36 ft	T2 Flow	17.77 ft^3/s

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	12
Elevation	6,933.00 ft
Orifice Area	0.0 ft²
Top Elevation	6,937.00 ft
Datum Elevation	6,933.00 ft
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 5 years
Storm Event: CO SPRINGS - 5 Year

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.50	0.00	0.00	0.00	6,932.15	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,934.00	0.00	0.00	0.00	6,932.21	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,934.50	0.00	0.00	0.00	6,932.26	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,935.00	0.00	0.00	0.00	6,932.30	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,935.50	0.00	0.00	0.00	6,932.34	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,936.00	0.00	0.00	0.00	6,932.38	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,936.50	0.00	0.00	0.00	6,932.40	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,937.00	0.00	0.00	0.00	6,932.43	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,937.50	4.24	6,937.50	Free Outfall	6,933.15	0.00	0.00	(N/A)	0.00	Weir: H =0.5ft
6,938.00	12.00	6,938.00	Free Outfall	6,933.96	0.00	0.00	(N/A)	0.00	Weir: H =1ft
6,938.50	22.05	6,938.50	Free Outfall	6,935.01	0.00	0.00	(N/A)	0.00	Weir: H =1.5ft
6,939.00	33.94	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00	FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2ft
6,939.50	47.43	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00	FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2.5ft
6,940.00	62.35	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00	

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =3ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
6,932.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,932.50	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.50	0.10	6,932.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	CRIT.DEPTH CONTROL Vh= .036ft Dcr= .107ft CRIT.DEPTH Hev= .00ft
6,934.00	0.20	6,932.21	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,934.50	0.30	6,932.26	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,935.00	0.40	6,932.30	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,935.50	0.50	6,932.34	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	CRIT.DEPTH CONTROL Vh= .083ft Dcr= .242ft CRIT.DEPTH Hev= .00ft
6,936.00	0.61	6,932.38	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,936.50	0.69	6,932.40	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,937.00	0.79	6,932.43	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,937.50	5.07	6,933.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,938.00	12.79	6,933.96	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,938.50	22.77	6,935.01	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00	
6,939.00	34.46	6,937.16	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00	
6,939.50	43.77	6,939.50	Free Outfall	Free Outfall	0.00	3.67	(N/A)	0.00	
6,940.00	45.51	6,940.00	Free Outfall	Free Outfall	0.00	16.84	(N/A)	0.00	

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .099ft Dcr= .286ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .106ft Dcr= .306ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .557ft Dcr= 1.287ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =3.01
INLET CONTROL... Submerged: HW =5.16
INLET CONTROL... Submerged: HW =7.50
INLET CONTROL... Submerged: HW =8.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.50	0.10	6,933.50	Free Outfall	6,932.15	0.00	0.00	(N/A)	0.00
6,934.00	0.20	6,934.00	Free Outfall	6,932.21	0.00	0.00	(N/A)	0.00
6,934.50	0.30	6,934.50	Free Outfall	6,932.26	0.00	0.00	(N/A)	0.00
6,935.00	0.40	6,935.00	Free Outfall	6,932.30	0.00	0.00	(N/A)	0.00
6,935.50	0.50	6,935.50	Free Outfall	6,932.34	0.00	0.00	(N/A)	0.00
6,936.00	0.60	6,936.00	Free Outfall	6,932.38	0.00	0.00	(N/A)	0.00
6,936.50	0.69	6,936.50	Free Outfall	6,932.40	0.00	0.00	(N/A)	0.00
6,937.00	0.79	6,937.00	Free Outfall	6,932.43	0.00	0.00	(N/A)	0.00
6,937.50	0.83	6,937.50	6,933.15	6,933.15	0.00	0.00	(N/A)	0.00
6,938.00	0.80	6,938.00	6,933.96	6,933.96	0.00	0.00	(N/A)	0.00
6,938.50	0.74	6,938.50	6,935.01	6,935.01	0.00	0.00	(N/A)	0.00
6,939.00	0.54	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00
6,939.50	0.00	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00
6,940.00	0.00	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Hi=.50; Ht=4.00; Qt=.07
Hi=1.00; Ht=4.00; Qt=.07
Hi=1.50; Ht=4.00; Qt=.07
Hi=2.00; Ht=4.00; Qt=.07
Hi=2.50; Ht=4.00; Qt=.07
Hi=3.00; Ht=4.00; Qt=.07
Hi=3.50; Ht=4.00; Qt=.07
H =4.00
H =4.35
H =4.04
H =3.49
H =1.84
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

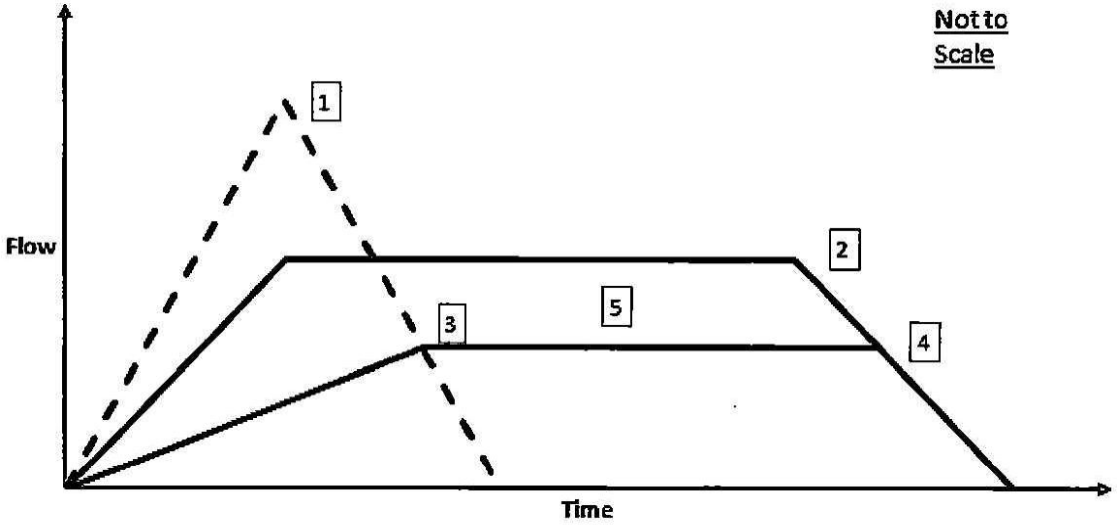
Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Subsection: Modified Rational Graph
Label: Basins

Return Event: 5 years
Storm Event: CO SPRINGS - 5 Year

Method Type	Method T
Time of Duration (Modified Rational, Critical)	0.350 hours



[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.288	hours	Time of Duration (Modified Rational, Critical)	0.350	hours
Intensity (Modified Rational, Peak)	3.253	in/h	Intensity (Modified Rational, Critical)	2.944	in/h
Flow (Modified Rational, Peak)	22.22	ft³/s	Flow (Modified Rational, Critical)	20.11	ft³/s

[3]	
First Outflow Breakpoint (Modified Rational, Method T)	0.466 hours
Flow (Modified Rational, Allowable)	12.00 ft³/s

[4]			[5]		
Second Outflow Breakpoint (Modified Rational)	0.421	hours	Storage (Modified Rational, Estimated)	0.243	ac-ft
Flow (Modified Rational, Allowable)	12.00	ft³/s			

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Project Summary	
Title	BENT GRASS RESIDENTIAL FILING NO.1
Engineer	MAW
Company	CLASSIC CONSULTING
Date	7/10/2014

Notes	POND 1 10 YEAR

Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Basins	Post-Development 10 Year	10	0.710	0.300	22.45

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Post-Development 10 Year	10	0.565	0.700	0.49

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Pond 1 (IN)	*Post-Development 10 Year*	*10*	*0.710*	*0.300*	22.45	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 10 Year	10	0.565	0.700	0.49	6,935.48	0.694

Subsection: I-D-F Table
Label: CO SPRINGS

Return Event: 10 years
Storm Event: CO SPRINGS - 10 Year

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	5.960
0.167	4.790
0.250	4.040
0.333	3.520
0.417	3.130
0.500	2.830
0.583	2.580
0.667	2.390
0.750	2.220
0.833	2.080
0.917	1.950
1.000	1.850

Subsection: Elevation-Area Volume Curve
Label: Pond 1

Return Event: 10 years
Storm Event: CO SPRINGS - 10 Year

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,932.00	0.0	0.005	0.000	0.000	0.000
6,934.00	0.0	0.292	0.335	0.223	0.223
6,936.00	0.0	0.367	0.986	0.658	0.881
6,938.00	0.0	0.451	1.225	0.817	1.698
6,940.00	0.0	0.545	1.492	0.995	2.692

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,932.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,940.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,937.00	6,940.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,933.00	6,940.00
Culvert-Circular	Culvert - 1	Forward	TW	6,932.00	6,940.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,937.00 ft
Orifice Area	10.2 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	60.00 ft
Length (Computed Barrel)	60.03 ft
Slope (Computed)	0.033 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.079
T2 ratio (HW/D)	1.181
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,934.16 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,934.36 ft	T2 Flow	17.77 ft³/s

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	12
Elevation	6,933.00 ft
Orifice Area	0.0 ft²
Top Elevation	6,937.00 ft
Datum Elevation	6,933.00 ft
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: CO SPRINGS - 10 Year

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.50	0.00	0.00	0.00	6,932.15	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,934.00	0.00	0.00	0.00	6,932.21	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,934.50	0.00	0.00	0.00	6,932.26	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,935.00	0.00	0.00	0.00	6,932.30	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,935.50	0.00	0.00	0.00	6,932.34	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,936.00	0.00	0.00	0.00	6,932.38	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,936.50	0.00	0.00	0.00	6,932.40	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,937.00	0.00	0.00	0.00	6,932.43	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,937.50	4.24	6,937.50	Free Outfall	6,933.15	0.00	0.00	(N/A)	0.00	Weir: H =0.5ft
6,938.00	12.00	6,938.00	Free Outfall	6,933.96	0.00	0.00	(N/A)	0.00	Weir: H =1ft
6,938.50	22.05	6,938.50	Free Outfall	6,935.01	0.00	0.00	(N/A)	0.00	Weir: H =1.5ft
6,939.00	33.94	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00	FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2ft
6,939.50	47.43	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00	FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2.5ft
6,940.00	62.35	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00	

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =3ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
6,932.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
6,932.50	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
6,933.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
6,933.50	0.10	6,932.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,934.00	0.20	6,932.21	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,934.50	0.30	6,932.26	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,935.00	0.40	6,932.30	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,935.50	0.50	6,932.34	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,936.00	0.61	6,932.38	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,936.50	0.69	6,932.40	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,937.00	0.79	6,932.43	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,937.50	5.07	6,933.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,938.00	12.79	6,933.96	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
6,938.50	22.77	6,935.01	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
6,939.00	34.46	6,937.16	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
6,939.50	43.77	6,939.50	Free Outfall	Free Outfall	0.00	3.67	(N/A)	0.00
6,940.00	45.51	6,940.00	Free Outfall	Free Outfall	0.00	16.84	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .036ft Dcr= .107ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .083ft Dcr= .242ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft^3/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .099ft Dcr= .286ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .106ft Dcr= .306ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .557ft Dcr= 1.287ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =3.01
INLET CONTROL... Submerged: HW =5.16
INLET CONTROL... Submerged: HW =7.50
INLET CONTROL... Submerged: HW =8.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
6,933.50	0.10	6,933.50	Free Outfall	6,932.15	0.00	0.00	(N/A)	0.00
6,934.00	0.20	6,934.00	Free Outfall	6,932.21	0.00	0.00	(N/A)	0.00
6,934.50	0.30	6,934.50	Free Outfall	6,932.26	0.00	0.00	(N/A)	0.00
6,935.00	0.40	6,935.00	Free Outfall	6,932.30	0.00	0.00	(N/A)	0.00
6,935.50	0.50	6,935.50	Free Outfall	6,932.34	0.00	0.00	(N/A)	0.00
6,936.00	0.60	6,936.00	Free Outfall	6,932.38	0.00	0.00	(N/A)	0.00
6,936.50	0.69	6,936.50	Free Outfall	6,932.40	0.00	0.00	(N/A)	0.00
6,937.00	0.79	6,937.00	Free Outfall	6,932.43	0.00	0.00	(N/A)	0.00
6,937.50	0.83	6,937.50	6,933.15	6,933.15	0.00	0.00	(N/A)	0.00
6,938.00	0.80	6,938.00	6,933.96	6,933.96	0.00	0.00	(N/A)	0.00
6,938.50	0.74	6,938.50	6,935.01	6,935.01	0.00	0.00	(N/A)	0.00
6,939.00	0.54	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00
6,939.50	0.00	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00
6,940.00	0.00	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Hi=.50; Ht=4.00; Qt=.07
Hi=1.00; Ht=4.00; Qt=.07
Hi=1.50; Ht=4.00; Qt=.07
Hi=2.00; Ht=4.00; Qt=.07
Hi=2.50; Ht=4.00; Qt=.07
Hi=3.00; Ht=4.00; Qt=.07
Hi=3.50; Ht=4.00; Qt=.07
H =4.00
H =4.35
H =4.04
H =3.49
H =1.84
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

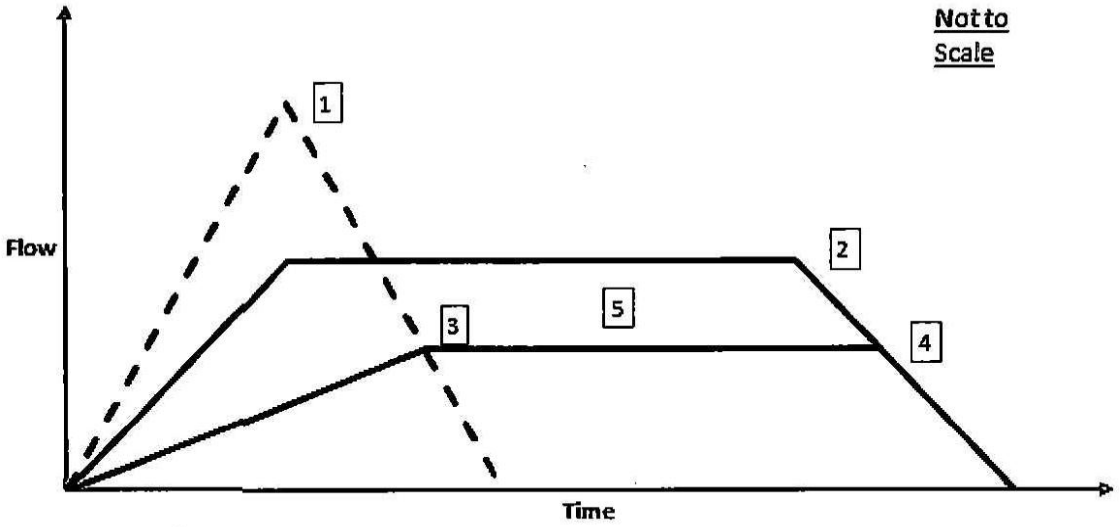
Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Subsection: Modified Rational Graph
Label: Basins

Return Event: 10 years
Storm Event: CO SPRINGS - 10 Year

Method Type	Method T
Time of Duration (Modified Rational, Critical)	0.383 hours



[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.288	hours	Time of Duration (Modified Rational, Critical)	0.383	hours
Intensity (Modified Rational, Peak)	3.801	in/h	Intensity (Modified Rational, Critical)	3.286	in/h
Flow (Modified Rational, Peak)	25.96	ft³/s	Flow (Modified Rational, Critical)	22.45	ft³/s

[3]	
First Outflow Breakpoint (Modified Rational, Method T)	0.518 hours
Flow (Modified Rational, Allowable)	12.00 ft³/s

[4]			[5]		
Second Outflow Breakpoint (Modified Rational)	0.443	hours	Storage (Modified Rational, Estimated)	0.341	ac-ft
Flow (Modified Rational, Allowable)	12.00	ft³/s			

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Project Summary	
Title	BENT GRASS RESIDENTIAL FILING NO.1
Engineer	MAW
Company	CLASSIC CONSULTING
Date	7/10/2014

Notes	POND 1 100 YEAR

Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Basins	Post-Development 100 Year	100	1.657	0.300	28.64

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Post-Development 100 Year	100	1.305	0.900	6.77

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Pond 1 (IN)	Post-Development 100 Year	100	1.657	0.300	28.64	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 100 Year	100	1.305	0.900	6.77	6,937.61	1.525

Subsection: I-D-F Table
Label: CO SPRINGS

Return Event: 100 years
Storm Event: CO SPRINGS - 100 Year

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	9.070
0.167	7.290
0.250	6.160
0.333	5.360
0.417	4.770
0.500	4.310
0.583	3.940
0.667	3.630
0.750	3.380
0.833	3.160
0.917	2.980
1.000	2.810

Subsection: Elevation-Area Volume Curve
Label: Pond 1

Return Event: 100 years
Storm Event: CO SPRINGS - 100 Year

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
6,932.00	0.0	0.005	0.000	0.000	0.000
6,934.00	0.0	0.292	0.335	0.223	0.223
6,936.00	0.0	0.367	0.986	0.658	0.881
6,938.00	0.0	0.451	1.225	0.817	1.698
6,940.00	0.0	0.545	1.492	0.995	2.692

Requested Pond Water Surface Elevations	
Minimum (Headwater)	6,932.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6,940.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward	Culvert - 1	6,937.00	6,940.00
Orifice-Area	Orifice - 1	Forward	Culvert - 1	6,933.00	6,940.00
Culvert-Circular	Culvert - 1	Forward	TW	6,932.00	6,940.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	6,937.00 ft
Orifice Area	10.2 ft²
Orifice Coefficient	0.600
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	60.00 ft
Length (Computed Barrel)	60.03 ft
Slope (Computed)	0.033 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.079
T2 ratio (HW/D)	1.181
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	6,934.16 ft	T1 Flow	15.55 ft³/s
T2 Elevation	6,934.36 ft	T2 Flow	17.77 ft³/s

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	12
Elevation	6,933.00 ft
Orifice Area	0.0 ft²
Top Elevation	6,937.00 ft
Datum Elevation	6,933.00 ft
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.50	0.00	0.00	0.00	6,932.15	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,934.00	0.00	0.00	0.00	6,932.21	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,934.50	0.00	0.00	0.00	6,932.26	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,935.00	0.00	0.00	0.00	6,932.30	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,935.50	0.00	0.00	0.00	6,932.34	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,936.00	0.00	0.00	0.00	6,932.38	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,936.50	0.00	0.00	0.00	6,932.40	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,937.00	0.00	0.00	0.00	6,932.43	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,937.50	4.24	6,937.50	Free Outfall	6,933.15	0.00	0.00	(N/A)	0.00	Weir: H =0.5ft
6,938.00	12.00	6,938.00	Free Outfall	6,933.96	0.00	0.00	(N/A)	0.00	Weir: H =1ft
6,938.50	22.05	6,938.50	Free Outfall	6,935.01	0.00	0.00	(N/A)	0.00	Weir: H =1.5ft
6,939.00	33.94	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00	FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2ft
6,939.50	47.43	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00	FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2.5ft
6,940.00	62.35	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00	

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Inlet Box)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =3ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(Into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
6,932.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,932.50	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.50	0.10	6,932.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	CRIT.DEPTH CONTROL Vh= .036ft Dcr= .107ft CRIT.DEPTH Hev= .00ft
6,934.00	0.20	6,932.21	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,934.50	0.30	6,932.26	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,935.00	0.40	6,932.30	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,935.50	0.50	6,932.34	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	CRIT.DEPTH CONTROL Vh= .083ft Dcr= .242ft CRIT.DEPTH Hev= .00ft
6,936.00	0.61	6,932.38	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
6,936.50	0.69	6,932.40	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,937.00	0.79	6,932.43	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,937.50	5.07	6,933.15	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,938.00	12.79	6,933.96	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00	
6,938.50	22.77	6,935.01	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00	
6,939.00	34.46	6,937.16	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00	
6,939.50	43.77	6,939.50	Free Outfall	Free Outfall	0.00	3.67	(N/A)	0.00	
6,940.00	45.51	6,940.00	Free Outfall	Free Outfall	0.00	16.84	(N/A)	0.00	

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 44.43 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .099ft Dcr= .286ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .106ft Dcr= .306ft CRIT.DEPTH Hev= .00ft
FLOW PRECEDENCE SET TO UPSTREAM CONTROLLING STRUCTURE
CRIT.DEPTH CONTROL Vh= .557ft Dcr= 1.287ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =3.01
INLET CONTROL... Submerged: HW =5.16
INLET CONTROL... Submerged: HW =7.50
INLET CONTROL... Submerged: HW =8.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)	Message
6,932.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,932.50	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00	WS below an invert; no flow.
6,933.50	0.10	6,933.50	Free Outfall	6,932.15	0.00	0.00	(N/A)	0.00	Hi=.50; Ht=4.00; Qt=.07
6,934.00	0.20	6,934.00	Free Outfall	6,932.21	0.00	0.00	(N/A)	0.00	Hi=1.00; Ht=4.00; Qt=.07
6,934.50	0.30	6,934.50	Free Outfall	6,932.26	0.00	0.00	(N/A)	0.00	Hi=1.50; Ht=4.00; Qt=.07
6,935.00	0.40	6,935.00	Free Outfall	6,932.30	0.00	0.00	(N/A)	0.00	Hi=2.00; Ht=4.00; Qt=.07
6,935.50	0.50	6,935.50	Free Outfall	6,932.34	0.00	0.00	(N/A)	0.00	Hi=2.50; Ht=4.00; Qt=.07
6,936.00	0.60	6,936.00	Free Outfall	6,932.38	0.00	0.00	(N/A)	0.00	Hi=3.00; Ht=4.00; Qt=.07
6,936.50	0.69	6,936.50	Free Outfall	6,932.40	0.00	0.00	(N/A)	0.00	Hi=3.50; Ht=4.00; Qt=.07
6,937.00	0.79	6,937.00	Free Outfall	6,932.43	0.00	0.00	(N/A)	0.00	H =4.00
6,937.50	0.83	6,937.50	6,933.15	6,933.15	0.00	0.00	(N/A)	0.00	H =4.35
6,938.00	0.80	6,938.00	6,933.96	6,933.96	0.00	0.00	(N/A)	0.00	H =4.04
6,938.50	0.74	6,938.50	6,935.01	6,935.01	0.00	0.00	(N/A)	0.00	H =3.49
6,939.00	0.54	6,939.00	6,937.16	6,937.16	0.00	0.00	(N/A)	0.00	H =1.84
6,939.50	0.00	6,939.50	6,939.50	6,939.50	0.00	0.00	(N/A)	0.00	FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
6,940.00	0.00	6,940.00	6,940.00	6,940.00	0.00	0.00	(N/A)	0.00	

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Area)

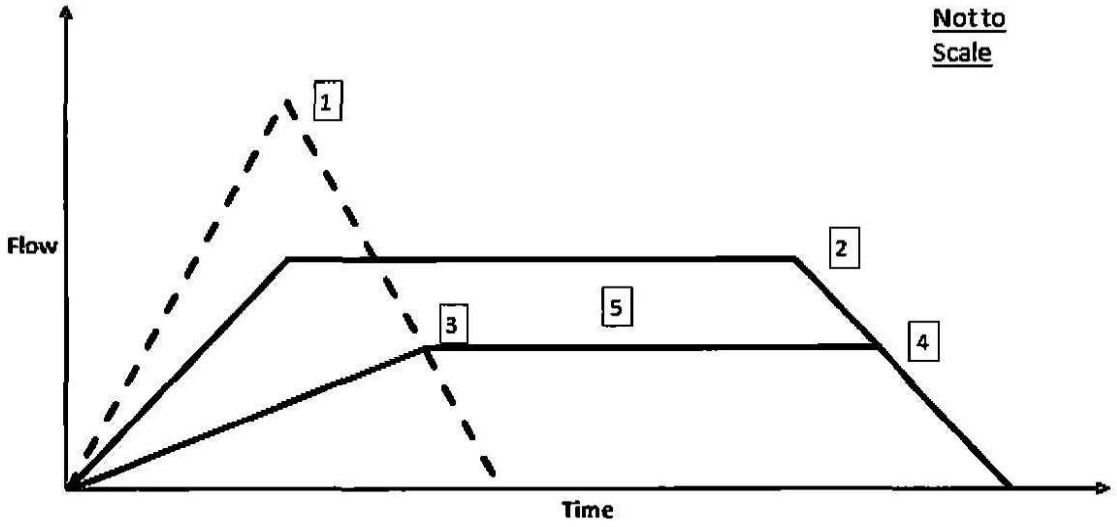
Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Subsection: Modified Rational Graph
Label: Basins

Return Event: 100 years
Storm Event: CO SPRINGS - 100 Year

Method Type	Method T
Time of Duration (Modified Rational, Critical)	0.700 hours

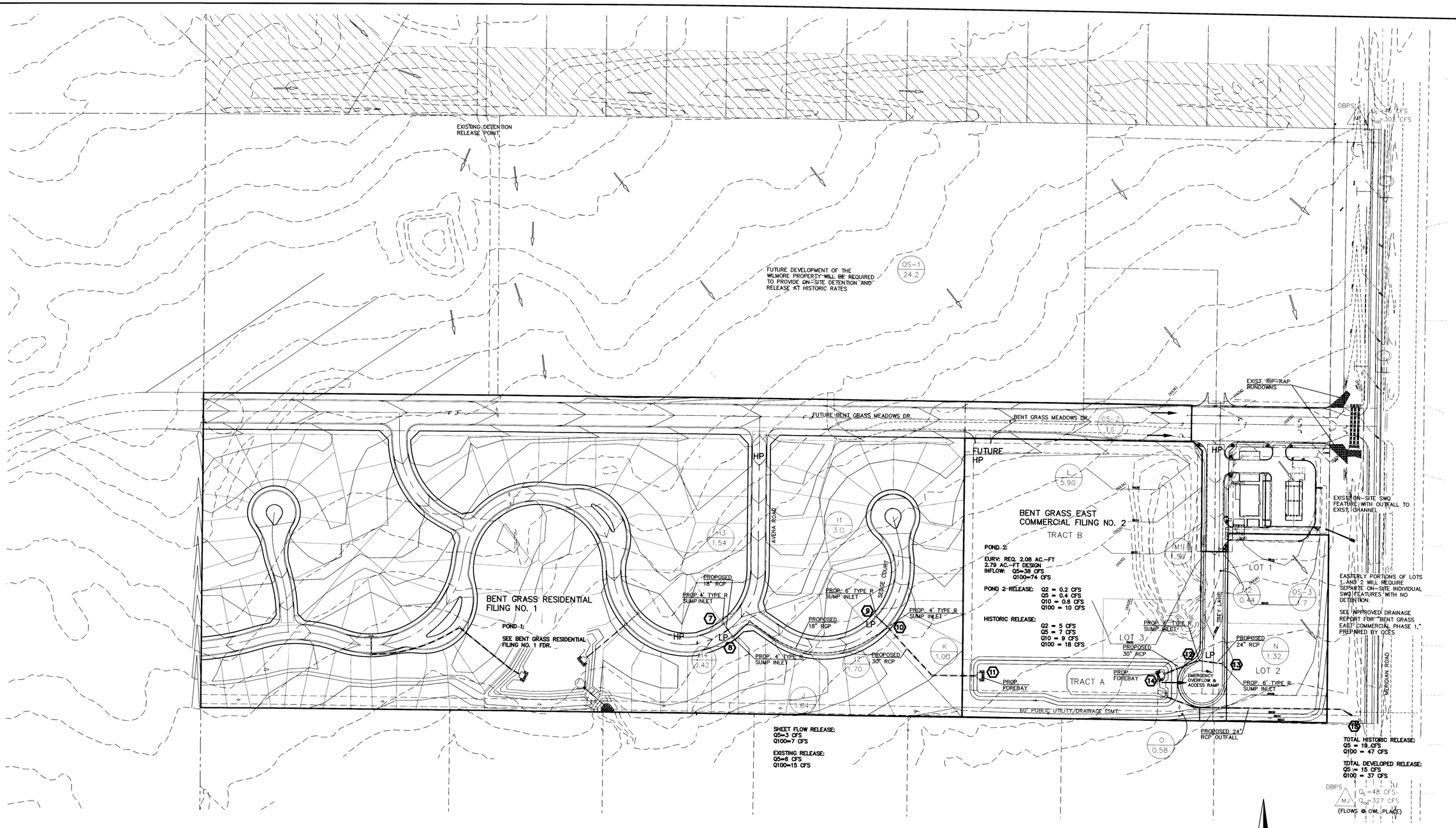


[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.288	hours	Time of Duration (Modified Rational, Critical)	0.700	hours
Intensity (Modified Rational, Peak)	5.792	in/h	Intensity (Modified Rational, Critical)	3.530	in/h
Flow (Modified Rational, Peak)	46.99	ft³/s	Flow (Modified Rational, Critical)	28.64	ft³/s

[3]	
First Outflow Breakpoint (Modified Rational, Method T)	0.867 hours
Flow (Modified Rational, Allowable)	12.00 ft³/s

[4]			[5]		
Second Outflow Breakpoint (Modified Rational)	0.503	hours	Storage (Modified Rational, Estimated)	0.986	ac-ft
Flow (Modified Rational, Allowable)	12.00	ft³/s			

Index



LEGEND

EXISTING GROUND CONTOUR	5910	PROPOSED STORM SEWER	
PROPOSED FINISHED CONTOUR	5910	PROPOSED STORM INLET	
SUBDIVISION BOUNDARY		LOW POINT/HIGH POINT	LP/HP
LOT LINE		BASIN IDENTIFIER	D
PROPOSED BASIN BOUNDARY		AREA IN ACRES	1.41
DIRECTION OF DRAINAGE		DESIGN POINT	1
EXISTING STORM SEWER			
EXISTING STORM INLET			

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(10) (cfs)	Q(25) (cfs)	Q(50) (cfs)	Q(100) (cfs)
OS-1	6.05	8.47	0.25	950	22	37.1					37.1	1.55	2.14	2.49	3.21	3.63	3.80	9	13	15	27	31	32
OS-2	1.38	1.46	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	5	7	8	11	13	13
OS-3	1.34	1.44	0.25	30	0.6	6.9	200	1.5%	4.3	0.8	7.7	3.27	4.50	5.25	6.75	7.65	8.00	4	6	7	10	11	11
H3	0.85	1.00	0.25	100	2	12.6	350	2.0%	4.9	1.2	13.8	2.61	3.59	4.19	5.39	6.11	6.38	2	3	4	5	6	6
H4	0.23	0.27	0.25	50	1	8.9	150	2.0%	4.9	0.5	9.4	3.06	4.19	4.89	6.29	7.12	7.45	0.7	1.0	1.1	1.7	1.9	2.0
I1	1.65	1.95	0.25	50	1	8.9	550	2.0%	4.9	1.9	10.8	2.89	3.96	4.65	5.97	6.77	7.08	5	7	8	12	13	14
I2	0.94	1.11	0.25	50	1	8.9	300	2.0%	4.9	1.0	10.0	2.99	4.11	4.79	6.16	6.99	7.31	3	4	4	7	8	8
J	0.66	0.90	0.25	75	4	7.9					7.9	3.24	4.46	5.20	6.69	7.58	7.93	2	3	3	6	7	7
K	0.40	0.55	0.25	65	3	7.7					7.7	3.27	4.49	5.24	6.74	7.64	7.99	1	2	2	4	4	4
L	4.60	4.93	0.25	30	0.6	6.9	800	1.0%	3.5	3.8	10.7	2.90	3.99	4.66	5.99	6.78	7.10	13	18	21	29	33	35
M1	1.33	1.40	0.25	30	0.6	6.9	300	1.0%	3.5	1.4	8.4	3.18	4.36	5.11	6.57	7.44	7.78	4	6	7	9	10	11
M2	0.37	0.40	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	1.4	1.9	2.2	3.0	3.4	3.6
N	1.12	1.19	0.25	20	0.4	5.7	330	2.0%	4.9	1.1	6.8	3.41	4.69	5.47	7.04	7.97	8.34	4	5	6	8	9	10
O	0.15	0.20	0.25	60	5	6.1					6.1	3.51	4.83	5.64	7.25	8.22	8.59	0.5	0.7	0.8	1.5	1.7	1.7

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
7	H3	0.85	1.00	13.8	3.59	6.38	3	6	4' TYPE R SUMP INLET
8	H4	0.23	0.27	9.4	4.19	7.45	1	2	4' TYPE R SUMP INLET
9	I1	1.65	1.95	10.8	3.98	7.08	7	14	6' TYPE R SUMP INLET
10	I2	0.94	1.11	10.0	4.11	7.31	4	8	4' TYPE R SUMP INLET
11	DP 7 - DP 10 (Westerly Flow into Pond 2)	3.66	4.33	16.9	3.27	5.82	12	25	30" RCP
12	M1	1.33	1.40	8.4	4.38	7.78	6	11	4' TYPE R SUMP INLET
13	M2 & N	1.50	1.58	6.8	4.69	8.34	7	13	6' TYPE R SUMP INLET
14	DP 12 & DP 13 (Easterly Flow into Pond 2)	2.82	2.99	8.9	4.29	7.63	12	23	30" RCP
	Total Flow into Pond 2 (Incl. Basins K & L)	11.48	12.79	16.9	3.27	5.82	38	74	2.3 AC-FT. POND 2
15	OS-1, OS-2, OS-3, O AND POND 2 RELEASE	SCS MODEL					15	37	

CLASSIC CONSULTING ENGINEERS & SURVEYORS SM
6385 Corporate Drive, Suite 101 (719)785-0790
Colorado Springs, Colorado 80919 (719)785-0799 (Fax)

BENT GRASS EAST COMM. FILING NO. 2

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS MAP

CLASSIC CONSULTING ENGINEERS & SURVEYORS

DESIGNED BY	MAW	SCALE		DATE	07-22-14
DRAWN BY	MAW	(H) 1"= 100'		SHEET	1 OF 1
CHECKED BY		(V) 1"= N/A		JOB NO.	2177.53

APPENDIX B

Hydrologic Computations

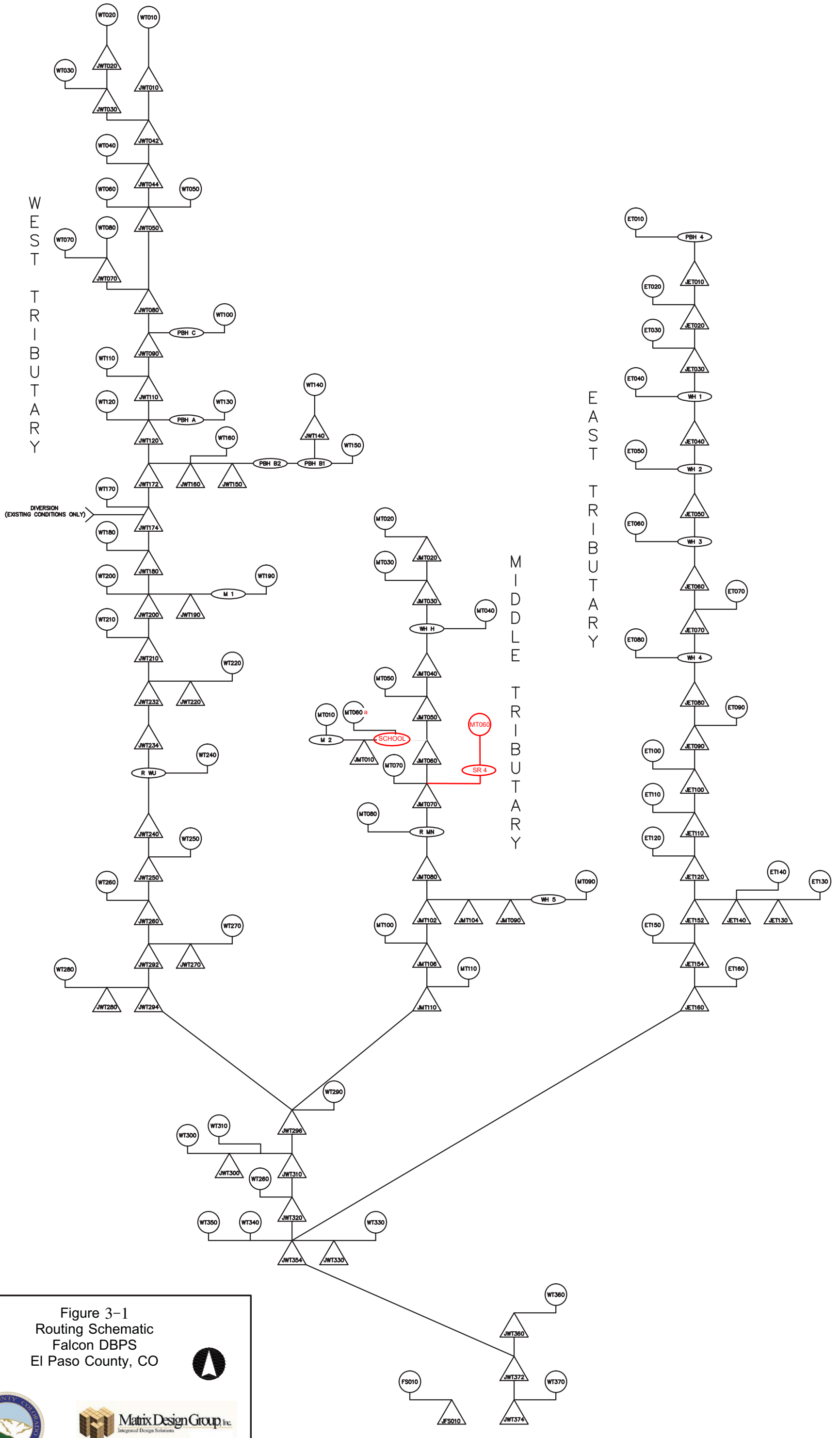


Figure 3-1
Routing Schematic
Falcon DBPS
El Paso County, CO

DRAWING NOT TO SCALE

Current HMS Model

CURRENT 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT020	0.0671383	41.9	01Jan2011, 06:21	4.8
JWT020	0.0671383	41.9	01Jan2011, 06:21	4.8
RWT030	0.0671383	41.9	01Jan2011, 06:29	4.8
WT030	0.0764732	75.3	01Jan2011, 06:07	5.5
JWT030	0.1436115	85.4	01Jan2011, 06:09	10.3
RWT042	0.1436115	85.3	01Jan2011, 06:15	10.3
WT010	0.1353300	88.9	01Jan2011, 06:17	9.3
JWT010	0.1353300	88.9	01Jan2011, 06:17	9.3
RWT044	0.1353300	88.8	01Jan2011, 06:24	9.3
JWT042	0.2789415	167.0	01Jan2011, 06:21	19.6
RWT046	0.2789415	166.7	01Jan2011, 06:28	19.6
WT040	0.1850600	92.7	01Jan2011, 06:28	12.8
JWT044	0.4640015	259.4	01Jan2011, 06:28	32.4
RWT054	0.4640015	258.8	01Jan2011, 06:35	32.3
WT060	0.1956300	116.8	01Jan2011, 06:26	15.1
WT050	0.1899300	139.4	01Jan2011, 06:19	15.3
JWT050	0.8495615	475.4	01Jan2011, 06:31	62.7
RWT092	0.8495615	475.2	01Jan2011, 06:32	62.7
WT070	0.1711000	133.9	01Jan2011, 06:12	11.8
JWT070	0.1711000	133.9	01Jan2011, 06:12	11.8
RWT080	0.1711000	133.4	01Jan2011, 06:22	11.8
WT080	0.0691596	67.3	01Jan2011, 06:10	5.6
Sub Regional Pond SR1	1.0898211	513.2	01Jan2011, 06:40	78.4
JWT080	1.0898211	513.2	01Jan2011, 06:40	78.4
RWT094	1.0898211	512.4	01Jan2011, 06:45	78.3
WT100-REV	0.1292700	203.0	01Jan2011, 06:04	12.9
W26-REV	0.0720000	103.6	01Jan2011, 06:03	6.4
WS3-1	0.0720000	102.8	01Jan2011, 06:10	6.4
Paint Brush Hills Pond C	0.2012700	64.4	01Jan2011, 06:26	19.2
WT090	0.1533300	162.4	01Jan2011, 06:09	12.8
JWT090	1.4444211	595.9	01Jan2011, 06:44	110.2
RWT122	1.4444211	595.5	01Jan2011, 06:45	110.2
WT110	0.1942800	169.9	01Jan2011, 06:14	16.2
JWT110	1.6387011	651.0	01Jan2011, 06:43	126.4
RWT124	1.6387011	650.8	01Jan2011, 06:47	126.3
WT130-REV	0.1016250	130.0	01Jan2011, 06:11	10.9
Paint Brush Hills Pond A	0.1016250	53.8	01Jan2011, 06:32	10.9
WT120-REV	0.0430300	51.1	01Jan2011, 06:08	3.8
JWT120	1.7833561	703.6	01Jan2011, 06:46	140.9

CURRENT 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RWT172	1.7833561	702.5	01Jan2011, 06:58	140.5
WT140-REV	0.1445300	194.2	01Jan2011, 06:12	16.8
JWT140	0.1445300	194.2	01Jan2011, 06:12	16.8
RWT150	0.1445300	193.3	01Jan2011, 06:22	16.8
WT150-REV	0.1308100	202.5	01Jan2011, 06:08	15.0
Paint Brush Hills Pond B1	0.2753400	235.6	01Jan2011, 06:29	31.8
W34B2-REV	0.0935900	141.8	01Jan2011, 06:07	10.2
Paint Brush Hills Pond B2	0.3689300	234.3	01Jan2011, 06:43	38.9
JWT150	0.3689300	234.3	01Jan2011, 06:43	38.9
RWT160	0.3689300	234.2	01Jan2011, 06:49	38.8
WT160-REV	0.0734800	109.9	01Jan2011, 06:06	7.5
JWT160	0.4424100	244.8	01Jan2011, 06:48	46.3
RWT174	0.4424100	244.7	01Jan2011, 06:56	46.2
WT170-REV	0.1060150	85.2	01Jan2011, 06:19	9.2
W34-CY-REV	0.0465469	38.1	01Jan2011, 06:16	3.8
JWT172	2.3783280	981.9	01Jan2011, 06:56	199.7
RWT176	2.3783280	981.6	01Jan2011, 06:57	199.7
Sub Regional Pond SR2	2.3783280	972.9	01Jan2011, 07:01	194.8
JWT174	2.3783280	972.9	01Jan2011, 07:01	194.8
RWT180	2.3783280	972.1	01Jan2011, 07:10	194.2
WT180-REV	0.0409400	29.3	01Jan2011, 06:19	3.2
JWT180	2.4192680	978.0	01Jan2011, 07:10	197.4
RWT202	2.4192680	977.3	01Jan2011, 07:21	196.8
WT200	0.3017100	186.8	01Jan2011, 06:30	26.0
WT190	0.0574561	74.7	01Jan2011, 06:05	5.0
The Meadows Pond #1	0.0574561	2.1	01Jan2011, 08:29	2.8
JWT190	0.0574561	2.1	01Jan2011, 08:29	2.8
RWT204	0.0574561	2.1	01Jan2011, 08:55	2.7
JWT200	2.7784341	1041.0	01Jan2011, 07:19	225.5
RWT210	2.7784341	1040.5	01Jan2011, 07:24	225.1
WT210	0.2654600	187.9	01Jan2011, 06:35	28.0
JWT210	3.0438941	1113.0	01Jan2011, 07:23	253.1
RWT232	3.0438941	1112.6	01Jan2011, 07:27	252.7
WT220	0.1895300	250.4	01Jan2011, 06:12	21.3
JWT220	0.1895300	250.4	01Jan2011, 06:12	21.3
RWT234	0.1895300	249.6	01Jan2011, 06:20	21.3
JWT232	3.2334241	1138.4	01Jan2011, 07:26	274.0
RWT236	3.2334241	1138.3	01Jan2011, 07:26	274.0
WT230	0.1981800	346.7	01Jan2011, 06:05	23.1
JWT234	3.4316041	1155.6	01Jan2011, 07:26	297.0

CURRENT 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RWT240	3.4316041	1155.0	01Jan2011, 07:29	296.8
WT240	0.0761461	160.3	01Jan2011, 06:01	9.1
Regional Pond WU North	3.5077502	1160.9	01Jan2011, 07:30	304.7
Regional Pond WU Dive...	3.5077502	1122.2	01Jan2011, 07:30	261.4
Old Meridian	0.0335900	85.0	01Jan2011, 06:07	6.1
RWT-OM	0.0335900	84.2	01Jan2011, 06:12	6.1
Regional Pond WU South	3.5413402	997.3	01Jan2011, 07:47	255.2
RWT240_Diversion Reach	0.0000000	38.8	01Jan2011, 07:35	43.1
JWT240	3.5413402	1036.0	01Jan2011, 07:47	298.4
RWT250	3.5413402	1035.7	01Jan2011, 07:48	298.3
WT250	0.1469500	291.4	01Jan2011, 06:02	17.1
JWT250	3.6882902	1048.0	01Jan2011, 07:48	315.4
RWT260	3.6882902	1047.5	01Jan2011, 07:58	314.3
WT260	0.1388002	77.5	01Jan2011, 06:34	11.5
JWT260	3.8270904	1061.8	01Jan2011, 07:58	325.9
RWT291	3.8270904	1061.7	01Jan2011, 08:00	325.6
WT270	0.0324738	57.1	01Jan2011, 06:04	3.6
JWT270	0.0324738	57.1	01Jan2011, 06:04	3.6
RWT292	0.0324738	56.9	01Jan2011, 06:08	3.5
JWT292	3.8595642	1064.3	01Jan2011, 08:00	329.2
RWT295	3.8595642	1064.2	01Jan2011, 08:01	329.0
WT280	0.2669500	251.8	01Jan2011, 06:12	22.3
JWT280	0.2669500	251.8	01Jan2011, 06:12	22.3
RWT294	0.2669500	251.2	01Jan2011, 06:15	22.2
JWT294	4.1265142	1082.0	01Jan2011, 08:01	351.3
RWT296	4.1265142	1081.4	01Jan2011, 08:07	350.6
MT040	0.3084200	455.2	01Jan2011, 06:11	38.1
MT030	0.1566300	228.6	01Jan2011, 06:05	15.1
MT020	0.0902033	143.1	01Jan2011, 06:04	9.0
JMT020	0.0902033	143.1	01Jan2011, 06:04	9.0
RMT030	0.0902033	141.8	01Jan2011, 06:17	8.9
JMT030	0.2468333	294.4	01Jan2011, 06:07	24.0
RMT040	0.2468333	293.0	01Jan2011, 06:11	24.0
Woodmen Hills Pond H	0.5552533	751.7	01Jan2011, 06:11	61.7
JMT040	0.5552533	751.7	01Jan2011, 06:11	61.7
RMT050	0.5552533	745.8	01Jan2011, 06:14	61.7
MT010	0.2898900	139.9	01Jan2011, 06:24	17.7
The Meadows Pond #2	0.2898900	72.6	01Jan2011, 06:51	14.4
JMT010	0.2898900	72.6	01Jan2011, 06:51	14.4
RMT062	0.2898900	72.5	01Jan2011, 07:02	14.4

CURRENT 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
MT060a	0.0311000	48.5	01Jan2011, 06:03	2.9
School Site	0.3209900	70.2	01Jan2011, 07:12	15.9
JMT060a	0.3209900	70.2	01Jan2011, 07:12	15.9
RMT060a	0.3209900	70.2	01Jan2011, 07:17	15.8
MT050	0.1186100	109.7	01Jan2011, 06:18	11.4
JMT050	0.9948533	852.0	01Jan2011, 06:14	88.9
RMT064	0.9948533	847.2	01Jan2011, 06:21	88.8
MT060	0.1588000	196.8	01Jan2011, 06:08	14.7
Sub Regional Pond SR4	1.1536533	612.5	01Jan2011, 06:38	89.3
JMT060	1.1536533	612.5	01Jan2011, 06:38	89.3
RMT070	1.1536533	609.7	01Jan2011, 06:44	89.1
MT070	0.1994800	170.2	01Jan2011, 06:22	19.6
JMT070	1.3531333	715.5	01Jan2011, 06:42	108.7
RMT080	1.3531333	714.6	01Jan2011, 06:44	108.7
MT080	0.0638371	191.9	01Jan2011, 06:00	11.0
Regional Pond MN	1.4169704	691.1	01Jan2011, 06:49	117.1
JMT080	1.4169704	691.1	01Jan2011, 06:49	117.1
RMT102	1.4169704	688.3	01Jan2011, 06:56	116.9
MT090	0.0435103	127.4	01Jan2011, 06:00	7.1
Woodmen Hills Pond #5	0.0435103	18.6	01Jan2011, 06:07	5.9
JMT090	0.0435103	18.6	01Jan2011, 06:07	5.9
RMT090	0.0435103	18.6	01Jan2011, 06:08	5.9
JMT104	0.0435103	18.6	01Jan2011, 06:08	5.9
RMT104	0.0435103	18.6	01Jan2011, 06:12	5.9
JMT102	1.4604807	703.3	01Jan2011, 06:56	122.8
RMT106	1.4604807	697.7	01Jan2011, 06:58	122.7
MT100	0.0557682	88.2	01Jan2011, 06:05	5.9
JMT106	1.5162489	704.5	01Jan2011, 06:58	128.6
RMT112	1.5162489	701.0	01Jan2011, 07:10	127.9
MT110	0.1163900	117.4	01Jan2011, 06:16	11.5
JMT110	1.6326389	720.0	01Jan2011, 07:10	139.5
RMT114	1.6326389	718.9	01Jan2011, 07:15	139.2
WT290	0.1037800	110.3	01Jan2011, 06:09	8.7
Regional Pond R1	5.8629331	1361.9	01Jan2011, 08:07	490.9
JWT296	5.8629331	1361.9	01Jan2011, 08:07	490.9
RWT314	5.8629331	1361.6	01Jan2011, 08:13	489.9
WT300	0.0970199	91.6	01Jan2011, 06:12	8.1
JWT300	0.0970199	91.6	01Jan2011, 06:12	8.1
RWT312	0.0970199	91.1	01Jan2011, 06:29	8.1
WT310	0.2774200	246.7	01Jan2011, 06:13	22.3

CURRENT 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JWT310	6.2373730	1385.2	01Jan2011, 08:12	520.3
RWT320	6.2373730	1384.4	01Jan2011, 08:18	519.3
WT320	0.2061400	200.6	01Jan2011, 06:11	17.2
JWT320	6.4435130	1395.9	01Jan2011, 08:17	536.5
RWT352	6.4435130	1395.0	01Jan2011, 08:27	535.3
ET020	0.2131700	360.5	01Jan2011, 06:06	24.8
ET010	0.1451300	198.3	01Jan2011, 06:11	16.4
Paint Brush Hills Pond #4	0.1451300	150.9	01Jan2011, 06:20	16.3
JET010	0.1451300	150.9	01Jan2011, 06:20	16.3
RET020	0.1451300	150.0	01Jan2011, 06:37	16.3
Sub Regional Pond SR6	0.3583000	195.4	01Jan2011, 06:41	37.9
JET020	0.3583000	195.4	01Jan2011, 06:41	37.9
RET030	0.3583000	194.9	01Jan2011, 07:02	37.5
ET030	0.2042800	242.0	01Jan2011, 06:15	23.0
JET030	0.5625800	266.0	01Jan2011, 06:43	60.5
RET040	0.5625800	265.2	01Jan2011, 06:50	60.3
Woodmen Hills Pond #1...	0.7117200	263.5	01Jan2011, 07:09	75.5
ET040	0.1491400	165.7	01Jan2011, 06:14	15.3
Woodmen Hills Pond #1...	0.7117200	261.1	01Jan2011, 07:18	69.5
JET040	0.7117200	261.1	01Jan2011, 07:18	69.5
RET050	0.7117200	261.1	01Jan2011, 07:23	69.4
ET050	0.1171900	197.1	01Jan2011, 06:03	11.6
Woodmen Hills Pond #2	0.8289100	250.3	01Jan2011, 07:46	79.3
JET050	0.8289100	250.3	01Jan2011, 07:46	79.3
RET060	0.8289100	250.3	01Jan2011, 07:53	79.1
ET060	0.2854300	529.3	01Jan2011, 06:01	29.3
Woodmen Hills Pond #3	1.1143400	360.9	01Jan2011, 06:06	105.9
JET060	1.1143400	360.9	01Jan2011, 06:06	105.9
RET070	1.1143400	356.7	01Jan2011, 06:16	105.6
ET070	0.2497500	461.0	01Jan2011, 06:02	27.3
JET070	1.3640900	636.4	01Jan2011, 06:04	132.9
RET080	1.3640900	517.5	01Jan2011, 06:23	131.3
ET080	0.2916400	517.9	01Jan2011, 06:07	37.1
Woodmen Hills Pond #4	1.6557300	288.0	01Jan2011, 07:00	139.2
JET080	1.6557300	288.0	01Jan2011, 07:00	139.2
RET090	1.6557300	287.3	01Jan2011, 07:03	139.0
ET090	0.1242400	133.0	01Jan2011, 06:22	14.9
JET090	1.7799700	330.8	01Jan2011, 06:59	153.9
RET100	1.7799700	330.7	01Jan2011, 07:01	153.8
ET100	0.0480615	72.0	01Jan2011, 06:02	4.0

CURRENT 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JET100	1.8280315	335.4	01Jan2011, 07:01	157.8
RET110	1.8280315	335.2	01Jan2011, 07:05	157.6
ET110	0.2260300	198.8	01Jan2011, 06:12	17.5
JET110	2.0540615	362.1	01Jan2011, 07:03	175.1
RET120	2.0540615	361.3	01Jan2011, 07:09	174.7
ET120	0.1091300	89.4	01Jan2011, 06:14	8.5
JET120	2.1631915	403.2	01Jan2011, 06:17	183.2
RET152	2.1631915	402.2	01Jan2011, 06:24	182.9
ET130	0.1348100	85.4	01Jan2011, 06:27	11.2
JET130	0.1348100	85.4	01Jan2011, 06:27	11.2
RET140	0.1348100	84.7	01Jan2011, 06:54	11.1
ET140	0.2675900	122.8	01Jan2011, 06:46	22.2
JET140	0.4024000	204.8	01Jan2011, 06:51	33.3
RET154	0.4024000	204.4	01Jan2011, 07:05	33.2
JET152	2.5655915	572.3	01Jan2011, 07:10	216.1
RET156	2.5655915	572.0	01Jan2011, 07:14	215.8
ET150	0.1777300	136.2	01Jan2011, 06:18	14.3
JET154	2.7433215	595.8	01Jan2011, 07:12	230.1
RET162	2.7433215	595.1	01Jan2011, 07:25	228.9
ET160	0.1889200	137.2	01Jan2011, 06:23	16.3
JET160	2.9322415	633.6	01Jan2011, 06:38	245.2
RET164	2.9322415	629.0	01Jan2011, 06:47	244.7
WT350	0.3037700	276.7	01Jan2011, 06:14	26.3
JWT352	9.6795245	1942.0	01Jan2011, 07:42	806.3
RWT354	9.6795245	1941.9	01Jan2011, 07:42	806.3
WT330	0.3266800	249.3	01Jan2011, 06:19	27.2
JWT330	0.3266800	249.3	01Jan2011, 06:19	27.2

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 100-yr Reservoir: School Site

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	100-yr
Compute Time:	22Jan2021, 16:58:57	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	75.8 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 07:02
Peak Outflow :	70.2 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 07:12
Total Inflow :	17.2 (AC-FT)	Peak Storage :	2.2 (AC-FT)
Total Outflow :	15.9 (AC-FT)	Peak Elevation :	6957.8 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 100-yr Reservoir: Sub Regional Pond SR4

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	100-yr
Compute Time:	22Jan2021, 16:58:57	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	951.4 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:20
Peak Outflow :	612.5 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:38
Total Inflow :	103.5 (AC-FT)	Peak Storage :	26.2 (AC-FT)
Total Outflow :	89.3 (AC-FT)	Peak Elevation :	6896.9 (FT)

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 100-yr Reservoir: Regional Pond MN

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	100-yr
Compute Time:	22Jan2021, 16:58:57	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	724.7 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:44
Peak Outflow :	691.1 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:49
Total Inflow :	119.7 (AC-FT)	Peak Storage :	6.7 (AC-FT)
Total Outflow :	117.1 (AC-FT)	Peak Elevation :	6853.6 (FT)

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT020	0.0671383	10.3	01Jan2011, 06:23	1.4
JWT020	0.0671383	10.3	01Jan2011, 06:23	1.4
RWT030	0.0671383	10.3	01Jan2011, 06:34	1.4
WT030	0.0764732	19.5	01Jan2011, 06:08	1.6
JWT030	0.1436115	20.0	01Jan2011, 06:09	3.0
RWT042	0.1436115	19.9	01Jan2011, 06:18	3.0
WT010	0.1353300	21.2	01Jan2011, 06:19	2.6
JWT010	0.1353300	21.2	01Jan2011, 06:19	2.6
RWT044	0.1353300	21.2	01Jan2011, 06:29	2.6
JWT042	0.2789415	37.2	01Jan2011, 06:24	5.6
RWT046	0.2789415	37.2	01Jan2011, 06:35	5.6
WT040	0.1850600	21.9	01Jan2011, 06:31	3.6
JWT044	0.4640015	58.9	01Jan2011, 06:34	9.2
RWT054	0.4640015	58.7	01Jan2011, 06:43	9.2
WT060	0.1956300	30.1	01Jan2011, 06:29	4.5
WT050	0.1899300	37.3	01Jan2011, 06:21	4.7
JWT050	0.8495615	108.6	01Jan2011, 06:38	18.4
RWT092	0.8495615	108.5	01Jan2011, 06:39	18.4
WT070	0.1711000	32.6	01Jan2011, 06:13	3.4
JWT070	0.1711000	32.6	01Jan2011, 06:13	3.4
RWT080	0.1711000	32.5	01Jan2011, 06:28	3.3
WT080	0.0691596	18.5	01Jan2011, 06:12	1.7
Sub Regional Pond SR1	1.0898211	113.8	01Jan2011, 06:50	21.9
JWT080	1.0898211	113.8	01Jan2011, 06:50	21.9
RWT094	1.0898211	113.7	01Jan2011, 06:58	21.8
WT100-REV	0.1292700	67.7	01Jan2011, 06:05	4.5
W26-REV	0.0720000	33.7	01Jan2011, 06:04	2.1
WS3-1	0.0720000	33.4	01Jan2011, 06:13	2.1
Paint Brush Hills Pond C	0.2012700	14.0	01Jan2011, 06:38	6.5
WT090	0.1533300	46.0	01Jan2011, 06:10	4.0
JWT090	1.4444211	133.8	01Jan2011, 06:57	32.3
RWT122	1.4444211	133.7	01Jan2011, 07:01	32.3
WT110	0.1942800	47.0	01Jan2011, 06:16	5.1
JWT110	1.6387011	144.0	01Jan2011, 07:00	37.4
RWT124	1.6387011	144.0	01Jan2011, 07:08	37.3
WT130-REV	0.1016250	43.5	01Jan2011, 06:12	3.9
Paint Brush Hills Pond A	0.1016250	9.3	01Jan2011, 06:49	3.9
WT120-REV	0.0430300	14.8	01Jan2011, 06:09	1.2

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JWT120	1.7833561	154.4	01Jan2011, 07:08	42.4
RWT172	1.7833561	154.2	01Jan2011, 07:18	42.2
WT140-REV	0.1445300	65.2	01Jan2011, 06:14	6.1
JWT140	0.1445300	65.2	01Jan2011, 06:14	6.1
RWT150	0.1445300	64.9	01Jan2011, 06:24	6.1
WT150-REV	0.1308100	71.3	01Jan2011, 06:08	5.5
Paint Brush Hills Pond...	0.2753400	110.4	01Jan2011, 06:15	11.6
W34B2-REV	0.0935900	49.1	01Jan2011, 06:08	3.7
Paint Brush Hills Pond...	0.3689300	20.1	01Jan2011, 07:15	13.8
JWT150	0.3689300	20.1	01Jan2011, 07:15	13.8
RWT160	0.3689300	20.0	01Jan2011, 07:24	13.8
WT160-REV	0.0734800	36.3	01Jan2011, 06:07	2.6
JWT160	0.4424100	37.3	01Jan2011, 06:07	16.4
RWT174	0.4424100	36.9	01Jan2011, 06:20	16.3
WT170-REV	0.1060150	24.0	01Jan2011, 06:21	2.9
W34-CY-REV	0.0465469	10.7	01Jan2011, 06:18	1.2
JWT172	2.3783280	181.3	01Jan2011, 07:17	62.6
RWT176	2.3783280	181.2	01Jan2011, 07:18	62.6
Sub Regional Pond SR2	2.3783280	171.7	01Jan2011, 07:30	59.3
JWT174	2.3783280	171.7	01Jan2011, 07:30	59.3
RWT180	2.3783280	171.6	01Jan2011, 07:45	59.0
WT180-REV	0.0409400	7.6	01Jan2011, 06:21	1.0
JWT180	2.4192680	172.6	01Jan2011, 07:45	59.9
RWT202	2.4192680	172.6	01Jan2011, 08:03	59.5
WT200	0.3017100	52.2	01Jan2011, 06:33	8.3
WT190	0.0574561	22.5	01Jan2011, 06:06	1.6
The Meadows Pond #1	0.0574561	0.6	01Jan2011, 10:18	0.9
JWT190	0.0574561	0.6	01Jan2011, 10:18	0.9
RWT204	0.0574561	0.6	01Jan2011, 10:56	0.8
JWT200	2.7784341	182.8	01Jan2011, 08:02	68.6
RWT210	2.7784341	182.7	01Jan2011, 08:10	68.3
WT210	0.2654600	59.7	01Jan2011, 06:38	9.8
JWT210	3.0438941	194.3	01Jan2011, 08:09	78.2
RWT232	3.0438941	194.3	01Jan2011, 08:16	77.9
WT220	0.1895300	84.8	01Jan2011, 06:13	7.8
JWT220	0.1895300	84.8	01Jan2011, 06:13	7.8
RWT234	0.1895300	84.4	01Jan2011, 06:25	7.7
JWT232	3.2334241	200.7	01Jan2011, 08:16	85.7
RWT236	3.2334241	200.7	01Jan2011, 08:16	85.7

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT230	0.1981800	124.0	01Jan2011, 06:06	8.5
JWT234	3.4316041	205.6	01Jan2011, 08:15	94.2
RWT240	3.4316041	205.4	01Jan2011, 08:21	94.0
WT240	0.0761461	61.0	01Jan2011, 06:02	3.4
Regional Pond WU No...	3.5077502	206.4	01Jan2011, 08:23	96.3
Regional Pond WU Di...	3.5077502	169.3	01Jan2011, 08:23	64.8
Old Meridian	0.0335900	38.2	01Jan2011, 06:09	2.8
RWT-OM	0.0335900	37.8	01Jan2011, 06:14	2.8
Regional Pond WU So...	3.5413402	144.6	01Jan2011, 08:49	57.2
RWT240_Diversion R...	0.0000000	37.1	01Jan2011, 08:29	31.4
JWT240	3.5413402	180.6	01Jan2011, 08:47	88.6
RWT250	3.5413402	180.6	01Jan2011, 08:48	88.5
WT250	0.1469500	107.5	01Jan2011, 06:03	6.3
JWT250	3.6882902	183.2	01Jan2011, 08:48	94.9
RWT260	3.6882902	183.1	01Jan2011, 09:04	94.3
WT260	0.1388002	21.0	01Jan2011, 06:36	3.6
JWT260	3.8270904	185.4	01Jan2011, 09:03	97.9
RWT291	3.8270904	185.3	01Jan2011, 09:07	97.8
WT270	0.0324738	20.0	01Jan2011, 06:04	1.3
JWT270	0.0324738	20.0	01Jan2011, 06:04	1.3
RWT292	0.0324738	19.9	01Jan2011, 06:10	1.3
JWT292	3.8595642	185.9	01Jan2011, 09:07	99.0
RWT295	3.8595642	185.8	01Jan2011, 09:09	99.0
WT280	0.2669500	70.1	01Jan2011, 06:14	6.9
JWT280	0.2669500	70.1	01Jan2011, 06:14	6.9
RWT294	0.2669500	70.0	01Jan2011, 06:17	6.9
JWT294	4.1265142	189.2	01Jan2011, 09:09	105.9
RWT296	4.1265142	189.1	01Jan2011, 09:17	105.5
MT040	0.3084200	163.5	01Jan2011, 06:12	14.5
MT030	0.1566300	73.4	01Jan2011, 06:06	5.1
MT020	0.0902033	47.3	01Jan2011, 06:05	3.1
JMT020	0.0902033	47.3	01Jan2011, 06:05	3.1
RMT030	0.0902033	46.8	01Jan2011, 06:21	3.1
JMT030	0.2468333	93.6	01Jan2011, 06:07	8.1
RMT040	0.2468333	92.8	01Jan2011, 06:12	8.1
Woodmen Hills Pond H	0.5552533	242.5	01Jan2011, 06:16	22.5
JMT040	0.5552533	242.5	01Jan2011, 06:16	22.5
RMT050	0.5552533	242.2	01Jan2011, 06:19	22.5
MT010	0.2898900	36.7	01Jan2011, 06:26	5.2

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
The Meadows Pond #2	0.2898900	2.7	01Jan2011, 09:12	3.5
JMT010	0.2898900	2.7	01Jan2011, 09:12	3.5
RMT062	0.2898900	2.7	01Jan2011, 09:38	3.4
MT060a	0.0311000	15.6	01Jan2011, 06:03	1.0
School Site	0.3209900	3.0	01Jan2011, 11:20	3.0
JMT060a	0.3209900	3.0	01Jan2011, 11:20	3.0
RMT060a	0.3209900	3.0	01Jan2011, 11:30	3.0
MT050	0.1186100	33.2	01Jan2011, 06:20	3.8
JMT050	0.9948533	275.4	01Jan2011, 06:19	29.3
RMT064	0.9948533	273.1	01Jan2011, 06:29	29.2
MT060	0.1588000	60.1	01Jan2011, 06:09	4.8
Sub Regional Pond SR4	1.1536533	24.1	01Jan2011, 08:42	23.4
JMT060	1.1536533	24.1	01Jan2011, 08:42	23.4
RMT070	1.1536533	24.1	01Jan2011, 08:51	23.2
MT070	0.1994800	51.6	01Jan2011, 06:24	6.6
JMT070	1.3531333	55.6	01Jan2011, 06:25	29.8
RMT080	1.3531333	55.6	01Jan2011, 06:28	29.8
MT080	0.0638371	91.5	01Jan2011, 06:00	5.0
Regional Pond MN	1.4169704	62.4	01Jan2011, 06:32	32.3
JMT080	1.4169704	62.4	01Jan2011, 06:32	32.3
RMT102	1.4169704	62.2	01Jan2011, 06:41	32.0
MT090	0.0435103	59.3	01Jan2011, 06:00	3.2
Woodmen Hills Pond #5	0.0435103	2.2	01Jan2011, 08:01	2.3
JMT090	0.0435103	2.2	01Jan2011, 08:01	2.3
RMT090	0.0435103	2.2	01Jan2011, 08:01	2.3
JMT104	0.0435103	2.2	01Jan2011, 08:01	2.3
RMT104	0.0435103	2.2	01Jan2011, 08:07	2.3
JMT102	1.4604807	64.3	01Jan2011, 06:41	34.4
RMT106	1.4604807	64.0	01Jan2011, 06:43	34.3
MT100	0.0557682	29.8	01Jan2011, 06:06	2.1
JMT106	1.5162489	67.8	01Jan2011, 06:42	36.4
RMT112	1.5162489	66.0	01Jan2011, 07:16	35.5
MT110	0.1163900	36.3	01Jan2011, 06:18	3.9
JMT110	1.6326389	72.0	01Jan2011, 07:16	39.4
RMT114	1.6326389	71.2	01Jan2011, 07:25	39.1
WT290	0.1037800	31.2	01Jan2011, 06:10	2.7
Regional Pond R1	5.8629331	222.9	01Jan2011, 09:27	140.2
JWT296	5.8629331	222.9	01Jan2011, 09:27	140.2
RWT314	5.8629331	222.9	01Jan2011, 09:34	139.5

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT300	0.0970199	25.5	01Jan2011, 06:14	2.5
JWT300	0.0970199	25.5	01Jan2011, 06:14	2.5
RWT312	0.0970199	25.4	01Jan2011, 06:34	2.5
WT310	0.2774200	67.1	01Jan2011, 06:14	6.9
JWT310	6.2373730	227.4	01Jan2011, 09:34	148.9
RWT320	6.2373730	227.3	01Jan2011, 09:42	148.1
WT320	0.2061400	56.1	01Jan2011, 06:13	5.4
JWT320	6.4435130	229.8	01Jan2011, 09:42	153.5
RWT352	6.4435130	229.8	01Jan2011, 09:51	152.6
ET020	0.2131700	128.1	01Jan2011, 06:07	9.2
ET010	0.1451300	67.4	01Jan2011, 06:12	5.9
Paint Brush Hills Pond...	0.1451300	48.8	01Jan2011, 06:22	5.9
JET010	0.1451300	48.8	01Jan2011, 06:22	5.9
RET020	0.1451300	48.7	01Jan2011, 06:37	5.9
Sub Regional Pond SR6	0.3583000	19.9	01Jan2011, 07:26	13.5
JET020	0.3583000	19.9	01Jan2011, 07:26	13.5
RET030	0.3583000	19.7	01Jan2011, 08:14	13.1
ET030	0.2042800	81.2	01Jan2011, 06:17	8.4
JET030	0.5625800	81.2	01Jan2011, 06:17	21.5
RET040	0.5625800	80.9	01Jan2011, 06:28	21.4
Woodmen Hills Pond ...	0.7117200	103.5	01Jan2011, 06:35	26.6
ET040	0.1491400	52.6	01Jan2011, 06:15	5.3
Woodmen Hills Pond ...	0.7117200	32.8	01Jan2011, 07:14	21.7
JET040	0.7117200	32.8	01Jan2011, 07:14	21.7
RET050	0.7117200	32.8	01Jan2011, 07:22	21.6
ET050	0.1171900	66.6	01Jan2011, 06:03	4.0
Woodmen Hills Pond #2	0.8289100	29.6	01Jan2011, 08:07	23.9
JET050	0.8289100	29.6	01Jan2011, 08:07	23.9
RET060	0.8289100	29.6	01Jan2011, 08:19	23.7
ET060	0.2854300	185.5	01Jan2011, 06:02	10.2
Woodmen Hills Pond #3	1.1143400	82.1	01Jan2011, 06:08	31.5
JET060	1.1143400	82.1	01Jan2011, 06:08	31.5
RET070	1.1143400	81.0	01Jan2011, 06:18	31.2
ET070	0.2497500	164.1	01Jan2011, 06:03	9.8
JET070	1.3640900	164.5	01Jan2011, 06:03	41.0
RET080	1.3640900	123.5	01Jan2011, 06:29	40.2
ET080	0.2916400	192.2	01Jan2011, 06:08	14.3
Woodmen Hills Pond #4	1.6557300	26.7	01Jan2011, 14:58	26.8
JET080	1.6557300	26.7	01Jan2011, 14:58	26.8

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RET090	1.6557300	26.7	01Jan2011, 15:03	26.6
ET090	0.1242400	46.0	01Jan2011, 06:23	5.6
JET090	1.7799700	50.6	01Jan2011, 06:24	32.2
RET100	1.7799700	50.6	01Jan2011, 06:28	32.1
ET100	0.0480615	22.3	01Jan2011, 06:02	1.3
JET100	1.8280315	53.2	01Jan2011, 06:28	33.3
RET110	1.8280315	53.1	01Jan2011, 06:35	33.1
ET110	0.2260300	52.7	01Jan2011, 06:13	5.3
JET110	2.0540615	86.0	01Jan2011, 06:13	38.4
RET120	2.0540615	85.1	01Jan2011, 06:19	38.1
ET120	0.1091300	23.5	01Jan2011, 06:16	2.5
JET120	2.1631915	107.9	01Jan2011, 06:19	40.7
RET152	2.1631915	107.7	01Jan2011, 06:25	40.4
ET130	0.1348100	23.2	01Jan2011, 06:30	3.5
JET130	0.1348100	23.2	01Jan2011, 06:30	3.5
RET140	0.1348100	23.1	01Jan2011, 07:00	3.5
ET140	0.2675900	33.4	01Jan2011, 06:49	6.9
JET140	0.4024000	55.3	01Jan2011, 06:56	10.4
RET154	0.4024000	55.2	01Jan2011, 07:19	10.3
JET152	2.5655915	108.6	01Jan2011, 06:26	50.8
RET156	2.5655915	108.3	01Jan2011, 06:30	50.6
ET150	0.1777300	36.6	01Jan2011, 06:20	4.4
JET154	2.7433215	138.8	01Jan2011, 06:29	55.0
RET162	2.7433215	135.5	01Jan2011, 06:54	54.2
ET160	0.1889200	38.5	01Jan2011, 06:25	5.2
JET160	2.9322415	154.7	01Jan2011, 06:53	59.4
RET164	2.9322415	154.3	01Jan2011, 06:58	59.2
WT350	0.3037700	78.7	01Jan2011, 06:16	8.4
JWT352	9.6795245	311.7	01Jan2011, 07:22	220.1
RWT354	9.6795245	311.7	01Jan2011, 07:22	220.1
WT330	0.3266800	68.2	01Jan2011, 06:21	8.5
JWT330	0.3266800	68.2	01Jan2011, 06:21	8.5
RWT344	0.3266800	67.9	01Jan2011, 06:30	8.5
WT340	0.2780000	40.0	01Jan2011, 06:39	7.2
JWT354	10.2842045	350.6	01Jan2011, 07:20	235.7
RWT372	10.2842045	350.4	01Jan2011, 07:24	235.1
WT360	0.0656830	14.8	01Jan2011, 06:17	1.6
JWT360	0.0656830	14.8	01Jan2011, 06:17	1.6
RWT374	0.0656830	14.7	01Jan2011, 06:32	1.6

CURRENT 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Regional Pond R2	10.3498875	352.6	01Jan2011, 07:26	233.5
JWT372	10.3498875	352.6	01Jan2011, 07:26	233.5
RWT376	10.3498875	351.6	01Jan2011, 07:35	232.3
WT370	0.2147600	23.4	01Jan2011, 06:15	2.8
JWT374_OUTLET	10.5646475	354.7	01Jan2011, 07:35	235.1
FS010	0.1220000	16.6	01Jan2011, 06:18	2.1
JFS010_OUTLET	0.1220000	16.6	01Jan2011, 06:18	2.1

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 5-yr Reservoir: School Site

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	5-yr
Compute Time:	22Jan2021, 17:04:18	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	15.6 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:03
Peak Outflow :	3.0 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 11:20
Total Inflow :	4.4 (AC-FT)	Peak Storage :	1.4 (AC-FT)
Total Outflow :	3.0 (AC-FT)	Peak Elevation :	6957.0 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 5-yr Reservoir: Sub Regional Pond SR4

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	5-yr
Compute Time:	22Jan2021, 17:04:18	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	292.9 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:29
Peak Outflow :	24.1 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 08:42
Total Inflow :	34.0 (AC-FT)	Peak Storage :	16.2 (AC-FT)
Total Outflow :	23.4 (AC-FT)	Peak Elevation :	6893.9 (FT)

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 5-yr Reservoir: Regional Pond MN

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	5-yr
Compute Time:	22Jan2021, 17:04:18	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	99.9 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:01
Peak Outflow :	62.4 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:32
Total Inflow :	34.8 (AC-FT)	Peak Storage :	2.8 (AC-FT)
Total Outflow :	32.3 (AC-FT)	Peak Elevation :	6851.6 (FT)

CURRENT 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT020	0.0671383	4.4	01Jan2011, 06:25	0.7
JWT020	0.0671383	4.4	01Jan2011, 06:25	0.7
RWT030	0.0671383	4.4	01Jan2011, 06:39	0.7
WT030	0.0764732	8.6	01Jan2011, 06:09	0.8
JWT030	0.1436115	8.7	01Jan2011, 06:09	1.5
RWT042	0.1436115	8.7	01Jan2011, 06:20	1.5
WT010	0.1353300	8.8	01Jan2011, 06:21	1.3
JWT010	0.1353300	8.8	01Jan2011, 06:21	1.3
RWT044	0.1353300	8.8	01Jan2011, 06:33	1.3
JWT042	0.2789415	15.1	01Jan2011, 06:26	2.8
RWT046	0.2789415	15.1	01Jan2011, 06:40	2.8
WT040	0.1850600	9.1	01Jan2011, 06:34	1.8
JWT044	0.4640015	23.9	01Jan2011, 06:39	4.5
RWT054	0.4640015	23.8	01Jan2011, 06:50	4.5
WT060	0.1956300	13.6	01Jan2011, 06:30	2.3
WT050	0.1899300	17.3	01Jan2011, 06:23	2.4
JWT050	0.8495615	42.8	01Jan2011, 06:47	9.3
RWT092	0.8495615	42.7	01Jan2011, 06:49	9.3
WT070	0.1711000	13.6	01Jan2011, 06:15	1.6
JWT070	0.1711000	13.6	01Jan2011, 06:15	1.6
RWT080	0.1711000	13.6	01Jan2011, 06:34	1.6
WT080	0.0691596	8.7	01Jan2011, 06:13	0.9
Sub Regional Pond SR1	1.0898211	41.9	01Jan2011, 07:03	10.4
JWT080	1.0898211	41.9	01Jan2011, 07:03	10.4
RWT094	1.0898211	41.9	01Jan2011, 07:14	10.3
WT100-REV	0.1292700	37.0	01Jan2011, 06:05	2.5
W26-REV	0.0720000	18.4	01Jan2011, 06:04	1.2
WS3-1	0.0720000	18.1	01Jan2011, 06:15	1.2
Paint Brush Hills Pond C	0.2012700	10.4	01Jan2011, 06:34	3.7
WT090	0.1533300	22.1	01Jan2011, 06:11	2.1
JWT090	1.4444211	54.5	01Jan2011, 07:12	16.1
RWT122	1.4444211	54.5	01Jan2011, 07:17	16.1
WT110	0.1942800	22.3	01Jan2011, 06:17	2.7
JWT110	1.6387011	58.6	01Jan2011, 07:16	18.7
RWT124	1.6387011	58.6	01Jan2011, 07:26	18.7
WT130-REV	0.1016250	24.0	01Jan2011, 06:13	2.3
Paint Brush Hills Pond A	0.1016250	4.8	01Jan2011, 06:53	2.3
WT120-REV	0.0430300	7.2	01Jan2011, 06:09	0.6
JWT120	1.7833561	63.9	01Jan2011, 07:26	21.6

CURRENT 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RWT172	1.7833561	63.8	01Jan2011, 07:38	21.5
WT140-REV	0.1445300	35.7	01Jan2011, 06:14	3.6
JWT140	0.1445300	35.7	01Jan2011, 06:14	3.6
RWT150	0.1445300	35.5	01Jan2011, 06:25	3.6
WT150-REV	0.1308100	40.8	01Jan2011, 06:09	3.3
Paint Brush Hills Pond B1	0.2753400	58.7	01Jan2011, 06:19	6.8
W34B2-REV	0.0935900	27.9	01Jan2011, 06:08	2.2
Paint Brush Hills Pond B2	0.3689300	9.8	01Jan2011, 07:30	8.0
JWT150	0.3689300	9.8	01Jan2011, 07:30	8.0
RWT160	0.3689300	9.8	01Jan2011, 07:40	8.0
WT160-REV	0.0734800	19.7	01Jan2011, 06:07	1.5
JWT160	0.4424100	20.1	01Jan2011, 06:07	9.5
RWT174	0.4424100	19.8	01Jan2011, 06:23	9.4
WT170-REV	0.1060150	11.6	01Jan2011, 06:22	1.6
W34-CY-REV	0.0465469	5.2	01Jan2011, 06:19	0.6
JWT172	2.3783280	81.2	01Jan2011, 06:39	33.1
RWT176	2.3783280	81.1	01Jan2011, 06:40	33.1
Sub Regional Pond SR2	2.3783280	66.8	01Jan2011, 08:06	30.0
JWT174	2.3783280	66.8	01Jan2011, 08:06	30.0
RWT180	2.3783280	66.8	01Jan2011, 08:25	29.7
WT180-REV	0.0409400	3.4	01Jan2011, 06:22	0.5
JWT180	2.4192680	67.2	01Jan2011, 08:25	30.2
RWT202	2.4192680	67.1	01Jan2011, 08:51	29.9
WT200	0.3017100	25.3	01Jan2011, 06:34	4.4
WT190	0.0574561	11.3	01Jan2011, 06:07	0.9
The Meadows Pond #1	0.0574561	0.3	01Jan2011, 13:19	0.4
JWT190	0.0574561	0.3	01Jan2011, 13:19	0.4
RWT204	0.0574561	0.3	01Jan2011, 14:16	0.4
JWT200	2.7784341	70.6	01Jan2011, 08:50	34.8
RWT210	2.7784341	70.6	01Jan2011, 09:00	34.6
WT210	0.2654600	31.9	01Jan2011, 06:39	5.6
JWT210	3.0438941	74.5	01Jan2011, 08:59	40.2
RWT232	3.0438941	74.5	01Jan2011, 09:08	40.0
WT220	0.1895300	47.1	01Jan2011, 06:14	4.5
JWT220	0.1895300	47.1	01Jan2011, 06:14	4.5
RWT234	0.1895300	46.9	01Jan2011, 06:26	4.5
JWT232	3.2334241	76.6	01Jan2011, 09:08	44.5
RWT236	3.2334241	76.6	01Jan2011, 09:09	44.5
WT230	0.1981800	71.3	01Jan2011, 06:06	5.0
JWT234	3.4316041	84.5	01Jan2011, 06:43	49.5

CURRENT 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RWT240	3.4316041	84.0	01Jan2011, 06:48	49.4
WT240	0.0761461	36.4	01Jan2011, 06:02	2.1
Regional Pond WU North	3.5077502	89.8	01Jan2011, 06:10	50.3
Regional Pond WU Diver…	3.5077502	62.4	01Jan2011, 06:10	27.5
Old Meridian	0.0335900	24.6	01Jan2011, 06:09	1.9
RWT-OM	0.0335900	24.3	01Jan2011, 06:16	1.8
Regional Pond WU South	3.5413402	31.1	01Jan2011, 10:35	19.2
RWT240_Diversion Reach	0.0000000	27.1	01Jan2011, 06:16	22.8
JWT240	3.5413402	51.8	01Jan2011, 10:19	42.0
RWT250	3.5413402	51.8	01Jan2011, 10:20	42.0
WT250	0.1469500	63.0	01Jan2011, 06:03	3.7
JWT250	3.6882902	63.4	01Jan2011, 06:03	45.7
RWT260	3.6882902	61.1	01Jan2011, 06:24	45.4
WT260	0.1388002	9.9	01Jan2011, 06:38	1.9
JWT260	3.8270904	69.2	01Jan2011, 06:24	47.3
RWT291	3.8270904	68.9	01Jan2011, 06:29	47.1
WT270	0.0324738	11.3	01Jan2011, 06:05	0.7
JWT270	0.0324738	11.3	01Jan2011, 06:05	0.7
RWT292	0.0324738	11.2	01Jan2011, 06:11	0.7
JWT292	3.8595642	71.9	01Jan2011, 06:29	47.9
RWT295	3.8595642	71.5	01Jan2011, 06:31	47.8
WT280	0.2669500	33.4	01Jan2011, 06:15	3.7
JWT280	0.2669500	33.4	01Jan2011, 06:15	3.7
RWT294	0.2669500	33.4	01Jan2011, 06:18	3.7
JWT294	4.1265142	94.0	01Jan2011, 06:30	51.5
RWT296	4.1265142	91.9	01Jan2011, 06:40	51.2
MT040	0.3084200	94.6	01Jan2011, 06:13	8.8
MT030	0.1566300	39.0	01Jan2011, 06:06	2.8
MT020	0.0902033	25.8	01Jan2011, 06:05	1.7
JMT020	0.0902033	25.8	01Jan2011, 06:05	1.7
RMT030	0.0902033	25.4	01Jan2011, 06:20	1.7
JMT030	0.2468333	50.1	01Jan2011, 06:10	4.5
RMT040	0.2468333	49.3	01Jan2011, 06:16	4.5
Woodmen Hills Pond H	0.5552533	107.8	01Jan2011, 06:25	13.2
JMT040	0.5552533	107.8	01Jan2011, 06:25	13.2
RMT050	0.5552533	107.4	01Jan2011, 06:28	13.2
MT010	0.2898900	17.3	01Jan2011, 06:28	2.7
The Meadows Pond #2	0.2898900	1.5	01Jan2011, 09:08	1.9
JMT010	0.2898900	1.5	01Jan2011, 09:08	1.9
RMT062	0.2898900	1.5	01Jan2011, 09:48	1.8

CURRENT 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
MT060a	0.0311000	8.3	01Jan2011, 06:04	0.5
School Site	0.3209900	1.5	01Jan2011, 15:29	1.0
JMT060a	0.3209900	1.5	01Jan2011, 15:29	1.0
RMT060a	0.3209900	1.5	01Jan2011, 15:42	1.0
MT050	0.1186100	17.0	01Jan2011, 06:21	2.1
JMT050	0.9948533	123.1	01Jan2011, 06:27	16.3
RMT064	0.9948533	121.2	01Jan2011, 06:40	16.2
MT060	0.1588000	30.7	01Jan2011, 06:10	2.7
Sub Regional Pond SR4	1.1536533	11.2	01Jan2011, 09:34	13.8
JMT060	1.1536533	11.2	01Jan2011, 09:34	13.8
RMT070	1.1536533	11.2	01Jan2011, 09:45	13.7
MT070	0.1994800	26.4	01Jan2011, 06:25	3.7
JMT070	1.3531333	29.0	01Jan2011, 06:26	17.3
RMT080	1.3531333	29.0	01Jan2011, 06:29	17.3
MT080	0.0638371	62.4	01Jan2011, 06:00	3.4
Regional Pond MN	1.4169704	30.9	01Jan2011, 06:37	18.2
JMT080	1.4169704	30.9	01Jan2011, 06:37	18.2
RMT102	1.4169704	30.8	01Jan2011, 06:48	18.0
MT090	0.0435103	39.9	01Jan2011, 06:00	2.1
Woodmen Hills Pond #5	0.0435103	1.4	01Jan2011, 08:02	1.5
JMT090	0.0435103	1.4	01Jan2011, 08:02	1.5
RMT090	0.0435103	1.4	01Jan2011, 08:02	1.5
JMT104	0.0435103	1.4	01Jan2011, 08:02	1.5
RMT104	0.0435103	1.4	01Jan2011, 08:09	1.5
JMT102	1.4604807	32.1	01Jan2011, 06:48	19.6
RMT106	1.4604807	31.8	01Jan2011, 06:51	19.5
MT100	0.0557682	16.5	01Jan2011, 06:06	1.2
JMT106	1.5162489	33.6	01Jan2011, 06:51	20.7
RMT112	1.5162489	33.0	01Jan2011, 07:29	20.0
MT110	0.1163900	18.9	01Jan2011, 06:19	2.2
JMT110	1.6326389	35.8	01Jan2011, 07:29	22.2
RMT114	1.6326389	35.7	01Jan2011, 07:40	22.0
WT290	0.1037800	15.0	01Jan2011, 06:11	1.4
Regional Pond R1	5.8629331	74.9	01Jan2011, 07:54	67.7
JWT296	5.8629331	74.9	01Jan2011, 07:54	67.7
RWT314	5.8629331	74.8	01Jan2011, 08:05	67.1
WT300	0.0970199	12.2	01Jan2011, 06:15	1.3
JWT300	0.0970199	12.2	01Jan2011, 06:15	1.3
RWT312	0.0970199	12.1	01Jan2011, 06:39	1.3
WT310	0.2774200	31.3	01Jan2011, 06:16	3.6

CURRENT 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JWT310	6.2373730	79.8	01Jan2011, 08:05	72.1
RWT320	6.2373730	79.7	01Jan2011, 08:15	71.5
WT320	0.2061400	26.8	01Jan2011, 06:14	2.8
JWT320	6.4435130	82.2	01Jan2011, 08:14	74.3
RWT352	6.4435130	82.1	01Jan2011, 08:26	73.6
ET020	0.2131700	73.4	01Jan2011, 06:07	5.4
ET010	0.1451300	37.5	01Jan2011, 06:12	3.5
Paint Brush Hills Pond #4	0.1451300	29.4	01Jan2011, 06:21	3.5
JET010	0.1451300	29.4	01Jan2011, 06:21	3.5
RET020	0.1451300	29.3	01Jan2011, 06:37	3.5
Sub Regional Pond SR6	0.3583000	9.3	01Jan2011, 07:43	7.9
JET020	0.3583000	9.3	01Jan2011, 07:43	7.9
RET030	0.3583000	9.3	01Jan2011, 08:37	7.6
ET030	0.2042800	44.9	01Jan2011, 06:17	4.9
JET030	0.5625800	44.9	01Jan2011, 06:17	12.5
RET040	0.5625800	44.6	01Jan2011, 06:30	12.4
Woodmen Hills Pond #1 ...	0.7117200	60.8	01Jan2011, 06:33	15.4
ET040	0.1491400	27.9	01Jan2011, 06:16	3.0
Woodmen Hills Pond #1 ...	0.7117200	9.6	01Jan2011, 12:57	12.0
JET040	0.7117200	9.6	01Jan2011, 12:57	12.0
RET050	0.7117200	9.6	01Jan2011, 13:08	11.8
ET050	0.1171900	36.5	01Jan2011, 06:03	2.2
Woodmen Hills Pond #2	0.8289100	10.4	01Jan2011, 13:06	12.5
JET050	0.8289100	10.4	01Jan2011, 13:06	12.5
RET060	0.8289100	10.4	01Jan2011, 13:21	12.3
ET060	0.2854300	105.0	01Jan2011, 06:02	5.8
Woodmen Hills Pond #3	1.1143400	12.6	01Jan2011, 13:03	15.7
JET060	1.1143400	12.6	01Jan2011, 13:03	15.7
RET070	1.1143400	12.6	01Jan2011, 13:18	15.5
ET070	0.2497500	93.5	01Jan2011, 06:03	5.7
JET070	1.3640900	93.6	01Jan2011, 06:03	21.2
RET080	1.3640900	64.9	01Jan2011, 06:31	20.7
ET080	0.2916400	113.3	01Jan2011, 06:08	8.7
Woodmen Hills Pond #4	1.6557300	9.8	02Jan2011, 00:00	12.0
JET080	1.6557300	9.8	02Jan2011, 00:00	12.0
RET090	1.6557300	9.8	02Jan2011, 00:00	11.9
ET090	0.1242400	26.0	01Jan2011, 06:24	3.3
JET090	1.7799700	29.2	01Jan2011, 06:25	15.3
RET100	1.7799700	29.1	01Jan2011, 06:30	15.2
ET100	0.0480615	11.4	01Jan2011, 06:02	0.7

CURRENT 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JET100	1.8280315	30.6	01Jan2011, 06:30	15.8
RET110	1.8280315	30.6	01Jan2011, 06:38	15.7
ET110	0.2260300	24.0	01Jan2011, 06:15	2.7
JET110	2.0540615	41.4	01Jan2011, 06:32	18.4
RET120	2.0540615	41.4	01Jan2011, 06:39	18.2
ET120	0.1091300	10.7	01Jan2011, 06:17	1.3
JET120	2.1631915	49.7	01Jan2011, 06:21	19.5
RET152	2.1631915	49.5	01Jan2011, 06:29	19.4
ET130	0.1348100	10.9	01Jan2011, 06:31	1.8
JET130	0.1348100	10.9	01Jan2011, 06:31	1.8
RET140	0.1348100	10.9	01Jan2011, 07:06	1.8
ET140	0.2675900	15.9	01Jan2011, 06:51	3.6
JET140	0.4024000	25.8	01Jan2011, 07:01	5.5
RET154	0.4024000	25.7	01Jan2011, 07:27	5.4
JET152	2.5655915	53.7	01Jan2011, 07:01	24.8
RET156	2.5655915	53.5	01Jan2011, 07:06	24.7
ET150	0.1777300	17.0	01Jan2011, 06:21	2.3
JET154	2.7433215	62.3	01Jan2011, 06:34	27.0
RET162	2.7433215	59.6	01Jan2011, 07:07	26.4
ET160	0.1889200	18.6	01Jan2011, 06:26	2.8
JET160	2.9322415	66.8	01Jan2011, 07:06	29.2
RET164	2.9322415	66.5	01Jan2011, 07:12	29.1
WT350	0.3037700	38.3	01Jan2011, 06:17	4.5
JWT352	9.6795245	134.6	01Jan2011, 08:21	107.2
RWT354	9.6795245	134.6	01Jan2011, 08:21	107.2
WT330	0.3266800	32.2	01Jan2011, 06:23	4.5
JWT330	0.3266800	32.2	01Jan2011, 06:23	4.5
RWT344	0.3266800	32.0	01Jan2011, 06:34	4.5
WT340	0.2780000	18.9	01Jan2011, 06:42	3.8
JWT354	10.2842045	143.4	01Jan2011, 08:20	115.4
RWT372	10.2842045	143.3	01Jan2011, 08:26	115.0
WT360	0.0656830	6.9	01Jan2011, 06:18	0.8
JWT360	0.0656830	6.9	01Jan2011, 06:18	0.8
RWT374	0.0656830	6.9	01Jan2011, 06:36	0.8
Regional Pond R2	10.3498875	143.9	01Jan2011, 08:27	112.6
JWT372	10.3498875	143.9	01Jan2011, 08:27	112.6
RWT376	10.3498875	143.7	01Jan2011, 08:37	111.8
WT370	0.2147600	7.2	01Jan2011, 06:17	1.2
JWT374_OUTLET	10.5646475	144.5	01Jan2011, 08:37	113.0
FS010	0.1220000	6.3	01Jan2011, 06:20	1.0

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 2-yr Reservoir: School Site

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	2-yr
Compute Time:	22Jan2021, 17:09:00	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	8.3 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:04
Peak Outflow :	1.5 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 15:29
Total Inflow :	2.4 (AC-FT)	Peak Storage :	1.3 (AC-FT)
Total Outflow :	1.0 (AC-FT)	Peak Elevation :	6957.0 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 2-yr Reservoir: Sub Regional Pond SR4

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	2-yr
Compute Time:	22Jan2021, 17:09:00	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	128.2 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:40
Peak Outflow :	11.2 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 09:34
Total Inflow :	18.9 (AC-FT)	Peak Storage :	8.9 (AC-FT)
Total Outflow :	13.8 (AC-FT)	Peak Elevation :	6891.4 (FT)

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 2-yr Reservoir: Regional Pond MN

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	2-yr
Compute Time:	22Jan2021, 17:09:00	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

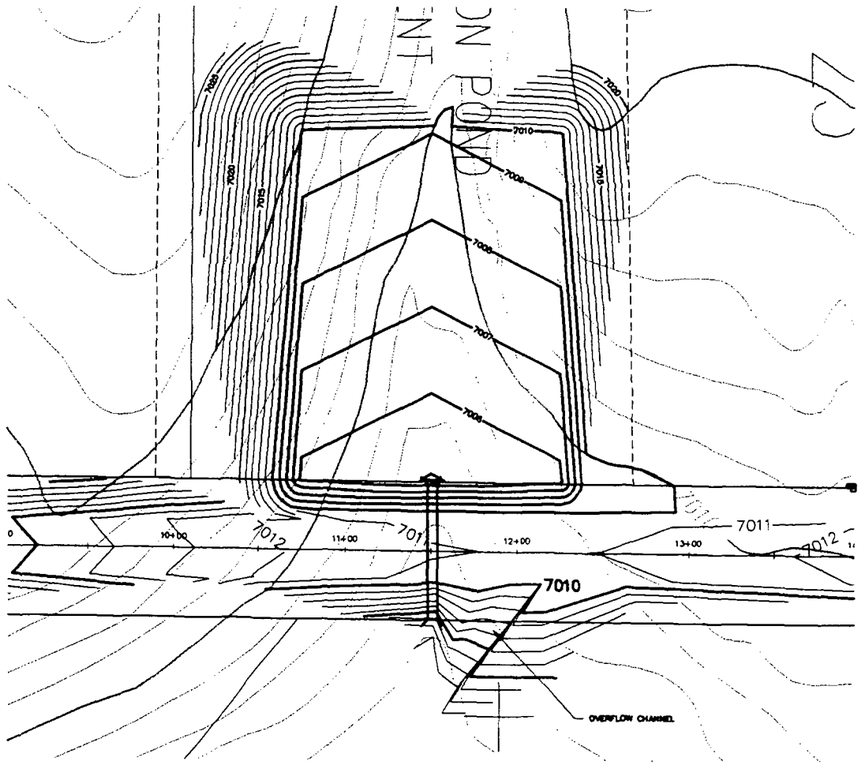
Peak Inflow :	64.9 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:01
Peak Outflow :	30.9 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:37
Total Inflow :	20.7 (AC-FT)	Peak Storage :	2.6 (AC-FT)
Total Outflow :	18.2 (AC-FT)	Peak Elevation :	6851.5 (FT)

tmp#2.txt

Pond 1
100 year, 24 hour storm

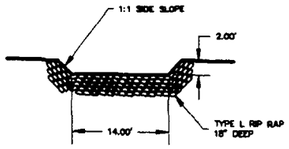
Basin Output

Pond Name ..... D:\Land Projects\meadows\hd\pond1.ssc
Distribution Type ..... Type II
Frequency Type ..... 100 years
Area 0.1180 mi2
Peak Inflow ..... 85.4110 cfs
Peak Outflow ..... 69.9000 cfs
Runoff ..... 1.7500 in
Runoff Volume 479929.5062 ft3
Storage Volume 81307.9403 ft3
Maximum Storage Elevation ..... 7010.0000 ft

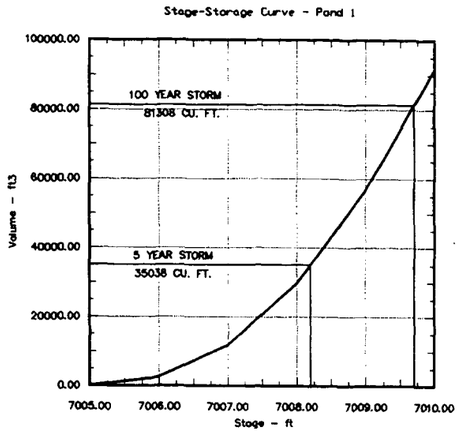


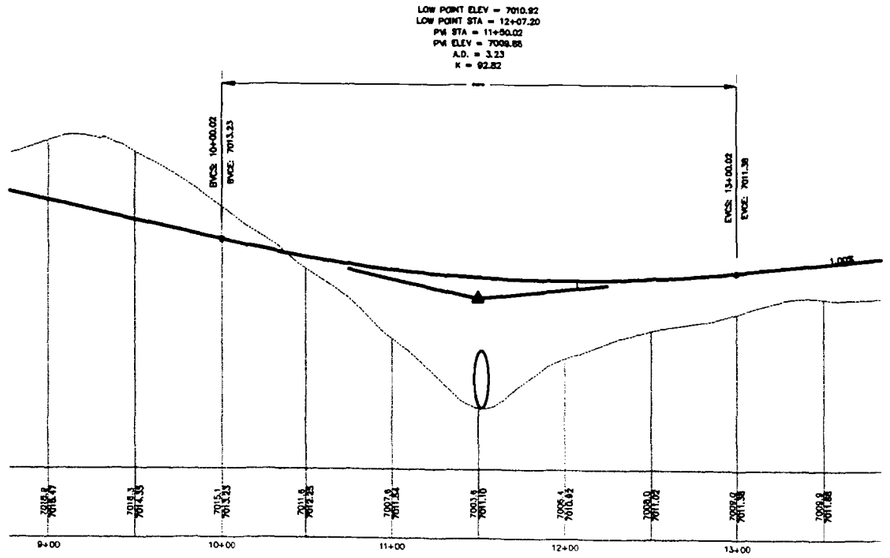
GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

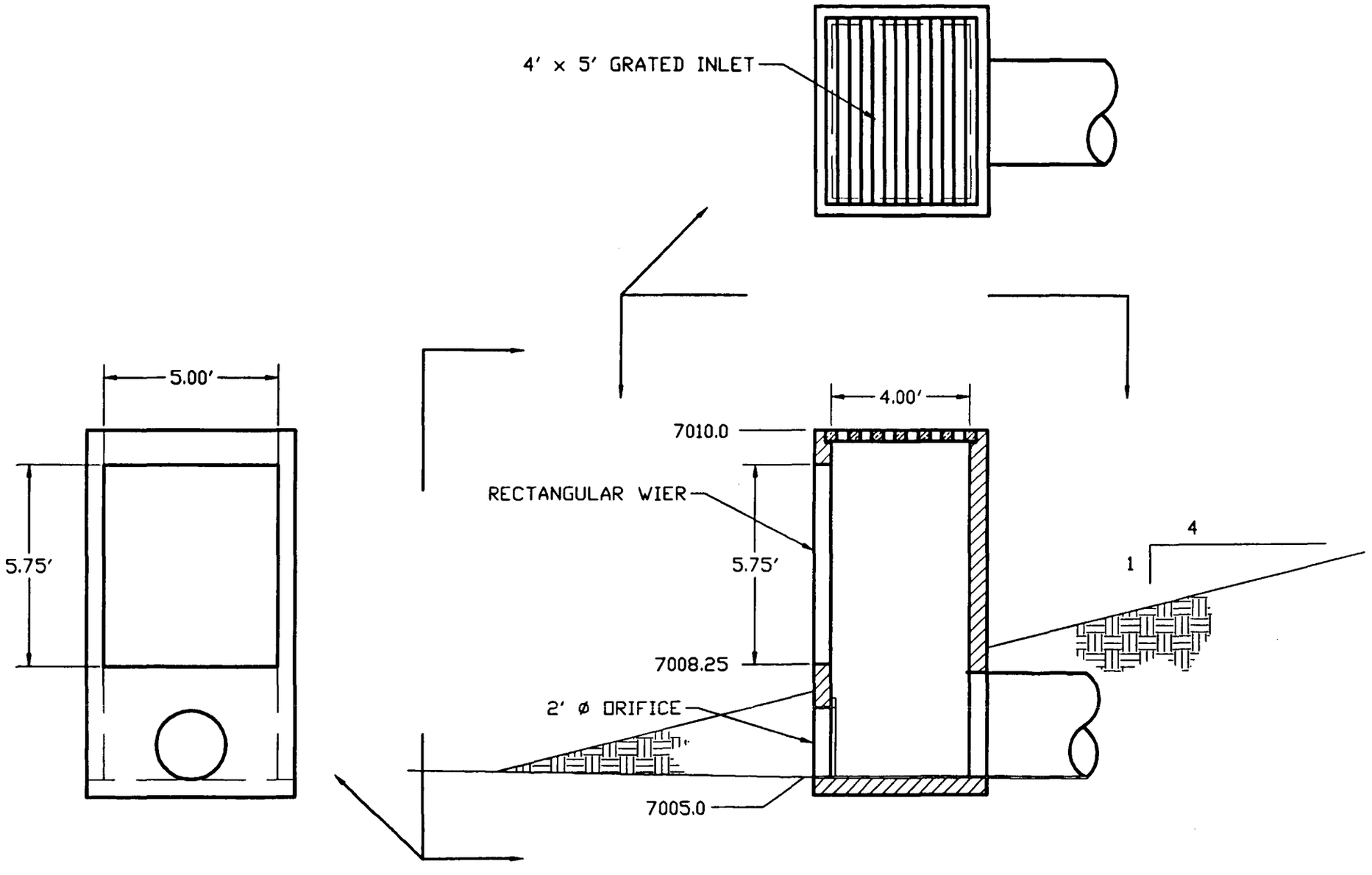


POND 1
OVERFLOW CHANNEL
CROSS SECTION





	ADD ENGINEERING CONSULTING ENGINEERS LAND SURVEYORS BUSINESS (719) 963-1127
	THE MEADOWS FILING NUMBER THREE
PROJECT NO.:	DETENTION POND 1
DESIGN: FL,DZ DRAFTING: DZ CHECKED:	DATE: 05-24-00 DWG. NO. 1 OF 1



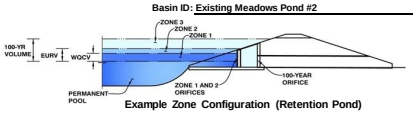
POND 1
OUTLET STRUCTURE

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Meridian Road

Basin ID: Existing Meadows Pond #2



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	186.00	acres	
Watershed Length =	3,000	ft	
Watershed Slope =	0.020	ft/ft	
Watershed Imperviousness =	11.00%	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	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	1.125	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	1.544	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	1.005	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.374	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.809	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	2.654	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.704	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.67 in.) =	9.173	acre-feet	2.67 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	21.246	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.929	acre-feet	
Approximate 5-yr Detention Volume =	1.272	acre-feet	
Approximate 10-yr Detention Volume =	1.667	acre-feet	
Approximate 25-yr Detention Volume =	2.243	acre-feet	
Approximate 50-yr Detention Volume =	2.963	acre-feet	
Approximate 100-yr Detention Volume =	4.948	acre-feet	

Stage-Storage Calculation

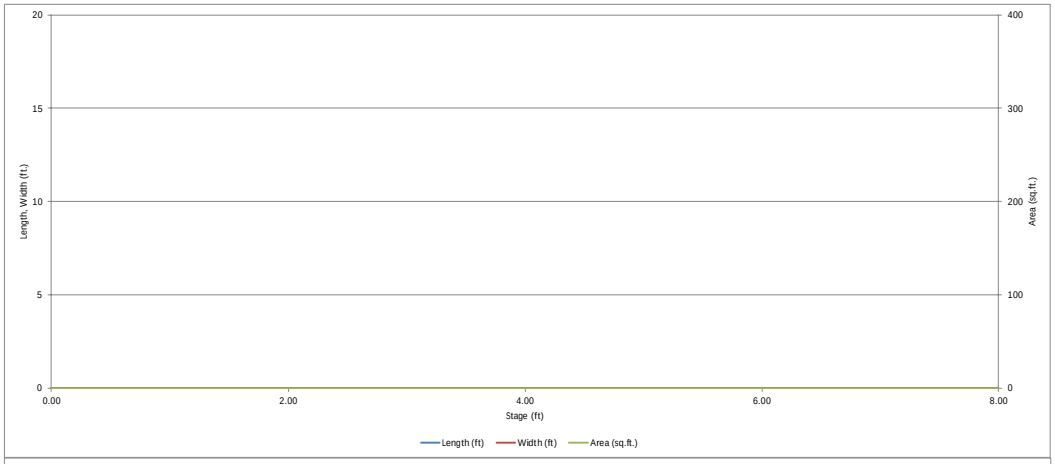
Zone 1 Volume (WQCV) =	1.125	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	**Total detention volume is less than 100-year volume.**
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	1.125	acre-feet	
Initial Surcharge Volume (ISV) =	user	ft^3	
Initial Surcharge Depth (ISD) =	user	ft	
Total Available Detention Depth (H_{total}) =	user	ft	
Depth of Trickle Channel (H_{TC}) =	user	ft	
Slope of Trickle Channel (S_{TC}) =	user	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	user	H:V	
Basin Length-to-Width Ratio ($R_{L/W}$) =	user		
Initial Surcharge Area (A_{ISV}) =	user	ft^2	
Surcharge Volume Length (L_{ISV}) =	user	ft	
Surcharge Volume Width (W_{ISV}) =	user	ft	
Depth of Basin Floor (H_{FLOOR}) =	user	ft	
Length of Basin Floor (L_{FLOOR}) =	user	ft	
Width of Basin Floor (W_{FLOOR}) =	user	ft	
Area of Basin Floor (A_{FLOOR}) =	user	ft^2	
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3	
Depth of Main Basin (H_{MAIN}) =	user	ft	
Length of Main Basin (L_{MAIN}) =	user	ft	
Width of Main Basin (W_{MAIN}) =	user	ft	
Area of Main Basin (A_{MAIN}) =	user	ft^2	
Volume of Main Basin (V_{MAIN}) =	user	ft^3	
Calculated Total Basin Volume (V_{total}) =	user	acre-feet	

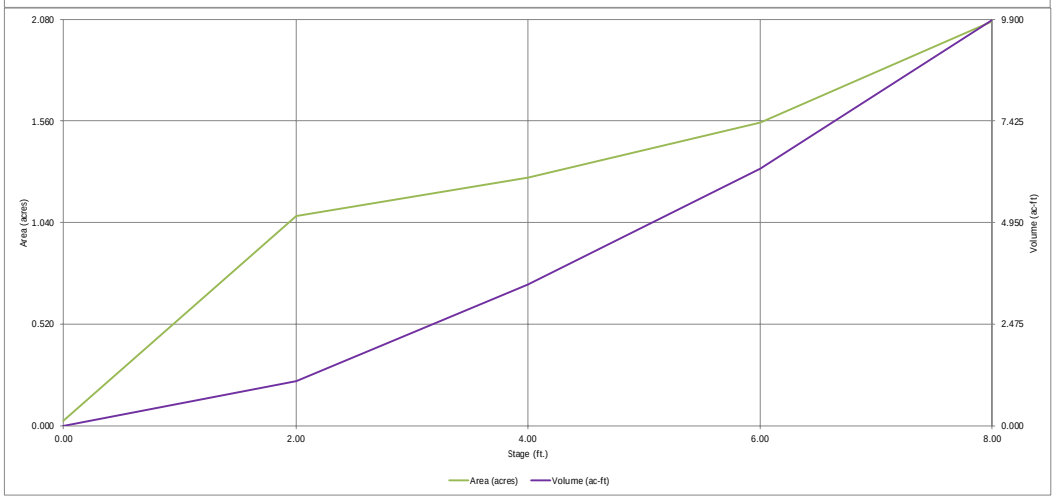
Depth Increment = User ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	1,202	0.028		
7006	--	2.00	--	--	--	46,729	1.073	47,465	1.090
7008	--	4.00	--	--	--	55,287	1.269	149,947	3.442
7010	--	6.00	--	--	--	67,516	1.550	272,750	6.261
7012	--	8.00	--	--	--	90,179	2.070	430,445	9.882

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



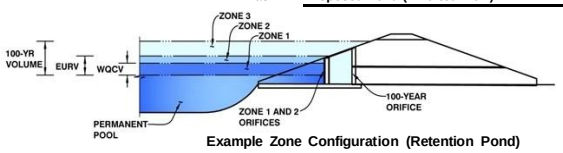


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Meridian Road

Basin ID: Proposed Pond (Diverted Flow)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.03	1.125	Orifice Plate
Zone 2			
Zone 3			
		1.125	Total

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.17	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.563E-02	ft²
Depth at top of Zone using Orifice Plate =	2.67	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 =	6.57	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft²

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)	0.17	0.50	0.83	1.17	1.50	1.83	2.17	2.50
Orifice Area (sq. inches)	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	5.30		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.24		ft²
Depth at top of Zone using Vertical Orifice =	6.50		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.28		feet
Vertical Orifice Diameter =	6.68		inches				

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

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.00		feet
Overflow Weir Front Edge Length =	5.50		feet	Over Flow Weir Slope Length =	7.50		feet
Overflow Weir Slope =	0.00		H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Horiz. Length of Weir Sides =	7.50		feet	Overflow Grate Open Area w/o Debris =	28.88		ft²
Overflow Grate Open Area % =	70%		%, grate open area/total area	Overflow Grate Open Area w/ Debris =	14.44		ft²
Debris Clogging % =	50%		%				

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

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

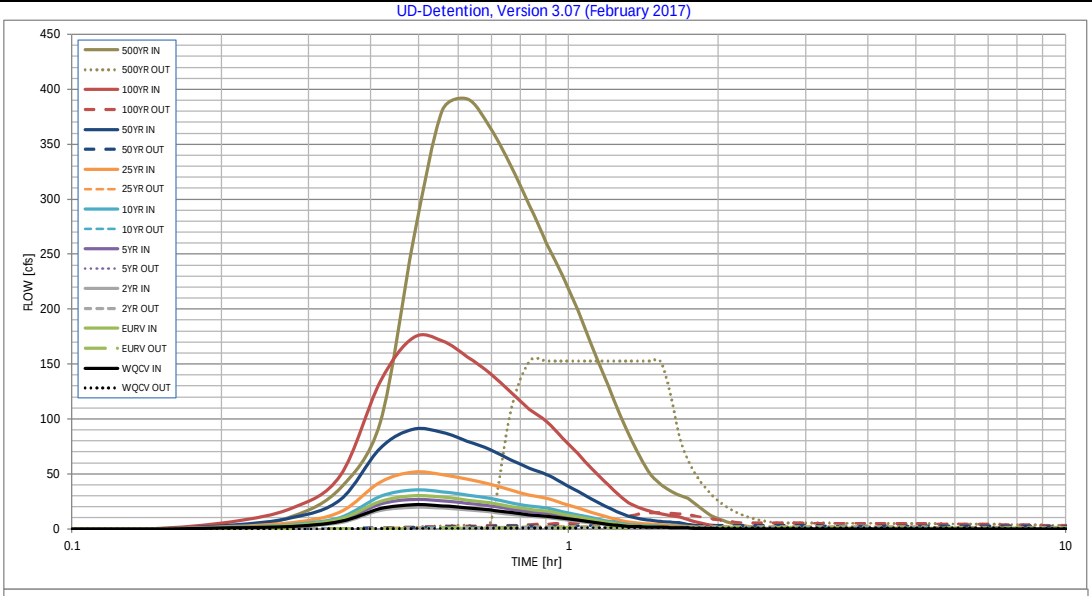
			Calculated Parameters for Spillway		
Spillway Invert Stage=	7.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	2.07	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	10.07	feet
Spillway End Slopes =	0.17	H:V	Basin Area at Top of Freeboard =	2.07	acres
Freeboard above Max Water Surface =	1.00	feet			

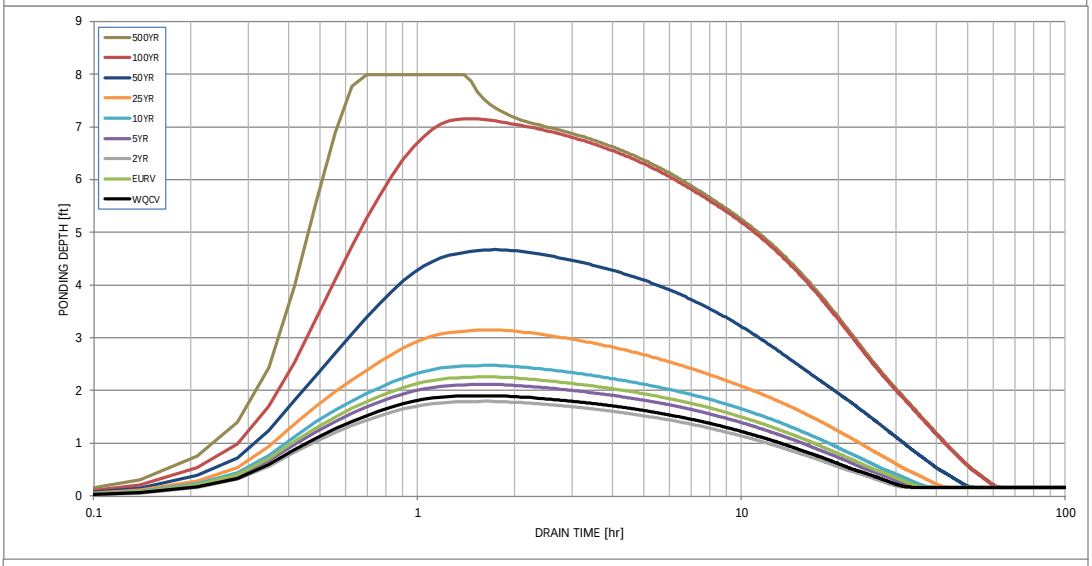
Routed Hydrograph Results

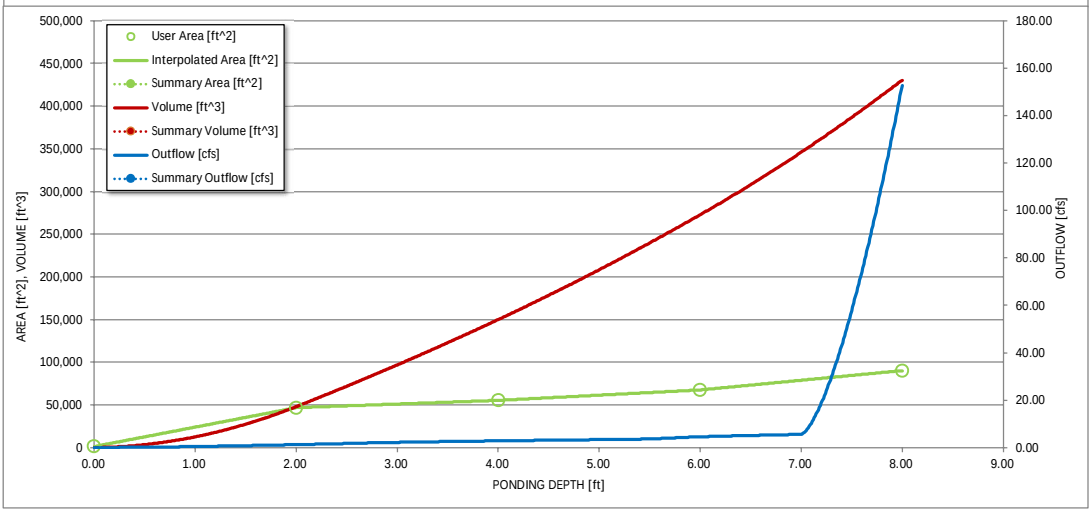
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.67	3.68
Calculated Runoff Volume (acre-ft) =	1.125	1.544	1.005	1.374	1.809	2.654	4.704	9.173	21.246
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.124	1.542	1.004	1.373	1.808	2.652	4.701	9.160	21.230
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.03	0.25	0.65	1.59
Predevelopment Peak Q (cfs) =	0.0	0.0	0.2	1.2	2.9	6.4	47.4	121.1	296.4
Peak Inflow Q (cfs) =	22.2	30.4	19.9	27.1	35.6	51.9	91.1	174.5	391.6
Peak Outflow Q (cfs) =	1.2	1.5	1.0	1.3	1.7	2.3	3.2	14.8	152.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.6	0.4	0.1	0.1	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Spillway	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0.2	-0.2
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) =	28	30	27	29	30	32	37	43	36
Time to Drain 99% of Inflow Volume (hours) =	>120	35	>120	34	36	39	44	51	45
Maximum Ponding Depth (ft) =	1.91	2.26	1.80	2.12	2.48	3.15	4.68	7.16	8.00
Area at Maximum Ponding Depth (acres) =	1.02	1.10	0.96	1.08	1.12	1.19	1.36	1.85	2.07
Maximum Volume Stored (acre-ft) =	0.996	1.383	0.887	1.230	1.627	2.399	4.324	8.216	9.882

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

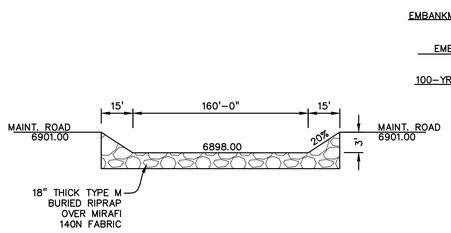
Outflow Hydrograph Workbook Filename: _____

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

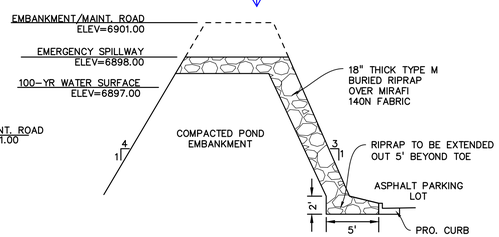
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.17 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:08:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:12:31	0.97	1.32	0.87	1.18	1.53	2.21	3.74	6.52	11.53
1.198	0:16:41	2.63	3.58	2.36	3.20	4.18	6.06	10.44	19.06	37.39
	0:20:51	6.77	9.21	6.06	8.22	10.74	15.57	26.82	48.95	96.79
	0:25:01	18.58	25.28	16.66	22.57	29.49	42.73	73.50	133.84	263.09
	0:29:11	22.24	30.40	19.90	27.09	35.56	51.90	91.10	174.48	380.73
	0:33:22	21.25	29.09	19.01	25.91	34.04	49.75	87.83	171.02	391.60
	0:37:32	19.35	26.48	17.31	23.59	30.98	45.28	80.06	156.91	365.27
	0:41:42	17.33	23.74	15.49	21.14	27.81	40.71	72.14	141.58	330.76
	0:45:52	15.01	20.61	13.41	18.34	24.15	35.48	63.16	124.59	294.71
	0:50:02	13.06	17.91	11.67	15.94	20.98	30.89	55.17	109.08	260.03
	0:54:13	11.84	16.24	10.58	14.46	19.03	27.97	49.76	97.81	230.44
	0:58:23	9.82	13.51	8.77	12.02	15.86	23.36	41.76	82.89	199.17
	1:02:33	8.06	11.12	7.19	9.88	13.07	19.30	34.63	68.95	167.84
	1:06:43	6.26	8.69	5.58	7.70	10.23	15.20	27.49	55.31	138.06
	1:10:53	4.72	6.58	4.19	5.82	7.78	11.65	21.27	43.15	110.53
	1:15:04	3.42	4.82	3.03	4.25	5.71	8.62	15.92	32.65	86.77
	1:19:14	2.63	3.67	2.33	3.25	4.34	6.51	11.92	24.16	65.97
	1:23:24	2.15	3.00	1.92	2.66	3.54	5.27	9.56	19.19	50.11
	1:27:34	1.82	2.53	1.62	2.25	2.99	4.45	8.04	16.08	40.94
	1:31:44	1.60	2.22	1.42	1.97	2.61	3.88	6.99	13.92	34.89
	1:35:55	1.44	1.99	1.28	1.77	2.34	3.47	6.25	12.40	30.73
	1:40:05	1.32	1.83	1.18	1.62	2.15	3.19	5.72	11.32	27.73
	1:44:15	0.97	1.35	0.86	1.19	1.59	2.36	4.28	8.67	22.24
	1:48:25	0.71	0.98	0.63	0.87	1.16	1.71	3.10	6.24	16.21
	1:52:35	0.52	0.72	0.47	0.64	0.85	1.26	2.29	4.63	11.86
	1:56:46	0.39	0.54	0.34	0.47	0.63	0.94	1.70	3.44	8.85
	2:00:56	0.28	0.39	0.25	0.34	0.46	0.68	1.25	2.54	6.60
	2:05:06	0.20	0.28	0.18	0.24	0.32	0.49	0.90	1.84	4.87
	2:09:16	0.14	0.20	0.13	0.18	0.24	0.35	0.65	1.33	3.55
	2:13:26	0.10	0.14	0.08	0.12	0.16	0.24	0.46	0.95	2.63
	2:17:37	0.06	0.08	0.05	0.07	0.10	0.16	0.30	0.63	1.85
	2:21:47	0.03	0.04	0.03	0.04	0.05	0.09	0.17	0.37	1.21
	2:25:57	0.01	0.02	0.01	0.01	0.02	0.04	0.08	0.18	0.70
	2:30:07	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.06	0.33
	2:34:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
	2:38:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:42:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:46:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:59:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:03:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:07:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:11:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:24:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:28:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:36:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:41:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:49:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:53:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:14:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:18:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:26:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:31:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:39:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:43:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:47:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:51:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:56:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

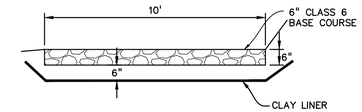
See conditions



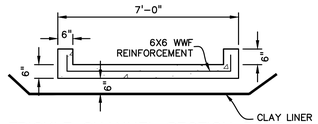
SPILLWAY SECTION A1–A1
NO SCALE



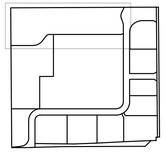
SPILLWAY SECTION A2–A2
NO SCALE



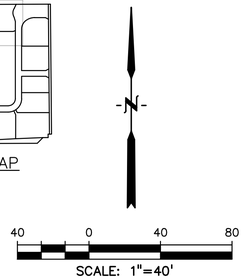
STABILIZED ACCESS SECTION D1–D1
NO SCALE



TRICKLE CHANNEL SECTION B1–B1
NO SCALE

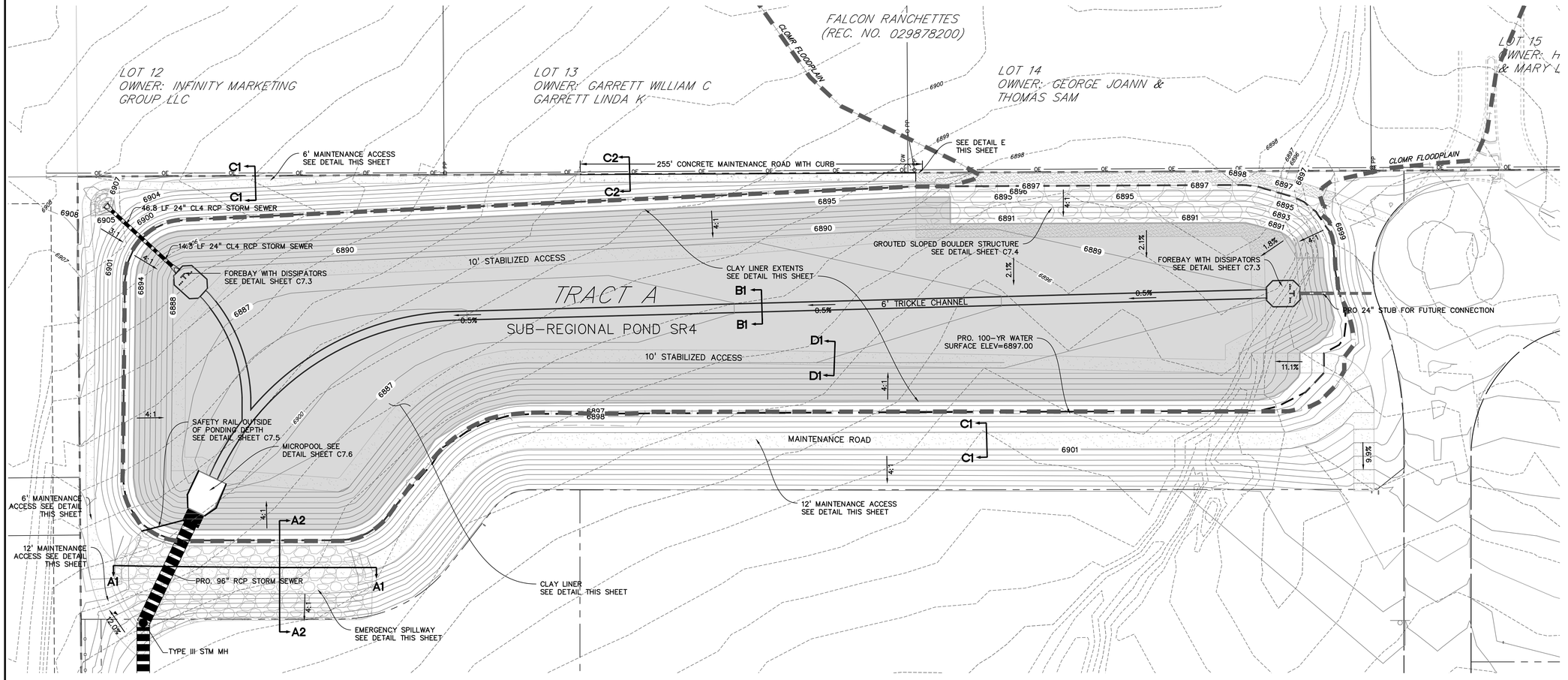


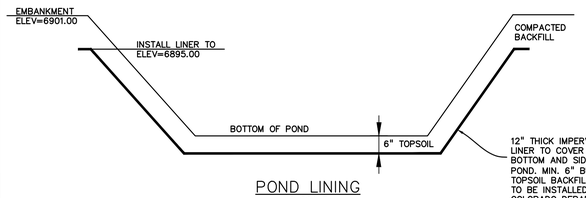
KEY MAP
NTS



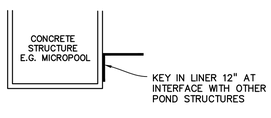
LEGEND

- PROPERTY LINE
- LOT LINE
- CURB & GUTTER
- SIDEWALK
- PRO. WATER LINE
- PRO. FIRE HYDRANT
- PRO. RAW WATER
- PRO. SANITARY SEWER
- PRO. STORM SEWER
- EX. OVERHEAD ELECTRIC — OE
- EX. SANITARY SEWER — SS
- EX. GAS — G

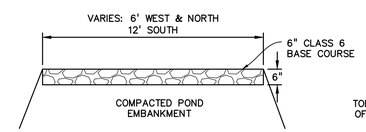




POND LINING
NO SCALE

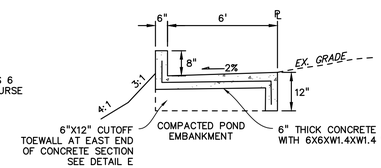


POND LINING INTERFACE
NO SCALE



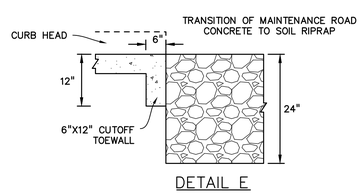
THIS SECTION C1–C1 APPLIES TO ALL AREAS OF MAINTENANCE ROAD EXCEPT THAT PORTION DETAILED BY SECTION C2–C2

MAINTENANCE ROAD SECTION C1–C1
NO SCALE



THIS SECTION C2–C2 REFERS TO A PORTION OF MAINTENANCE ROAD BEGINNING AT THE EAST EDGE OF THE GROUTED RIPRAP FOR A LENGTH OF 250-LF EAST ALONG THE NORTH PROPERTY LINE

MAINTENANCE ROAD SECTION C2–C2
NO SCALE



DETAIL E
NO SCALE

EPC 10/20/2020

EL PASO COUNTY FILE NO: SP-17-001
CDR-16-007

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

OVERLOT GRADING, POND SR4 & UTILITY
CONSTRUCTION DRAWINGS FOR

FALCON MARKETPLACE

FALCON, COLORADO

ISSUE	DATE
1ST SUBMITTAL	6-20-17
RESUBMITTAL	9-6-18
REVISED	7-24-20

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=40'
VERTICAL: N/A

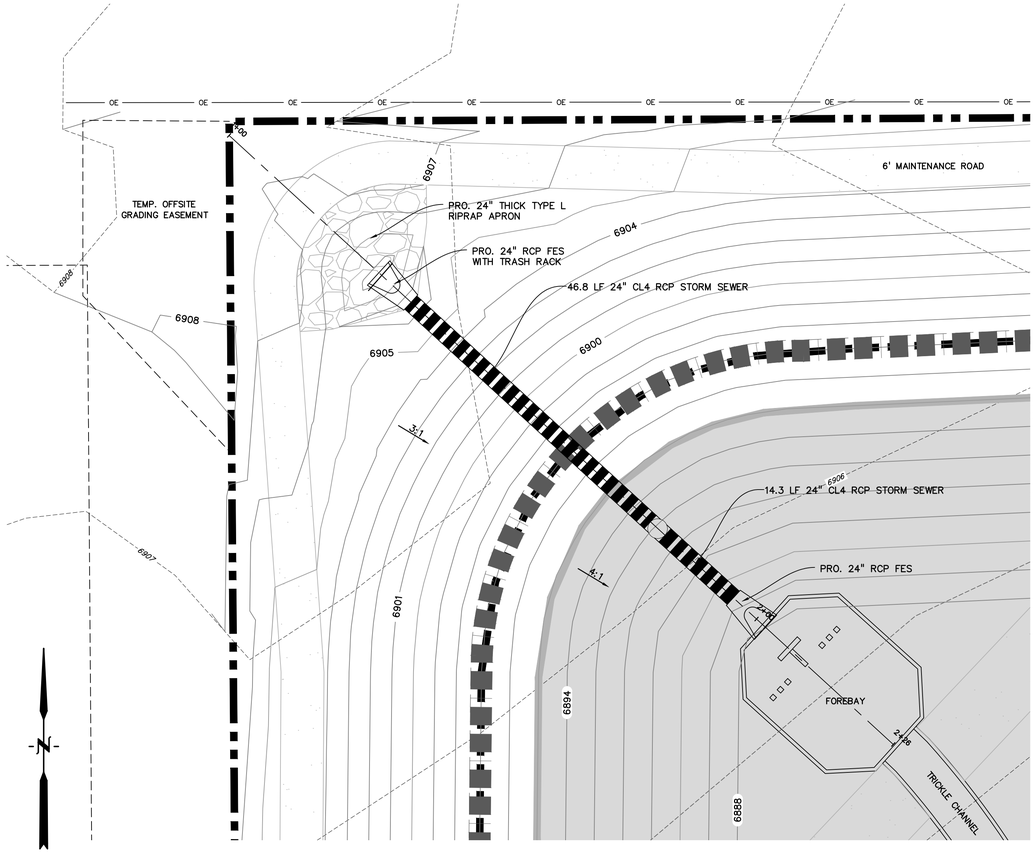
SUB-REGIONAL POND #1 (SR4)

PROJECT NO. 20988-00CSCV

DRAWING NO.

C7.2

SHEET: 9 OF 12

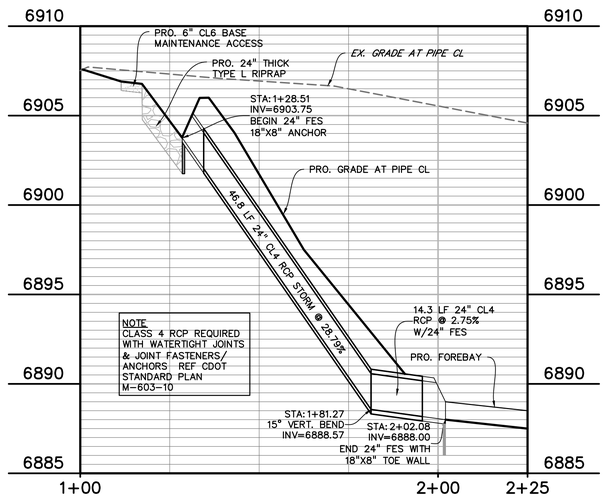


10 0 10 20

SCALE: 1"=10'

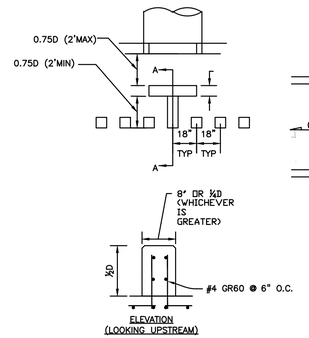
NORTHWEST DRAIN PLAN

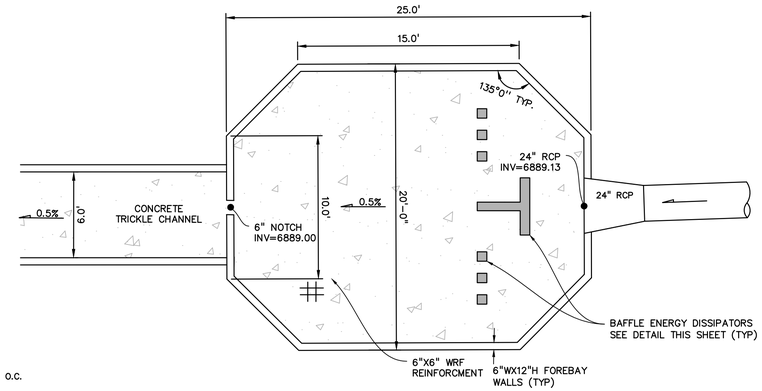
1"=10'



NORTHWEST DRAIN PROFILE

1"=20'



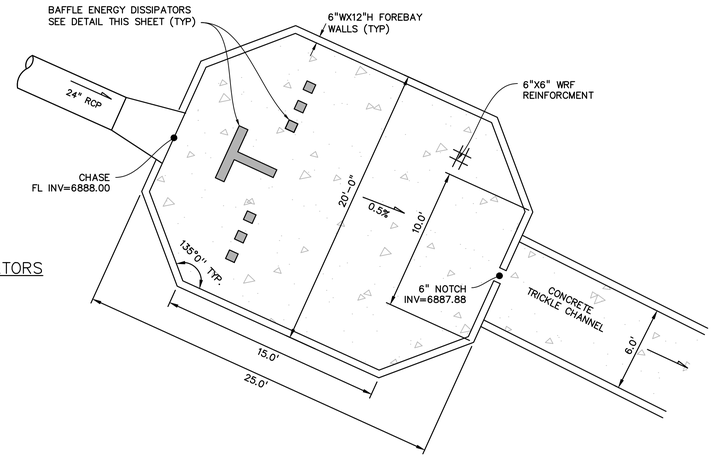


EAST FOREBAY

NO SCALE

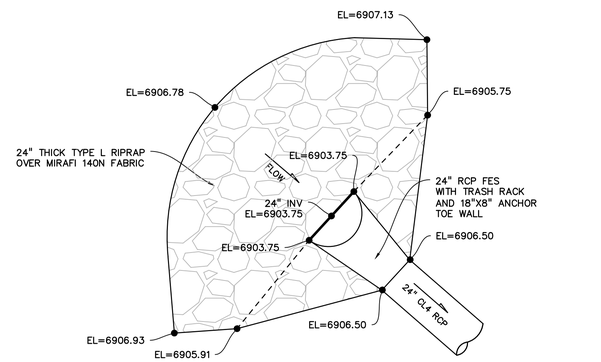
FOREBAY BAFFLE ENERGY DISSIPATORS

NO SCALE



NORTHWEST FOREBAY

NO SCALE



NORTHWEST RIPRAP APRON

NO SCALE

EPC 10/20/2020

EL PASO COUNTY FILE NO: SP-17-001
CDR-16-007

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
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CLIENT:

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8117 PRESTON ROAD, SUITE 120
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OVERLOT GRADING, POND SR4 & UTILITY CONSTRUCTION DRAWINGS FOR

FALCON MARKETPLACE

FALCON, COLORADO

ISSUE	DATE
1ST SUBMITTAL	6-20-17
RESUBMITTAL	9-6-18
REVISED	7-24-20

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED PROFESSIONAL ENGINEER TIMOTHY D. McCONNELL 33797 9-28-20

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: N/A
VERTICAL: N/A

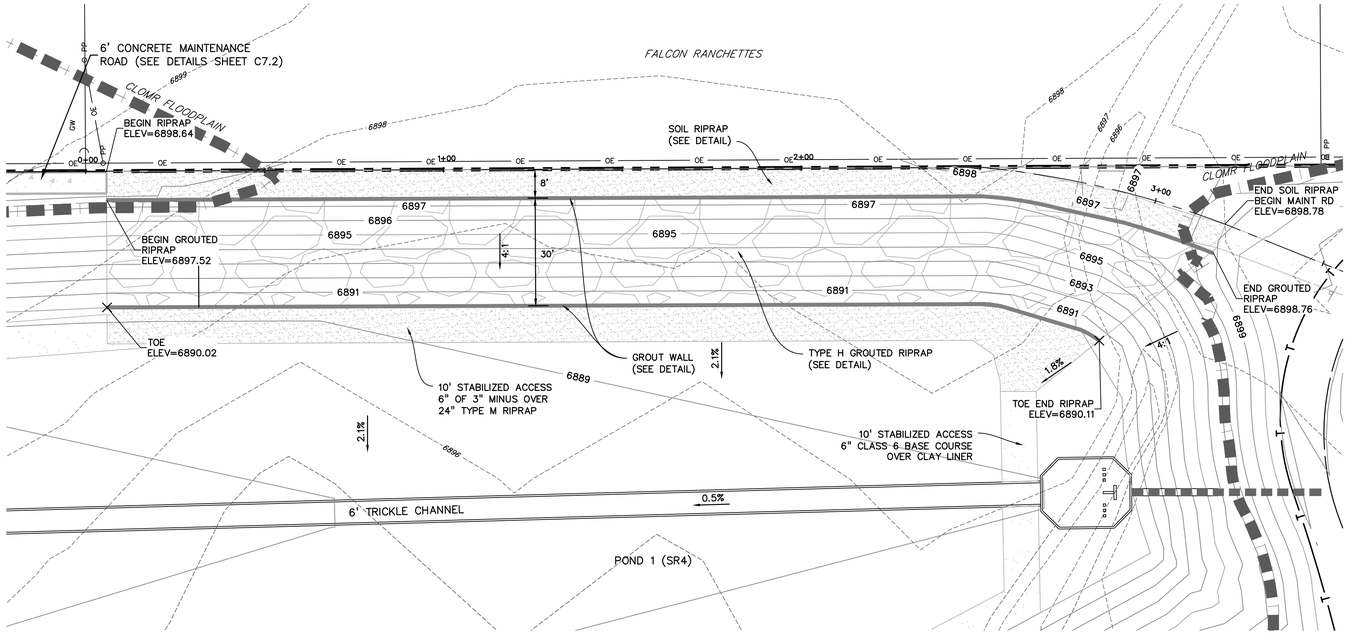
POND #1 (SR4) DETAILS

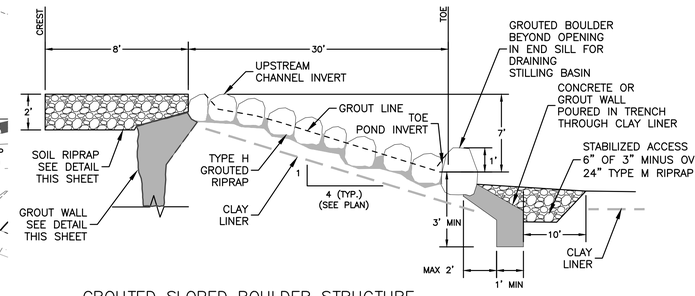
PROJECT NO. 20988-00CSCV

DRAWING NO.

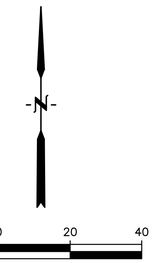
C7.3

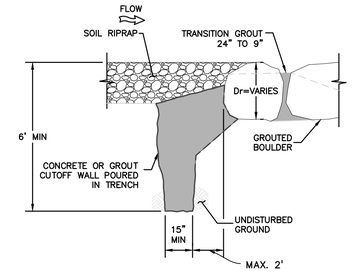
SHEET: 10 OF 12



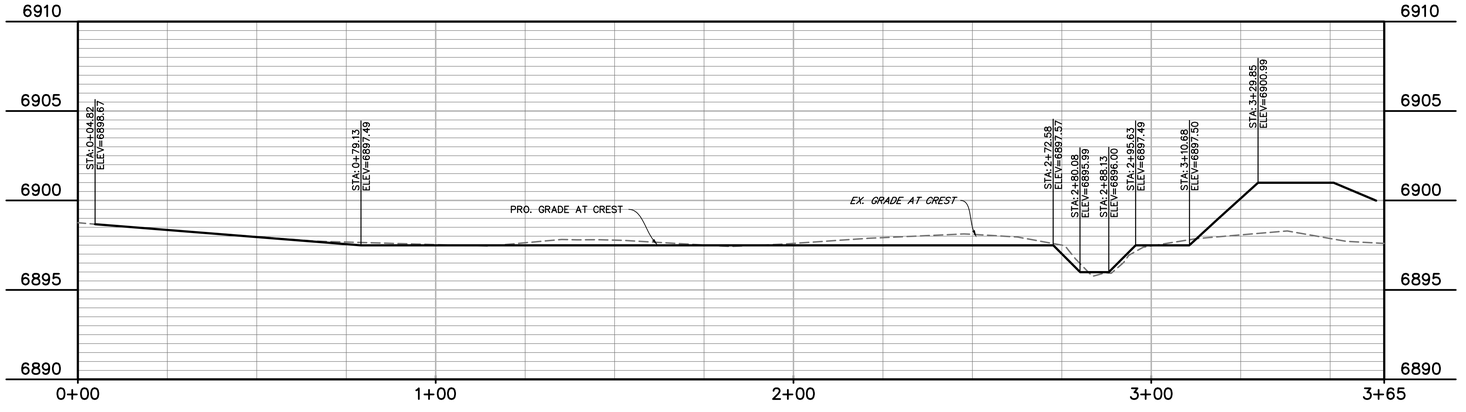


GROUTED SLOPED BOULDER STRUCTURE
NO SCALE

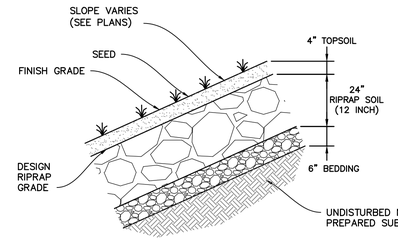




GROUT WALL CONNECTION TRENCHED VERTICAL WALL UPSTREAM OF DROP



CREST PROFILE



SOIL RIPRAP
N.T.S

NOTE

REFERENCE UDFCD SPECIFICATION SECTIONS 31 37 00 AND 31 37 19 FOR GROUT, BOULDER AND RIPRAP SPECIFICATIONS, REINFORCEMENT AND INSTALLATION GUIDELINES.

EPC 10/20/2020

EL PASO COUNTY FILE NO: SP-17-001
CDR-16-007

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
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OVERLOT GRADING, POND SR4 & UTILITY CONSTRUCTION DRAWINGS FOR

FALCON MARKETPLACE

FALCON, COLORADO

ISSUE	DATE
1ST SUBMITTAL	6-20-17
RESUBMITTAL	9-6-18
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DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED 33797 PROFESSIONAL ENGINEER 8-28-20

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=20'
VERTICAL: N/A

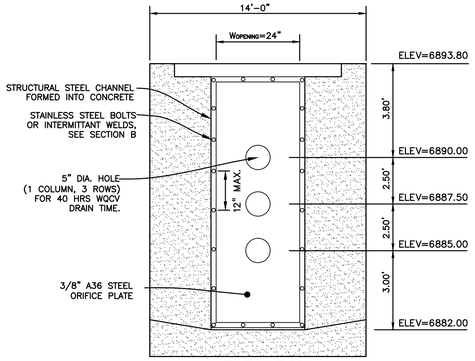
POND #1 (SR4) GROUTED DROP DETAILS

PROJECT NO. 20988-00CSCV

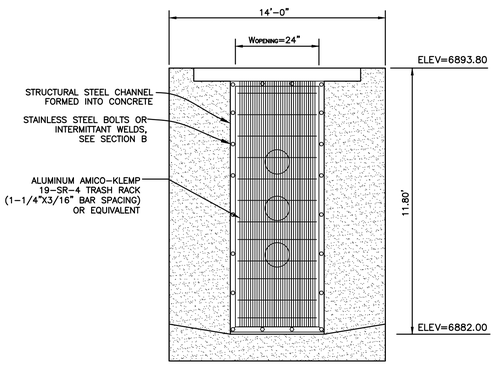
DRAWING NO.

C7.4

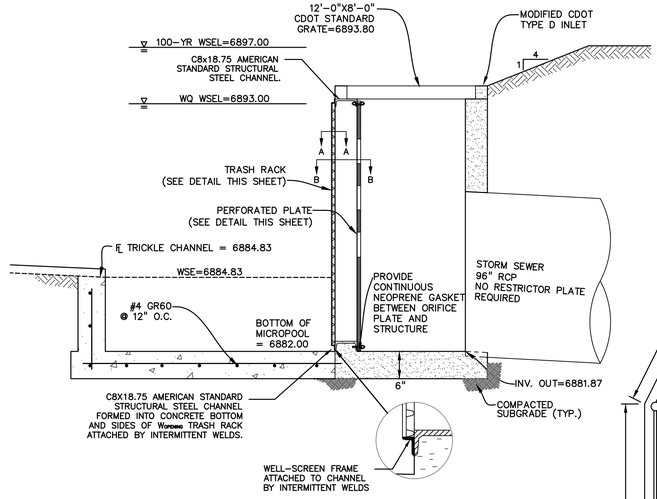
SHEET: 11 OF 12



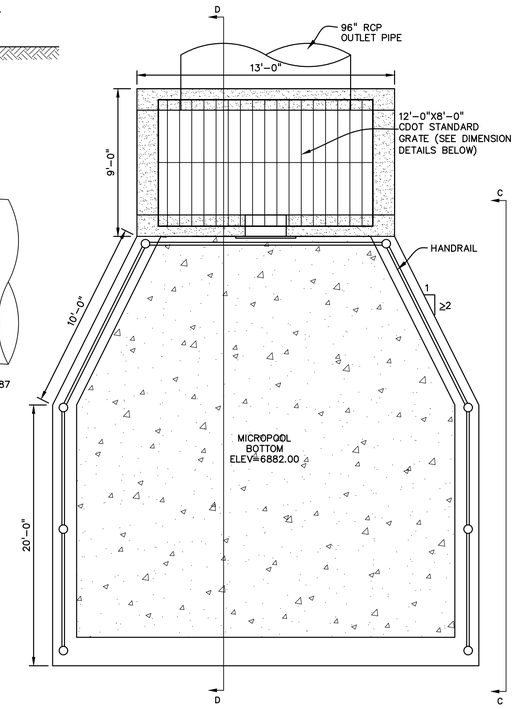
ELEVATION
PERFORATED PLATE DETAIL
NO SCALE



ELEVATION
TRASH RACK
NO SCALE



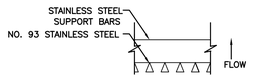
POND OUTLET PROFILE SECTION D-D
NO SCALE



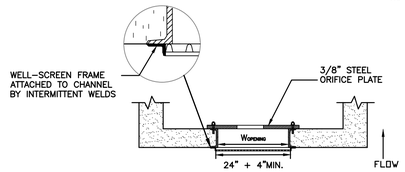
POND OUTLET
NO SCALE

PERFORATED PLATE NOTES:

1. PROVIDE NEOPRENE GASKET MATERIAL OR GROUT BETWEEN THE ORIFICE PLATE AND CONCRETE.
2. BOLT PLATE TO CONCRETE @ 12" MAX. ON CENTER. ORIFICE PLATE IS TO BE REMOVABLE.
3. ALL NON STAINLESS STEEL SURFACES ARE TO BE COATED WITH ZRC COLD GALVANIZING COMPOUND.



SECTION A-A
NO SCALE



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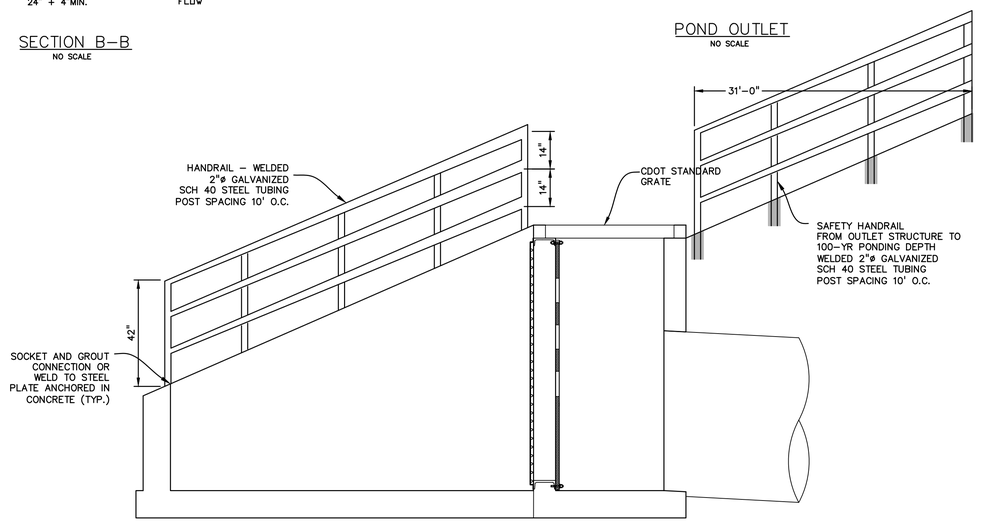

SECTION C-C
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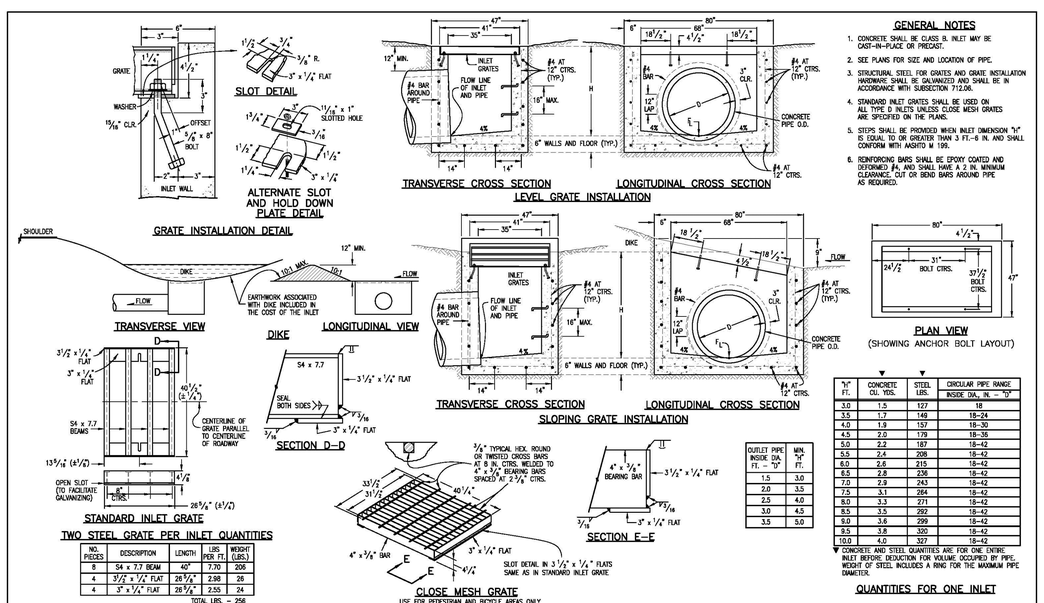

NO. PIECES	DESCRIPTION	LENGTH	LBS PER FT.	WEIGHT (LBS.)
8	54 x 7.7 BEAM	40"	7.70	205
4	3 1/2" x 1/4" FLAT	26 5/8"	2.98	26
4	3" x 1/4" FLAT	26 5/8"	2.55	24
TOTAL LBS. = 256				

GENERAL NOTES

1. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
2. SEE PLANS FOR SIZE AND LOCATION OF PIPE.
3. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.
4. STANDARD INLET GRATES SHALL BE USED ON ALL TYPE D INLETS UNLESS CLOSE MESH GRATES ARE SPECIFIED ON THE PLANS.
5. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "h" IS EQUAL TO OR GREATER THAN 3 FT.-6 IN. AND SHALL CONFORM WITH AASHTO M 199.
6. REINFORCING BARS SHALL BE EPOXY COATED AND DEFORMED #4, AND SHALL HAVE A 2 IN. MINIMUM CLEARANCE. CUT OR BEND BARS AROUND PIPE AS REQUIRED.

"h" FT.	CONCRETE CU. YDS.	STEEL LBS.	CIRCULAR PIPE RANGE INSIDE DIA., IN. - "D"
3.0	1.5	127	18
3.5	1.7	149	18-24
4.0	1.9	157	18-30
4.5	2.0	179	18-36
5.0	2.2	187	18-42
5.5	2.4	208	18-42
6.0	2.6	215	18-42
6.5	2.8	236	18-42
7.0	2.8	243	18-42
7.5	3.1	264	18-42
8.0	3.3	271	18-42
8.5	3.5	292	18-42
9.0	3.6	299	18-42
9.5	3.8	320	18-42
10.0	4.0	327	18-42

CONCRETE AND STEEL QUANTITIES ARE FOR ONE ENTIRE INLET BEFORE DEDUCTION FOR VOLUME OCCUPIED BY PIPE. WEIGHT OF STEEL INCLUDES A RING FOR THE MAXIMUM PIPE DIAMETER.

QUANTITIES FOR ONE INLET

OUTLET PIPE INSIDE DIA. FT. - "D"	MIN. "h" FT.
1.5	3.0
2.0	3.5
2.5	4.0
3.0	4.5
3.5	5.0

Computer File Information	
Creation Date: 07/04/06	Initials: SJR
Last Modification Date: 07/04/06	Initials: LTA
Full Path: www.dot.state.co.us/DesignSupport/	
Drawing File Name: 6040110101.dwg	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9083
Fax: (303) 757-9820
Project Development Branch SRJ/LTA

INLET, TYPE D

Issued By: Project Development Branch on July 04, 2006

STANDARD PLAN NO.
M-604-11
Sheet No. 1 of 1

EPC 10/20/2020
EL PASO COUNTY FILE NO: SP-17-001
CDR-16-007

PREPARED BY:

DREXEL, BARRELL & CO.
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3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
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(719)260-0887
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CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

OVERLOT GRADING, POND SR4 & UTILITY CONSTRUCTION DRAWINGS FOR

FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
1ST SUBMITTAL	6-20-17
RESUBMITTAL	9-6-18
REVISED	7-24-20

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

COLORADO REGISTERED PROFESSIONAL ENGINEER TIMOTHY D. McCONNELL 33797 8-28-20

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: N/A
VERTICAL: N/A

POND #1 (SR4) DETAILS

PROJECT NO. 20988-00CSCV

DRAWING NO.

C7.5

SHEET: 12 OF 12

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project:

Basin ID:

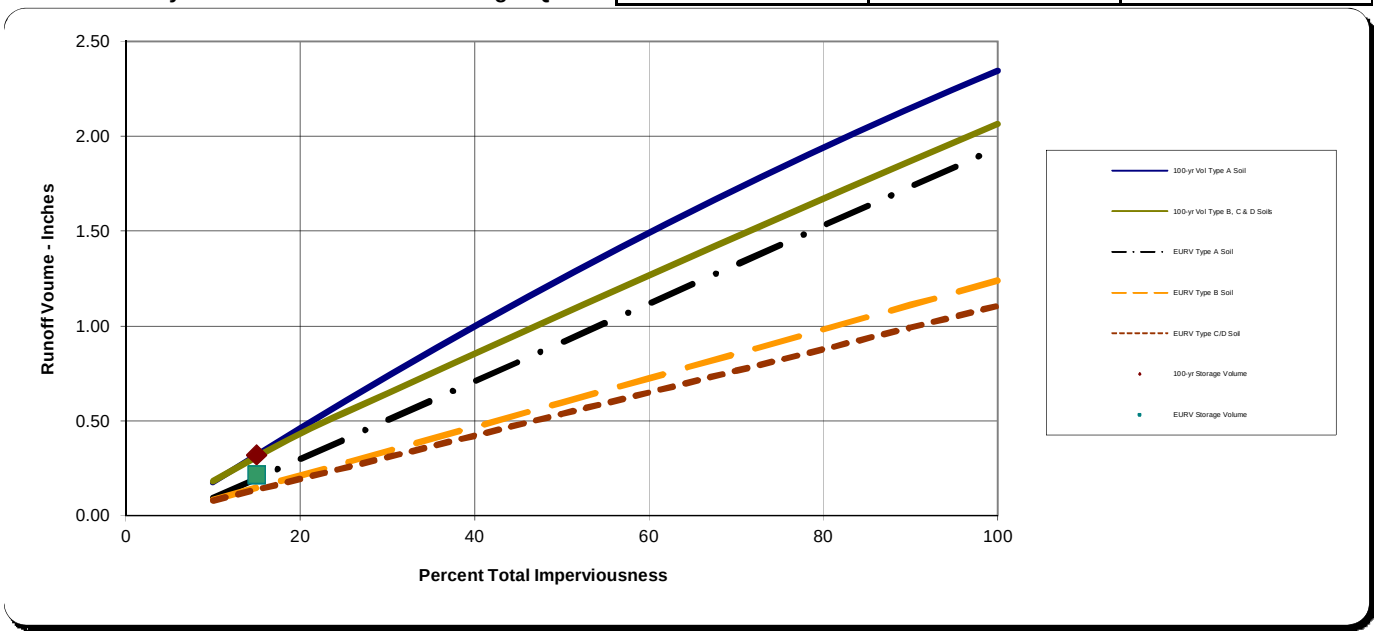
* User input data shown in blue.

Area of Watershed (acres)	740.00	
Subwatershed Imperviousness	15.0%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0
Effective Imperviousness[1]	15.0%	

Hydrologic Soil Type	**Percentage of Area**	**Area (acres)**
Type A	100.0%	740.0
Type B		0.0
Type C or D		0.0

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		**Decay Coefficient--α**
Initial--f_i	**Final--f_o**	
5	1.0	0.0007

	Detention Volumes[2,5]		
	(watershed inches)	**(acre-feet)**	**Maximum Allowable Release Rate, cfs**[3]
Excess Urban Runoff Volume[4]	0.22	13.30	Design Oulet to Empty EURV in 72 Hours
100-year Detention Volume Including WQCV [5]	0.32	19.72	370.00



Notes:

1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).

2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.

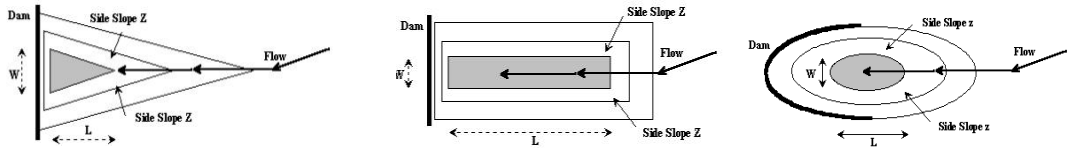
3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.

4) EURV approximates the difference between developed and pre-developed runoff volume.

5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

STAGE-STORAGE SIZING FOR DETENTION BASINS

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1



Design Information (Input):

Width of Basin Bottom, W =		ft
Length of Basin Bottom, L =		ft
Dam Side-slope (H:V), Z_d =		ft/ft

Check Basin Shape

Right Triangle		OR…
Isosceles Triangle		OR…
Rectangle		OR…
Circle / Ellipse		OR…
Irregular		(Use Overide values in cells G32:G52)

Stage-Storage Relationship:

	MINOR	MAJOR	
Storage Requirement from Sheet 'Modified FAA':			acre-ft.
Storage Requirement from Sheet 'Hydrograph':			acre-ft.
Storage Requirement from Sheet 'Full-Spectrum':	13.30	19.72	acre-ft.

Labels for WQCV, Minor, & Major Storage Stages (input)	Water Surface Elevation ft (input)	Side Slope (H:V) ft/ft Below El.	Basin Width at Stage ft (output)	Basin Length at Stage ft (output)	Surface Area at Stage ft^2 (output)	Surface Area at Stage ft^2 User Overide	Volume Below Stage ft^3 (output)	Surface Area at Stage acres (output)	Volume Below Stage acre-ft (output)	Target Volumes for WQCV, Minor, & Major Storage Volumes (for goal seek)
	6882.00	(input)				531		0.012	0.000	
	6883.00		0.00	0.00		531	531	0.012	0.012	
	6884.00		0.00	0.00		531	1,062	0.012	0.024	
	6885.00		0.00	0.00		886	1,771	0.020	0.041	
	6886.00		0.00	0.00		9,189	6,808	0.211	0.156	
	6887.00		0.00	0.00		27,880	25,343	0.640	0.582	
	6888.00		0.00	0.00		60,263	69,414	1.383	1.594	
	6889.00		0.00	0.00		85,329	142,210	1.959	3.265	
	6890.00		0.00	0.00		103,874	236,812	2.385	5.436	
	6891.00		0.00	0.00		111,922	344,710	2.569	7.913	
	6892.00		0.00	0.00		116,616	458,979	2.677	10.537	
WQCV	6893.00		0.00	0.00		128,472	581,523	2.949	13.350	
	6894.00		0.00	0.00		136,926	714,222	3.143	16.396	
	6895.00		0.00	0.00		145,498	855,434	3.340	19.638	
	6896.00		0.00	0.00		154,188	1,005,277	3.540	23.078	
	6896.50		0.00	0.00		158,590	1,083,471	3.641	24.873	
100-YR	6897.00		0.00	0.00		162,992	1,163,867	3.742	26.719	
	6897.50		0.00	0.00		167,639	1,246,524	3.848	28.616	
	6898.00		0.00	0.00		172,286	1,331,506	3.955	30.567	
	6899.00		0.00	0.00		181,155	1,508,226	4.159	34.624	
	6900.00		0.00	0.00		190,124	1,693,866	4.365	38.886	
	6901.00		0.00	0.00		199,194	1,888,525	4.573	43.355	
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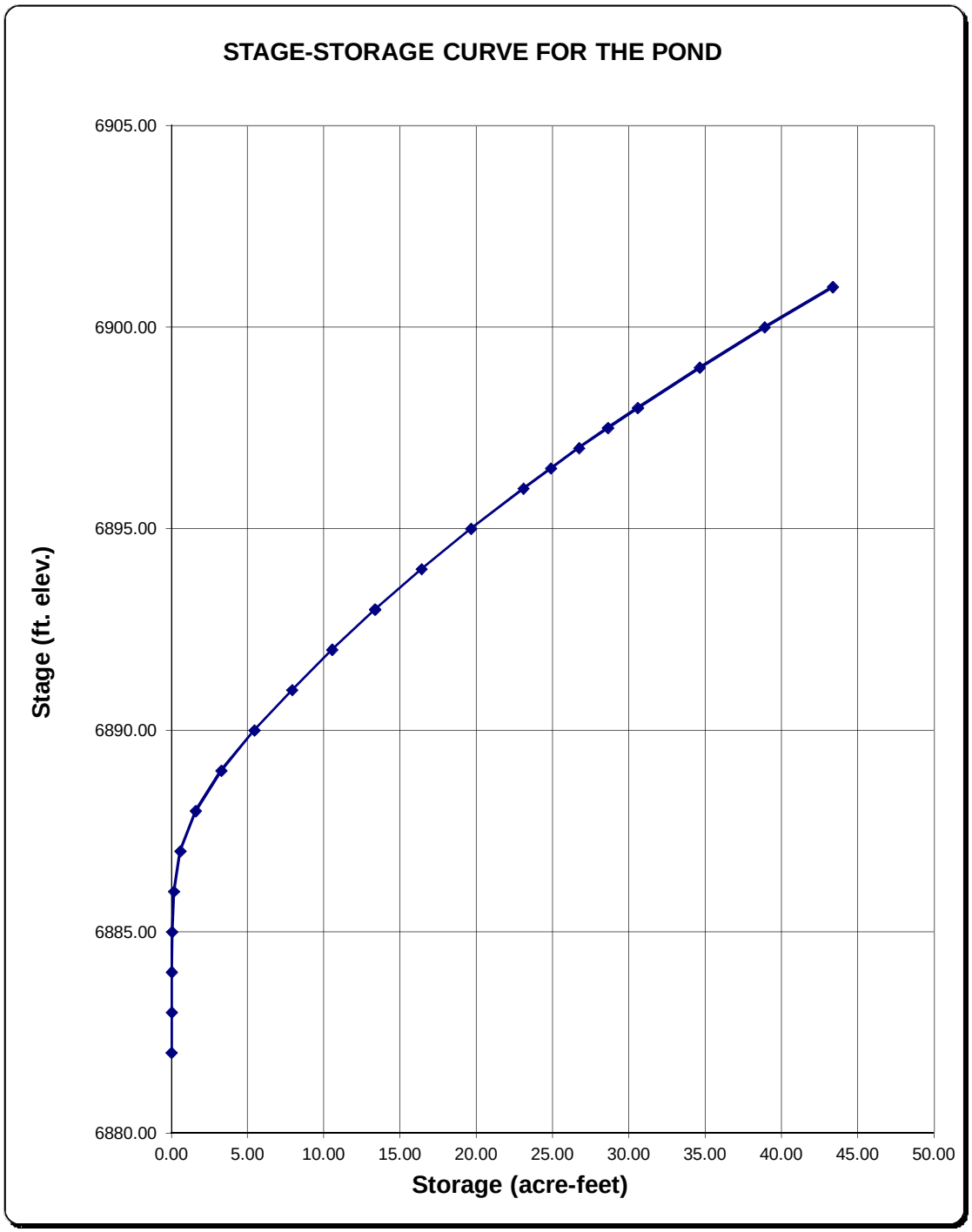
STAGE-STORAGE SIZING FOR DETENTION BASINS

Project: _____

Basin ID: _____



STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: FALCON MARKETPLACE

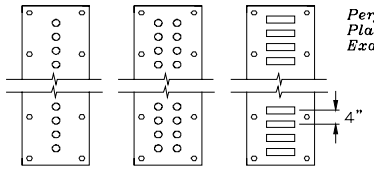
Basin ID: NORTH POND #1

WQCV Design Volume (Input):

Catchment Imperviousness, I_a =	15.0	percent		
Catchment Area, A =	740.00	acres	Diameter of holes, D =	5.000 inches
Depth at WQCV outlet above lowest perforation, H =	8	feet	Number of holes per row, N =	1
Vertical distance between rows, h =	30.00	inches	**OR**	
Number of rows, NL =	3.00			
Orifice discharge coefficient, C_o =	0.50		Height of slot, H =	inches
Slope of Basin Trickle Channel, S =	0.005	ft / ft	Width of slot, W =	inches
Time to Drain the Pond =	40	hours		

Watershed Design Information (Input):

Percent Soil Type A =	100	%
Percent Soil Type B =		%
Percent Soil Type C/D =		%



Perforated Plate Examples

Outlet Design Information (Output):

Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	0.216	watershed inches
	N/A	
Excess Urban Runoff Volume (From 'Full-Spectrum Sheet')	**13.300**	**acre-feet**
Outlet area per row, Ao =	69.21	square inches
Total opening area at each row based on user-input above, Ao =	19.63	square inches
Total opening area at each row based on user-input above, Ao =	0.136	square feet

3

	Central Elevations of Rows of Holes in feet																							
	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14	Row 15	Row 16	Row 17	Row 18	Row 19	Row 20	Row 21	Row 22	Row 23	Row 23	Σ Flow
	6885.00	6887.50	6890.00																						
	Collection Capacity for Each Row of Holes in cfs																								
6882.00	0.0000	0.0000	0.0000																						0.00
6883.00	0.0000	0.0000	0.0000																						0.00
6884.00	0.0000	0.0000	0.0000																						0.00
6885.00	0.0000	0.0000	0.0000																						0.00
6886.00	0.5457	0.0000	0.0000																						0.55
6887.00	0.7717	0.0000	0.0000																						0.77
6888.00	0.9452	0.3859	0.0000																						1.33
6889.00	1.0914	0.6683	0.0000																						1.76
6890.00	1.2202	0.8628	0.0000																						2.08
6891.00	1.3367	1.0209	0.5457																						2.90
6892.00	1.4438	1.1576	0.7717																						3.37
6893.00	1.5435	1.2798	0.9452																						3.77
6894.00	1.6371	1.3913	1.0914																						4.12
6895.00	1.7256	1.4945	1.2202																						4.44
6896.00	1.8099	1.5910	1.3367																						4.74
6896.50	1.8505	1.6371	1.3913																						4.88
6897.00	1.8904	1.6820	1.4438																						5.02
6897.50	1.9293	1.7256	1.4945																						5.15
6898.00	1.9675	1.7683	1.5435																						5.28
6899.00	2.0418	1.8505	1.6371																						5.53
6900.00	2.1135	1.9293	1.7256																						5.77
6901.00	2.1828	2.0050	1.8099																						6.00
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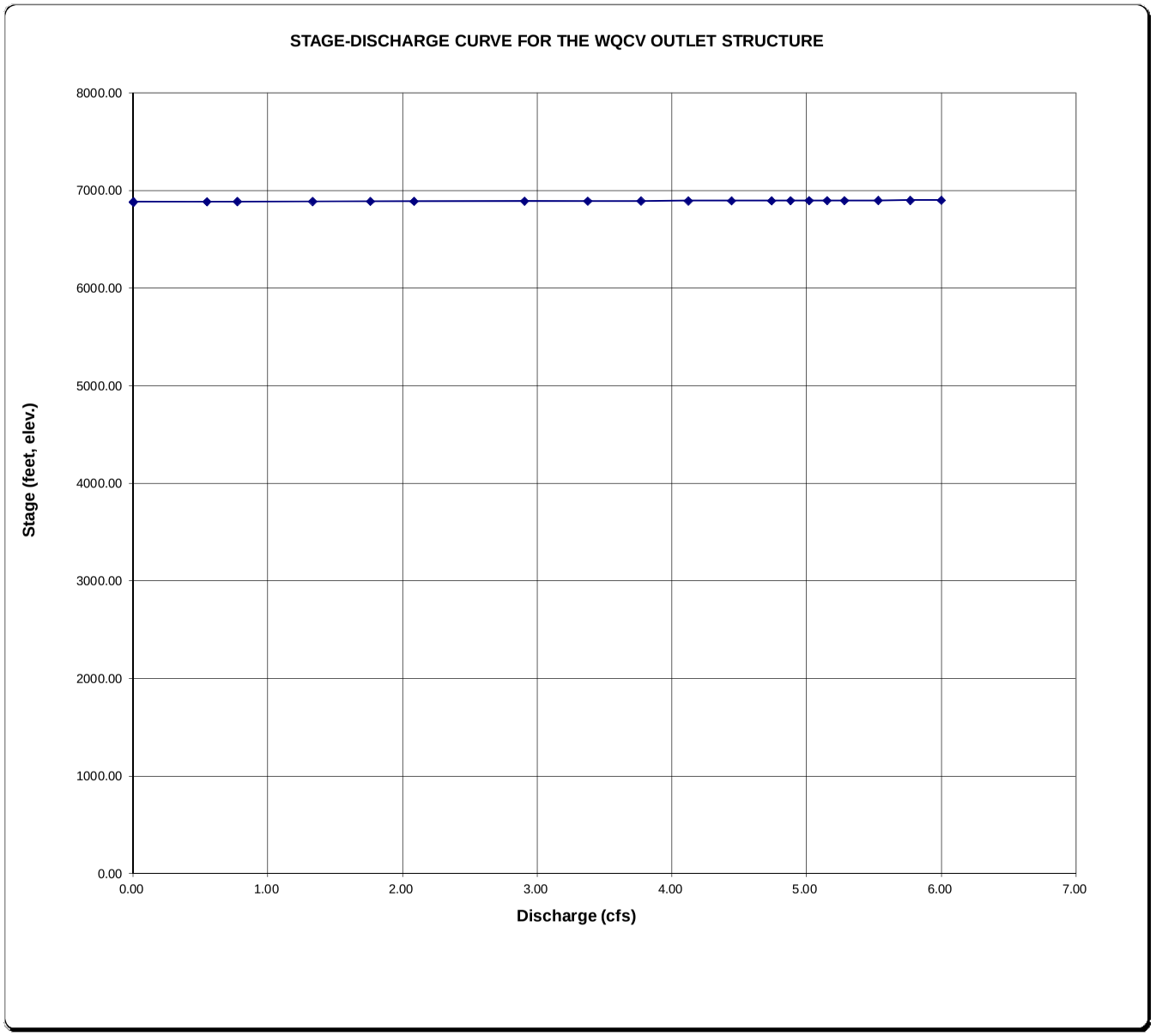
	#N/A	#N/A	#N/A																						#N/A
	Override Area Row 1	Override Area Row 2	Override Area Row 3	Override Area Row 4	Override Area Row 5	Override Area Row 6	Override Area Row 7	Override Area Row 8	Override Area Row 9	Override Area Row 10	Override Area Row 11	Override Area Row 12	Override Area Row 13	Override Area Row 14	Override Area Row 15	Override Area Row 16	Override Area Row 17	Override Area Row 18	Override Area Row 19	Override Area Row 20	Override Area Row 21	Override Area Row 22	Override Area Row 23	Override Area Row 24	
	0.14	0.14	0.14																						

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

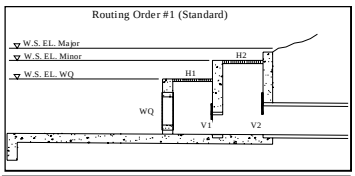
Project: FALCON MARKETPLACE

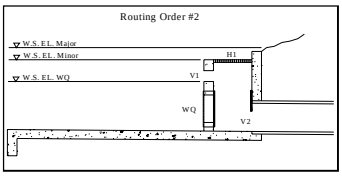
Basin ID: NORTH POND #1

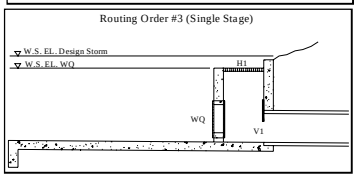


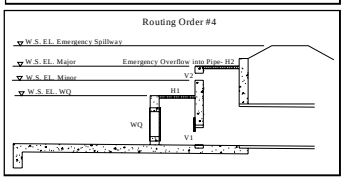
STAGE-DISCHARGE SIZING OF THE WEIRS AND ORIFICES (INLET CONTROL)

Project: Falcon Marketplace #1
Basin ID: NORTH POND #1









Current Routing Order is #3

Design Information (Input):

			#1 Horiz.	#2 Horiz.	#1 Vert.	#2 Vert.	
Circular Opening:	Diameter in Inches	Dia. =			96.00		inches
OR							
Rectangular Opening:	Width in Feet	W =	8.00				ft.
	Length (Height for Vertical)	L or H =	12.00				ft.
	Percentage of Open Area After Trash Rack Reduction	% open =	80		100		%
	Orifice Coefficient	C_o =	0.75		0.75		
	Weir Coefficient	C_w =	3.00				
	Orifice Elevation (Bottom for Vertical)	E_o =	6893.80		6,881.97		ft.

Calculation of Collection Capacity:

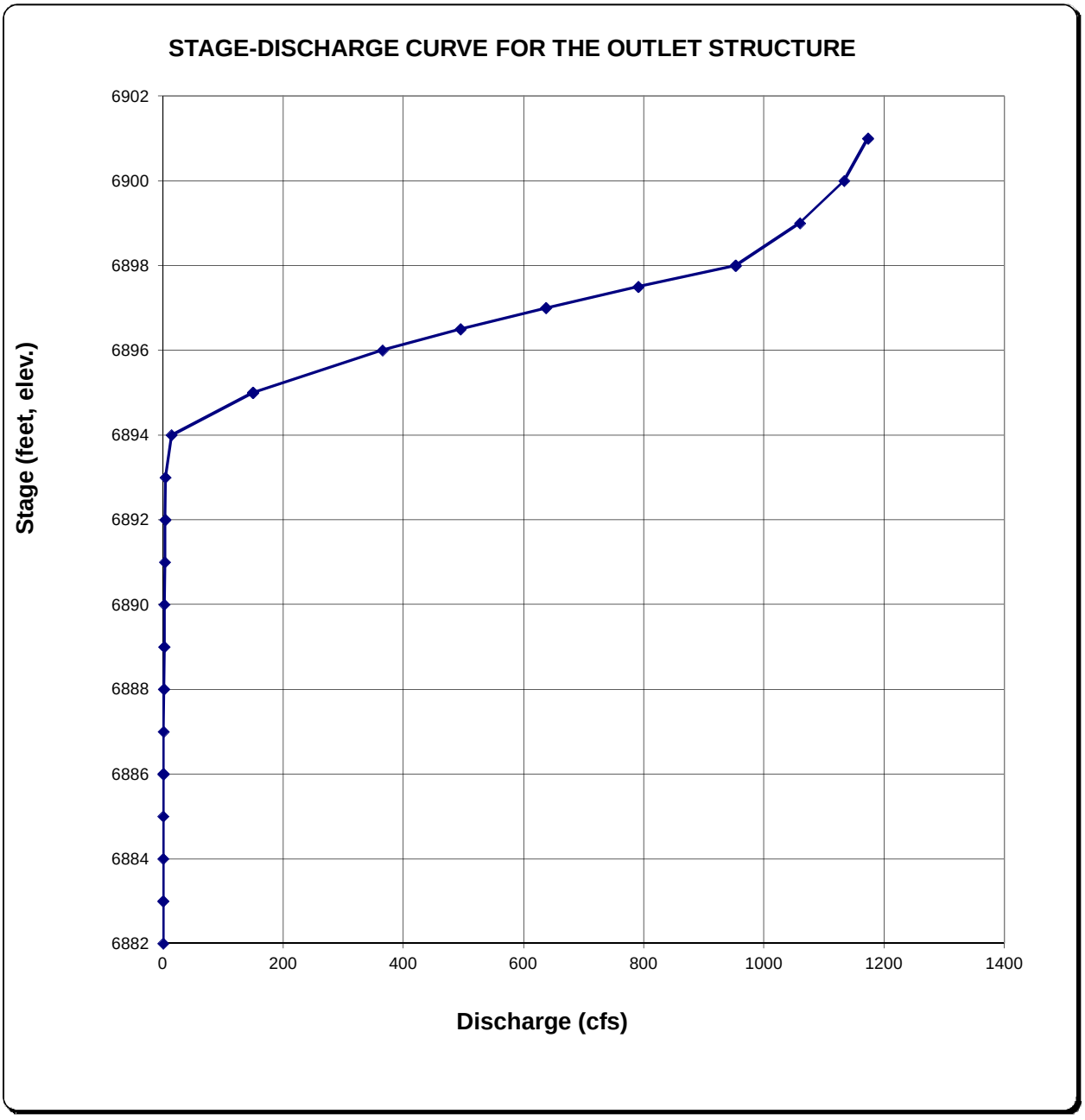
Net Opening Area (after Trash Rack Reduction)	A_o =	76.80		50.27	sq. ft.
OPTIONAL: User-Overide Net Opening Area	A_o =				sq. ft.
Perimeter as Weir Length	L_w =	36.80	ft.		
OPTIONAL: User-Overide Weir Length	L_w =		ft.		
Top Elevation of Vertical Orifice Opening, Top =				6889.97	ft.
Center Elevation of Vertical Orifice Opening, Cen =				6885.97	ft.

Routing 3: Single Stage - Water flows through WQCV plate and #1 horizontal opening into #1 vertical opening. This flow will be applied to culvert sheet (#2 vertical & horizontal openings is not used).

			Horizontal Orifices				Vertical Orifices			
Labels for WQCV, Minor, & Major Storage W.S. Elevations (input)	Water Surface Elevation ft (linked)	WQCV Plate/Riser Flow cfs (User-linked)	#1 Horiz. Weir Flow cfs (output)	#1 Horiz. Orifice Flow cfs (output)	#2 Horiz. Weir Flow cfs (output)	#2 Horiz. Orifice Flow cfs (output)	#1 Vert. Collection Capacity cfs (output)	#2 Vert. Collection Capacity cfs (output)	**Total Collection Capacity cfs (output)**	Target Volumes for WQCV, Minor, & Major Storage Volumes (link for goal seek)
	6882.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	**0.00**	
	6883.00	0.00	0.00	0.00	0.00	0.00	27.95	0.00	**0.00**	
	6884.00	0.00	0.00	0.00	0.00	0.00	77.34	0.00	**0.00**	
	6885.00	0.00	0.00	0.00	0.00	0.00	141.04	0.00	**0.00**	
	6886.00	0.55	0.00	0.00	0.00	0.00	216.33	0.00	**0.55**	
	6887.00	0.77	0.00	0.00	0.00	0.00	301.66	0.00	**0.77**	
	6888.00	1.33	0.00	0.00	0.00	0.00	395.95	0.00	**1.33**	
	6889.00	1.76	0.00	0.00	0.00	0.00	498.43	0.00	**1.76**	
	6890.00	2.08	0.00	0.00	0.00	0.00	607.33	0.00	**2.08**	
	6891.00	2.90	0.00	0.00	0.00	0.00	678.51	0.00	**2.90**	
	6892.00	3.37	0.00	0.00	0.00	0.00	742.90	0.00	**3.37**	
WQCV	6893.00	3.77	0.00	0.00	0.00	0.00	802.14	0.00	**3.77**	
	6894.00	4.12	9.87	206.72	0.00	0.00	857.30	0.00	**13.99**	
	6895.00	4.44	145.12	506.36	0.00	0.00	909.11	0.00	**149.56**	
	6896.00	4.74	360.25	685.61	0.00	0.00	958.13	0.00	**364.99**	
	6896.50	4.88	489.80	759.53	0.00	0.00	981.72	0.00	**494.67**	
100-YR	6897.00	5.02	631.97	826.88	0.00	0.00	1004.76	0.00	**636.98**	
	6897.50	5.15	785.73	889.13	0.00	0.00	1027.28	0.00	**790.88**	
	6898.00	5.28	950.26	947.31	0.00	0.00	1049.32	0.00	**952.58**	
	6899.00	5.53	1309.10	1054.06	0.00	0.00	1092.06	0.00	**1059.59**	
	6900.00	5.77	1704.34	1150.96	0.00	0.00	1133.19	0.00	**1133.19**	
	6901.00	6.00	2132.89	1240.31	0.00	0.00	1172.88	0.00	**1172.88**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	

STAGE-DISCHARGE SIZING OF THE WEIRS AND ORIFICES (INLET CONTROL)

Project: Falcon Marketplace #1
Basin ID: NORTH POND #1

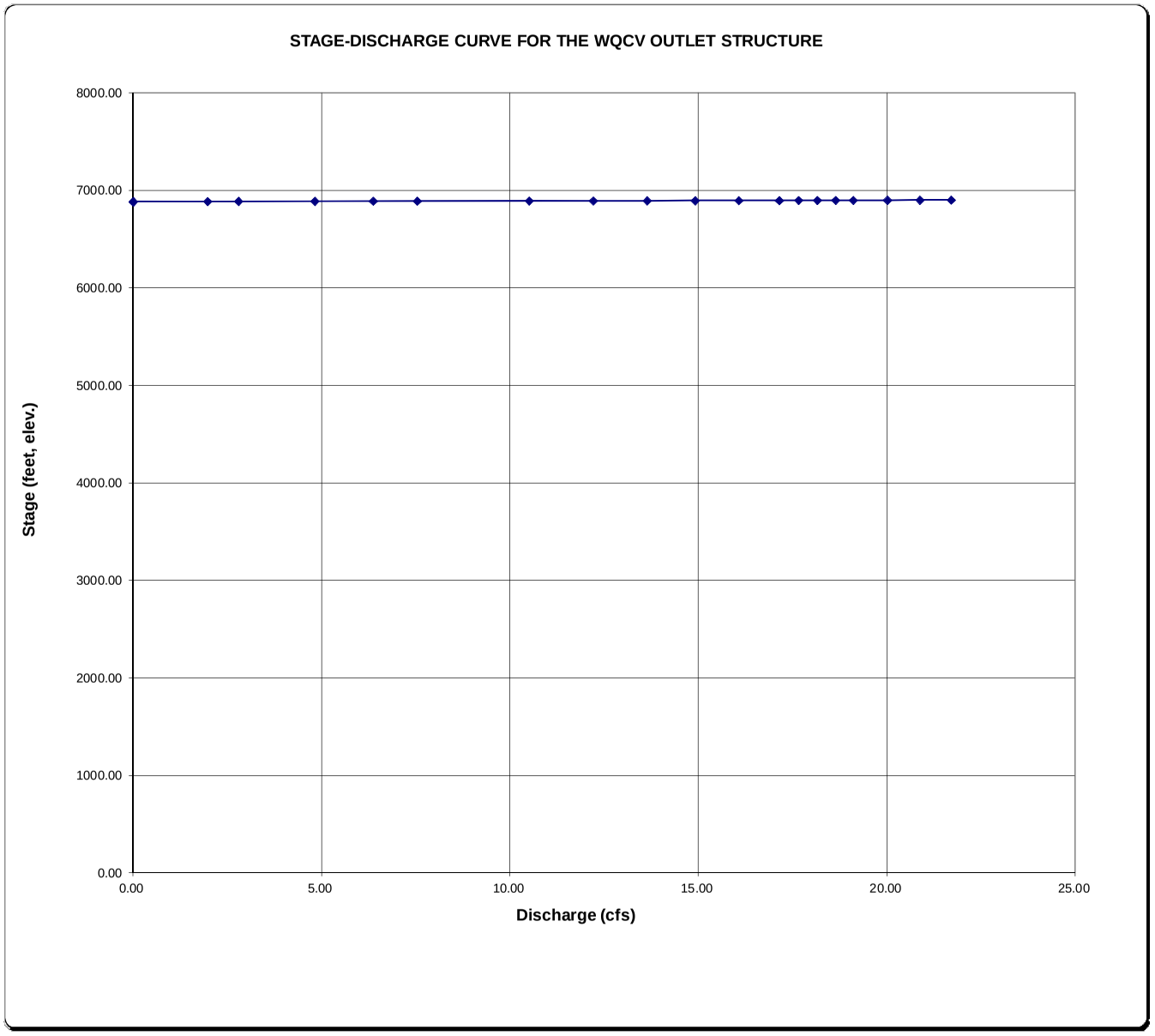


STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Worksheet Protected

Project: FALCON MARKETPLACE

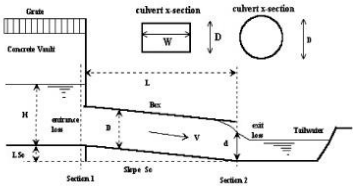
Basin ID: NORTH POND #1



STAGE-DISCHARGE SIZING OF THE OUTLET CULVERT (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1

Status: Culvert Data is valid!



Design Information (Input):

Circular Culvert: Barrel Diameter in Inches	D =	96	in.
Circular Culvert: Inlet Edge Type (choose from pull-down list)		Grooved End with Headwall	
OR:			
Box Culvert: Barrel Height (Rise) in Feet	Height (Rise) =		ft.
Box Culvert: Barrel Width (Span) in Feet	Width (Span) =		ft.
Box Culvert: Inlet Edge Type (choose from pull-down list)		Square Edge w/ 90-15 deg. Flared Wingwall	
Number of Barrels	No =	1	
Inlet Elevation at Culvert Invert	I_{elev} =	6881.97	ft. elev.
Outlet Elevation at Culvert Invert	O_{elev} =	6880.85	ft. elev.
Culvert Length in Feet	L =	78.0	ft.
Manning's Roughness	n =	0.0120	
Bend Loss Coefficient	K_b =	0.00	
Exit Loss Coefficient	K_x =	1.00	

Design Information (calculated):

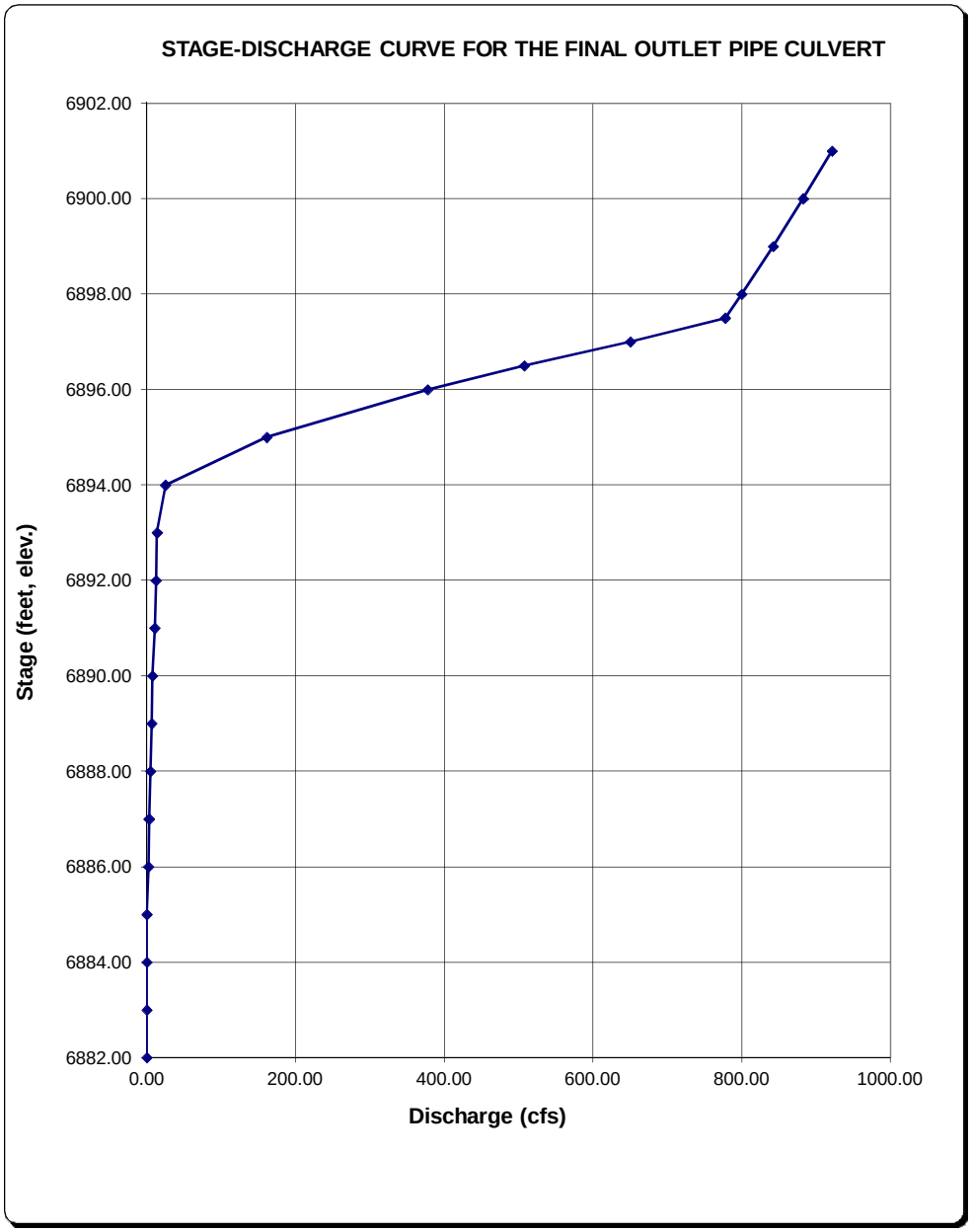
Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.13
Sum of All Loss Coefficients	K_s =	1.33
Orifice Inlet Condition Coefficient	C_d =	0.99
Minimum Energy Condition Coefficient	KE_{low} =	-0.04

Calculations of Culvert Capacity (output):

Water Surface Elevation From Sheet "Basin" (ft., linked)	Tailwater Surface Elevation ft (input if known)	Culvert Inlet-Control Flowrate cfs (output)	Culvert Outlet-Control Flowrate cfs (output)	Flowrate Into Culvert From Sheet "Outlet" (cfs, linked)	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used (output)
6882.00	0.00	0.10	73.88	**0.00**	**0.00**	Min. Energy. Eqn.
6883.00	0.00	8.20	127.58	**0.00**	**0.00**	Min. Energy. Eqn.
6884.00	0.00	38.80	179.44	**0.00**	**0.00**	Min. Energy. Eqn.
6885.00	0.00	83.70	227.39	**0.00**	**0.00**	Min. Energy. Eqn.
6886.00	0.00	142.70	253.50	**1.98**	**1.98**	Regression Eqn.
6887.00	0.00	207.40	260.30	**2.79**	**2.79**	Regression Eqn.
6888.00	0.00	284.50	274.34	**4.82**	**4.82**	Regression Eqn.
6889.00	0.00	370.40	296.59	**6.37**	**6.37**	Regression Eqn.
6890.00	0.00	456.70	327.85	**7.54**	**7.54**	Regression Eqn.
6891.00	0.00	537.00	401.74	**10.51**	**10.51**	Regression Eqn.
6892.00	0.00	609.70	475.03	**12.21**	**12.21**	Regression Eqn.
6893.00	0.00	675.30	541.57	**13.64**	**13.64**	Regression Eqn.
6894.00	0.00	735.40	601.48	**24.79**	**24.79**	Regression Eqn.
6895.00	0.00	790.90	656.53	**161.20**	**161.20**	Regression Eqn.
6896.00	0.00	843.00	707.57	**377.40**	**377.40**	Regression Eqn.
6896.50	0.00	867.90	731.66	**507.45**	**507.45**	Regression Eqn.
6897.00	0.00	892.20	755.10	**650.12**	**650.12**	Regression Eqn.
6897.50	0.00	915.90	777.72	**804.36**	**777.72**	Regression Eqn.
6898.00	0.00	939.10	799.86	**966.41**	**799.86**	Regression Eqn.
6899.00	0.00	984.10	842.42	**1074.08**	**842.42**	Regression Eqn.
6900.00	0.00	1027.50	882.74	**1133.19**	**882.74**	Regression Eqn.
6901.00	0.00	1069.50	921.46	**1172.88**	**921.46**	Regression Eqn.
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)
0.00	0.00	0.00	0.00	**#N/A**	**#N/A**	No Flow (WS < inlet)

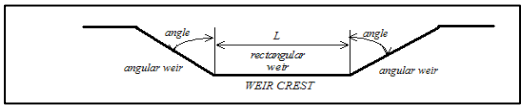
STAGE-DISCHARGE SIZING OF THE OUTLET CULVERT (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1



STAGE-DISCHARGE SIZING OF THE SPILLWAY

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1



Design Information (input):

Bottom Length of Weir	L =	160.00	feet
Angle of Side Slope Weir	Angle =	75.96	degrees
Elev. for Weir Crest	EL. Crest =	6,898.00	feet
Coef. for Rectangular Weir	C_w =		
Coef. for Trapezoidal Weir	C_t =	3.50	

Calculation of Spillway Capacity (output):

Water Surface Elevation ft. (linked)	Rect. Weir Flowrate cfs (output)	Triangle Weir Flowrate cfs (output)	Total Spillway Release cfs (output)	Total Pond Release cfs (output)
6882.00	0.00	0.00	0.00	0.00
6883.00	0.00	0.00	0.00	0.00
6884.00	0.00	0.00	0.00	0.00
6885.00	0.00	0.00	0.00	0.00
6886.00	0.00	0.00	0.00	1.98
6887.00	0.00	0.00	0.00	2.79
6888.00	0.00	0.00	0.00	4.82
6889.00	0.00	0.00	0.00	6.37
6890.00	0.00	0.00	0.00	7.54
6891.00	0.00	0.00	0.00	10.51
6892.00	0.00	0.00	0.00	12.21
6893.00	0.00	0.00	0.00	13.64
6894.00	0.00	0.00	0.00	24.79
6895.00	0.00	0.00	0.00	161.20
6896.00	0.00	0.00	0.00	377.40
6896.50	0.00	0.00	0.00	507.45
6897.00	0.00	0.00	0.00	650.12
6897.50	0.00	0.00	0.00	777.72
6898.00	0.00	0.00	0.00	799.86
6899.00	0.00	14.00	14.00	856.42
6900.00	0.00	79.17	79.17	961.91
6901.00	0.00	218.18	218.18	1,139.63
#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	#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	#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	#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	#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
#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	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A
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#N/A	#N/A	#N/A	#N/A	#N/A
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#N/A	#N/A	#N/A	#N/A	#N/A
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PROJECT INFORMATION

PROJECT:	Falcon Marketplace
PROJECT NO:	20988-00CSCV
DESIGN BY:	KGV
REV. BY:	TDM
AGENCY:	El Paso County
REPORT TYPE:	Preliminary
DATE:	6/19/2017

Drexel, Barrell & Co.

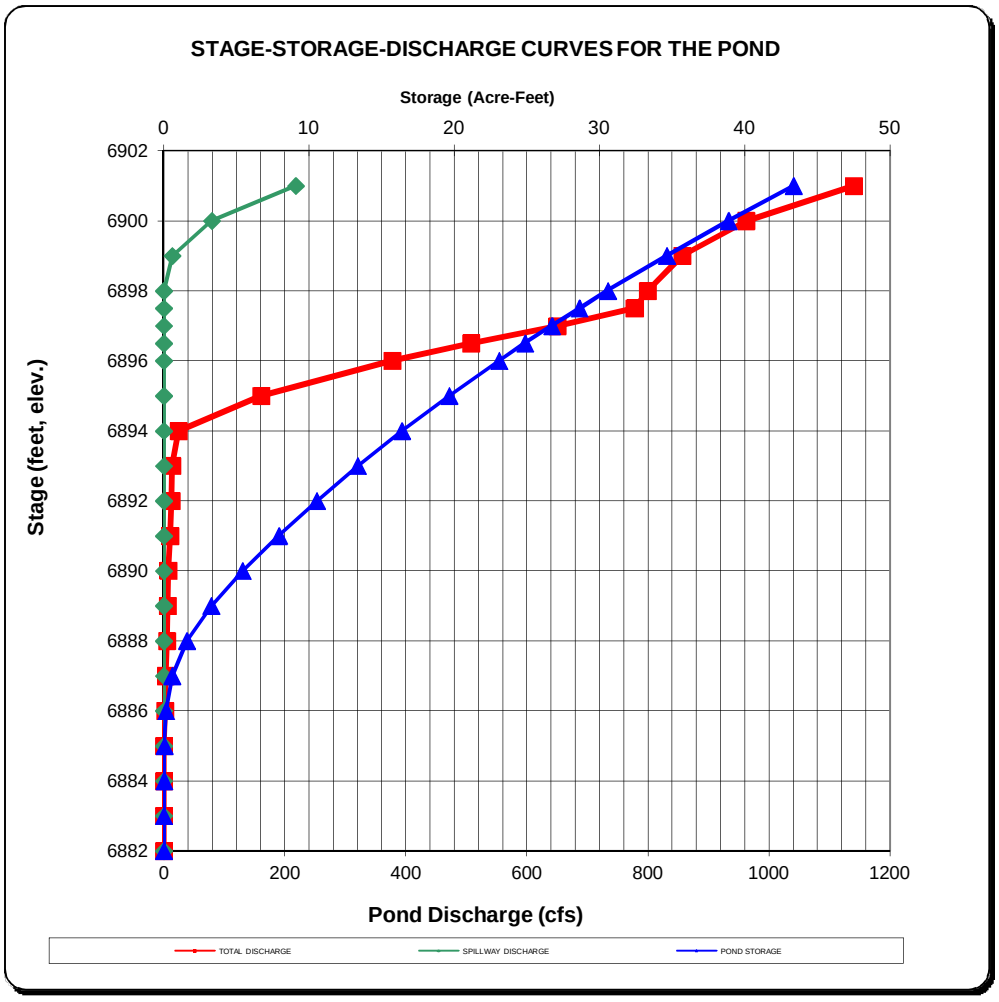
SPILLWAY CALCULATIONS

Q=CL(H^(2/3))

Weir coefficient C:	3.5
Depth H, ft:	1.5
Flowrate Q. cfs:	1016
Required L, ft:	**158.01**

STAGE-DISCHARGE SIZING OF THE SPILLWAY

Project: FALCON MARKETPLACE
Basin ID: NORTH POND #1



Aluminum Bar Grating

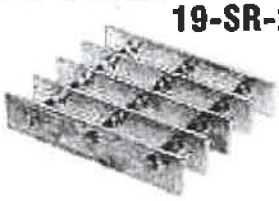
TRASH RACK GRATE
AT FRONT OF BOX

RECTANGULAR BAR SWAGE-LOCKED 1-3/16" C/C Bearing Bars

19-SR-4

Cross Rods 4" C/C

19-SR-2



Cross Rods 2" C/C

NON-SERRATED & SERRATED

PRESS-LOCKED 1-3/16" C/C Bearing Bars

19-AP-4

Cross Bars 4" C/C

19-AP-2

Cross Bars 2" C/C

LOAD & DEFLECTION TABLE

Bar Size	Symbol	Approx. Weight psf	Sec. Mod Per Ft. Of Width		SPAN (Direction of Bearing Bar) 24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	96"	108"
3/4" x 1/8"	19-SR-4	1.4	0.118	U	237	152	105	77									
	19-SR-2	1.6		D	0.192	0.300	0.432	0.588									
	19-AP-4	1.5		C	237	189	158	135									
	19-AP-2	1.8		D	0.154	0.240	0.346	0.470									
3/4" x 3/16"	19-SR-4	1.9	0.178	U	355	227	158	116									
	19-SR-2	2.1		D	0.192	0.300	0.432	0.588									
	19-AP-4	2.2		C	355	284	237	203									
	19-AP-2	2.7		D	0.154	0.240	0.346	0.470									
1" x 1/8"	19-SR-4	1.7	0.211	U	421	269	187	137	105								
	19-SR-2	1.9		D	0.144	0.225	0.324	0.441	0.576								
	19-AP-4	1.8		C	421	337	281	241	211								
	19-AP-2	2.2		D	0.115	0.180	0.259	0.353	0.461								
1" x 3/16"	19-SR-4	2.5	0.316	U	632	404	281	206	158	125							
	19-SR-2	2.7		D	0.144	0.225	0.324	0.441	0.576	0.729							
	19-AP-4	2.8		C	632	505	421	361	316	281							
	19-AP-2	3.3		D	0.115	0.180	0.259	0.353	0.461	0.583							
1-1/4" x 1/8"	19-SR-4	2.1	0.329	U	658	421	292	215	164	130							
	19-SR-2	2.3		D	0.115	0.180	0.259	0.353	0.461	0.583							
	19-AP-4	2.4		C	658	526	439	376	329	292							
	19-AP-2	2.8		D	0.092	0.144	0.207	0.282	0.369	0.467							
1-1/4" x 3/16"	19-SR-4	3.1	0.493	U	987	632	439	322	247	195	158						
	19-SR-2	3.3		D	0.115	0.180	0.259	0.353	0.461	0.583	0.720						
	19-AP-4	3.5		C	987	789	658	564	493	439	395						
	19-AP-2	4.2		D	0.092	0.144	0.207	0.282	0.369	0.467	0.576						
1-1/2" x 1/8"	19-SR-4	2.5	0.474	U	947	606	421	309	237	187	152						
	19-SR-2	2.7		D	0.096	0.150	0.216	0.294	0.384	0.486	0.600						
	19-AP-4	2.8		C	947	758	632	541	474	421	379						
	19-AP-2	3.2		D	0.077	0.120	0.173	0.235	0.307	0.389	0.480						
1-1/2" x 3/16"	19-SR-4	3.7	0.711	U	1421	909	632	464	355	281	227	188					
	19-SR-2	3.9		D	0.096	0.150	0.216	0.294	0.384	0.486	0.600	0.726					
	19-AP-4	4.1		C	1421	1137	947	812	711	632	568	517					
	19-AP-2	4.8		D	0.077	0.120	0.173	0.235	0.307	0.389	0.480	0.581					
1-3/4" x 3/16"	19-SR-4	4.2	0.967	U	1934	1238	860	632	484	382	309	256	215	183			
	19-SR-2	4.4		D	0.082	0.129	0.185	0.252	0.329	0.417	0.514	0.622	0.741	0.869			
	19-AP-4	4.7		C	1934	1547	1289	1105	967	860	774	703	645	595			
	19-AP-2	5.3		D	0.066	0.103	0.148	0.202	0.263	0.333	0.411	0.498	0.592	0.695			
2" x 3/16"	19-SR-4	4.8	1.263	U	2526	1617	1123	825	632	499	404	334	281	239	206		
	19-SR-2	5.0		D	0.072	0.113	0.162	0.221	0.288	0.365	0.450	0.545	0.648	0.761	0.882		
	19-AP-4	5.3		C	2526	2021	1684	1444	1263	1123	1011	919	842	777	722		
	19-AP-2	5.9		D	0.058	0.090	0.130	0.176	0.230	0.292	0.360	0.436	0.518	0.608	0.706		
2-1/4" x 3/16"	19-SR-4	5.4	1.599	U	3197	2046	1421	1044	799	632	512	423	355	303	261	200	
	19-SR-2	5.6		D	0.064	0.100	0.144	0.196	0.256	0.324	0.400	0.484	0.576	0.676	0.784	1.024	
	19-AP-4	5.8		C	3197	2558	2132	1827	1599	1421	1279	1163	1066	984	914	799	
	19-AP-2	6.5		D	0.051	0.080	0.115	0.157	0.205	0.259	0.320	0.387	0.461	0.541	0.627	0.819	
2-1/2" x 3/16"	19-SR-4	5.9	1.974	U	3947	2526	1754	1289	987	780	632	522	439	374	322	247	195
	19-SR-2	6.1		D	0.058	0.090	0.130	0.176	0.230	0.292	0.360	0.436	0.518	0.608	0.706	0.922	1.166
	19-AP-4	6.4		C	3947	3158	2632	2256	1974	1754	1579	1435	1316	1215	1128	987	877
	19-AP-2	7.1		D	0.046	0.072	0.104	0.141	0.184	0.233	0.288	0.348	0.415	0.487	0.564	0.737	0.933

U = safe uniform load, psf (page 93)
C = safe concentrated load, psf (page 93)
D = deflection, inches
E = modulus of elasticity, 10,000,000 psi
F = fiber stress, 12,000 psi
Material: ASTM B-221, 6063 or 6061
Deflection: Spans and loads to the right of the bold line exceed 1/4" deflection for uniform load of 100 psf which provides safe pedestrian comfort. These can be exceeded for other types of loads with engineer's approval.
Serrated Bars: For serrated grating, the depth of grating required for a specified load is 1/4" deeper than that shown in the table.
General: Loads and deflections are theoretical and based on static loading.
Finish: Mill finish unless otherwise specified.

FALCON MARKETPLACE
15-FT Head x 62.4 = 936 psf

SR/AP-19 PANEL WIDTH (inches)

Note: Includes 1/4" (1/8" each side) for extended cross rods on swage-locked (SR) and extended cross bars on press-locked (AP).

No. of Bars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/8" Bar	1 9/16	2 3/4	3 15/16	5 1/8	6 5/16	7 1/2	8 11/16	9 7/8	11 1/16	12 1/4	13 7/16	14 5/8	15 13/16	17	18 3/16
3/16" Bar	1 5/8	2 13/16	4	5 3/16	6 3/8	7 9/16	8 3/4	9 15/16	11 1/8	12 5/16	13 1/2	14 11/16	15 7/8	17 1/16	18 1/4
No. of Bars	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
1/8" Bar	19 3/8	20 9/16	21 3/4	22 15/16	24 1/8	25 5/16	26 1/2	27 11/16	28 7/8	30 1/16	31 1/4	32 7/16	33 5/8	34 13/16	36
3/16" Bar	19 7/16	20 5/8	21 13/16	23	24 3/16	25 3/8	26 9/16	27 3/4	28 15/16	30 1/8	31 5/16	32 1/2	33 11/16	34 7/8	36 1/16

Flow depths entering Pond SR4

CLOMR

Min Ch El	6895.98	
WS Elev	6898.75	
Max flow depth (north)	***2.8***	ft

NORTHWEST SWALE

Assuming trapezoidal channelized flow at riprap entry

Q100	30.2	cfs
Width	8	ft
Side Slopes	5	:1
Slope	1.6	%
n	0.020	

Calculated flow depth	***0.5***	ft

Future HMS Model

FUTURE 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT020	0.0671383	41.9	01Jan2011, 06:21	4.8
JWT020	0.0671383	41.9	01Jan2011, 06:21	4.8
RWT030	0.0671383	41.9	01Jan2011, 06:29	4.8
WT030	0.0764732	75.3	01Jan2011, 06:07	5.5
JWT030	0.1436115	85.4	01Jan2011, 06:09	10.3
RWT042	0.1436115	85.3	01Jan2011, 06:15	10.3
WT010	0.1353300	88.9	01Jan2011, 06:17	9.3
JWT010	0.1353300	88.9	01Jan2011, 06:17	9.3
RWT044	0.1353300	88.8	01Jan2011, 06:24	9.3
JWT042	0.2789415	167.0	01Jan2011, 06:21	19.6
RWT046	0.2789415	166.7	01Jan2011, 06:28	19.6
WT040	0.1850600	92.7	01Jan2011, 06:28	12.8
JWT044	0.4640015	259.4	01Jan2011, 06:28	32.4
RWT054	0.4640015	258.8	01Jan2011, 06:35	32.3
WT060	0.1956300	116.8	01Jan2011, 06:26	15.1
WT050	0.1899300	139.4	01Jan2011, 06:19	15.3
JWT050	0.8495615	475.4	01Jan2011, 06:31	62.7
RWT092	0.8495615	475.2	01Jan2011, 06:32	62.7
WT070	0.1711000	133.9	01Jan2011, 06:12	11.8
JWT070	0.1711000	133.9	01Jan2011, 06:12	11.8
RWT080	0.1711000	133.4	01Jan2011, 06:22	11.8
WT080	0.0691596	67.3	01Jan2011, 06:10	5.6
Sub Regional Pond SR1	1.0898211	513.2	01Jan2011, 06:40	78.4
JWT080	1.0898211	513.2	01Jan2011, 06:40	78.4
RWT094	1.0898211	512.4	01Jan2011, 06:45	78.3
WT100-REV	0.1292700	203.0	01Jan2011, 06:04	12.9
W26-REV	0.0720000	103.6	01Jan2011, 06:03	6.4
WS3-1	0.0720000	102.8	01Jan2011, 06:10	6.4
Paint Brush Hills Pond C	0.2012700	64.4	01Jan2011, 06:26	19.2
WT090	0.1533300	162.4	01Jan2011, 06:09	12.8
JWT090	1.4444211	595.9	01Jan2011, 06:44	110.2
RWT122	1.4444211	595.5	01Jan2011, 06:45	110.2
WT110	0.1942800	169.9	01Jan2011, 06:14	16.2
JWT110	1.6387011	651.0	01Jan2011, 06:43	126.4
RWT124	1.6387011	650.8	01Jan2011, 06:47	126.3
WT130-REV	0.1016250	130.0	01Jan2011, 06:11	10.9
Paint Brush Hills Pond A	0.1016250	53.8	01Jan2011, 06:32	10.9
WT120-REV	0.0430300	51.1	01Jan2011, 06:08	3.8
JWT120	1.7833561	703.6	01Jan2011, 06:46	140.9

FUTURE 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RWT172	1.7833561	702.5	01Jan2011, 06:58	140.5
WT140-REV	0.1445300	194.2	01Jan2011, 06:12	16.8
JWT140	0.1445300	194.2	01Jan2011, 06:12	16.8
RWT150	0.1445300	193.3	01Jan2011, 06:22	16.8
WT150-REV	0.1308100	202.5	01Jan2011, 06:08	15.0
Paint Brush Hills Pond B1	0.2753400	235.6	01Jan2011, 06:29	31.8
W34B2-REV	0.0935900	141.8	01Jan2011, 06:07	10.2
Paint Brush Hills Pond B2	0.3689300	234.3	01Jan2011, 06:43	38.9
JWT150	0.3689300	234.3	01Jan2011, 06:43	38.9
RWT160	0.3689300	234.2	01Jan2011, 06:49	38.8
WT160-REV	0.0734800	109.9	01Jan2011, 06:06	7.5
JWT160	0.4424100	244.8	01Jan2011, 06:48	46.3
RWT174	0.4424100	244.7	01Jan2011, 06:56	46.2
WT170-REV	0.1060150	85.2	01Jan2011, 06:19	9.2
W34-CY-REV	0.0465469	38.1	01Jan2011, 06:16	3.8
JWT172	2.3783280	981.9	01Jan2011, 06:56	199.7
RWT176	2.3783280	981.6	01Jan2011, 06:57	199.7
Sub Regional Pond SR2	2.3783280	972.9	01Jan2011, 07:01	194.8
JWT174	2.3783280	972.9	01Jan2011, 07:01	194.8
RWT180	2.3783280	972.1	01Jan2011, 07:10	194.2
WT180-REV	0.0409400	29.3	01Jan2011, 06:19	3.2
JWT180	2.4192680	978.0	01Jan2011, 07:10	197.4
RWT202	2.4192680	977.3	01Jan2011, 07:21	196.8
WT200	0.3017100	186.8	01Jan2011, 06:30	26.0
WT190	0.0574561	74.7	01Jan2011, 06:05	5.0
The Meadows Pond #1	0.0574561	2.1	01Jan2011, 08:29	2.8
JWT190	0.0574561	2.1	01Jan2011, 08:29	2.8
RWT204	0.0574561	2.1	01Jan2011, 08:55	2.7
JWT200	2.7784341	1041.0	01Jan2011, 07:19	225.5
RWT210	2.7784341	1040.5	01Jan2011, 07:24	225.1
WT210	0.2654600	187.9	01Jan2011, 06:35	28.0
JWT210	3.0438941	1113.0	01Jan2011, 07:23	253.1
RWT232	3.0438941	1112.6	01Jan2011, 07:27	252.7
WT220	0.1895300	250.4	01Jan2011, 06:12	21.3
JWT220	0.1895300	250.4	01Jan2011, 06:12	21.3
RWT234	0.1895300	249.6	01Jan2011, 06:20	21.3
JWT232	3.2334241	1138.4	01Jan2011, 07:26	274.0
RWT236	3.2334241	1138.3	01Jan2011, 07:26	274.0
WT230	0.1981800	346.7	01Jan2011, 06:05	23.1
JWT234	3.4316041	1155.6	01Jan2011, 07:26	297.0
RWT240	3.4316041	1155.0	01Jan2011, 07:29	296.8

FUTURE 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT240	0.0761461	160.3	01Jan2011, 06:01	9.1
Regional Pond WU North	3.5077502	1160.9	01Jan2011, 07:30	304.7
Regional Pond WU Diver…	3.5077502	1122.2	01Jan2011, 07:30	261.4
Old Meridian	0.0335900	85.0	01Jan2011, 06:07	6.1
RWT-OM	0.0335900	84.2	01Jan2011, 06:12	6.1
Regional Pond WU South	3.5413402	997.3	01Jan2011, 07:47	255.2
RWT240_Diversion Reach	0.0000000	38.8	01Jan2011, 07:35	43.1
JWT240	3.5413402	1036.0	01Jan2011, 07:47	298.4
RWT250	3.5413402	1035.7	01Jan2011, 07:48	298.3
WT250	0.1469500	291.4	01Jan2011, 06:02	17.1
JWT250	3.6882902	1048.0	01Jan2011, 07:48	315.4
RWT260	3.6882902	1047.5	01Jan2011, 07:58	314.3
WT260	0.1388002	77.5	01Jan2011, 06:34	11.5
JWT260	3.8270904	1061.8	01Jan2011, 07:58	325.9
RWT291	3.8270904	1061.7	01Jan2011, 08:00	325.6
WT270	0.0324738	57.1	01Jan2011, 06:04	3.6
JWT270	0.0324738	57.1	01Jan2011, 06:04	3.6
RWT292	0.0324738	56.9	01Jan2011, 06:08	3.5
JWT292	3.8595642	1064.3	01Jan2011, 08:00	329.2
RWT295	3.8595642	1064.2	01Jan2011, 08:01	329.0
WT280	0.2669500	251.8	01Jan2011, 06:12	22.3
JWT280	0.2669500	251.8	01Jan2011, 06:12	22.3
RWT294	0.2669500	251.2	01Jan2011, 06:15	22.2
JWT294	4.1265142	1082.0	01Jan2011, 08:01	351.3
RWT296	4.1265142	1081.4	01Jan2011, 08:07	350.6
MT040	0.3084200	455.2	01Jan2011, 06:11	38.1
MT030	0.1566300	228.6	01Jan2011, 06:05	15.1
MT020	0.0902033	143.1	01Jan2011, 06:04	9.0
JMT020	0.0902033	143.1	01Jan2011, 06:04	9.0
RMT030	0.0902033	141.8	01Jan2011, 06:17	8.9
JMT030	0.2468333	294.4	01Jan2011, 06:07	24.0
RMT040	0.2468333	293.0	01Jan2011, 06:11	24.0
Woodmen Hills Pond H	0.5552533	751.7	01Jan2011, 06:11	61.7
JMT040	0.5552533	751.7	01Jan2011, 06:11	61.7
RMT050	0.5552533	745.8	01Jan2011, 06:14	61.7
MT010	0.2898900	139.9	01Jan2011, 06:24	17.7
The Meadows Pond #2	0.2898900	72.6	01Jan2011, 06:51	14.4
JMT010	0.2898900	72.6	01Jan2011, 06:51	14.4
RMT062	0.2898900	72.5	01Jan2011, 07:02	14.4
MT060a	0.0311000	48.5	01Jan2011, 06:03	2.9
School Site	0.3209900	15.3	01Jan2011, 09:24	12.3

FUTURE 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JMT060a	0.3209900	15.3	01Jan2011, 09:24	12.3
RMT060a	0.3209900	15.3	01Jan2011, 09:31	12.3
MT050	0.1186100	109.7	01Jan2011, 06:18	11.4
JMT050	0.9948533	852.6	01Jan2011, 06:14	85.3
RMT064	0.9948533	847.9	01Jan2011, 06:21	85.2
MT060	0.1588000	196.8	01Jan2011, 06:08	14.7
Sub Regional Pond SR4	1.1536533	607.7	01Jan2011, 06:38	85.4
JMT060	1.1536533	607.7	01Jan2011, 06:38	85.4
RMT070	1.1536533	604.8	01Jan2011, 06:44	85.2
MT070	0.1994800	170.2	01Jan2011, 06:22	19.6
JMT070	1.3531333	710.9	01Jan2011, 06:42	104.8
RMT080	1.3531333	709.9	01Jan2011, 06:44	104.7
MT080	0.0638371	191.9	01Jan2011, 06:00	11.0
Regional Pond MN	1.4169704	686.6	01Jan2011, 06:49	113.2
JMT080	1.4169704	686.6	01Jan2011, 06:49	113.2
RMT102	1.4169704	683.7	01Jan2011, 06:56	112.9
MT090	0.0435103	127.4	01Jan2011, 06:00	7.1
Woodmen Hills Pond #5	0.0435103	18.6	01Jan2011, 06:07	5.9
JMT090	0.0435103	18.6	01Jan2011, 06:07	5.9
RMT090	0.0435103	18.6	01Jan2011, 06:08	5.9
JMT104	0.0435103	18.6	01Jan2011, 06:08	5.9
RMT104	0.0435103	18.6	01Jan2011, 06:12	5.9
JMT102	1.4604807	698.8	01Jan2011, 06:56	118.9
RMT106	1.4604807	693.3	01Jan2011, 06:58	118.7
MT100	0.0557682	88.2	01Jan2011, 06:05	5.9
JMT106	1.5162489	700.0	01Jan2011, 06:58	124.6
RMT112	1.5162489	696.5	01Jan2011, 07:10	123.9
MT110	0.1163900	117.4	01Jan2011, 06:16	11.5
JMT110	1.6326389	715.5	01Jan2011, 07:10	135.5
RMT114	1.6326389	714.4	01Jan2011, 07:15	135.2
WT290	0.1037800	110.3	01Jan2011, 06:09	8.7
Regional Pond R1	5.8629331	1339.4	01Jan2011, 08:04	486.8
JWT296	5.8629331	1339.4	01Jan2011, 08:04	486.8
RWT314	5.8629331	1339.1	01Jan2011, 08:10	485.9
WT300	0.0970199	91.6	01Jan2011, 06:12	8.1
JWT300	0.0970199	91.6	01Jan2011, 06:12	8.1
RWT312	0.0970199	91.1	01Jan2011, 06:29	8.1
WT310	0.2774200	246.7	01Jan2011, 06:13	22.3
JWT310	6.2373730	1363.2	01Jan2011, 08:09	516.3
RWT320	6.2373730	1362.4	01Jan2011, 08:15	515.2
WT320	0.2061400	200.6	01Jan2011, 06:11	17.2

FUTURE 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JWT320	6.4435130	1374.5	01Jan2011, 08:15	532.4
RWT352	6.4435130	1373.7	01Jan2011, 08:24	531.2
ET020	0.2131700	360.5	01Jan2011, 06:06	24.8
ET010	0.1451300	198.3	01Jan2011, 06:11	16.4
Paint Brush Hills Pond #4	0.1451300	150.9	01Jan2011, 06:20	16.3
JET010	0.1451300	150.9	01Jan2011, 06:20	16.3
RET020	0.1451300	150.0	01Jan2011, 06:37	16.3
Sub Regional Pond SR6	0.3583000	195.4	01Jan2011, 06:41	37.9
JET020	0.3583000	195.4	01Jan2011, 06:41	37.9
RET030	0.3583000	194.9	01Jan2011, 07:02	37.5
ET030	0.2042800	242.0	01Jan2011, 06:15	23.0
JET030	0.5625800	266.0	01Jan2011, 06:43	60.5
RET040	0.5625800	265.2	01Jan2011, 06:50	60.3
Woodmen Hills Pond #1 ...	0.7117200	263.5	01Jan2011, 07:09	75.5
ET040	0.1491400	165.7	01Jan2011, 06:14	15.3
Woodmen Hills Pond #1 ...	0.7117200	261.1	01Jan2011, 07:18	69.5
JET040	0.7117200	261.1	01Jan2011, 07:18	69.5
RET050	0.7117200	261.1	01Jan2011, 07:23	69.4
ET050	0.1171900	197.1	01Jan2011, 06:03	11.6
Woodmen Hills Pond #2	0.8289100	250.3	01Jan2011, 07:46	79.3
JET050	0.8289100	250.3	01Jan2011, 07:46	79.3
RET060	0.8289100	250.3	01Jan2011, 07:53	79.1
ET060	0.2854300	529.3	01Jan2011, 06:01	29.3
Woodmen Hills Pond #3	1.1143400	360.9	01Jan2011, 06:06	105.9
JET060	1.1143400	360.9	01Jan2011, 06:06	105.9
RET070	1.1143400	356.7	01Jan2011, 06:16	105.6
ET070	0.2497500	461.0	01Jan2011, 06:02	27.3
JET070	1.3640900	636.4	01Jan2011, 06:04	132.9
RET080	1.3640900	517.5	01Jan2011, 06:23	131.3
ET080	0.2916400	517.9	01Jan2011, 06:07	37.1
Woodmen Hills Pond #4	1.6557300	288.0	01Jan2011, 07:00	139.2
JET080	1.6557300	288.0	01Jan2011, 07:00	139.2
RET090	1.6557300	287.3	01Jan2011, 07:03	139.0
ET090	0.1242400	133.0	01Jan2011, 06:22	14.9
JET090	1.7799700	330.8	01Jan2011, 06:59	153.9
RET100	1.7799700	330.7	01Jan2011, 07:01	153.8
ET100	0.0480615	72.0	01Jan2011, 06:02	4.0
JET100	1.8280315	335.4	01Jan2011, 07:01	157.8
RET110	1.8280315	335.2	01Jan2011, 07:05	157.6
ET110	0.2260300	198.8	01Jan2011, 06:12	17.5
JET110	2.0540615	362.1	01Jan2011, 07:03	175.1

FUTURE 100-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RET120	2.0540615	361.3	01Jan2011, 07:09	174.7
ET120	0.1091300	89.4	01Jan2011, 06:14	8.5
JET120	2.1631915	403.2	01Jan2011, 06:17	183.2
RET152	2.1631915	402.2	01Jan2011, 06:24	182.9
ET130	0.1348100	85.4	01Jan2011, 06:27	11.2
JET130	0.1348100	85.4	01Jan2011, 06:27	11.2
RET140	0.1348100	84.7	01Jan2011, 06:54	11.1
ET140	0.2675900	122.8	01Jan2011, 06:46	22.2
JET140	0.4024000	204.8	01Jan2011, 06:51	33.3
RET154	0.4024000	204.4	01Jan2011, 07:05	33.2
JET152	2.5655915	572.3	01Jan2011, 07:10	216.1
RET156	2.5655915	572.0	01Jan2011, 07:14	215.8
ET150	0.1777300	136.2	01Jan2011, 06:18	14.3
JET154	2.7433215	595.8	01Jan2011, 07:12	230.1
RET162	2.7433215	595.1	01Jan2011, 07:25	228.9
ET160	0.1889200	137.2	01Jan2011, 06:23	16.3
JET160	2.9322415	633.6	01Jan2011, 06:38	245.2
RET164	2.9322415	629.0	01Jan2011, 06:47	244.7
WT350	0.3037700	276.7	01Jan2011, 06:14	26.3
JWT352	9.6795245	1938.3	01Jan2011, 07:42	802.2
RWT354	9.6795245	1938.3	01Jan2011, 07:42	802.2
WT330	0.3266800	249.3	01Jan2011, 06:19	27.2
JWT330	0.3266800	249.3	01Jan2011, 06:19	27.2
RWT344	0.3266800	248.4	01Jan2011, 06:25	27.2
WT340	0.2780000	147.3	01Jan2011, 06:37	23.1
JWT354	10.2842045	2011.2	01Jan2011, 07:41	852.4
RWT372	10.2842045	2008.9	01Jan2011, 07:47	851.3
WT360	0.0656830	54.8	01Jan2011, 06:15	5.3
JWT360	0.0656830	54.8	01Jan2011, 06:15	5.3
RWT374	0.0656830	54.6	01Jan2011, 06:24	5.3

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 100-yr Reservoir: School Site

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	100-yr
Compute Time:	25Jan2021, 10:31:29	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	75.8 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 07:02
Peak Outflow :	15.3 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 09:24
Total Inflow :	17.2 (AC-FT)	Peak Storage :	7.7 (AC-FT)
Total Outflow :	12.3 (AC-FT)	Peak Elevation :	6957.0 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 100-yr Reservoir: Sub Regional Pond SR4

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	100-yr
Compute Time:	25Jan2021, 10:31:29	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	952.1 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:20
Peak Outflow :	607.7 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:38
Total Inflow :	99.9 (AC-FT)	Peak Storage :	26.2 (AC-FT)
Total Outflow :	85.4 (AC-FT)	Peak Elevation :	6896.9 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 100-yr Reservoir: Regional Pond MN

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	100-yr
Compute Time:	25Jan2021, 10:31:29	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	720.0 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:44
Peak Outflow :	686.6 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:49
Total Inflow :	115.8 (AC-FT)	Peak Storage :	6.7 (AC-FT)
Total Outflow :	113.2 (AC-FT)	Peak Elevation :	6853.6 (FT)

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT020	0.0671383	10.3	01Jan2011, 06:23	1.4
JWT020	0.0671383	10.3	01Jan2011, 06:23	1.4
RWT030	0.0671383	10.3	01Jan2011, 06:34	1.4
WT030	0.0764732	19.5	01Jan2011, 06:08	1.6
JWT030	0.1436115	20.0	01Jan2011, 06:09	3.0
RWT042	0.1436115	19.9	01Jan2011, 06:18	3.0
WT010	0.1353300	21.2	01Jan2011, 06:19	2.6
JWT010	0.1353300	21.2	01Jan2011, 06:19	2.6
RWT044	0.1353300	21.2	01Jan2011, 06:29	2.6
JWT042	0.2789415	37.2	01Jan2011, 06:24	5.6
RWT046	0.2789415	37.2	01Jan2011, 06:35	5.6
WT040	0.1850600	21.9	01Jan2011, 06:31	3.6
JWT044	0.4640015	58.9	01Jan2011, 06:34	9.2
RWT054	0.4640015	58.7	01Jan2011, 06:43	9.2
WT060	0.1956300	30.1	01Jan2011, 06:29	4.5
WT050	0.1899300	37.3	01Jan2011, 06:21	4.7
JWT050	0.8495615	108.6	01Jan2011, 06:38	18.4
RWT092	0.8495615	108.5	01Jan2011, 06:39	18.4
WT070	0.1711000	32.6	01Jan2011, 06:13	3.4
JWT070	0.1711000	32.6	01Jan2011, 06:13	3.4
RWT080	0.1711000	32.5	01Jan2011, 06:28	3.3
WT080	0.0691596	18.5	01Jan2011, 06:12	1.7
Sub Regional Pond SR1	1.0898211	113.8	01Jan2011, 06:50	21.9
JWT080	1.0898211	113.8	01Jan2011, 06:50	21.9
RWT094	1.0898211	113.7	01Jan2011, 06:58	21.8
WT100-REV	0.1292700	67.7	01Jan2011, 06:05	4.5
W26-REV	0.0720000	33.7	01Jan2011, 06:04	2.1
WS3-1	0.0720000	33.4	01Jan2011, 06:13	2.1
Paint Brush Hills Pond C	0.2012700	14.0	01Jan2011, 06:38	6.5
WT090	0.1533300	46.0	01Jan2011, 06:10	4.0
JWT090	1.4444211	133.8	01Jan2011, 06:57	32.3
RWT122	1.4444211	133.7	01Jan2011, 07:01	32.3
WT110	0.1942800	47.0	01Jan2011, 06:16	5.1
JWT110	1.6387011	144.0	01Jan2011, 07:00	37.4
RWT124	1.6387011	144.0	01Jan2011, 07:08	37.3
WT130-REV	0.1016250	43.5	01Jan2011, 06:12	3.9
Paint Brush Hills Pond A	0.1016250	9.3	01Jan2011, 06:49	3.9
WT120-REV	0.0430300	14.8	01Jan2011, 06:09	1.2

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JWT120	1.7833561	154.4	01Jan2011, 07:08	42.4
RWT172	1.7833561	154.2	01Jan2011, 07:18	42.2
WT140-REV	0.1445300	65.2	01Jan2011, 06:14	6.1
JWT140	0.1445300	65.2	01Jan2011, 06:14	6.1
RWT150	0.1445300	64.9	01Jan2011, 06:24	6.1
WT150-REV	0.1308100	71.3	01Jan2011, 06:08	5.5
Paint Brush Hills Pond...	0.2753400	110.4	01Jan2011, 06:15	11.6
W34B2-REV	0.0935900	49.1	01Jan2011, 06:08	3.7
Paint Brush Hills Pond...	0.3689300	20.1	01Jan2011, 07:15	13.8
JWT150	0.3689300	20.1	01Jan2011, 07:15	13.8
RWT160	0.3689300	20.0	01Jan2011, 07:24	13.8
WT160-REV	0.0734800	36.3	01Jan2011, 06:07	2.6
JWT160	0.4424100	37.3	01Jan2011, 06:07	16.4
RWT174	0.4424100	36.9	01Jan2011, 06:20	16.3
WT170-REV	0.1060150	24.0	01Jan2011, 06:21	2.9
W34-CY-REV	0.0465469	10.7	01Jan2011, 06:18	1.2
JWT172	2.3783280	181.3	01Jan2011, 07:17	62.6
RWT176	2.3783280	181.2	01Jan2011, 07:18	62.6
Sub Regional Pond SR2	2.3783280	171.7	01Jan2011, 07:30	59.3
JWT174	2.3783280	171.7	01Jan2011, 07:30	59.3
RWT180	2.3783280	171.6	01Jan2011, 07:45	59.0
WT180-REV	0.0409400	7.6	01Jan2011, 06:21	1.0
JWT180	2.4192680	172.6	01Jan2011, 07:45	59.9
RWT202	2.4192680	172.6	01Jan2011, 08:03	59.5
WT200	0.3017100	52.2	01Jan2011, 06:33	8.3
WT190	0.0574561	22.5	01Jan2011, 06:06	1.6
The Meadows Pond #1	0.0574561	0.6	01Jan2011, 10:18	0.9
JWT190	0.0574561	0.6	01Jan2011, 10:18	0.9
RWT204	0.0574561	0.6	01Jan2011, 10:56	0.8
JWT200	2.7784341	182.8	01Jan2011, 08:02	68.6
RWT210	2.7784341	182.7	01Jan2011, 08:10	68.3
WT210	0.2654600	59.7	01Jan2011, 06:38	9.8
JWT210	3.0438941	194.3	01Jan2011, 08:09	78.2
RWT232	3.0438941	194.3	01Jan2011, 08:16	77.9
WT220	0.1895300	84.8	01Jan2011, 06:13	7.8
JWT220	0.1895300	84.8	01Jan2011, 06:13	7.8
RWT234	0.1895300	84.4	01Jan2011, 06:25	7.7
JWT232	3.2334241	200.7	01Jan2011, 08:16	85.7
RWT236	3.2334241	200.7	01Jan2011, 08:16	85.7

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT230	0.1981800	124.0	01Jan2011, 06:06	8.5
JWT234	3.4316041	205.6	01Jan2011, 08:15	94.2
RWT240	3.4316041	205.4	01Jan2011, 08:21	94.0
WT240	0.0761461	61.0	01Jan2011, 06:02	3.4
Regional Pond WU No...	3.5077502	206.4	01Jan2011, 08:23	96.3
Regional Pond WU Di...	3.5077502	169.3	01Jan2011, 08:23	64.8
Old Meridian	0.0335900	38.2	01Jan2011, 06:09	2.8
RWT-OM	0.0335900	37.8	01Jan2011, 06:14	2.8
Regional Pond WU So...	3.5413402	144.6	01Jan2011, 08:49	57.2
RWT240_Diversion R...	0.0000000	37.1	01Jan2011, 08:29	31.4
JWT240	3.5413402	180.6	01Jan2011, 08:47	88.6
RWT250	3.5413402	180.6	01Jan2011, 08:48	88.5
WT250	0.1469500	107.5	01Jan2011, 06:03	6.3
JWT250	3.6882902	183.2	01Jan2011, 08:48	94.9
RWT260	3.6882902	183.1	01Jan2011, 09:04	94.3
WT260	0.1388002	21.0	01Jan2011, 06:36	3.6
JWT260	3.8270904	185.4	01Jan2011, 09:03	97.9
RWT291	3.8270904	185.3	01Jan2011, 09:07	97.8
WT270	0.0324738	20.0	01Jan2011, 06:04	1.3
JWT270	0.0324738	20.0	01Jan2011, 06:04	1.3
RWT292	0.0324738	19.9	01Jan2011, 06:10	1.3
JWT292	3.8595642	185.9	01Jan2011, 09:07	99.0
RWT295	3.8595642	185.8	01Jan2011, 09:09	99.0
WT280	0.2669500	70.1	01Jan2011, 06:14	6.9
JWT280	0.2669500	70.1	01Jan2011, 06:14	6.9
RWT294	0.2669500	70.0	01Jan2011, 06:17	6.9
JWT294	4.1265142	189.2	01Jan2011, 09:09	105.9
RWT296	4.1265142	189.1	01Jan2011, 09:17	105.5
MT040	0.3084200	163.5	01Jan2011, 06:12	14.5
MT030	0.1566300	73.4	01Jan2011, 06:06	5.1
MT020	0.0902033	47.3	01Jan2011, 06:05	3.1
JMT020	0.0902033	47.3	01Jan2011, 06:05	3.1
RMT030	0.0902033	46.8	01Jan2011, 06:21	3.1
JMT030	0.2468333	93.6	01Jan2011, 06:07	8.1
RMT040	0.2468333	92.8	01Jan2011, 06:12	8.1
Woodmen Hills Pond H	0.5552533	242.5	01Jan2011, 06:16	22.5
JMT040	0.5552533	242.5	01Jan2011, 06:16	22.5
RMT050	0.5552533	242.2	01Jan2011, 06:19	22.5
MT010	0.2898900	36.7	01Jan2011, 06:26	5.2

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
The Meadows Pond #2	0.2898900	2.7	01Jan2011, 09:12	3.5
JMT010	0.2898900	2.7	01Jan2011, 09:12	3.5
RMT062	0.2898900	2.7	01Jan2011, 09:38	3.4
MT060a	0.0311000	15.6	01Jan2011, 06:03	1.0
School Site	0.3209900	1.7	02Jan2011, 00:00	1.7
JMT060a	0.3209900	1.7	02Jan2011, 00:00	1.7
RMT060a	0.3209900	1.7	02Jan2011, 00:00	1.7
MT050	0.1186100	33.2	01Jan2011, 06:20	3.8
JMT050	0.9948533	275.6	01Jan2011, 06:19	28.0
RMT064	0.9948533	273.3	01Jan2011, 06:29	27.9
MT060	0.1588000	60.1	01Jan2011, 06:09	4.8
Sub Regional Pond SR4	1.1536533	24.2	01Jan2011, 08:44	22.9
JMT060	1.1536533	24.2	01Jan2011, 08:44	22.9
RMT070	1.1536533	24.2	01Jan2011, 08:52	22.7
MT070	0.1994800	51.6	01Jan2011, 06:24	6.6
JMT070	1.3531333	55.6	01Jan2011, 06:25	29.3
RMT080	1.3531333	55.6	01Jan2011, 06:28	29.3
MT080	0.0638371	91.5	01Jan2011, 06:00	5.0
Regional Pond MN	1.4169704	62.4	01Jan2011, 06:32	31.8
JMT080	1.4169704	62.4	01Jan2011, 06:32	31.8
RMT102	1.4169704	62.2	01Jan2011, 06:41	31.6
MT090	0.0435103	59.3	01Jan2011, 06:00	3.2
Woodmen Hills Pond #5	0.0435103	2.2	01Jan2011, 08:01	2.3
JMT090	0.0435103	2.2	01Jan2011, 08:01	2.3
RMT090	0.0435103	2.2	01Jan2011, 08:01	2.3
JMT104	0.0435103	2.2	01Jan2011, 08:01	2.3
RMT104	0.0435103	2.2	01Jan2011, 08:07	2.3
JMT102	1.4604807	64.3	01Jan2011, 06:41	33.9
RMT106	1.4604807	64.0	01Jan2011, 06:43	33.9
MT100	0.0557682	29.8	01Jan2011, 06:06	2.1
JMT106	1.5162489	67.8	01Jan2011, 06:42	35.9
RMT112	1.5162489	66.0	01Jan2011, 07:16	35.0
MT110	0.1163900	36.3	01Jan2011, 06:18	3.9
JMT110	1.6326389	72.0	01Jan2011, 07:16	39.0
RMT114	1.6326389	71.2	01Jan2011, 07:25	38.7
WT290	0.1037800	31.2	01Jan2011, 06:10	2.7
Regional Pond R1	5.8629331	223.1	01Jan2011, 09:27	139.8
JWT296	5.8629331	223.1	01Jan2011, 09:27	139.8
RWT314	5.8629331	223.0	01Jan2011, 09:34	139.1

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT300	0.0970199	25.5	01Jan2011, 06:14	2.5
JWT300	0.0970199	25.5	01Jan2011, 06:14	2.5
RWT312	0.0970199	25.4	01Jan2011, 06:34	2.5
WT310	0.2774200	67.1	01Jan2011, 06:14	6.9
JWT310	6.2373730	227.5	01Jan2011, 09:34	148.4
RWT320	6.2373730	227.4	01Jan2011, 09:42	147.7
WT320	0.2061400	56.1	01Jan2011, 06:13	5.4
JWT320	6.4435130	230.0	01Jan2011, 09:42	153.0
RWT352	6.4435130	229.9	01Jan2011, 09:51	152.2
ET020	0.2131700	128.1	01Jan2011, 06:07	9.2
ET010	0.1451300	67.4	01Jan2011, 06:12	5.9
Paint Brush Hills Pond...	0.1451300	48.8	01Jan2011, 06:22	5.9
JET010	0.1451300	48.8	01Jan2011, 06:22	5.9
RET020	0.1451300	48.7	01Jan2011, 06:37	5.9
Sub Regional Pond SR6	0.3583000	19.9	01Jan2011, 07:26	13.5
JET020	0.3583000	19.9	01Jan2011, 07:26	13.5
RET030	0.3583000	19.7	01Jan2011, 08:14	13.1
ET030	0.2042800	81.2	01Jan2011, 06:17	8.4
JET030	0.5625800	81.2	01Jan2011, 06:17	21.5
RET040	0.5625800	80.9	01Jan2011, 06:28	21.4
Woodmen Hills Pond ...	0.7117200	103.5	01Jan2011, 06:35	26.6
ET040	0.1491400	52.6	01Jan2011, 06:15	5.3
Woodmen Hills Pond ...	0.7117200	32.8	01Jan2011, 07:14	21.7
JET040	0.7117200	32.8	01Jan2011, 07:14	21.7
RET050	0.7117200	32.8	01Jan2011, 07:22	21.6
ET050	0.1171900	66.6	01Jan2011, 06:03	4.0
Woodmen Hills Pond #2	0.8289100	29.6	01Jan2011, 08:07	23.9
JET050	0.8289100	29.6	01Jan2011, 08:07	23.9
RET060	0.8289100	29.6	01Jan2011, 08:19	23.7
ET060	0.2854300	185.5	01Jan2011, 06:02	10.2
Woodmen Hills Pond #3	1.1143400	82.1	01Jan2011, 06:08	31.5
JET060	1.1143400	82.1	01Jan2011, 06:08	31.5
RET070	1.1143400	81.0	01Jan2011, 06:18	31.2
ET070	0.2497500	164.1	01Jan2011, 06:03	9.8
JET070	1.3640900	164.5	01Jan2011, 06:03	41.0
RET080	1.3640900	123.5	01Jan2011, 06:29	40.2
ET080	0.2916400	192.2	01Jan2011, 06:08	14.3
Woodmen Hills Pond #4	1.6557300	26.7	01Jan2011, 14:58	26.8
JET080	1.6557300	26.7	01Jan2011, 14:58	26.8

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RET090	1.6557300	26.7	01Jan2011, 15:03	26.6
ET090	0.1242400	46.0	01Jan2011, 06:23	5.6
JET090	1.7799700	50.6	01Jan2011, 06:24	32.2
RET100	1.7799700	50.6	01Jan2011, 06:28	32.1
ET100	0.0480615	22.3	01Jan2011, 06:02	1.3
JET100	1.8280315	53.2	01Jan2011, 06:28	33.3
RET110	1.8280315	53.1	01Jan2011, 06:35	33.1
ET110	0.2260300	52.7	01Jan2011, 06:13	5.3
JET110	2.0540615	86.0	01Jan2011, 06:13	38.4
RET120	2.0540615	85.1	01Jan2011, 06:19	38.1
ET120	0.1091300	23.5	01Jan2011, 06:16	2.5
JET120	2.1631915	107.9	01Jan2011, 06:19	40.7
RET152	2.1631915	107.7	01Jan2011, 06:25	40.4
ET130	0.1348100	23.2	01Jan2011, 06:30	3.5
JET130	0.1348100	23.2	01Jan2011, 06:30	3.5
RET140	0.1348100	23.1	01Jan2011, 07:00	3.5
ET140	0.2675900	33.4	01Jan2011, 06:49	6.9
JET140	0.4024000	55.3	01Jan2011, 06:56	10.4
RET154	0.4024000	55.2	01Jan2011, 07:19	10.3
JET152	2.5655915	108.6	01Jan2011, 06:26	50.8
RET156	2.5655915	108.3	01Jan2011, 06:30	50.6
ET150	0.1777300	36.6	01Jan2011, 06:20	4.4
JET154	2.7433215	138.8	01Jan2011, 06:29	55.0
RET162	2.7433215	135.5	01Jan2011, 06:54	54.2
ET160	0.1889200	38.5	01Jan2011, 06:25	5.2
JET160	2.9322415	154.7	01Jan2011, 06:53	59.4
RET164	2.9322415	154.3	01Jan2011, 06:58	59.2
WT350	0.3037700	78.7	01Jan2011, 06:16	8.4
JWT352	9.6795245	311.7	01Jan2011, 07:22	219.7
RWT354	9.6795245	311.7	01Jan2011, 07:22	219.7
WT330	0.3266800	68.2	01Jan2011, 06:21	8.5
JWT330	0.3266800	68.2	01Jan2011, 06:21	8.5
RWT344	0.3266800	67.9	01Jan2011, 06:30	8.5
WT340	0.2780000	40.0	01Jan2011, 06:39	7.2
JWT354	10.2842045	350.6	01Jan2011, 07:20	235.3
RWT372	10.2842045	350.4	01Jan2011, 07:24	234.7
WT360	0.0656830	14.8	01Jan2011, 06:17	1.6
JWT360	0.0656830	14.8	01Jan2011, 06:17	1.6
RWT374	0.0656830	14.7	01Jan2011, 06:32	1.6

FUTURE 5-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Regional Pond R2	10.3498875	352.6	01Jan2011, 07:26	233.1
JWT372	10.3498875	352.6	01Jan2011, 07:26	233.1
RWT376	10.3498875	351.6	01Jan2011, 07:35	231.9
WT370	0.2147600	23.4	01Jan2011, 06:15	2.8

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 5-yr Reservoir: School Site

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	5-yr
Compute Time:	25Jan2021, 10:40:43	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	15.6 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:03
Peak Outflow :	1.7 (CFS)	Date/Time of Peak Outflow :	02Jan2011, 00:00
Total Inflow :	4.4 (AC-FT)	Peak Storage :	2.6 (AC-FT)
Total Outflow :	1.7 (AC-FT)	Peak Elevation :	6955.4 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 5-yr Reservoir: Sub Regional Pond SR4

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	5-yr
Compute Time:	25Jan2021, 10:40:43	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	293.1 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:29
Peak Outflow :	24.2 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 08:44
Total Inflow :	32.7 (AC-FT)	Peak Storage :	16.2 (AC-FT)
Total Outflow :	22.9 (AC-FT)	Peak Elevation :	6894.0 (FT)

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 5-yr Reservoir: Regional Pond MN

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	5-yr
Compute Time:	25Jan2021, 10:40:43	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	99.9 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:01
Peak Outflow :	62.4 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:32
Total Inflow :	34.3 (AC-FT)	Peak Storage :	2.8 (AC-FT)
Total Outflow :	31.8 (AC-FT)	Peak Elevation :	6851.6 (FT)

FUTURE 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT040	0.1850600	9.1	01Jan2011, 06:34	1.8
JWT044	0.4640015	23.9	01Jan2011, 06:39	4.5
RWT054	0.4640015	23.8	01Jan2011, 06:50	4.5
WT060	0.1956300	13.6	01Jan2011, 06:30	2.3
WT050	0.1899300	17.3	01Jan2011, 06:23	2.4
JWT050	0.8495615	42.8	01Jan2011, 06:47	9.3
RWT092	0.8495615	42.7	01Jan2011, 06:49	9.3
WT070	0.1711000	13.6	01Jan2011, 06:15	1.6
JWT070	0.1711000	13.6	01Jan2011, 06:15	1.6
RWT080	0.1711000	13.6	01Jan2011, 06:34	1.6
WT080	0.0691596	8.7	01Jan2011, 06:13	0.9
Sub Regional Pond SR1	1.0898211	41.9	01Jan2011, 07:03	10.4
JWT080	1.0898211	41.9	01Jan2011, 07:03	10.4
RWT094	1.0898211	41.9	01Jan2011, 07:14	10.3
WT100-REV	0.1292700	37.0	01Jan2011, 06:05	2.5
W26-REV	0.0720000	18.4	01Jan2011, 06:04	1.2
WS3-1	0.0720000	18.1	01Jan2011, 06:15	1.2
Paint Brush Hills Pond C	0.2012700	10.4	01Jan2011, 06:34	3.7
WT090	0.1533300	22.1	01Jan2011, 06:11	2.1
JWT090	1.4444211	54.5	01Jan2011, 07:12	16.1
RWT122	1.4444211	54.5	01Jan2011, 07:17	16.1
WT110	0.1942800	22.3	01Jan2011, 06:17	2.7
JWT110	1.6387011	58.6	01Jan2011, 07:16	18.7
RWT124	1.6387011	58.6	01Jan2011, 07:26	18.7
WT130-REV	0.1016250	24.0	01Jan2011, 06:13	2.3
Paint Brush Hills Pond A	0.1016250	4.8	01Jan2011, 06:53	2.3
WT120-REV	0.0430300	7.2	01Jan2011, 06:09	0.6
JWT120	1.7833561	63.9	01Jan2011, 07:26	21.6
RWT172	1.7833561	63.8	01Jan2011, 07:38	21.5
WT140-REV	0.1445300	35.7	01Jan2011, 06:14	3.6
JWT140	0.1445300	35.7	01Jan2011, 06:14	3.6
RWT150	0.1445300	35.5	01Jan2011, 06:25	3.6
WT150-REV	0.1308100	40.8	01Jan2011, 06:09	3.3
Paint Brush Hills Pond B1	0.2753400	58.7	01Jan2011, 06:19	6.8
W34B2-REV	0.0935900	27.9	01Jan2011, 06:08	2.2
Paint Brush Hills Pond B2	0.3689300	9.8	01Jan2011, 07:30	8.0
JWT150	0.3689300	9.8	01Jan2011, 07:30	8.0
RWT160	0.3689300	9.8	01Jan2011, 07:40	8.0
WT160-REV	0.0734800	19.7	01Jan2011, 06:07	1.5
JWT160	0.4424100	20.1	01Jan2011, 06:07	9.5
RWT174	0.4424100	19.8	01Jan2011, 06:23	9.4

FUTURE 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
WT170-REV	0.1060150	11.6	01Jan2011, 06:22	1.6
W34-CY-REV	0.0465469	5.2	01Jan2011, 06:19	0.6
JWT172	2.3783280	81.2	01Jan2011, 06:39	33.1
RWT176	2.3783280	81.1	01Jan2011, 06:40	33.1
Sub Regional Pond SR2	2.3783280	66.8	01Jan2011, 08:06	30.0
JWT174	2.3783280	66.8	01Jan2011, 08:06	30.0
RWT180	2.3783280	66.8	01Jan2011, 08:25	29.7
WT180-REV	0.0409400	3.4	01Jan2011, 06:22	0.5
JWT180	2.4192680	67.2	01Jan2011, 08:25	30.2
RWT202	2.4192680	67.1	01Jan2011, 08:51	29.9
WT200	0.3017100	25.3	01Jan2011, 06:34	4.4
WT190	0.0574561	11.3	01Jan2011, 06:07	0.9
The Meadows Pond #1	0.0574561	0.3	01Jan2011, 13:19	0.4
JWT190	0.0574561	0.3	01Jan2011, 13:19	0.4
RWT204	0.0574561	0.3	01Jan2011, 14:16	0.4
JWT200	2.7784341	70.6	01Jan2011, 08:50	34.8
RWT210	2.7784341	70.6	01Jan2011, 09:00	34.6
WT210	0.2654600	31.9	01Jan2011, 06:39	5.6
JWT210	3.0438941	74.5	01Jan2011, 08:59	40.2
RWT232	3.0438941	74.5	01Jan2011, 09:08	40.0
WT220	0.1895300	47.1	01Jan2011, 06:14	4.5
JWT220	0.1895300	47.1	01Jan2011, 06:14	4.5
RWT234	0.1895300	46.9	01Jan2011, 06:26	4.5
JWT232	3.2334241	76.6	01Jan2011, 09:08	44.5
RWT236	3.2334241	76.6	01Jan2011, 09:09	44.5
WT230	0.1981800	71.3	01Jan2011, 06:06	5.0
JWT234	3.4316041	84.5	01Jan2011, 06:43	49.5
RWT240	3.4316041	84.0	01Jan2011, 06:48	49.4
WT240	0.0761461	36.4	01Jan2011, 06:02	2.1
Regional Pond WU North	3.5077502	89.8	01Jan2011, 06:10	50.3
Regional Pond WU Diversion	3.5077502	62.4	01Jan2011, 06:10	27.5
Old Meridian	0.0335900	24.6	01Jan2011, 06:09	1.9
RWT-OM	0.0335900	24.3	01Jan2011, 06:16	1.8
Regional Pond WU South	3.5413402	31.1	01Jan2011, 10:35	19.2
RWT240_Diversion Reach	0.0000000	27.1	01Jan2011, 06:16	22.8
JWT240	3.5413402	51.8	01Jan2011, 10:19	42.0
RWT250	3.5413402	51.8	01Jan2011, 10:20	42.0
WT250	0.1469500	63.0	01Jan2011, 06:03	3.7
JWT250	3.6882902	63.4	01Jan2011, 06:03	45.7
RWT260	3.6882902	61.1	01Jan2011, 06:24	45.4
WT260	0.1388002	9.9	01Jan2011, 06:38	1.9
JWT260	3.8270904	69.2	01Jan2011, 06:24	47.3

FUTURE 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RWT291	3.8270904	68.9	01Jan2011, 06:29	47.1
WT270	0.0324738	11.3	01Jan2011, 06:05	0.7
JWT270	0.0324738	11.3	01Jan2011, 06:05	0.7
RWT292	0.0324738	11.2	01Jan2011, 06:11	0.7
JWT292	3.8595642	71.9	01Jan2011, 06:29	47.9
RWT295	3.8595642	71.5	01Jan2011, 06:31	47.8
WT280	0.2669500	33.4	01Jan2011, 06:15	3.7
JWT280	0.2669500	33.4	01Jan2011, 06:15	3.7
RWT294	0.2669500	33.4	01Jan2011, 06:18	3.7
JWT294	4.1265142	94.0	01Jan2011, 06:30	51.5
RWT296	4.1265142	91.9	01Jan2011, 06:40	51.2
MT040	0.3084200	94.6	01Jan2011, 06:13	8.8
MT030	0.1566300	39.0	01Jan2011, 06:06	2.8
MT020	0.0902033	25.8	01Jan2011, 06:05	1.7
JMT020	0.0902033	25.8	01Jan2011, 06:05	1.7
RMT030	0.0902033	25.4	01Jan2011, 06:20	1.7
JMT030	0.2468333	50.1	01Jan2011, 06:10	4.5
RMT040	0.2468333	49.3	01Jan2011, 06:16	4.5
Woodmen Hills Pond H	0.5552533	107.8	01Jan2011, 06:25	13.2
JMT040	0.5552533	107.8	01Jan2011, 06:25	13.2
RMT050	0.5552533	107.4	01Jan2011, 06:28	13.2
MT010	0.2898900	17.3	01Jan2011, 06:28	2.7
The Meadows Pond #2	0.2898900	1.5	01Jan2011, 09:08	1.9
JMT010	0.2898900	1.5	01Jan2011, 09:08	1.9
RMT062	0.2898900	1.5	01Jan2011, 09:48	1.8
MT060a	0.0311000	8.3	01Jan2011, 06:04	0.5
School Site	0.3209900	1.0	02Jan2011, 00:00	1.0
JMT060a	0.3209900	1.0	02Jan2011, 00:00	1.0
RMT060a	0.3209900	1.0	02Jan2011, 00:00	0.9
MT050	0.1186100	17.0	01Jan2011, 06:21	2.1
JMT050	0.9948533	123.2	01Jan2011, 06:27	16.2
RMT064	0.9948533	121.3	01Jan2011, 06:40	16.2
MT060	0.1588000	30.7	01Jan2011, 06:10	2.7
Sub Regional Pond SR4	1.1536533	11.2	01Jan2011, 09:39	13.9
JMT060	1.1536533	11.2	01Jan2011, 09:39	13.9
RMT070	1.1536533	11.2	01Jan2011, 09:50	13.7
MT070	0.1994800	26.4	01Jan2011, 06:25	3.7
JMT070	1.3531333	29.0	01Jan2011, 06:26	17.4
RMT080	1.3531333	29.0	01Jan2011, 06:29	17.4
MT080	0.0638371	62.4	01Jan2011, 06:00	3.4
Regional Pond MN	1.4169704	30.9	01Jan2011, 06:37	18.3
JMT080	1.4169704	30.9	01Jan2011, 06:37	18.3

FUTURE 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RMT102	1.4169704	30.8	01Jan2011, 06:48	18.1
MT090	0.0435103	39.9	01Jan2011, 06:00	2.1
Woodmen Hills Pond #5	0.0435103	1.4	01Jan2011, 08:02	1.5
JMT090	0.0435103	1.4	01Jan2011, 08:02	1.5
RMT090	0.0435103	1.4	01Jan2011, 08:02	1.5
JMT104	0.0435103	1.4	01Jan2011, 08:02	1.5
RMT104	0.0435103	1.4	01Jan2011, 08:09	1.5
JMT102	1.4604807	32.1	01Jan2011, 06:48	19.6
RMT106	1.4604807	31.8	01Jan2011, 06:51	19.6
MT100	0.0557682	16.5	01Jan2011, 06:06	1.2
JMT106	1.5162489	33.6	01Jan2011, 06:51	20.8
RMT112	1.5162489	33.0	01Jan2011, 07:29	20.1
MT110	0.1163900	18.9	01Jan2011, 06:19	2.2
JMT110	1.6326389	35.8	01Jan2011, 07:29	22.3
RMT114	1.6326389	35.7	01Jan2011, 07:40	22.1
WT290	0.1037800	15.0	01Jan2011, 06:11	1.4
Regional Pond R1	5.8629331	74.9	01Jan2011, 07:54	67.8
JWT296	5.8629331	74.9	01Jan2011, 07:54	67.8
RWT314	5.8629331	74.8	01Jan2011, 08:05	67.2
WT300	0.0970199	12.2	01Jan2011, 06:15	1.3
JWT300	0.0970199	12.2	01Jan2011, 06:15	1.3
RWT312	0.0970199	12.1	01Jan2011, 06:39	1.3
WT310	0.2774200	31.3	01Jan2011, 06:16	3.6
JWT310	6.2373730	79.8	01Jan2011, 08:05	72.1
RWT320	6.2373730	79.7	01Jan2011, 08:15	71.6
WT320	0.2061400	26.8	01Jan2011, 06:14	2.8
JWT320	6.4435130	82.2	01Jan2011, 08:14	74.4
RWT352	6.4435130	82.1	01Jan2011, 08:26	73.7
ET020	0.2131700	73.4	01Jan2011, 06:07	5.4
ET010	0.1451300	37.5	01Jan2011, 06:12	3.5
Paint Brush Hills Pond #4	0.1451300	29.4	01Jan2011, 06:21	3.5
JET010	0.1451300	29.4	01Jan2011, 06:21	3.5
RET020	0.1451300	29.3	01Jan2011, 06:37	3.5
Sub Regional Pond SR6	0.3583000	9.3	01Jan2011, 07:43	7.9
JET020	0.3583000	9.3	01Jan2011, 07:43	7.9
RET030	0.3583000	9.3	01Jan2011, 08:37	7.6
ET030	0.2042800	44.9	01Jan2011, 06:17	4.9
JET030	0.5625800	44.9	01Jan2011, 06:17	12.5
RET040	0.5625800	44.6	01Jan2011, 06:30	12.4
Woodmen Hills Pond #1 North	0.7117200	60.8	01Jan2011, 06:33	15.4
ET040	0.1491400	27.9	01Jan2011, 06:16	3.0
Woodmen Hills Pond #1 South	0.7117200	9.6	01Jan2011, 12:57	12.0

FUTURE 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
JET040	0.7117200	9.6	01Jan2011, 12:57	12.0
RET050	0.7117200	9.6	01Jan2011, 13:08	11.8
ET050	0.1171900	36.5	01Jan2011, 06:03	2.2
Woodmen Hills Pond #2	0.8289100	10.4	01Jan2011, 13:06	12.5
JET050	0.8289100	10.4	01Jan2011, 13:06	12.5
RET060	0.8289100	10.4	01Jan2011, 13:21	12.3
ET060	0.2854300	105.0	01Jan2011, 06:02	5.8
Woodmen Hills Pond #3	1.1143400	12.6	01Jan2011, 13:03	15.7
JET060	1.1143400	12.6	01Jan2011, 13:03	15.7
RET070	1.1143400	12.6	01Jan2011, 13:18	15.5
ET070	0.2497500	93.5	01Jan2011, 06:03	5.7
JET070	1.3640900	93.6	01Jan2011, 06:03	21.2
RET080	1.3640900	64.9	01Jan2011, 06:31	20.7
ET080	0.2916400	113.3	01Jan2011, 06:08	8.7
Woodmen Hills Pond #4	1.6557300	9.8	02Jan2011, 00:00	12.0
JET080	1.6557300	9.8	02Jan2011, 00:00	12.0
RET090	1.6557300	9.8	02Jan2011, 00:00	11.9
ET090	0.1242400	26.0	01Jan2011, 06:24	3.3
JET090	1.7799700	29.2	01Jan2011, 06:25	15.3
RET100	1.7799700	29.1	01Jan2011, 06:30	15.2
ET100	0.0480615	11.4	01Jan2011, 06:02	0.7
JET100	1.8280315	30.6	01Jan2011, 06:30	15.8
RET110	1.8280315	30.6	01Jan2011, 06:38	15.7
ET110	0.2260300	24.0	01Jan2011, 06:15	2.7
JET110	2.0540615	41.4	01Jan2011, 06:32	18.4
RET120	2.0540615	41.4	01Jan2011, 06:39	18.2
ET120	0.1091300	10.7	01Jan2011, 06:17	1.3
JET120	2.1631915	49.7	01Jan2011, 06:21	19.5
RET152	2.1631915	49.5	01Jan2011, 06:29	19.4
ET130	0.1348100	10.9	01Jan2011, 06:31	1.8
JET130	0.1348100	10.9	01Jan2011, 06:31	1.8
RET140	0.1348100	10.9	01Jan2011, 07:06	1.8
ET140	0.2675900	15.9	01Jan2011, 06:51	3.6
JET140	0.4024000	25.8	01Jan2011, 07:01	5.5
RET154	0.4024000	25.7	01Jan2011, 07:27	5.4
JET152	2.5655915	53.7	01Jan2011, 07:01	24.8
RET156	2.5655915	53.5	01Jan2011, 07:06	24.7
ET150	0.1777300	17.0	01Jan2011, 06:21	2.3
JET154	2.7433215	62.3	01Jan2011, 06:34	27.0
RET162	2.7433215	59.6	01Jan2011, 07:07	26.4
ET160	0.1889200	18.6	01Jan2011, 06:26	2.8
JET160	2.9322415	66.8	01Jan2011, 07:06	29.2

FUTURE 2-year STORM

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
RET164	2.9322415	66.5	01Jan2011, 07:12	29.1
WT350	0.3037700	38.3	01Jan2011, 06:17	4.5
JWT352	9.6795245	134.6	01Jan2011, 08:21	107.3
RWT354	9.6795245	134.6	01Jan2011, 08:21	107.3
WT330	0.3266800	32.2	01Jan2011, 06:23	4.5
JWT330	0.3266800	32.2	01Jan2011, 06:23	4.5
RWT344	0.3266800	32.0	01Jan2011, 06:34	4.5
WT340	0.2780000	18.9	01Jan2011, 06:42	3.8
JWT354	10.2842045	143.4	01Jan2011, 08:20	115.5
RWT372	10.2842045	143.3	01Jan2011, 08:26	115.1
WT360	0.0656830	6.9	01Jan2011, 06:18	0.8
JWT360	0.0656830	6.9	01Jan2011, 06:18	0.8
RWT374	0.0656830	6.9	01Jan2011, 06:36	0.8
Regional Pond R2	10.3498875	143.9	01Jan2011, 08:27	112.7
JWT372	10.3498875	143.9	01Jan2011, 08:27	112.7
RWT376	10.3498875	143.7	01Jan2011, 08:37	111.9
WT370	0.2147600	7.2	01Jan2011, 06:17	1.2
JWT374_OUTLET	10.5646475	144.5	01Jan2011, 08:37	113.1

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 2-yr Reservoir: School Site

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	2-yr
Compute Time:	25Jan2021, 10:36:10	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	8.3 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:04
Peak Outflow :	1.0 (CFS)	Date/Time of Peak Outflow :	02Jan2011, 00:00
Total Inflow :	2.4 (AC-FT)	Peak Storage :	1.4 (AC-FT)
Total Outflow :	1.0 (AC-FT)	Peak Elevation :	6954.9 (FT)

Project: Aug15_Working_Falcon_DBPS_S

Simulation Run: FU 2-yr Reservoir: Sub Regional Pond SR4

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	2-yr
Compute Time:	25Jan2021, 10:36:10	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	128.3 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:40
Peak Outflow :	11.2 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 09:39
Total Inflow :	18.8 (AC-FT)	Peak Storage :	9.0 (AC-FT)
Total Outflow :	13.9 (AC-FT)	Peak Elevation :	6891.4 (FT)

Project: Aug15_Working_Falcon_DBPS_S
Simulation Run: FU 2-yr Reservoir: Regional Pond MN

Start of Run:	01Jan2011, 00:00	Basin Model:	Falcon_DBPS_Future
End of Run:	02Jan2011, 00:00	Meteorologic Model:	2-yr
Compute Time:	25Jan2021, 10:36:10	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	64.9 (CFS)	Date/Time of Peak Inflow :	01Jan2011, 06:01
Peak Outflow :	30.9 (CFS)	Date/Time of Peak Outflow :	01Jan2011, 06:37
Total Inflow :	20.7 (AC-FT)	Peak Storage :	2.6 (AC-FT)
Total Outflow :	18.3 (AC-FT)	Peak Elevation :	6851.5 (FT)

Historic Rational Calculations

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Bent Grass — Bent Grass
Location: CO, Colorado Springs — CLH017.20
TJE
CMD
12/2/20

Basin ID	Total Area (ac)	Paved Roads			Lawns			Roofs			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
OFFSITE BASINS											
WT200	192.00										10.0
MT060	185.60										10.0
OS-25	14.13	100	0.17	1.2	2	13.71	1.9	90	0.22	1.4	4.5
OS-26	5.81	100	0.00	0.0	2	5.81	2.0	90	0.00	0.0	2.0
H5	11.30	100	0.00	0.0	2	5.81	1.0	90	0.00	0.0	1.0
OS-22	4.42	100	0.00	0.0	2	4.42	2.0	90	0.00	0.0	2.0
OS-23	10.24	100	0.00	0.0	2	10.24	2.0	90	0.00	0.0	2.0
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS											
C1	2.07										80.0
C2	2.15										95.0
D1	5.22										95.0
D2	1.40										75.0
H1	3.00										30.0
H2	1.22										30.0
F	1.37										40.0
G	1.70										40.0
H3	1.54										75.0
H4	0.42										75.0
I1	3.00										75.0
I2	1.70										75.0
J	1.64										55.0
K	1.00										55.0
L	5.90										90.0
M1	1.56										95.0
M2	0.44										95.0
N	1.32										95.0
D	0.41										90.0
BENT GRASS FILING NO. 2 & BENT GRASS WEST BASINS											

Basin ID	Total Area (ac)	Paved 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	3.0	2	5.26	1.9	90	0.00	0.0	4.9
A-2	18.00	100	0.00	0.0	2	18.00	2.0	90	0.00	0.0	2.0
A-3	19.59	100	0.00	0.0	2	19.59	2.0	90	0.00	0.0	2.0
A-4	23.81	100	0.57	2.4	2	23.12	1.9	90	0.12	0.5	4.8
B-1	32.53	100	0.00	0.0	2	32.53	2.0	90	0.00	0.0	2.0
B-2	4.51	100	0.00	0.0	2	4.51	2.0	90	0.00	0.0	2.0
B-3	16.18	100	1.00	6.2	2	15.18	1.9	90	0.00	0.0	8.1
OS-1	13.06	100	0.84	6.4	2	11.65	1.8	90	0.57	3.9	12.1
OS-2	17.81	100	2.00	11.2	2	15.18	1.7	90	0.63	3.2	16.1
OS-4	30.69	100	1.42	4.6	2	28.41	1.9	90	0.86	2.5	9.0
MERIDIAN ROAD BASIN											
P-1	2.03	100	1.29	63.5	2	0.74	0.7	90	0.00	0.0	64.2

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Bent Grass
Location: CO, Colorado Springs

Bent Grass
CLH017.20
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Basin ID	Total Area (ac)	Hydrologic Soils Group	Paved Roads			Lawns			Roofs			Composite C_5	Composite C_{100}
			C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)		
OFFSITE BASINS													
WT200	192.00											0.20	0.44
MT060	185.60											0.20	0.44
OS-25	14.13	A	0.90	0.96	0.17	0.09	0.36	13.71	0.73	0.81	0.22	0.11	0.37
OS-26	5.81	A	0.90	0.96	0.00	0.09	0.36	5.81	0.73	0.81	0.00	0.09	0.36
H5	11.30	A	0.90	0.96	0.00	0.09	0.36	5.81	0.73	0.81	0.00	0.05	0.19
OS-22	4.42	A	0.90	0.96	0.00	0.09	0.36	4.42	0.73	0.81	0.00	0.09	0.36
OS-23	10.24	A	0.90	0.96	0.00	0.09	0.36	10.24	0.73	0.81	0.00	0.09	0.36
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS*													
C1	2.07	A										0.75	0.81
C2	2.15	A										0.76	0.82
D1	5.22	A										0.55	0.65
D2	1.40	A										0.55	0.65
H1	3.00	A										0.25	0.27
H2	1.22	A										0.25	0.27
F	1.37	A										0.40	0.55
G	1.70	A										0.40	0.50
H3	1.54	A										0.55	0.65
H4	0.42	A										0.55	0.65
I1	3.00	A										0.55	0.65
I2	1.70	A										0.55	0.65
J	1.64	A										0.40	0.55
K	1.00	A										0.40	0.55
L	5.90	A										0.78	0.83
M1	1.56	A										0.85	0.90
M2	0.44	A										0.85	0.90
N	1.32	A										0.85	0.90
D	0.41	A										0.82	0.83
BENT GRASS FILING NO. 2 & BENT GRASS WEST BASINS													
A-1	5.42	A	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	A	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	A	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	A	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	A	0.90	0.96	0.00	0.09	0.36	32.53	0.73	0.81	0.00	0.09	0.36

Basin ID	Total Area (ac)	Hydrologic Soils Group	Paved Roads			Lawns			Roofs			Composite C_5	Composite C_{100}
			C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)		
B-2	4.51	A	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	A	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	A	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	A	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	A	0.90	0.96	1.42	0.09	0.36	28.41	0.73	0.81	0.86	0.15	0.40
MERIDIAN ROAD BASIN													
P-1	2.03	A	0.90	0.96	1.29	0.09	0.36	0.00	0.73	0.81	0.00	0.57	0.61

*FROM FDR BG RES FILING 1 & BG EAST COMMERCIAL FILING NO. 1

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass
Project No.: CLH017.20
Calculated By: TJE
Checked By: CMD
Date: 12/2/20

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 (%)	C5	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 BASINS																	
WT200	192.00	A	10.00	0.20	0.44	300	2.0	22.7	2060	2.0	15.0	2.1	16.2	38.8	2360.0	23.1	23.1
MT060	185.60	A	10.00	0.20	0.44	300	2.0	22.7	2060	2.0	15.0	2.1	16.2	38.8	2360.0	23.1	23.1
OS-25	14.13	A	4.50	0.11	0.37	300	2.5	23.1	1400	3.0	15.0	2.6	9.0	32.1	1700.0	19.4	19.4
OS-26	5.81	A	2.00	0.09	0.36	300	2.0	25.4	400	2.0	15.0	2.1	3.1	28.6	700.0	13.9	13.9
H5	11.30	A	1.00	0.05	0.19	100	6.0	10.6	1460	2.0	15.0	2.1	11.5	22.1	1560.0	18.7	18.7
OS-22	4.42	A	2.00	0.09	0.36	100	1.0	18.5	650	1.0	10.0	1.0	10.8	29.3	750.0	14.2	14.2
OS-23	10.24	A	2.00	0.09	0.36	100	1.0	18.5	600	1.0	10.0	1.0	10.0	28.5	700.0	13.9	13.9
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS*																	
C1	2.07	A	80.00	0.75	0.81	5	2.0	1.1	400	1.0	20.0	2.0	3.3	4.5	405.0	12.3	5.0
C2	2.15	A	95.00	0.76	0.82	10	2.0	1.6	310	2.0	20.0	2.8	1.8	3.4	320.0	11.8	5.0
D1	5.22	A	95.00	0.55	0.65	50	2.0	5.7	310	2.0	20.0	2.8	1.8	7.5	360.0	12.0	7.5
D2	1.40	A	75.00	0.55	0.65	5	2.0	1.8	400	1.0	20.0	2.0	3.3	5.1	405.0	12.3	5.1
H1	3.00	A	30.00	0.25	0.27	10	2.0	3.9	310	2.0	20.0	2.8	1.8	5.7	320.0	11.8	5.7
H2	1.22	A	30.00	0.25	0.27	50	2.0	8.7	310	2.0	20.0	2.8	1.8	10.6	360.0	12.0	10.6
F	1.37	A	40.00	0.40	0.55	80	4.5	6.9						6.9	80.0	10.4	6.9
G	1.70	A	40.00	0.40	0.50	240	1.5	17.3						17.3	240.0	11.3	11.3
H3	1.54	A	75.00	0.55	0.65	100	0.5	12.6	350	2.0		4.9	1.2	13.8	450.0	12.5	12.5
H4	0.42	A	75.00	0.55	0.65	50	0.5	8.9	150	2.0		4.9	0.5	9.4	200.0	11.1	9.4
I1	3.00	A	75.00	0.55	0.65	50	0.5	8.9	550	2.0		4.9	1.9	10.7	600.0	13.3	10.7
I2	1.70	A	75.00	0.55	0.65	50	0.5	8.9	300	2.0		4.9	1.0	9.9	350.0	11.9	9.9
J	1.64	A	55.00	0.40	0.55	75	2.8	7.9						7.9	75.0	10.4	7.9
K	1.00	A	55.00	0.40	0.55	65	2.4	7.7						7.7	65.0	10.4	7.7
L	5.90	A	90.00	0.78	0.83	50	0.2	6.9	800	1.0		3.5	3.8	10.7	850.0	14.7	10.7
M1	1.56	A	95.00	0.85	0.90	50	0.1	6.9	300	1.0		3.5	1.4	8.3	350.0	11.9	8.3
M2	0.44	A	95.00	0.85	0.90									0.0	0.0	10.0	5.0
N	1.32	A	95.00	0.85	0.90	40	0.1	5.7	330	2.0		4.9	1.1	6.8	370.0	12.1	6.8
D	0.41	A	90.00	0.82	0.83	50	2.0	2.9						2.9	50.0	10.3	5.0
BENT GRASS FILING NO. 2 & BENT GRASS WEST BASINS																	
A-1	5.42	A	4.90	0.11	0.38	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	0.09	0.36	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	0.09	0.36	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	0.11	0.38	300	2.0	24.9	1500	2.0	15.0	2.1	11.8	36.7	1800.0	20.0	20.0
B-1	32.53	A	2.00	0.09	0.36	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	0.09	0.36	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	0.14	0.40	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	0.17	0.42	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	0.20	0.44	300	2.3	21.6	1370	2.3	15.0	2.3	10.0	31.7	1670.0	19.3	19.3
OS-4	30.69	A	9.00	0.15	0.40	300	2.3	22.8	2600	2.3	15.0	2.3	19.0	41.9	2900.0	26.1	26.1

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass
Project No.: CLH017.20
Calculated By: TJE
Checked By: CMD
Date: 12/2/20

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 (%)	C5	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)
PROPOSED:																	
P-1	2.03	A	64.20	0.57	0.61	100	6.0	5.3	1230	1.7	15.0	2.0	10.5	15.8	1330.0	17.4	15.8

*FROM FDR BG RES FILING 1 & BG EAST COMMERCIAL FILING NO. 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 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

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass
Project No.: CLH017.20
Calculated By: TJE
Checked By: CMD
Date: 12/2/20

		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						11.4	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
Release rate from Meadows Pond #2		MT060	185.60	0.20	23.1			91.8													Flows from HEC-HMS Model
		OS-25	14.13	0.11	19.4	1.55	3.13	4.9													
		OS-26	5.81	0.09	13.9	0.52	3.64	1.9													
		H5	11.30	0.05	18.7	0.57	3.19	1.8													
		OS-22	4.42	0.09	14.2	0.40	3.61	1.4													
		OS-23	10.24	0.09	13.9	0.92	3.64	3.3													
		C1	2.07	0.75	5.0	1.55	5.17	8.0													
		C2	2.15	0.76	5.0	1.63	5.17	8.4													
		D1	5.22	0.55	7.5	2.87	4.56	13.1													
		D2	1.40	0.55	5.1	0.77	5.13	4.0													
		H1	3.00	0.25	5.7	0.75	4.96	3.7													
		H2	1.22	0.25	10.6	0.31	4.05	1.3													
		F	1.37	0.40	6.9	0.55	4.68	2.6													
		G	1.70	0.40	11.3	0.68	3.94	2.7													
		H3	1.54	0.55	12.5	0.85	3.79	3.2													
		H4	0.42	0.55	9.4	0.23	4.23	1.0													
		I1	3.00	0.55	10.7	1.65	4.02	6.6													
		I2	1.70	0.55	9.9	0.94	4.15	3.9													
		J	1.64	0.40	7.9	0.66	4.48	3.0													
		K	1.00	0.40	7.7	0.40	4.52	1.8													
		L	5.90	0.78	10.7	4.60	4.03	18.5													
		M1	1.56	0.85	8.3	1.33	4.41	5.9													

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass
Project No.: CLH017.20
Calculated By: TJE
Checked By: CMD
Date: 12/2/20

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)	
		M2	0.44	0.85	5.0	0.37	5.17	1.9													
		N	1.32	0.85	6.8	1.12	4.70	5.3													
		D	0.41	0.82	5.0	0.34	5.17	1.8													
BENT GRASS FILING NO. 2 & BENT GRASS WEST BASINS																					
		A-1	5.42	0.11	14.3	0.60	3.60	2.2													
		A-2	18.00	0.09	17.9	1.62	3.25	5.3													
		A-3	19.59	0.09	15.9	1.76	3.43	6.0													
		A-4	23.81	0.11	20.0	2.62	3.09	8.1													
		B-1	32.53	0.09	17.8	2.93	3.27	9.6													
		B-2	4.51	0.09	13.5	0.41	3.68	1.5													
		B-3	16.18	0.14	16.0	2.27	3.42	7.8													
		OS-1	13.06	0.17	19.6	2.22	3.12	6.9													
		OS-2	17.81	0.20	19.3	3.56	3.14	11.2													
		OS-4	30.69	0.15	26.1	4.60	2.69	12.4													
MERIDIAN ROAD BASIN																					
		P-1	2.03	0.61	15.8	1.24	3.44	4.3													

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

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

Project Name: Bent Grass
Project No.: CLH017.20
Calculated By: TJE
Checked By: CMD
Date: 12/2/20

		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						11.4	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
Release rate from Meadows Pond #2		MT060	185.60	0.44	23.1			226.0													Flows from HEC-HMS Model
		OS-25	14.13	0.37	19.4	5.23	5.26	27.5													
		OS-26	5.81	0.36	13.9	2.09	6.10	12.7													
		H5	11.30	0.19	18.7	2.15	5.36	11.5													
		OS-22	4.42	0.36	14.2	1.59	6.05	9.6													
		OS-23	10.24	0.36	13.9	3.69	6.10	22.5													
		C1	2.07	0.81	5.0	1.68	8.68	14.6													
		C2	2.15	0.82	5.0	1.76	8.68	15.3													
		D1	5.22	0.65	7.5	3.39	7.66	26.0													
		D2	1.40	0.65	5.1	0.91	8.62	7.8													
		H1	3.00	0.27	5.7	0.81	8.33	6.7													
		H2	1.22	0.27	10.6	0.33	6.79	2.2													
		F	1.37	0.55	6.9	0.75	7.85	5.9													
		G	1.70	0.50	11.3	0.85	6.62	5.6													
		H3	1.54	0.65	12.5	1.00	6.37	6.4													
		H4	0.42	0.65	9.4	0.27	7.10	1.9													
		I1	3.00	0.65	10.7	1.95	6.76	13.2													
		I2	1.70	0.65	9.9	1.11	6.96	7.7													
		J	1.64	0.55	7.9	0.90	7.52	6.8													
		K	1.00	0.55	7.7	0.55	7.59	4.2													
		L	5.90	0.83	10.7	4.90	6.77	33.2													
		M1	1.56	0.90	8.3	1.40	7.41	10.4													
		M2	0.44	0.90	5.0	0.40	8.68	3.5													
		N	1.32	0.90	6.8	1.19	7.89	9.4													

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

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

Project Name: Bent Grass
Project No.: CLH017.20
Calculated By: TJE
Checked By: CMD
Date: 12/2/20

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)	
		D	0.41	0.83	5.0	0.34	8.68	3.0													
BENT GRASS FILING NO. 2 & BENT GRASS WEST BASINS																					
		A-1	5.42	0.38	14.3	2.06	6.04	12.4													
		A-2	18.00	0.36	17.9	6.48	5.46	35.4													
		A-3	19.59	0.36	15.9	7.05	5.77	40.7													
		A-4	23.81	0.38	20.0	9.05	5.19	47.0													
		B-1	32.53	0.36	17.8	11.71	5.48	64.2													
		B-2	4.51	0.36	13.5	1.62	6.18	10.0													
		B-3	16.18	0.40	16.0	6.47	5.75	37.2													
		OS-1	13.06	0.42	19.6	5.49	5.24	28.8													
		OS-2	17.81	0.44	19.3	7.84	5.28	41.4													
		OS-4	30.69	0.40	26.1	12.28	4.51	55.4													
MERIDIAN ROAD BASIN																					
		P-1	2.03	0.61	15.8	1.24	5.78	7.2													

BENT GRASS/MERIDIAN ROAD - MDDP
SURFACE ROUTING - EXISTING CONDITIONS

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
1	OS-1	2.22	5.49	19.6	2.9	5.2	8.3	38.9	
	A-1	0.60	2.06	TRAVEL TIME					
		2.82	7.55	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	450	2.6	2.9	22.4	
30	MT060			15.0			91.8	226.0	Flows from Meadows Filing No. 3 Pond 2
				TRAVEL TIME					
				Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	2300	2.1	18.3	33.3	
31	OS-25	1.55	5.23	33.3	2.2	3.8	55.9	245.9	
	DP 30	24.11	59.36	TRAVEL TIME					
		25.66	64.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	700	2.6	4.5	37.7	
32	OS-26	0.52	2.09	37.7	2.0	3.5	58.5	261.4	
	DP 1	2.82	7.55						
	DP 11	25.66	64.59	TRAVEL TIME					
		29.00	74.23	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	1850	5.0	6.2	43.9	
14	C1	1.55	1.68	43.9	1.8	3.2	59.4	266.7	
	H5	0.57	2.15						
	OS-22	0.40	1.59						
	OS-23	0.92	3.69						
	DP 32	29.00	74.23	TRAVEL TIME					
		32.44	83.34	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	400	5.0	1.3	45.2	
BG1	D1	2.87	3.39	7.5	4.5	7.9	13.0	26.9	Existing Sump Inlet
		2.87	3.39	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	7.5	
BG2	D2	0.77	0.91	5.1	5.2	9.0	4.0	8.2	Existing Sump Inlet
				TRAVEL TIME					
		0.77	0.91	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	5.1	
BG4	H1	0.75	0.81	5.7	5.0	8.7	3.7	7.0	Existing Sump Inlet
				TRAVEL TIME					
		0.75	0.81	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	5.7	
BG5	H2	0.31	0.33	10.6	4.0	6.9	1.2	2.3	Existing Sump Inlet
				TRAVEL TIME					
		0.31	0.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	10.6	
BG POND	G	0.68	0.85	10.6	4.0	6.9	21.3	43.5	Flows into existing Pond at Bent Grass Filing No. 1
	BG1	2.87	3.39						
	BG2	0.77	0.91						
	BG4	0.75	0.81						
	BG5	0.31	0.33	TRAVEL TIME					
		5.38	6.29	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	10.6	
BG POND 1	BG Pond 1 Release Flows	0.06	0.32	5.0	5.2	9.1	0.3	2.9	Release flows from Bent Grass Res 1 Pond 1
				TRAVEL TIME					
		0.06	0.32	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	5.0	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
50		111.34	193.50	26.1	2.5	4.4	280.0	850.0	Flow from Falcon DBPS at Meridian Rd & BGMD Intersection
				TRAVEL TIME					
		111.34	193.50	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	26.1	
20	DP 50	111.34	193.50	45.2	1.8	3.1	200.6	608.4	
	DP 14	0.31	0.33	TRAVEL TIME					
		111.65	193.83	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Culverts	125	11.2	0.2	45.4	
15	C2	1.63	1.76	45.4	1.8	3.1	203.0	612.3	
	DP 20	111.65	193.83	TRAVEL TIME					
		113.28	195.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	45.4	
BG32	F	0.55	0.75	6.9	4.7	8.1	2.6	6.1	
				TRAVEL TIME					
		0.55	0.75	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	6.9	
BG33	J	0.66	0.90	7.9	4.4	7.8	2.9	7.0	
				TRAVEL TIME					
		0.66	0.90	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	7.9	
BG 7	H3	0.85	1.00	12.5	3.7	6.4	3.1	6.4	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.85	1.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	12.5	
BG 8	H4	0.23	0.27	9.4	4.2	7.3	1.0	2.0	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.23	0.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	9.4	
BG 9	I1	1.65	1.95	10.7	3.9	6.9	6.5	13.4	Ex 6' Sump Inlet
				TRAVEL TIME					
		1.65	1.95	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	10.7	
BG 10	I2	0.94	1.11	9.9	4.1	7.1	3.8	7.9	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.94	1.11	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	9.9	
BG 11	DP BG 7	0.85	1.00	12.5	3.7	6.4	13.5	27.8	Inflow to BG Pond 2 West storm sewer
	DP BG 8	0.23	0.27						
	DP BG 9	1.65	1.95						
	DP BG 10	0.94	1.11	TRAVEL TIME					
		3.67	4.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	12.5	
BG 12	M1	1.33	1.40	8.3	4.4	7.6	5.8	10.7	Ex 6' Sump Inlet
				TRAVEL TIME					
		1.33	1.40	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	8.3	
BG 13	M2	0.37	0.40	6.8	4.7	8.2	7.0	13.0	Ex 6' Sump Inlet
	N	1.12	1.19	TRAVEL TIME					
		1.49	1.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	6.8	
BG 14	BG DP 12	1.33	1.40	8.3	4.4	7.6	12.3	22.8	Ex 6' Sump Inlet
	BG DP 13	1.49	1.59	TRAVEL TIME					
		2.82	2.99	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	8.3	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
BG 15	K	0.40	0.55	12.5	3.7	6.4	42.2	82.0	Total inflo to BG Pond 2
	L	4.60	4.90						
	DP BG 11	3.67	4.33						
	DP BG 14	2.82	2.99			TRAVEL TIME			
		11.49	12.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	12.5	
BG POND 2	BG Pond 2 Release Flows	0.08	1.10	5.0	5.2	9.1	0.4	10.0	Release flows from Bent Grass Res 1 Pond 2
						TRAVEL TIME			
		0.08	1.10	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	5.0	
BG 30	PLD RELEASE RATE	0.58	0.55	5.0	5.2	9.1	3.0	5.0	Released flows from existing PLD on 7-11 site
						TRAVEL TIME			
		0.58	0.55	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	5.0	
BG31	D	0.34	0.34	5.0	5.2	9.1	1.8	3.1	Future lot for development in Bent Grass East Commercial Filing No. 1
						TRAVEL TIME			
		0.34	0.34	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	5.0	
25	P-1	1.24	1.24	45.4	1.8	3.1	205.2	616.2	
	DP 15	113.28	195.59						
	BG 30	2.82	2.99						
	BG 31	0.34	0.34						
	BG POND2	0.08	1.10			TRAVEL TIME			
		114.52	196.83	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	45.4	
	RWT202	124.80	324.77	46.6	1.8	3.1	220.0	1000.0	
						TRAVEL TIME			
		124.80	324.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	2000	5.0	6.7	53.3	
	RWT204	1.83	6.43	11.4	3.8	6.7	7.0	43.0	
						TRAVEL TIME			
		1.83	6.43	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.0	2.7	14.1	
9	WT200	25.81	54.00	37.8	2.0	3.5	52.0	190.0	
						TRAVEL TIME			
		25.81	54.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.1	2.6	40.4	
2	OS-2	3.56	7.84	19.3	3.0	5.2	12.4	51.4	
	A-1	0.60	2.06			TRAVEL TIME			
		4.16	9.90	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	1000	5.0	3.3	22.6	
3	A-3	1.76	7.05	40.4	1.9	3.4	53.3	206.0	
	DP 9	25.81	54.00			TRAVEL TIME			
		27.57	61.05	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	1000	5.0	3.3	43.7	
4	OS-4	4.60	12.28	26.1	2.5	4.4	18.2	93.7	Flows offsite to Latigo Business Center Filing No. 1
	A-4	2.62	9.05			TRAVEL TIME			
		7.22	21.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	26.1	
5	B-1	2.93	11.71	17.8	3.1	5.4	9.1	63.4	Flows offsite at south property line
						TRAVEL TIME			
		2.93	11.71	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	17.8	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
6	B-2	0.41	1.62	43.7	1.8	3.2	59.0	232.8	
	DP 2	4.16	9.90						
	DP 3	27.57	61.05	TRAVEL TIME					
		32.14	72.57	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	365	5.0	1.2	45.0	
7	B-3	2.27	6.47	53.3	1.6	2.8	301.7	1309.1	Flows exiting site at channel
	DP 6	32.14	72.57						
	RWT202	124.80	324.77						
	RWT204	1.83	6.43						
	WT200	25.81	54.00	TRAVEL TIME					
		186.86	464.24	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	53.3	

Current Rational Calculations

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Bent Grass — Bent Grass/Meridian Road
Location: CO, Colorado Springs — CLH015.20
TJE
CMD
3/23/20

Basin ID	Total Area (ac)	Paved Roads			Lawns			Roofs			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Basins Total
		% 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.	% Imp.	Area (ac)	Weighted % Imp.	Weighted % Imp.
OFFSITE BASINS																									
WT200	192.00																								10.0
MT060	185.60																								10.0
OS-2	20.08	80	0.90	3.6	2	18.62	1.9	90	0.56	2.5	65	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	10.62	80	0.48	3.6	2	9.84	1.9	90	0.30	2.5	65	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-24	2.64	100	0.00	0.0	2	2.64	2.0	90	0.00	0.0	65	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
OS-25	14.13	100	0.17	1.2	2	13.71	1.9	90	0.22	1.4	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	4.5
OS-26	5.81	100	0.00	0.0	2	5.81	2.0	90	0.00	0.0	65	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
H5	11.30	100	0.00	0.0	2	5.81	1.0	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	1.0
OS-22	4.42	100	0.00	0.0	2	4.42	2.0	90	0.00	0.0	65	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
OS-23	10.24	100	0.00	0.0	2	10.24	2.0	90	0.00	0.0	65	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
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																									
C1a	0.48	100	0.36	75.0	2	0.12	0.5	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	75.5
C1b	0.88	100	0.68	77.3	2	0.20	0.5	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	77.7
C1c	1.09	100	0.88	80.7	2	0.21	0.4	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	81.1
D1a	0.56	100	0.33	58.9	2	0.23	0.8	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.8
D1b	0.68	100	0.17	25.0	2	0.21	0.6	90	0.30	39.7	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.3
D1c	1.20	100	0.19	15.8	2	0.34	0.6	90	0.67	50.3	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	66.7
D1d	2.79	100	0.50	17.9	2	0.76	0.5	90	1.53	49.4	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	67.8
C2a	1.26	100	0.74	58.7	2	0.52	0.8	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.6
C2b	0.99	100	0.92	92.9	2	0.07	0.1	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	93.1
D2a	1.00	100	0.19	19.0	2	0.65	1.3	90	0.16	14.4	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	34.7
D2b	0.41	100	0.11	26.8	2	0.20	1.0	90	0.10	22.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	49.8
H1a	0.40	100	0.16	40.0	2	0.20	1.0	90	0.04	9.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	50.0
H1b	2.52	100	0.40	15.9	2	1.22	1.0	90	0.86	30.7	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	47.6
H1c	0.16	100	0.05	31.3	2	0.09	1.1	90	0.02	11.3	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	43.6
H2a	1.09	100	0.30	27.5	2	0.63	1.2	90	0.16	13.2	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	41.9
H2b	0.15	100	0.05	33.3	2	0.10	1.3	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	34.7
F	1.37																								40.0
G	1.70																								40.0
H3	1.54																								75.0
H4	0.42																								75.0
I1	3.00																								75.0
I2	1.70																								75.0
J	1.64																								55.0
K	1.00																								55.0
L	5.90																								90.0
M1	1.56																								95.0
M2	0.44																								95.0
N	1.32																								95.0
D	0.41																								90.0
BENT GRASS FILING NO. 2 BASINS																									
OS-1	32.28	100	2.15	6.7	2	29.25	1.8	90	0.88	2.5	65	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-4	4.46	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	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	90	0.00	0.0	65	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	90	0.00	0.0	65	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
A-1	2.70	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	1.18	28.4	40	0.68	10.1	30	0.00	0.0	25	0.00	0.0	20	0.84	6.2	44.7
A-2	1.19	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.37	20.2	40	0.56	18.8	30	0.00	0.0	25	0.00	0.0	20	0.26	4.4	43.4
A-3	1.57	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.59	24.4	40	0.98	25.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	49.4
A-4	2.24	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.93	27.0	40	0.88	15.7	30	0.00	0.0	25	0.00	0.0	20	0.43	3.8	46.5
C-1	1.35	100	0.03	2.1	2	0.16	0.2	90	0.00	0.0	65	1.16	55.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	58.2
C-2	6.80	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	2.61	24.9	40	2.75	16.2	30	0.50	2.2	25	0.94	3.5	20	0.00	0.0	46.8
C-3	2.38	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	1.61	44.0	40	0.77	12.9	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	56.9

Basin ID	Total Area (ac)	Paved Roads			Lawns			Roofs			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Basins Total 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.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
C-4	3.61	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	2.86	51.4	40	0.75	8.4	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.8
C-5	7.86	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	6.53	54.0	40	1.33	6.8	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	60.8
C-6	5.54	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	3.14	36.8	40	1.60	11.6	30	0.80	4.3	25	0.00	0.0	20	0.00	0.0	52.7
C-7	0.89	100	0.00	0.0	2	0.89	2.0	90	0.00	0.0	65	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-8	0.42	100	0.00	0.0	2	0.42	2.0	90	0.00	0.0	65	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
E-1	1.71	100	0.78	45.6	2	0.23	0.3	90	0.00	0.0	65	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	90	0.00	0.0	65	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	90	0.00	0.0	65	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	90	0.00	0.0	65	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	90	0.00	0.0	65	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
F-1	0.44	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.00	0.0	40	0.41	37.3	30	0.00	0.0	25	0.00	0.0	20	0.03	1.4	38.7
F-2	0.55	100	0.21	38.2	2	0.11	0.4	90	0.00	0.0	65	0.23	27.2	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.8
G-1	1.47	100	0.00	0.0	2	0.64	0.9	90	0.00	0.0	65	0.25	11.1	40	0.08	2.2	30	0.20	4.1	25	0.30	5.1	20	0.00	0.0	23.4
H-1	0.52	100	0.00	0.0	2	0.52	2.0	90	0.00	0.0	65	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
I-1	0.31	100	0.22	71.0	2	0.09	0.6	90	0.00	0.0	65	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
BENT GRASS WEST BASINS																										
EX-1	1.19	100	0.00	0.0	2	1.19	2.0	2	0.00	0.0	65	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	1.56	100	0.00	0.0	2	1.56	2.0	90	0.00	0.0	65	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	0.62	100	0.00	0.0	2	0.62	2.0	1	0.00	0.0	65	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	12.49	100	0.00	0.0	2	12.49	2.0	90	0.00	0.0	65	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	5.15	100	0.00	0.0	2	5.15	2.0	10	0.00	0.0	65	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	9.53	100	0.00	0.0	2	9.53	2.0	90	0.00	0.0	65	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	9.16	100	0.00	0.0	2	9.16	2.0	18	0.00	0.0	65	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	21.30	100	0.00	0.0	2	21.30	2.0	90	0.00	0.0	65	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
MERIDIAN ROAD BASIN																										
P-1	2.03	100	1.29	63.6	2	0.74	0.7	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	64.3

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)		
OFFSITE BASINS																										
WT200	192.00																								0.20	0.44
MT060	185.60																								0.20	0.44
OS-2	20.08	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	10.62	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-24	2.64	0.90	0.96	0.00	0.09	0.36	2.64	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
OS-25	14.13	0.90	0.96	0.17	0.09	0.36	13.71	0.73	0.81	0.22	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	0.11	0.37
OS-26	5.81	0.90	0.96	0.00	0.09	0.36	5.81	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
H5	11.30	0.90	0.96	0.00	0.09	0.36	5.81	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	0.05	0.19
OS-22	4.42	0.90	0.96	0.00	0.09	0.36	4.42	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
OS-23	10.24	0.90	0.96	0.00	0.09	0.36	10.24	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
BENT GRASS EAST COMMER FILING NO. 1 BASINS																											
C1a	0.48	0.90	0.96	0.36	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	0.70	0.81
C1b	0.88	0.90	0.96	0.68	0.09	0.36	0.20	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	0.72	0.82
C1c	1.09	0.90	0.96	0.88	0.09	0.36	0.21	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
D1a	0.56	0.90	0.96	0.33	0.09	0.36	0.23	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	0.57	0.71
D1b	0.68	0.90	0.96	0.17	0.09	0.36	0.21	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	0.57	0.71
D1c	1.20	0.90	0.96	0.19	0.09	0.36	0.34	0.73	0.81	0.67	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	0.58	0.71
D1d	2.79	0.90	0.96	0.50	0.09	0.36	0.76	0.73	0.81	1.53	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	0.59	0.71
C2a	1.26	0.90	0.96	0.74	0.09	0.36	0.52	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	0.57	0.71
C2b	0.99	0.90	0.96	0.92	0.09	0.36	0.07	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	0.84	0.92
D2a	1.00	0.90	0.96	0.19	0.09	0.36	0.65	0.73	0.81	0.16	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	0.35	0.55
D2b	0.41	0.90	0.96	0.11	0.09	0.36	0.20	0.73	0.81	0.10	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	0.46	0.63
H1a	0.40	0.90	0.96	0.16	0.09	0.36	0.20	0.73	0.81	0.04	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	0.48	0.65
H1b	2.52	0.90	0.96	0.40	0.09	0.36	1.22	0.73	0.81	0.86	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	0.44	0.60
H1c	0.16	0.90	0.96	0.05	0.09	0.36	0.09	0.73	0.81	0.02	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	0.42	0.60
H2a	1.09	0.90	0.96	0.30	0.09	0.36	0.63	0.73	0.81	0.16	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	0.41	0.59
H2b	0.15	0.90	0.96	0.05	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	0.36	0.56
F	1.37																									0.40	0.55
G	1.70																									0.40	0.50
H3	1.54																									0.55	0.65
H4	0.42																									0.55	0.65
I1	3.00																									0.55	0.65
I2	1.70																									0.55	0.65
J	1.64																									0.40	0.55
K	1.00																									0.40	0.55
L	5.90																									0.78	0.83
M1	1.56																									0.85	0.90
M2	0.44																									0.85	0.90
N	1.32																									0.85	0.90
D	0.41																									0.82	0.83
BENT GRASS FILING NO. 2 BASINS:																											
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-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
A-1	2.70	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.18	0.30	0.50	0.68	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.84	0.33	0.52
A-2	1.19	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.37	0.30	0.50	0.56	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.26	0.32	0.51
A-3	1.57	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.59	0.30	0.50	0.98	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.36	0.53
A-4	2.24	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.93	0.30	0.50	0.88	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.43	0.34	0.53
C-1	1.35	0.90	0.96	0.03	0.09	0.36	0.16	0.73	0.81	0.00	0.45	0.59	1.16	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.42	0.57
C-2	6.80	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.61	0.30	0.50	2.75	0.25	0.47	0.50	0.22	0.46	0.94	0.20	0.44	0.00	0.34	0.53
C-3	2.38	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.61	0.30	0.50	0.77	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.40	0.56
C-4	3.61	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.86	0.30	0.50	0.75	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.42	0.57
C-5	7.86	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	6.53	0.30	0.50	1.33	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.42	0.57
C-6	5.54	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	3.14	0.30	0.50	1.60	0.25	0.47	0.80	0.22	0.46	0.00	0.20	0.44	0.00	0.38	0.55
C-7	0.89	0.90	0.96	0.00	0.09	0.36	0.89	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
C-8	0.42	0.90	0.96	0.00	0.09	0.36	0.42	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
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

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)		
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
F-1	0.44	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.41	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.03	0.29	0.50
F-2	0.55	0.90	0.96	0.21	0.09	0.36	0.11	0.73	0.81	0.00	0.45	0.59	0.23	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	0.69
G-1	1.47	0.90	0.96	0.00	0.09	0.36	0.64	0.73	0.81	0.00	0.45	0.59	0.25	0.30	0.50	0.08	0.25	0.47	0.20	0.22	0.46	0.30	0.20	0.44	0.00	0.21	0.44
H-1	0.52	0.90	0.96	0.00	0.09	0.36	0.52	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
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
BENT GRASS WEST BASINS:																											
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	1.56	0.90	0.96	0.00	0.09	0.36	1.56	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	0.62	0.90	0.96	0.00	0.09	0.36	0.62	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	12.49	0.90	0.96	0.00	0.09	0.36	12.49	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	5.15	0.90	0.96	0.00	0.09	0.36	5.15	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	9.53	0.90	0.96	0.00	0.09	0.36	9.53	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	9.16	0.90	0.96	0.00	0.09	0.36	9.16	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
EX-8	21.30	0.90	0.96	0.00	0.09	0.36	21.30	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
PROPOSED:																											
P-1	2.03	0.90	0.96	1.29	0.09	0.36	0.74	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	0.60	0.74

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
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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	C100	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 BASINS																	
WT200	192.00	A	10.0	0.20	0.44	300	2.0	22.7	2060	2.0	15	2.1	16.2	38.8	2360.0	23.1	23.1
MT060	185.60	A	10.0	0.20	0.44	300	2.0	22.7	2060	2.0	15	2.1	16.2	38.8	2360.0	23.1	23.1
OS-2	20.08	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	10.62	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-24	2.64	A	2.0	0.09	0.36	100	6.0	10.2	1460	2.0	15	2.1	11.5	21.7	1560.0	18.7	18.7
OS-25	14.13	A	4.5	0.11	0.37	100	6.0	10.0	1230	1.7	15	2.0	10.5	20.5	1330.0	17.4	17.4
OS-26	5.81	A	2.0	0.09	0.36	100	1.0	18.5	650	1.0	10	1.0	10.8	29.3	750.0	14.2	14.2
H5	11.30	A	1.0	0.05	0.19	100	1.0	19.2	600	1.0	10	1.0	10.0	29.2	700.0	13.9	13.9
OS-22	4.42	A	2.0	0.09	0.36	100	1.0	18.5	600	1.0	10	1.0	10.0	28.5	700.0	13.9	13.9
OS-23	10.24	A	2.0	0.09	0.36	100	1.0	18.5	600	1.0	10	1.0	10.0	28.5	700.0	13.9	13.9
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																	
C1a	0.48	A	75.5	0.70	0.81	5	2.0	1.3	400	1.0	20	2.0	3.3	4.6	405.0	12.3	5.0
C1b	0.88	A	77.7	0.72	0.82	10	2.0	1.7	310	2.0	20	2.8	1.8	3.6	320.0	11.8	5.0
C1c	1.09	A	81.1	0.74	0.84	50	2.0	3.7	310	2.0	20	2.8	1.8	5.5	360.0	12.0	5.5
D1a	0.56	A	59.8	0.57	0.71	5	2.0	1.7	400	1.0	20	2.0	3.3	5.1	405.0	12.3	5.1
D1b	0.68	A	65.3	0.57	0.71	10	2.0	2.4	310	2.0	20	2.8	1.8	4.3	320.0	11.8	5.0
D1c	1.20	A	66.7	0.58	0.71	50	2.0	5.3	310	2.0	20	2.8	1.8	7.2	360.0	12.0	7.2
D1d	2.79	A	67.8	0.59	0.71	100	2.0	7.4	485	2.0	20	2.8	2.9	10.3	585.0	13.3	10.3
C2a	1.26	A	59.6	0.57	0.71	12	2.0	2.7	965	1.0	20	2.0	8.0	10.7	977.0	15.4	10.7
C2b	0.99	A	93.1	0.84	0.92	12	2.0	1.3	1190	1.0	20	2.0	9.9	11.2	1202.0	16.7	11.2
D2a	1.00	A	34.7	0.35	0.55	5	2.0	2.4	310	2.0	20	2.8	1.8	4.3	315.0	11.8	5.0
D2b	0.41	A	49.8	0.46	0.63	5	2.0	2.1	225	2.0	20	2.8	1.3	3.4	230.0	11.3	5.0
H1a	0.40	A	50.0	0.48	0.65	10	2.0	2.8	310	2.0	20	2.8	1.8	4.7	320.0	11.8	5.0
H1b	2.52	A	47.6	0.44	0.60	50	2.0	6.8	575	1.0	20	2.0	4.8	11.6	625.0	13.5	11.6
H1c	0.16	A	43.6	0.42	0.60	5	2.0	2.2	100	1.0	20	2.0	0.8	3.0	105.0	10.6	5.0
H2a	1.09	A	41.9	0.41	0.59	50	2.0	7.1	575	1.0	20	2.0	4.8	11.9	625.0	13.5	11.9
H2b	0.15	A	34.7	0.36	0.56	5	2.0	2.4	100	1.0	20	2.0	0.8	3.2	105.0	10.6	5.0
F	1.37	A	40.0	0.40	0.55	80	4.5	6.9						6.9	80.0	10.4	6.9
G	1.70	A	40.0	0.40	0.50	240	1.5	17.3						17.3	240.0	11.3	11.3
H3	1.54	A	75.0	0.55	0.65	100	0.5	12.6	350	2.0		4.9	1.2	13.8	450.0	12.5	12.5
H4	0.42	A	75.0	0.55	0.65	50	0.5	8.9	150	2.0		4.9	0.5	9.4	200.0	11.1	9.4
I1	3.00	A	75.0	0.55	0.65	50	0.5	8.9	550	2.0		4.9	1.9	10.7	600.0	13.3	10.7
I2	1.70	A	75.0	0.55	0.65	50	0.5	8.9	300	2.0		4.9	1.0	9.9	350.0	11.9	9.9
J	1.64	A	55.0	0.40	0.55	75	2.8	7.9						7.9	75.0	10.4	7.9
K	1.00	A	55.0	0.40	0.55	65	2.4	7.7						7.7	65.0	10.4	7.7
L	5.90	A	90.0	0.78	0.83	50	0.2	6.9	800	1.0		3.5	3.8	10.7	850.0	14.7	10.7
M1	1.56	A	95.0	0.85	0.90	50	0.1	6.9	300	1.0		3.5	1.4	8.3	350.0	11.9	8.3

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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	C100	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)
M2	0.44	A	95.0	0.85	0.90									0.0	0.0	10.0	5.0
N	1.32	A	95.0	0.85	0.90	40	0.1	5.7	330	2.0		4.9	1.1	6.8	370.0	12.1	6.8
D	0.41	A	90.0	0.82	0.83	50	2.0	2.9						2.9	50.0	10.3	5.0
BENT GRASS FILING NO. 2 BASINS																	
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-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
A-1	2.70	A	44.7	0.33	0.52	100	1.3	12.9	550	1.3	20	2.3	4.0	16.9	650.0	13.6	13.6
A-2	1.19	A	43.4	0.32	0.51	100	4.3	8.8	310	2.3	20	3.0	1.7	10.5	410.0	12.3	10.5
A-3	1.57	A	49.4	0.36	0.53	70	1.0	11.3	680	1.2	20	2.2	5.2	16.5	750.0	14.2	14.2
A-4	2.24	A	46.5	0.34	0.53	100	4.2	8.6	650	1.7	20	2.6	4.2	12.8	750.0	14.2	12.8
C-1	1.35	A	58.2	0.42	0.57	35	2.4	5.5	400	2.4	20	3.1	2.2	7.7	435.0	12.4	7.7
C-2	6.80	A	46.8	0.34	0.53	100	2.0	11.0	1770	1.5	20	2.4	12.0	23.1	1870.0	20.4	20.4
C-3	2.38	A	56.9	0.40	0.56	100	1.6	11.0	810	1.0	20	2.0	6.8	17.7	910.0	15.1	15.1
C-4	3.61	A	59.8	0.42	0.57	100	2.0	9.9	973	2.0	20	2.8	5.7	15.6	1073.0	16.0	15.6
C-5	7.86	A	60.8	0.42	0.57	100	2.0	9.9	1200	1.3	20	2.3	8.8	18.7	1300.0	17.2	17.2
C-6	5.54	A	52.7	0.38	0.55	100	3.0	9.1	1230	1.5	20	2.4	8.4	17.5	1330.0	17.4	17.4
C-7	0.89	A	2.0	0.09	0.36	80	2.5	12.2	150	2.0	15	2.1	1.2	13.4	230.0	11.3	11.3
C-8	0.42	A	2.0	0.09	0.36	100	2.5	13.6	170	2.5	15	2.4	1.2	14.8	270.0	11.5	11.5
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
F-1	0.44	A	38.7	0.29	0.50	66	2.5	8.9	1	1.0	15	1.5	0.0	8.9	67.0	10.4	8.9
F-2	0.55	A	65.8	0.55	0.69	25	2.0	4.0	464	4.0	20	4.0	1.9	5.9	489.0	12.7	5.9
G-1	1.47	A	23.4	0.21	0.44	20	2.0	5.8	700	3.5	15	2.8	4.2	9.9	720.0	14.0	9.9
H-1	0.52	A	2.0	0.09	0.36	25	2.0	7.3	135	2.0	20	2.8	0.8	8.1	160.0	10.9	8.1
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
BENT GRASS WEST BASINS																	
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	1.56	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	0.62	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	12.49	A	2.0	0.09	0.36	100	2.7	13.3	1180	2.7	15	2.5	8.0	21.3	1280.0	17.1	17.1
EX-5	5.15	A	2.0	0.09	0.36	100	2.7	13.3	1000	2.7	15	2.5	6.8	20.0	1100.0	16.1	16.1
EX-6	9.53	A	2.0	0.09	0.36	100	2.7	13.3	1700	2.7	15	2.5	11.5	24.8	1800.0	20.0	20.0
EX-7	9.16	A	2.0	0.09	0.36	90	2.7	12.6	1020	2.7	15	2.5	6.9	19.5	1110.0	16.2	16.2

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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	C100	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	21.30	A	2.0	0.09	0.36	100	2.7	13.3	996	2.7	15	2.5	6.7	20.0	1096.0	16.1	16.1
PROPOSED:																	
P-1	2.03	A	64.3	0.60	0.74	100	6.0	5.0	1230	1.7	15	2.0	10.5	15.5	1330.0	17.4	15.5

NOTES:

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

T_t=L/60V

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

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

		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
OFFSITE BASINS																					
		RWT202	1574.40						46.6	120.88	1.82	220.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.4	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
		OS-2	20.08	0.14	18.3	2.81	3.22	9.0													
		OS-3	10.62	0.14	18.9	1.49	3.18	4.7													
Release rate from Meadows Pond #2		MT060	185.60	0.20	23.1			2.7													Total flow from existing culvert onto Basin OS-5 = 2.7
		OS-24	2.64	0.09	18.7	0.24	3.19	0.8													
		OS-25	14.13	0.11	17.4	1.55	3.30	5.1													
		OS-26	5.81	0.09	14.2	0.52	3.61	1.9													
		H5	11.30	0.05	13.9	0.57	3.64	2.1													
		OS-22	4.42	0.09	13.9	0.40	3.64	1.5													
		OS-23	10.24	0.09	13.9	0.92	3.64	3.3													
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																					
		C1a	0.48	0.70	5.0	0.34	5.17	1.8													
		D1a	0.56	0.57	5.1	0.32	5.15	1.6													
		H1a	0.40	0.48	5.0	0.19	5.17	1.0													
		D1b	0.68	0.57	5.0	0.39	5.17	2.0													
		D1c	1.20	0.58	7.2	0.70	4.63	3.2													
		D1d	2.79	0.59	10.3	1.65	4.09	6.7													
		D2a	1.00	0.35	5.0	0.35	5.17	1.8													
		D2b	0.41	0.46	5.0	0.19	5.17	1.0													
		H1b	2.52	0.44	11.6	1.11	3.91	4.3													
		H1c	0.16	0.42	5.0	0.07	5.17	0.4													
		H2a	1.09	0.41	11.9	0.45	3.87	1.7													
		H2b	0.15	0.36	5.0	0.05	5.17	0.3													
		C1b	0.88	0.72	5.0	0.63	5.17	3.3													

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

		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
		C1c	1.09	0.74	5.5	0.81	5.02	4.1													
		C2a	1.26	0.57	10.7	0.72	4.03	2.9													
		C2b	0.99	0.84	11.2	0.83	3.96	3.3													
		F	1.37	0.40	6.9	0.55	4.68	2.6													
		G	1.70	0.40	11.3	0.68	3.94	2.7													
		H3	1.54	0.55	12.5	0.85	3.79	3.2													
		H4	0.42	0.55	9.4	0.23	4.23	1.0													
		I1	3.00	0.55	10.7	1.65	4.02	6.6													
		I2	1.70	0.55	9.9	0.94	4.15	3.9													
		J	1.64	0.40	7.9	0.66	4.48	3.0													
		K	1.00	0.40	7.7	0.40	4.52	1.8													
		L	5.90	0.78	10.7	4.60	4.03	18.5													
		M1	1.56	0.85	8.3	1.33	4.41	5.9													
		M2	0.44	0.85	5.0	0.37	5.17	1.9													
		N	1.32	0.85	6.8	1.12	4.70	5.3													
		D	0.41	0.82	5.0	0.34	5.17	1.8													
BENT GRASS FILING NO. 2 BASINS																					
		OS-1	32.28	0.16	22.2	5.16	2.93	15.1													
		OS-4	4.46	0.36	15.6	1.61	3.46	5.6													
		OS-5	0.46	0.45	5.2	0.21	5.10	1.1													
		OS-6	1.17	0.45	12.9	0.53	3.75	2.0													
		A-1	2.70	0.33	13.6	0.89	3.67	3.3													
		A-2	1.19	0.32	10.5	0.38	4.06	1.5													
		A-3	1.57	0.36	14.2	0.57	3.61	2.1													
		A-4	2.24	0.34	12.8	0.76	3.76	2.9													
		C-1	1.35	0.42	7.7	0.57	4.53	2.6													
		C-2	6.80	0.34	20.4	2.31	3.06	7.1													

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
		C-3	2.38	0.40	15.1	0.95	3.52	3.3													
		C-4	3.61	0.42	15.6	1.52	3.46	5.3													
		C-5	7.86	0.42	17.2	3.30	3.31	10.9													
		C-6	5.54	0.38	17.4	2.11	3.30	7.0													
		C-7	0.89	0.09	11.3	0.08	3.95	0.3													
		C-8	0.42	0.09	11.5	0.04	3.92	0.2													
		E-1	1.71	0.55	11.8	0.94	3.88	3.6													
		E-2	0.68	0.76	6.9	0.52	4.70	2.4													
		E-3	0.78	0.81	7.4	0.63	4.59	2.9													
		E-4	0.91	0.74	8.0	0.67	4.46	3.0													
		E-5	0.89	0.81	7.3	0.72	4.60	3.3													
		F-1	0.44	0.29	8.9	0.13	4.31	0.6													
		F-2	0.55	0.55	5.9	0.30	4.91	1.5													
		G-1	1.47	0.21	9.9	0.31	4.14	1.3													
		H-1	0.52	0.09	8.1	0.05	4.44	0.2													
		I-1	0.31	0.66	5.0	0.20	5.17	1.0													
BENT GRASS WEST BASINS																					
		EX-1	1.19	0.09	15.5	0.11	3.47	0.4													
		EX-2	1.56	0.09	11.7	0.14	3.90	0.5													
		EX-3	0.62	0.09	10.7	0.06	4.02	0.2													
		EX-4	12.49	0.09	17.1	1.12	3.32	3.7													
		EX-5	5.15	0.09	16.1	0.46	3.41	1.6													
		EX-6	9.53	0.09	20.0	0.86	3.09	2.7													
		EX-7	9.16	0.09	16.2	0.82	3.41	2.8													
		EX-8	21.30	0.09	16.1	1.92	3.42	6.6													
MERIDIAN ROAD BASINS																					
		P-1	2.03	0.60	15.5	1.22	3.47	4.2													

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

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

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

		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
OFFSITE BASINS																					
		RWT202	1574.40						46.6	327.87	3.05	1000.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.4	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
		OS-2	20.08	0.40	18.3	8.03	5.41	43.4													
		OS-3	10.62	0.40	18.9	4.25	5.33	22.7													
Release rate from Meadows Pond #2		MT060	185.60	0.44	23.1			72.6													Total flow from existing culvert onto Basin OS-5 = 72.6
		OS-24	2.64	0.36	18.7	0.95	5.36	5.1													
		OS-25	14.13	0.37	17.4	5.23	5.54	29.0													
		OS-26	5.81	0.36	14.2	2.09	6.05	12.6													
		H5	11.30	0.19	13.9	2.15	6.10	13.1													
		OS-22	4.42	0.36	13.9	1.59	6.10	9.7													
		OS-23	10.24	0.36	13.9	3.69	6.10	22.5													
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																					
		C1a	0.48	0.81	5.0	0.39	8.68	3.4													
		D1a	0.56	0.71	5.1	0.40	8.65	3.5													
		H1a	0.40	0.65	5.0	0.26	8.68	2.3													
		D1b	0.68	0.71	5.0	0.48	8.68	4.2													
		D1c	1.20	0.71	7.2	0.85	7.77	6.6													
		D1d	2.79	0.71	10.3	1.98	6.87	13.6													
		D2a	1.00	0.55	5.0	0.55	8.68	4.8													
		D2b	0.41	0.63	5.0	0.26	8.68	2.3													
		H1b	2.52	0.60	11.6	1.51	6.56	9.9													
		H1c	0.16	0.60	5.0	0.10	8.68	0.9													
		H2a	1.09	0.59	11.9	0.64	6.50	4.2													
		H2b	0.15	0.56	5.0	0.08	8.68	0.7													
		C1b	0.88	0.82	5.0	0.72	8.68	6.2													
		C1c	1.09	0.84	5.5	0.92	8.43	7.8													

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

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

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
		C2a	1.26	0.71	10.7	0.89	6.76	6.0													
		C2b	0.99	0.92	11.2	0.91	6.64	6.0													
		F	1.37	0.55	6.9	0.75	7.85	5.9													
		G	1.70	0.50	11.3	0.85	6.62	5.6													
		H3	1.54	0.65	12.5	1.00	6.37	6.4													
		H4	0.42	0.65	9.4	0.27	7.10	1.9													
		I1	3.00	0.65	10.7	1.95	6.76	13.2													
		I2	1.70	0.65	9.9	1.11	6.96	7.7													
		J	1.64	0.55	7.9	0.90	7.52	6.8													
		K	1.00	0.55	7.7	0.55	7.59	4.2													
		L	5.90	0.83	10.7	4.90	6.77	33.2													
		M1	1.56	0.90	8.3	1.40	7.41	10.4													
		M2	0.44	0.90	5.0	0.40	8.68	3.5													
		N	1.32	0.90	6.8	1.19	7.89	9.4													
		D	0.41	0.83	5.0	0.34	8.68	3.0													
BENT GRASS FILING NO. 2 BASINS																					
		OS-1	32.28	0.41	22.2	13.23	4.92	65.1													
		OS-4	4.46	0.54	15.6	2.41	5.81	14.0													
		OS-5	0.46	0.59	5.2	0.27	8.56	2.3													
		OS-6	1.17	0.59	12.9	0.69	6.30	4.3													
		A-1	2.70	0.52	13.6	1.40	6.16	8.6													
		A-2	1.19	0.51	10.5	0.61	6.81	4.2													
		A-3	1.57	0.53	14.2	0.83	6.05	5.0													
		A-4	2.24	0.53	12.8	1.19	6.31	7.5													
		C-1	1.35	0.57	7.7	0.77	7.61	5.9													
		C-2	6.80	0.53	20.4	3.60	5.14	18.5													
		C-3	2.38	0.56	15.1	1.33	5.90	7.8													

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

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

Project Name: Bent Grass/Meridian Road
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
		C-4	3.61	0.57	15.6	2.06	5.81	12.0													
		C-5	7.86	0.57	17.2	4.48	5.56	24.9													
		C-6	5.54	0.55	17.4	3.05	5.54	16.9													
		C-7	0.89	0.36	11.3	0.32	6.63	2.1													
		C-8	0.42	0.36	11.5	0.15	6.58	1.0													
		E-1	1.71	0.69	11.8	1.18	6.51	7.7													
		E-2	0.68	0.85	6.9	0.58	7.89	4.6													
		E-3	0.78	0.89	7.4	0.69	7.70	5.3													
		E-4	0.91	0.84	8.0	0.76	7.50	5.7													
		E-5	0.89	0.89	7.3	0.79	7.73	6.1													
		F-1	0.44	0.50	8.9	0.22	7.23	1.6													
		F-2	0.55	0.69	5.9	0.38	8.25	3.1													
		G-1	1.47	0.44	9.9	0.65	6.95	4.5													
		H-1	0.52	0.36	8.1	0.19	7.45	1.4													
		I-1	0.31	0.79	5.0	0.24	8.68	2.1													
BENT GRASS WEST BASINS																					
		EX-1	1.19	0.36	15.5	0.43	5.83	2.5													
		EX-2	1.56	0.36	11.7	0.56	6.54	3.7													
		EX-3	0.62	0.36	10.7	0.22	6.76	1.5													
		EX-4	12.49	0.36	17.1	4.50	5.58	25.1													
		EX-5	5.15	0.36	16.1	1.85	5.73	10.6													
		EX-6	9.53	0.36	20.0	3.43	5.19	17.8													
		EX-7	9.16	0.36	16.2	3.30	5.72	18.9													
		EX-8	21.30	0.36	16.1	7.67	5.73	43.9													
MERIDIAN ROAD BASIN																					
		P-1	2.03	0.74	15.5	1.50	5.82	8.7													

BENT GRASS/MERIDIAN ROAD - MDDP
SURFACE ROUTING - CURRENT CONDITIONS

DESIGN POINT	CONTRIBUTING BASINS	CA (equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
FILING NO. 2:									
	RWT202	124.80	324.77	46.6	1.8	3.1	220.0	1000.0	
				TRAVEL TIME					
		124.80	324.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	2000	5.0	6.7	53.3	
	RWT204	1.83	6.43	11.4	3.8	6.7	7.0	43.0	
				TRAVEL TIME					
		1.83	6.43	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.0	2.7	14.1	
	WT200	25.81	54.00	37.8	2.0	3.5	52.0	190.0	
				TRAVEL TIME					
		25.81	54.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.0	2.7	40.5	
40	OS-1	5.16	13.23	16.1	3.3	5.7	16.8	75.3	
				TRAVEL TIME					
		5.16	13.23	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.1	2.6	18.7	
1	A-1	0.89	1.40	13.6	3.5	6.2	3.1	8.6	
				TRAVEL TIME					
		0.89	1.40	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	140	2.0	1.2	14.8	
2	A-2	0.38	0.61	14.8	3.4	5.9	4.3	11.9	
	DP 1	0.89	1.40	TRAVEL TIME					
		1.27	2.01	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	275	2.4	1.9	16.7	
3	A-3	0.57	0.83	16.7	3.2	5.6	5.9	15.9	
	DP 2	1.27	2.01	TRAVEL TIME					
		1.84	2.84	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	40	2.4	0.3	17.0	
4	A-4	0.76	1.19	17.0	3.2	5.5	8.3	22.3	
	DP 3	1.84	2.84	TRAVEL TIME					
		2.60	4.03	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	780	2.0	6.5	23.5	
5	EX-5	0.46	1.85	5.0	5.2	9.1	2.4	16.8	@ GRADE INLET
				TRAVEL TIME					
		0.46	1.85	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	80	2.0	0.7	5.7	
6	EX-4	1.12	4.50	5.0	5.2	9.1	5.8	50.4	@ GRADE INLET
	FB DP 5	0.00	1.06	TRAVEL TIME					
		1.12	5.56	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	460	2.0	3.8	8.8	
7	E-3	0.63	0.69	5.0	5.2	9.1	3.3	6.3	SUMP INLET
				TRAVEL TIME					
		0.63	0.69	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
8	E-1	0.94	1.18	23.5	2.7	4.7	11.2	32.7	SUMP INLET
	E-2	0.52	0.58						
	DP 4	2.60	4.03						
	FB DP 6	0.15	1.22	TRAVEL TIME					
		4.21	7.01	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	23.5	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
9	OS-5	0.21	0.27	16.1	3.3	5.7	0.7	1.5	
				TRAVEL TIME					
		0.21	0.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	125	3.2	0.7	16.7	
10	EX-1	0.11	0.43	16.7	3.2	5.6	1.0	3.9	
	DP 9	0.21	0.27	TRAVEL TIME					
		0.32	0.70	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	295	6.2	0.8	17.5	
11	OS-4	1.61	2.41	15.6	3.3	5.8	5.3	13.9	
				TRAVEL TIME					
		1.61	2.41	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	15.6	
12	OS-6	0.53	0.69	12.9	3.6	6.3	1.9	4.4	
				TRAVEL TIME					
		0.53	0.69	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	12.9	
13	DP 11	1.61	2.41	15.6	3.3	5.8	7.1	17.9	
	DP 12	0.53	0.69	TRAVEL TIME					
		2.14	3.10	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	160	6.1	0.4	16.0	
14	EX-2	0.14	0.56	17.5	3.1	5.5	8.1	23.8	
	DP 10	0.32	0.70						
	DP 13	2.14	3.10	TRAVEL TIME					
		2.60	4.36	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	50	6.0	0.1	17.7	
15	EX-3	0.06	0.22	23.5	2.7	4.7	18.3	54.1	
	DP 8	4.21	7.01						
	DP 14	2.60	4.36	TRAVEL TIME					
		6.87	11.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	23.5	
15A	NORTH POND	2.35	4.08	5.0	5.2	9.1	12.2	37.0	
	RELEASE			TRAVEL TIME					
		2.35	4.08	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
AA	WT200	25.81	54.00	53.3	1.6	2.8	258.2	1135.1	
	RWT202	124.80	324.77						
	RWT204	1.83	6.43						
	DP 40	5.16	13.23	TRAVEL TIME					
	DP 15A	2.35	4.08						
		159.95	402.51	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Culverts	135	5.1	0.4	53.7	
BB	DP AA	159.95	402.51	53.7	1.6	2.8	257.8	1130.8	
	DP 7	0.63	0.69	TRAVEL TIME					
		160.58	403.20	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	1000	7.0	2.4	56.1	
16	C-5	3.30	4.48	11.2	3.9	6.7	12.7	30.2	@ GRADE INLET
				TRAVEL TIME					
		3.30	4.48	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	115	2.0	1.0	12.2	
17	C-6	2.11	3.05	11.2	3.9	6.7	8.1	20.5	@ GRADE INLET
				TRAVEL TIME					
		2.11	3.05	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	115	2.0	1.0	12.2	
18	C-3	0.95	1.33	11.2	3.9	6.7	10.6	32.2	SUMP INLET
	C-4	1.52	2.06						
	FB DP 16	0.29	1.40	TRAVEL TIME					
		2.76	4.79	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	11.2	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
19	C-1	0.57	0.77	20.4	2.9	5.0	9.5	29.7	SUMP INLET
	C-2	2.31	3.60						
	FB DP 17	0.42	1.53	TRAVEL TIME					
		3.30	5.90	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	20.4	
20	G-1	0.31	0.65	9.9	4.1	7.1	1.3	4.6	
				TRAVEL TIME					
		0.31	0.65	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	9.9	
20A	C-7	0.08	0.32	20.4	2.9	5.0	18.6	58.7	
	DP 18	2.76	4.79						
	DP 19	3.30	5.90						
	DP 20	0.31	0.65	TRAVEL TIME					
		6.44	11.65	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	20.4	
20B	SOUTH POND RELEASE	4.11	7.28	5.0	5.2	9.1	21.3	66.0	
				TRAVEL TIME					
		4.11	7.28	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
28	OS-2	2.81	8.03	18.3	3.1	5.3	8.6	42.8	
				TRAVEL TIME					
		2.81	8.03	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	640	4.0	2.7	21.0	
29	OS-3	1.49	4.25	21.0	2.8	5.0	12.2	60.9	
	DP 28	2.81	8.03	TRAVEL TIME					
		4.30	12.28	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	475	3.5	2.3	23.3	
21	EX-7	0.82	3.30	5.0	5.2	9.1	4.3	29.9	@ GRADE INLET
				TRAVEL TIME					
		0.82	3.30	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	60	2.0	0.5	5.5	
22	EX-6	0.86	3.43	5.0	5.2	9.1	4.5	43.2	@ GRADE INLET
	FB DP 21	0.00	1.34	TRAVEL TIME					
		0.86	4.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	515	2.0	4.3	9.3	
23				23.3	2.7	4.7	11.5	57.6	TYPE C INLET
	DP 29	4.30	12.28	TRAVEL TIME					
		4.30	12.28	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	190	3.5	0.9	24.2	
24	E-4	0.67	0.76	18.7	3.0	5.3	2.9	21.1	@ GRADE INLET
	OS-24	0.24	0.95						
	FB DP 22	0.07	2.29	TRAVEL TIME					
		0.98	4.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	18.7	
25	E-5	0.72	0.79	5.0	5.2	9.1	3.7	11.6	@ GRADE INLET
	FB DP 24	0.00	0.49	TRAVEL TIME					
		0.72	1.28	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
26	DP 23	4.30	12.28	24.2	2.6	4.6	15.8	80.6	
	DP 24	0.98	4.00						
	DP 25	0.72	1.28	TRAVEL TIME					
		6.00	17.56	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	900	5.4	2.8	26.9	
27A	EX-8	1.92	7.67	5.0	5.2	9.1	10.0	69.5	
				TRAVEL TIME					
		1.92	7.67	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
27B	C-8	0.04	0.15	11.2	3.9	6.7	0.2	1.0	
				TRAVEL TIME					
		0.04	0.15	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	11.2	
CC	DP 27A	1.92	7.67	56.1	1.6	2.7	269.3	1187.4	EXITS SITE
	DP 27B	0.04	0.15						
	DP 20B	4.11	7.28						
	DP 26	6.00	17.56						
	BB	160.58	403.20	TRAVEL TIME					
		172.64	435.86	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	56.1	
EAST OF FILING NO. 2:									
30	MT060			15.0			2.7	72.6	Flows from Meadows Filing No. 3 Pond 2 - Updated HEC HMS model
				TRAVEL TIME					
				Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	2300	2.1	18.3	33.3	
31	OS-25	1.55	5.23	33.3	2.2	3.8	6.1	92.5	
	DP 30	1.24	19.07	TRAVEL TIME					
		2.79	24.30	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	700	2.6	4.5	37.7	
32	OS-26	0.52	2.09	37.7	2.0	3.5	7.4	94.3	
	C1a	0.34	0.39						
	DP 31	2.79	24.30	TRAVEL TIME					
		3.65	26.78	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	37.7	
32-N	DP-32	3.65	9.44	37.7	2.0	3.5	7.4	33.2	Flows remaining in north half of BGMD & continuing east (Max gutter flow allowed 5 Yr=9.4, 100 Yr=33.2)
				TRAVEL TIME					
		3.65	9.44	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	905	2.0	7.5	45.3	
32-S	DP BG 1a	0.32	0.40	37.7	2.0	3.5	0.6	33.2	Flows remaining in south half of BGMD & continuing east (Max gutter flow allowed 5 Yr=9.4 & 100 Yr=33.2)
	OT from DP 32-N	0.00	9.04						
		0.32	9.44	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	37.7	
BG 1a-Os		0.00	8.30	37.7	2.0	3.5	0.0	29.2	Overtopping Flows from DP 32 which will head south through Bent Grass Filing No. 1 in Sea Oats Drive (Sea Oats Dr can carry 2.2 & 11.6 cfs per side)
				TRAVEL TIME					
		0.00	8.30	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	37.7	
BG 1a-Ose		0.00	4.15	37.7	2.0	3.5	0.0	14.6	Overtopping Flows from DP 1a-Os which will flow in east half of Sea Oats Drive
				TRAVEL TIME					
		0.00	4.15	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	37.7	
BG 1a-Osw		0.00	4.15	37.7	2.0	3.5	0.0	14.6	Overtopping Flows from DP 1a-Os which will flow in west half of Sea Oats Drive
				TRAVEL TIME					
		0.00	4.15	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	37.7	
BG 4a	H1a	0.19	0.26	37.7	2.0	3.5	0.4	15.5	Flows to west side of Inlet 4
	DP BG 1a-Ose	0.00	4.15	TRAVEL TIME					
		0.19	4.41	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	600	2.0	5.0	42.7	
BG .1b	D1b	0.39	0.48	37.7	2.0	3.5	0.8	16.3	
	DP BG 1a-Osw	0.00	4.15	TRAVEL TIME					
		0.39	4.63	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	575	2.8	3.4	41.2	
BG 1c	D1c	0.70	0.85	41.2	1.9	3.3	2.1	18.3	Flows in Aveno Rd to east side of Inlet 1 (Max gutter allowed 1.6 & 8.6 cfs per side)
	DP BG 1b	0.39	4.63	TRAVEL TIME					
		1.09	5.48	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	41.2	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
BG 1	D1d	1.65	1.98	41.2	1.9	3.3	5.2	24.9	Existing 10' Sump Inlet - Total flow to Inlet 1
	DP 1c	1.09	5.48	TRAVEL TIME					
		2.74	7.46	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	41.2	
BG 2e	D2a	0.35	0.55	5.0	5.2	9.1	1.8	5.0	Flows in Aveno Rd to east side of Inlet 2 (Max gutter allowed 1.6 & 8.6 cfs per side)
				TRAVEL TIME					
		0.35	0.55	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 2w	D2b	0.19	0.26	5.0	5.2	9.1	1.0	2.4	Flows in Aveno Rd to west side of Inlet 2 (Max gutter allowed 2.2 & 11.4 cfs per side)
				TRAVEL TIME					
		0.19	0.26	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 2	DP BG 2e	0.35	0.55	5.0	5.2	9.1	2.8	7.3	Existing 4' Sump Inlet - Total flow to Inlet 2
	DP BG 2w	0.19	0.26	TRAVEL TIME					
		0.54	0.81	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	5.0	
BG 4e	H1c	0.07	0.10	5.0	5.2	9.1	0.4	0.9	Flows in Aveno Rd to east side of Inlet 4 (Max gutter allowed 1.8 & 9.8 cfs per side)
				TRAVEL TIME					
		0.07	0.10	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 4w	H1b	1.11	1.51	42.7	1.9	3.3	2.4	19.3	Flows in Aveno Rd to west side of Inlet 4 (Max gutter allowed 2.1 & 11.3 cfs per side)
	DP BG 4a	0.19	4.41	TRAVEL TIME					
		1.30	5.92	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	42.7	
BG 4	DP BG 4e	0.07	0.10	42.7	1.9	3.3	2.6	19.6	Existing 4' Sump Inlet
	DP BG 4w	1.30	5.92	TRAVEL TIME					
		1.37	6.02	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	42.7	
BG 5e	H2b	0.05	0.08	5.0	5.2	9.1	0.3	0.7	Flows in Aveno Rd to east side of Inlet 5 (Max gutter allowed 1.8 & 9.8 cfs per side)
				TRAVEL TIME					
		0.05	0.08	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 5w	H2a	0.45	0.64	11.9	3.8	6.6	1.7	4.2	Flows in Aveno Rd to west side of Inlet 5 (Max gutter allowed 2.1 & 11.3 cfs per side)
				TRAVEL TIME					
		0.45	0.64	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	11.9	
BG 5	DP BG 5e	0.05	0.08	11.9	3.8	6.6	1.9	4.7	Existing 4' Sump Inlet
	DP BG 5w	0.45	0.64	TRAVEL TIME					
		0.50	0.72	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	11.9	
BG 3	G	0.68	0.85	41.2	1.9	3.3	7.6	30.4	Flows into BG Pond 1 from West side
	DP BG 1	2.74	7.46						
	DP BG 2	0.54	0.81	TRAVEL TIME					
		3.96	9.12	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	41.2	
BG 6	DP BG 4	1.37	6.02	42.7	1.9	3.3	3.5	21.9	Flows into BG Pond 1 from East Side
	DP BG 5	0.50	0.72	TRAVEL TIME					
		1.87	6.74	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	42.7	
	DP BG 3	3.96	9.12	42.7	1.9	3.3	10.9	51.6	Total flows into BG Pond 1
	DP BG 6	1.87	6.74	TRAVEL TIME					
		5.83	15.86	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	42.7	
BG POND1	BG POND 1	0.10	2.43	5.0	5.2	9.1	0.5	22.0	
	RELEASE			TRAVEL TIME					
		0.10	2.43	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
BG 14n	OS-2	2.81	8.03	45.3	1.8	3.1	13.8	63.8	Flow continuing in North half of BGMD
	H5	0.57	2.15						
	C1b	0.63	0.72						
	DP 32-N	3.65	9.44	TRAVEL TIME					
		7.66	20.34	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	300	2.8	1.8	47.1	
BG 15n	OS-3	1.49	4.25	47.1	1.8	3.1	13.4	62.2	Flow continuing in North half of BGMD
	D1c	0.70	0.85						
	DP BG 14n	7.66	20.34	TRAVEL TIME					
		9.85	25.44	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	47.1	
BG 50		111.34	193.50	26.1	2.5	4.4	280.0	850.0	Flow from Falcon DBPS at Meridian Rd & BGMD Intersection
				TRAVEL TIME					
				Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	26.1	
BG 20	DP BG 15n	9.85	25.44	26.1	2.5	4.4	304.8	961.8	Combined flow at Culvert Crossing - North side of BGMD
	DP BG 50	111.34	193.50	TRAVEL TIME					
		121.18	218.94	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Culverts	125	11.2	0.2	26.3	
BG 14s	C2a	0.72	0.89	37.7	2.0	3.5	1.5	36.4	Flow continuing in South half of BGMD
	DP 32-S		9.44	TRAVEL TIME					
		0.72	10.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	300	2.8	1.8	39.5	
BG 15s	C2b	0.83	0.91	39.5	2.0	3.4	3.0	38.5	Flow continuing in South half of BGMD
	DP BG 14s	0.72	10.33	TRAVEL TIME					
		1.55	11.24	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	39.5	
BG 21	DP 20	121.18	218.94	26.3	2.5	4.4	307.4	1007.0	Combined flow at Culvert Crossing - South side of BGMD
	DP BG 15s	1.55	11.24	TRAVEL TIME					
		122.73	230.18	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Channel	1250	2.0	10.4	36.7	
BG 32	F	0.55	0.75	6.9	4.7	8.1	2.6	6.1	
				TRAVEL TIME					
		0.55	0.75	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	6.9	
BG 33	J	0.66	0.90	7.9	4.4	7.8	2.9	7.0	
				TRAVEL TIME					
		0.66	0.90	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	7.9	
BG 7	H3	0.85	1.00	12.5	3.7	6.4	3.1	6.4	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.85	1.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	12.5	
BG 8	H4	0.23	0.27	9.4	4.2	7.3	1.0	2.0	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.23	0.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	9.4	
BG 9	I1	1.65	1.95	10.7	3.9	6.9	6.5	13.4	Ex 6' Sump Inlet
				TRAVEL TIME					
		1.65	1.95	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	10.7	
BG 10	I2	0.94	1.11	9.9	4.1	7.1	3.8	7.9	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.94	1.11	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	9.9	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)	NOTES
BG 11	DP BG 7	0.85	1.00	12.5	3.7	6.4	13.5	27.8	Inflow to BG Pond 2 West Storm Sewer
	DP BG 8	0.23	0.27						
	DP BG 9	1.65	1.95						
	DP BG 10	0.94	1.11	TRAVEL TIME					
		3.67	4.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	12.5	
BG 12	M1	1.33	1.40	8.3	4.4	7.6	5.8	10.7	Ex 6' Sump Inlet
				TRAVEL TIME					
		1.33	1.40	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	8.3	
BG 13	M2	0.37	0.40	6.8	4.7	8.2	7.0	13.0	Ex 6' Sump Inlet
	N	1.12	1.19	TRAVEL TIME					
		1.49	1.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	6.8	
BG 14	DP BG 12	1.33	1.40	8.3	4.4	7.6	12.3	22.8	Inflow to BG Pond 2 East Storm Sewer
	DP BG 13	1.49	1.59	TRAVEL TIME					
		2.82	2.99	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	8.3	
BG 15	K	0.40	0.55	12.5	3.7	6.4	42.2	82.0	Total Inflow to BG Pond 2
	L	4.60	4.90						
	DP BG 11	3.67	4.33						
	DP BG 14	2.82	2.99	TRAVEL TIME					
		11.49	12.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	12.5	
BG POND2	BG POND 2 RELEASE	0.08	1.10	5.0	5.2	9.1	0.4	10.0	
				TRAVEL TIME					
		0.08	1.10	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
BG 30	PLD RELEASE RATE	0.58	0.55	5.0	5.2	9.1	3.0	5.0	Released flows from existing PLD on 7-11 site
				TRAVEL TIME					
		0.58	0.55	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
BG 31	D	0.34	0.34	5.0	5.2	9.1	1.8	3.1	Future lot for development in Bent Grass East Commercial Filing No. 1
				TRAVEL TIME					
		0.34	0.34	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 25	P-1	1.22	1.50	36.7	2.1	3.6	256.3	837.4	Flow @ Existing Culvert, north side of Owl Place
	DP BG 21	122.73	230.18						
	BG 30	0.58	0.55						
	BG 31	0.34	0.34						
	BG POND 2	0.08	1.10	TRAVEL TIME					
		124.95	233.68	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	36.7	

Future Rational Calculations

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Bent Grass
Location: CO, Colorado Springs

Bent Grass
CLH015.20
TJE
CMD
3/23/20

Basin ID	Total Area (ac)	Paved Roads			Lawns			Roofs			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Basins Total 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.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
OFFSITE BASINS																									
WT200	192.00																								10.0
MT060	185.60																								10.0
OS-2	20.08	80	0.90	3.6	2	18.62	1.9	90	0.56	2.5	65	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	10.62	80	0.48	3.6	2	9.84	1.9	90	0.30	2.5	65	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-24	2.64	100	0.00	0.0	2	2.64	2.0	90	0.00	0.0	65	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
OS-25	14.13	100	0.17	1.2	2	13.71	1.9	90	0.22	1.4	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	4.5
OS-26	5.81	100	0.00	0.0	2	5.81	2.0	90	0.00	0.0	65	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
H5	11.30	100	0.00	0.0	2	5.81	1.0	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	1.0
OS-22	4.42	100	0.00	0.0	2	4.42	2.0	90	0.00	0.0	65	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
OS-23	10.24	100	0.00	0.0	2	10.24	2.0	90	0.00	0.0	65	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
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																									
C1a	0.48	100	0.36	75.0	2	0.12	0.5	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	75.5
C1b	0.88	100	0.68	77.3	2	0.20	0.5	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	77.7
C1c	1.09	100	0.88	80.7	2	0.21	0.4	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	81.1
D1a	0.56	100	0.33	58.9	2	0.23	0.8	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.8
D1b	0.68	100	0.17	25.0	2	0.21	0.6	90	0.30	39.7	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.3
D1c	1.20	100	0.19	15.8	2	0.34	0.6	90	0.67	50.3	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	66.7
D1d	2.79	100	0.50	17.9	2	0.76	0.5	90	1.53	49.4	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	67.8
C2a	1.26	100	0.74	58.7	2	0.52	0.8	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.6
C2b	0.99	100	0.92	92.9	2	0.07	0.1	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	93.1
D2a	1.00	100	0.19	19.0	2	0.65	1.3	90	0.16	14.4	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	34.7
D2b	0.41	100	0.11	26.8	2	0.20	1.0	90	0.10	22.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	49.8
H1a	0.40	100	0.16	40.0	2	0.20	1.0	90	0.04	9.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	50.0
H1b	2.52	100	0.40	15.9	2	1.22	1.0	90	0.86	30.7	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	47.6
H1c	0.16	100	0.05	31.3	2	0.09	1.1	90	0.02	11.3	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	43.6
H2a	1.09	100	0.30	27.5	2	0.63	1.2	90	0.16	13.2	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	41.9
H2b	0.15	100	0.05	33.3	2	0.10	1.3	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	34.7
F	1.37																									40.0
G	1.70																									40.0
H3	1.54																									75.0
H4	0.42																									75.0
I1	3.00																									75.0
I2	1.70																									75.0
J	1.64																									55.0
K	1.00																									55.0
L	5.90																									90.0
M1	1.56																									95.0
M2	0.44																									95.0
N	1.32																									95.0
D	0.41																									90.0
BENT GRASS FILING NO. 2 BASINS																									
OS-1	32.28	100	2.15	6.7	2	29.25	1.8	90	0.88	2.5	65	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-4	4.46	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	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	90	0.00	0.0	65	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	90	0.00	0.0	65	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
A-1	2.70	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	1.18	28.4	40	0.68	10.1	30	0.00	0.0	25	0.00	0.0	20	0.84	6.2	44.7
A-2	1.19	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.37	20.2	40	0.56	18.8	30	0.00	0.0	25	0.00	0.0	20	0.26	4.4	43.4
A-3	1.57	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.59	24.4	40	0.98	25.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	49.4
A-4	2.24	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.93	27.0	40	0.88	15.7	30	0.00	0.0	25	0.00	0.0	20	0.43	3.8	46.5
C-1	1.35	100	0.03	2.1	2	0.16	0.2	90	0.00	0.0	65	1.16	55.9	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	58.2
C-2	6.80	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	2.61	24.9	40	2.75	16.2	30	0.50	2.2	25	0.94	3.5	20	0.00	0.0	46.8
C-3	2.38	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	1.61	44.0	40	0.77	12.9	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	56.9
C-4	3.61	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	2.86	51.4	40	0.75	8.4	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.8
C-5	7.86	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	6.53	54.0	40	1.33	6.8	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	60.8
C-6	5.54	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	3.14	36.8	40	1.60	11.6	30	0.80	4.3	25	0.00	0.0	20	0.00	0.0	52.7
C-7	0.89	100	0.00	0.0	2	0.89	2.0	90	0.00	0.0	65	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
E-1	1.71	100	0.78	45.6	2	0.23	0.3	90	0.00	0.0	65	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	90	0.00	0.0	65	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	90	0.00	0.0	65	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

Basin ID	Total Area (ac)	Paved Roads			Lawns			Roofs			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Basins Total 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.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
E-4	0.91	100	0.73	80.2	2	0.18	0.4	90	0.00	0.0	65	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	90	0.00	0.0	65	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
F-1	0.44	100	0.00	0.0	2	0.00	0.0	90	0.00	0.0	65	0.00	0.0	40	0.41	37.3	30	0.00	0.0	25	0.00	0.0	20	0.03	1.4	38.7
F-2	0.55	100	0.21	38.2	2	0.11	0.4	90	0.00	0.0	65	0.23	27.2	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.8
G-1	1.47	100	0.00	0.0	2	0.64	0.9	90	0.00	0.0	65	0.25	11.1	40	0.08	2.2	30	0.20	4.1	25	0.30	5.1	20	0.00	0.0	23.4
H-1	0.52	100	0.00	0.0	2	0.52	2.0	90	0.00	0.0	65	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
I-1	0.31	100	0.22	71.0	2	0.09	0.6	90	0.00	0.0	65	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
BENT GRASS WEST BASINS																										
AA-1	2.57	100	0.52	20.2	2	0.20	0.2	90	0.00	0.0	65.0	0.79	20.0	40	0.00	0.0	30	0.31	3.6	25	0.00	0.0	20	0.75	5.8	49.8
AA-2	2.28	100	0.40	17.5	2	0.46	0.4	90	0.00	0.0	65.0	1.43	40.8	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	58.7
B-1	5.43	100	0.00	0.0	2	4.37	1.6	90	0.00	0.0	65.0	1.06	12.7	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	14.3
B-2	4.16	100	0.00	0.0	2	4.41	2.1	90	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	2.1
CC-1	9.07	100	2.14	23.6	2	0.33	0.1	90	0.00	0.0	65.0	4.56	32.7	40	1.70	7.5	30	0.34	1.1	25	0.00	0.0	20	0.00	0.0	65.0
CC-2	1.35	100	0.44	32.6	2	0.19	0.3	90	0.00	0.0	65.0	0.72	34.7	40	0.00	0.0	30	0.25	5.6	25	0.00	0.0	20	0.00	0.0	73.2
CC-3	1.88	100	1.12	59.6	2	0.00	0.0	90	0.00	0.0	65.0	0.76	26.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	85.9
CC-4	4.34	100	0.00	0.0	2	1.85	0.9	90	0.00	0.0	65.0	2.49	37.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	38.2
CC-5	0.45	100	0.00	0.0	2	0.45	2.0	90	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	2.0
D-1	9.07	100	1.52	16.8	2	0.69	0.2	90	0.00	0.0	65.0	2.35	16.8	40	1.86	8.2	30	1.53	5.1	25	1.12	3.1	20	0.00	0.0	50.2
D-2	6.72	100	2.31	34.4	2	0.76	0.2	90	0.00	0.0	65.0	3.65	35.3	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	69.9
D-3	2.03	100	0.00	0.0	2	0.28	0.3	90	0.00	0.0	65.0	0.36	11.5	40	0.17	3.3	30	0.12	1.8	25	0.00	0.0	20	0.00	0.0	16.9
D-4	4.38	100	1.21	27.6	2	0.63	0.3	90	0.00	0.0	65.0	2.53	37.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.4
D-5	1.08	100	0.22	20.4	2	0.11	0.2	90	0.00	0.0	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-6	4.01	100	0.91	22.7	2	0.09	0.0	90	0.00	0.0	65.0	3.01	48.8	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	71.5
D-7	6.39	100	0.00	0.0	2	5.59	1.7	90	0.00	0.0	65.0	0.80	8.1	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	9.8
D-8	1.69	100	0.00	0.0	2	1.13	1.3	90	0.00	0.0	65.0	0.56	21.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	22.8
MERIDIAN ROAD BASIN																										
P-1	2.03	100	1.29	63.6	2	0.74	0.7	90	0.00	0.0	65	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	64.3

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Bent Grass
Location: CO, Colorado Springs

Bent Grass
CLH015.20
TJE
CMD
3/23/20

Basin ID	Total Area (ac)	Paved Roads			Lawns			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)		
OFFSITE BASINS																										
WT200	192.00																								0.20	0.44
MT060	185.60																								0.20	0.44
OS-2	20.08	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	10.62	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-24	2.64	0.90	0.96	0.00	0.09	0.36	2.64	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
OS-25	14.13	0.90	0.96	0.17	0.09	0.36	13.71	0.73	0.81	0.22	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	0.11	0.37
OS-26	5.81	0.90	0.96	0.00	0.09	0.36	5.81	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
H5	11.30	0.90	0.96	0.00	0.09	0.36	5.81	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	0.05	0.19
OS-22	4.42	0.90	0.96	0.00	0.09	0.36	4.42	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
OS-23	10.24	0.90	0.96	0.00	0.09	0.36	10.24	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
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																											
C1a	0.48	0.90	0.96	0.36	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	0.70	0.81
C1b	0.88	0.90	0.96	0.68	0.09	0.36	0.20	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	0.72	0.82
C1c	1.09	0.90	0.96	0.88	0.09	0.36	0.21	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
D1a	0.56	0.90	0.96	0.33	0.09	0.36	0.23	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	0.57	0.71
D1b	0.68	0.90	0.96	0.17	0.09	0.36	0.21	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	0.57	0.71
D1c	1.20	0.90	0.96	0.19	0.09	0.36	0.34	0.73	0.81	0.67	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	0.58	0.71
D1d	2.79	0.90	0.96	0.50	0.09	0.36	0.76	0.73	0.81	1.53	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	0.59	0.71
C2a	1.26	0.90	0.96	0.74	0.09	0.36	0.52	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	0.57	0.71
C2b	0.99	0.90	0.96	0.92	0.09	0.36	0.07	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	0.84	0.92
D2a	1.00	0.90	0.96	0.19	0.09	0.36	0.65	0.73	0.81	0.16	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	0.35	0.55
D2b	0.41	0.90	0.96	0.11	0.09	0.36	0.20	0.73	0.81	0.10	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	0.46	0.63
H1a	0.40	0.90	0.96	0.16	0.09	0.36	0.20	0.73	0.81	0.04	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	0.48	0.65
H1b	2.52	0.90	0.96	0.40	0.09	0.36	1.22	0.73	0.81	0.86	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	0.44	0.60
H1c	0.16	0.90	0.96	0.05	0.09	0.36	0.09	0.73	0.81	0.02	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	0.42	0.60
H2a	1.09	0.90	0.96	0.30	0.09	0.36	0.63	0.73	0.81	0.16	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	0.41	0.59
H2b	0.15	0.90	0.96	0.05	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	0.36	0.56
F	1.37																									0.40	0.55
G	1.70																									0.40	0.50
H3	1.54																									0.55	0.65
H4	0.42																									0.55	0.65
I1	3.00																									0.55	0.65
I2	1.70																									0.55	0.65
J	1.64																									0.40	0.55
K	1.00																									0.40	0.55
L	5.90																									0.78	0.83
M1	1.56																									0.85	0.90
M2	0.44																									0.85	0.90
N	1.32																									0.85	0.90
D	0.41																									0.82	0.83
BENT GRASS FILING NO. 2 BASINS:																											
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-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
A-1	2.70	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.18	0.30	0.50	0.68	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.84	0.33	0.52
A-2	1.19	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.37	0.30	0.50	0.56	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.26	0.32	0.51
A-3	1.57	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.59	0.30	0.50	0.98	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.36	0.53
A-4	2.24	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.93	0.30	0.50	0.88	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.43	0.34	0.53
C-1	1.35	0.90	0.96	0.03	0.09	0.36	0.16	0.73	0.81	0.00	0.45	0.59	1.16	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.42	0.57
C-2	6.80	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.61	0.30	0.50	2.75	0.25	0.47	0.50	0.22	0.46	0.94	0.20	0.44	0.00	0.34	0.53
C-3	2.38	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.61	0.30	0.50	0.77	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.40	0.56
C-4	3.61	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.86	0.30	0.50	0.75	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.42	0.57
C-5	7.86	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	6.53	0.30	0.50	1.33	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.42	0.57
C-6	5.54	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	3.14	0.30	0.50	1.60	0.25	0.47	0.80	0.22	0.46	0.00	0.20	0.44	0.00	0.38	0.55
C-7	0.89	0.90	0.96	0.00	0.09	0.36	0.89	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

Basin ID	Total Area (ac)	Paved Roads			Lawns			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)		
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
F-1	0.44	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.41	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.03	0.29	0.50
F-2	0.55	0.90	0.96	0.21	0.09	0.36	0.11	0.73	0.81	0.00	0.45	0.59	0.23	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	0.69
G-1	1.47	0.90	0.96	0.00	0.09	0.36	0.64	0.73	0.81	0.00	0.45	0.59	0.25	0.30	0.50	0.08	0.25	0.47	0.20	0.22	0.46	0.30	0.20	0.44	0.00	0.21	0.44
H-1	0.52	0.90	0.96	0.00	0.09	0.36	0.52	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
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
BENT GRASS WEST BASINS:																											
AA-1	2.57	0.90	0.96	0.52	0.09	0.36	0.20	0.73	0.81	0.00	0.45	0.59	0.79	0.30	0.50	0.00	0.25	0.47	0.31	0.22	0.46	0.00	0.20	0.44	0.75	0.42	0.59
AA-2	2.28	0.90	0.96	0.40	0.09	0.36	0.46	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	0.46	0.61
B-1	5.43	0.90	0.96	0.00	0.09	0.36	4.37	0.73	0.81	0.00	0.45	0.59	1.06	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
B-2	4.16	0.90	0.96	0.00	0.09	0.36	4.41	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	0.10	0.38
CC-1	9.07	0.90	0.96	2.14	0.09	0.36	0.33	0.73	0.81	0.00	0.45	0.59	4.56	0.30	0.50	1.70	0.25	0.47	0.34	0.22	0.46	0.00	0.20	0.44	0.00	0.51	0.65
CC-2	1.35	0.90	0.96	0.44	0.09	0.36	0.19	0.73	0.81	0.00	0.45	0.59	0.72	0.30	0.50	0.00	0.25	0.47	0.25	0.22	0.46	0.00	0.20	0.44	0.00	0.59	0.77
CC-3	1.88	0.90	0.96	1.12	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.76	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.72	0.81
CC-4	4.34	0.90	0.96	0.00	0.09	0.36	1.85	0.73	0.81	0.00	0.45	0.59	2.49	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.30	0.49
CC-5	0.45	0.90	0.96	0.00	0.09	0.36	0.45	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-1	9.07	0.90	0.96	1.52	0.09	0.36	0.69	0.73	0.81	0.00	0.45	0.59	2.35	0.30	0.50	1.86	0.25	0.47	1.53	0.22	0.46	1.12	0.20	0.44	0.00	0.41	0.58
D-2	6.72	0.90	0.96	2.31	0.09	0.36	0.76	0.73	0.81	0.00	0.45	0.59	3.65	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.56	0.69
D-3	2.03	0.90	0.96	0.00	0.09	0.36	0.28	0.73	0.81	0.00	0.45	0.59	0.36	0.30	0.50	0.17	0.25	0.47	0.12	0.22	0.46	0.00	0.20	0.44	0.00	0.13	0.22
D-4	4.38	0.90	0.96	1.21	0.09	0.36	0.63	0.73	0.81	0.00	0.45	0.59	2.53	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.52	0.66
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-6	4.01	0.90	0.96	0.91	0.09	0.36	0.09	0.73	0.81	0.00	0.45	0.59	3.01	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	0.67
D-7	6.39	0.90	0.96	0.00	0.09	0.36	5.59	0.73	0.81	0.00	0.45	0.59	0.80	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	0.39
D-8	1.69	0.90	0.96	0.00	0.09	0.36	1.13	0.73	0.81	0.00	0.45	0.59	0.56	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.21	0.44
PROPOSED:																											
P-1	2.03	0.90	0.96	1.29	0.09	0.36	0.74	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	0.60	0.74

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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	C100	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 BASINS																	
WT200	192.00	A	0.0	0.20	0.44	300	2.0	22.7	2060	2.0	15	2.1	16.2	38.8	2360.0	23.1	23.1
MT060	185.60	A	0.0	0.20	0.44	300	2.0	22.7	2060	2.0	15	2.1	16.2	38.8	2360.0	23.1	23.1
OS-2	20.08	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	10.62	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-24	2.64	A	2.0	0.09	0.36	100	2.0	14.7	1460	2.0	15	2.1	11.5	26.1	1560.0	18.7	18.7
OS-25	14.13	A	4.5	0.11	0.37	100	1.7	15.2	1230	1.7	15	2.0	10.5	25.7	1330.0	17.4	17.4
OS-26	5.81	A	2.0	0.09	0.36	100	1.0	18.5	650	1.0	10	1.0	10.8	29.3	750.0	14.2	14.2
H5	11.30	A	1.0	0.05	0.19	100	1.0	19.2	600	7.0	10	2.6	3.8	23.0	700.0	13.9	13.9
OS-22	4.42	A	2.0	0.09	0.36	100	1.0	18.5	600	1.0	10	1.0	10.0	28.5	700.0	13.9	13.9
OS-23	10.24	A	2.0	0.09	0.36	100	1.0	18.5	600	1.0	10	1.0	10.0	28.5	700.0	13.9	13.9
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																	
C1a	0.48	A	75.5	0.70	0.81	5	2.0	1.3	400	1.0	20	2.0	3.3	4.6	405.0	12.3	5.0
C1b	0.88	A	77.7	0.72	0.82	10	2.0	1.7	310	2.0	20	2.8	1.8	3.6	320.0	11.8	5.0
C1c	1.09	A	81.1	0.74	0.84	50	2.0	3.7	310	2.0	20	2.8	1.8	5.5	360.0	12.0	5.5
D1a	0.56	A	59.8	0.57	0.71	5	2.0	1.7	400	1.0	20	2.0	3.3	5.1	405.0	12.3	5.1
D1b	0.68	A	65.3	0.57	0.71	10	2.0	2.4	310	2.0	20	2.8	1.8	4.3	320.0	11.8	5.0
D1c	1.20	A	66.7	0.58	0.71	50	2.0	5.3	310	2.0	20	2.8	1.8	7.2	360.0	12.0	7.2
D1d	2.79	A	67.8	0.59	0.71	100	2.0	7.4	485	2.0	20	2.8	2.9	10.3	585.0	13.3	10.3
C2a	1.26	A	59.6	0.57	0.71	12	2.0	2.7	965	1.0	20	2.0	8.0	10.7	977.0	15.4	10.7
C2b	0.99	A	93.1	0.84	0.92	12	2.0	1.3	1190	1.0	20	2.0	9.9	11.2	1202.0	16.7	11.2
D2a	1.00	A	34.7	0.35	0.55	5	2.0	2.4	310	2.0	20	2.8	1.8	4.3	315.0	11.8	5.0
D2b	0.41	A	49.8	0.46	0.63	5	2.0	2.1	225	2.0	20	2.8	1.3	3.4	230.0	11.3	5.0
H1a	0.40	A	50.0	0.48	0.65	10	2.0	2.8	310	2.0	20	2.8	1.8	4.7	320.0	11.8	5.0
H1b	2.52	A	47.6	0.44	0.60	50	2.0	6.8	575	1.0	20	2.0	4.8	11.6	625.0	13.5	11.6
H1c	0.16	A	43.6	0.42	0.60	5	2.0	2.2	100	1.0	20	2.0	0.8	3.0	105.0	10.6	5.0
H2a	1.09	A	41.9	0.41	0.59	50	2.0	7.1	575	1.0	20	2.0	4.8	11.9	625.0	13.5	11.9
H2b	0.15	A	34.7	0.36	0.56	5	2.0	2.4	100	1.0	20	2.0	0.8	3.2	105.0	10.6	5.0
F	1.37	A	40.0	0.40	0.55	80	4.5	6.9						6.9	80.0	10.4	6.9
G	1.70	A	40.0	0.40	0.50	240	1.5	17.3						17.3	240.0	11.3	11.3
H3	1.54	A	75.0	0.55	0.65	100	0.5	12.6	350	2.0		4.9	1.2	13.8	450.0	12.5	12.5
H4	0.42	A	75.0	0.55	0.65	50	0.5	8.9	150	2.0		4.9	0.5	9.4	200.0	11.1	9.4
I1	3.00	A	75.0	0.55	0.65	50	0.5	8.9	550	2.0		4.9	1.9	10.7	600.0	13.3	10.7
I2	1.70	A	75.0	0.55	0.65	50	0.5	8.9	300	2.0		4.9	1.0	9.9	350.0	11.9	9.9
J	1.64	A	55.0	0.40	0.55	75	2.8	7.9						7.9	75.0	10.4	7.9
K	1.00	A	55.0	0.40	0.55	65	2.4	7.7						7.7	65.0	10.4	7.7
L	5.90	A	90.0	0.78	0.83	50	0.2	6.9	800	1.0		3.5	3.8	10.7	850.0	14.7	10.7
M1	1.56	A	95.0	0.85	0.90	50	0.1	6.9	300	1.0		3.5	1.4	8.3	350.0	11.9	8.3
M2	0.44	A	95.0	0.85	0.90									0.0	0.0	10.0	5.0

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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	C100	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)
N	1.32	A	95.0	0.85	0.90	40	0.1	5.7	330	2.0		4.9	1.1	6.8	370.0	12.1	6.8
D	0.41	A	90.0	0.82	0.83	50	2.0	2.9						2.9	50.0	10.3	5.0
BENT GRASS FILING NO. 2 BASINS																	
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-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
A-1	2.70	A	44.7	0.33	0.52	100	1.3	12.9	550	1.3	20	2.3	4.0	16.9	650.0	13.6	13.6
A-2	1.19	A	43.4	0.32	0.51	100	4.3	8.8	310	2.3	20	3.0	1.7	10.5	410.0	12.3	10.5
A-3	1.57	A	49.4	0.36	0.53	70	1.0	11.3	680	1.2	20	2.2	5.2	16.5	750.0	14.2	14.2
A-4	2.24	A	46.5	0.34	0.53	100	4.2	8.6	650	1.7	20	2.6	4.2	12.8	750.0	14.2	12.8
C-1	1.35	A	58.2	0.42	0.57	35	2.4	5.5	400	2.4	20	3.1	2.2	7.7	435.0	12.4	7.7
C-2	6.80	A	46.8	0.34	0.53	100	2.0	11.0	1770	1.5	20	2.4	12.0	23.1	1870.0	20.4	20.4
C-3	2.38	A	56.9	0.40	0.56	100	1.6	11.0	810	1.0	20	2.0	6.8	17.7	910.0	15.1	15.1
C-4	3.61	A	59.8	0.42	0.57	100	2.0	9.9	973	2.0	20	2.8	5.7	15.6	1073.0	16.0	15.6
C-5	7.86	A	60.8	0.42	0.57	100	2.0	9.9	1200	1.3	20	2.3	8.8	18.7	1300.0	17.2	17.2
C-6	5.54	A	52.7	0.38	0.55	100	3.0	9.1	1230	1.5	20	2.4	8.4	17.5	1330.0	17.4	17.4
C-7	0.89	A	2.0	0.09	0.36	80	2.5	12.2	150	2.0	15	2.1	1.2	13.4	230.0	11.3	11.3
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
F-1	0.44	A	38.7	0.29	0.50	66	2.5	8.9	1	1.0	15	1.5	0.0	8.9	67.0	10.4	8.9
F-2	0.55	A	65.8	0.55	0.69	25	2.0	4.0	464	4.0	20	4.0	1.9	5.9	489.0	12.7	5.9
G-1	1.47	A	23.4	0.21	0.44	20	2.0	5.8	700	3.5	15	2.8	4.2	9.9	720.0	14.0	9.9
H-1	0.52	A	2.0	0.09	0.36	25	2.0	7.3	135	2.0	20	2.8	0.8	8.1	160.0	10.9	8.1
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
BENT GRASS WEST BASINS																	
AA-1	2.57	A	49.8	0.42	0.59	100	4.0	7.8	765	2.5	20	3.2	4.0	11.9	865.0	14.8	11.9
AA-2	2.28	A	58.7	0.46	0.61	60	2.0	7.2	735	2.5	20	3.2	3.9	11.1	795.0	14.4	11.1
B-1	5.43	A	14.3	0.16	0.40	90	6.4	8.8	2000	1.7	15	2.0	17.0	25.8	2090.0	21.6	21.6
B-2	4.16	A	2.1	0.10	0.38	160	11.0	10.4	920	1.6	15	1.9	8.1	18.5	1080.0	16.0	16.0
CC-1	9.07	A	65.0	0.51	0.65	75	2.0	7.4	1160	2.3	20	3.0	6.4	13.9	1235.0	16.9	13.9
CC-2	1.35	A	73.2	0.59	0.77	10	2.0	2.3	380	4.0	20	4.0	1.6	3.9	390.0	12.2	5.0
CC-3	1.88	A	85.9	0.72	0.81	10	2.0	1.7	945	2.5	20	3.2	5.0	6.7	955.0	15.3	6.7
CC-4	4.34	A	38.2	0.30	0.49	5	2.0	2.6	575	2.5	20	3.2	3.0	5.6	580.0	13.2	5.6
CC-5	0.45	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
D-1	9.07	A	50.2	0.41	0.58	100	2.6	9.2	1900	1.3	20	2.3	13.9	23.1	2000.0	21.1	21.1

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Bent Grass
Location: CO, Colorado Springs

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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	C100	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)
D-2	6.72	A	69.9	0.56	0.69	10	2.0	2.5	1355	1.3	20	2.3	9.9	12.4	1365.0	17.6	12.4
D-3	2.03	A	16.9	0.13	0.22	25	8.0	4.4	1960	1.0	15	1.5	21.8	26.2	1985.0	21.0	21.0
D-4	4.38	A	65.4	0.52	0.66	100	2.3	8.0	980	1.0	20	2.0	8.2	16.2	1080.0	16.0	16.0
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-6	4.01	A	71.5	0.54	0.67	45	2.0	5.5	835	1.0	20	2.0	7.0	12.4	880.0	14.9	12.4
D-7	6.39	A	9.8	0.14	0.39	200	7.5	12.7	665	1.0	15	1.5	7.4	20.1	865.0	14.8	14.8
D-8	1.69	A	22.8	0.21	0.44	125	3.7	11.8	600	1.0	15	1.5	6.7	18.4	725.0	14.0	14.0
PROPOSED:																	
P-1	2.03	A	64.3	0.60	0.74	100	6.0	5.0	1230	1.7	15	2.0	10.5	15.5	1330.0	17.4	15.5

NOTES:

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

T_t=L/60V

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

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

		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
OFFSITE BASINS																					
		RWT202	1574.40						46.6	120.88	1.82	220.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.4	1.78	3.93	7.0									From Falcon DBPS by Matrix
		WT200	192.00						37.8	24.41	2.13	52.0									From Falcon DBPS by Matrix
		OS-2	20.08	0.14	18.3	2.81	3.22	9.0													
		OS-3	10.62	0.14	18.9	1.49	3.18	4.7													
Release rate from Meadows Pond #2		MT060	185.60	0.44	23.1			2.7													Total flow from existing culvert onto Basin OS-5 = 2.7
		OS-24	2.64	0.09	18.7	0.24	3.19	0.8													
		OS-25	14.13	0.11	17.4	1.55	3.30	5.1													
		OS-26	5.81	0.09	14.2	0.52	3.61	1.9													
		H5	11.30	0.05	13.9	0.57	3.64	2.1													
		OS-22	4.42	0.09	13.9	0.40	3.64	1.5													
		OS-23	10.24	0.09	13.9	0.92	3.64	3.3													
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																					
		C1a	0.48	0.70	5.0	0.34	5.17	1.8													
		D1a	0.56	0.57	5.1	0.32	5.15	1.6													
		H1a	0.40	0.48	5.0	0.19	5.17	1.0													
		D1b	0.68	0.57	5.0	0.39	5.17	2.0													
		D1c	1.20	0.58	7.2	0.70	4.63	3.2													
		D1d	2.79	0.59	10.3	1.65	4.09	6.7													
		D2a	1.00	0.35	5.0	0.35	5.17	1.8													
		D2b	0.41	0.46	5.0	0.19	5.17	1.0													
		H1b	2.52	0.44	11.6	1.11	3.91	4.3													
		H1c	0.16	0.42	5.0	0.07	5.17	0.4													
		H2a	1.09	0.41	11.9	0.45	3.87	1.7													
		H2b	0.15	0.36	5.0	0.05	5.17	0.3													

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
		C1b	0.88	0.72	5.0	0.63	5.17	3.3													
		C1c	1.09	0.74	5.5	0.81	5.02	4.1													
		C2a	1.26	0.57	10.7	0.72	4.03	2.9													
		C2b	0.99	0.84	11.2	0.83	3.96	3.3													
		F	1.37	0.40	6.9	0.55	4.68	2.6													
		G	1.70	0.40	11.3	0.68	3.94	2.7													
		H3	1.54	0.55	12.5	0.85	3.79	3.2													
		H4	0.42	0.55	9.4	0.23	4.23	1.0													
		I1	3.00	0.55	10.7	1.65	4.02	6.6													
		I2	1.70	0.55	9.9	0.94	4.15	3.9													
		J	1.64	0.40	7.9	0.66	4.48	3.0													
		K	1.00	0.40	7.7	0.40	4.52	1.8													
		L	5.90	0.78	10.7	4.60	4.03	18.5													
		M1	1.56	0.85	8.3	1.33	4.41	5.9													
		M2	0.44	0.85	5.0	0.37	5.17	1.9													
		N	1.32	0.85	6.8	1.12	4.70	5.3													
		D	0.41	0.82	5.0	0.34	5.17	1.8													
BENT GRASS FILING NO. 2 BASINS																					
		OS-1	32.28	0.16	22.2	5.16	2.93	15.1													
		OS-4	4.46	0.36	15.6	1.61	3.46	5.6													
		OS-5	0.46	0.45	5.2	0.21	5.10	1.1													
		OS-6	1.17	0.45	12.9	0.53	3.75	2.0													
		A-1	2.70	0.33	13.6	0.89	3.67	3.3													
		A-2	1.19	0.32	10.5	0.38	4.06	1.5													
		A-3	1.57	0.36	14.2	0.57	3.61	2.1													

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

		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
		A-4	2.24	0.34	12.8	0.76	3.76	2.9													
		C-1	1.35	0.42	7.7	0.57	4.53	2.6													
		C-2	6.80	0.34	20.4	2.31	3.06	7.1													
		C-3	2.38	0.40	15.1	0.95	3.52	3.3													
		C-4	3.61	0.42	15.6	1.52	3.46	5.3													
		C-5	7.86	0.42	17.2	3.30	3.31	10.9													
		C-6	5.54	0.38	17.4	2.11	3.30	7.0													
		C-7	0.89	0.09	11.3	0.08	3.95	0.3													
		E-1	1.71	0.55	11.8	0.94	3.88	3.6													
		E-2	0.68	0.76	6.9	0.52	4.70	2.4													
		E-3	0.78	0.81	7.4	0.63	4.59	2.9													
		E-4	0.91	0.74	8.0	0.67	4.46	3.0													
		E-5	0.89	0.81	7.3	0.72	4.60	3.3													
		F-1	0.44	0.29	8.9	0.13	4.31	0.6													
		F-2	0.55	0.55	5.9	0.30	4.91	1.5													
		G-1	1.47	0.21	9.9	0.31	4.14	1.3													
		H-1	0.52	0.09	8.1	0.05	4.44	0.2													
		I-1	0.31	0.66	5.0	0.20	5.17	1.0													
BENT GRASS WEST BASINS																					
		AA-1	2.57	0.42	11.9	1.08	3.87	4.2													
		AA-2	2.28	0.46	11.1	1.05	3.98	4.2													
		B-1	5.43	0.16	21.6	0.87	2.97	2.6													
		B-2	4.16	0.10	16.0	0.42	3.42	1.4													
		CC-1	9.07	0.51	13.9	4.63	3.64	16.9													
		CC-2	1.35	0.59	5.0	0.80	5.17	4.1													

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
		CC-3	1.88	0.72	6.7	1.35	4.72	6.4													
		CC-4	4.34	0.30	5.6	1.30	4.99	6.5													
		CC-5	0.45	0.09	5.0	0.04	5.17	0.2													
		D-1	9.07	0.41	21.1	3.72	3.01	11.2													
		D-2	6.72	0.56	12.4	3.76	3.81	14.3													
		D-3	2.03	0.13	21.0	0.26	3.01	0.8													
		D-4	4.38	0.52	16.0	2.28	3.42	7.8													
		D-5	1.08	0.51	11.0	0.55	3.99	2.2													
		D-6	4.01	0.54	12.4	2.17	3.80	8.2													
		D-7	6.39	0.14	14.8	0.89	3.54	3.2													
		D-8	1.69	0.21	14.0	0.35	3.62	1.3													
MERIDIAN ROAD BASINS																					
		P-1	2.03	0.60	15.5	1.22	3.47	4.2													

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

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

		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
OFFSITE BASINS																					
		RWT202	1574.40						46.6	327.87	3.05	1000.0									From Falcon DBPS by Matrix
		RWT204	38.40						11.4	6.52	6.60	43.0									From Falcon DBPS by Matrix
		WT200	192.00						37.8	53.07	3.58	190.0									From Falcon DBPS by Matrix
		OS-2	20.08	0.40	18.3	8.03	5.41	43.4													
		OS-3	10.62	0.40	18.9	4.25	5.33	22.7													
Release rate from Meadows Pond #2		MT060	185.60	0.44	23.1			72.6													Total flow from existing culvert onto Basin OS-5 = 72.6
		OS-24	2.64	0.36	18.7	0.95	5.36	5.1													
		OS-25	14.13	0.37	17.4	5.23	5.54	29.0													
		OS-26	5.81	0.36	14.2	2.09	6.05	12.6													
		H5	11.30	0.19	13.9	2.15	6.10	13.1													
		OS-22	4.42	0.36	13.9	1.59	6.10	9.7													
		OS-23	10.24	0.36	13.9	3.69	6.10	22.5													
BENT GRASS EAST COMMERCIAL & FILING NO. 1 BASINS																					
		C1a	0.48	0.81	5.0	0.39	8.68	3.4													
		D1a	0.56	0.71	5.1	0.40	8.65	3.5													
		H1a	0.40	0.65	5.0	0.26	8.68	2.3													
		D1b	0.68	0.71	5.0	0.48	8.68	4.2													
		D1c	1.20	0.71	7.2	0.85	7.77	6.6													
		D1d	2.79	0.71	10.3	1.98	6.87	13.6													
		D2a	1.00	0.55	5.0	0.55	8.68	4.8													
		D2b	0.41	0.63	5.0	0.26	8.68	2.3													
		H1b	2.52	0.60	11.6	1.51	6.56	9.9													
		H1c	0.16	0.60	5.0	0.10	8.68	0.9													

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

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
		H2a	1.09	0.59	11.9	0.64	6.50	4.2													
		H2b	0.15	0.56	5.0	0.08	8.68	0.7													
		H3	1.54	0.65	12.5	1.00	6.37	6.4													
		C1b	0.88	0.82	5.0	0.72	8.68	6.2													
		C1c	1.09	0.84	5.5	0.92	8.43	7.8													
		C2a	1.26	0.71	10.7	0.89	6.76	6.0													
		C2b	0.99	0.92	11.2	0.91	6.64	6.0													
		F	1.37	0.55	6.9	0.75	7.85	5.9													
		G	1.70	0.50	11.3	0.85	6.62	5.6													
		H3	1.54	0.65	12.5	1.00	6.37	6.4													
		H4	0.42	0.65	9.4	0.27	7.10	1.9													
		I1	3.00	0.65	10.7	1.95	6.76	13.2													
		I2	1.70	0.65	9.9	1.11	6.96	7.7													
		J	1.64	0.55	7.9	0.90	7.52	6.8													
		K	1.00	0.55	7.7	0.55	7.59	4.2													
		L	5.90	0.83	10.7	4.90	6.77	33.2													
		M1	1.56	0.90	8.3	1.40	7.41	10.4													
		M2	0.44	0.90	5.0	0.40	8.68	3.5													
		N	1.32	0.90	6.8	1.19	7.89	9.4													
		D	0.41	0.83	5.0	0.34	8.68	3.0													
BENT GRASS FILING NO. 2 BASINS																					
		OS-1	32.28	0.41	22.2	13.23	4.92	65.1													
		OS-4	4.46	0.54	15.6	2.41	5.81	14.0													

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

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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-5	0.46	0.59	5.2	0.27	8.56	2.3													
		OS-6	1.17	0.59	12.9	0.69	6.30	4.3													
		A-1	2.70	0.52	13.6	1.40	6.16	8.6													
		A-2	1.19	0.51	10.5	0.61	6.81	4.2													
		A-3	1.57	0.53	14.2	0.83	6.05	5.0													
		A-4	2.24	0.53	12.8	1.19	6.31	7.5													
		C-1	1.35	0.57	7.7	0.77	7.61	5.9													
		C-2	6.80	0.53	20.4	3.60	5.14	18.5													
		C-3	2.38	0.56	15.1	1.33	5.90	7.8													
		C-4	3.61	0.57	15.6	2.06	5.81	12.0													
		C-5	7.86	0.57	17.2	4.48	5.56	24.9													
		C-6	5.54	0.55	17.4	3.05	5.54	16.9													
		C-7	0.89	0.36	11.3	0.32	6.63	2.1													
		E-1	1.71	0.69	11.8	1.18	6.51	7.7													
		E-2	0.68	0.85	6.9	0.58	7.89	4.6													
		E-3	0.78	0.89	7.4	0.69	7.70	5.3													
		E-4	0.91	0.84	8.0	0.76	7.50	5.7													
		E-5	0.89	0.89	7.3	0.79	7.73	6.1													
		F-1	0.44	0.50	8.9	0.22	7.23	1.6													
		F-2	0.55	0.69	5.9	0.38	8.25	3.1													
		G-1	1.47	0.44	9.9	0.65	6.95	4.5													
		H-1	0.52	0.36	8.1	0.19	7.45	1.4													
		I-1	0.31	0.79	5.0	0.24	8.68	2.1													

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

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

Project Name: Bent Grass
Project No.: CLH015.20
Calculated By: TJE
Checked By: CMD
Date: 3/23/20

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)	
BENT GRASS WEST BASINS																					
		AA-1	2.57	0.59	11.9	1.52	6.50	9.9													
		AA-2	2.28	0.61	11.1	1.39	6.67	9.3													
		B-1	5.43	0.40	21.6	2.17	4.99	10.8													
		B-2	4.16	0.38	16.0	1.58	5.75	9.1													
		CC-1	9.07	0.65	13.9	5.90	6.11	36.0													
		CC-2	1.35	0.77	5.0	1.04	8.68	9.0													
		CC-3	1.88	0.81	6.7	1.52	7.93	12.1													
		CC-4	4.34	0.49	5.6	2.13	8.38	17.8													
		CC-5	0.45	0.36	5.0	0.16	8.68	1.4													
		D-1	9.07	0.58	21.1	5.26	5.05	26.6													
		D-2	6.72	0.69	12.4	4.64	6.39	29.6													
		D-3	2.03	0.22	21.0	0.45	5.06	2.3													
		D-4	4.38	0.66	16.0	2.89	5.75	16.6													
		D-5	1.08	0.64	11.0	0.69	6.70	4.6													
		D-6	4.01	0.67	12.4	2.69	6.39	17.2													
		D-7	6.39	0.39	14.8	2.49	5.94	14.8													
		D-8	1.69	0.44	14.0	0.74	6.08	4.5													
MERIDIAN ROAD BASINS																					
		P-1	2.03	0.74	15.5	1.50	5.82	8.7													

BENT GRASS/MERIDIAN ROAD - MDDP
SURFACE ROUTING - FUTURE CONDITIONS

DESIGN POINT	CONTRIBUTING BASINS	CA (equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
FILING NO. 2:									
	RWT202	124.80	324.77	46.6	1.8	3.1	220.0	1000.0	
				TRAVEL TIME					
		124.80	324.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	2000	5.0	6.7	53.3	
	RWT204	1.83	6.43	11.4	3.8	6.7	7.0	43.0	
				TRAVEL TIME					
		1.83	6.43	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.0	2.7	14.1	
	WT200	25.81	54.00	37.8	2.0	3.5	52.0	190.0	
				TRAVEL TIME					
		25.81	54.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.0	2.7	40.5	
40	OS-1	5.16	13.23	22.2	2.8	4.8	14.2	63.6	
				TRAVEL TIME					
		5.16	13.23	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	800	5.1	2.6	24.8	
1	A-1	0.89	1.40	13.6	3.5	6.2	3.1	8.6	
				TRAVEL TIME					
		0.89	1.40	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	140	2.0	1.2	14.8	
2	A-2	0.38	0.61	14.8	3.4	5.9	4.3	11.9	
	DP 1	0.89	1.40	TRAVEL TIME					
		1.27	2.01	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	275	2.4	1.9	16.7	
3	A-3	0.57	0.83	16.7	3.2	5.6	5.9	15.9	
	DP 2	1.27	2.01	TRAVEL TIME					
		1.84	2.84	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	40	2.4	0.3	17.0	
4	A-4	0.76	1.19	17.0	3.2	5.5	8.3	22.3	
	DP 3	1.84	2.84	TRAVEL TIME					
		2.60	4.03	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	780	2.0	6.5	23.5	
9	OS-5	0.21	0.27	5.2	5.1	8.9	1.1	2.4	
				TRAVEL TIME					
		0.21	0.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	315	3.2	1.6	6.9	
11	OS-4	1.61	2.41	15.6	3.3	5.8	6.0	15.5	
	DP 9	0.21	0.27	TRAVEL TIME					
		1.82	2.68	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	150	3.2	0.8	16.4	
12	OS-6	0.53	0.69	16.4	3.2	5.6	7.6	19.0	
	DP 11	1.82	2.68	TRAVEL TIME					
		2.35	3.37	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	120	3.2	0.6	17.0	
5	AA-1	1.08	1.52	17.0	3.2	5.5	10.9	27.1	
	DP 12	2.35	3.37	TRAVEL TIME					
		3.43	4.89	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	17.0	
6	AA-2	1.05	1.39	11.1	3.9	6.8	4.1	9.4	
				TRAVEL TIME					
		1.05	1.39	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	11.1	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
7	E-3	0.63	0.69	7.4	4.6	8.0	2.9	5.5	
				TRAVEL TIME					
		0.63	0.69	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	7.4	
8	E-1	0.94	1.18	11.8	3.8	6.6	25.3	62.1	
	E-2	0.52	0.58						
	CC-3	1.35	1.52						
	CC-4	1.30	2.13						
	DP 4	2.60	4.03	TRAVEL TIME					
		6.71	9.44	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	11.8	
13	CC-1	4.63	5.90	13.9	3.5	6.1	19.0	42.5	
	CC-2	0.80	1.04	TRAVEL TIME					
		5.43	6.94	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	60	3.2	0.3	14.2	
14	CC-3	1.35	1.52	6.7	4.7	8.2	6.4	12.5	
				TRAVEL TIME					
		1.35	1.52	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	6.7	
10	CC-5	0.04	0.16	14.2	3.5	6.1	23.6	52.2	TOTAL FLOWS INTO NORTH POND
	DP 13	5.43	6.94						BENT GRASS WEST
	DP 14	1.35	1.52	TRAVEL TIME					
		6.82	8.62	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	14.2	
10A	BG NORTH POND RELEASE	1.16	2.42	5.0	5.2	9.1	6.0	21.9	
				TRAVEL TIME					
		1.16	2.42	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
15	DP 5	3.43	4.89	17.0	3.2	5.5	37.5	90.8	TOTAL FLOWS INTO NORTH POND
	DP 6	1.05	1.39						FILING NO. 2
	DP 7	0.63	0.69						
	DP 8	6.71	9.44	TRAVEL TIME					
		11.82	16.41	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.4	0.0	17.0	
15A	F2 NORTH POND RELEASE	2.35	4.08	5.0	5.2	9.1	12.2	37.0	
				TRAVEL TIME					
		2.35	4.08	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
AA	WT200	25.81	54.00	53.3	1.6	2.8	259.6	1141.2	
	B-1	0.87	2.17						
	RWT202	124.80	324.77						
	RWT204	1.83	6.43						
	DP 40	5.16	13.23						
	DP 15A	2.35	4.08	TRAVEL TIME					
		160.82	404.68	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CULVERTS	135	5.1	0.4	53.7	
BB	B-2	0.42	1.58	53.7	1.6	2.8	258.9	1139.4	
	DP AA	160.82	404.68	TRAVEL TIME					
		161.24	406.26	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				CHANNEL	1000	7.0	2.4	56.1	
16	C-5	3.30	4.48	11.2	3.9	6.7	12.7	30.2	@ GRADE INLET
				TRAVEL TIME					
		3.30	4.48	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	115	2.0	1.0	12.2	
17	C-6	2.11	3.05	11.2	3.9	6.7	8.1	20.5	@ GRADE INLET
				TRAVEL TIME					
		2.11	3.05	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				STREET	115	2.0	1.0	12.2	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
18	C-3	0.95	1.33	11.2	3.9	6.7	10.6	32.2	SUMP INLET
	C-4	1.52	2.06						
	FB DP 16	0.29	1.40	TRAVEL TIME					
		2.76	4.79	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	11.2	
19	C-1	0.57	0.77	20.4	2.9	5.0	9.5	29.7	SUMP INLET
	C-2	2.31	3.60						
	FB DP 17	0.42	1.53	TRAVEL TIME					
		3.30	5.90	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	20.4	
20	G-1	0.31	0.65	9.9	4.1	7.1	1.3	4.6	
				TRAVEL TIME					
		0.31	0.65	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	9.9	
20A	C-7	0.08	0.32	20.4	2.9	5.0	18.6	58.7	TOTAL FLOW INTO FILING NO. 2
	DP 18	2.76	4.79						SOUTH POND
	DP 19	3.30	5.90						
	DP 20	0.31	0.65	TRAVEL TIME					
		6.44	11.65	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	20.4	
20B	F2 SOUTH POND	4.11	7.28	5.0	5.2	9.1	21.3	66.0	
	RELEASE			TRAVEL TIME					
		4.11	7.28	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
28	OS-2	2.81	8.03	18.3	3.1	5.3	8.6	42.8	
				TRAVEL TIME					
		2.81	8.03	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	640	4.0	2.7	21.0	
29	OS-3	1.49	4.25	21.0	2.8	5.0	12.2	60.9	
	DP 28	2.81	8.03	TRAVEL TIME					
		4.30	12.28	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SWALE	475	3.5	2.3	23.3	
21	D-2	3.76	4.64	12.4	3.7	6.4	13.9	29.9	@ GRADE INLET
				TRAVEL TIME					
		3.76	4.64	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						4.0	0.0	12.4	
22	D-1	3.72	5.26	21.1	2.8	4.9	10.5	26.0	@ GRADE INLET
				TRAVEL TIME					
		3.72	5.26	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						3.5	0.0	21.1	
23	D-3	0.26	0.45	23.3	2.7	4.7	12.2	59.7	TYPE C INLET
	DP 29	4.30	12.28	TRAVEL TIME					
		4.56	12.73	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						4.0	0.0	23.3	
24	E-4	0.67	0.76	18.7	3.0	5.3	2.9	21.1	@ GRADE INLET
	OS-24	0.24	0.95						
	FB DP 22	0.07	2.29	TRAVEL TIME					
		0.98	4.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						3.5	0.0	18.7	
25	E-5	0.72	0.79	7.3	4.6	8.0	3.3	10.7	@ GRADE INLET
	FB DP 24	0.00	0.55	TRAVEL TIME					
		0.72	1.34	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						3.5	0.0	7.3	
26	D-7	0.89	2.49	14.8	3.4	5.9	8.8	46.4	
	DP 24	0.98	4.00						
	DP 25	0.72	1.34	TRAVEL TIME					
		2.59	7.83	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						3.5	0.0	14.8	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
42	D-4	2.28	2.89	16.0	3.3	5.7	7.5	16.5	SUMP INLET
				TRAVEL TIME					
		2.28	2.89	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	16.0	
43	D-5	0.55	0.69	12.4	3.7	6.4	10.0	21.8	SUMP INLET
	D-6	2.17	2.69	TRAVEL TIME					
		2.72	3.38	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	12.4	
44	D-8	0.35	0.74	14.0	3.5	6.1	1.2	4.5	
				TRAVEL TIME					
		0.35	0.74	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	14.0	
45	DP 21	3.76	4.64	23.3	2.7	4.7	53.6	175.7	TOTAL FLOW INTO BENT GRASS
	DP 22	3.72	5.26						WEST SOUTH POND
	DP 23	4.56	12.73						
	DP 26	2.59	7.83						
	DP 42	2.28	2.89						
	DP 43	2.72	3.38						
	DP 44	0.35	0.74	TRAVEL TIME					
		19.98	37.47	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	23.3	
45A	BG SOUTH POND RELEASE	0.21	5.05	5.0	5.2	9.1	1.1	45.8	
				TRAVEL TIME					
		0.21	5.05	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
CC	DP BB	161.24	406.26	56.1	1.6	2.7	260.0	1147.0	EXITS SITE
	DP 10A	1.16	2.42						
	DP 20B	4.11	7.28						
	DP 45A	0.21	5.05	TRAVEL TIME					
		166.72	421.02	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						3.5	0.0	56.1	
EAST OF FILING NO. 2:									
30	MTO60			15.0			2.7	72.6	Flows from Meadows Filing No. 3
				TRAVEL TIME					Pond 2 - Updated HEC HMS model
				Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	2300	2.1	18.3	33.3	
31	OS-25	1.55	5.23	33.3	2.2	3.8	6.1	92.5	
	DP 30	1.24	19.07						
		2.79	24.30	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	700	2.6	4.5	37.7	
32	OS-6	0.53	0.69	37.7	2.0	3.5	6.7	88.0	Flow into revised pond on "School
	DP 31	2.79	24.30						Site"
		3.32	24.99	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Sheet	700	2.6	4.5	42.2	
32A	Fut Pond Release	1.11	5.46	15.0	3.4	5.9	4.9	34.5	Designed release rates from Future
	C1a	0.34	0.39						Pond are 3.8 & 32.2 cfs
				TRAVEL TIME					
		1.45	5.85	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.0	0.0	15.0	
32A-N	DP-32	1.45	5.64	15.0	3.4	5.9	4.9	33.2	Flows remaining in north half of
				TRAVEL TIME					BGMD & continuing east (Max gutter
		1.45	5.64	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	flow allowed 5 Yr=9.4, 100 Yr=33.2)
				Street	905	2.0	7.5	22.5	
32A-S	D1a	3.72	0.40	15.0	3.4	5.9	12.5	3.6	Flows remaining in south half of
	OT from DP 32A-N	0.00	0.21						BGMD & continuing east (Max gutter
		3.72	0.61	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	flow allowed 5 Yr=9.4 & 100 Yr=33.2)
						2.5	0.0	15.0	
BG 1a-Os		0.00	0.00	15.0	3.4	5.9	0.0	0.0	Overtopping Flows from DP 32A which
				TRAVEL TIME					will head south through Bent Grass Filing
		0.00	0.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	No. 1 in Sea Oats Drive (Sea Oats Dr can
						2.5	0.0	15.0	carry 2.2 & 11.6 cfs per side)

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
BG 1a-Ose		0.00	0.00	15.0	3.4	5.9	0.0	0.0	Overtopping Flows from DP 1a-Os which will flow in east half of Sea Oats Drive
				TRAVEL TIME					
		0.00	0.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	15.0	
BG 1a-Osw		0.00	0.00	15.0	3.4	5.9	0.0	0.0	Overtopping Flows from DP 1a-Os which will flow in west half of Sea Oats Drive
				TRAVEL TIME					
		0.00	0.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	15.0	
BG 4a	H1a	0.19	0.26	15.0	3.4	5.9	0.6	1.5	Flows to west side of Inlet 4
	DP BG 1a-Ose	0.00	0.00	TRAVEL TIME					
		0.19	0.26	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	600	2.0	5.0	20.0	
BG 1b	D1b	0.39	0.48	15.0	3.4	5.9	1.3	2.8	
	DP BG 1a-Osw	0.00	0.00	TRAVEL TIME					
		0.39	0.48	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	575	2.8	3.4	18.4	
BG 1c	D1c	0.70	0.85	18.4	3.0	5.3	3.3	7.1	Flows in Aveno Rd to east side of Inlet 1 (Max gutter allowed 1.6 & 8.6 cfs per side)
	DP BG 1b	0.39	0.48	TRAVEL TIME					
		1.09	1.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.5	0.0	18.4	
BG 1	D1d	1.65	1.98	18.4	3.0	5.3	8.3	17.6	Existing 10' Sump Inlet - Total flow to Inlet 1
	DP BG 1c	1.09	1.33	TRAVEL TIME					
		2.74	3.31	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	18.4	
BG 2e	D2a	0.35	0.55	5.0	5.2	9.1	1.8	5.0	Flows in Aveno Rd to east side of Inlet 2 (Max gutter allowed 1.6 & 8.6 cfs per side)
				TRAVEL TIME					
		0.35	0.55	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 2w	D2b	0.19	0.26	5.0	5.2	9.1	1.0	2.4	Flows in Aveno Rd to west side of Inlet 2 (Max gutter allowed 2.2 & 11.4 cfs per side)
				TRAVEL TIME					
		0.19	0.26	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 2	DP BG 2e	0.35	0.55	5.0	5.2	9.1	2.8	7.3	Existing 4' Sump Inlet - Total flow to
	DP BG 2w	0.19	0.26	TRAVEL TIME					
		0.54	0.81	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	5.0	
BG 4e	H1c	0.07	0.10	5.0	5.2	9.1	0.4	0.9	Flows in Aveno Rd to west side of Inlet 4 (Max gutter allowed 1.8 & 9.8 cfs per side)
				TRAVEL TIME					
		0.07	0.10	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 4w	H1b	1.11	1.51	20.0	2.9	5.1	3.8	9.0	Flows in Aveno Rd to east side of Inlet 4 (Max gutter allowed 2.1 & 11.3 cfs per side)
	DP BG 4a	0.19	0.26	TRAVEL TIME					
		1.30	1.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	20.0	
BG 4	DP BG 4e	0.07	0.10	20.0	2.9	5.1	4.0	9.5	Existing 4' Sump Inlet
	DP BG 4w	1.30	1.77	TRAVEL TIME					
		1.37	1.87	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	20.0	
BG 5e	H2b	0.05	0.08	5.0	5.2	9.1	0.3	0.7	Flows in Aveno Rd to west side of Inlet 5 (Max gutter allowed 1.8 & 9.8 cfs per side)
				TRAVEL TIME					
		0.05	0.08	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 5w	H2a	0.45	0.64	11.9	3.8	6.6	1.7	4.2	Flows in Aveno Rd to east side of Inlet 5 (Max gutter allowed 2.1 & 11.3 cfs per side)
				TRAVEL TIME					
		0.45	0.64	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	11.9	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
BG 5	DP BG 5e	0.05	0.08	11.9	3.8	6.6	1.9	4.7	Existing 4' Sump Inlet
	DP BG 5w	0.45	0.64	TRAVEL TIME					
		0.50	0.72	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				SUMP		5.0	0.0	11.9	
BG 3	G	1.55	5.23	18.4	3.0	5.3	14.7	49.7	Flows into BG Pond 1 from West side
	DP BG 1	2.74	3.31						
	DP BG 2	0.54	0.81	TRAVEL TIME					
		4.83	9.35	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	18.4	
BG 6	DP BG 4	1.37	1.87	20.0	2.9	5.1	5.4	13.2	Flows into BG Pond 1 from East side
	DP BG 5	0.50	0.72	TRAVEL TIME					
		1.87	2.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	20.0	
	DP BG 3	4.83	9.35	20.0	2.9	5.1	19.5	60.8	Total flows into BG Pond 1
	DP BG 6	1.87	2.59	TRAVEL TIME					
		6.70	11.94	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	20.0	
BG POND1	BG POND 1 RELEASE	0.06	0.32	5.0	5.2	9.1	0.3	2.9	
				TRAVEL TIME					
		0.06	0.32	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
BG 14n	OS-22	0.40	1.59	22.5	2.7	4.8	8.3	42.7	Flow continuing in North half of BGMD
	H5	0.57	1.00						
	C1b	0.63	0.72						
	DP BG 32A-N	1.45	5.64	TRAVEL TIME					
		3.05	8.95	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	300	2.8	1.8	24.3	
BG 15n	OS-23	0.92	3.69	24.3	2.6	4.6	8.0	40.9	Flow continuing in North half of BGMD
	D1c	0.70	0.85						
	DP BG 14n	3.05	8.95	TRAVEL TIME					
		4.67	13.49	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	24.3	
BG 50		111.34	193.50	26.1	2.5	4.4	280.0	850.0	Flow from Falcon DBPS at Meridian Rd & BGMD Intersection
				TRAVEL TIME					
				Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	26.1	
BG 20	DP BG 15n	4.67	13.49	26.1	2.5	4.4	291.7	909.3	Combined flow at Culvert Crossing - North side of BGMD
	DP BG 50	111.34	193.50	TRAVEL TIME					
		116.01	206.99	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Culverts	125	11.2	0.2	26.3	
BG 14s	C2a	0.72	0.71	15.0	3.4	5.9	15.0	7.8	Flow continuing in South half of BGMD
	DP BG 12-S	3.72	0.61	TRAVEL TIME					
		4.44	1.32	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	300	2.8	1.8	16.8	
BG 15s	C2b	0.83	0.91	16.8	3.2	5.6	16.8	12.4	Flow continuing in South half of BGMD
	DP BG 14s	4.44	1.32	TRAVEL TIME					
		5.27	2.23	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	16.8	
BG 21	DP BG 20	116.01	206.99	26.3	2.5	4.4	303.8	915.3	Combined flow at Culvert Crossing - South side of BGMD
	DP BG 15s	5.27	2.23	TRAVEL TIME					
		121.28	209.22	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Channel	1250	2.0	10.4	36.7	
BG 32	F	0.55	0.75	6.9	4.7	8.1	2.6	6.1	
				TRAVEL TIME					
		0.55	0.75	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	6.9	
BG 33	J	0.66	0.90	7.9	4.4	7.8	2.9	7.0	
				TRAVEL TIME					
		0.66	0.90	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	7.9	

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)	NOTES
BG 7	H3	0.85	1.00	12.5	3.7	6.4	3.1	6.4	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.85	1.00	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	12.5	
BG 8	H4	0.23	0.27	9.4	4.2	7.3	1.0	2.0	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.23	0.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	9.4	
BG 9	I1	1.65	1.95	10.7	3.9	6.9	6.5	13.4	Ex 6' Sump Inlet
				TRAVEL TIME					
		1.65	1.95	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	10.7	
BG 10	I2	0.94	1.11	9.9	4.1	7.1	3.8	7.9	Ex 4' Sump Inlet
				TRAVEL TIME					
		0.94	1.11	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	9.9	
BG 11	DP BG 7	0.85	1.00	12.5	3.7	6.4	13.5	27.8	Inflow to BG Pond 2 West storm sewer
	DP BG 8	0.23	0.27						
	DP BG 9	1.65	1.95						
	DP BG 10	0.94	1.11	TRAVEL TIME					
		3.67	4.33	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.8	0.0	12.5	
BG 12	M1	1.33	1.40	8.3	4.4	7.6	5.8	10.7	Ex 6' Sump Inlet
				TRAVEL TIME					
		1.33	1.40	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	8.3	
BG 13	M2	0.37	0.40	6.8	4.7	8.2	7.0	13.0	Ex 6' Sump Inlet
	N	1.12	1.19	TRAVEL TIME					
		1.49	1.59	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	6.8	
BG 14	DP BG 12	1.33	1.40	8.3	4.4	7.6	12.3	22.8	Inflow to BG Pond 2 East Storm sewer
	DP BG 13	1.49	1.59	TRAVEL TIME					
		2.82	2.99	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	8.3	
BG 15	K	0.40	0.55	12.5	3.7	6.4	42.2	82.0	Total inflow to BG Pond 2
	L	4.60	4.90						
	DP BG 11	3.67	4.33						
	DP BG 14	2.82	2.99	TRAVEL TIME					
		11.49	12.77	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
				Street	300	2.8	1.8	14.3	
BG POND2	BG POND 2 RELEASE	0.08	1.10	5.0	5.2	9.1	0.4	10.0	
				TRAVEL TIME					
		0.08	1.10	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
BG 30	PLD RELEASE RATE	0.58	0.55	5.0	5.2	9.1	3.0	5.0	Released flows from existing PLD on 7-11 site
				TRAVEL TIME					
		0.58	0.55	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						2.6	0.0	5.0	
BG 31	D	0.34	0.34	5.0	5.2	9.1	1.8	3.1	Future lot for development in Bent Grass East Commercial Filing No. 1
				TRAVEL TIME					
		0.34	0.34	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	5.0	
BG 25	P-1	1.22	0.45	36.7	2.1	3.6	251.3	751.4	Flow @ Existing Culvert, north side of Owl Place
	DP BG 21	121.28	209.22						
	BG 30	0.58	0.55						
	BG 31	0.34	0.34						
	BG POND 2	0.08	1.10	TRAVEL TIME					
		122.50	209.67	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)	
						5.0	0.0	36.7	

APPENDIX C

Hydraulic Computations

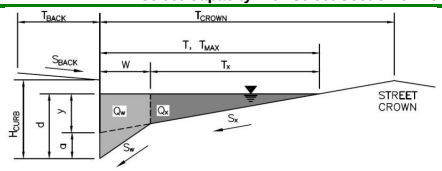
Version 4.05 Released March 2017

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

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

Project: Bent Grass Residential Filing No. 2

Inlet ID: Street Capacity - 1/2 Street Section of Bent Grass Meadows Drive



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	14.0	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} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	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} =	16.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	6.24	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	5.35	7.75	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	14.0	24.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.372	0.225	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	5.9	24.7	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	3.5	7.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	1.3	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**9.4**	**33.2**	**cfs**
Flow Velocity within the Gutter Section	V =	4.8	6.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	2.1	4.1	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	28.3	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	16.7	26.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.318	0.206	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	9.4	31.5	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	9.4	31.5	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	4.4	8.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	2.6	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	13.8	42.3	cfs
Average Flow Velocity Within the Gutter Section	V =	5.2	6.7	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	2.6	4.7	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**13.8**	**42.3**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	6.00	8.30	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.55	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**9.4**	**33.2**	**cfs**

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

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

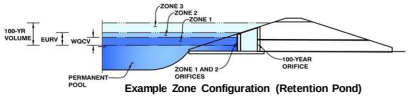
Current Pond Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Bent Grass

Basin ID: Current Sediment Pond (School Site)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	228.00	acres	Note: L / W Ratio < 1
Watershed Length =	2,400	ft	L / W Ratio = 0.6
Watershed Slope =	0.020	ft/ft	
Watershed Imperviousness =	28.00%	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	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	2.757	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	6.258	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	4.193	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.596	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.070	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	9.378	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	13.092	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.67 in.) =	19.212	acre-feet	2.67 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	35.173	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	3.923	acre-feet	
Approximate 5-yr Detention Volume =	5.242	acre-feet	
Approximate 10-yr Detention Volume =	6.574	acre-feet	
Approximate 25-yr Detention Volume =	8.342	acre-feet	
Approximate 50-yr Detention Volume =	9.701	acre-feet	
Approximate 100-yr Detention Volume =	12.690	acre-feet	

Stage-Storage Calculation

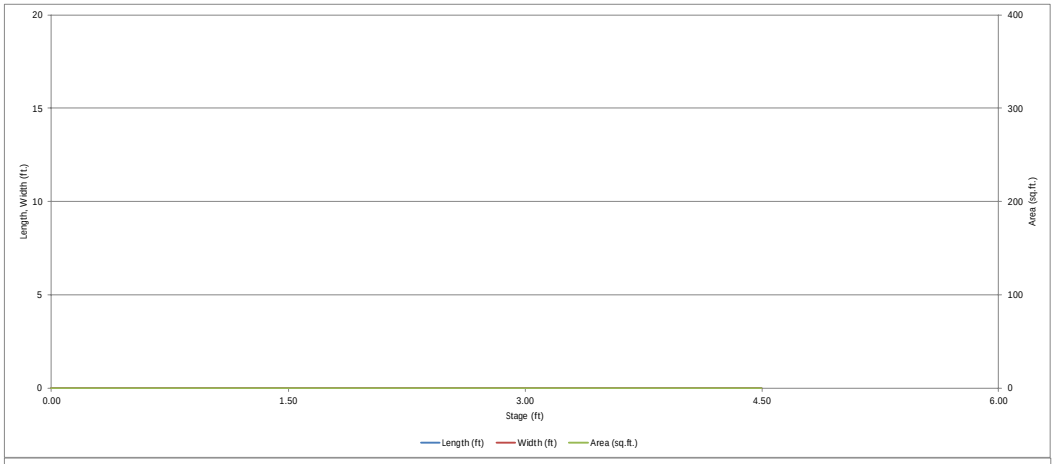
Zone 1 Volume (WQCV) =	2.757	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	Total detention volume is less than 100-year volume.
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	2.757	acre-feet	
Initial Surcharge Volume (ISV) =	user	ft^3	
Initial Surcharge Depth (ISD) =	user	ft	
Total Available Detention Depth (H_{total}) =	user	ft	
Depth of Trickle Channel (H_{TC}) =	user	ft	
Slope of Trickle Channel (S_{TC}) =	user	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	user	H:V	
Basin Length-to-Width Ratio ($R_{L/W}$) =	user		
Initial Surcharge Area (A_{ISV}) =	user	ft^2	
Surcharge Volume Length (L_{ISV}) =	user	ft	
Surcharge Volume Width (W_{ISV}) =	user	ft	
Depth of Basin Floor (H_{FLOOR}) =	user	ft	
Length of Basin Floor (L_{FLOOR}) =	user	ft	
Width of Basin Floor (W_{FLOOR}) =	user	ft	
Area of Basin Floor (A_{FLOOR}) =	user	ft^2	
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3	
Depth of Main Basin (H_{MAIN}) =	user	ft	
Length of Main Basin (L_{MAIN}) =	user	ft	
Width of Main Basin (W_{MAIN}) =	user	ft	
Area of Main Basin (A_{MAIN}) =	user	ft^2	
Volume of Main Basin (V_{MAIN}) =	user	ft^3	
Calculated Total Basin Volume (V_{total}) =	user	acre-feet	

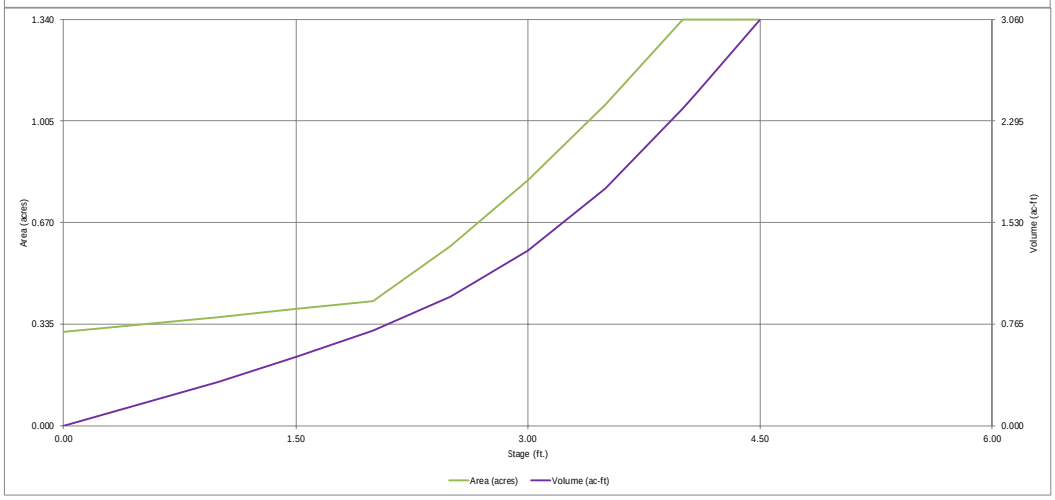
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	13,504	0.310		
	--	1.00	--	--	--	15,594	0.358	14,393	0.330
	--	1.50	--	--	--	16,727	0.384	22,462	0.516
	--	2.00	--	--	--	17,860	0.410	31,098	0.714
	--	2.50	--	--	--	25,788	0.592	42,188	0.969
	--	3.00	--	--	--	35,196	0.808	57,434	1.319
	--	3.50	--	--	--	46,043	1.057	77,744	1.785
	--	4.00	--	--	--	58,370	1.340	103,847	2.384
	--	4.10	--	--	--	58,370	1.340	109,684	2.518
	--	4.50	--	--	--	58,370	1.340	133,032	3.054

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



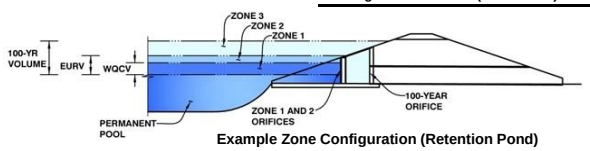


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Bent Grass

Basin ID: Existing Sediment Pond (School Site)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.28	2.757	
Zone 2			
Zone 3			
		2.757	Total

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 Diameter =		inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =		ft^2
Underdrain Orifice Centroid =		feet

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

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

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	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) and Grate (Flat or Sloped)

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

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =			feet
Over Flow Weir Slope Length =			feet
Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area w/ Debris =			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 =			ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =			inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	0.17	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	2.83	feet
Stage at Top of Freeboard =	6.83	feet
Basin Area at Top of Freeboard =	1.34	acres

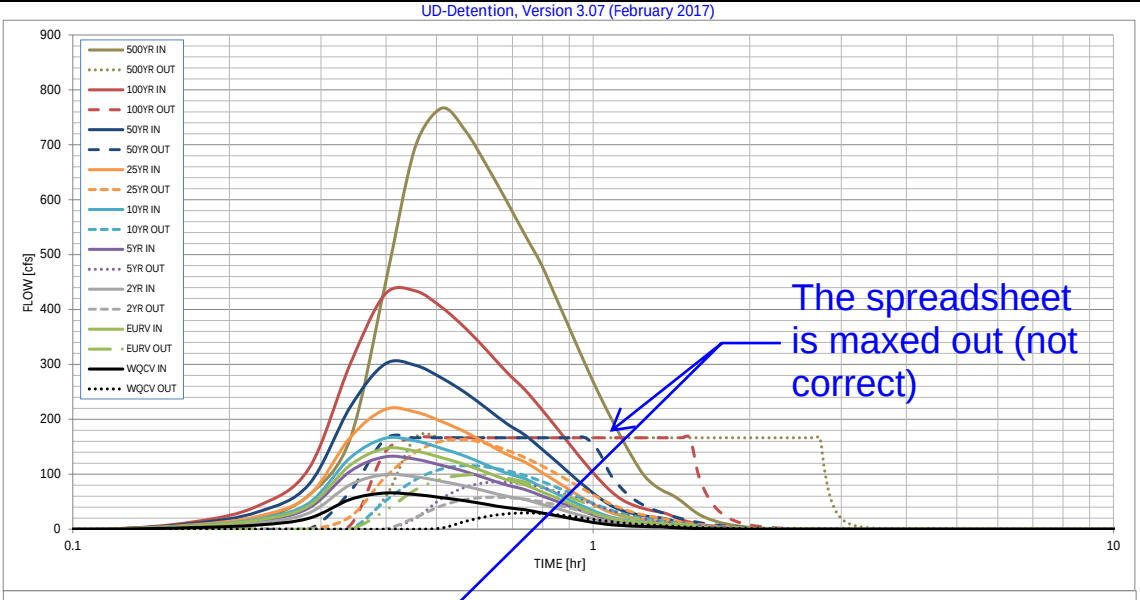
Routed Hydrograph Results

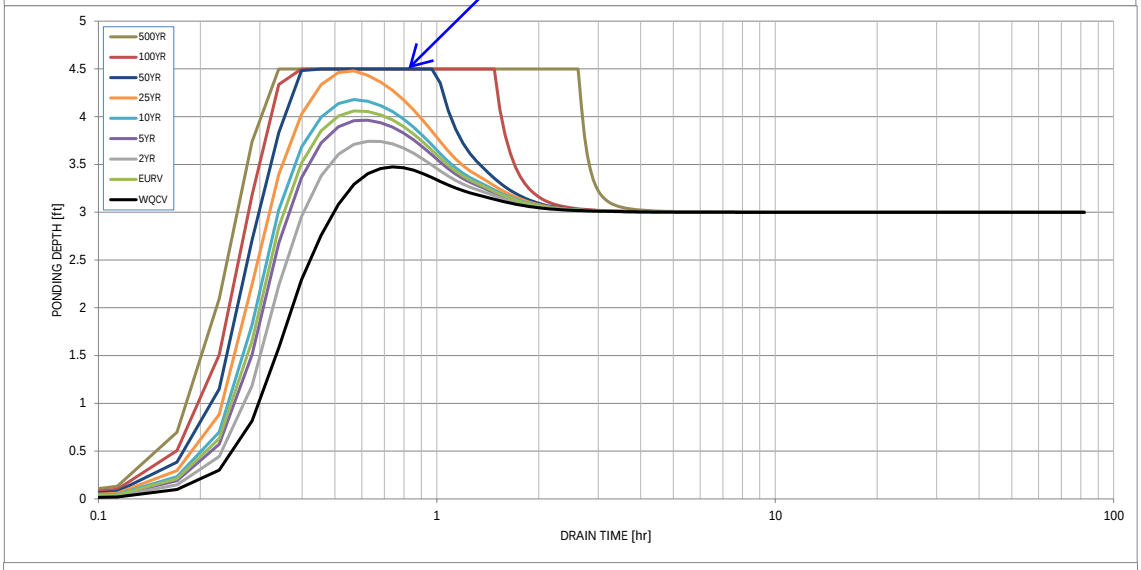
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.67	3.68
Calculated Runoff Volume (acre-ft) =	2.757	6.258	4.193	5.596	7.070	9.378	13.092	19.212	35.173
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	2.753	6.244	4.187	5.585	7.053	9.361	13.072	19.181	35.120
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.04	0.27	0.68	1.66
Predevelopment Peak Q (cfs) =	0.0	0.0	0.2	1.6	3.7	8.2	60.9	155.2	378.7
Peak Inflow Q (cfs) =	65.8	147.0	99.5	131.8	165.5	217.9	300.8	434.3	766.8
Peak Outflow Q (cfs) =	29.6	98.8	57.9	85.4	115.9	163.1	166.5	166.5	166.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	53.9	31.4	19.8	2.7	1.1	0.4
Structure Controlling Flow =	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	N/A	N/A	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	>120	>120	>120	>120	>120	>120	>120	>120	>120
Time to Drain 99% of Inflow Volume (hours) =	>120	>120	>120	>120	>120	>120	>120	>120	>120
Maximum Ponding Depth (ft) =	3.48	4.06	3.74	3.96	4.18	4.48	4.50	4.50	4.50
Area at Maximum Ponding Depth (acres) =	1.04	1.34	1.19	1.32	1.34	1.34	1.34	1.34	1.34
Maximum Volume Stored (acre-ft) =	1.753	2.464	2.055	2.331	2.612	3.014	3.054	3.054	3.054

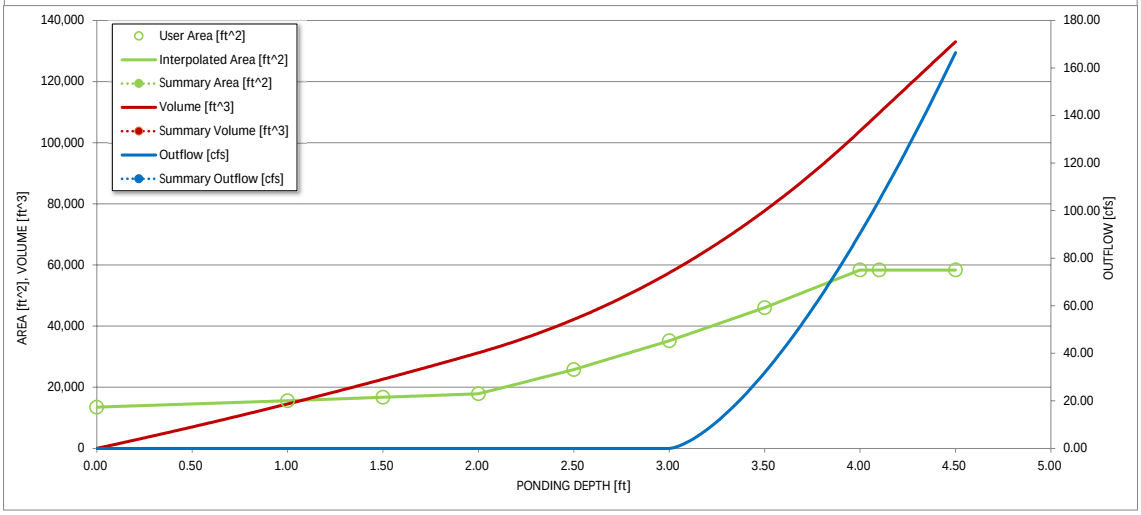
The spreadsheet is maxed out (not correct)

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

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

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

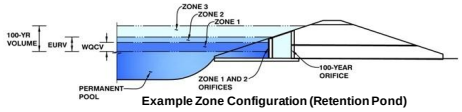
Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
3.41 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:03:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:06:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:10:14	2.80	5.84	4.12	5.31	6.46	8.11	10.43	13.38	17.58
1.464	0:13:38	7.69	16.57	11.47	14.97	18.48	23.75	31.64	42.76	61.92
	0:17:03	19.74	42.53	29.44	38.42	47.47	61.01	81.36	110.27	164.14
	0:20:28	54.15	116.49	80.71	105.27	129.94	166.78	221.98	300.12	443.34
	0:23:52	65.83	147.00	99.46	131.82	165.50	217.91	300.82	427.83	695.12
	0:27:17	63.12	142.54	95.71	127.51	160.98	213.75	298.77	434.31	766.82
	0:30:41	57.44	130.26	87.17	116.41	147.29	196.16	275.35	404.30	725.47
	0:34:06	51.66	117.44	78.53	104.93	132.82	177.01	248.62	366.06	661.08
	0:37:31	45.04	103.04	68.70	91.98	116.64	155.79	219.40	325.14	597.46
	0:40:55	39.22	90.11	59.98	80.41	102.05	136.41	192.25	286.10	536.60
	0:44:20	35.50	81.08	54.14	72.42	91.73	122.29	171.76	254.16	481.59
	0:47:44	29.65	68.30	45.38	60.91	77.41	103.68	146.51	218.87	417.39
	0:51:09	24.51	56.72	37.61	50.55	64.31	86.24	122.03	183.53	356.64
	0:54:34	19.31	45.22	29.80	40.24	51.38	69.21	98.46	150.09	299.97
	0:57:58	14.81	35.13	23.02	31.21	39.97	54.01	77.11	119.15	248.93
	1:01:23	10.97	26.42	17.20	23.43	30.12	40.88	58.67	92.52	204.07
	1:04:47	8.28	19.68	12.89	17.49	22.39	30.24	43.32	69.60	164.31
	1:08:12	6.70	15.72	10.37	14.00	17.86	24.01	34.15	53.52	128.70
	1:11:37	5.65	13.21	8.73	11.76	14.99	20.11	28.52	44.04	98.89
	1:15:01	4.93	11.46	7.59	10.21	12.99	17.40	24.61	37.69	81.07
	1:18:26	4.41	10.23	6.79	9.12	11.59	15.50	21.87	33.29	69.69
	1:21:50	4.05	9.35	6.22	8.34	10.59	14.15	19.93	30.13	61.81
	1:25:15	3.00	7.06	4.64	6.27	8.03	10.85	15.52	24.00	51.00
	1:28:40	2.18	5.10	3.36	4.53	5.79	7.81	11.18	17.40	38.51
	1:32:04	1.61	3.78	2.48	3.36	4.29	5.80	8.29	12.83	28.04
	1:35:29	1.19	2.81	1.85	2.50	3.19	4.31	6.15	9.55	20.65
	1:38:53	0.87	2.07	1.35	1.83	2.35	3.18	4.56	7.10	15.68
	1:42:18	0.62	1.49	0.97	1.32	1.70	2.30	3.31	5.21	11.79
	1:45:43	0.45	1.08	0.70	0.96	1.23	1.67	2.39	3.78	8.85
	1:49:07	0.31	0.76	0.49	0.67	0.87	1.18	1.71	2.77	6.62
	1:52:32	0.20	0.50	0.32	0.44	0.57	0.78	1.14	1.91	4.98
	1:55:56	0.11	0.29	0.18	0.25	0.33	0.47	0.69	1.22	3.57
	1:59:21	0.05	0.14	0.08	0.12	0.16	0.23	0.35	0.68	2.40
	2:02:46	0.01	0.04	0.02	0.04	0.05	0.07	0.12	0.29	1.45
	2:06:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.74
	2:09:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
	2:12:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	2:16:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:19:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:23:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:26:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:30:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:33:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:36:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:43:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:47:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:53:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:57:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:04:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:07:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:14:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:17:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:21:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:24:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:28:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:31:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:34:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:38:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:41:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:48:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:51:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:02:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: Meridian Road - Falcon MDDP

Basin ID: BG Filing No. 1 - Ex. Pond 1 - Current Conditions



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	22.80	acres
Watershed Length =	1,100	ft
Watershed Length to Centroid =	420	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	53.00%	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) =	0.408	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.416	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.022	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.354	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.619	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.020	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.412	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.906	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	4.962	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.913	acre-feet		
Approximate 5-yr Detention Volume =	1.200	acre-feet		
Approximate 10-yr Detention Volume =	1.461	acre-feet		
Approximate 25-yr Detention Volume =	1.780	acre-feet		
Approximate 50-yr Detention Volume =	1.981	acre-feet		
Approximate 100-yr Detention Volume =	2.217	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.408	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.008	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.801	acre-feet
Total Detention Basin Volume =	2.217	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_{LW}) =	user	

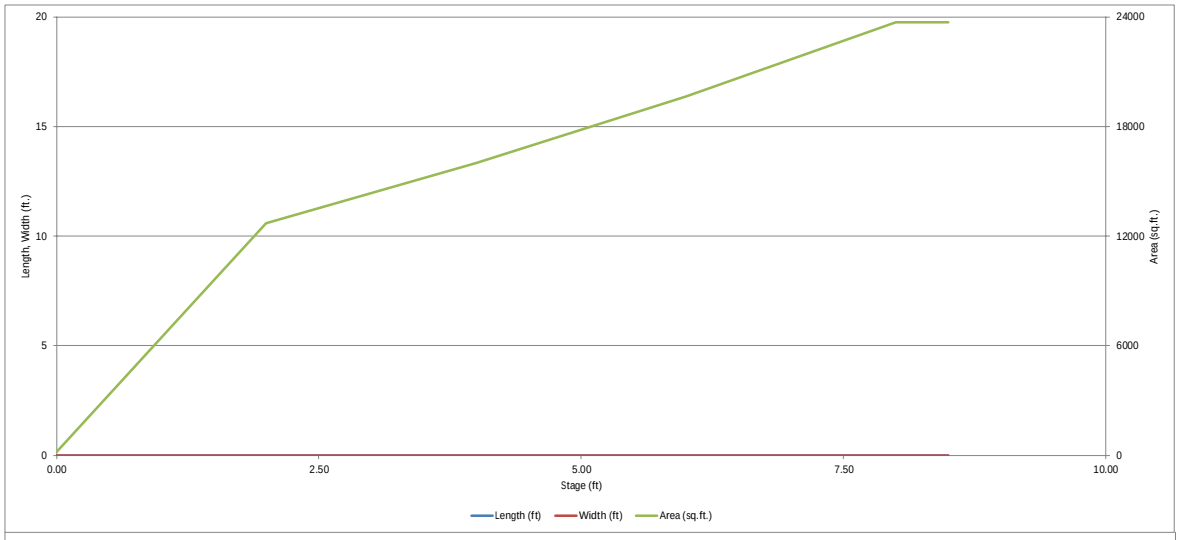
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

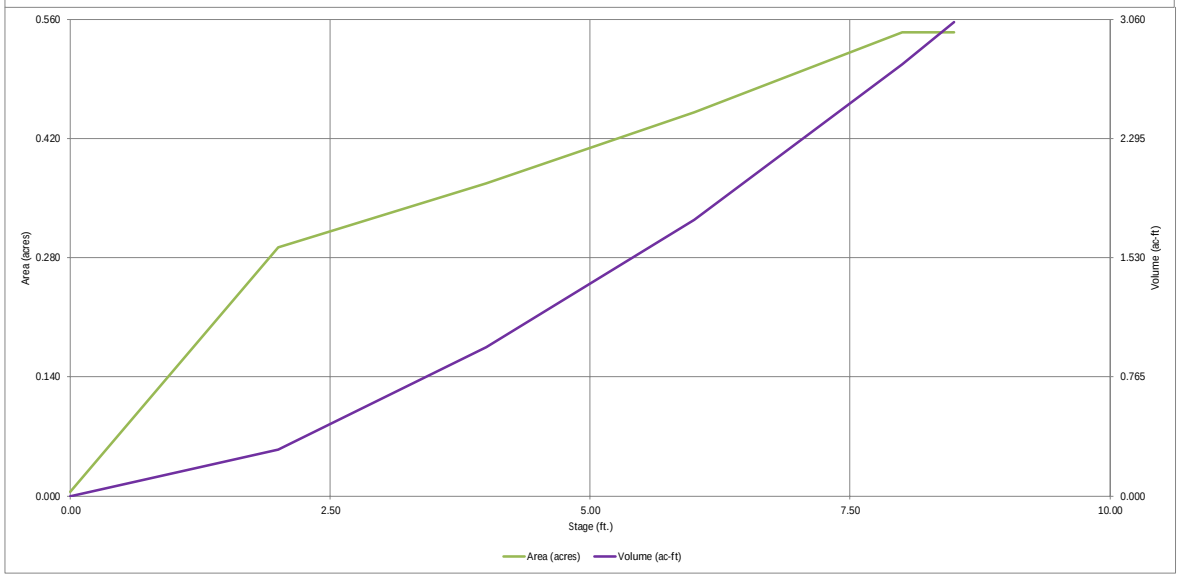
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	218	0.005		
6934	--	2.00	--	--	--	12,719	0.292	12,937	0.297
6936	--	4.00	--	--	--	15,986	0.367	41,642	0.956
6938	--	6.00	--	--	--	19,645	0.451	77,273	1.774
6940	--	8.00	--	--	--	23,740	0.545	120,658	2.770
6940.5	--	8.50	--	--	--	23,740	0.545	132,528	3.042

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)



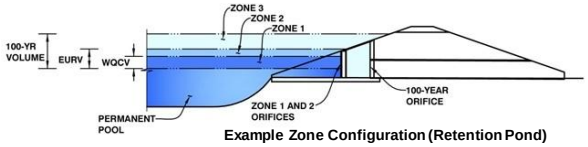


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: Meridian Road - Falcon MDDP

Basin ID: BG Filing No. 1 - Ex. Pond 1 - Current Conditions



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.38	0.408	Orifice Plate
Zone 2 (EURV)	5.18	1.008	Not Utilized
Zone 3 (100-year)	6.94	0.801	Weir&Pipe (Restrict)
Total (all zones)		2.217	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	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 =	1.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.875E-03	ft^2
Depth at top of Zone using Orifice Plate =	4.90	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 =	0.99	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)	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33
Orifice Area (sq. inches)	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99

	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)	3.67	4.00	4.33	4.67				
Orifice Area (sq. inches)	0.99	0.99	0.99	0.99				

User Input: Vertical Orifice (Circular or Rectangular)

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

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)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.00	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	2.55	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	2.27	N/A	
Horiz. Length of Weir Sides =	2.55	N/A	feet	Overflow Grate Open Area w/o Debris =	7.14	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	3.57	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.14	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	1.00	N/A	feet
Restrictor Plate Height Above Pipe Invert =	24.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.61	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.54	feet
Spillway Crest Length =	24.00	feet	Stage at Top of Freeboard =	8.50	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	0.54	acres
Freeboard above Max Water Surface =	0.35	feet	Basin Volume at Top of Freeboard =	3.04	acre-ft

Calculated Parameters for Spillway

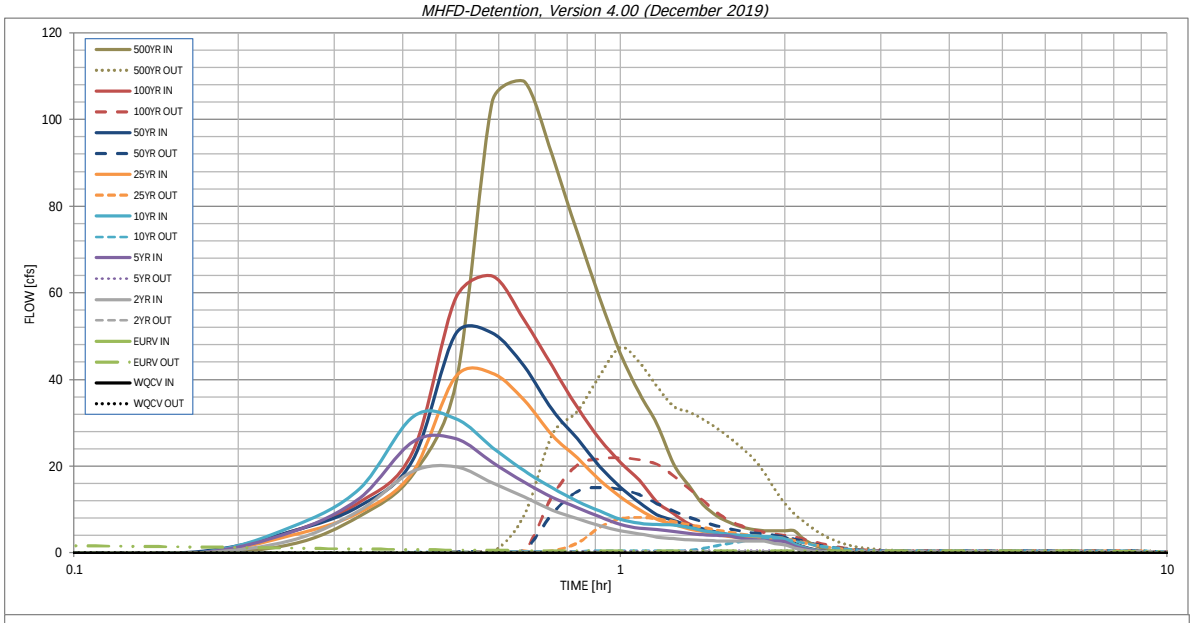
Routed Hydrograph Results

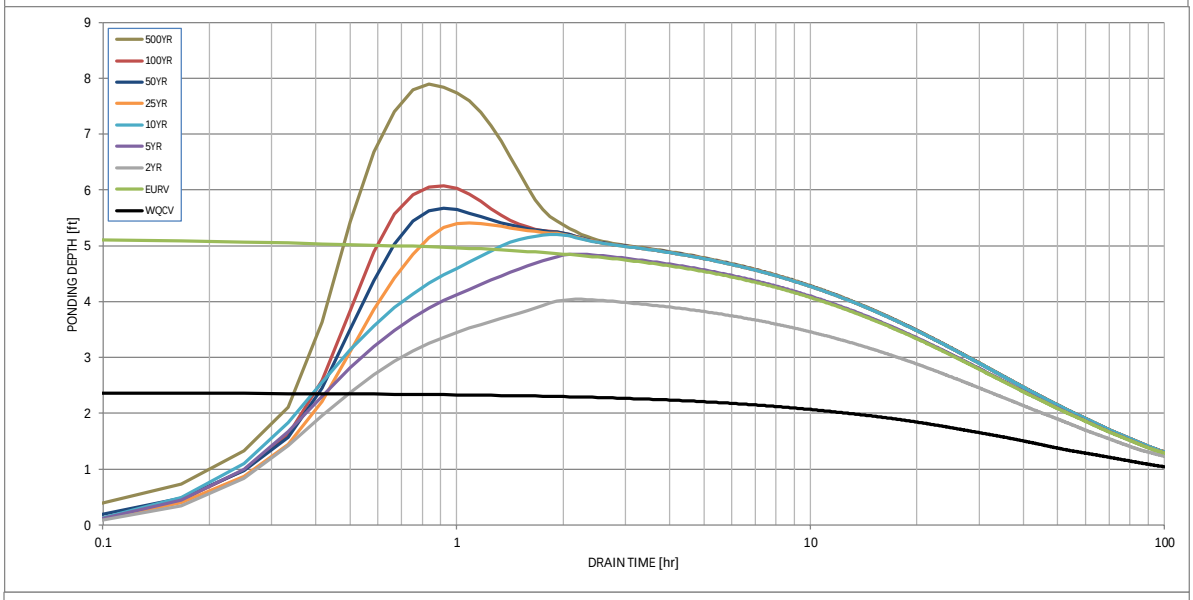
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

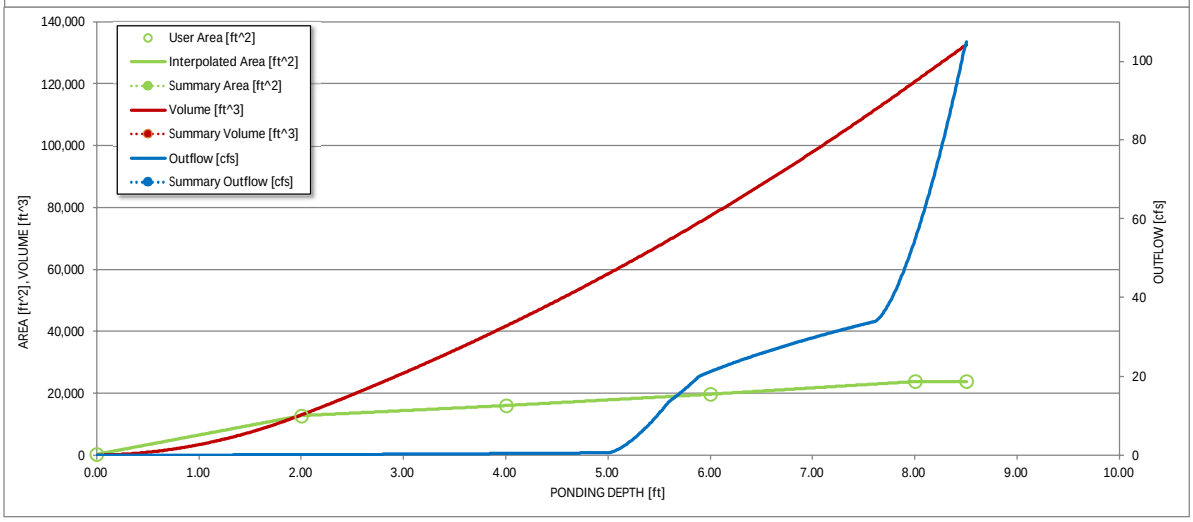
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.408	1.416	1.022	1.354	1.619	2.020	2.412	2.906	4.962
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.022	1.354	1.619	2.020	2.412	2.906	4.962
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.5	0.7	6.2	12.0	19.6	49.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.27	0.53	0.86	2.16
Peak Inflow Q (cfs) =	N/A	N/A	19.9	26.3	31.5	41.5	50.8	63.9	108.8
Peak Outflow Q (cfs) =	0.1	2.3	0.4	0.5	3.3	8.3	15.1	22.0	47.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	4.7	1.3	1.3	1.1	1.0
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.30	N/A	N/A	0.4	1.1	2.0	3.0	4.9
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) =	>120	>120	>120	>120	>120	>120	>120	>120	91
Time to Drain 99% of Inflow Volume (hours) =	>120	>120	>120	>120	>120	>120	>120	>120	>120
Maximum Ponding Depth (ft) =	2.38	5.18	4.05	4.86	5.21	5.42	5.68	6.08	7.90
Area at Maximum Ponding Depth (acres) =	0.31	0.42	0.37	0.40	0.42	0.43	0.44	0.45	0.54
Maximum Volume Stored (acre-ft) =	0.411	1.418	0.971	1.283	1.431	1.515	1.627	1.810	2.716

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.

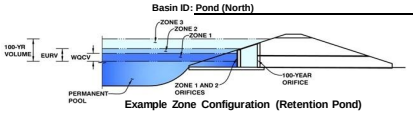
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.03	2.01
	0:15:00	0.00	0.00	2.97	4.82	5.99	4.04	4.97	4.93	8.52
	0:20:00	0.00	0.00	9.87	12.72	14.91	9.36	10.83	11.73	18.07
	0:25:00	0.00	0.00	18.88	25.69	31.49	18.74	21.53	23.45	39.16
	0:30:00	0.00	0.00	19.88	26.34	31.01	40.79	50.66	58.91	104.32
	0:35:00	0.00	0.00	16.15	20.89	24.38	41.50	50.76	63.94	108.83
	0:40:00	0.00	0.00	13.00	16.36	18.97	35.23	43.14	53.76	91.65
	0:45:00	0.00	0.00	9.93	12.85	15.04	27.21	33.00	43.05	73.95
	0:50:00	0.00	0.00	7.89	10.53	12.00	21.98	26.42	33.66	58.81
	0:55:00	0.00	0.00	6.33	8.35	9.65	16.77	19.95	26.28	46.09
	1:00:00	0.00	0.00	5.14	6.67	7.82	12.96	15.22	20.93	36.87
	1:05:00	0.00	0.00	4.47	5.74	6.88	10.05	11.65	16.76	29.82
	1:10:00	0.00	0.00	3.72	5.39	6.58	7.77	8.90	11.78	20.61
	1:15:00	0.00	0.00	3.31	4.96	6.49	6.67	7.58	9.13	15.61
	1:20:00	0.00	0.00	3.07	4.51	5.94	5.61	6.33	6.78	11.20
	1:25:00	0.00	0.00	2.93	4.22	5.15	4.97	5.60	5.39	8.60
	1:30:00	0.00	0.00	2.84	4.04	4.64	4.27	4.81	4.55	7.03
	1:35:00	0.00	0.00	2.78	3.94	4.31	3.83	4.31	4.00	6.00
	1:40:00	0.00	0.00	2.75	3.43	4.10	3.55	3.99	3.68	5.40
	1:45:00	0.00	0.00	2.74	3.10	3.96	3.39	3.81	3.54	5.18
	1:50:00	0.00	0.00	2.74	2.89	3.87	3.30	3.70	3.49	5.09
	1:55:00	0.00	0.00	2.24	2.76	3.69	3.25	3.65	3.48	5.07
	2:00:00	0.00	0.00	1.92	2.56	3.29	3.22	3.63	3.48	5.07
	2:05:00	0.00	0.00	1.21	1.61	2.08	2.04	2.29	2.20	3.19
	2:10:00	0.00	0.00	0.74	0.99	1.29	1.27	1.43	1.36	1.97
	2:15:00	0.00	0.00	0.44	0.59	0.77	0.77	0.86	0.82	1.17
	2:20:00	0.00	0.00	0.24	0.35	0.44	0.44	0.50	0.47	0.67
	2:25:00	0.00	0.00	0.12	0.19	0.23	0.24	0.27	0.25	0.35
	2:30:00	0.00	0.00	0.05	0.08	0.09	0.10	0.11	0.10	0.14
	2:35:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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 STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Bent Grass Residential Filing No. 2

Basin ID: Pond (North)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	19.12	acres	
Watershed Length =	1,700	ft	
Watershed Slope =	0.020	ft/ft	
Watershed Imperviousness =	47.90%	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	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	0.320	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	1.043	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	0.711	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.936	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.154	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.445	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.817	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.259	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	3.846	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.670	acre-feet	
Approximate 5-yr Detention Volume =	0.883	acre-feet	
Approximate 10-yr Detention Volume =	1.079	acre-feet	
Approximate 25-yr Detention Volume =	1.324	acre-feet	
Approximate 50-yr Detention Volume =	1.481	acre-feet	
Approximate 100-yr Detention Volume =	1.678	acre-feet	

Stage-Storage Calculation

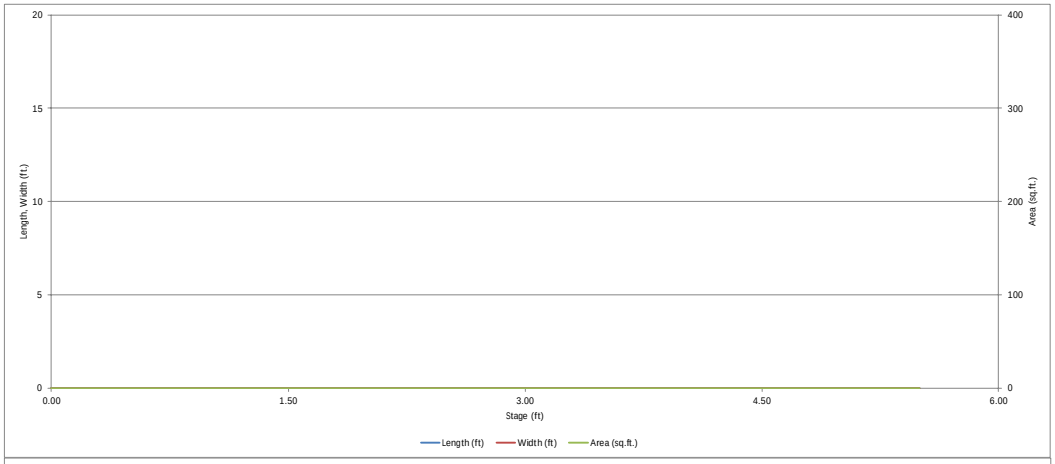
Zone 1 Volume (WQCV) =	0.320	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	Total detention volume is less than 100-year volume.
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	0.320	acre-feet	
Initial Surcharge Volume (ISV) =	user	ft^3	
Initial Surcharge Depth (ISD) =	user	ft	
Total Available Detention Depth (H_{total}) =	user	ft	
Depth of Trickle Channel (H_{TC}) =	user	ft	
Slope of Trickle Channel (S_{TC}) =	user	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	user	H:V	
Basin Length-to-Width Ratio ($R_{L/W}$) =	user		
Initial Surcharge Area (A_{ISV}) =	user	ft^2	
Surcharge Volume Length (L_{ISV}) =	user	ft	
Surcharge Volume Width (W_{ISV}) =	user	ft	
Depth of Basin Floor (H_{FLOOR}) =	user	ft	
Length of Basin Floor (L_{FLOOR}) =	user	ft	
Width of Basin Floor (W_{FLOOR}) =	user	ft	
Area of Basin Floor (A_{FLOOR}) =	user	ft^2	
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3	
Depth of Main Basin (H_{MAIN}) =	user	ft	
Length of Main Basin (L_{MAIN}) =	user	ft	
Width of Main Basin (W_{MAIN}) =	user	ft	
Area of Main Basin (A_{MAIN}) =	user	ft^2	
Volume of Main Basin (V_{MAIN}) =	user	ft^3	
Calculated Total Basin Volume (V_{total}) =	user	acre-feet	

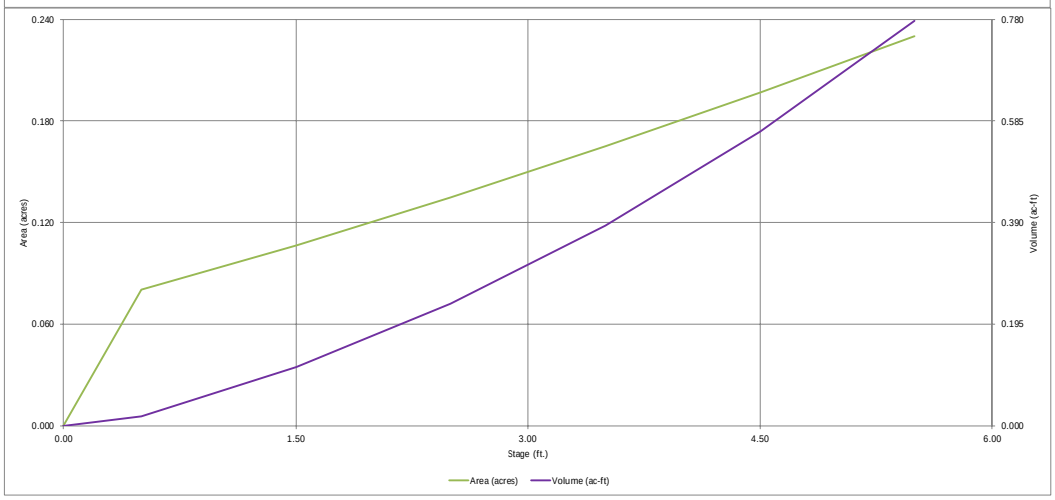
Depth Increment = User ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
6939.25	--	0.50	--	--	--	3,500	0.080	840	0.019
6940.25	--	1.50	--	--	--	4,637	0.106	4,897	0.112
6941.25	--	2.50	--	--	--	5,865	0.135	10,194	0.234
6942.25	--	3.50	--	--	--	7,177	0.165	16,715	0.384
6943.25	--	4.50	--	--	--	8,559	0.196	24,583	0.564
6944.25	--	5.50	--	--	--	10,013	0.230	33,869	0.778

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



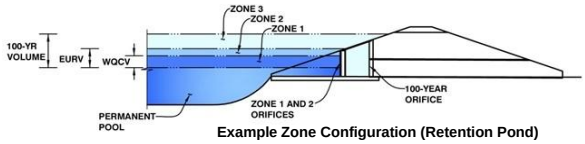


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Bent Grass Residential Filing No. 2

Basin ID: Pond (North)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.10	0.320	Orifice Plate
Zone 2			
Zone 3			
		0.320	Total

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

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

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.153E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.10	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 =	1.66	sq. inches (diameter = 1-7/16 inches)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	1.66	1.66	1.66					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =			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				

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

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Over Flow Weir Slope Length =			feet
Overflow Weir Slope =			H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =			should be ≥ 4
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft^2
Overflow Grate Open Area % =			%, grate open area/total area	Overflow Grate Open Area w/ Debris =			ft^2
Debris Clogging % =			%				

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

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

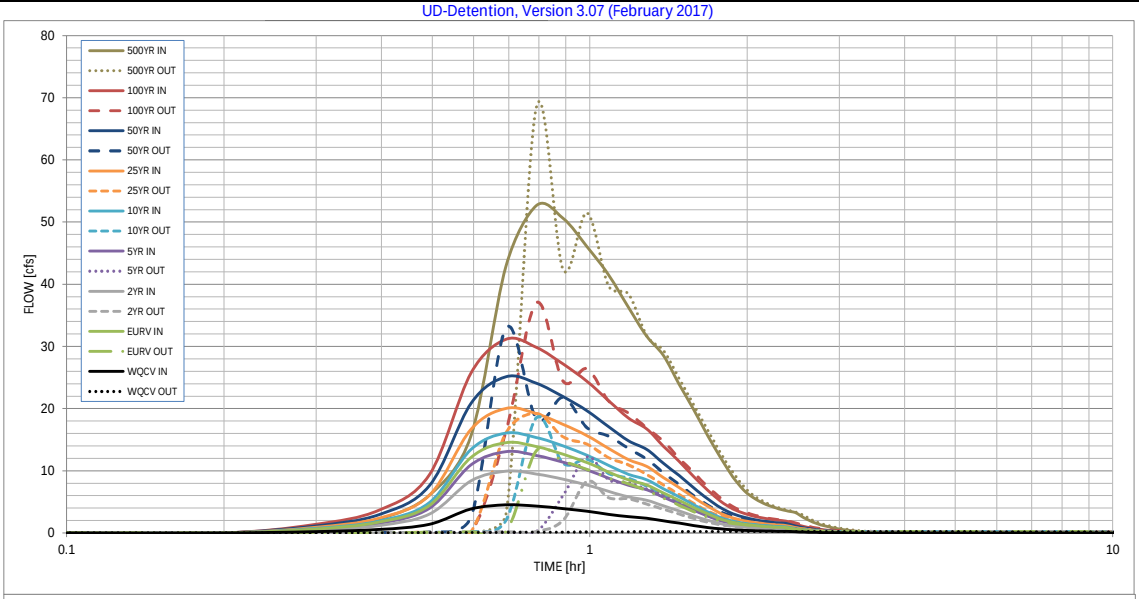
			Calculated Parameters for Spillway		
Spillway Invert Stage=	3.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.39	feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	4.64	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.20	acres
Freeboard above Max Water Surface =	1.00	feet			

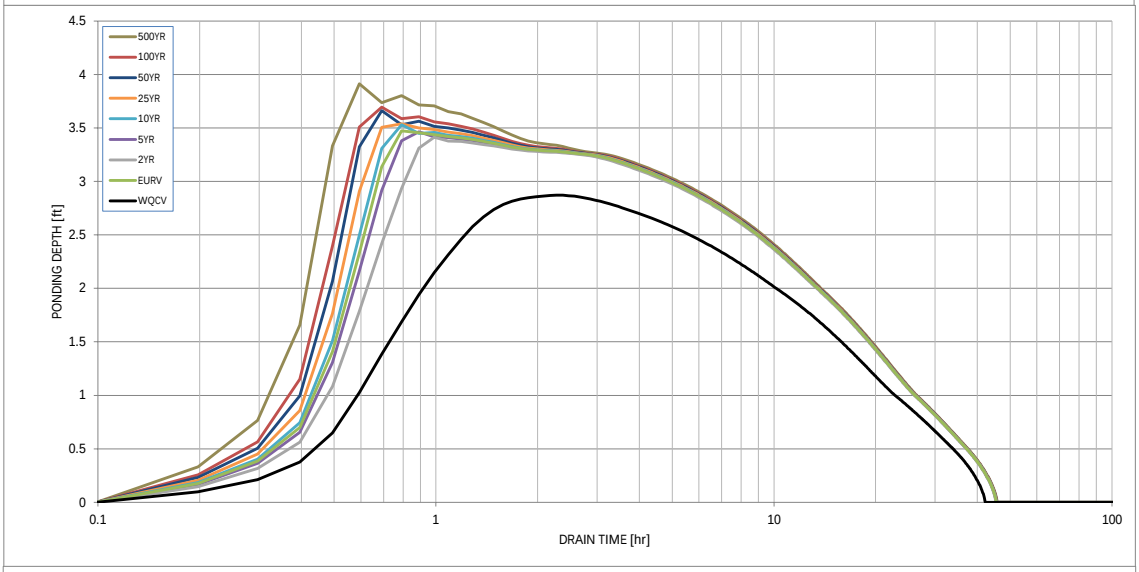
Routed Hydrograph Results

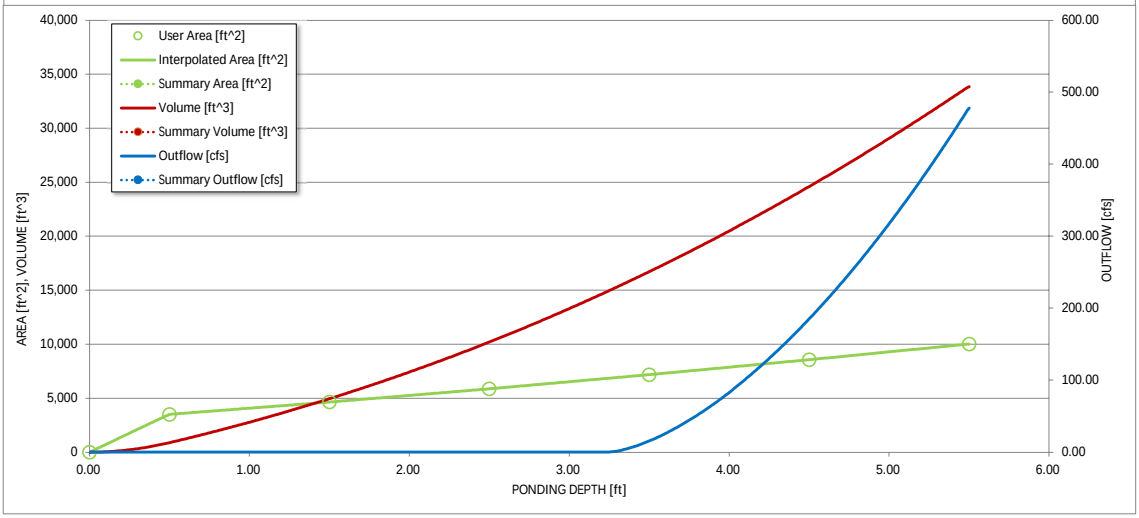
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.68
Calculated Runoff Volume (acre-ft) =	0.320	1.043	0.711	0.936	1.154	1.445	1.817	2.259	3.846
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.320	1.043	0.710	0.936	1.154	1.445	1.817	2.259	3.847
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.00	0.01	0.02	0.15	0.38	1.02
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.2	0.4	3.0	7.2	19.5
Peak Inflow Q (cfs) =	4.5	14.5	9.9	13.0	16.1	20.0	25.1	31.1	52.6
Peak Outflow Q (cfs) =	0.2	13.2	8.3	12.2	18.5	19.2	32.9	37.0	68.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	159.6	104.1	48.2	11.1	5.1	3.5
Structure Controlling Flow =	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	34	37	35	33	31	28	26	19
Time to Drain 99% of Inflow Volume (hours) =	40	40	42	41	40	39	38	37	32
Maximum Ponding Depth (ft) =	2.87	3.47	3.41	3.46	3.53	3.54	3.66	3.69	3.91
Area at Maximum Ponding Depth (acres) =	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.18
Maximum Volume Stored (acre-ft) =	0.286	0.379	0.369	0.377	0.389	0.389	0.410	0.416	0.454

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

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

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.93 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:11:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:17:47	0.20	0.64	0.44	0.57	0.70	0.87	1.08	1.33	2.20
0.843	0:23:43	0.54	1.72	1.18	1.55	1.90	2.37	2.96	3.65	6.09
	0:29:39	1.40	4.43	3.04	3.98	4.88	6.08	7.59	9.37	15.63
	0:35:35	3.84	12.16	8.36	10.93	13.41	16.68	20.84	25.73	42.87
	0:41:31	4.51	14.53	9.94	13.05	16.05	20.04	25.13	31.15	52.63
	0:47:26	4.30	13.89	9.49	12.46	15.35	19.17	24.06	29.84	50.59
	0:53:22	3.91	12.64	8.64	11.35	13.97	17.45	21.90	27.16	46.05
	0:59:18	3.48	11.32	7.72	10.15	12.51	15.65	19.65	24.40	41.48
	1:05:14	2.99	9.80	6.67	8.79	10.84	13.57	17.07	21.24	36.27
	1:11:10	2.61	8.53	5.81	7.65	9.43	11.80	14.83	18.47	31.65
	1:17:05	2.36	7.73	5.26	6.93	8.55	10.70	13.45	16.74	28.58
	1:23:01	1.94	6.41	4.35	5.74	7.10	8.90	11.21	13.96	23.94
	1:28:57	1.57	5.26	3.55	4.70	5.82	7.32	9.24	11.53	19.83
	1:34:53	1.20	4.08	2.74	3.64	4.53	5.71	7.23	9.05	15.69
	1:40:49	0.88	3.06	2.04	2.73	3.41	4.32	5.50	6.92	12.11
	1:46:44	0.64	2.22	1.48	1.97	2.48	3.16	4.04	5.10	9.03
	1:52:40	0.50	1.71	1.14	1.52	1.90	2.41	3.07	3.86	6.78
	1:58:36	0.41	1.40	0.94	1.25	1.56	1.97	2.50	3.14	5.46
	2:04:32	0.35	1.19	0.80	1.06	1.32	1.67	2.11	2.65	4.60
	2:10:28	0.31	1.04	0.70	0.93	1.16	1.46	1.85	2.31	4.00
	2:16:23	0.28	0.94	0.63	0.84	1.04	1.31	1.66	2.07	3.58
	2:22:19	0.26	0.86	0.58	0.77	0.96	1.20	1.52	1.90	3.28
	2:28:15	0.19	0.63	0.43	0.56	0.70	0.89	1.12	1.41	2.44
	2:34:11	0.14	0.46	0.31	0.41	0.51	0.65	0.82	1.02	1.77
	2:40:07	0.10	0.34	0.23	0.30	0.38	0.48	0.60	0.75	1.31
	2:46:02	0.07	0.25	0.17	0.22	0.28	0.35	0.45	0.56	0.97
	2:51:58	0.05	0.18	0.12	0.16	0.20	0.25	0.32	0.41	0.71
	2:57:54	0.04	0.13	0.09	0.11	0.14	0.18	0.23	0.29	0.51
	3:03:50	0.03	0.09	0.06	0.08	0.10	0.13	0.17	0.21	0.37
	3:09:46	0.02	0.06	0.04	0.05	0.07	0.09	0.11	0.14	0.26
	3:15:41	0.01	0.04	0.02	0.03	0.04	0.05	0.07	0.09	0.17
	3:21:37	0.00	0.02	0.01	0.02	0.02	0.03	0.04	0.05	0.09
	3:27:33	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.04
	3:33:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:39:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:51:16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:03:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:09:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:14:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:26:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:38:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:44:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:56:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:02:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:08:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:14:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:32:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:38:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:43:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:49:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:01:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:07:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:13:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:19:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:25:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:31:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:37:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:43:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:49:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:55:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:01:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:06:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

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'.

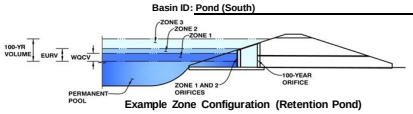
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Bent Grass Residential Filing No. 2

Basin ID: Pond (South)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	29.90	acres	
Watershed Length =	1,800	ft	
Watershed Slope =	0.020	ft/ft	
Watershed Imperviousness =	53.20%	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	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	0.536	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	1.866	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	1.276	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.674	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.056	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	2.545	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.141	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.840	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	6.387	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	1.203	acre-feet	
Approximate 5-yr Detention Volume =	1.582	acre-feet	
Approximate 10-yr Detention Volume =	1.924	acre-feet	
Approximate 25-yr Detention Volume =	2.345	acre-feet	
Approximate 50-yr Detention Volume =	2.609	acre-feet	
Approximate 100-yr Detention Volume =	2.919	acre-feet	

Stage-Storage Calculation

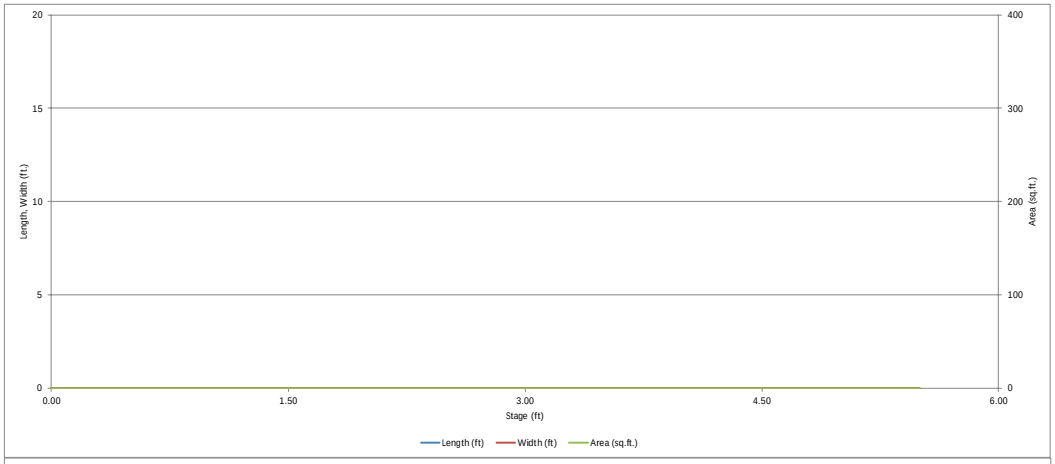
Zone 1 Volume (WQCV) =	0.536	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	Total detention volume is less than 100-year volume.
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	0.536	acre-feet	
Initial Surcharge Volume (ISV) =	user	ft^3	
Initial Surcharge Depth (ISD) =	user	ft	
Total Available Detention Depth (H_{total}) =	user	ft	
Depth of Trickle Channel (H_{TC}) =	user	ft	
Slope of Trickle Channel (S_{TC}) =	user	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	user	H:V	
Basin Length-to-Width Ratio ($R_{L/W}$) =	user		
Initial Surcharge Area (A_{ISV}) =	user	ft^2	
Surcharge Volume Length (L_{ISV}) =	user	ft	
Surcharge Volume Width (W_{ISV}) =	user	ft	
Depth of Basin Floor (H_{FLOOR}) =	user	ft	
Length of Basin Floor (L_{FLOOR}) =	user	ft	
Width of Basin Floor (W_{FLOOR}) =	user	ft	
Area of Basin Floor (A_{FLOOR}) =	user	ft^2	
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3	
Depth of Main Basin (H_{MAIN}) =	user	ft	
Length of Main Basin (L_{MAIN}) =	user	ft	
Width of Main Basin (W_{MAIN}) =	user	ft	
Area of Main Basin (A_{MAIN}) =	user	ft^2	
Volume of Main Basin (V_{MAIN}) =	user	ft^3	
Calculated Total Basin Volume (V_{total}) =	user	acre-feet	

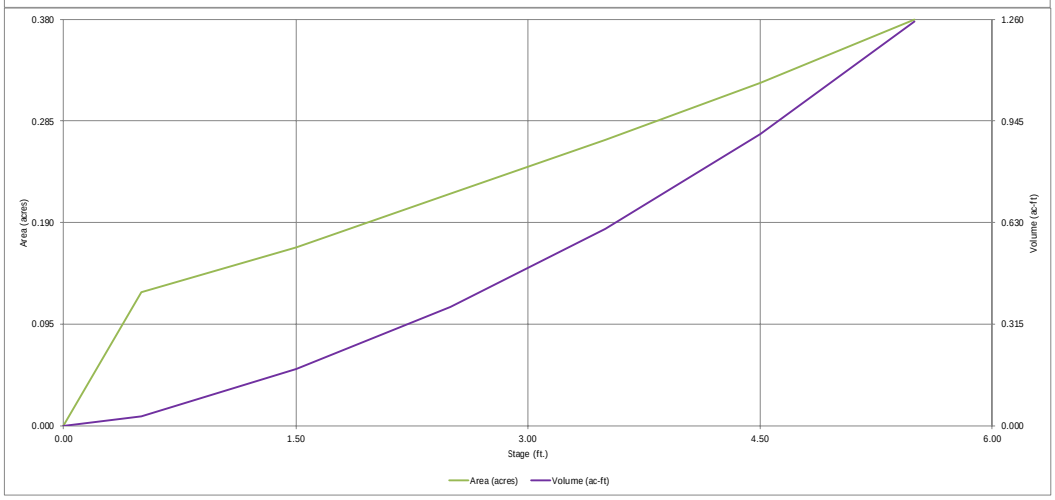
Depth Increment = User ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
6924	--	0.50	--	--	--	5,438	0.125	1,305	0.030
6925	--	1.50	--	--	--	7,249	0.166	7,630	0.175
6926	--	2.50	--	--	--	9,448	0.217	16,051	0.368
6927	--	3.50	--	--	--	11,635	0.267	26,593	0.610
6928	--	4.50	--	--	--	13,951	0.320	39,386	0.904
6929	--	5.50	--	--	--	16,542	0.380	54,632	1.254

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



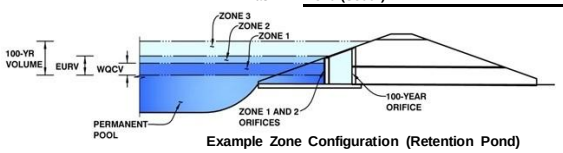


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Bent Grass Residential Filing No. 2

Basin ID: Pond (South)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.22	0.536	Orifice Plate
Zone 2			Not Utilized
Zone 3			Not Utilized
		0.536	Total

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

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

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.910E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.30	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.75	sq. inches (diameter = 1-7/8 inches)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.20					
Orifice Area (sq. inches)	2.75	2.75	2.75					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

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

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	N/A	N/A	feet
Overflow Weir Front Edge Length =	N/A	N/A	feet	Over Flow Weir Slope Length =	N/A	N/A	feet
Overflow Weir Slope =	N/A	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	N/A	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	N/A	N/A	feet	Overflow Grate Open Area w/o Debris =	N/A	N/A	ft^2
Overflow Grate Open Area % =	N/A	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	N/A	N/A	ft^2
Debris Clogging % =	N/A	N/A	%				

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

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

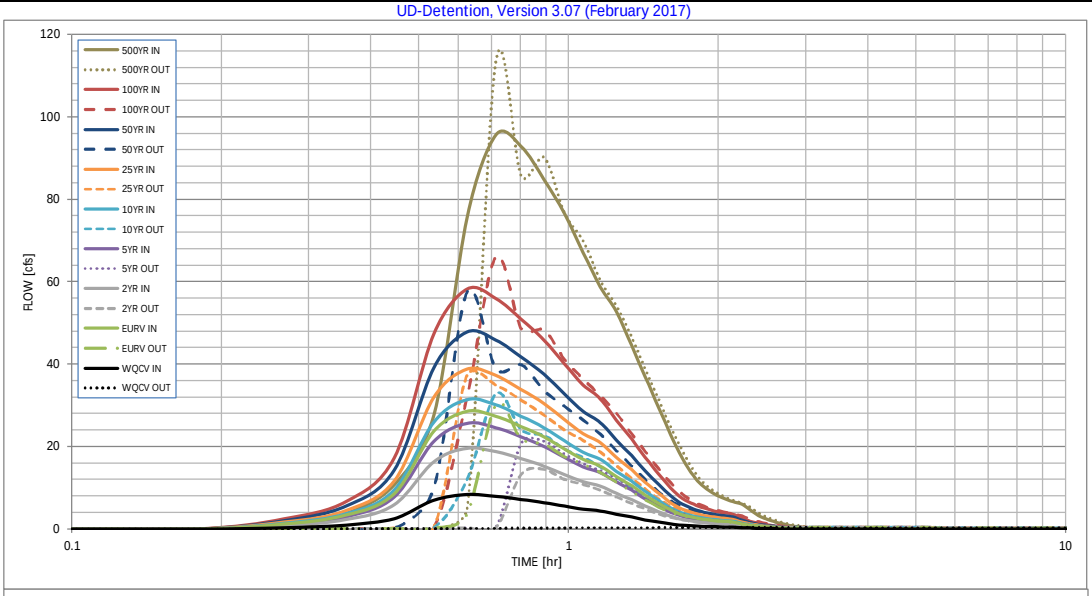
			Calculated Parameters for Spillway		
Spillway Invert Stage=	3.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.52	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	4.77	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.34	acres
Freeboard above Max Water Surface =	1.00	feet			

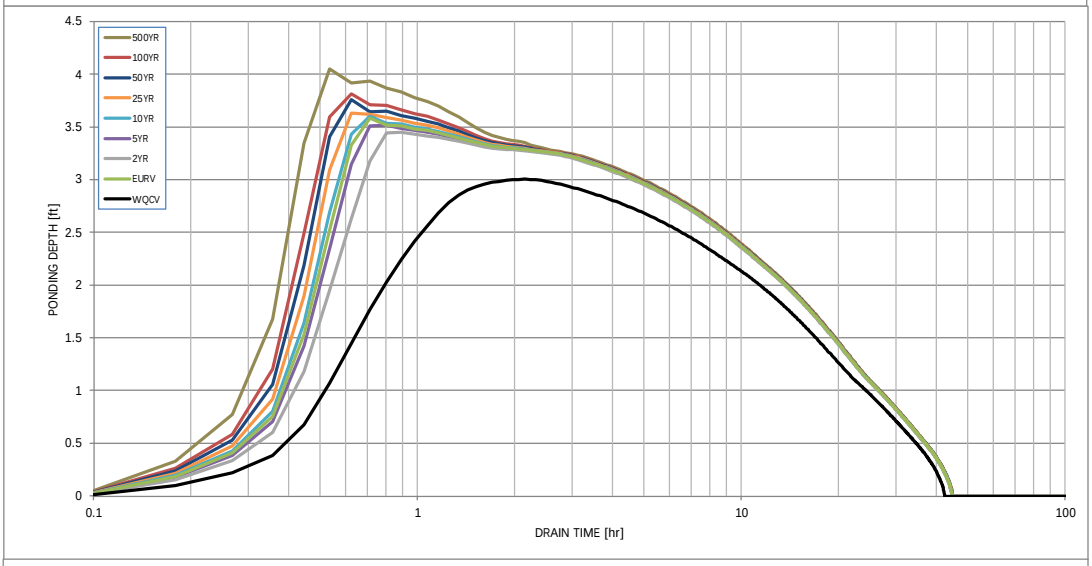
Routed Hydrograph Results

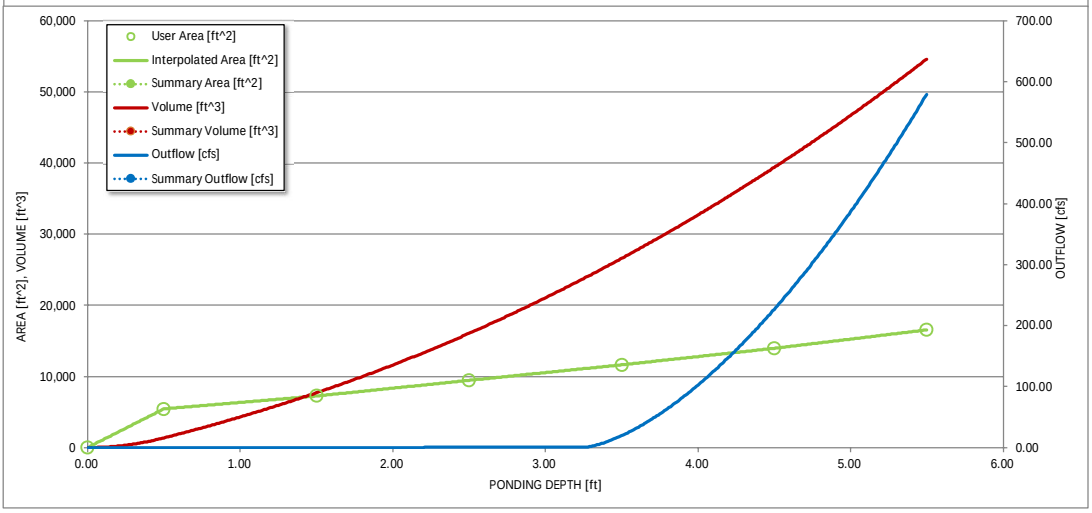
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.68
Calculated Runoff Volume (acre-ft) =	0.536	1.866	1.276	1.674	2.056	2.545	3.141	3.840	6.387
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.536	1.866	1.275	1.674	2.055	2.544	3.141	3.840	6.382
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.00	0.01	0.02	0.18	0.43	1.16
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.3	0.7	5.4	13.0	34.7
Peak Inflow Q (cfs) =	8.3	28.6	19.6	25.7	31.5	38.8	47.8	58.2	95.7
Peak Outflow Q (cfs) =	0.4	30.1	14.5	21.3	32.8	37.3	57.5	66.0	113.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	153.5	101.7	51.7	10.7	5.1	3.3
Structure Controlling Flow =	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	33	36	34	32	30	27	25	19
Time to Drain 99% of Inflow Volume (hours) =	40	40	41	40	39	38	37	36	32
Maximum Ponding Depth (ft) =	3.01	3.58	3.45	3.52	3.60	3.64	3.76	3.81	4.05
Area at Maximum Ponding Depth (acres) =	0.24	0.27	0.26	0.27	0.27	0.27	0.28	0.28	0.30
Maximum Volume Stored (acre-ft) =	0.483	0.632	0.597	0.613	0.637	0.646	0.682	0.696	0.765

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: _____

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

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.35 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:10:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:16:03	0.37	1.23	0.86	1.11	1.35	1.65	2.02	2.43	3.79
0.935	0:21:24	1.00	3.36	2.32	3.03	3.69	4.54	5.56	6.74	10.77
	0:26:45	2.56	8.64	5.96	7.77	9.48	11.66	14.29	17.30	27.66
	0:32:06	7.04	23.71	16.37	21.33	26.03	31.99	39.19	47.44	75.74
	0:37:27	8.33	28.60	19.63	25.69	31.46	38.83	47.79	58.23	95.72
	0:42:48	7.95	27.38	18.77	24.58	30.13	37.22	45.85	55.97	92.86
	0:48:09	7.23	24.92	17.09	22.38	27.42	33.87	41.73	50.95	84.88
	0:53:30	6.45	22.37	15.31	20.08	24.63	30.45	37.55	45.89	76.53
	0:58:51	5.57	19.44	13.28	17.43	21.42	26.53	32.77	40.12	67.15
	1:04:12	4.85	16.88	11.54	15.14	18.61	23.09	28.57	35.01	58.73
	1:09:33	4.39	15.31	10.47	13.74	16.87	20.91	25.83	31.62	52.84
	1:14:54	3.62	12.76	8.69	11.44	14.07	17.46	21.60	26.49	44.52
	1:20:15	2.95	10.52	7.14	9.42	11.61	14.42	17.87	21.94	36.97
	1:25:36	2.27	8.24	5.56	7.37	9.10	11.35	14.10	17.36	29.49
	1:30:57	1.68	6.27	4.20	5.59	6.94	8.69	10.84	13.39	22.91
	1:36:18	1.22	4.61	3.06	4.10	5.11	6.43	8.05	9.99	17.24
	1:41:39	0.95	3.50	2.34	3.12	3.88	4.86	6.07	7.50	12.84
	1:47:00	0.78	2.85	1.92	2.54	3.15	3.94	4.90	6.04	10.25
	1:52:21	0.66	2.41	1.62	2.15	2.66	3.32	4.13	5.08	8.61
	1:57:42	0.58	2.10	1.42	1.88	2.32	2.90	3.60	4.43	7.47
	2:03:03	0.52	1.89	1.28	1.69	2.08	2.60	3.22	3.96	6.67
	2:08:24	0.48	1.73	1.17	1.55	1.91	2.38	2.95	3.63	6.10
	2:13:45	0.35	1.28	0.86	1.14	1.41	1.76	2.19	2.70	4.60
	2:19:06	0.26	0.93	0.63	0.83	1.03	1.28	1.59	1.95	3.32
	2:24:27	0.19	0.69	0.46	0.61	0.76	0.94	1.17	1.44	2.46
	2:29:48	0.14	0.51	0.34	0.45	0.56	0.70	0.87	1.07	1.83
	2:35:09	0.10	0.37	0.25	0.33	0.41	0.51	0.64	0.79	1.35
	2:40:30	0.07	0.26	0.18	0.23	0.29	0.36	0.46	0.56	0.97
	2:45:51	0.05	0.19	0.13	0.17	0.21	0.26	0.33	0.41	0.70
	2:51:12	0.03	0.13	0.09	0.12	0.14	0.18	0.23	0.29	0.50
	2:56:33	0.02	0.08	0.05	0.07	0.09	0.12	0.15	0.18	0.33
	3:01:54	0.01	0.04	0.03	0.04	0.05	0.06	0.08	0.10	0.19
	3:07:15	0.00	0.02	0.01	0.02	0.02	0.03	0.04	0.05	0.09
	3:12:36	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03
	3:17:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:23:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:28:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:34:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:39:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:11:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:16:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:27:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:38:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:43:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:48:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:54:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:59:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:04:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:21:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:31:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:37:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:42:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:47:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:53:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:58:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:03:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:09:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:14:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:19:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:25:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

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).

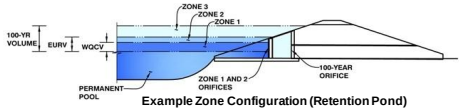
Future Pond Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: Meridian Road - Falcon MDDP

Basin ID: Future Pond for Offsite Flows



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	228.00	acres
Watershed Length =	5,200	ft
Watershed Length to Centroid =	840	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	28.00%	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) =	2.757	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	6.258	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.304	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.972	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.399	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	11.188	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	14.721	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	19.467	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	39.641	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	3.923	acre-feet	
Approximate 5-yr Detention Volume =	5.242	acre-feet	
Approximate 10-yr Detention Volume =	6.574	acre-feet	
Approximate 25-yr Detention Volume =	8.342	acre-feet	
Approximate 50-yr Detention Volume =	9.701	acre-feet	
Approximate 100-yr Detention Volume =	11.977	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.757	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.501	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.720	acre-feet
Total Detention Basin Volume =	11.977	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_{LW}) =	user	

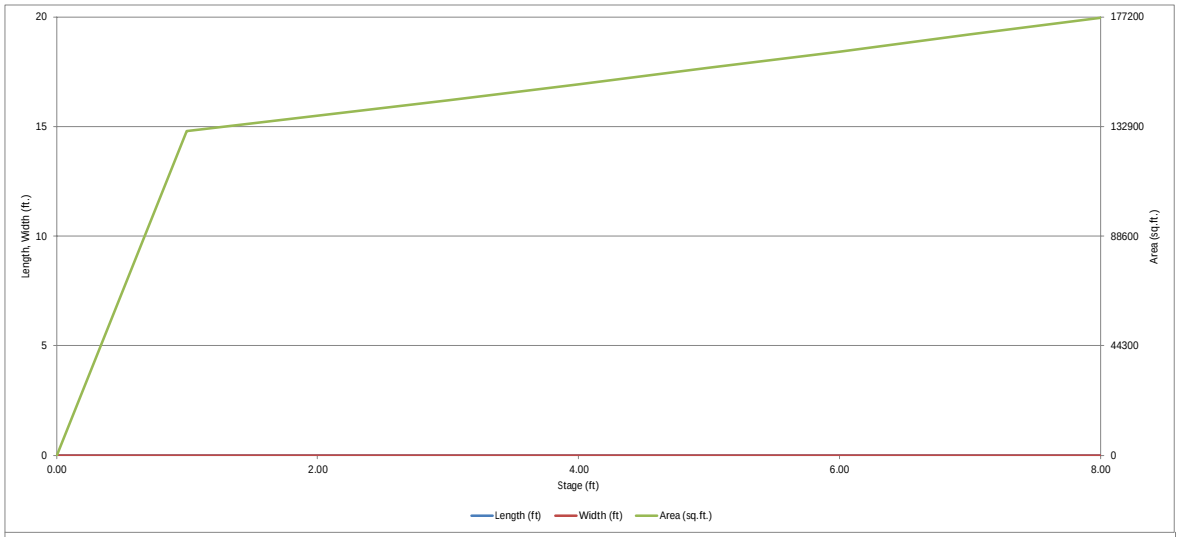
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

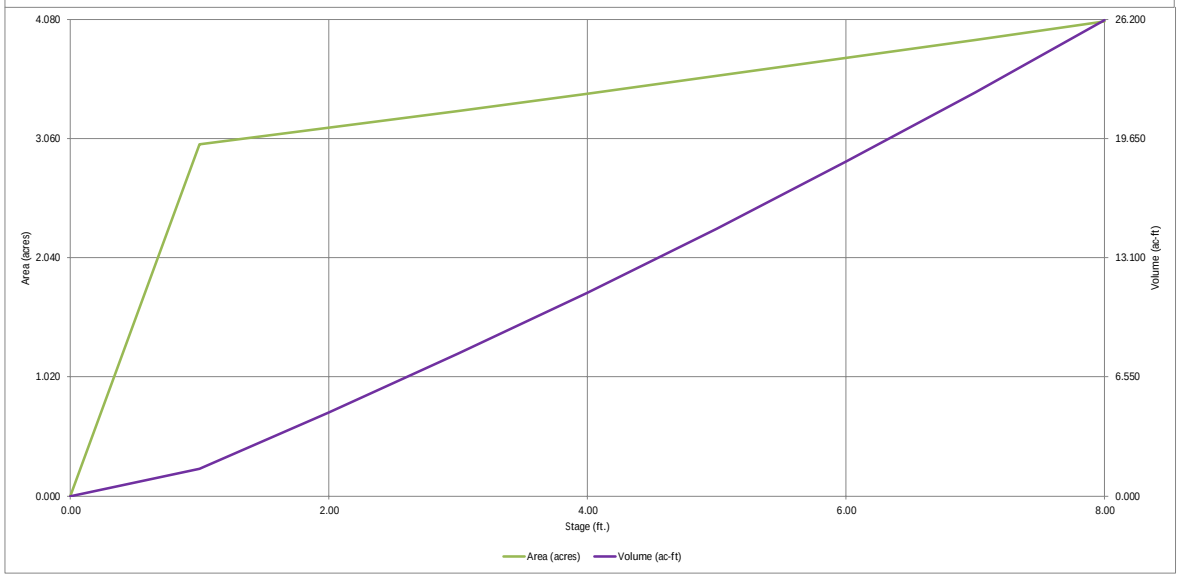
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	131,064	3.009	65,527	1.504
	--	2.00	--	--	--	137,256	3.151	199,687	4.584
	--	3.00	--	--	--	143,576	3.296	340,103	7.808
	--	4.00	--	--	--	150,024	3.444	486,903	11.178
	--	5.00	--	--	--	156,600	3.595	640,215	14.697
	--	6.00	--	--	--	163,304	3.749	800,167	18.369
	--	7.00	--	--	--	170,136	3.906	966,887	22.197
	--	8.00	--	--	--	177,096	4.066	1,140,503	26.182

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)



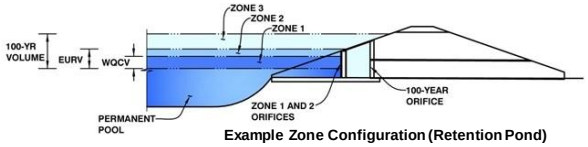


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: Meridian Road - Falcon MDDP

Basin ID: Future Pond for Offsite Flows



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.42	2.757	Orifice Plate
Zone 2 (EURV)	2.53	3.501	Circular Orifice
Zone 3 (100-year)	4.24	5.720	Weir&Pipe (Restrict)
Total (all zones)		11.977	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	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 =	1.111E-01	ft²
Depth at top of Zone using Orifice Plate =	1.42	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	5.70	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	16.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft²

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	0.47	0.95					
Orifice Area (sq. inches)	16.00	16.00	16.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79	N/A	ft²
Depth at top of Zone using Vertical Orifice =	2.53	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50	N/A	feet
Vertical Orifice Diameter =	12.00	N/A	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)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.60	N/A	feet
Overflow Weir Front Edge Length =	2.92	N/A	feet	Overflow Weir Slope Length =	5.82	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	4.71	N/A	
Horiz. Length of Weir Sides =	5.82	N/A	feet	Overflow Grate Open Area w/o Debris =	11.90	N/A	ft²
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.95	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.53	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.83	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.75	feet
Spillway Crest Length =	150.00	feet	Stage at Top of Freeboard =	7.25	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	3.95	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	23.18	acre-ft

Calculated Parameters for Spillway

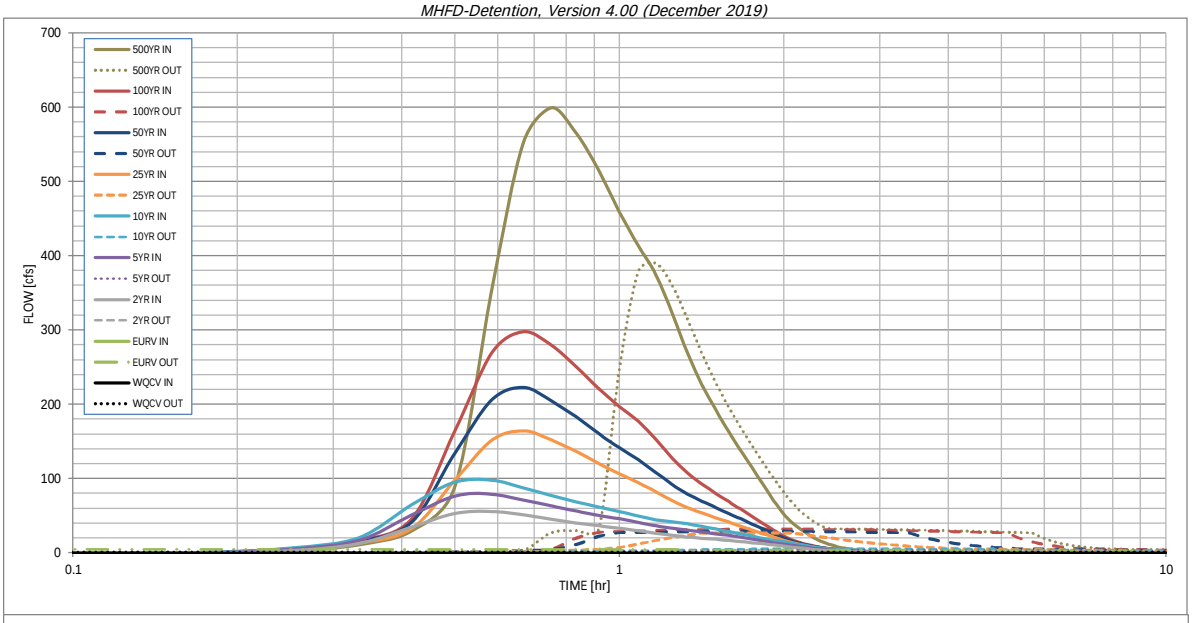
Routed Hydrograph Results

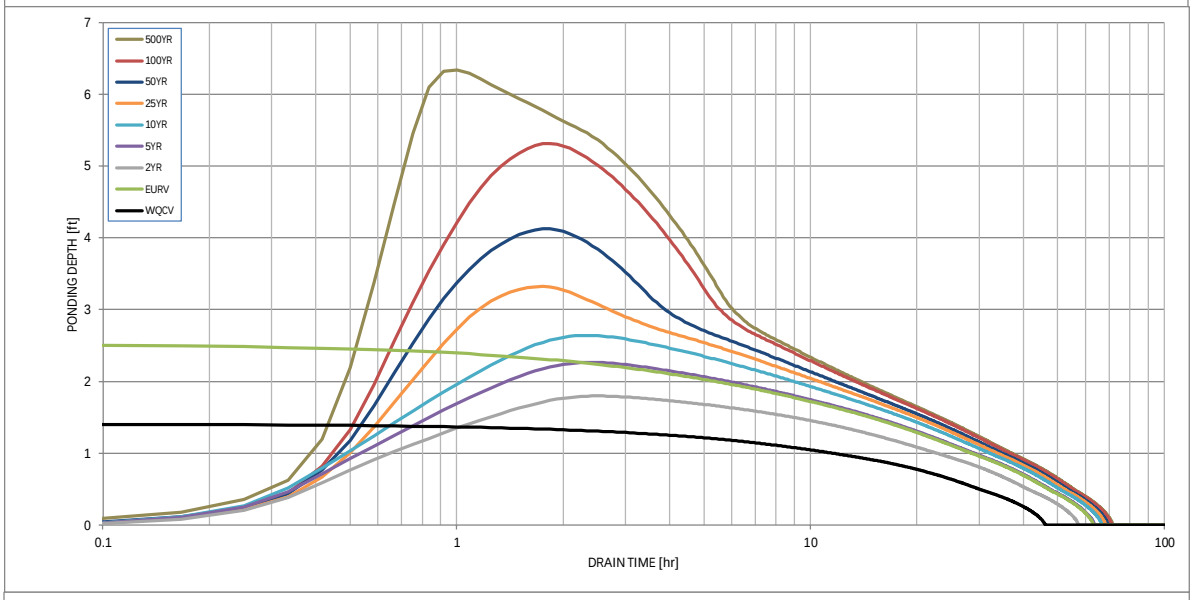
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

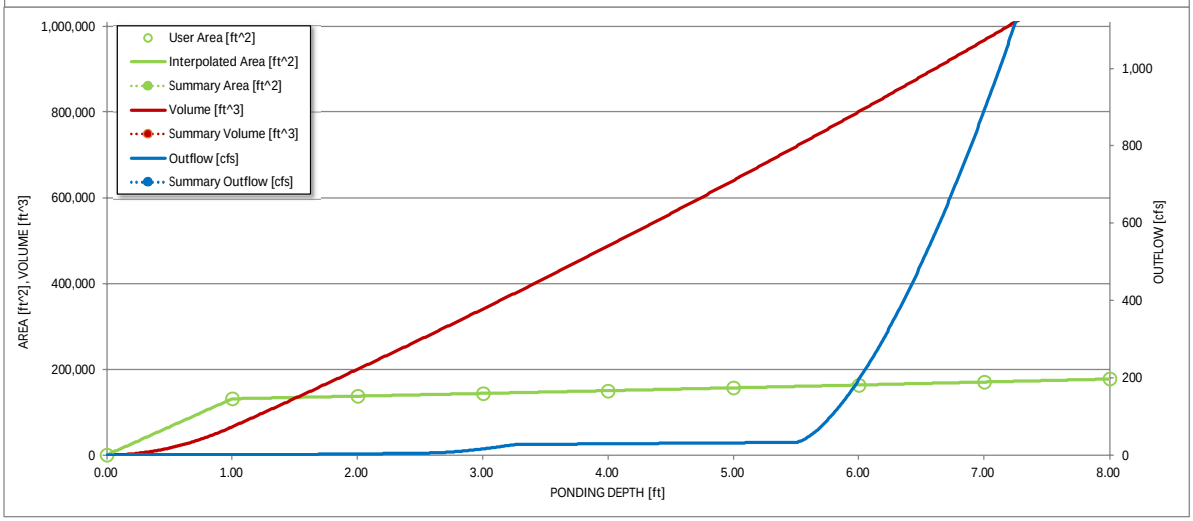
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	2.757	6.258	4.304	5.972	7.399	11.188	14.721	19.467	39.641
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.304	5.972	7.399	11.188	14.721	19.467	39.641
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.0	4.1	5.7	50.3	100.5	165.9	426.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.22	0.44	0.73	1.87
Peak Inflow Q (cfs) =	N/A	N/A	56.1	79.5	98.2	164.6	223.0	297.7	599.5
Peak Outflow Q (cfs) =	1.5	5.0	2.1	3.8	5.8	27.2	29.3	32.2	390.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.0	0.5	0.3	0.2	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	1.7	1.7	1.8	1.9
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) =	41	53	50	54	56	53	52	51	41
Time to Drain 99% of Inflow Volume (hours) =	44	59	54	59	62	62	61	61	55
Maximum Ponding Depth (ft) =	1.42	2.53	1.80	2.27	2.65	3.33	4.13	5.32	6.34
Area at Maximum Ponding Depth (acres) =	3.07	3.23	3.12	3.19	3.24	3.34	3.46	3.64	3.80
Maximum Volume Stored (acre-ft) =	2.781	6.275	3.957	5.408	6.631	8.870	11.592	15.819	19.653

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.

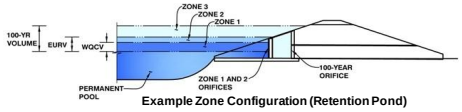
Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.04	2.25
	0:15:00	0.00	0.00	3.17	5.15	6.42	4.34	5.62	5.36	11.14
	0:20:00	0.00	0.00	12.88	17.39	20.72	13.26	15.74	16.61	29.79
	0:25:00	0.00	0.00	34.95	51.45	65.17	33.08	41.62	46.39	89.31
	0:30:00	0.00	0.00	53.08	76.70	95.51	97.89	134.37	164.02	351.30
	0:35:00	0.00	0.00	56.14	79.47	98.20	151.18	205.50	268.52	552.35
	0:40:00	0.00	0.00	51.58	71.43	87.75	164.65	222.97	297.67	599.52
	0:45:00	0.00	0.00	45.77	63.25	77.65	152.11	204.89	279.90	564.97
	0:50:00	0.00	0.00	40.69	56.43	68.70	137.00	183.18	250.90	514.71
	0:55:00	0.00	0.00	36.68	50.93	61.86	120.70	160.48	221.27	459.44
	1:00:00	0.00	0.00	33.30	45.91	55.72	106.65	141.58	197.21	413.39
	1:05:00	0.00	0.00	30.01	41.04	50.02	94.61	125.16	177.21	374.61
	1:10:00	0.00	0.00	26.52	36.61	44.99	82.34	108.34	152.87	322.41
	1:15:00	0.00	0.00	23.62	33.13	41.93	70.31	91.98	127.64	268.42
	1:20:00	0.00	0.00	21.57	30.47	39.15	60.88	79.39	107.61	226.50
	1:25:00	0.00	0.00	19.92	28.10	35.74	53.81	69.75	92.67	192.72
	1:30:00	0.00	0.00	18.38	25.86	32.20	47.56	61.28	80.20	163.60
	1:35:00	0.00	0.00	16.90	23.71	28.89	41.72	53.39	69.20	137.95
	1:40:00	0.00	0.00	15.42	21.13	25.75	36.26	45.98	58.84	114.11
	1:45:00	0.00	0.00	13.95	18.38	22.71	31.02	38.88	48.91	91.63
	1:50:00	0.00	0.00	12.53	15.78	19.87	26.02	32.09	39.49	70.73
	1:55:00	0.00	0.00	10.79	13.54	17.22	21.35	25.73	30.74	52.19
	2:00:00	0.00	0.00	9.28	11.96	15.27	17.23	20.11	22.90	39.34
	2:05:00	0.00	0.00	7.75	10.16	12.97	13.52	15.66	17.11	29.92
	2:10:00	0.00	0.00	6.32	8.30	10.62	10.53	12.12	12.96	22.27
	2:15:00	0.00	0.00	5.11	6.69	8.59	8.25	9.47	9.82	16.38
	2:20:00	0.00	0.00	4.14	5.40	6.96	6.51	7.44	7.52	12.05
	2:25:00	0.00	0.00	3.33	4.35	5.59	5.15	5.86	5.73	8.74
	2:30:00	0.00	0.00	2.66	3.49	4.45	4.07	4.59	4.33	6.29
	2:35:00	0.00	0.00	2.11	2.76	3.49	3.17	3.55	3.27	4.66
	2:40:00	0.00	0.00	1.67	2.15	2.70	2.46	2.75	2.54	3.55
	2:45:00	0.00	0.00	1.32	1.67	2.08	1.90	2.12	1.97	2.74
	2:50:00	0.00	0.00	1.03	1.30	1.63	1.49	1.66	1.57	2.16
	2:55:00	0.00	0.00	0.79	0.99	1.26	1.16	1.28	1.22	1.65
	3:00:00	0.00	0.00	0.58	0.73	0.94	0.87	0.97	0.91	1.21
	3:05:00	0.00	0.00	0.41	0.52	0.67	0.63	0.69	0.65	0.84
	3:10:00	0.00	0.00	0.26	0.35	0.45	0.43	0.47	0.44	0.53
	3:15:00	0.00	0.00	0.15	0.22	0.27	0.26	0.28	0.26	0.29
	3:20:00	0.00	0.00	0.07	0.12	0.14	0.14	0.14	0.13	0.13
	3:25:00	0.00	0.00	0.03	0.05	0.05	0.05	0.05	0.04	0.03
	3:30:00	0.00	0.00	0.01	0.01	0.01	0.01	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Falcon Meadows at Bent Grass

Basin ID: WQCV Pond - North



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	10.87	acres
Watershed Length =	1,275	ft
Watershed Length to Centroid =	750	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	63.40%	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) =	0.225	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.849	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.622	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.817	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.973	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.180	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.383	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.631	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.666	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.552	acre-feet	
Approximate 5-yr Detention Volume =	0.722	acre-feet	
Approximate 10-yr Detention Volume =	0.871	acre-feet	
Approximate 25-yr Detention Volume =	1.050	acre-feet	
Approximate 50-yr Detention Volume =	1.158	acre-feet	
Approximate 100-yr Detention Volume =	1.273	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.225	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.225	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_{LW}) =	user	

Total detention volume is less than 100-year volume.

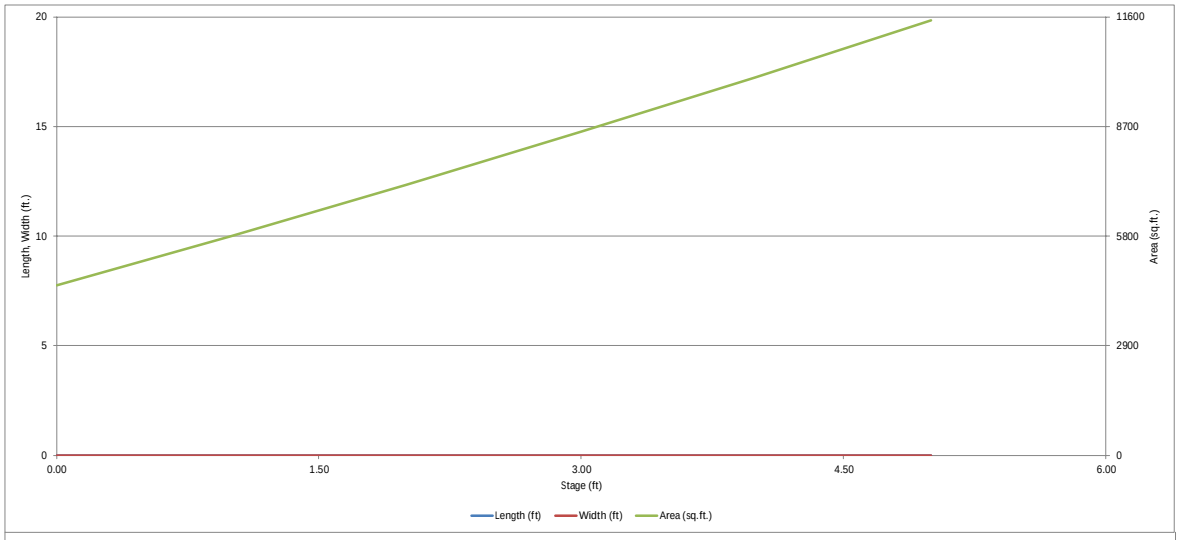
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

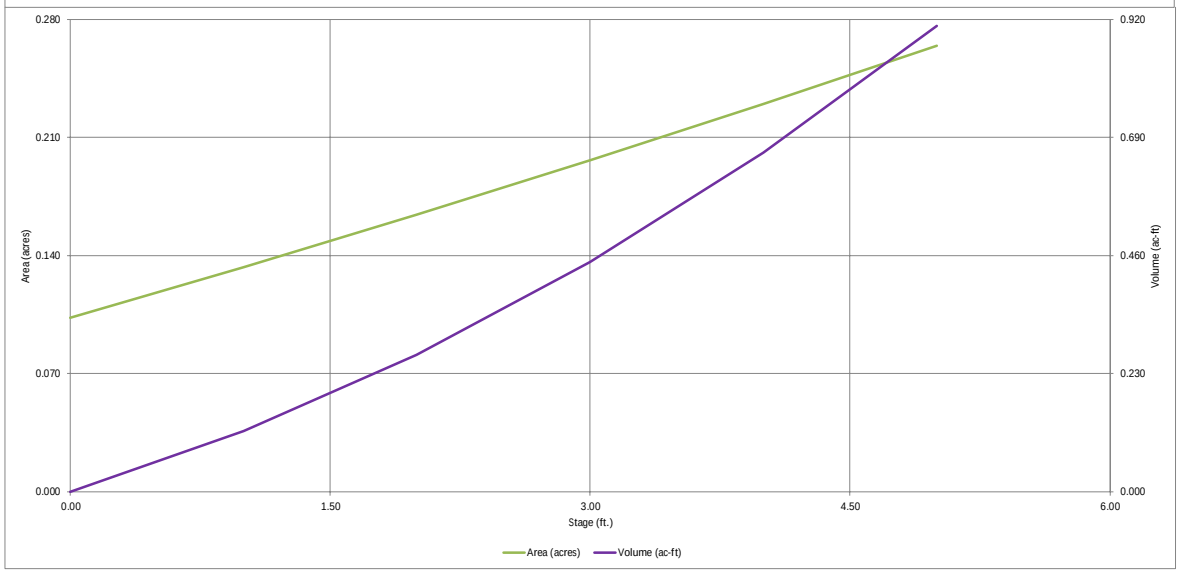
Depth Increment = 1.00 ft

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)
Top of Micropool	--	0.00	--	--	--	4,501	0.103		
6943	--	1.00	--	--	--	5,796	0.133	5,149	0.118
6944	--	2.00	--	--	--	7,155	0.164	11,625	0.267
6945	--	3.00	--	--	--	8,560	0.197	19,483	0.447
6946	--	4.00	--	--	--	10,011	0.230	28,768	0.660
6947	--	5.00	--	--	--	11,524	0.265	39,535	0.908

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



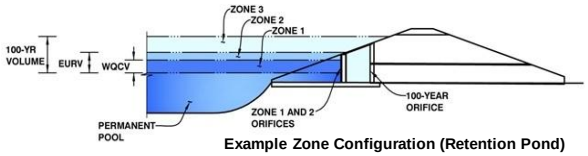


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Falcon Meadows at Bent Grass

Basin ID: WQCV Pond - North



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.74	0.225	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.225	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	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 =	1.389E-02	ft²
Depth at top of Zone using Orifice Plate =	1.74	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	9.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.00	sq. inches (diameter = 1-9/16 inches)	Elliptical Slot Area =	N/A	ft²

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	0.80	1.60					
Orifice Area (sq. inches)	2.00	2.00	2.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
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 =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Open Area % =			%, grate open area/total area	Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

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 =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			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=	2.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.76	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	4.26	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.24	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.72	acre-ft

Calculated Parameters for Spillway

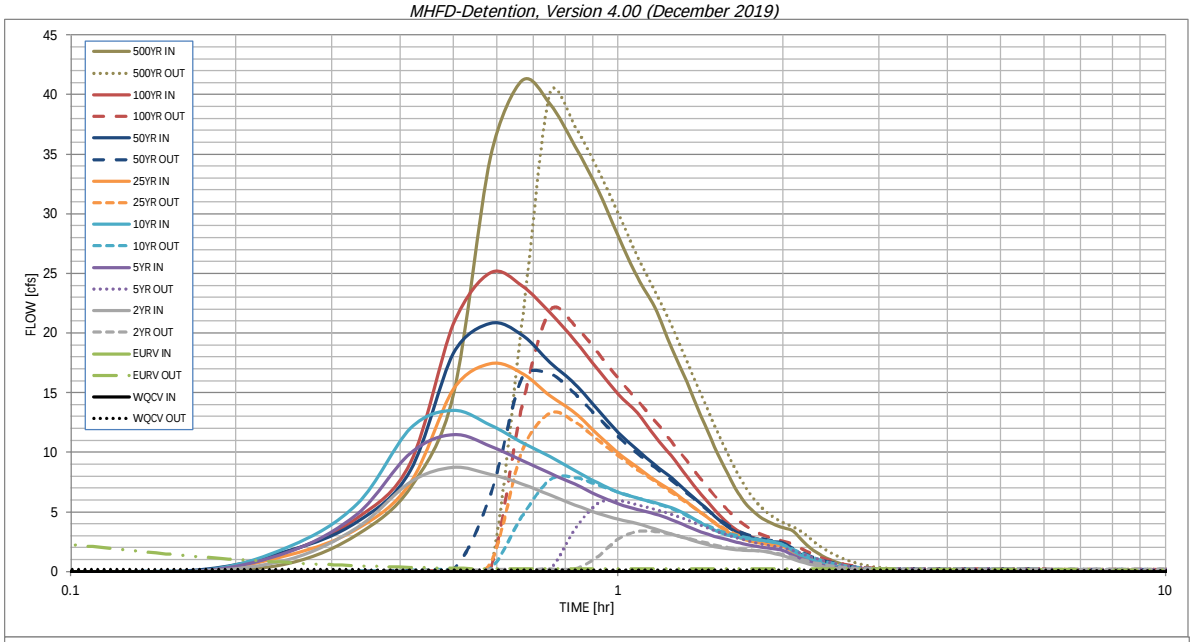
Routed Hydrograph Results

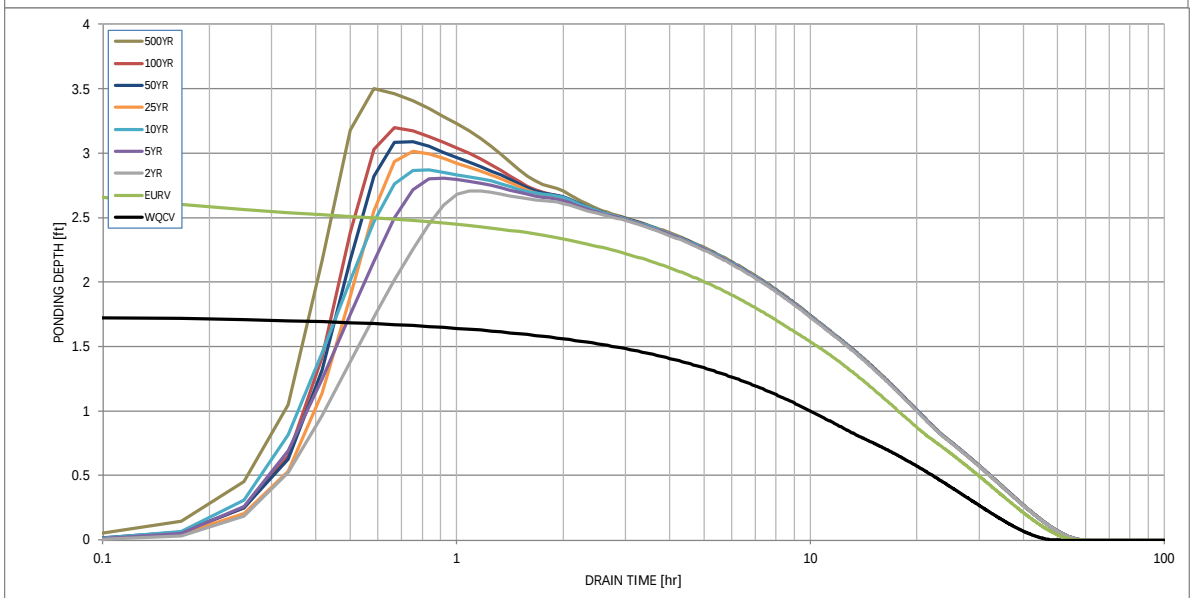
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

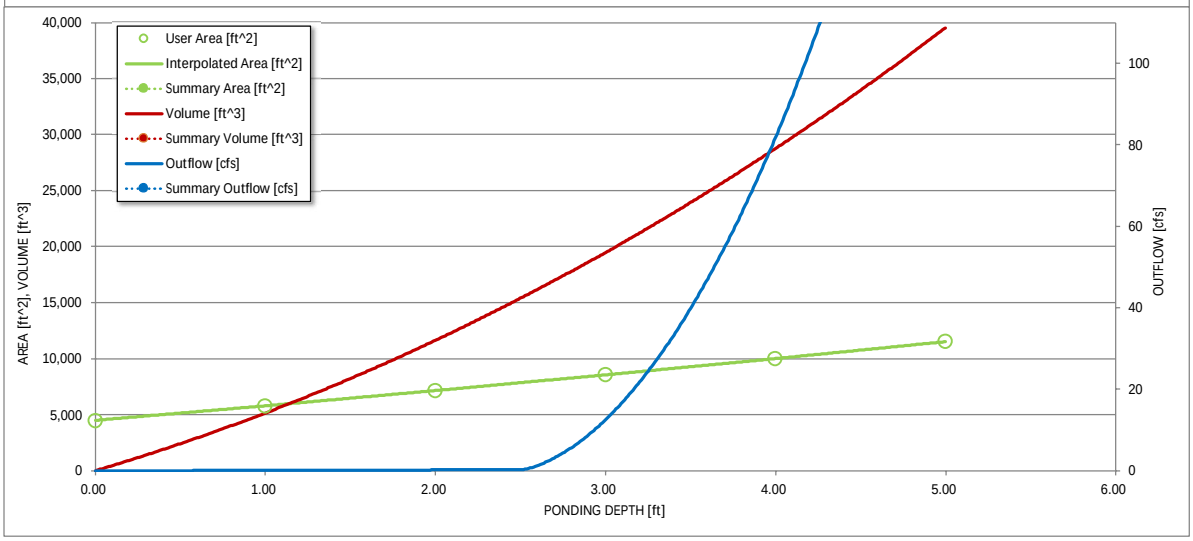
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.225	0.849	0.622	0.817	0.973	1.180	1.383	1.631	2.666
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.622	0.817	0.973	1.180	1.383	1.631	2.666
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.1	0.2	1.6	3.3	5.3	14.0
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	0.15	0.30	0.49	1.28
Peak Inflow Q (cfs) =	N/A	N/A	8.8	11.5	13.5	17.4	20.8	25.1	41.2
Peak Outflow Q (cfs) =	0.2	66.0	3.4	6.0	7.9	13.3	16.6	21.9	40.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	47.3	44.7	8.2	5.1	4.1	2.9
Structure Controlling Flow =	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	40	42	44	42	40	38	36	34	27
Time to Drain 99% of Inflow Volume (hours) =	44	48	51	49	48	47	46	45	41
Maximum Ponding Depth (ft) =	1.74	4.78	2.71	2.81	2.87	3.02	3.09	3.20	3.50
Area at Maximum Ponding Depth (acres) =	0.16	0.26	0.19	0.19	0.19	0.20	0.20	0.20	0.21
Maximum Volume Stored (acre-ft) =	0.225	0.850	0.392	0.409	0.422	0.449	0.465	0.487	0.550

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.

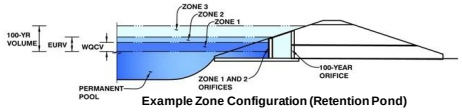
	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01	0.70
	0:15:00	0.00	0.00	1.04	1.69	2.10	1.41	1.76	1.72	3.13
	0:20:00	0.00	0.00	3.70	4.86	5.71	3.60	4.20	4.50	7.06
	0:25:00	0.00	0.00	7.52	9.95	12.01	7.45	8.51	9.15	14.81
	0:30:00	0.00	0.00	8.78	11.52	13.54	15.28	18.32	20.76	34.73
	0:35:00	0.00	0.00	8.17	10.54	12.30	17.44	20.83	25.10	41.19
	0:40:00	0.00	0.00	7.38	9.34	10.86	16.66	19.87	23.98	39.26
	0:45:00	0.00	0.00	6.43	8.26	9.66	14.77	17.55	21.72	35.71
	0:50:00	0.00	0.00	5.61	7.34	8.47	13.30	15.76	19.38	32.07
	0:55:00	0.00	0.00	4.91	6.42	7.45	11.52	13.58	16.97	28.11
	1:00:00	0.00	0.00	4.39	5.70	6.68	9.95	11.66	14.89	24.68
	1:05:00	0.00	0.00	4.04	5.23	6.19	8.75	10.21	13.31	22.17
	1:10:00	0.00	0.00	3.59	4.86	5.78	7.69	8.95	11.36	18.81
	1:15:00	0.00	0.00	3.17	4.38	5.37	6.81	7.89	9.72	15.94
	1:20:00	0.00	0.00	2.78	3.85	4.78	5.84	6.74	8.02	13.03
	1:25:00	0.00	0.00	2.42	3.36	4.07	4.96	5.70	6.51	10.48
	1:30:00	0.00	0.00	2.12	2.96	3.48	4.08	4.66	5.19	8.25
	1:35:00	0.00	0.00	1.92	2.70	3.09	3.33	3.77	4.09	6.38
	1:40:00	0.00	0.00	1.83	2.41	2.87	2.84	3.20	3.36	5.19
	1:45:00	0.00	0.00	1.78	2.20	2.73	2.55	2.87	2.93	4.49
	1:50:00	0.00	0.00	1.74	2.05	2.62	2.36	2.66	2.66	4.02
	1:55:00	0.00	0.00	1.55	1.93	2.50	2.23	2.51	2.47	3.69
	2:00:00	0.00	0.00	1.37	1.79	2.29	2.15	2.41	2.34	3.45
	2:05:00	0.00	0.00	1.07	1.40	1.78	1.67	1.88	1.79	2.63
	2:10:00	0.00	0.00	0.82	1.06	1.35	1.26	1.42	1.33	1.94
	2:15:00	0.00	0.00	0.62	0.81	1.02	0.95	1.07	1.00	1.46
	2:20:00	0.00	0.00	0.47	0.61	0.77	0.72	0.81	0.76	1.10
	2:25:00	0.00	0.00	0.35	0.45	0.57	0.53	0.60	0.57	0.82
	2:30:00	0.00	0.00	0.26	0.33	0.42	0.39	0.44	0.42	0.60
	2:35:00	0.00	0.00	0.19	0.23	0.30	0.29	0.32	0.31	0.44
	2:40:00	0.00	0.00	0.13	0.17	0.22	0.21	0.23	0.22	0.32
	2:45:00	0.00	0.00	0.09	0.11	0.15	0.14	0.16	0.15	0.22
	2:50:00	0.00	0.00	0.05	0.07	0.09	0.09	0.10	0.10	0.14
	2:55:00	0.00	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.07
	3:00:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Falcon Meadows at Bent Grass

Basin ID: WQCV Pond - South



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	66.05	acres
Watershed Length =	3,588	ft
Watershed Length to Centroid =	1,500	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	29.50%	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) =	0.825	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.938	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.351	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.865	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.297	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	3.405	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.438	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.824	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	11.682	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	1.218	acre-feet	
Approximate 5-yr Detention Volume =	1.625	acre-feet	
Approximate 10-yr Detention Volume =	2.033	acre-feet	
Approximate 25-yr Detention Volume =	2.571	acre-feet	
Approximate 50-yr Detention Volume =	2.976	acre-feet	
Approximate 100-yr Detention Volume =	3.638	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.825	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.825	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_{LW}) =	user	

Total detention volume is less than 100-year volume.

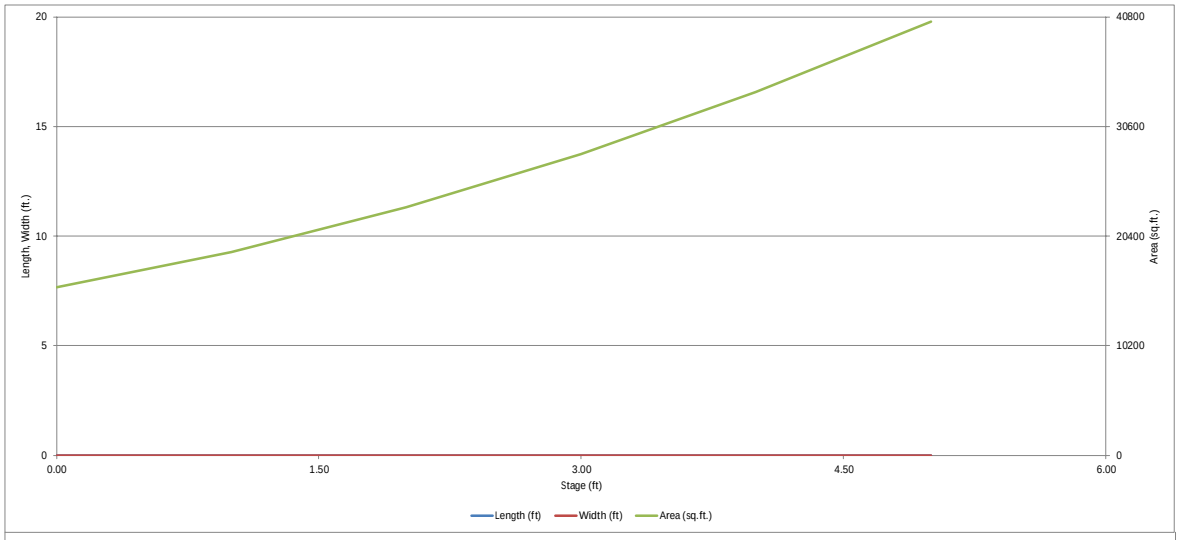
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

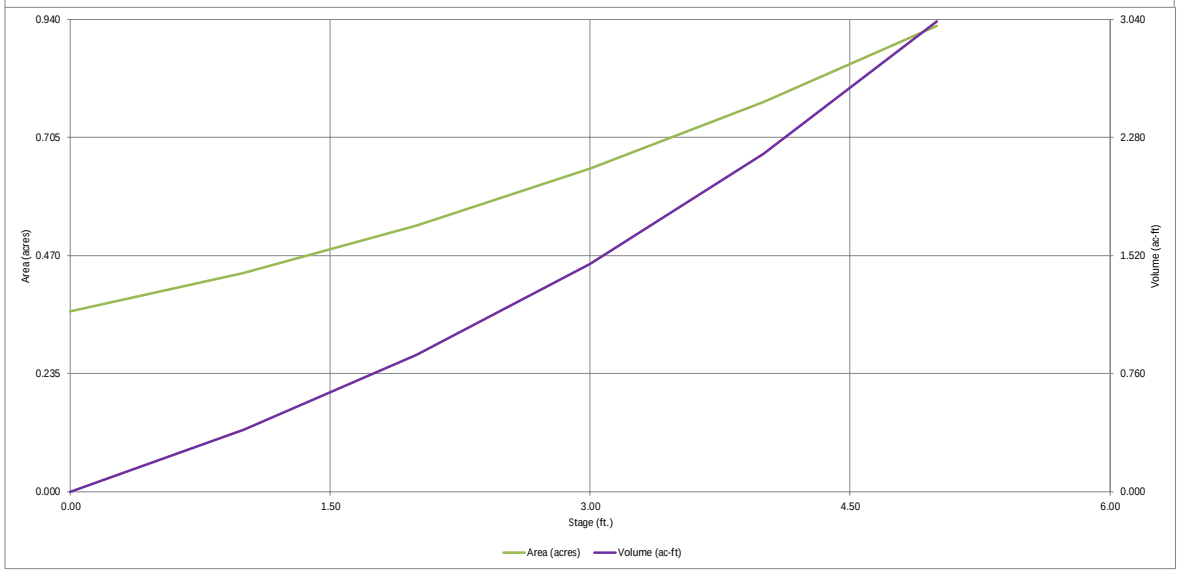
Depth Increment = 1.00 ft

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)
Top of Micropool	--	0.00	--	--	--	15,667	0.360		
6925	--	1.00	--	--	--	18,940	0.435	17,303	0.397
6926	--	2.00	--	--	--	23,065	0.530	38,306	0.879
6927	--	3.00	--	--	--	28,013	0.643	63,845	1.466
2928	--	4.00	--	--	--	33,794	0.776	94,748	2.175
6929	--	5.00	--	--	--	40,427	0.928	131,859	3.027

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



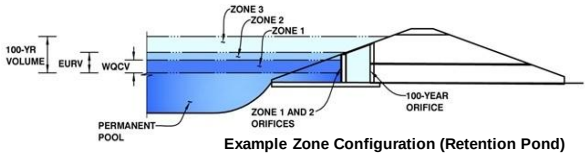


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Falcon Meadows at Bent Grass

Basin ID: WQCV Pond - South



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.90	0.825	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.825	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	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 =	4.861E-02	ft²
Depth at top of Zone using Orifice Plate =	1.90	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	9.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	7.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft²

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	0.80	1.60					
Orifice Area (sq. inches)	7.00	7.00	7.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
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 =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Open Area % =			%, grate open area/total area	Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

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 =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			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=	3.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.95	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	4.45	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.84	acres
Freeboard above Max Water Surface =	0.00	feet	Basin Volume at Top of Freeboard =	2.54	acre-ft

Calculated Parameters for Spillway

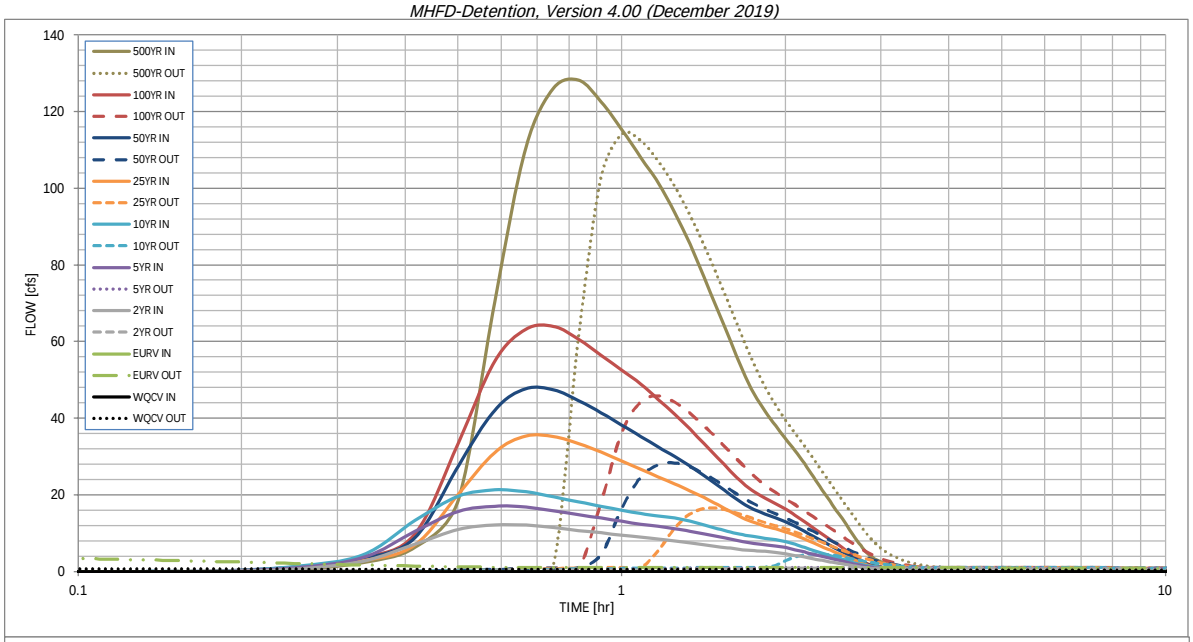
Routed Hydrograph Results

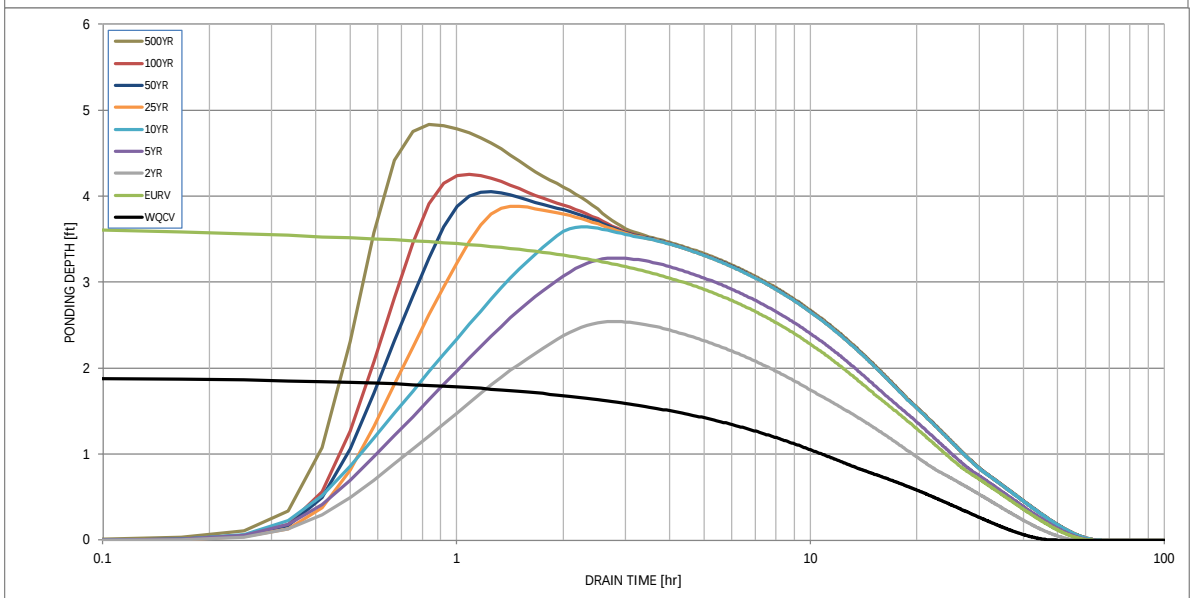
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

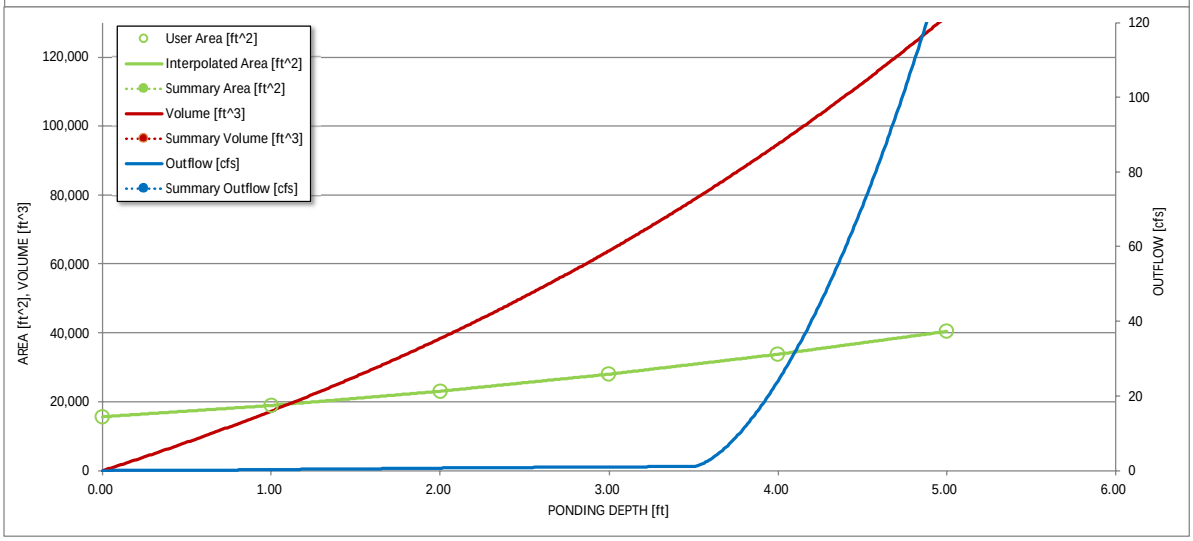
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.825	1.938	1.351	1.865	2.297	3.405	4.438	5.824	11.682
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.351	1.865	2.297	3.405	4.438	5.824	11.682
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.8	1.1	9.8	19.6	32.5	84.9
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	0.15	0.30	0.49	1.29
Peak Inflow Q (cfs) =	N/A	N/A	12.2	17.1	21.3	35.3	47.8	64.0	128.3
Peak Outflow Q (cfs) =	0.7	5.2	0.9	1.1	4.7	16.5	28.4	45.8	114.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	4.4	1.7	1.5	1.4	1.3
Structure Controlling Flow =	Plate	Spillway	Plate	Plate	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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) =	40	48	46	49	50	46	43	40	29
Time to Drain 99% of Inflow Volume (hours) =	44	54	51	55	56	54	53	51	45
Maximum Ponding Depth (ft) =	1.90	3.69	2.55	3.28	3.65	3.89	4.06	4.26	4.84
Area at Maximum Ponding Depth (acres) =	0.52	0.73	0.59	0.68	0.73	0.76	0.78	0.81	0.90
Maximum Volume Stored (acre-ft) =	0.827	1.941	1.182	1.651	1.904	2.083	2.214	2.374	2.871

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	0.08	0.01	0.49
	0:15:00	0.00	0.00	0.66	1.08	1.36	0.93	1.22	1.17	2.41
	0:20:00	0.00	0.00	2.70	3.64	4.39	2.84	3.40	3.61	6.34
	0:25:00	0.00	0.00	7.15	10.47	13.36	6.99	8.83	9.86	18.69
	0:30:00	0.00	0.00	10.96	15.74	19.72	20.21	27.61	33.65	70.54
	0:35:00	0.00	0.00	12.17	17.12	21.31	31.15	42.17	54.90	110.97
	0:40:00	0.00	0.00	12.12	16.81	20.82	35.35	47.78	63.29	126.34
	0:45:00	0.00	0.00	11.48	15.83	19.47	35.23	47.41	64.02	128.28
	0:50:00	0.00	0.00	10.74	14.86	18.20	33.47	44.65	60.56	122.65
	0:55:00	0.00	0.00	10.11	13.98	17.07	31.17	41.45	56.41	115.35
	1:00:00	0.00	0.00	9.53	13.13	16.01	28.88	38.24	52.55	108.08
	1:05:00	0.00	0.00	9.04	12.39	15.14	26.77	35.31	48.95	101.49
	1:10:00	0.00	0.00	8.55	11.82	14.52	24.72	32.52	44.98	93.68
	1:15:00	0.00	0.00	8.06	11.23	13.97	22.92	30.05	41.12	85.46
	1:20:00	0.00	0.00	7.56	10.57	13.22	21.12	27.56	37.24	76.82
	1:25:00	0.00	0.00	7.07	9.87	12.27	19.31	25.05	33.41	68.26
	1:30:00	0.00	0.00	6.57	9.18	11.27	17.49	22.55	29.79	60.21
	1:35:00	0.00	0.00	6.11	8.53	10.34	15.71	20.09	26.30	52.60
	1:40:00	0.00	0.00	5.73	7.89	9.62	14.06	17.84	23.16	46.40
	1:45:00	0.00	0.00	5.47	7.41	9.13	12.82	16.26	20.93	41.86
	1:50:00	0.00	0.00	5.29	7.02	8.72	11.90	15.07	19.23	38.07
	1:55:00	0.00	0.00	5.01	6.65	8.30	11.14	14.04	17.74	34.70
	2:00:00	0.00	0.00	4.69	6.29	7.83	10.43	13.08	16.36	31.58
	2:05:00	0.00	0.00	4.26	5.74	7.12	9.49	11.86	14.75	28.17
	2:10:00	0.00	0.00	3.81	5.13	6.33	8.47	10.54	13.06	24.73
	2:15:00	0.00	0.00	3.37	4.54	5.57	7.47	9.26	11.44	21.45
	2:20:00	0.00	0.00	2.96	3.99	4.85	6.52	8.03	9.91	18.32
	2:25:00	0.00	0.00	2.58	3.47	4.19	5.62	6.86	8.42	15.29
	2:30:00	0.00	0.00	2.22	2.97	3.56	4.75	5.73	6.98	12.33
	2:35:00	0.00	0.00	1.88	2.50	2.96	3.91	4.64	5.57	9.47
	2:40:00	0.00	0.00	1.55	2.05	2.41	3.11	3.61	4.22	6.79
	2:45:00	0.00	0.00	1.24	1.64	1.91	2.37	2.65	2.98	4.70
	2:50:00	0.00	0.00	0.97	1.28	1.53	1.71	1.90	2.09	3.42
	2:55:00	0.00	0.00	0.79	1.05	1.28	1.29	1.45	1.55	2.55
	3:00:00	0.00	0.00	0.67	0.89	1.08	1.03	1.15	1.19	1.91
	3:05:00	0.00	0.00	0.57	0.75	0.91	0.84	0.93	0.93	1.43
	3:10:00	0.00	0.00	0.48	0.63	0.77	0.68	0.75	0.73	1.07
	3:15:00	0.00	0.00	0.41	0.53	0.65	0.57	0.62	0.58	0.80
	3:20:00	0.00	0.00	0.35	0.45	0.55	0.47	0.51	0.46	0.61
	3:25:00	0.00	0.00	0.29	0.38	0.45	0.38	0.41	0.37	0.49
	3:30:00	0.00	0.00	0.24	0.31	0.37	0.31	0.33	0.30	0.39
	3:35:00	0.00	0.00	0.20	0.25	0.29	0.25	0.27	0.24	0.31
	3:40:00	0.00	0.00	0.16	0.20	0.23	0.20	0.21	0.19	0.24
	3:45:00	0.00	0.00	0.12	0.15	0.18	0.15	0.16	0.14	0.18
	3:50:00	0.00	0.00	0.09	0.12	0.14	0.11	0.12	0.10	0.12
	3:55:00	0.00	0.00	0.07	0.09	0.10	0.08	0.08	0.07	0.08
	4:00:00	0.00	0.00	0.05	0.06	0.07	0.05	0.05	0.05	0.05
	4:05:00	0.00	0.00	0.03	0.04	0.04	0.03	0.03	0.02	0.02
	4:10:00	0.00	0.00	0.02	0.02	0.02	0.02	0.01	0.01	0.01
	4:15:00	0.00	0.00	0.01	0.01	0.01	0.01	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

Current Channel Calculations

Meridian Road

Worksheet for Ex Channel - Pr DBPS 100 Yr Flow-MR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	1.75	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	850.00	ft³/s

Results

Normal Depth	4.68	ft
Flow Area	87.61	ft²
Wetted Perimeter	38.59	ft
Hydraulic Radius	2.27	ft
Top Width	37.44	ft
Critical Depth	4.89	ft
Critical Slope	0.01379	ft/ft
Velocity	9.70	ft/s
Velocity Head	1.46	ft
Specific Energy	6.14	ft
Froude Number	1.12	
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	4.68	ft
Critical Depth	4.89	ft
Channel Slope	1.75	%
Critical Slope	0.01379	ft/ft

Meridian Road

Worksheet for Ex Channel - Pr 100 Yr Flow-MR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	1.75	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	925.00	ft³/s

Results

Normal Depth	4.83	ft
Flow Area	93.35	ft²
Wetted Perimeter	39.84	ft
Hydraulic Radius	2.34	ft
Top Width	38.65	ft
Critical Depth	5.06	ft
Critical Slope	0.01364	ft/ft
Velocity	9.91	ft/s
Velocity Head	1.53	ft
Specific Energy	6.36	ft
Froude Number	1.12	
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	4.83	ft
Critical Depth	5.06	ft
Channel Slope	1.75	%
Critical Slope	0.01364	ft/ft

Worksheet for Ex Owl Place

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.050	
Channel Slope	1.60	%
Left Side Slope	11.00	ft/ft (H:V)
Right Side Slope	12.00	ft/ft (H:V)
Discharge	850.00	ft^3/s

Results

Normal Depth	3.64	ft
Flow Area	152.13	ft^2
Wetted Perimeter	83.97	ft
Hydraulic Radius	1.81	ft
Top Width	83.66	ft
Critical Depth	3.21	ft
Critical Slope	0.03128	ft/ft
Velocity	5.59	ft/s
Velocity Head	0.49	ft
Specific Energy	4.12	ft
Froude Number	0.73	
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	3.64	ft
Critical Depth	3.21	ft
Channel Slope	1.60	%
Critical Slope	0.03128	ft/ft

Future Channel Calculations

Meridian Road

Worksheet for Fut Channel - Pr 100 Yr Flow-MR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.30	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	15.00	ft
Discharge	925.00	ft³/s

Results

Normal Depth	5.15	ft
Flow Area	183.50	ft²
Wetted Perimeter	57.49	ft
Hydraulic Radius	3.19	ft
Top Width	56.22	ft
Critical Depth	3.58	ft
Critical Slope	0.01368	ft/ft
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	5.55	ft
Froude Number	0.49	
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	5.15	ft
Critical Depth	3.58	ft
Channel Slope	0.30	%

Worksheet for Fut Channel - Pr 100 Yr Flow-MR

GVF Output Data

Critical Slope	0.01368	ft/ft

HY-8 Culvert Analysis Report

Culvert Alternative for Roadside Ditch alongside Meridian Road

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 248.6 cfs

Design Flow: 850 cfs

Maximum Flow: 925 cfs

Table 1 - Summary of Culvert Flows at Crossing: Meridian Road-Fut Pipe Ditch Alt

Headwater Elevation (ft)	Total Discharge (cfs)	Fut Culvert Option-Parallel Meridian Rd Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6929.05	248.60	248.60	0.00	1
6929.72	316.24	316.24	0.00	1
6930.35	383.88	383.88	0.00	1
6930.97	451.52	451.52	0.00	1
6931.60	519.16	519.16	0.00	1
6932.28	586.80	586.80	0.00	1
6933.02	654.44	654.44	0.00	1
6933.83	722.08	722.08	0.00	1
6934.73	789.72	789.72	0.00	1
6935.28	850.00	828.14	21.64	5
6935.62	925.00	851.12	73.83	5
6935.00	809.07	809.07	0.00	Overtopping

Rating Curve Plot for Crossing: Meridian Road-Fut Pipe Ditch Alt

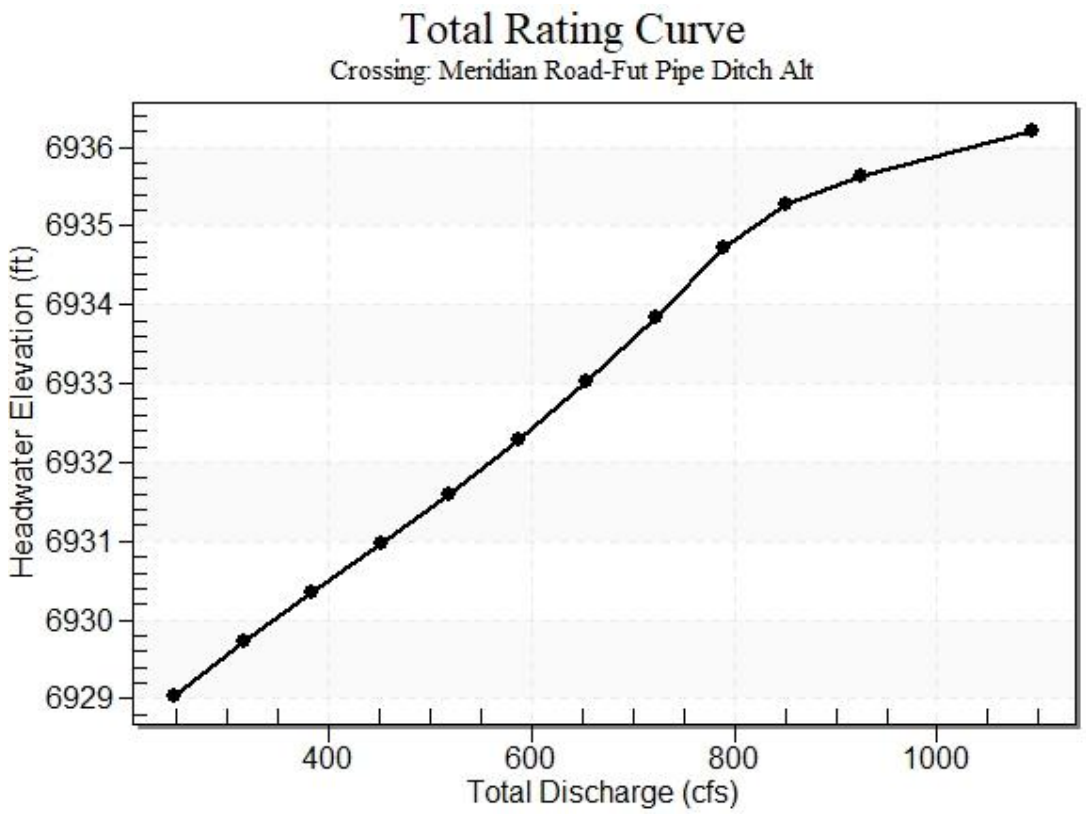


Table 2 - Culvert Summary Table: Fut Culvert Option-Parallel Meridian Rd

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
248.60	248.60	6929.05	4.247	0.0*	1-S2n	2.284	2.941	2.284	0.496	11.945	14.310
316.24	316.24	6929.72	4.923	0.0*	1-S2n	2.600	3.336	2.600	0.574	12.756	15.730
383.88	383.88	6930.35	5.551	0.0*	1-S2n	2.895	3.692	2.895	0.646	13.430	16.969
451.52	451.52	6930.97	6.168	0.0*	1-S2n	3.178	4.019	3.178	0.713	14.000	18.082
519.16	519.16	6931.60	6.802	0.0*	5-S2n	3.453	4.320	3.453	0.777	14.493	19.092
586.80	586.80	6932.28	7.480	0.0*	5-S2n	3.725	4.599	3.725	0.837	14.917	20.026
654.44	654.44	6933.02	8.218	0.0*	5-S2n	3.998	4.856	3.998	0.895	15.282	20.889
722.08	722.08	6933.83	9.030	1.896	5-S2n	4.278	5.091	4.278	0.951	15.590	21.705
789.72	789.72	6934.73	9.927	4.435	5-S2n	4.570	5.305	4.576	1.004	15.818	22.467
850.00	828.14	6935.28	10.476	5.969	5-S2n	4.746	5.417	4.746	1.051	15.953	23.118
925.00	851.12	6935.62	10.819	6.919	5-S2n	4.855	5.480	4.855	1.107	16.010	23.882

* Full Flow Headwater elevation is below inlet invert.

****

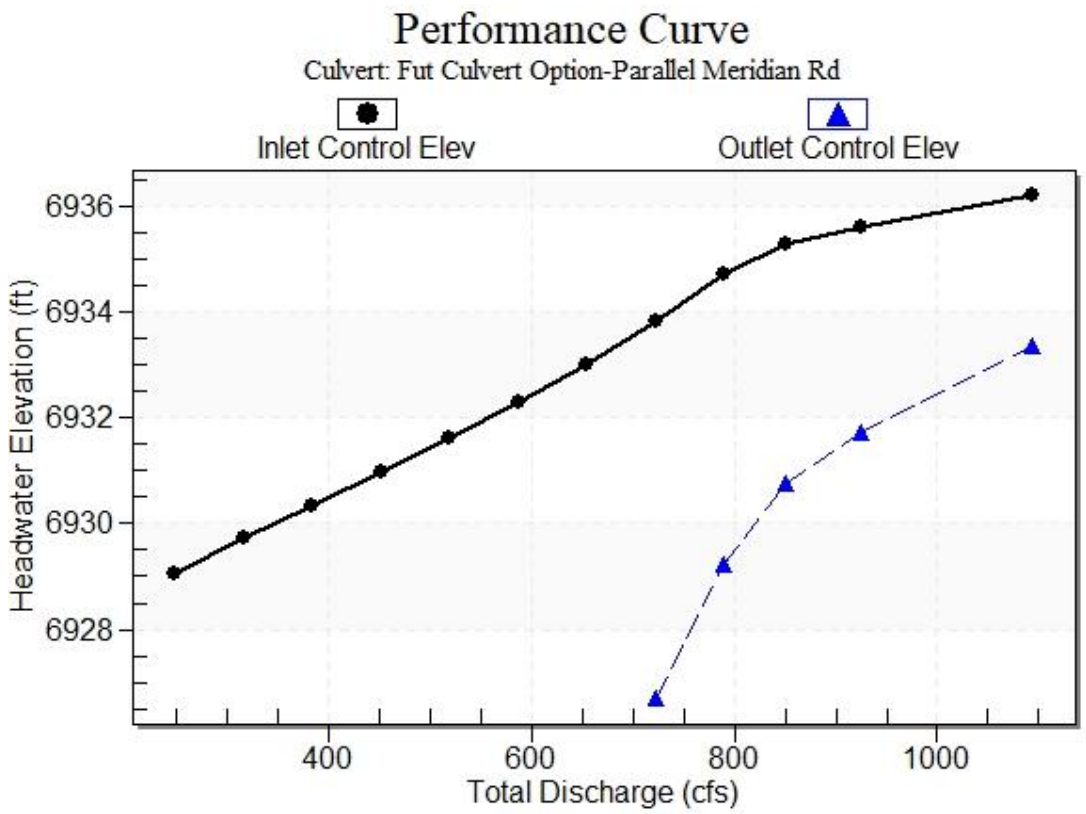
Straight Culvert

Inlet Elevation (invert): 6924.80 ft, Outlet Elevation (invert): 6908.50 ft

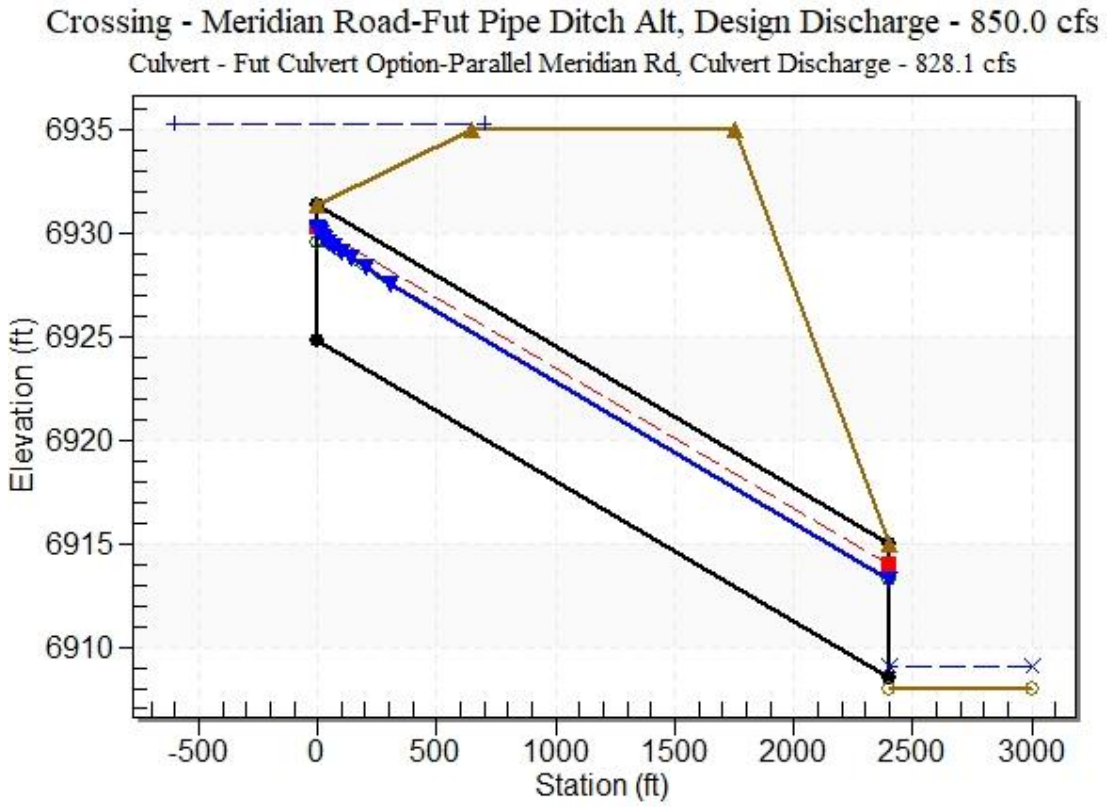
Culvert Length: 2400.06 ft, Culvert Slope: 0.0068

****

Culvert Performance Curve Plot: Fut Culvert Option-Parallel Meridian Rd



Water Surface Profile Plot for Culvert: Fut Culvert Option-Parallel Meridian Rd



Site Data - Fut Culvert Option-Parallel Meridian Rd

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6924.80 ft

Outlet Station: 2400.00 ft

Outlet Elevation: 6908.50 ft

Number of Barrels: 2

Culvert Data Summary - Fut Culvert Option-Parallel Meridian Rd

Barrel Shape: Circular

Barrel Diameter: 6.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Meridian Road-Fut Pipe Ditch Alt)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
248.60	6908.50	0.50	14.31	9.29	3.58
316.24	6908.57	0.57	15.73	10.75	3.66
383.88	6908.65	0.65	16.97	12.10	3.72
451.52	6908.71	0.71	18.08	13.36	3.77
519.16	6908.78	0.78	19.09	14.54	3.82
586.80	6908.84	0.84	20.03	15.67	3.86
654.44	6908.90	0.90	20.89	16.76	3.89
722.08	6908.95	0.95	21.70	17.79	3.92
789.72	6909.00	1.00	22.47	18.80	3.95
850.00	6909.05	1.05	23.12	19.67	3.97
925.00	6909.11	1.11	23.88	20.72	4.00

Tailwater Channel Data - Meridian Road-Fut Pipe Ditch Alt

Tailwater Channel Option: Rectangular Channel

Bottom Width: 35.00 ft

Channel Slope: 0.3000

Channel Manning's n: 0.0350

Channel Invert Elevation: 6908.00 ft

Worksheet for Fut Owl Place

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.30	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	35.00	ft
Discharge	925.00	ft^3/s

Results

Normal Depth	3.86	ft
Flow Area	194.93	ft^2
Wetted Perimeter	66.86	ft
Hydraulic Radius	2.92	ft
Top Width	65.91	ft
Critical Depth	2.52	ft
Critical Slope	0.01424	ft/ft
Velocity	4.75	ft/s
Velocity Head	0.35	ft
Specific Energy	4.21	ft
Froude Number	0.49	
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	3.86	ft
Critical Depth	2.52	ft
Channel Slope	0.30	%

Worksheet for Fut Owl Place

GVF Output Data

Critical Slope	0.01424	ft/ft

HY-8 Culvert Analysis Report

Culvert Alternative for Ditch alongside Bent Grass Meadows Drive

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 8 cfs

Design Flow: 40.9 cfs

Maximum Flow: 50 cfs

Table 1 - Summary of Culvert Flows at Crossing: BGMD-Future Pipe Channel Alt

Headwater Elevation (ft)	Total Discharge (cfs)	Fut Culvert Option-Parallel BGMD Discharge (cfs)	Roadway Discharge (cfs)	Iterations
26.16	8.00	8.00	0.00	1
26.45	12.20	12.20	0.00	1
26.70	16.40	16.40	0.00	1
26.96	20.60	20.60	0.00	1
27.20	24.80	24.80	0.00	1
27.42	29.00	29.00	0.00	1
27.63	33.20	33.20	0.00	1
27.83	37.40	37.40	0.00	1
28.00	40.90	40.90	0.00	1
28.22	45.80	45.80	0.00	1
28.42	50.00	50.00	0.00	1
30.00	78.87	78.87	0.00	Overtopping

Rating Curve Plot for Crossing: BGMD-Future Pipe Channel Alt

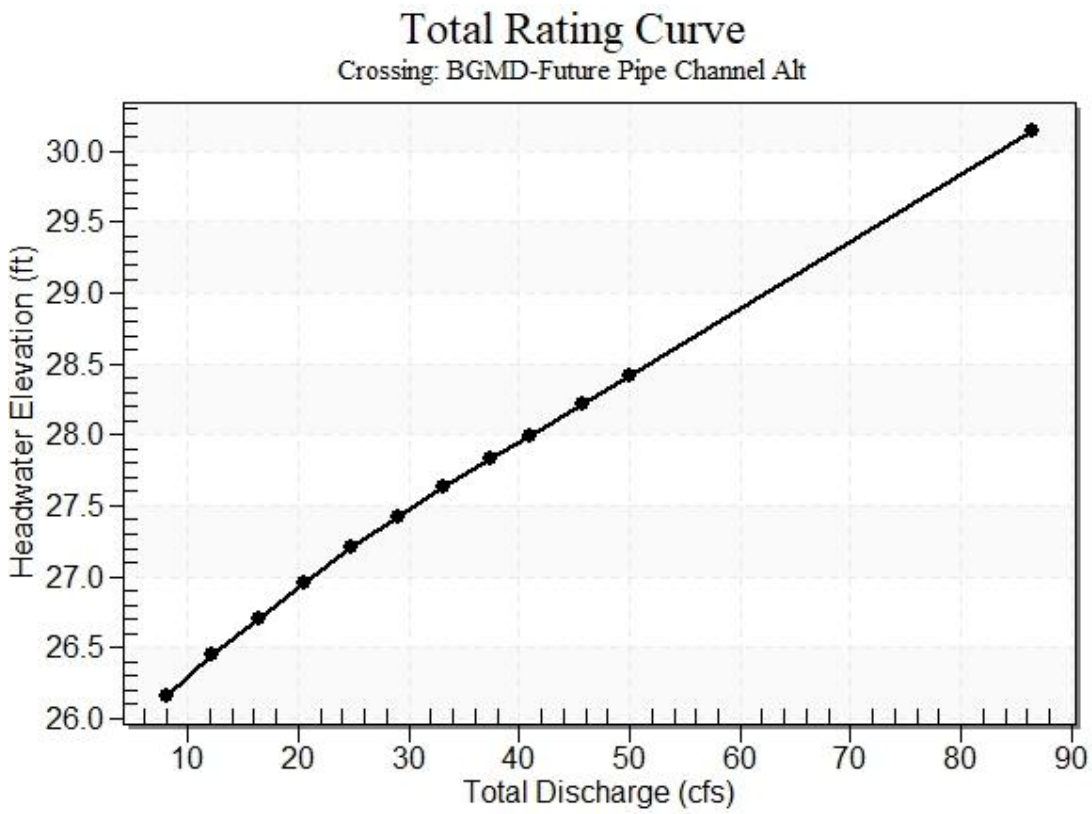


Table 2 - Culvert Summary Table: Fut Culvert Option-Parallel BGMD

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
8.00	8.00	26.16	1.163	0.0*	1-S2n	0.760	0.853	0.760	0.207	5.193	7.721
12.20	12.20	26.45	1.453	0.0*	1-S2n	0.940	1.060	0.940	0.269	5.865	9.058
16.40	16.40	26.70	1.702	0.0*	1-S2n	1.095	1.235	1.095	0.324	6.376	10.116
20.60	20.60	26.96	1.959	0.0*	1-S2n	1.234	1.390	1.234	0.374	6.795	11.007
24.80	24.80	27.20	2.201	0.0*	1-S2n	1.363	1.532	1.363	0.421	7.149	11.778
29.00	29.00	27.42	2.424	0.0*	1-S2n	1.486	1.662	1.486	0.465	7.456	12.463
33.20	33.20	27.63	2.633	0.0*	1-S2n	1.603	1.784	1.603	0.508	7.724	13.080
37.40	37.40	27.83	2.833	0.0*	1-S2n	1.717	1.899	1.717	0.548	7.963	13.649
40.90	40.90	28.00	2.995	0.0*	1-S2n	1.811	1.990	1.811	0.581	8.142	14.085
45.80	45.80	28.22	3.221	0.0*	1-S2n	1.940	2.111	1.940	0.625	8.367	14.651
50.00	50.00	28.42	3.416	0.0*	1-S2n	2.050	2.210	2.050	0.662	8.538	15.103

* Full Flow Headwater elevation is below inlet invert.

****

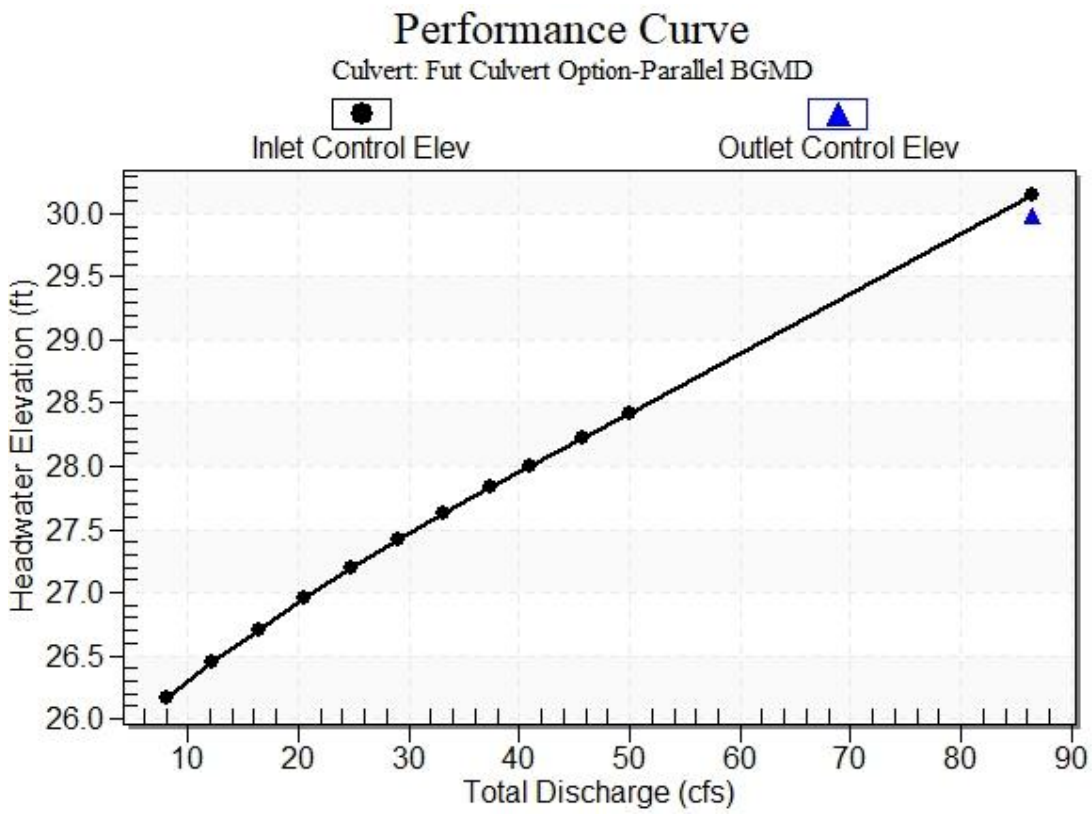
Straight Culvert

Inlet Elevation (invert): 25.00 ft, Outlet Elevation (invert): 13.00 ft

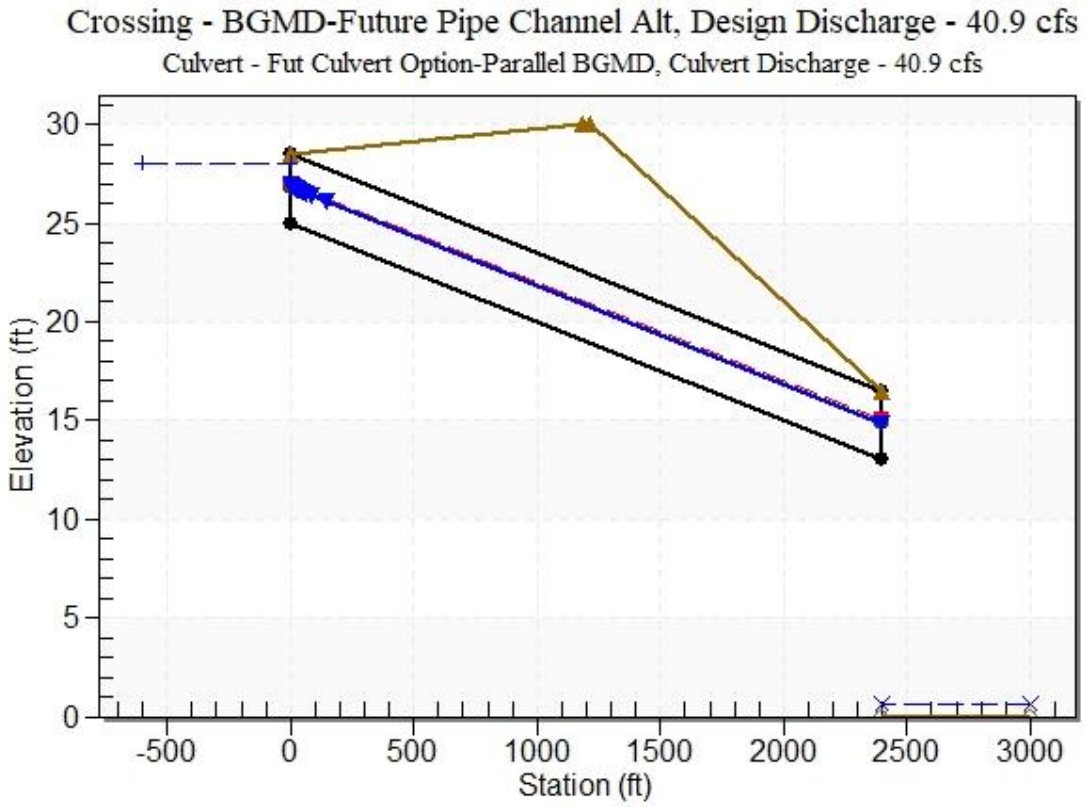
Culvert Length: 2400.03 ft, Culvert Slope: 0.0050

****

Culvert Performance Curve Plot: Fut Culvert Option-Parallel BGMD



Water Surface Profile Plot for Culvert: Fut Culvert Option-Parallel BGMD



Site Data - Fut Culvert Option-Parallel BGMD

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 25.00 ft

Outlet Station: 2400.00 ft

Outlet Elevation: 13.00 ft

Number of Barrels: 1

Culvert Data Summary - Fut Culvert Option-Parallel BGMD

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: BGMD-Future Pipe Channel Alt)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
8.00	0.21	0.21	7.72	3.88	2.99
12.20	0.27	0.27	9.06	5.04	3.08
16.40	0.32	0.32	10.12	6.07	3.13
20.60	0.37	0.37	11.01	7.01	3.17
24.80	0.42	0.42	11.78	7.88	3.20
29.00	0.47	0.47	12.46	8.71	3.22
33.20	0.51	0.51	13.08	9.50	3.24
37.40	0.55	0.55	13.65	10.26	3.25
40.90	0.58	0.58	14.09	10.87	3.26
45.80	0.63	0.63	14.65	11.70	3.27
50.00	0.66	0.66	15.10	12.39	3.27

Tailwater Channel Data - BGMD-Future Pipe Channel Alt

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 ft

Channel Slope: 0.3000

Channel Manning's n: 0.0350

Channel Invert Elevation: 0.00 ft

Sheet 6-10
Falcon DBPS
Conceptual Plan
West Tributary
El Paso County, CO

WT 10 - Woodmen Rd.
EX Size: 18.92' (W) x 8.75' (H) Concrete Box

Rock Cross Vane
Alt. Structure Type: Riffle Drop
See Detail on Sheet 6-53

Re-establish Natural Channel Cross Section
See Detail on Sheet 6-51

Small Drop Structure
See Detail on Sheet 6-54

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

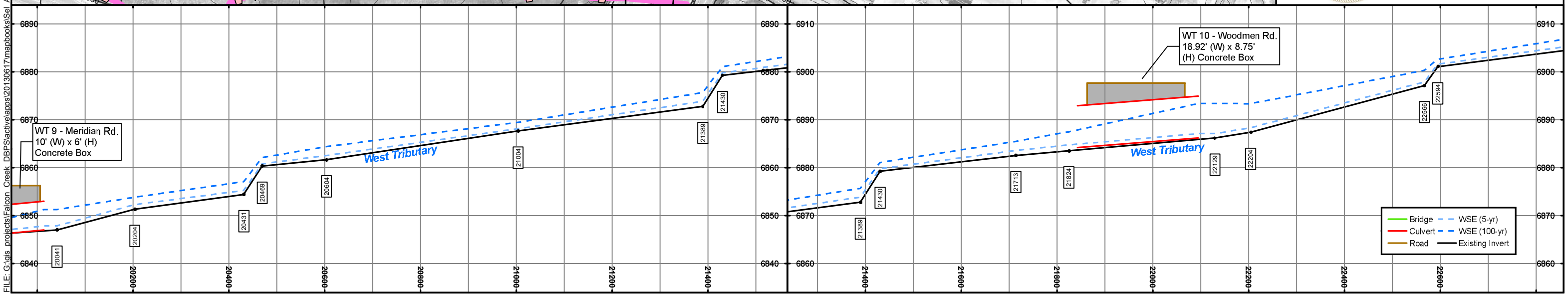
Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map



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Sheet 6-11
Falcon DBPS
Conceptual Plan
West Tributary
El Paso County, CO

Rock Cross Vane
Alt. Structure Type: Riffle Drop
See Detail on Sheet 6-53

Re-establish Natural Channel Cross Section
See Detail on Sheet 6-51

Sub Regional Pond SR3
EURV = 1.0 AF
$Q_{2\,in}$ = 72 cfs
$Q_{2\,out}$ = 72 cfs
$Q_{100\,in}$ = 910 cfs
$Q_{100\,out}$ = 910 cfs

RWT210
RWT210_upstream
RWT202
RWT204
West Tributary

matchline - see Sheet 6-10
matchline - see Sheet 6-12

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
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Index Map

Note:
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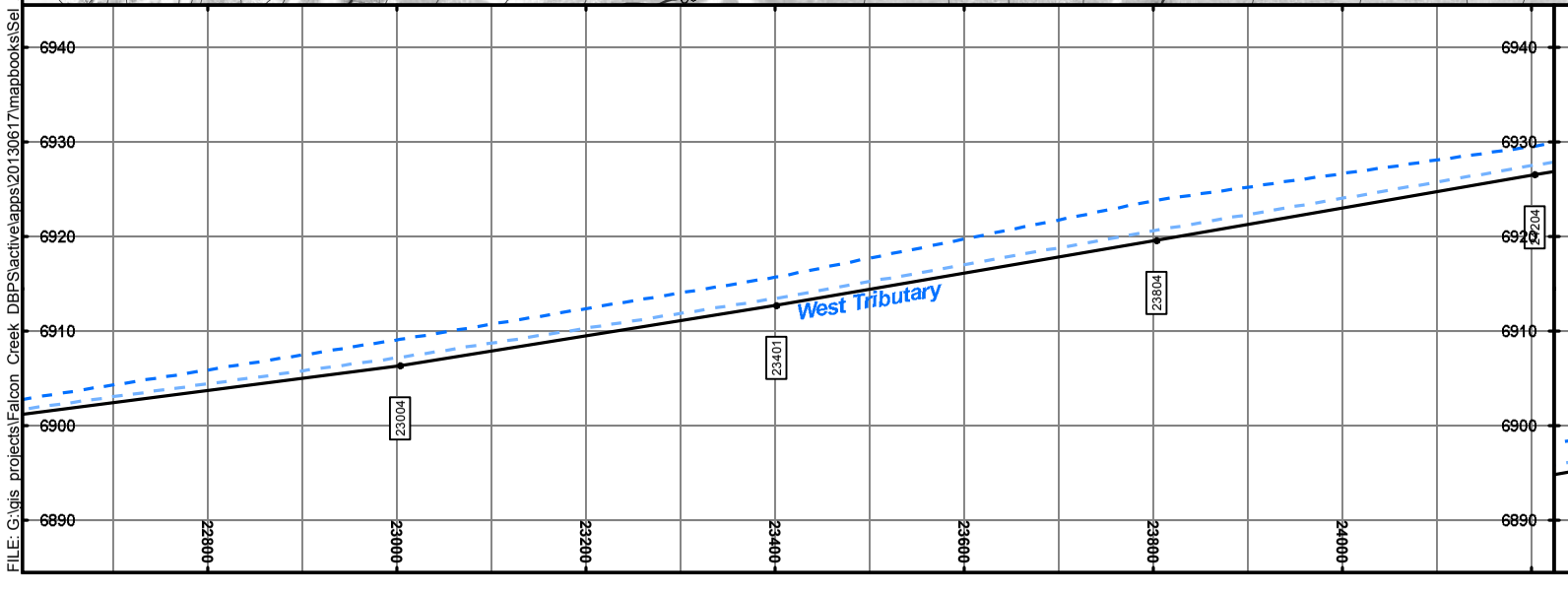
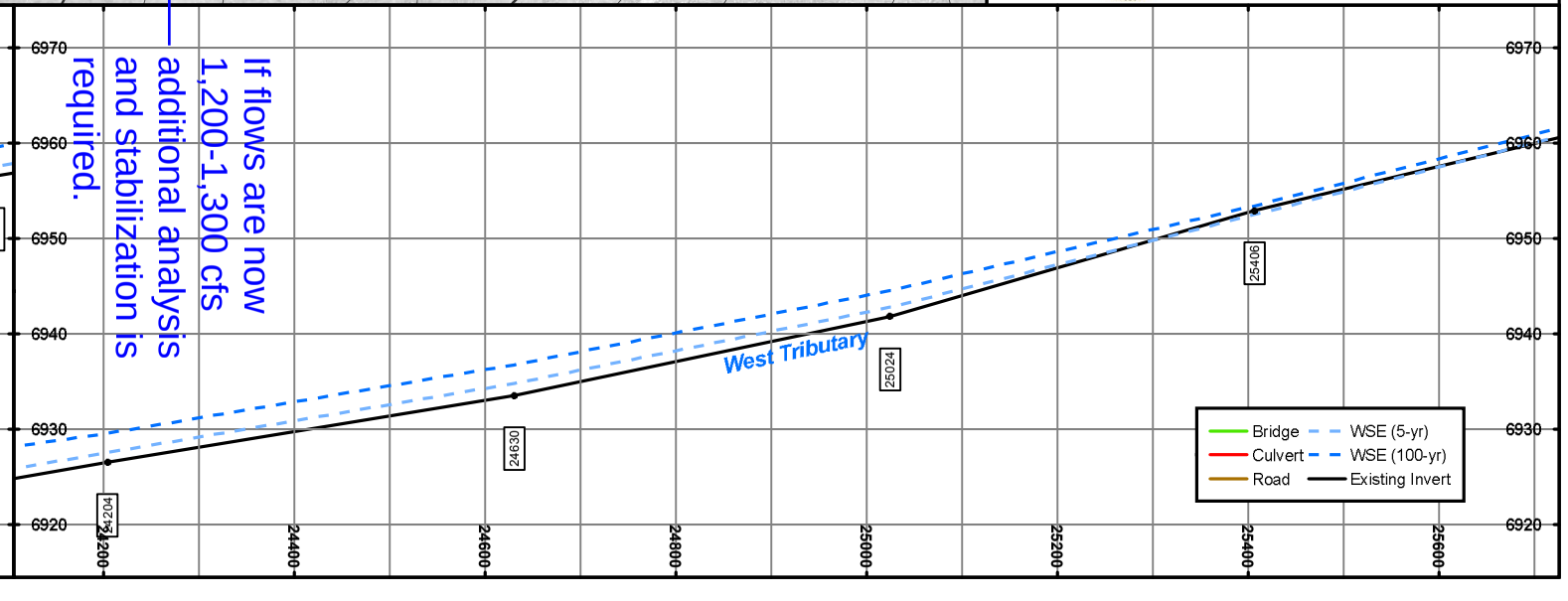
EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP





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Sheet 6-12
Falcon DBPS
Conceptual Plan
West Tributary
El Paso County, CO

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map

Approximate Limits of Split Flow for Existing 100-yr Floodplain

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

matchline, see Sheet 6-11

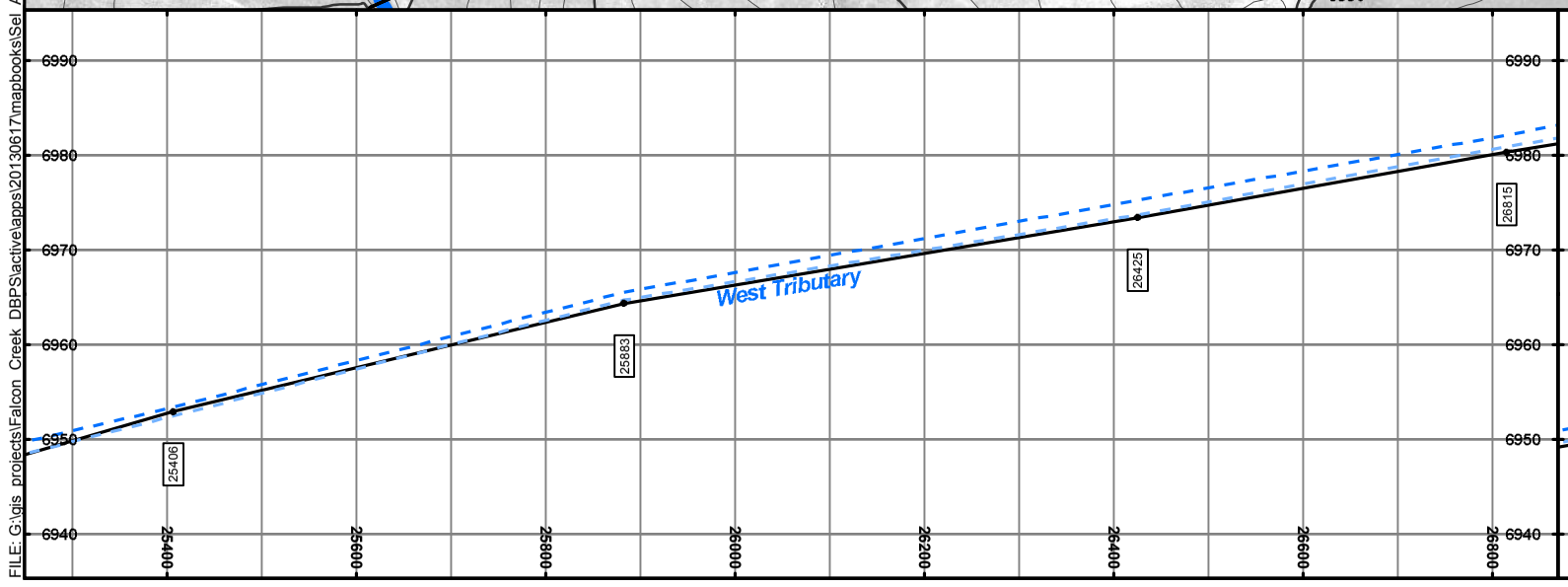
matchline, see Sheet 6-13

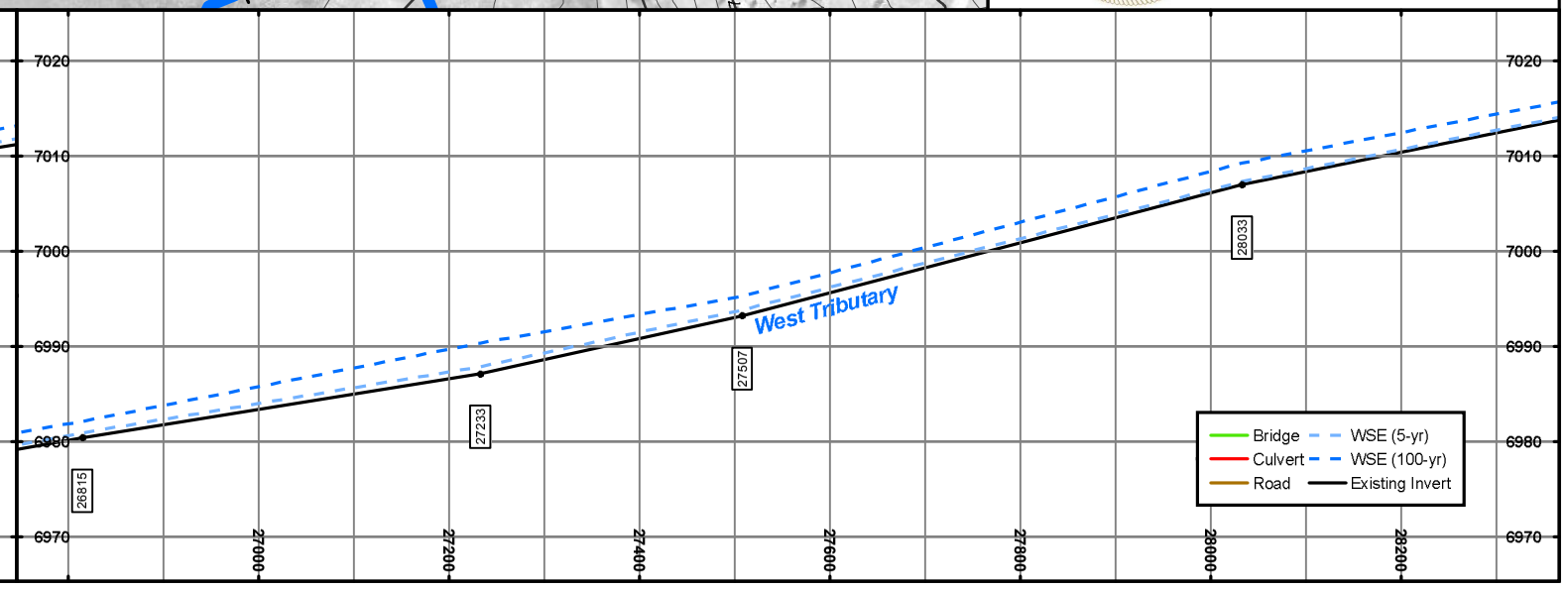
RWT202

RWT204

RWT180

West Tributary





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Sheet 6-13
Falcon DBPS
Conceptual Plan
West Tributary
El Paso County, CO

West Tributary

28200 28400 28600 28800 29000 29200 29400 29600 29800 30000 30200 30400 30600 30800 31000

RWT180

It is assumed that future development activities will remove this berm.

Approximate Limits of Split Flow for Existing 100-yr Floodplain

It is assumed that future development activities will remove this berm.

Approximate Limits of Split Flow for Existing 100-yr Floodplain

matchline - see Sheet 6-12

matchline - see Sheet 6-14

Woodmen Hills Dr

Towner Ave

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

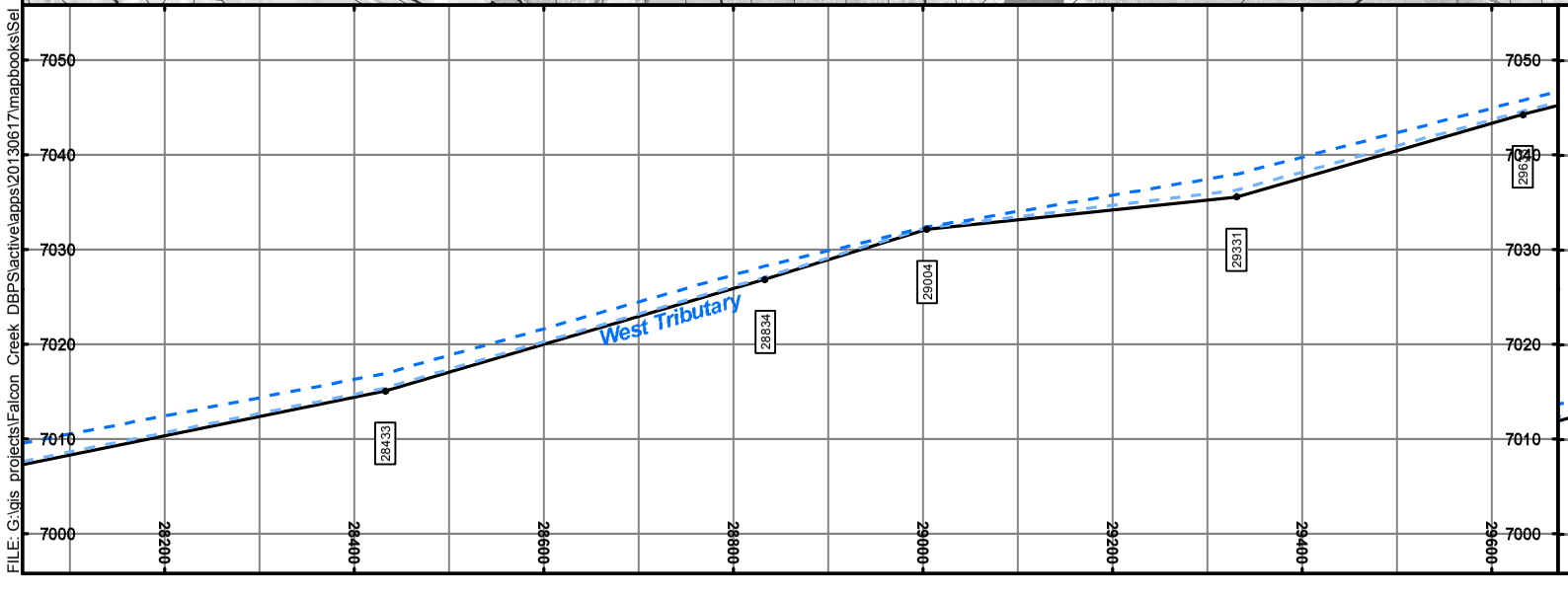
* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP



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Sheet 6-23
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

MT 6 - Woodmen Rd.
EX Size: 4' Circular RCP (x3)
PR Size: 5' Circular RCP (x3)
* Sub-Regional Pond SR4 will be designed to mitigate capacity issues.

Floodplain Enters Underground Storm System

Sub Regional Pond SR4
WQCV = 7.3 AF
100-yr Volume = 19 AF
$Q_{2\ in}$ = 130 cfs
$Q_{2\ out}$ = 27 cfs
$Q_{100\ in}$ = 1000 cfs
$Q_{100\ out}$ = 730 cfs
See Detail on Sheet 6-55

MT 7 - Owl Place
EX Size: 1.75' (W) x 1.25' (H) CMP Elliptical (x4)
PR Size: 4' (W) x 2' (H) Concrete Box (x9)
* Road profile would need to be raised to implement a feasible solution.

MT 6-2 - Woodmen Rd.
EX Size: 4' Circular RCP (x3)
PR Size: 5' Circular RCP (x3)
* Sub-Regional Pond SR4 will be designed to mitigate capacity issues.

Small Drop Structure
See Detail on Sheet 6-54

Future conveyance from Meridian Rd roadside ditch TBD

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

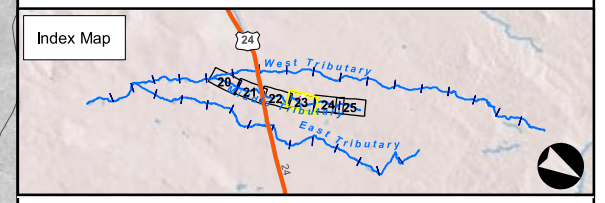
Storm Sewer
Inlet
Manhole
Pipe

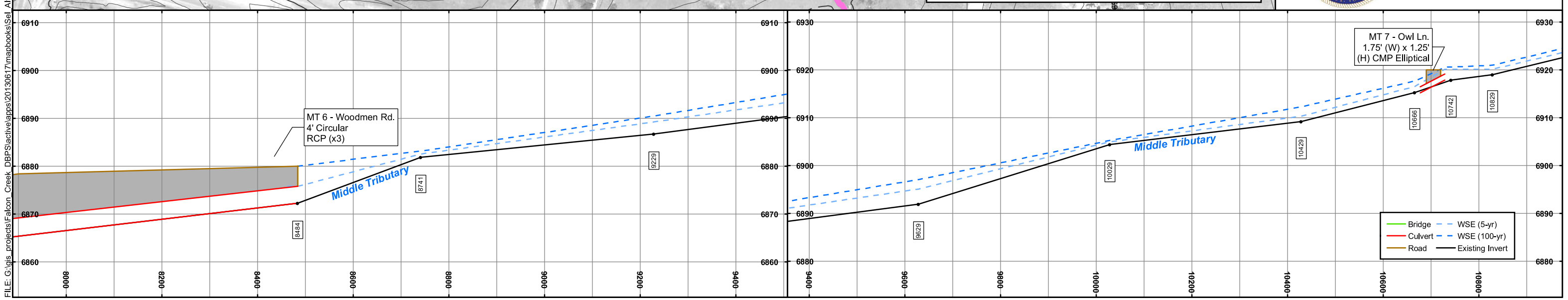
Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map





FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20130617\mapbooks\Sel Alt Middle_Trib.mxd 1/11/2016 Jeff Clonts

Sheet 6-24
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

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** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map

Small Drop Structure
See Detail on Sheet 6-54

Approximate Limits of Split Flow for Existing 100-yr Floodplain

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

matchline - see Sheet 6-23

matchline - see Sheet 6-25

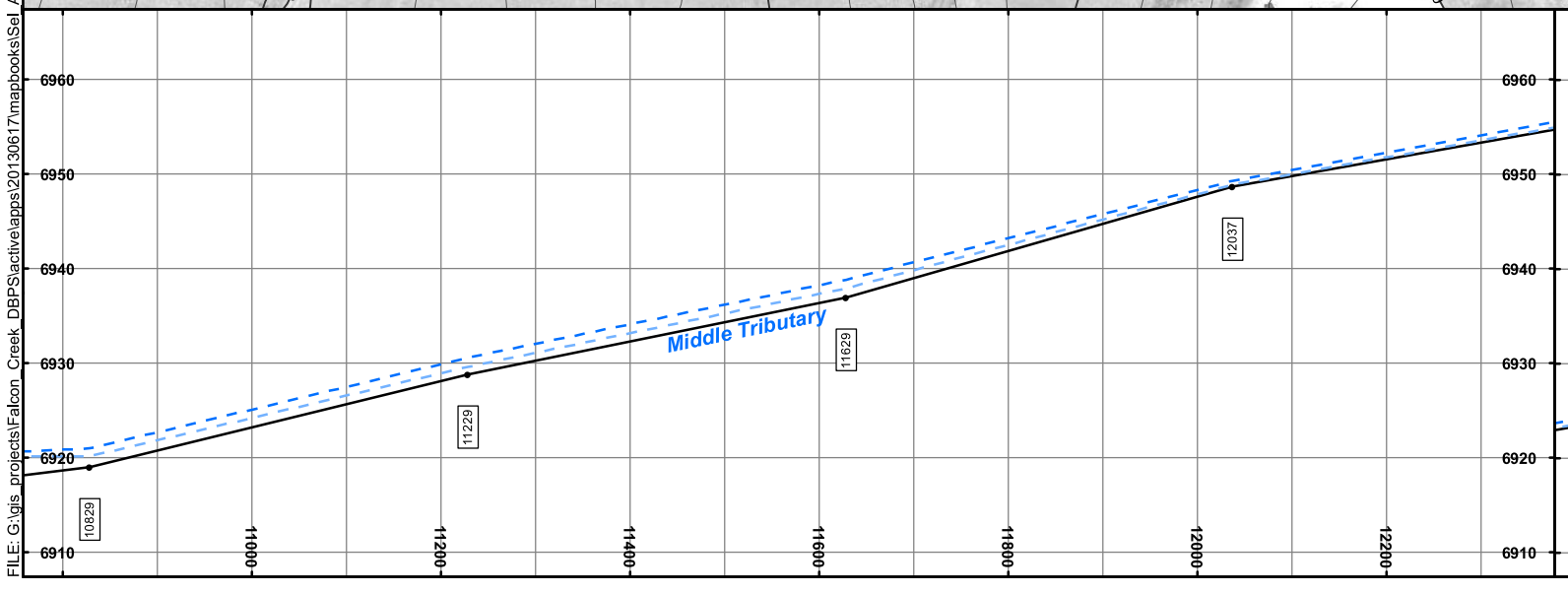
Middle Tributary

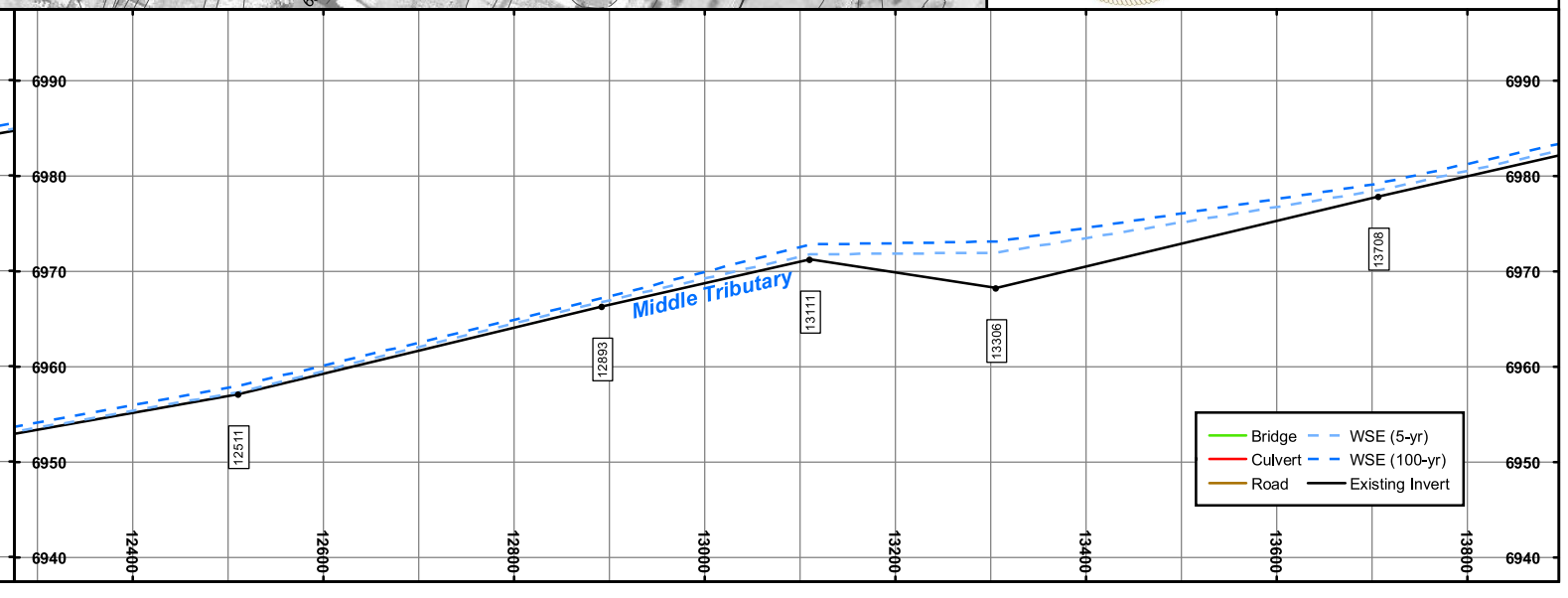
RMT062

Owl Pl

Cow Palace Rd

Galinas Rd





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Sheet 6-25
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

Approximate Limits of Split Flow for Existing 100-yr Floodplain

Small Drop Structure
See Detail on Sheet 6-54

Approximate Limits of Split Flow for Existing 100-yr Floodplain

RMT062

Middle Tributary

The Meadows Pond #2
EURV = 1.6 AF
100-yr Volume = 7.9 AF
$Q_{2\ in}$ = 28 cfs
$Q_{2\ out}$ = 5 cfs
$Q_{100\ in}$ = 210 cfs
$Q_{100\ out}$ = 100 cfs
See Detail on Sheet 6-55

M2 Outlet

M2 Outlet

matchline - see Sheet 6-24

Salinas Rd

Texarkanna Rd

Cow Palace Rd

Woodmen Hills Dr

Velvet Antler Way

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

- Drainageway Crossing
- Stream Centerline
- Existing Approximate 100-yr Floodplain*
- Floodplain Study Limit

Storm Sewer
- Inlet
- Manhole
- Pipe

Reach Improvements
- Natural Channel Design
- Protect In Place
- Roadside Ditch Improvement
- Small Drop Structures w/ Toe Protection
- Existing Detention
- Proposed Detention
- Proposed Detention Grading
- Small Drop Structure
- Cross Vane
- Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

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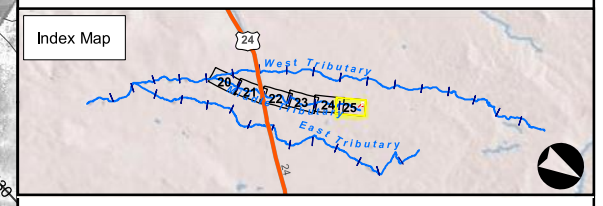
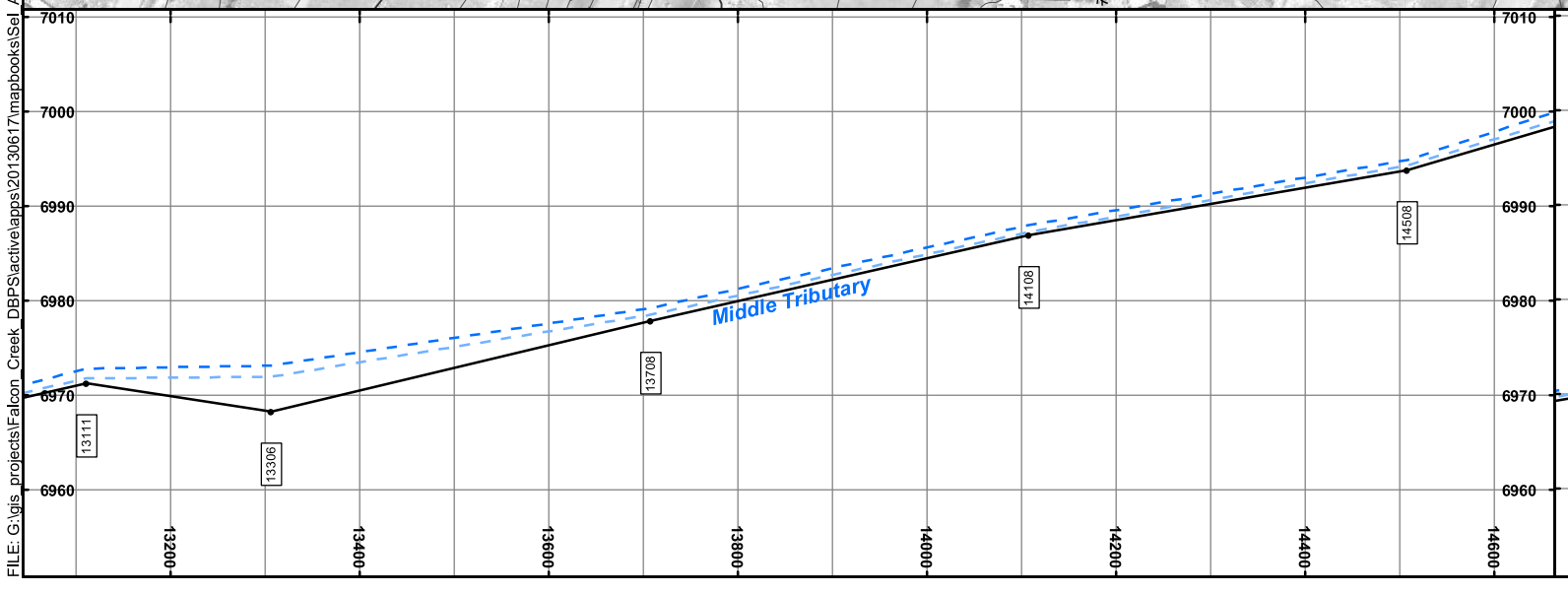
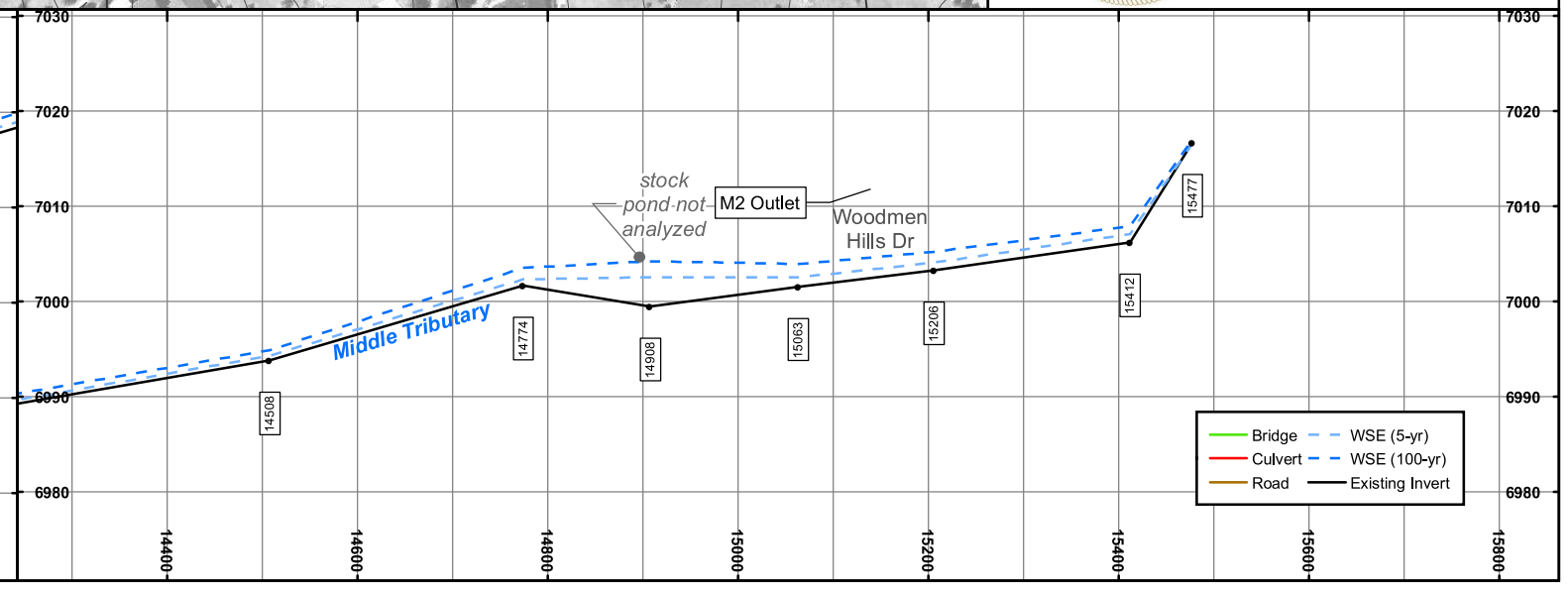
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map







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Sheet 6-46
Falcon DBPS
Conceptual Plan
Small Tributaries
El Paso County, CO

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map

Note:
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NO PROFILES FOR SMALL TRIBUTARIES

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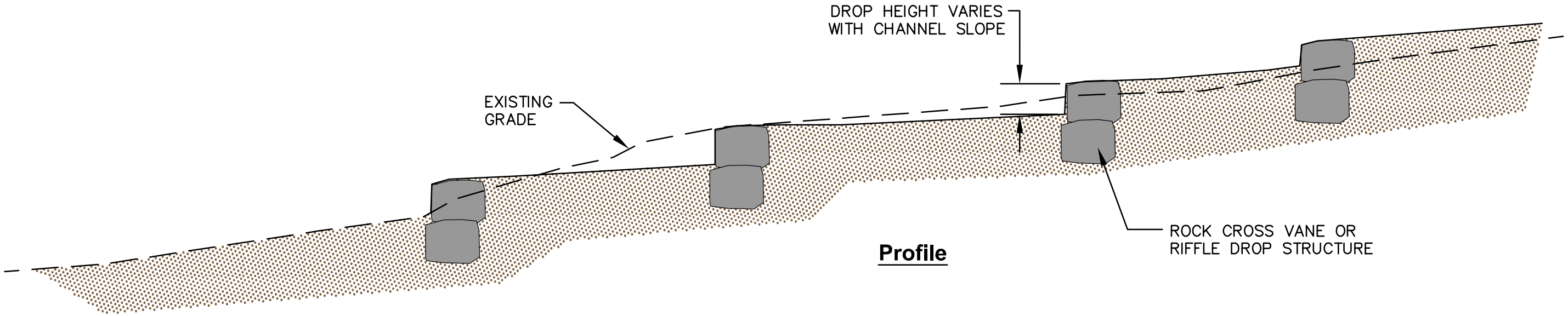

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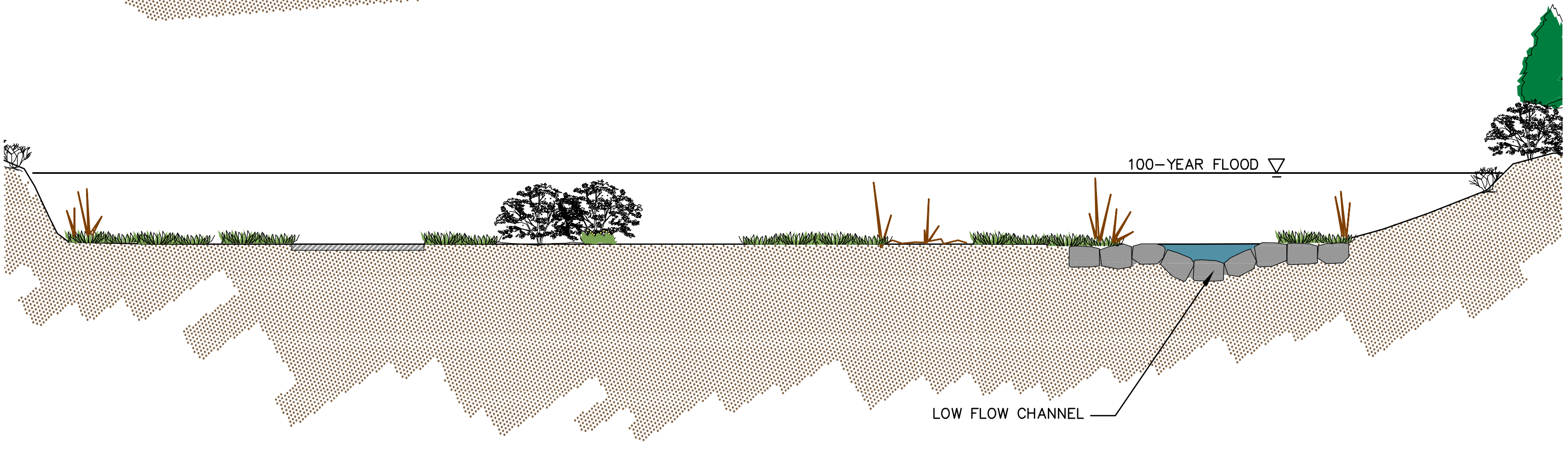

Section

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PCP: Matrix.ctb
PLOT DATE: Wed Dec 21, 2011 3:03pm

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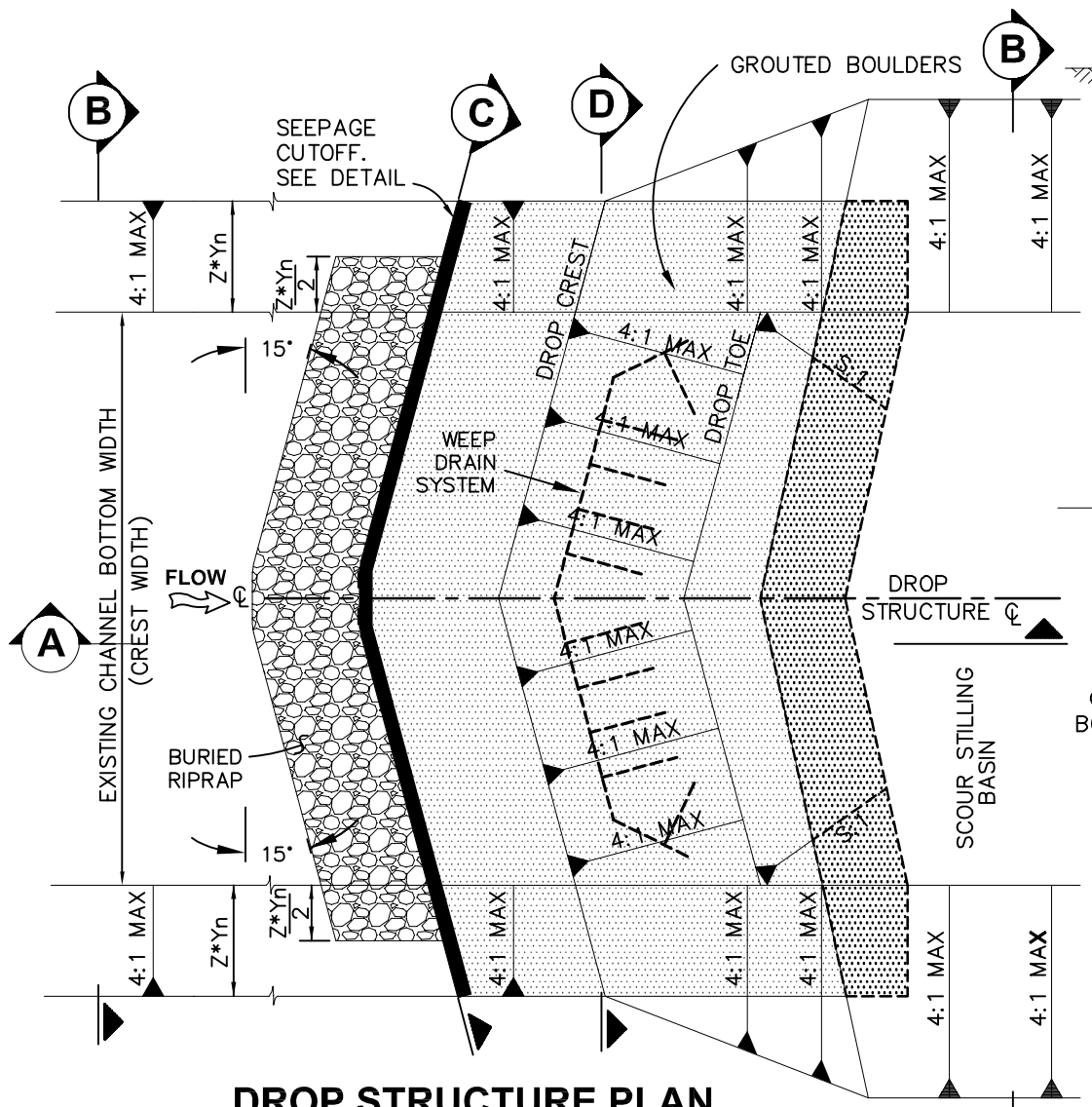
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

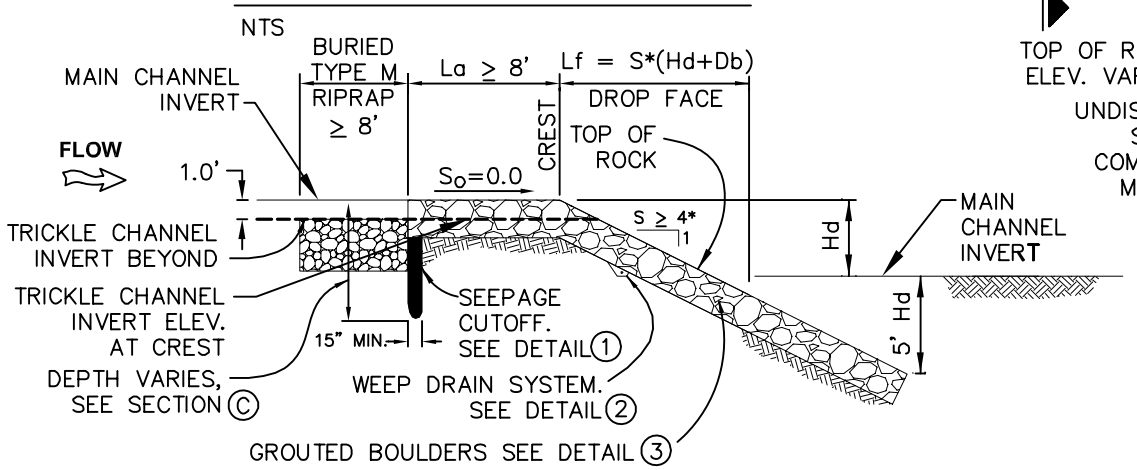
Natural Channel with Grade Control Structures

Figure 5-4



DROP STRUCTURE PLAN

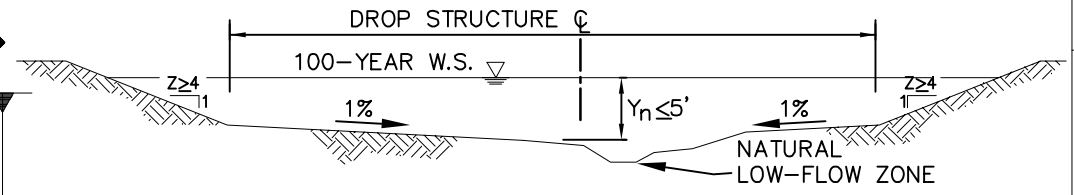
NTS



DROP STRUCTURE PROFILE

A

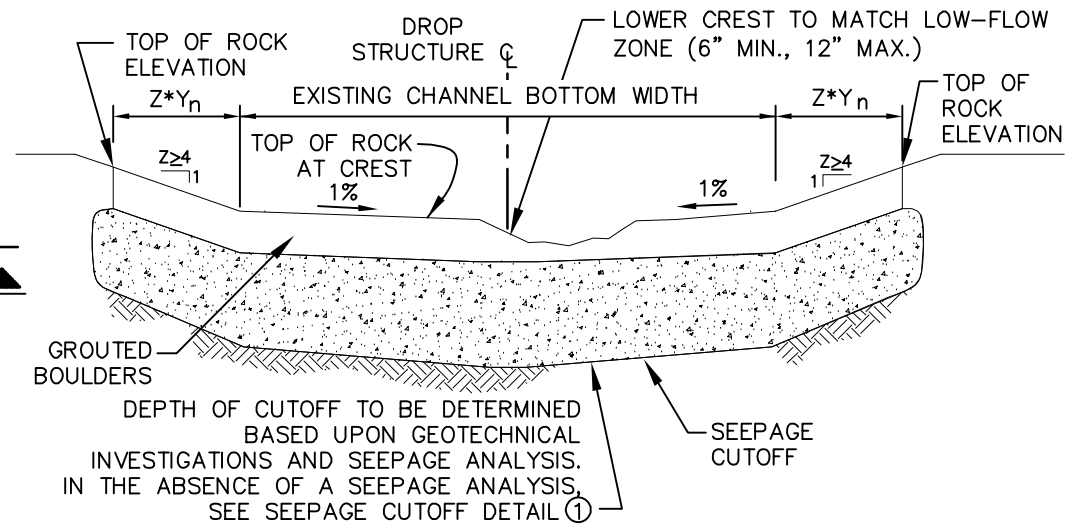
NTS



TYPICAL CHANNEL SECTION (UPSTREAM AND DOWNSTREAM OF DROP)

B

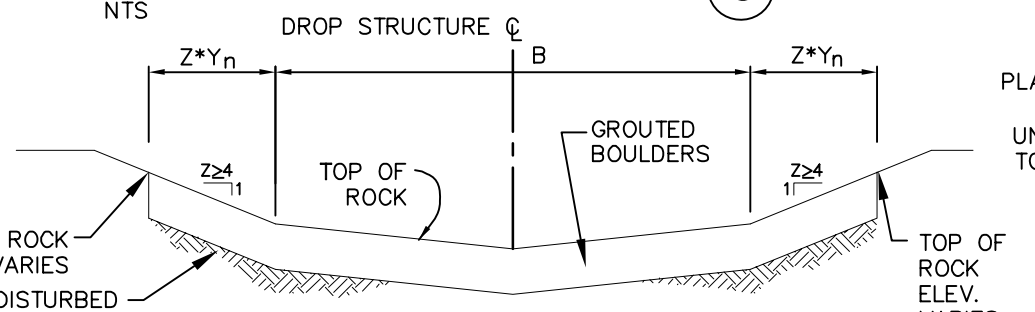
NTS



SEEPAGE CUTOFF SECTION

C

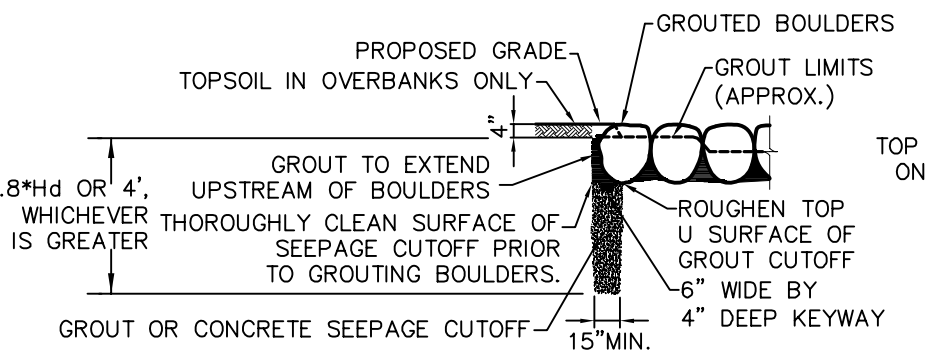
NTS



TYPICAL DROP FACE SECTION

D

NTS



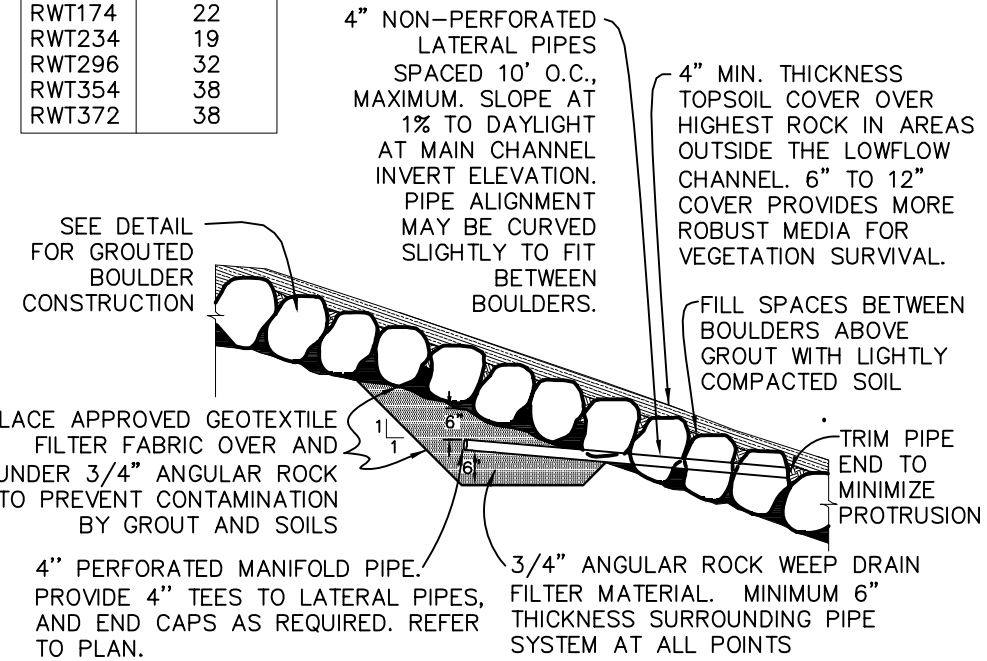
SEEPAGE CUTOFF DETAIL

1

NTS

REACH	CREST WIDTH (FT)
RET020	18
RET030	21
RET040	23
RET100	28
RET110	28
RET152	29
RET156	30
RET162	30
RMT050	23
RMT062	20
RMT064	24
RMT102	27
RMT104	15
RMT106	27
RMT112	27
RMT114	27
RWT054	22
RWT080	19
RWT092	25
RWT094	26
RWT122	27
RWT124	27
RWT174	22
RWT234	19
RWT296	32
RWT354	38
RWT372	38

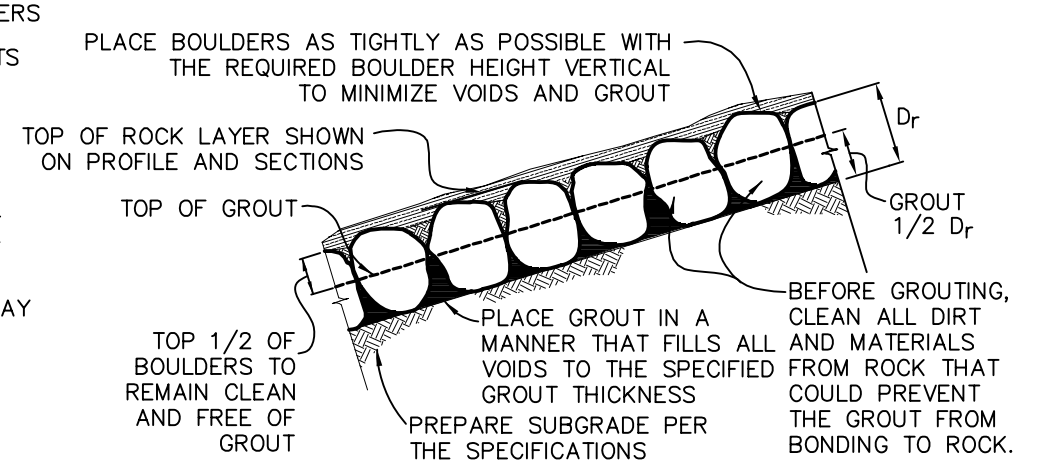
CONSTRUCTED GROUTED SLOPING BOULDER DROP STRUCTURE



WEEP DRAIN SYSTEM DETAIL

2

NTS USE ONLY IN DROPS HIGHER THAN 5 FEET



GROUTED BOULDER PLACEMENT DETAIL

3

NTS

TYPICAL GROUTED SLOPING (GSB) BOULDER DROP STRUCTURE

NOT FOR CONSTRUCTION

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PCP: Matrix.ctb
PLOT DATE: Tue Jun 18, 2013 1:38pm

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

NOTES:
1.) REACHES THAT ARE CURRENTLY DEGRADED MUST BE FILLED TO THE EXISTING FLOODPLAIN ELEVATION. THE LOW FLOW CHANNEL SHALL THEN BE CUT OUT OF THE FILL MATERIAL.

2.) DIMENSIONS SHOWN ARE TYPICAL AND VARY WITH THE LOW FLOW CHANNEL WIDTH.

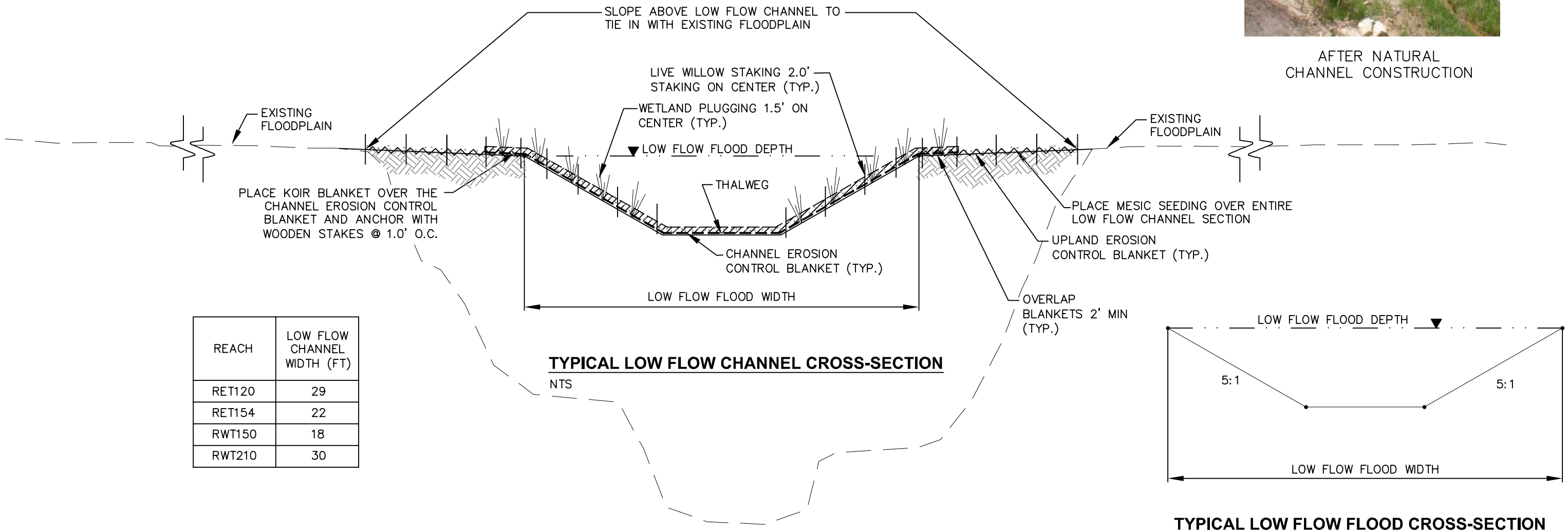
3.) ALL CHANNEL CROSS-SECTIONS SHALL HAVE A LOW FLOW FLOOD WIDTH TO DEPTH RATO (W/D) OF 23.

4.) CHANNEL CAPACITY VARIES WITH THE LOW FLOW CHANNEL WIDTH AND SLOPE.

5.) THESE CROSS-SECTIONS SHALL ONLY BE APPLIED TO "NATURAL CHANNEL DESIGN" REACHES.

BEFORE NATURAL
CHANNEL CONSTRUCTION

AFTER NATURAL
CHANNEL CONSTRUCTION



REACH	LOW FLOW CHANNEL WIDTH (FT)
RET120	29
RET154	22
RWT150	18
RWT210	30

TYPICAL LOW FLOW CHANNEL CROSS-SECTION

NTS

TYPICAL LOW FLOW FLOOD CROSS-SECTION

NTS

NAME: S:\10.122.003 (Falcon DBPS)\DWG\XSEC-RCVANE-RDSexhibit.dwg
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PLOT DATE: Tue Jun 18, 2013 1:46pm

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Colorado Springs, CO 80920
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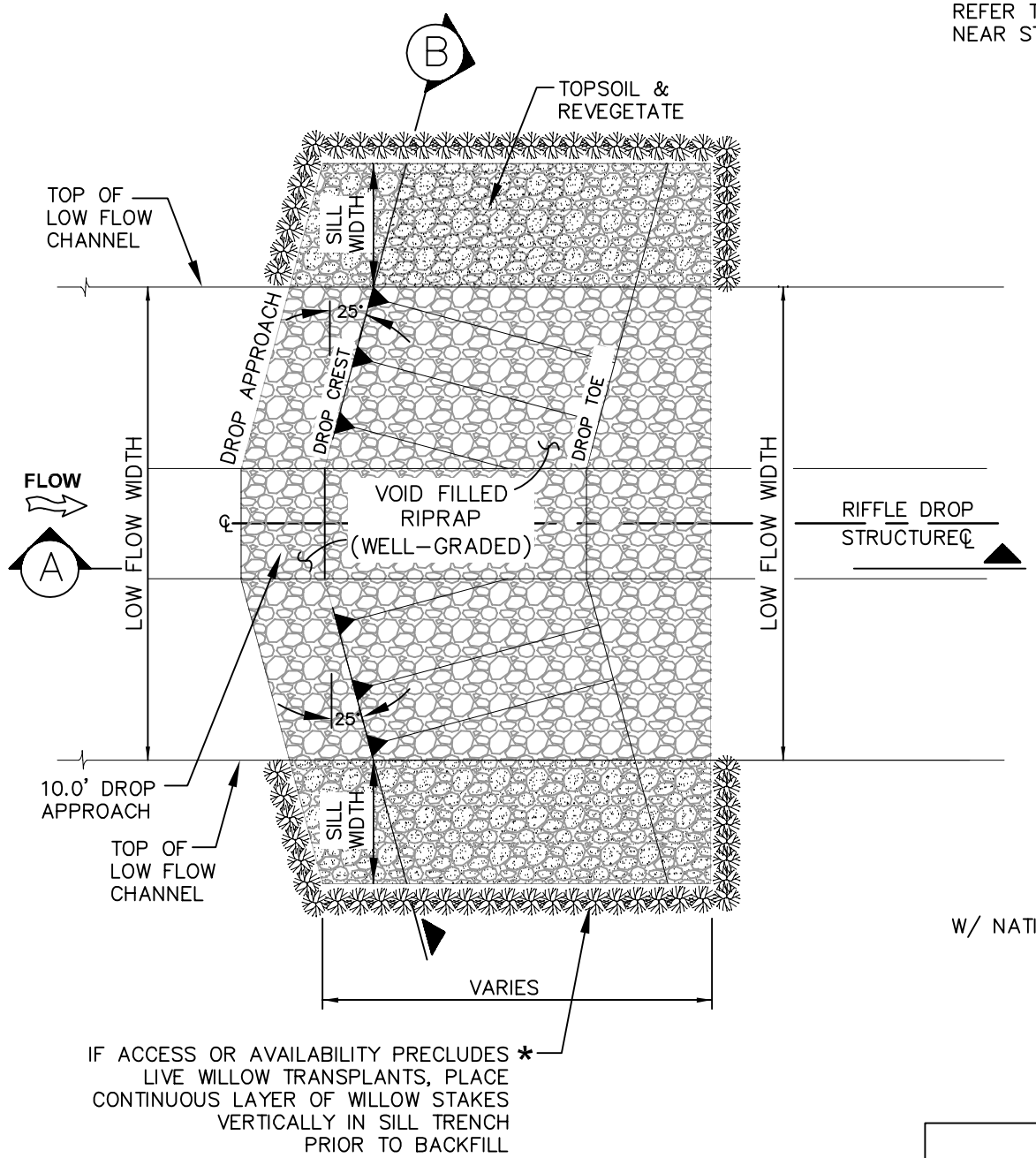
Fax 719-575-0208

TYPICAL NATURAL CHANNEL CROSS-SECTIONS

FOR USE IN NATURAL CHANNEL DESIGN REACHES

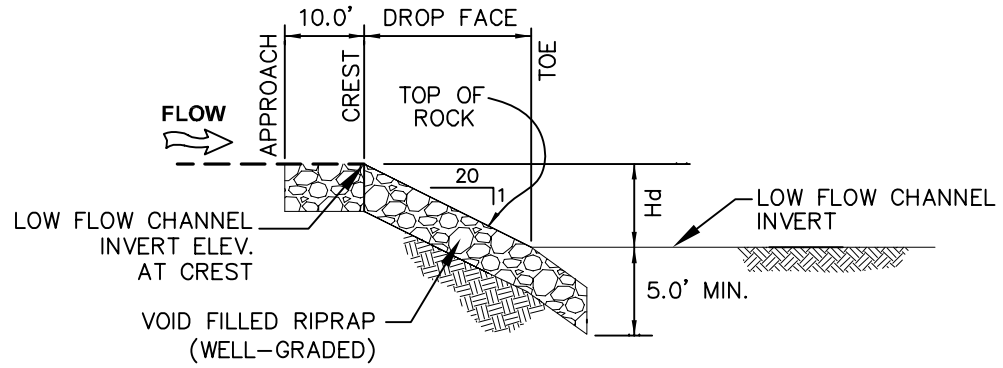
NOT FOR CONSTRUCTION



RIFFLE DROP STRUCTURE PLAN

NTS

NOTE:
REFER TO EROSION CONTROL BLANKET DETAIL FOR BLANKET INSTALLATION NEAR STRUCTURES.

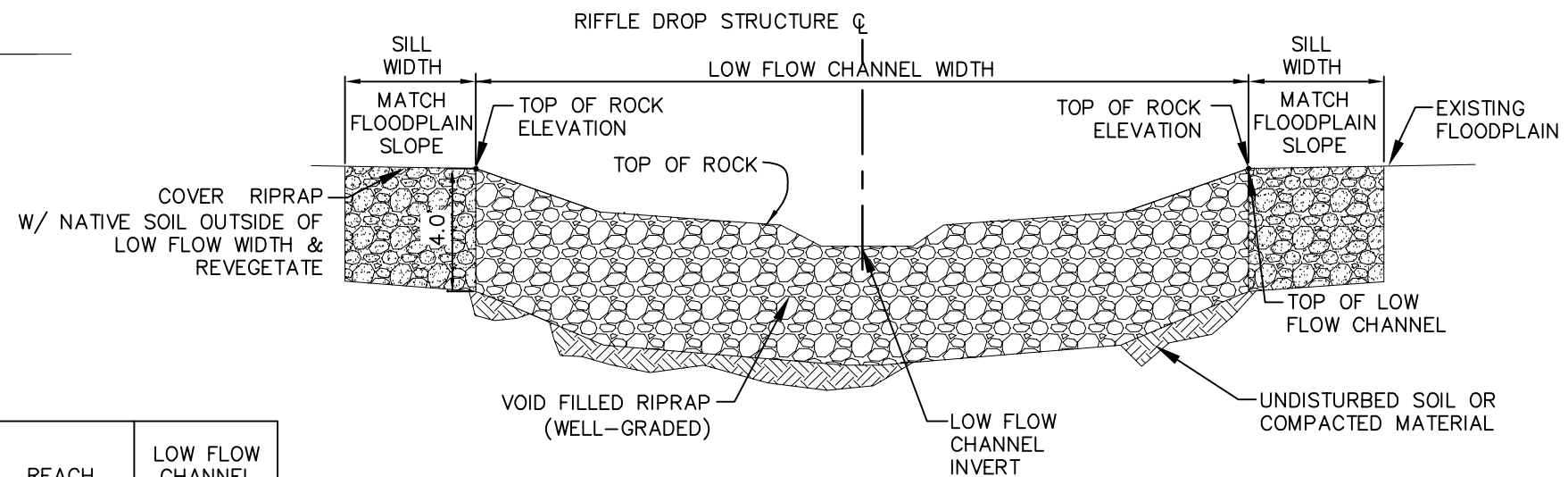


NOTE:
REFER TO EROSION CONTROL BLANKET DETAIL FOR BLANKET INSTALLATION.

RIFFLE DROP STRUCTURE PROFILE A

NTS

REACH	LOW FLOW CHANNEL WIDTH (FT)
RET120	29
RET154	22
RWT150	18
RWT210	30



RIFFLE DROP STRUCTURE SECTION B

NTS

CONSTRUCTED RIFFLE DROP STRUCTURE

TYPICAL RIFFLE DROP STRUCTURE

FOR USE IN NATURAL CHANNEL DESIGN REACHES

NOT FOR CONSTRUCTION

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PLOT DATE: Tue Jun 18, 2013 1:49pm

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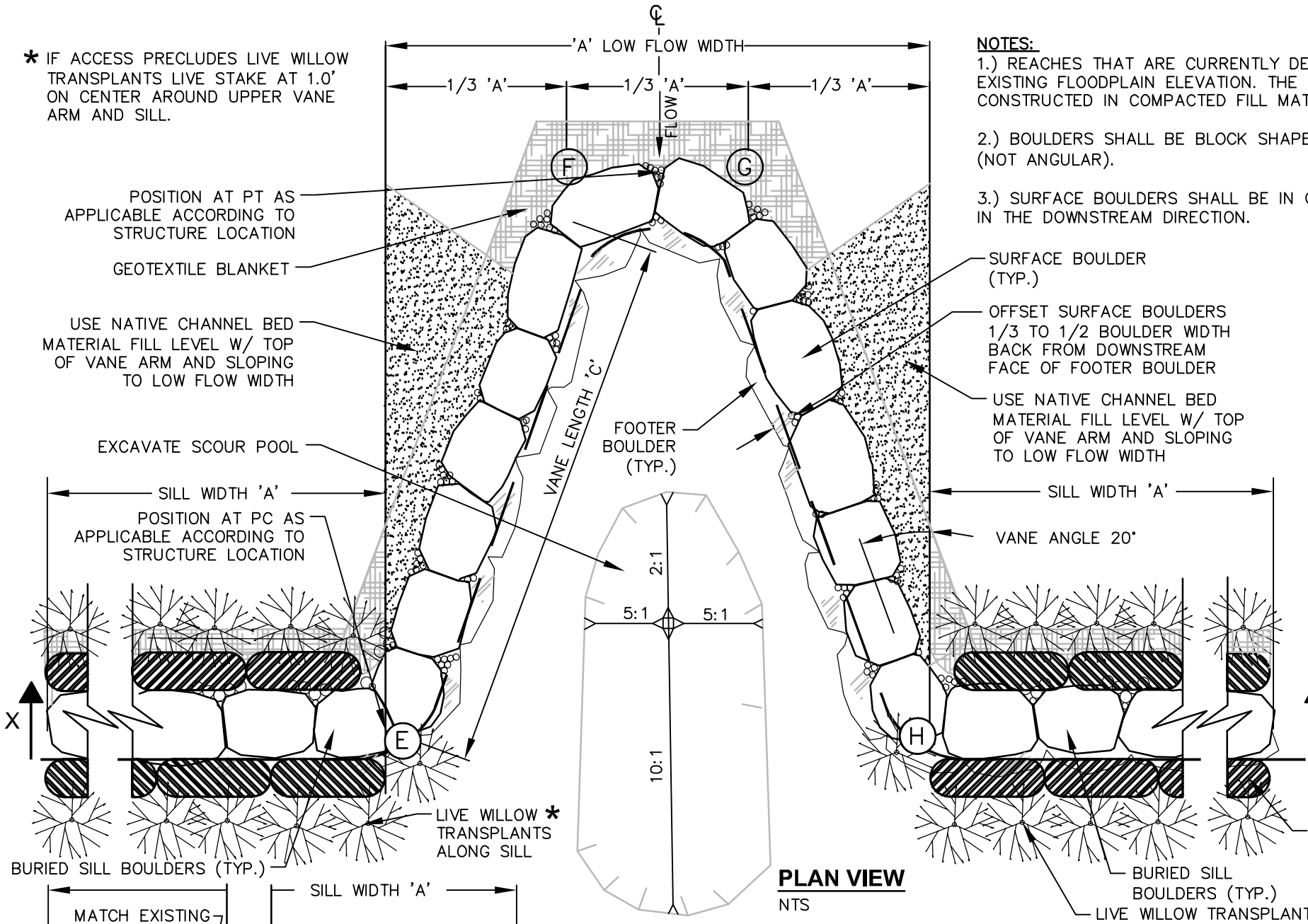
* IF ACCESS PRECLUDES LIVE WILLOW TRANSPLANTS LIVE STAKE AT 1.0' ON CENTER AROUND UPPER VANE ARM AND SILL.



PLAN VIEW
NTS

NOTES:
1.) REACHES THAT ARE CURRENTLY DEGRADED MUST BE FILLED TO THE EXISTING FLOODPLAIN ELEVATION. THE ROCK CROSS VANE SHALL THEN BE CONSTRUCTED IN COMPACTED FILL MATERIAL.

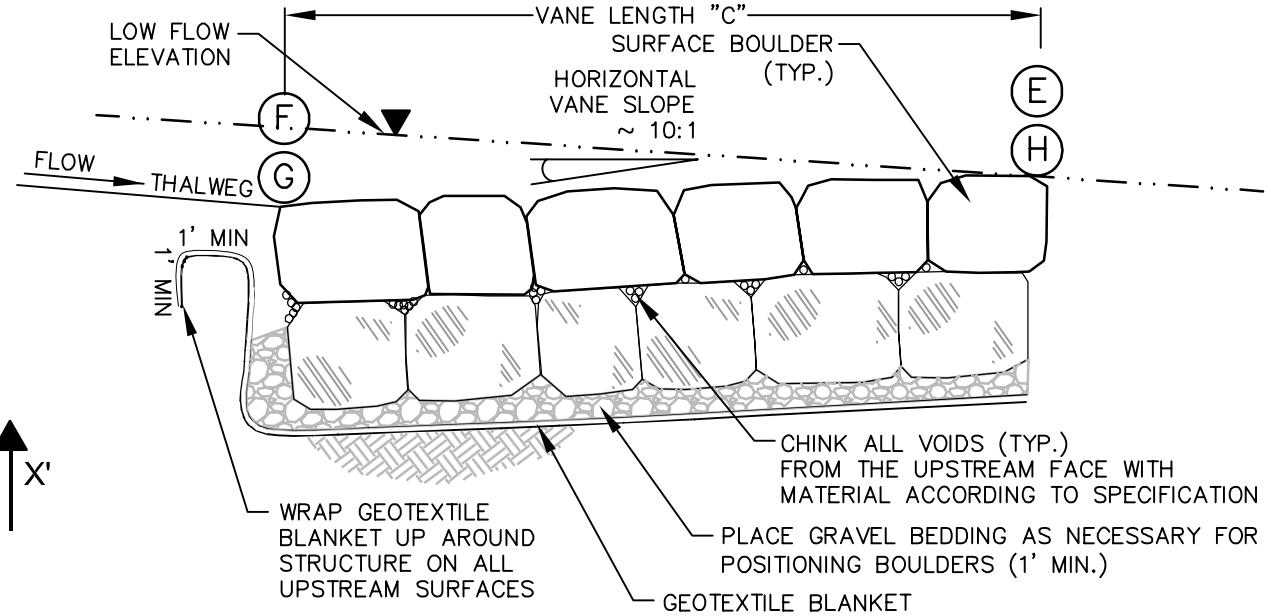
2.) BOULDERS SHALL BE BLOCK SHAPED ACCORDING TO SPECIFICATIONS (NOT ANGULAR).

3.) SURFACE BOULDERS SHALL BE IN COMPRESSION W/ FOOTER BOULDERS IN THE DOWNSTREAM DIRECTION.

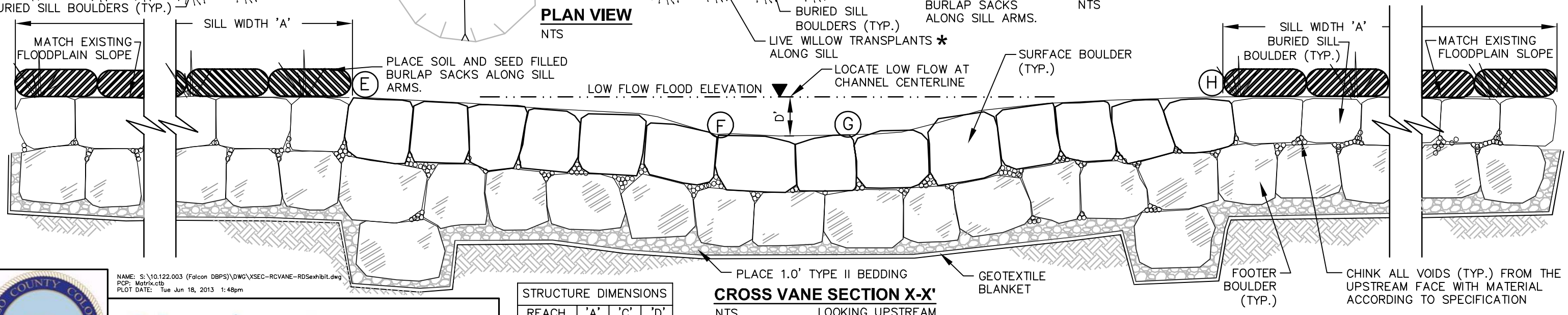
NOTE:
(E) AND (H) LOW FLOW FLOOD ELEVATION

(F) AND (G) MARK VANE ELEVATION AT HEAD OF VANE

CONSTRUCTED ROCK CROSS VANE



CROSS VANE LONGITUDINAL PROFILE ALONG VANE
NTS



CROSS VANE SECTION X-X'
NTS LOOKING UPSTREAM

STRUCTURE DIMENSIONS			
REACH	'A'	'C'	'D'
RET120	29'	26'	1.3'
RET154	22'	20'	1.0'
RWT150	18'	16'	0.8'
RWT210	30'	26'	1.3'

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PLOT DATE: Tue Jun 18, 2013 1:48pm

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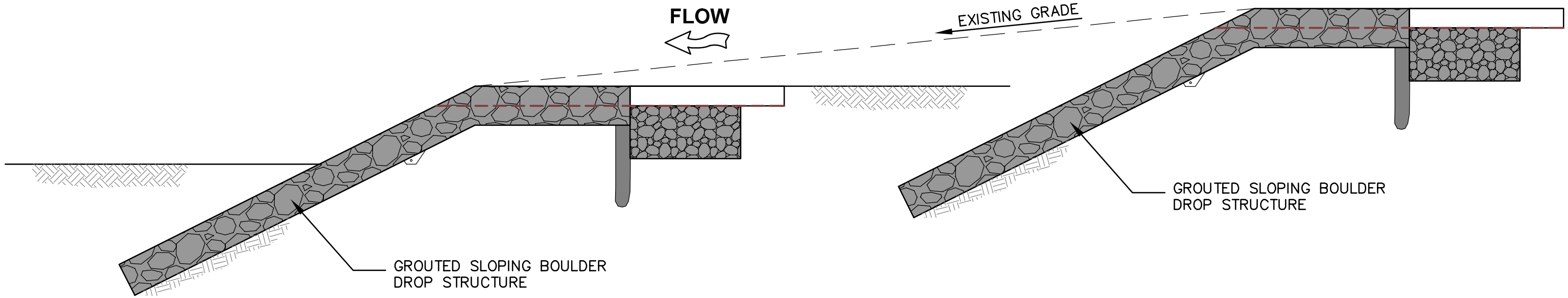
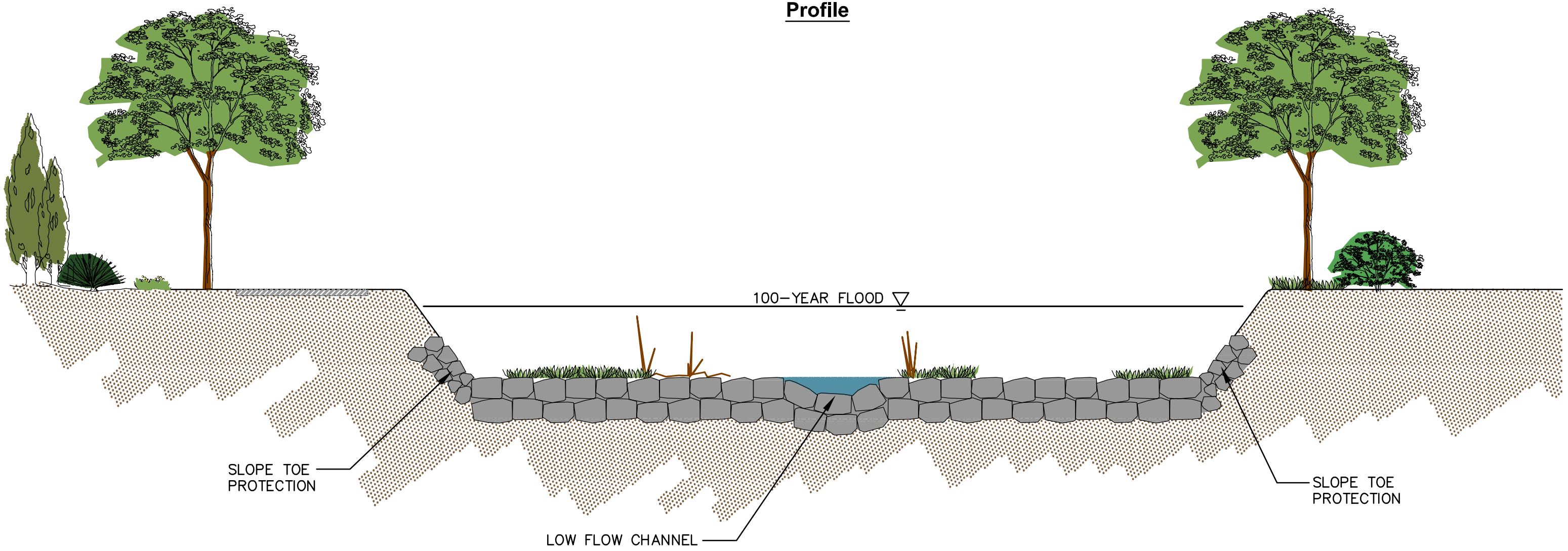
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

TYPICAL ROCK CROSS VANE DETAILS
FOR USE IN NATURAL CHANNEL DESIGN REACHES

NOT FOR CONSTRUCTION



Profile



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PLOT DATE: Wed Dec 21, 2011 3:03pm

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Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

Small Drop Structures with Toe Protection

Figure 5-5

Current Culvert Calculations

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 143 cfs

Maximum Flow: 143 cfs

Table 1 - Summary of Culvert Flows at Crossing: Bent Grass & Meridian Existing Ex

Headwater Elevation (ft)	Total Discharge (cfs)	Ex Culverts - Ex Pipe Capacity Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6928.05	0.00	0.00	0.00	1
6929.11	14.30	14.30	0.00	1
6929.47	28.60	28.60	0.00	1
6929.76	42.90	42.90	0.00	1
6930.02	57.20	57.20	0.00	1
6930.29	71.50	71.50	0.00	1
6930.56	85.80	85.80	0.00	1
6930.86	100.10	100.10	0.00	1
6931.18	114.40	114.40	0.00	1
6931.53	128.70	128.70	0.00	1
6931.90	143.00	143.00	0.00	1
6931.90	143.03	143.03	0.00	Overtopping

Pipe Cap Check

Rating Curve Plot for Crossing: Bent Grass & Meridian Existing Ex Pipe Cap Check

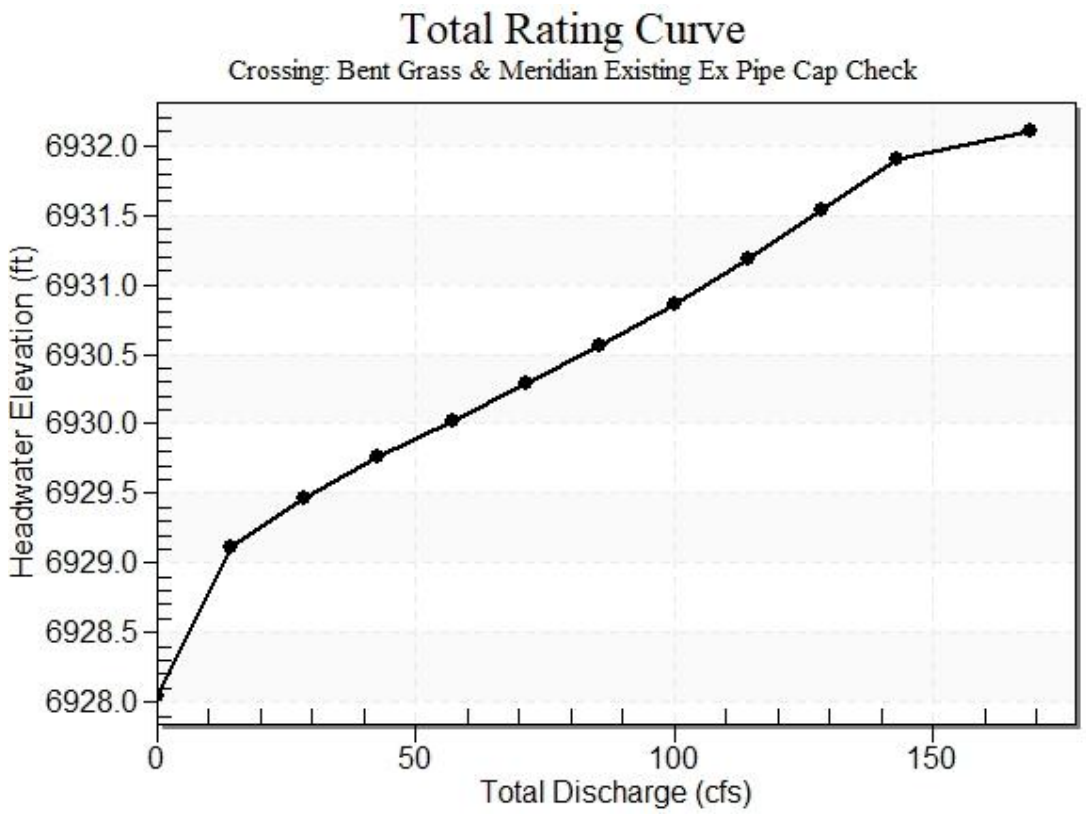


Table 2 - Culvert Summary Table: Ex Culverts - Ex Pipe Capacity

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	6928.05	0.000	0.000	0-NF	0.000	0.000	0.710	0.000	0.000	0.000
14.30	14.30	6929.11	0.753	1.061	1-S1t	0.481	0.558	1.722	1.012	0.851	3.494
28.60	28.60	6929.47	1.094	1.420	1-S1t	0.678	0.802	2.022	1.312	1.446	4.155
42.90	42.90	6929.76	1.388	1.709	1-S1t	0.835	0.995	2.237	1.527	1.997	4.598
57.20	57.20	6930.02	1.659	1.972	1-S1t	0.973	1.161	2.411	1.701	2.570	4.941
71.50	71.50	6930.29	1.913	2.237	1-S1f	1.100	1.303	2.417	1.850	3.213	5.225
85.80	85.80	6930.56	2.161	2.511	1-S1f	1.213	1.438	2.417	1.981	3.855	5.468
100.10	100.10	6930.86	2.415	2.810	1-S1f	1.321	1.562	2.417	2.098	4.498	5.683
114.40	114.40	6931.18	2.681	3.135	4-FFf	1.433	1.677	2.417	2.206	5.140	5.876
128.70	128.70	6931.53	2.968	3.481	4-FFf	1.545	1.783	2.417	2.306	5.783	6.052
143.00	143.00	6931.90	3.280	3.850	4-FFf	1.659	1.882	2.417	2.399	6.425	6.213

****

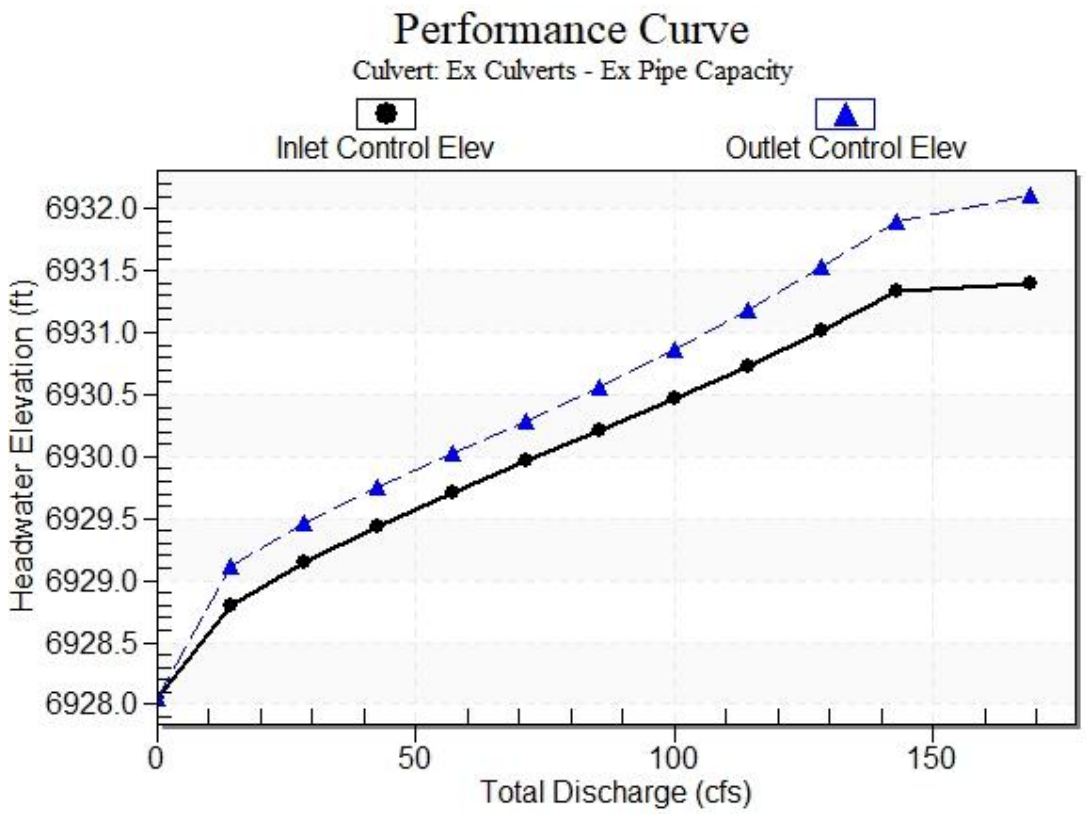
Straight Culvert

Inlet Elevation (invert): 6928.05 ft, Outlet Elevation (invert): 6927.34 ft

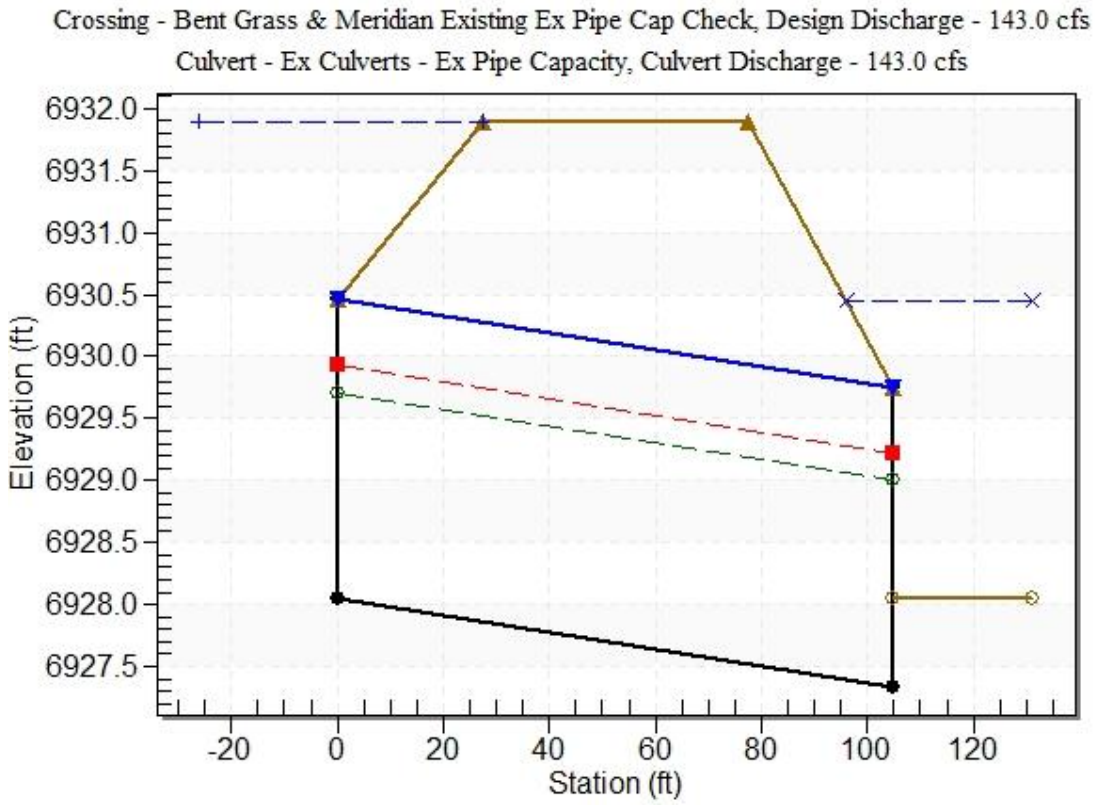
Culvert Length: 105.00 ft, Culvert Slope: 0.0068

****

Culvert Performance Curve Plot: Ex Culverts - Ex Pipe Capacity



Water Surface Profile Plot for Culvert: Ex Culverts - Ex Pipe Capacity



Site Data - Ex Culverts - Ex Pipe Capacity

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6928.05 ft

Outlet Station: 105.00 ft

Outlet Elevation: 6927.34 ft

Number of Barrels: 3

Culvert Data Summary - Ex Culverts - Ex Pipe Capacity

Barrel Shape: Elliptical

Barrel Span: 45.00 in

Barrel Rise: 29.00 in

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Bent Grass & Meridian Existing Ex Pipe Cap Check)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	6928.05	0.00	0.00	0.00	0.00
14.30	6929.06	1.01	3.49	1.10	0.87
28.60	6929.36	1.31	4.16	1.43	0.90
42.90	6929.58	1.53	4.60	1.67	0.93
57.20	6929.75	1.70	4.94	1.86	0.94
71.50	6929.90	1.85	5.22	2.02	0.96
85.80	6930.03	1.98	5.47	2.16	0.97
100.10	6930.15	2.10	5.68	2.29	0.98
114.40	6930.26	2.21	5.88	2.41	0.99
128.70	6930.36	2.31	6.05	2.52	0.99
143.00	6930.45	2.40	6.21	2.62	1.00

Tailwater Channel Data - Bent Grass & Meridian Existing Ex Pipe Cap Check

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0175

Channel Manning's n: 0.0350

Channel Invert Elevation: 6928.05 ft

Roadway Data for Crossing: Bent Grass & Meridian Existing Ex Pipe Cap Check

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 80.00 ft

Crest Elevation: 6931.90 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 270 cfs

Maximum Flow: 850 cfs

Table 1 - Summary of Culvert Flows at Crossing: Bent Grass & Meridian Existing Pr

Headwater Elevation (ft)	Total Discharge (cfs)	Ex Culverts - Pr DBPS Flow Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6928.05	0.00	0.00	0.00	1
6930.55	85.00	85.00	0.00	1
6932.12	170.00	145.81	24.11	8
6932.55	270.00	143.20	126.70	5
6932.78	340.00	140.88	199.06	5
6933.02	425.00	138.39	286.31	4
6933.23	510.00	136.38	373.41	4
6933.43	595.00	134.77	460.09	4
6933.62	680.00	133.49	546.45	4
6933.79	765.00	132.46	632.08	3
6933.96	850.00	131.74	718.07	3
6931.90	143.05	143.05	0.00	Overtopping

DBPS Flows

Rating Curve Plot for Crossing: Bent Grass & Meridian Existing Pr DBPS Flows

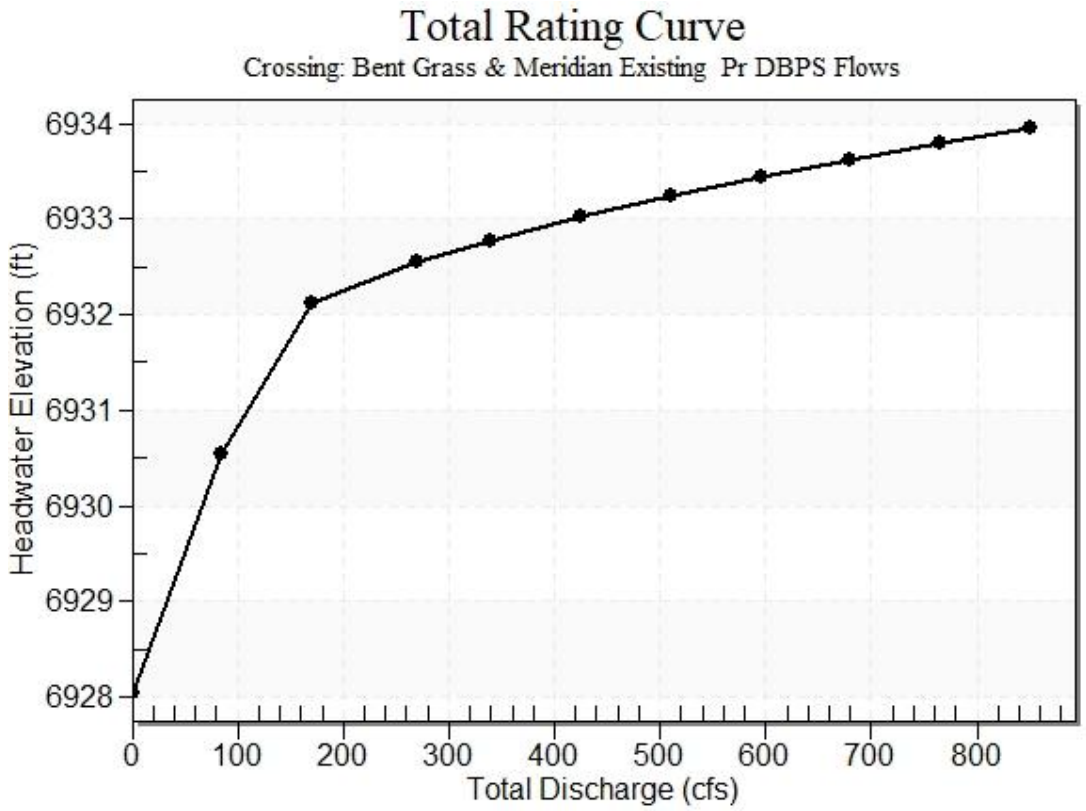


Table 2 - Culvert Summary Table: Ex Culverts - Pr DBPS Flow

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	6928.05	0.000	0.000	0-NF	0.000	0.000	0.710	0.000	0.000	0.000
85.00	85.00	6930.55	2.148	2.496	1-S1f	1.207	1.431	2.417	1.974	3.819	5.456
170.00	145.81	6932.12	3.345	4.068	4-FFf	1.682	1.900	2.417	2.559	6.551	6.488
270.00	143.20	6932.55	3.285	4.499	4-FFf	1.660	1.883	2.417	3.044	6.434	7.283
340.00	140.88	6932.78	3.232	4.727	4-FFf	1.642	1.868	2.417	3.319	6.330	7.715
425.00	138.39	6933.02	3.176	4.968	4-FFf	1.622	1.851	2.417	3.609	6.218	8.158
510.00	136.38	6933.23	3.132	5.184	4-FFf	1.606	1.837	2.417	3.864	6.128	8.539
595.00	134.77	6933.43	3.097	5.383	4-FFf	1.593	1.826	2.417	4.094	6.055	8.874
680.00	133.49	6933.62	3.069	5.569	4-FFf	1.583	1.817	2.417	4.304	5.998	9.175
765.00	132.46	6933.79	3.047	5.744	4-FFf	1.574	1.810	2.417	4.499	5.951	9.449
850.00	131.74	6933.96	3.032	5.912	4-FFf	1.569	1.805	2.417	4.680	5.919	9.702

****

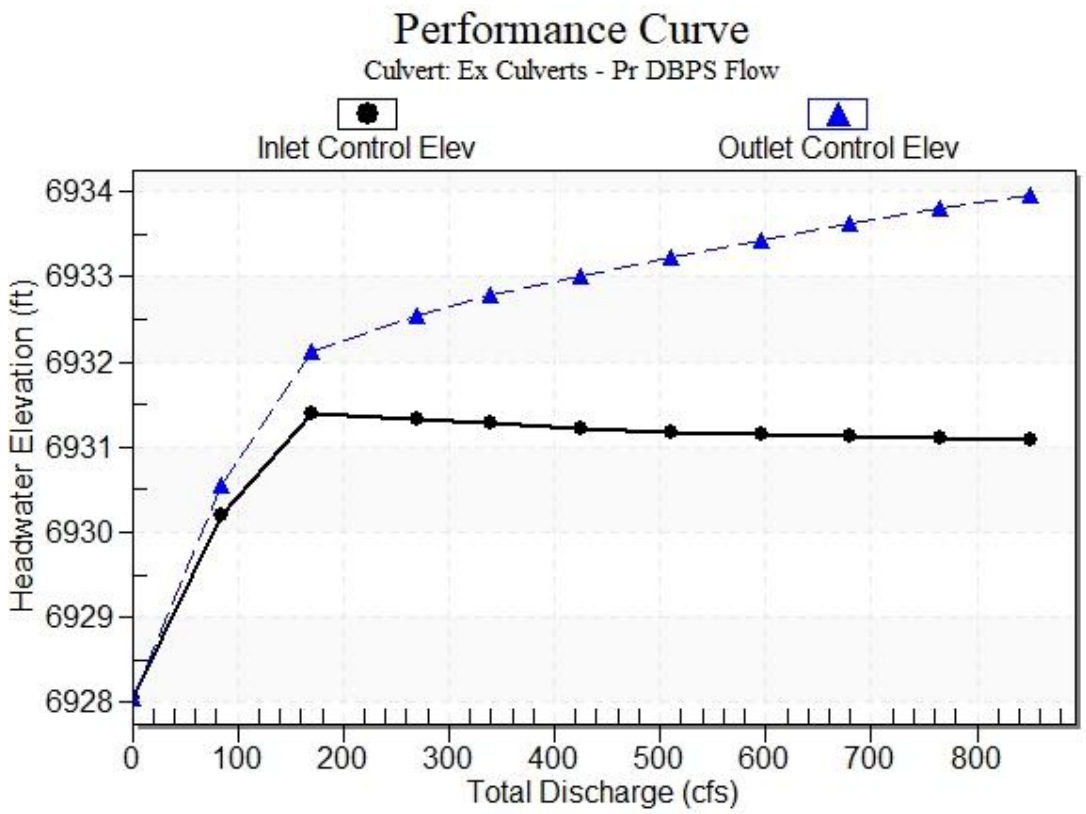
Straight Culvert

Inlet Elevation (invert): 6928.05 ft, Outlet Elevation (invert): 6927.34 ft

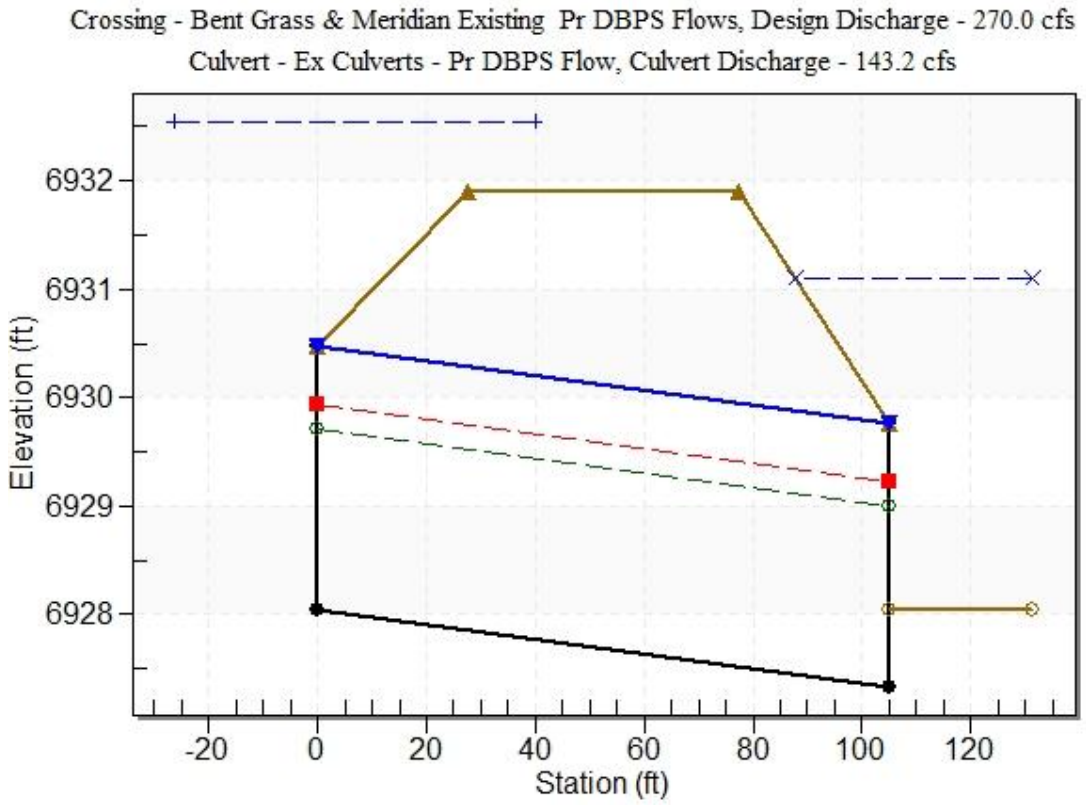
Culvert Length: 105.00 ft, Culvert Slope: 0.0068

****

Culvert Performance Curve Plot: Ex Culverts - Pr DBPS Flow



Water Surface Profile Plot for Culvert: Ex Culverts - Pr DBPS Flow



Site Data - Ex Culverts - Pr DBPS Flow

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6928.05 ft

Outlet Station: 105.00 ft

Outlet Elevation: 6927.34 ft

Number of Barrels: 3

Culvert Data Summary - Ex Culverts - Pr DBPS Flow

Barrel Shape: Elliptical

Barrel Span: 45.00 in

Barrel Rise: 29.00 in

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Bent Grass & Meridian Existing Pr DBPS Flows)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
0.00	6928.05	0.00	0.00	0.00	0.00
85.00	6930.02	1.97	5.46	2.16	0.97
170.00	6930.61	2.56	6.49	2.79	1.01
270.00	6931.09	3.04	7.28	3.32	1.04
340.00	6931.37	3.32	7.72	3.62	1.06
425.00	6931.66	3.61	8.16	3.94	1.07
510.00	6931.91	3.86	8.54	4.22	1.08
595.00	6932.14	4.09	8.87	4.47	1.09
680.00	6932.35	4.30	9.18	4.70	1.10
765.00	6932.55	4.50	9.45	4.91	1.11
850.00	6932.73	4.68	9.70	5.11	1.12

Tailwater Channel Data - Bent Grass & Meridian Existing Pr DBPS Flows

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0175

Channel Manning's n: 0.0350

Channel Invert Elevation: 6928.05 ft

Roadway Data for Crossing: Bent Grass & Meridian Existing Pr DBPS Flows

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 80.00 ft

Crest Elevation: 6931.90 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 25.8 cfs

Design Flow: 255 cfs

Maximum Flow: 275 cfs

Table 1 - Summary of Culvert Flows at Crossing: Add't Culverts for Add't Offsite Flow

Headwater Elevation (ft)	Total Discharge (cfs)	New Ellp Culverts for Offsite Flow Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6929.35	25.80	25.80	0.00	1
6930.04	50.72	50.72	0.00	1
6930.71	75.64	75.64	0.00	1
6931.51	100.56	100.56	0.00	1
6932.03	125.48	114.03	11.26	9
6932.17	150.40	117.27	32.97	6
6932.28	175.32	119.82	55.38	5
6932.38	200.24	120.43	79.53	4
6932.47	225.16	119.77	105.23	4
6932.58	255.00	118.96	135.95	4
6932.65	275.00	118.48	156.17	3
6931.90	110.74	110.74	0.00	Overtopping

Rating Curve Plot for Crossing: Add't Culverts for Add't Offsite Flow

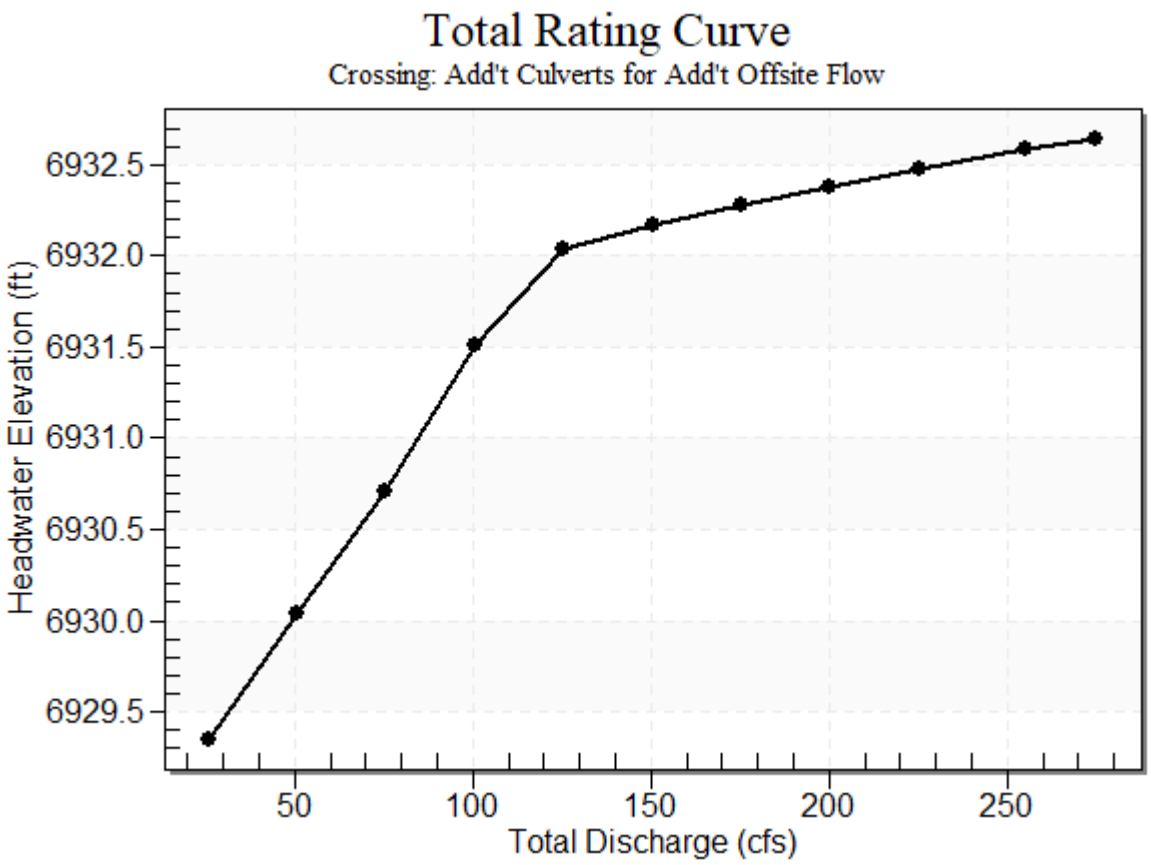


Table 2 - Culvert Summary Table: New Ellp Culverts for Offsite Flow

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25.80	25.80	6929.35	1.303	0.658	1-JS1t	0.792	0.941	1.262	1.262	3.305	4.049
50.72	50.72	6930.04	1.993	1.327	1-S2n	1.139	1.348	1.150	1.626	7.371	4.795
75.64	75.64	6930.71	2.663	2.093	5-S2n	1.426	1.670	1.441	1.889	8.261	5.299
100.56	100.56	6931.51	3.464	3.007	5-S2n	1.723	1.932	1.737	2.102	8.884	5.690
125.48	114.03	6932.03	3.982	3.650	5-JS1t	1.905	2.046	2.284	2.284	7.861	6.014
150.40	117.27	6932.17	4.116	3.930	4-FFf	1.955	2.070	2.417	2.445	7.904	6.292
175.32	119.82	6932.28	4.225	4.171	4-FFf	1.998	2.088	2.417	2.589	8.075	6.538
200.24	120.43	6932.38	4.252	4.327	4-FFf	2.009	2.093	2.417	2.721	8.117	6.759
225.16	119.77	6932.47	4.223	4.424	4-FFf	1.997	2.088	2.417	2.844	8.072	6.960
255.00	118.96	6932.58	4.188	4.529	4-FFf	1.982	2.082	2.417	2.980	8.018	7.180
275.00	118.48	6932.65	4.168	4.596	4-FFf	1.974	2.079	2.417	3.065	7.985	7.317

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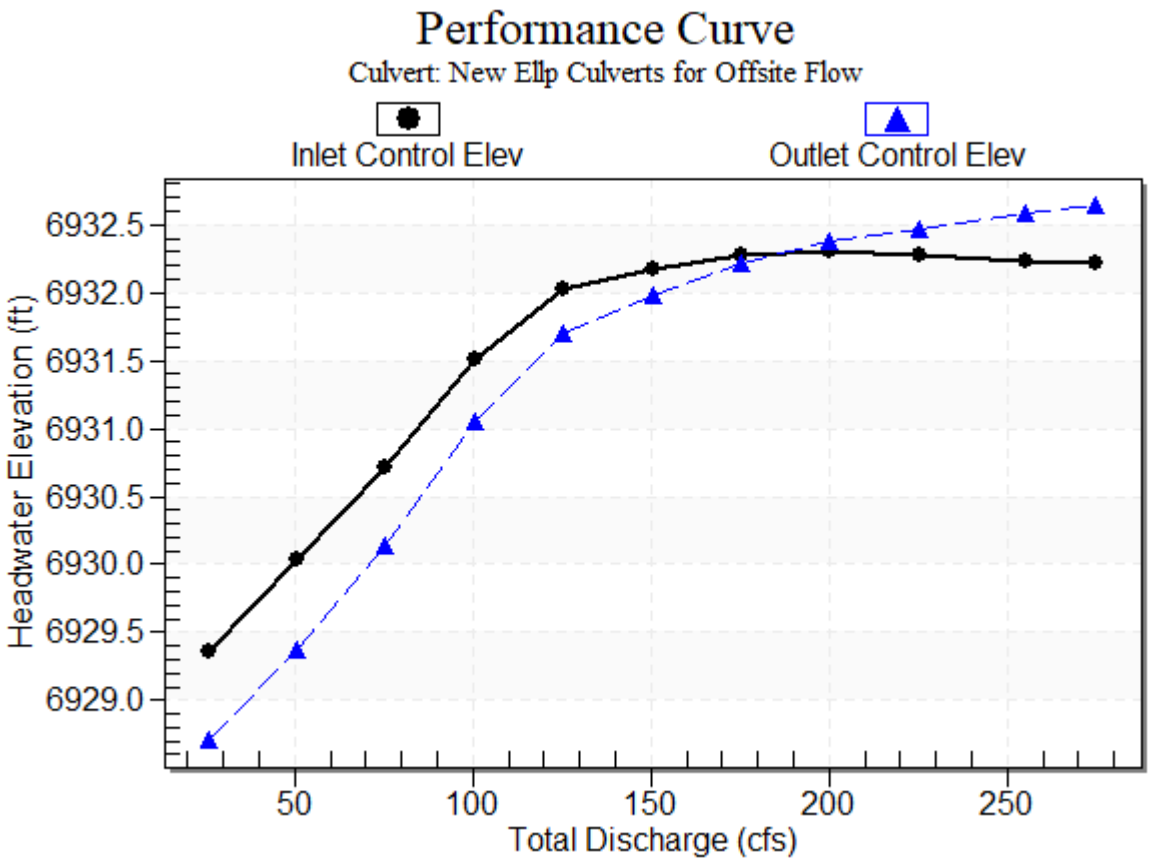
Straight Culvert

Inlet Elevation (invert): 6928.05 ft, Outlet Elevation (invert): 6927.34 ft

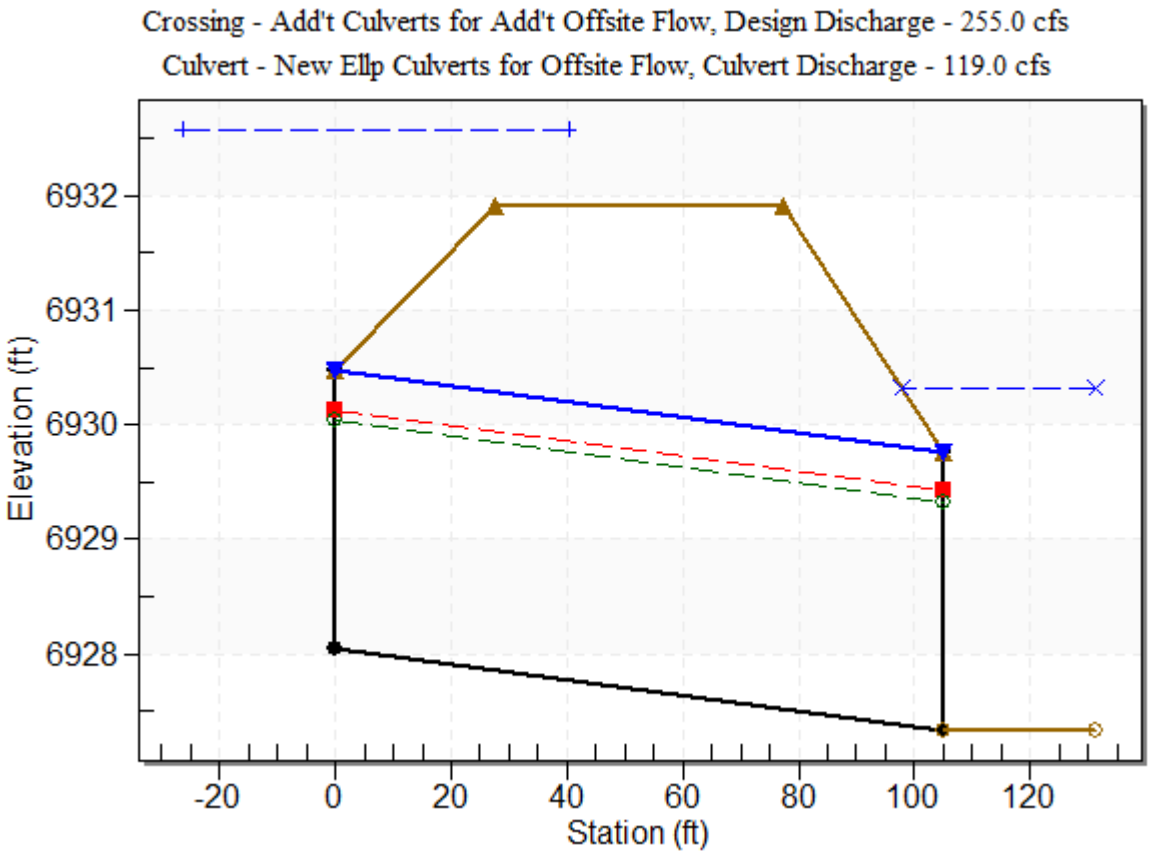
Culvert Length: 105.00 ft, Culvert Slope: 0.0068

****

Culvert Performance Curve Plot: New Ellp Culverts for Offsite Flow



Water Surface Profile Plot for Culvert: New Ellp Culverts for Offsite Flow



Site Data - New Ellp Culverts for Offsite Flow

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6928.05 ft

Outlet Station: 105.00 ft

Outlet Elevation: 6927.34 ft

Number of Barrels: 2

Culvert Data Summary - New Ellp Culverts for Offsite Flow

Barrel Shape: Elliptical

Barrel Span: 45.00 in

Barrel Rise: 29.00 in

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Add't Culverts for Add't

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
25.80	6928.60	1.26	4.05	1.38	0.90
50.72	6928.97	1.63	4.79	1.78	0.94
75.64	6929.23	1.89	5.30	2.06	0.96
100.56	6929.44	2.10	5.69	2.30	0.98
125.48	6929.62	2.28	6.01	2.49	0.99
150.40	6929.78	2.44	6.29	2.67	1.00
175.32	6929.93	2.59	6.54	2.83	1.01
200.24	6930.06	2.72	6.76	2.97	1.02
225.16	6930.18	2.84	6.96	3.11	1.03
255.00	6930.32	2.98	7.18	3.25	1.04
275.00	6930.41	3.07	7.32	3.35	1.04

Tailwater Channel Data - Add't Culverts for Add't Offsite Flow

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0175

Channel Manning's n: 0.0350

Channel Invert Elevation: 6927.34 ft

Roadway Data for Crossing: Add't Culverts for Add't Offsite Flow

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 80.00 ft

Crest Elevation: 6931.90 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

HY-8 Culvert Analysis Report

Existing Culverts @ Owl Place

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 248.6 cfs

Design Flow: 850 cfs

Maximum Flow: 925 cfs

Table 1 - Summary of Culvert Flows at Crossing: Owl Place - Ex Culvert Fut DBPS

Headwater Elevation (ft)	Total Discharge (cfs)	Ex Twin 36-IN CMPs Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6913.60	248.60	109.05	139.42	7
6913.77	316.24	111.86	204.26	5
6913.92	383.88	114.62	268.95	4
6914.07	451.52	116.94	334.34	4
6914.20	519.16	118.93	400.05	4
6914.33	586.80	121.04	465.66	4
6914.45	654.44	122.77	531.61	4
6914.57	722.08	123.99	597.68	3
6914.69	789.72	124.68	664.77	3
6914.79	850.00	125.03	724.82	3
6914.91	925.00	125.07	799.85	3
6913.00	97.95	97.95	0.00	Overtopping

Flow (850 cfs)

Rating Curve Plot for Crossing: Owl Place - Ex Culvert Fut DBPS Flow (850 cfs)

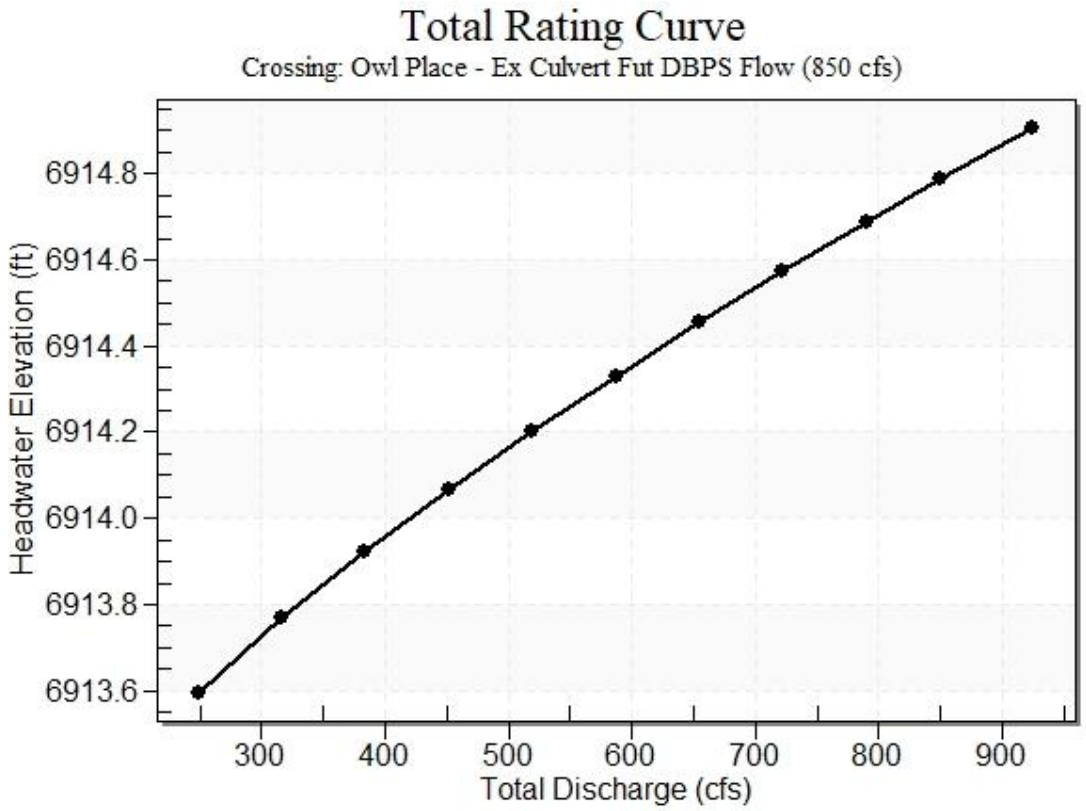


Table 2 - Culvert Summary Table: Ex Twin 36-IN CMPs

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
248.60	109.05	6913.60	5.096	5.078	7-M2c	3.000	2.397	2.397	2.361	9.005	4.055
316.24	111.86	6913.77	5.258	5.271	7-M2c	3.000	2.425	2.425	2.584	9.136	4.306
383.88	114.62	6913.92	5.423	5.421	7-M2c	3.000	2.452	2.452	2.779	9.267	4.520
451.52	116.94	6914.07	5.565	5.567	7-M2c	3.000	2.474	2.474	2.953	9.379	4.707
519.16	118.93	6914.20	5.689	5.702	7-M2c	3.000	2.492	2.492	3.112	9.476	4.874
586.80	121.04	6914.33	5.824	5.831	7-M2c	3.000	2.511	2.511	3.258	9.579	5.026
654.44	122.77	6914.45	5.937	5.954	7-M2t	3.000	2.526	2.624	3.394	9.362	5.165
722.08	123.99	6914.57	6.017	6.071	7-M2t	3.000	2.536	2.752	3.522	9.130	5.293
789.72	124.68	6914.69	6.063	6.187	7-M2t	3.000	2.542	2.872	3.642	8.951	5.413
850.00	125.03	6914.79	6.087	6.287	7-M2t	3.000	2.545	2.974	3.744	8.856	5.513
925.00	125.07	6914.91	6.090	6.408	4-FFf	3.000	2.545	3.000	3.864	8.847	5.631

****

Straight Culvert

Inlet Elevation (invert): 6908.50 ft, Outlet Elevation (invert): 6908.00 ft

Culvert Length: 50.50 ft, Culvert Slope: 0.0099

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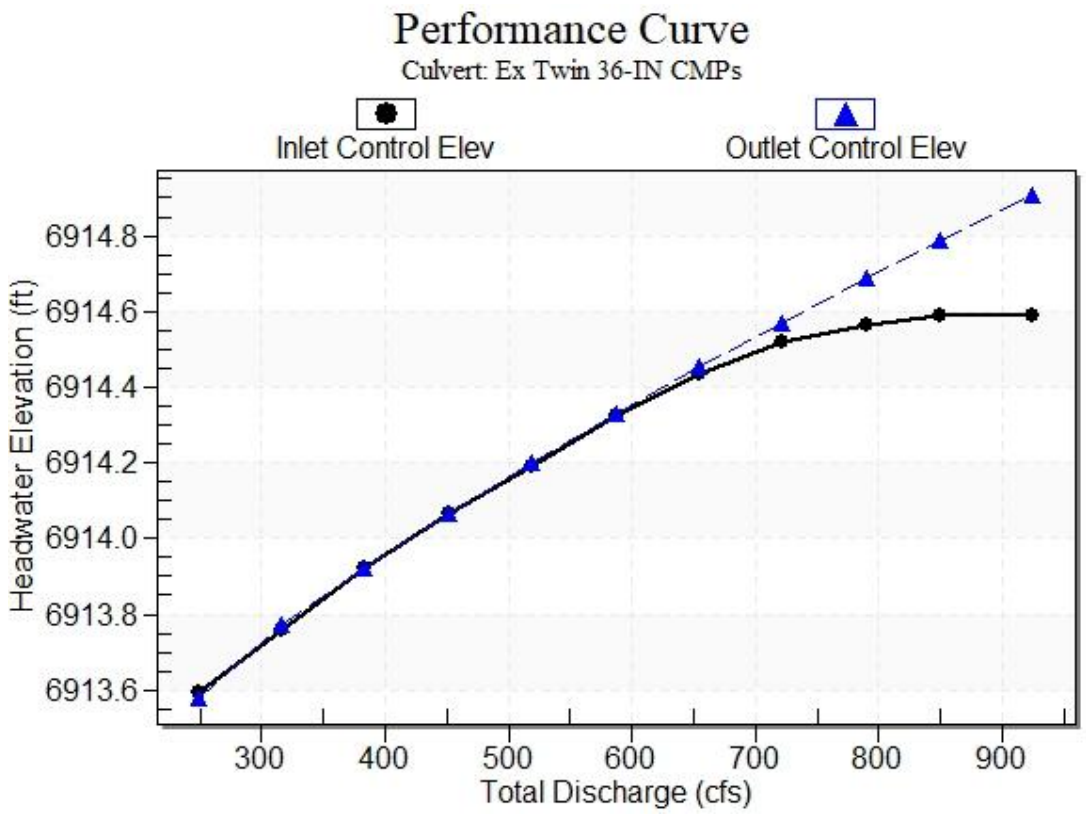
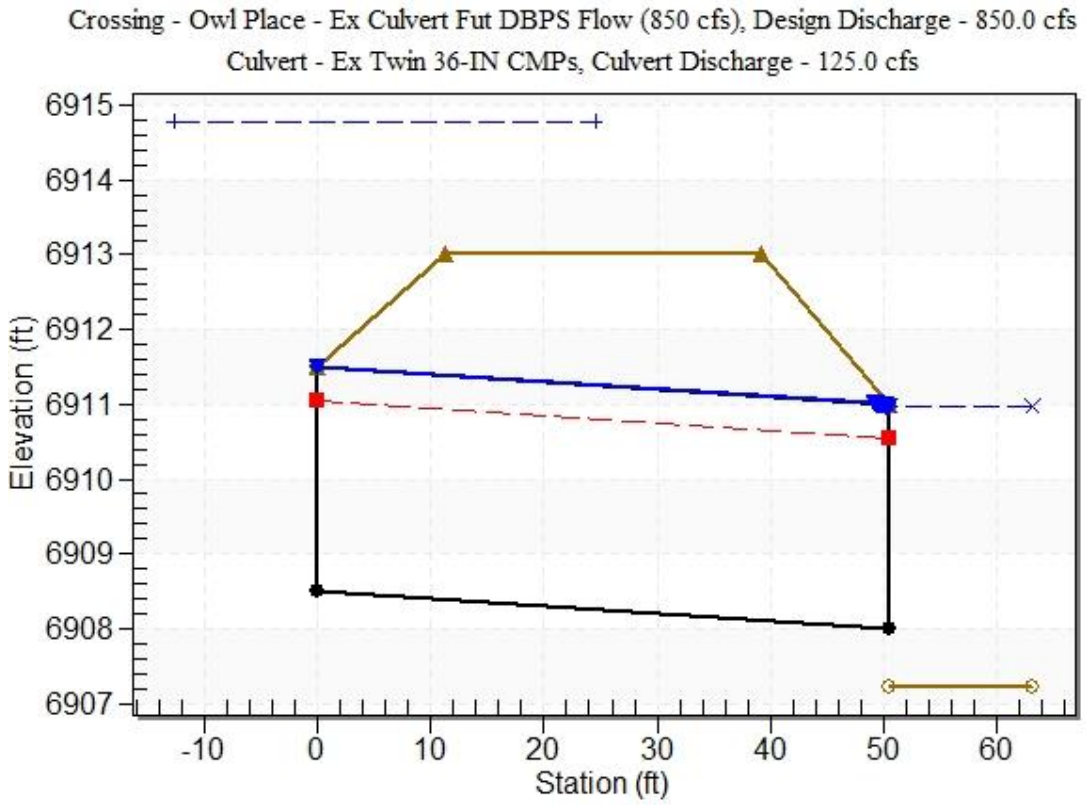
Culvert Performance Curve Plot: Ex Twin 36-IN CMPs



Water Surface Profile Plot for Culvert: Ex Twin 36-IN CMPs



Site Data - Ex Twin 36-IN CMPs

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6908.50 ft

Outlet Station: 50.50 ft

Outlet Elevation: 6908.00 ft

Number of Barrels: 2

Culvert Data Summary - Ex Twin 36-IN CMPs

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Owl Place - Ex Culvert Fut DBPS Flow (850 cfs))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
248.60	6909.59	2.36	4.05	2.21	0.66
316.24	6909.81	2.58	4.31	2.42	0.67
383.88	6910.01	2.78	4.52	2.60	0.68
451.52	6910.18	2.95	4.71	2.76	0.68
519.16	6910.34	3.11	4.87	2.91	0.69
586.80	6910.49	3.26	5.03	3.05	0.69
654.44	6910.62	3.39	5.16	3.18	0.70
722.08	6910.75	3.52	5.29	3.30	0.70
789.72	6910.87	3.64	5.41	3.41	0.71
850.00	6910.97	3.74	5.51	3.50	0.71
925.00	6911.09	3.86	5.63	3.62	0.71

Tailwater Channel Data - Owl Place - Ex Culvert Fut DBPS Flow (850 cfs)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 11.00 (_:1)

Channel Slope: 0.0150

Channel Manning's n: 0.0500

Channel Invert Elevation: 6907.23 ft

Roadway Data for Crossing: Owl Place - Ex Culvert Fut DBPS Flow (850 cfs)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 6913.00 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Future Culvert Calculations

HY-8 Culvert Analysis Report

Future Culvert @ Bent Grass Meadows Drive/Meridian Road

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 298 cfs

Design Flow: 850 cfs

Maximum Flow: 925 cfs

Table 1 - Summary of Culvert Flows at Crossing: Bent Grass & Meridian Future - Fut

Headwater Elevation (ft)	Total Discharge (cfs)	Future Culvert - Fut Flow Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6927.25	298.00	298.00	0.00	1
6927.54	360.70	360.70	0.00	1
6927.82	423.40	423.40	0.00	1
6928.08	486.10	486.10	0.00	1
6928.34	548.80	548.80	0.00	1
6928.58	611.50	611.50	0.00	1
6928.83	674.20	674.20	0.00	1
6929.08	736.90	736.90	0.00	1
6929.33	799.60	799.60	0.00	1
6929.53	850.00	850.00	0.00	1
6929.85	925.00	925.00	0.00	1
6931.50	1258.18	1258.18	0.00	Overtopping

DBPS Flow (850 cfs)

Rating Curve Plot for Crossing: Bent Grass & Meridian Future - Fut DBPS Flow (850 cfs)

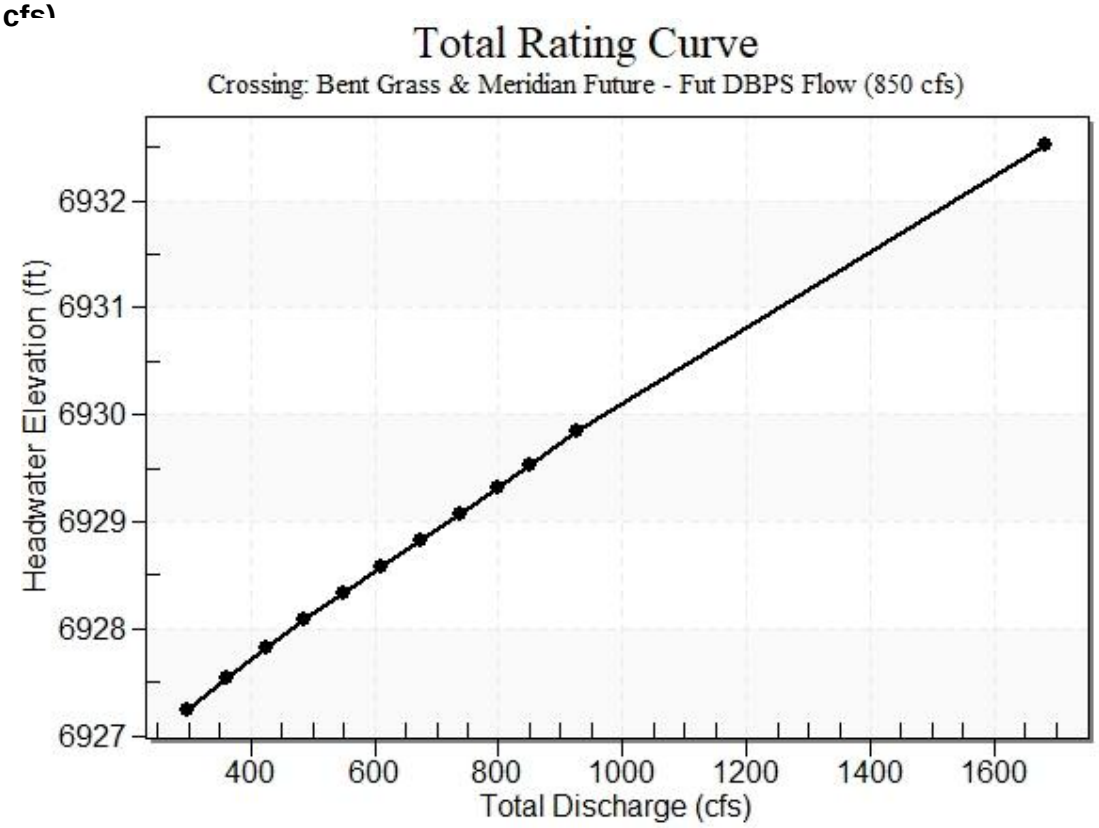


Table 2 - Culvert Summary Table: Future Culvert - Fut Flow

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
298.00	298.00	6927.25	2.138	1.250	1-S2n	1.356	1.391	1.356	0.729	6.866	7.728
360.70	360.70	6927.54	2.435	1.504	1-S2n	1.533	1.580	1.535	0.816	7.343	8.298
423.40	423.40	6927.82	2.712	1.759	1-S2n	1.699	1.758	1.702	0.897	7.773	8.808
486.10	486.10	6928.08	2.975	2.017	1-S2n	1.858	1.928	1.861	0.973	8.161	9.267
548.80	548.80	6928.34	3.228	2.281	1-S2n	2.010	2.090	2.015	1.045	8.513	9.688
611.50	611.50	6928.58	3.475	2.551	1-S2n	2.158	2.247	2.163	1.114	8.835	10.078
674.20	674.20	6928.83	3.719	2.828	1-S2n	2.301	2.398	2.307	1.180	9.133	10.441
736.90	736.90	6929.08	3.965	3.113	1-S2n	2.440	2.544	2.447	1.243	9.412	10.781
799.60	799.60	6929.33	4.216	3.406	5-S2n	2.576	2.687	2.583	1.304	9.673	11.102
850.00	850.00	6929.53	4.422	3.647	5-S2n	2.683	2.798	2.691	1.352	9.872	11.347
925.00	925.00	6929.85	4.740	4.018	5-S2n	2.839	2.961	2.848	1.420	10.151	11.695

****

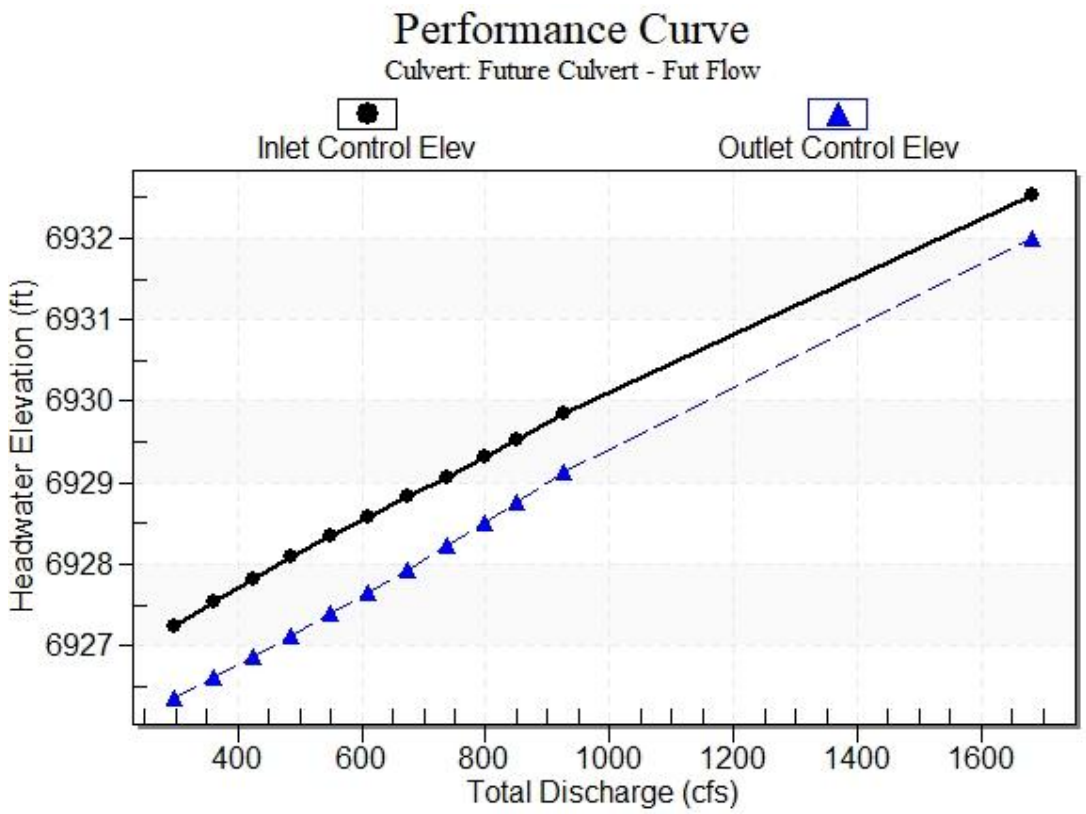
Straight Culvert

Inlet Elevation (invert): 6925.11 ft, Outlet Elevation (invert): 6924.83 ft

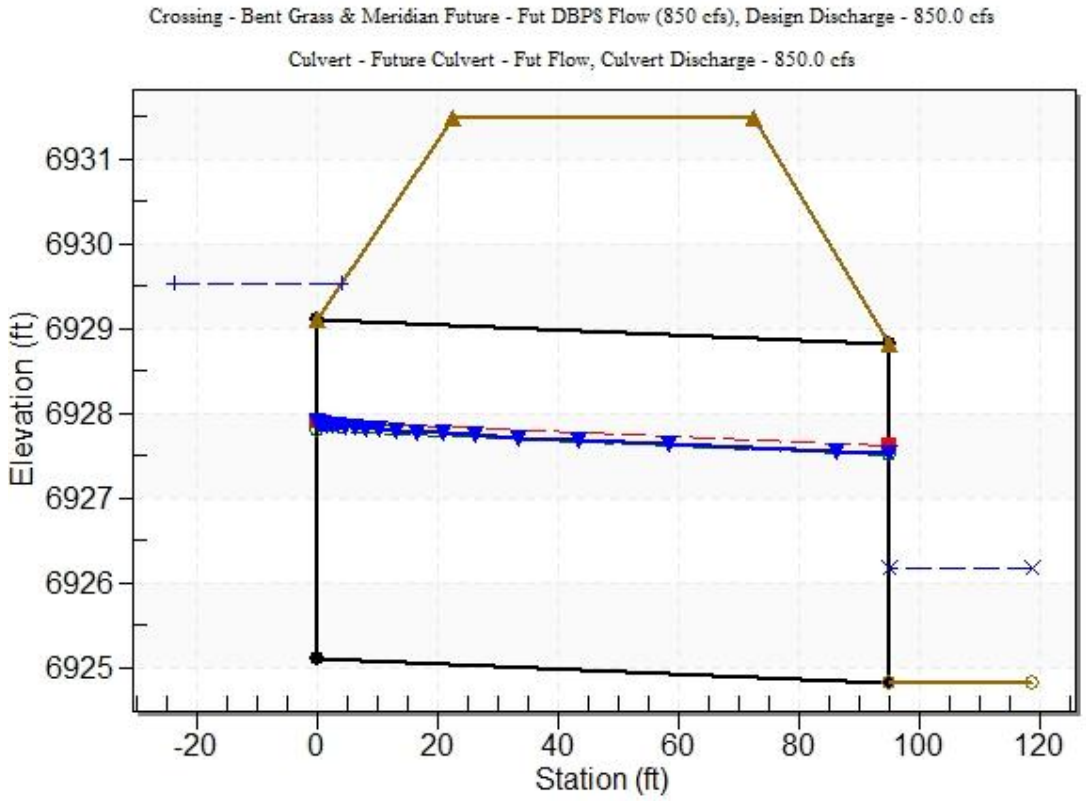
Culvert Length: 95.00 ft, Culvert Slope: 0.0029

****

Culvert Performance Curve Plot: Future Culvert - Fut Flow



Water Surface Profile Plot for Culvert: Future Culvert - Fut Flow



Site Data - Future Culvert - Fut Flow

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6925.11 ft

Outlet Station: 95.00 ft

Outlet Elevation: 6924.83 ft

Number of Barrels: 2

Culvert Data Summary - Future Culvert - Fut Flow

Barrel Shape: Concrete Box

Barrel Span: 16.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Bent Grass & Meridian

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
298.00	6925.56	0.73	7.73	2.48	1.64
360.70	6925.65	0.82	8.30	2.78	1.67
423.40	6925.73	0.90	8.81	3.05	1.69
486.10	6925.80	0.97	9.27	3.31	1.71
548.80	6925.88	1.05	9.69	3.56	1.73
611.50	6925.94	1.11	10.08	3.79	1.75
674.20	6926.01	1.18	10.44	4.01	1.77
736.90	6926.07	1.24	10.78	4.23	1.78
799.60	6926.13	1.30	11.10	4.44	1.79
850.00	6926.18	1.35	11.35	4.60	1.80
925.00	6926.25	1.42	11.70	4.83	1.82

Future - Fut DBPS Flow (850 cfs))

Tailwater Channel Data - Bent Grass & Meridian Future - Fut DBPS Flow (850 cfs)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 50.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0545

Channel Manning's n: 0.0350

Channel Invert Elevation: 6924.83 ft

Roadway Data for Crossing: Bent Grass & Meridian Future - Fut DBPS Flow (850 cfs)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 80.00 ft

Crest Elevation: 6931.50 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

HY-8 Culvert Analysis Report

Future Culvert @ Owl Place

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 248.6 cfs

Design Flow: 850 cfs

Maximum Flow: 925 cfs

Table 1 - Summary of Culvert Flows at Crossing: Owl Place - Fut RCBC FutDBPS

Headwater Elevation (ft)	Total Discharge (cfs)	Fut 20 X 4 RCBC Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6911.34	248.60	248.60	0.00	1
6911.83	316.24	316.24	0.00	1
6912.30	383.88	383.88	0.00	1
6912.76	451.52	451.52	0.00	1
6913.24	519.16	519.16	0.00	1
6913.75	586.80	586.80	0.00	1
6914.29	654.44	654.44	0.00	1
6914.88	722.08	722.08	0.00	1
6915.52	789.72	789.72	0.00	1
6916.14	850.00	850.00	0.00	1
6916.99	925.00	925.00	0.00	1
6917.00	926.05	926.05	0.00	Overtopping

Flow (850 cfs)

Rating Curve Plot for Crossing: Owl Place - Fut RCBC FutDBPS Flow (850 cfs)

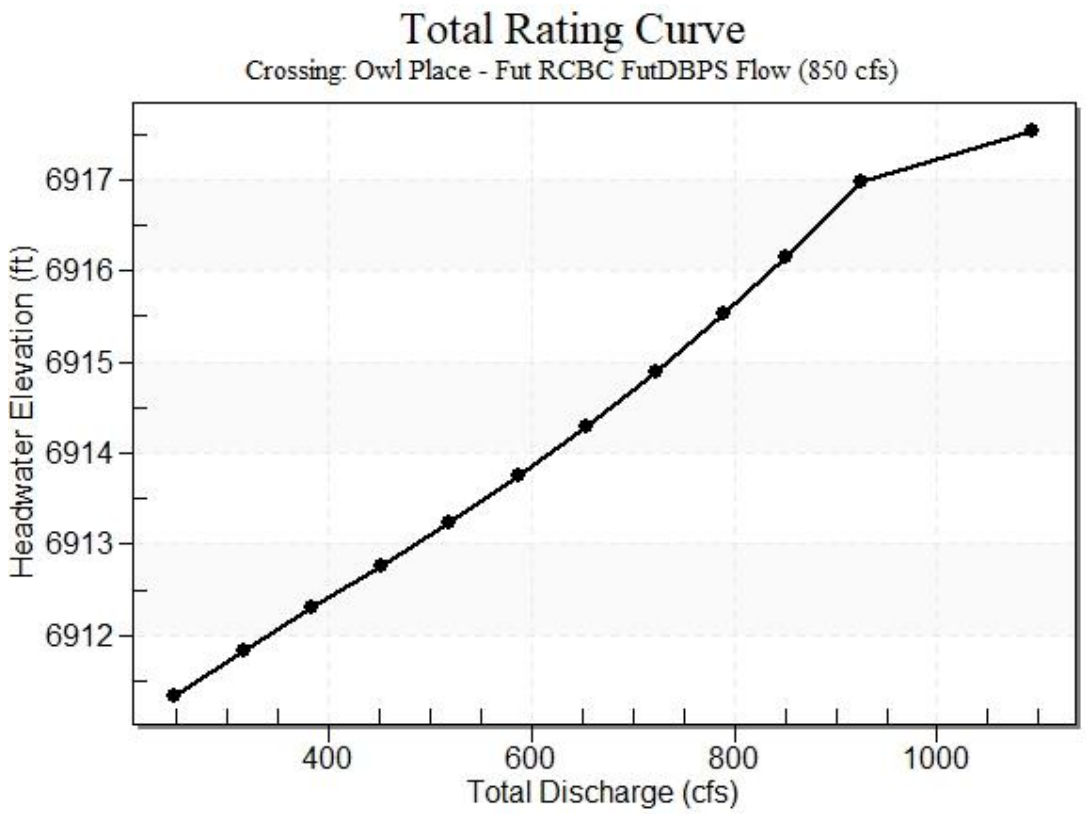


Table 2 - Culvert Summary Table: Fut 20 X 4 RCBC

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
248.60	248.60	6911.34	2.843	2.102	1-JS1t	1.044	1.687	2.361	2.361	5.265	4.055
316.24	316.24	6911.83	3.331	2.474	1-S2n	1.214	1.980	1.476	2.584	10.714	4.306
383.88	383.88	6912.30	3.797	2.853	1-S2n	1.371	2.253	1.700	2.779	11.287	4.520
451.52	451.52	6912.76	4.262	3.248	5-S2n	1.520	2.511	1.915	2.953	11.788	4.707
519.16	519.16	6913.24	4.740	3.662	5-S2n	1.661	2.756	2.122	3.112	12.232	4.874
586.80	586.80	6913.75	5.245	4.100	5-S2n	1.795	2.990	2.321	3.258	12.639	5.026
654.44	654.44	6914.29	5.789	4.564	5-S2n	1.925	3.216	2.514	3.394	13.018	5.165
722.08	722.08	6914.88	6.379	5.054	5-S2n	2.051	3.434	2.702	3.522	13.362	5.293
789.72	789.72	6915.52	7.022	5.754	5-S2n	2.173	3.645	2.885	3.642	13.688	5.413
850.00	850.00	6916.14	7.644	6.231	5-S2n	2.279	3.828	3.044	3.744	13.961	5.513
925.00	925.00	6916.99	8.487	6.835	5-S2n	2.407	4.000	3.238	3.864	14.285	5.631

****

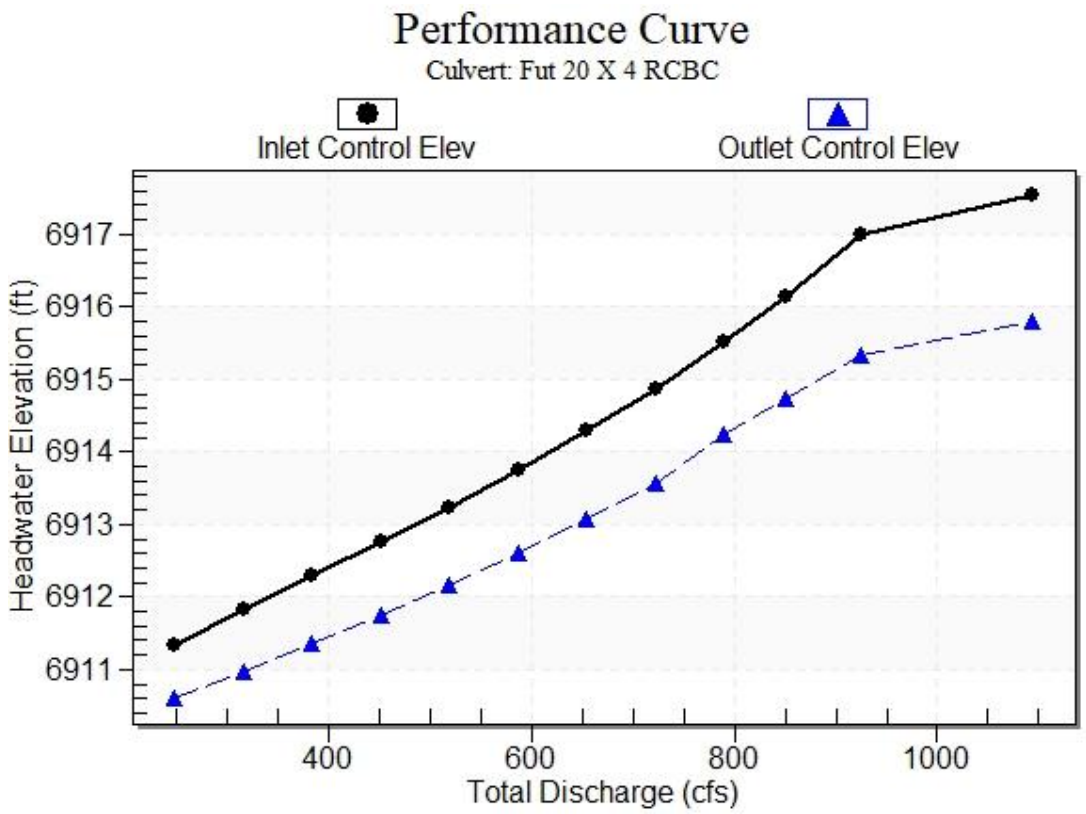
Straight Culvert

Inlet Elevation (invert): 6908.50 ft, Outlet Elevation (invert): 6908.00 ft

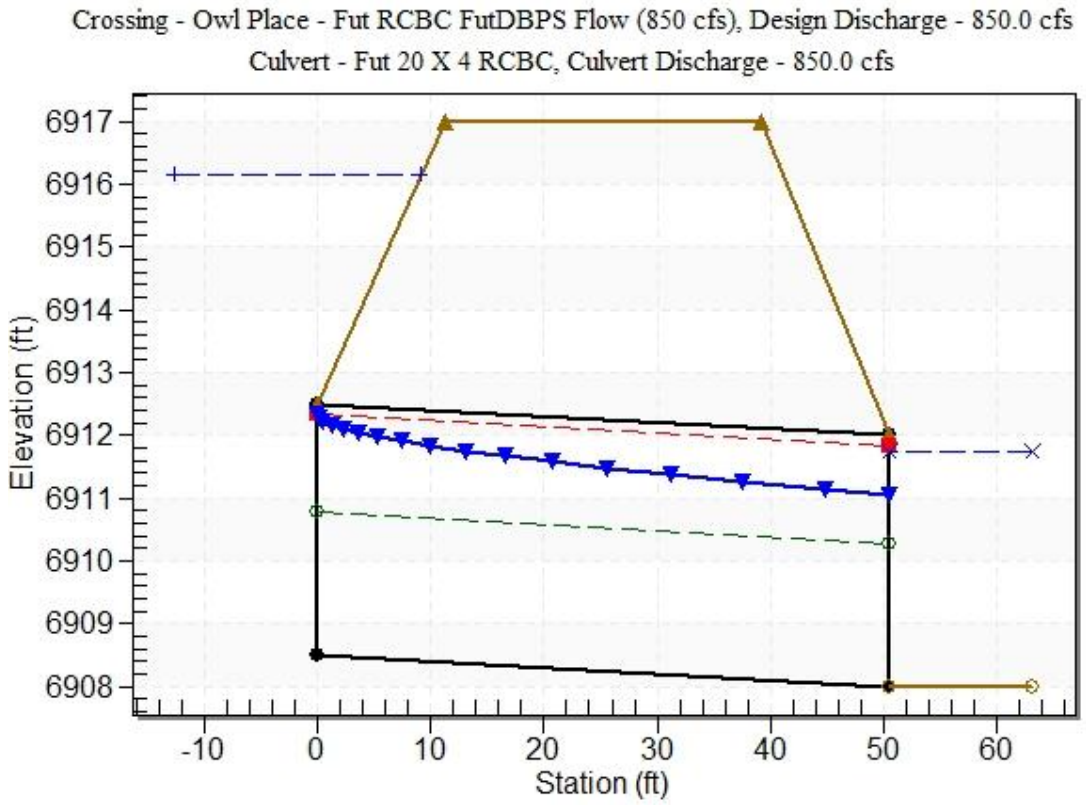
Culvert Length: 50.50 ft, Culvert Slope: 0.0099

****

Culvert Performance Curve Plot: Fut 20 X 4 RCBC



Water Surface Profile Plot for Culvert: Fut 20 X 4 RCBC



Site Data - Fut 20 X 4 RCBC

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6908.50 ft

Outlet Station: 50.50 ft

Outlet Elevation: 6908.00 ft

Number of Barrels: 1

Culvert Data Summary - Fut 20 X 4 RCBC

Barrel Shape: Concrete Box

Barrel Span: 20.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Owl Place - Fut RCBC FutDBPS Flow (850 cfs))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
248.60	6910.36	2.36	4.05	2.21	0.66
316.24	6910.58	2.58	4.31	2.42	0.67
383.88	6910.78	2.78	4.52	2.60	0.68
451.52	6910.95	2.95	4.71	2.76	0.68
519.16	6911.11	3.11	4.87	2.91	0.69
586.80	6911.26	3.26	5.03	3.05	0.69
654.44	6911.39	3.39	5.16	3.18	0.70
722.08	6911.52	3.52	5.29	3.30	0.70
789.72	6911.64	3.64	5.41	3.41	0.71
850.00	6911.74	3.74	5.51	3.50	0.71
925.00	6911.86	3.86	5.63	3.62	0.71

Tailwater Channel Data - Owl Place - Fut RCBC FutDBPS Flow (850 cfs)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 11.00 (_:1)

Channel Slope: 0.0150

Channel Manning's n: 0.0500

Channel Invert Elevation: 6908.00 ft

Roadway Data for Crossing: Owl Place - Fut RCBC FutDBPS Flow (850 cfs)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 6917.00 ft

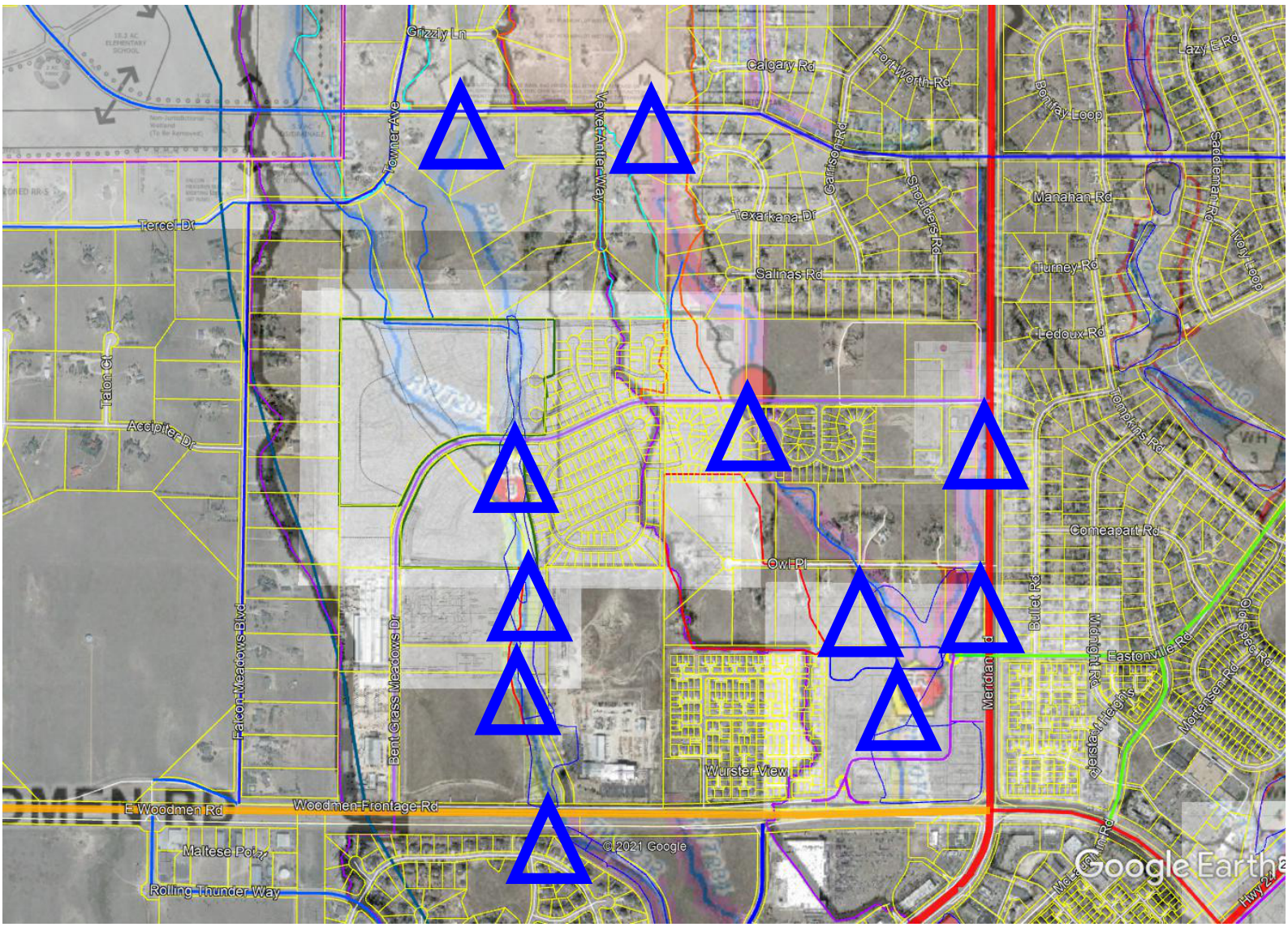
Roadway Surface: Paved

Roadway Top Width: 28.00 ft

APPENDIX D

Drainage Maps

Provide a plan showing the flow paths, design points indicated and major sub-basins in this area



Label basin

WOODMEN HILLS DR

TOWNER AVE

Q5=2.7 cfs
Q100=72.6 CFS
MEADOWS POND #2
RELEASE RATES
(PER HEC-HMS MODEL)

FLOW FROM MATRIX DBPS
Q100 = 43 CFS
Q5 = 7 CFS
(FLOW IN RWT204)

FLOW FROM MATRIX DBPS
Q100 = 1000 CFS
Q5 = 220. CFS
(FLOW IN RWT202)

LIMITS OF FLOODPLAIN STUDY

THE MEADOWS FILING NO. 3

(DBPS RMT062)

℄ CHANNEL REACH RWT204

℄ CHANNEL REACH RWT202

℄ CHANNEL REACH RWT210

EX SEDIMENT POND

FLOW CONTINUES EAST TO MERIDIAN ROAD DITCH

BENT GRASS MEADOWS DR

SEA OATS DR

AVENA RD

EX STM INLET 10' CDOT TYPE R

EX STM INLET 4' CDOT TYPE R

EX STM INLET 6' CDOT TYPE R

EX STM INLET 4' CDOT TYPE R

EX STM INLET 6' CDOT TYPE R

EX POND 1 – BENT GRASS RESIDENTIAL FILING NO. 1

EX POND 2 – BENT GRASS RESIDENTIAL FILING NO. 1

BENT GRASS RESIDENTIAL FILING NO. 1

BENT GRASS EAST COMMERCIAL FILING NO.2

BENT GRASS EAST COMMERCIAL FILING NO.1

EX PLD – BENT GRASS EAST COMMERCIAL FILING NO. 1, 7-11 DEV

EX 30" RCP & FOREBAY

EX 24" RCP & FOREBAY

EX OUTLET STRUCTURE & 24" RCP

(3) EX 45" X 29" ELLIPTICAL RCP

EX RIPRAP

MERIDIAN RD

TREY LN

OWL PL

EX TWIN 36" CMP'S

REACH RWT064
Q100=847.2 CFS
Q5=273.1 CFS
(PER HEC-HMS MODEL)

BASIN MT060
Q100=196.8 CFS
Q5=60.1 CFS
(PER HEC-HMS MODEL)

FALCON MEADOWS BLVD

THE MEADOWS FILING NO. 2

LATIGO BUSINESS CENTER FILING NO. 1

BENT GRASS MEADOWS DR

Provide a plan showing the basins and design points down to Woodmen Road

RUNOFF SUMMARY TABLE

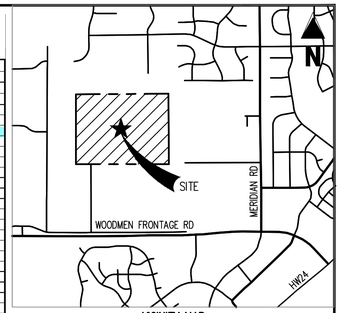
Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
MT060	185.60	91.8	226.0
OS-25	14.13	4.9	27.5
OS-26	5.81	1.9	12.7
H5	11.30	1.8	11.5
OS-22	4.42	1.4	9.6
OS-23	10.24	3.3	22.5
C1	2.07	8.0	14.6
C2	2.15	8.4	15.3
D1	5.22	13.1	26.0
D2	1.40	4.0	7.8
H1	3.00	3.7	6.7
H2	1.22	1.3	2.2
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
A-1	5.42	2.2	12.4
A-2	18.00	5.3	35.4
A-3	19.59	6.0	40.7
A-4	23.81	8.1	47.0
B-1	32.53	9.6	64.2
B-2	4.51	1.5	10.0
B-3	16.18	7.8	37.2
OS-1	13.06	6.9	28.8
OS-2	17.81	11.2	41.4
OS-4	30.69	12.4	55.4
P-1	2.03	4.3	7.2

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	8.3	38.9
30	91.8	226.0
31	55.9	245.9
32	58.5	261.4
14	59.4	266.7
BG1	13.0	26.9
BG2	4.0	8.2
BG4	3.7	7.0
BG5	1.2	2.3
BG POND	21.3	43.5
BG POND 1	0.3	2.9
50	280.0	850.0
20	200.6	608.4
15	203.0	612.3
BG32	2.6	6.1
BG33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND 2	0.4	10.0
BG 30	3.0	5.0
BG31	1.8	3.1
25	205.2	616.2
9	52.0	190.0
2	12.4	51.4
3	53.3	206.0
4	18.2	93.7
5	9.1	63.4
6	59.0	232.8
7	301.7	1309.1

provide 8

doesn't most of this go to BG Pond?



VICINITY MAP
SCALE: 1"=1000'

N
0 50 100 200
SCALE: 1"=200'

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

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

CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS RESIDENTIAL
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO - EL PASO COUNTY

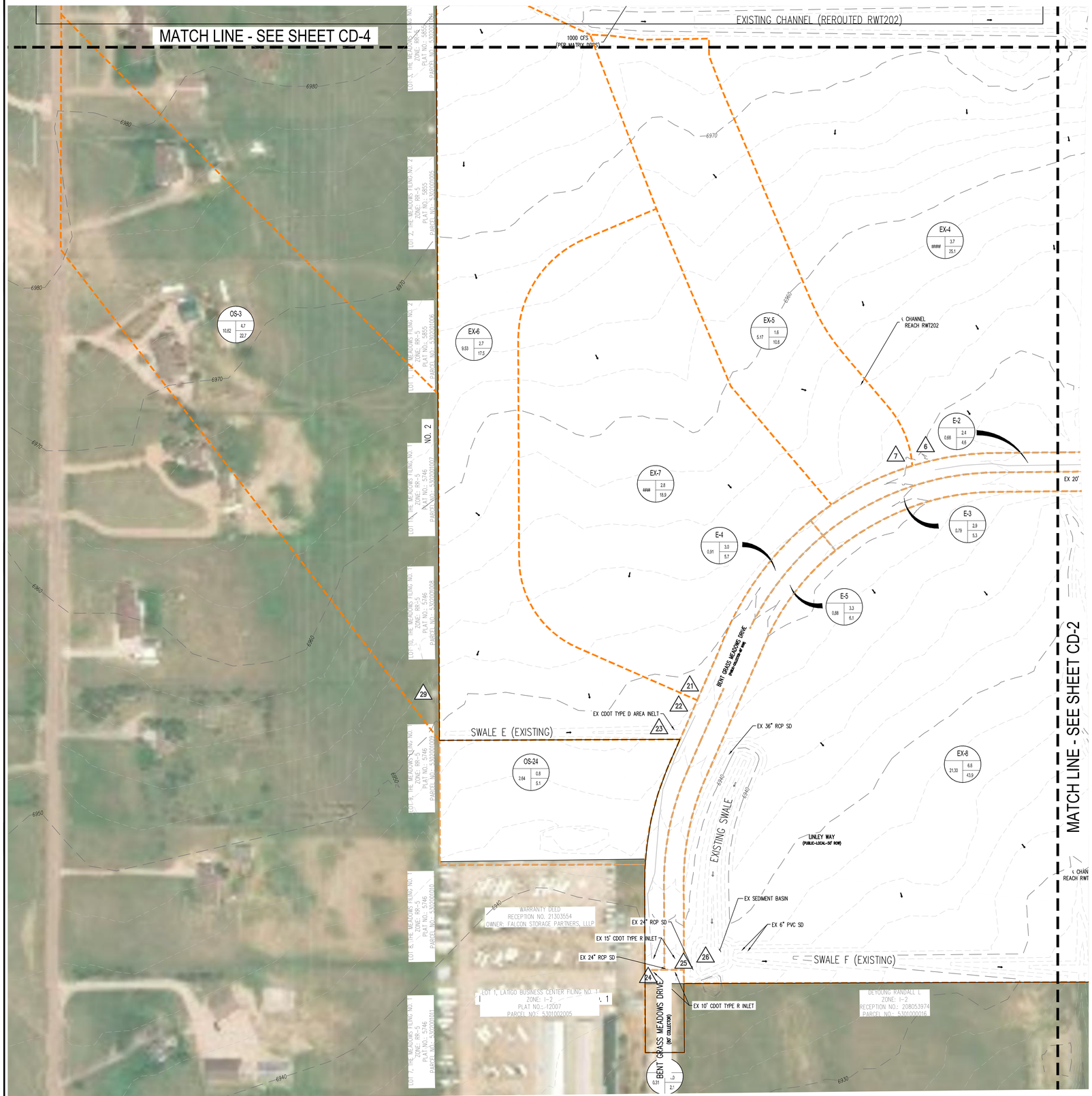
#	Date	Issue / Description	Init.

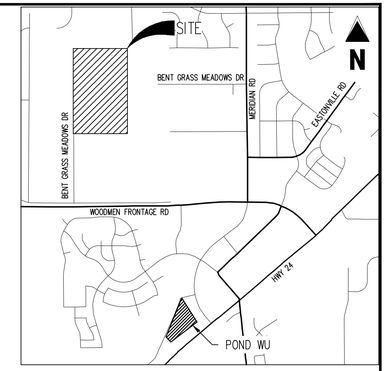
Project No:	CLH000014.20
Drawn By:	CMWJ
Checked By:	SMB
Date:	OCTOBER 2019

EXISTING CONDITIONS DRAINAGE MAP

ED-1
Sheet 1 of 1

N:\Challenger Homes Inc\CO - El Paso County\CLH000013\Bent Grass West\04 Drawings\Civil\Grading\Drainage Studies\DWG\Proposed Drainage Reports-Info\MDDP\Drainage Maps\CLH13_Exist Dr.dwg - Charlene Durham - 3/5/2021





VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6484 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6484 PROPOSED 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

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	36.40	7.0	43.0
WT200	192.00	52.0	190.0
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.61	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
C-8	0.42	0.2	1.0
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
EX-1	1.19	0.4	2.5
EX-2	1.56	0.5	3.7
EX-3	0.62	0.2	1.5
EX-4	12.49	3.7	25.1
EX-5	5.15	1.6	10.6
EX-6	9.53	2.7	17.8
EX-7	9.16	2.8	18.9
EX-8	21.30	6.6	43.9
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	16.8	75.3
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
5	2.4	16.8
6	5.8	50.4
7	3.3	6.3
8	11.2	32.7
9	0.7	1.5
10	1.0	3.9
11	5.3	13.9
12	1.9	4.4
13	7.1	17.9
14	8.1	23.8
15	18.3	54.1
15A	12.2	37.0
AA	258.2	1135.1
BB	257.8	1130.8
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
26	8.6	42.8
29	12.2	60.9
21	4.3	29.9
22	4.5	43.2
23	11.5	57.6
24	2.9	21.1
25	3.7	11.6
26	15.8	80.6
27A	10.0	69.5
27B	0.2	1.0
CC	269.3	1187.4
30	2.7	72.6
31	6.1	92.5
32	7.4	94.3
32-N	7.4	33.2
32-S	0.6	33.2
BG 1a-Os	0.0	29.2
BG 1a-Ose	0.0	14.6
BG 1a-Osw	0.0	14.6
BG 4a	0.4	15.5
BG 1b	0.8	16.3
BG 1c	2.1	18.3
BG 1	5.2	24.9
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	2.4	19.3
BG 4	2.6	19.6
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	7.6	30.4
BG 6	3.5	21.9
BG POND1	0.5	22.0
BG 14n	13.8	63.8
BG 15n	13.4	62.2
BG 50	280.0	850.0
BG 20	304.8	961.8
BG 14s	1.5	36.4
BG 15s	3.0	38.5
BG 21	307.4	1007.0
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	256.3	837.4

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CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS RESIDENTIAL FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

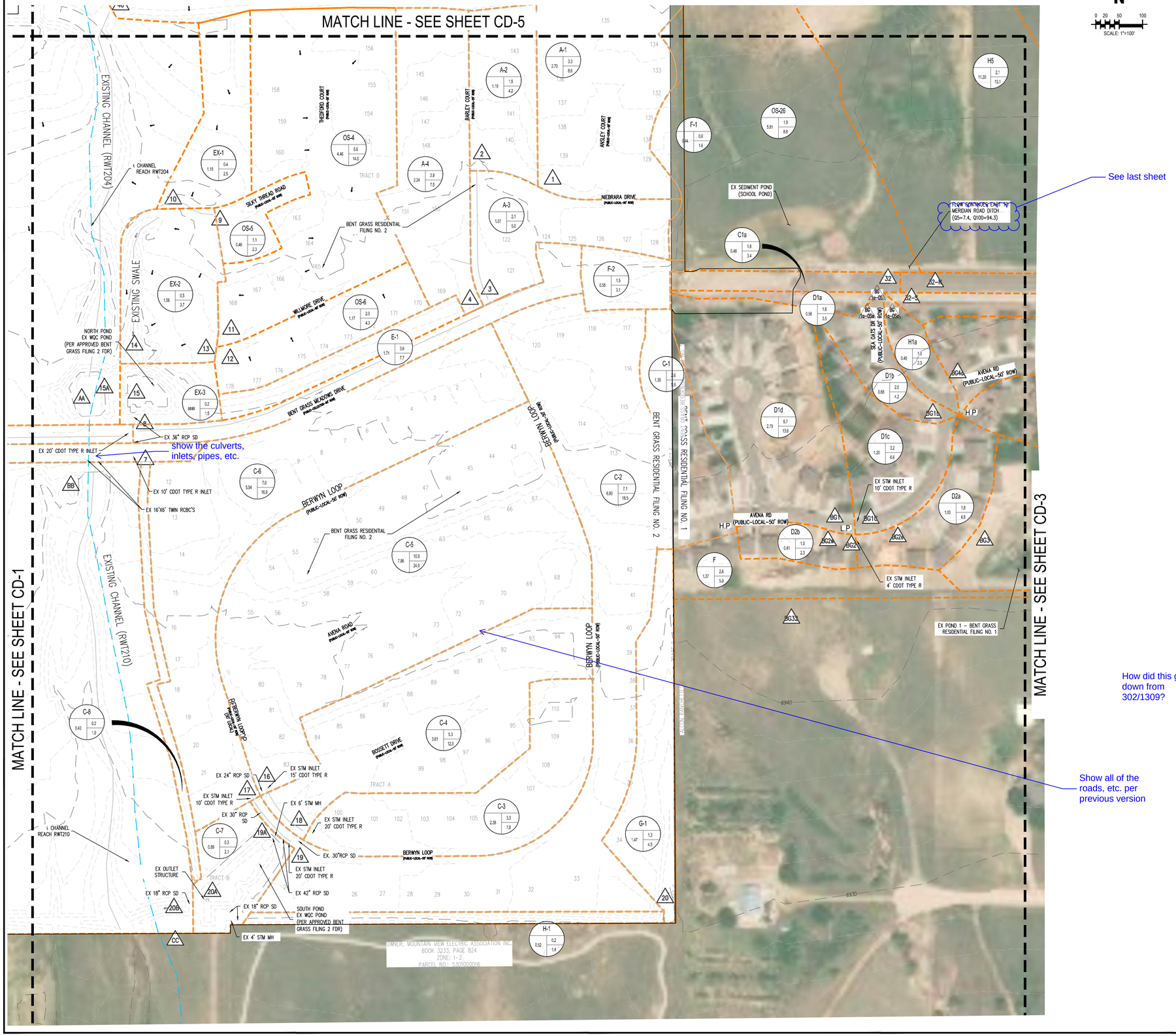
BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

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

CURRENT CONDITIONS DRAINAGE MAP

CD-1
Sheet 1 of 5



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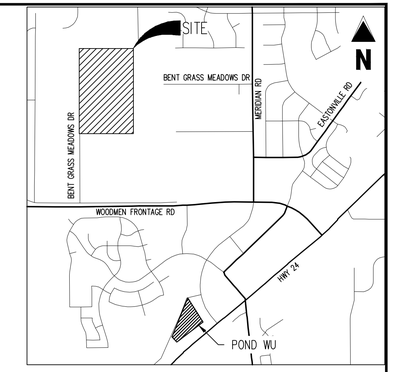
SCALE: 1"=100'



VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6484 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6484 PROPOSED 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

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	36.40	7.0	43.0
WT200	192.00	52.0	190.0
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.68	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.2	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
C-8	0.42	0.2	1.0
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
EX-1	1.19	0.4	2.5
EX-2	1.56	0.5	3.7
EX-3	0.62	0.2	1.5
EX-4	12.49	3.7	25.1
EX-5	5.15	1.6	10.6
EX-6	9.53	2.7	17.8
EX-7	9.16	2.8	18.9
EX-8	21.30	6.6	43.9
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	16.8	75.3
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
5	2.4	16.8
6	5.8	50.4
7	3.3	6.3
8	11.2	32.7
9	0.7	1.5
10	1.0	3.9
11	5.3	13.9
12	1.9	4.4
13	7.1	17.9
14	8.1	23.8
15	18.3	54.1
15A	12.2	37.0
AA	258.2	1135.1
BB	257.8	1130.8
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	4.3	29.9
22	4.5	43.2
23	11.5	57.6
24	2.9	21.1
25	3.7	11.6
26	15.8	80.6
27A	10.0	69.5
27B	0.2	1.0
CC	269.3	1187.4
30	2.7	72.6
31	6.1	92.5
32	7.4	94.3
32-N	7.4	33.2
32-S	0.6	33.2
BG 1a-Os	0.0	29.2
BG 1a-Ose	0.0	14.6
BG 1a-Osw	0.0	14.6
BG 4a	0.4	15.5
BG 1b	0.8	16.3
BG 1c	2.1	18.3
BG 1	5.2	24.9
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	2.4	19.3
BG 4	2.6	19.6
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	7.6	30.4
BG 6	3.5	21.9
BG POND1	0.5	22.0
BG 14n	13.8	63.8
BG 15n	13.4	62.2
BG 50	280.0	850.0
BG 20	304.8	961.8
BG 14s	1.5	36.4
BG 15s	3.0	38.5
BG 21	307.4	1007.0
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	62.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	256.3	837.4

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CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS RESIDENTIAL FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

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

CURRENT CONDITIONS DRAINAGE MAP

CD-2

Sheet 2 of 5

N

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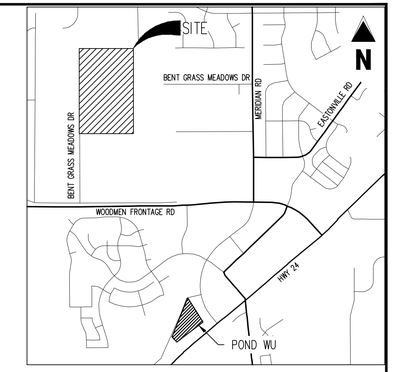
SCALE: 1"=100'



VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6484 EXISTING MINOR CONTOUR
- 6480 EXISTING MAJOR CONTOUR
- 6484 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

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	36.40	7.0	43.0
WT200	192.00	52.0	190.0
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-Z2	4.42	1.5	9.7
OS-Z3	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.9
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
C-8	0.42	0.2	1.0
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
EX1	1.19	0.4	2.5
EX2	1.56	0.5	3.7
EX3	0.62	0.2	1.5
EX4	12.49	3.7	25.1
EX5	5.15	1.6	10.6
EX6	9.53	2.7	17.8
EX7	9.16	2.8	18.9
EX8	21.30	6.6	43.9
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	16.8	75.3
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
5	2.4	16.8
6	5.8	50.4
7	3.3	6.3
8	11.2	32.7
9	0.7	1.5
10	1.0	3.9
11	5.3	13.9
12	1.9	4.4
13	7.1	17.9
14	8.1	23.8
15	18.3	54.1
15A	12.2	37.0
AA	258.2	1135.1
BB	257.8	1130.8
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	4.3	29.9
22	4.5	43.2
23	11.5	57.6
24	2.9	21.1
25	3.7	11.6
26	15.8	80.6
27A	10.0	69.5
27B	0.2	1.0
CC	269.3	1187.4
30	2.7	72.6
31	6.1	92.5
32	7.4	94.3
32-N	7.4	33.2
32-S	0.6	33.2
BG 1a-Os	0.0	29.2
BG 1a-Ose	0.0	14.6
BG 1a-Osw	0.0	14.6
BG 4a	0.4	15.5
BG 1b	0.8	16.3
BG 1c	2.1	18.3
BG 1	5.2	24.9
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	2.4	19.3
BG 4	2.6	19.6
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	7.6	30.4
BG 6	3.5	21.9
BG POND1	0.5	22.0
BG 14n	13.8	63.8
BG 15n	13.4	62.2
BG 50	280.0	850.0
BG 20	304.8	961.8
BG 14s	1.5	36.4
BG 15s	3.0	38.5
BG 21	307.4	1007.0
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	256.3	837.4

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CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS RESIDENTIAL FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

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

CURRENT CONDITIONS DRAINAGE MAP

CD-3
Sheet 3 of 5

show improvements per previous version

N

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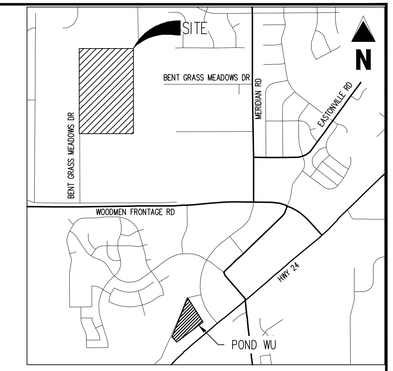
SCALE: 1"=100'



VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6484 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6484 PROPOSED 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

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
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
C-8	0.42	0.2	1.0
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
EX1	1.19	0.4	2.5
EX2	1.56	0.5	3.7
EX3	0.62	0.2	1.5
EX4	12.49	3.7	25.1
EX5	5.15	1.6	10.6
EX6	9.53	2.7	17.8
EX7	9.16	2.8	18.9
EX8	21.30	6.6	43.9
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	16.8	75.3
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
5	2.4	16.8
6	5.8	50.4
7	3.3	6.3
8	11.2	32.7
9	0.7	1.5
10	1.0	3.9
11	5.3	13.9
12	1.9	4.4
13	7.1	17.9
14	8.1	23.8
15	18.3	54.1
15A	12.2	37.0
AA	258.2	1135.1
BB	257.8	1130.8
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	4.3	29.9
22	4.5	43.2
23	11.5	57.6
24	2.9	21.1
25	3.7	11.6
26	15.8	80.6
27A	10.0	69.5
27B	0.2	1.0
CC	269.3	1187.4
30	2.7	72.6
31	6.1	92.5
32	7.4	94.3
32-N	7.4	33.2
32-S	0.6	33.2
BG 1a-Os	0.0	29.2
BG 1a-Ose	0.0	14.6
BG 1a-Osw	0.0	14.6
BG 4a	0.4	15.5
BG 1b	0.8	16.3
BG 1c	2.1	18.3
BG 1	5.2	24.9
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	2.4	19.3
BG 4	2.6	19.6
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	7.6	30.4
BG 6	3.5	21.9
BG POND1	0.5	22.0
BG 14n	13.8	63.8
BG 15n	13.4	62.2
BG 50	280.0	850.0
BG 20	304.8	961.8
BG 14s	1.5	36.4
BG 15s	3.0	38.5
BG 21	307.4	1007.0
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	256.3	837.4

Galloway
1155 Kelly Johnson Blvd., Suite 305
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GallowayUS.com

CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS RESIDENTIAL FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

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

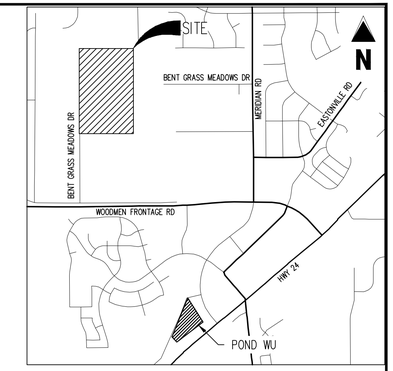
CURRENT CONDITIONS DRAINAGE MAP

CD-4
Sheet 4 of 5

N

0 20 50 100

SCALE: 1"=100'



VICINITY MAP

1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6480 EXISTING MAJOR CONTOUR
- 6484 EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- 6484 PROPOSED 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

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
W7200	192.00	52.0	190.0
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
C-8	0.42	0.2	1.0
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
EX-1	1.19	0.4	2.5
EX-2	1.56	0.5	3.7
EX-3	0.62	0.2	1.5
EX-4	12.49	3.7	25.1
EX-5	5.15	1.6	10.6
EX-6	9.53	2.7	17.8
EX-7	9.16	2.8	18.9
EX-8	21.30	6.6	43.9
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	16.8	75.3
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
5	2.4	16.8
6	5.8	50.4
7	3.3	6.3
8	11.2	32.7
9	0.7	1.5
10	1.0	3.9
11	5.3	13.9
12	1.9	4.4
13	7.1	17.9
14	8.1	23.8
15	18.3	54.1
15A	12.2	37.0
AA	258.2	1135.1
BB	257.8	1130.8
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	4.3	29.9
22	4.5	43.2
23	11.5	57.6
24	2.9	21.1
25	3.7	11.6
26	15.8	80.6
27A	10.0	69.5
27B	0.2	1.0
CC	269.3	1187.4
30	2.7	72.6
31	6.1	92.5
32	7.4	94.3
32-N	7.4	33.2
32-S	0.6	33.2
BG 1a-Os	0.0	29.2
BG 1a-Ose	0.0	14.6
BG 1a-Osw	0.0	14.6
BG 4a	0.4	15.5
BG 1b	0.8	16.3
BG 1c	2.1	18.3
BG 1	5.2	24.9
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	2.4	19.3
BG 4	2.6	19.6
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	7.6	30.4
BG 6	3.5	21.9
BG POND1	0.5	22.0
BG 14n	13.8	63.8
BG 15n	13.4	62.2
BG 50	280.0	850.0
BG 20	304.8	961.8
BG 14s	1.5	36.4
BG 15s	3.0	38.5
BG 21	307.4	1007.0
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	256.3	837.4

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BENT GRASS RESIDENTIAL FILING NO. 2
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO - EL PASO COUNTY

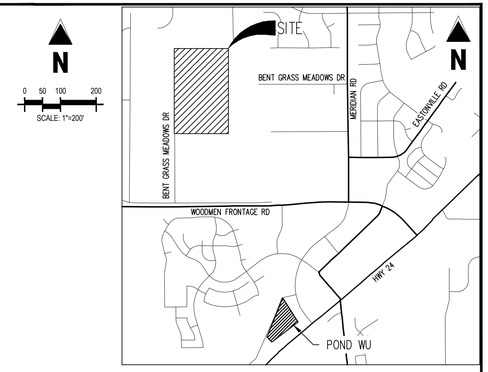
#	Date	Issue / Description	Init.

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

CURRENT CONDITIONS DRAINAGE MAP

CD-5

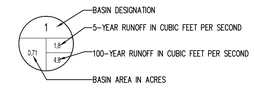
Sheet 5 of 5



VICINITY MAP

DRAINAGE LEGEND 1"=2,000'

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE MINOR CONTOUR
- BASIN BOUNDARY LINE
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- CENTERLINE OF STREAM



(Tables on all sheets will be checked with next review)

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
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.96	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.43	2.6	10.8
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.35	4.1	9.0
CC-3	1.98	6.4	12.1
CC-4	4.34	6.5	17.8
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	6.72	14.3	29.6
D-3	2.03	0.8	2.3
D-4	4.38	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	14.2	63.6
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
9	1.1	2.4
11	6.0	15.5
12	7.6	19.0
5	10.9	27.1
6	4.1	9.4
7	2.9	5.5
8	25.3	62.1
13	19.0	42.5
14	6.4	12.5
10	23.6	52.2
10A	6.0	21.9
15	37.5	90.8
15A	12.2	37.0
AA	259.6	1141.2
BB	258.9	1139.4
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	13.9	29.9
22	10.5	26.0
23	12.2	59.7
24	2.9	21.1
25	3.3	10.7
26	8.8	46.4
42	7.5	16.5
43	10.0	21.8
44	1.2	4.5
45	53.6	175.7
45A	1.1	45.8
CC	260.0	1147.0
30	2.7	72.6
31	6.1	92.5
32	6.7	88.0
32A	4.9	34.5
32A-N	4.9	33.2
32A-S	12.5	3.6
BG 1a-Os	0.0	0.0
BG 1a-Ose	0.0	0.0
BG 1a-Osw	0.0	0.0
BG 4a	0.6	1.5
BG 1b	1.3	2.8
BG 1c	3.3	7.1
BG 1	8.3	17.6
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	3.8	9.0
BG 4	4.0	9.5
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	14.7	49.7
BG 6	5.4	13.2
BG POND1	0.3	2.9
BG 14n	8.3	42.7
BG 15n	8.0	40.9
BG 50	280.0	850.0
BG 20	291.7	909.3
BG 14s	15.0	7.8
BG 15s	16.8	12.4
BG 21	303.8	915.3
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	251.3	751.4

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CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS DEVELOPMENT
FOR
CHALLENGER COMMUNITIES, LLC
FALCON, CO - EL PASO COUNTY

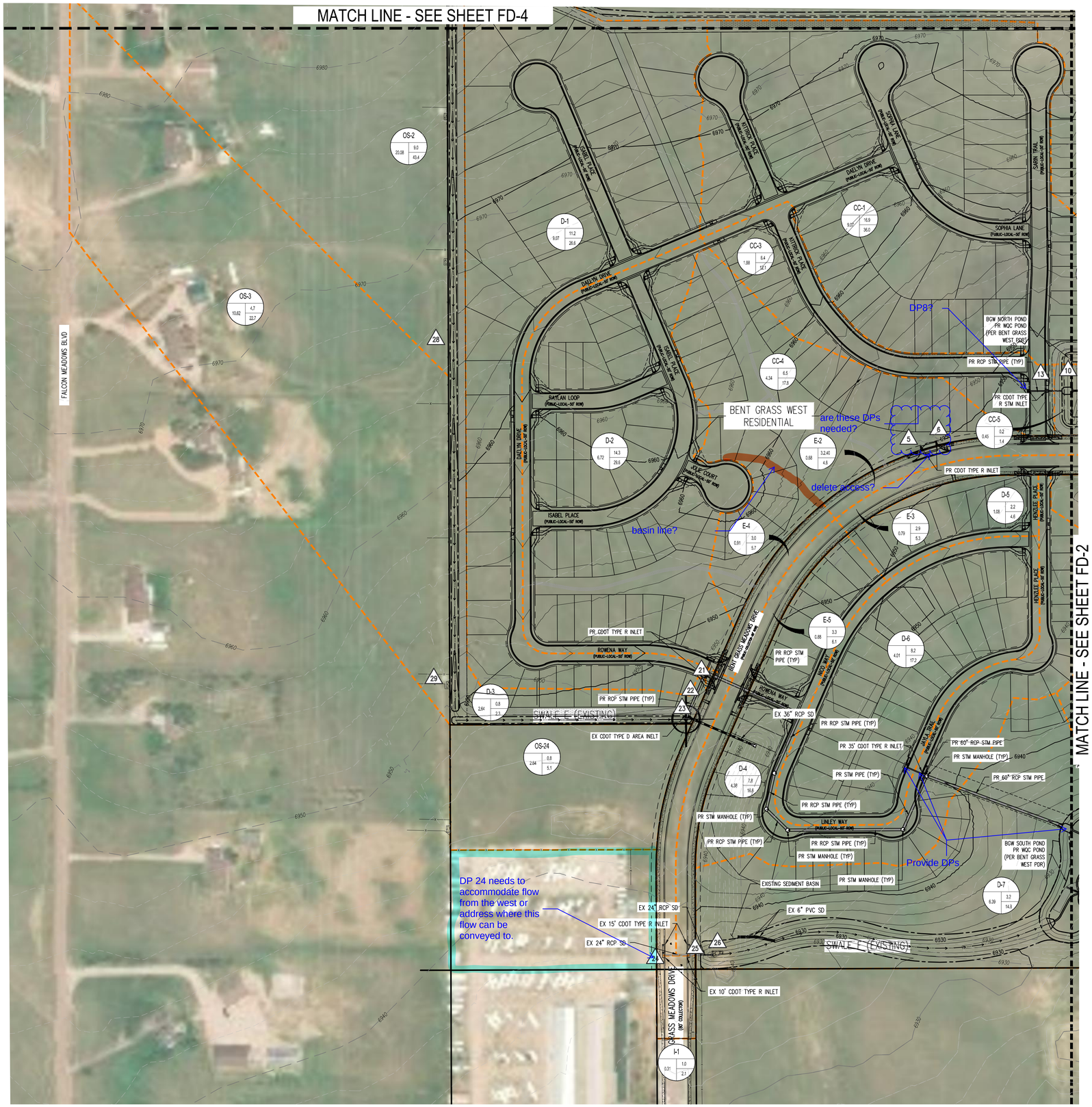
#	Date	Issue / Description	Init.

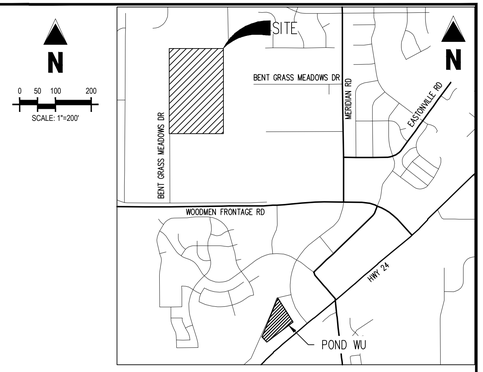
Project No:	CLH000014.20
Drawn By:	CMWJ
Checked By:	SMB
Date:	OCTOBER 2019

FUTURE CONDITIONS DRAINAGE MAP

sheet is out of order?

FD-5
Sheet 5 OF 5





VICINITY MAP

N

0 50 100 200

SCALE: 1"=200'

DRAINAGE LEGEND 1"=2,000'

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE 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

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
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	4.6
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.36	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.96	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.43	2.6	10.8
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.35	4.1	9.0
CC-3	1.88	6.4	12.1
CC-4	4.34	6.5	17.8
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	6.72	14.3	29.6
D-3	2.03	0.8	2.3
D-4	4.38	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	14.2	63.6
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
9	1.1	2.4
11	6.0	15.5
12	7.6	19.0
5	10.9	27.1
6	4.1	9.4
7	2.9	5.5
8	25.3	62.1
13	19.0	42.5
14	6.4	12.5
10	23.6	52.2
10A	6.0	21.9
15	37.5	90.8
15A	12.2	37.0
AA	259.6	1141.2
BB	258.9	1139.4
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	13.9	29.9
22	10.5	26.0
23	12.2	59.7
24	2.9	21.1
25	3.3	10.7
26	8.8	46.4
42	7.5	16.5
43	10.0	21.8
44	1.2	4.5
45	53.6	175.7
45A	1.1	45.8
CC	260.6	1147.0
30	2.7	72.6
31	6.1	92.5
32	6.7	88.0
32A	4.9	34.5
32A-N	4.9	33.2
32A-S	12.5	3.6
BG 1a-Os	0.0	0.0
BG 1a-Ose	0.0	0.0
BG 1a-Osw	0.0	0.0
BG 4a	0.6	1.5
BG 1b	1.3	2.8
BG 1c	3.3	7.1
BG 1	8.3	17.6
BG 2a	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4a	0.4	0.9
BG 4w	3.8	9.0
BG 4	4.0	9.5
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	14.7	49.7
BG 6	5.4	13.2
BG POND1	0.3	2.9
BG 14n	8.3	42.7
BG 15n	8.0	40.9
BG 50	280.0	850.0
BG 20	291.7	909.3
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BG 15s	16.8	12.4
BG 21	303.8	915.3
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	251.3	751.4

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BENT GRASS DEVELOPMENT
FOR
CHALLENGER COMMUNITIES, LLC

FALCON, CO - EL PASO COUNTY

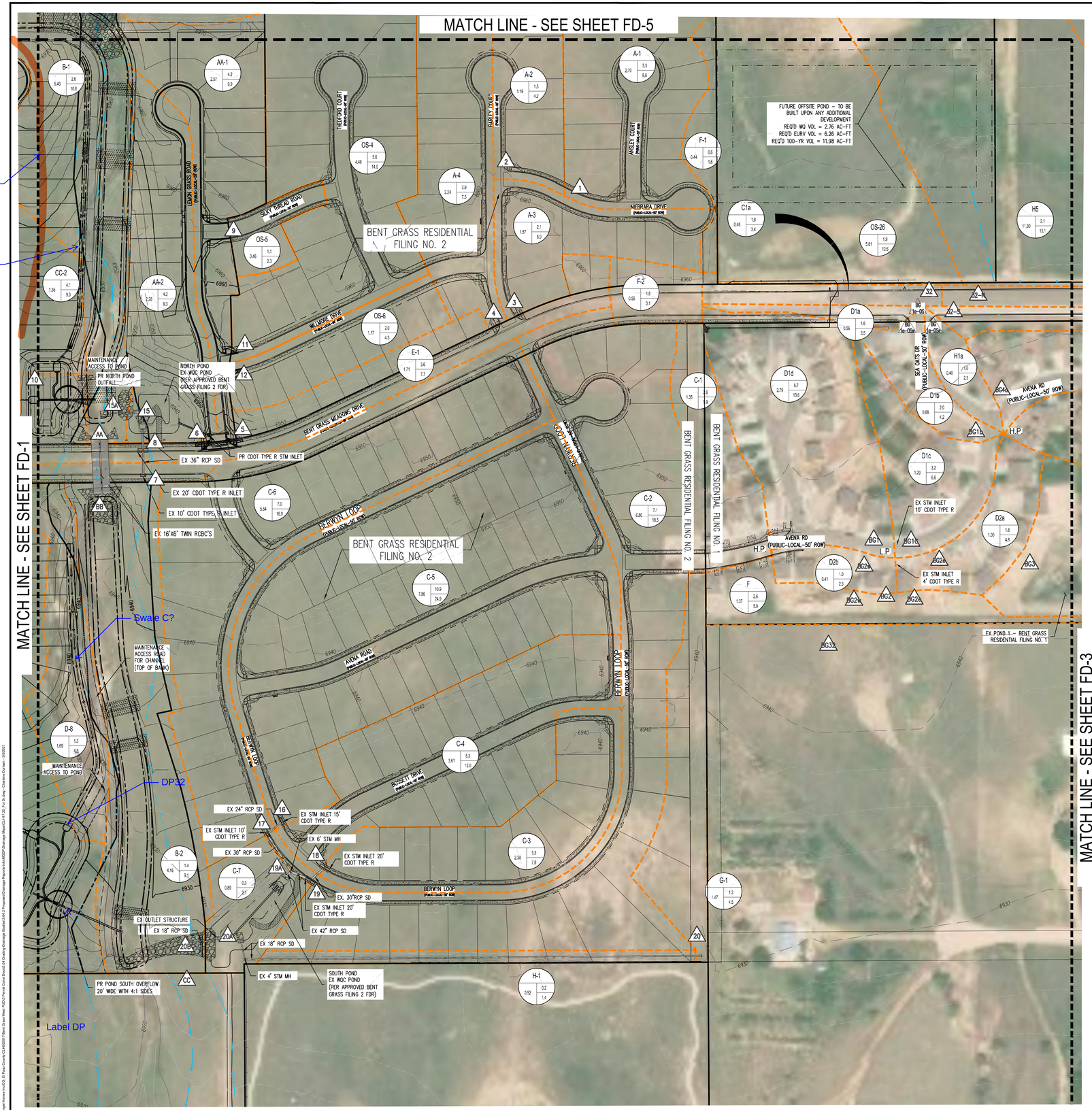
#	Date	Issue / Description	Init.

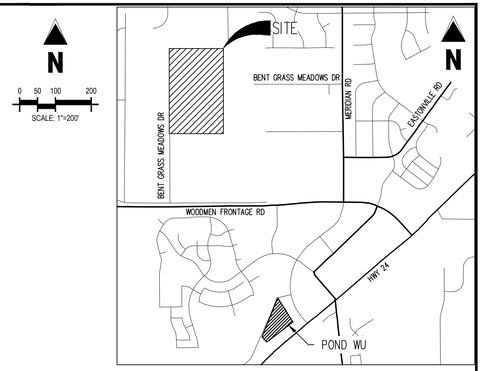
Project No:	CLH000014.20
Drawn By:	CMWJ
Checked By:	SMB
Date:	OCTOBER 2019

FUTURE CONDITIONS DRAINAGE MAP

FD-1

Sheet 1 of 5





VICINITY MAP

DRAINAGE LEGEND 1"=2,000'

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE 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

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
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.43	2.6	10.8
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.35	4.1	9.0
CC-3	1.88	6.4	12.1
CC-4	4.34	6.5	17.8
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	6.72	14.3	29.6
D-3	2.03	0.8	2.3
D-4	4.38	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	14.2	63.6
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
9	1.1	2.4
11	6.0	15.5
12	7.6	19.0
5	10.9	27.1
6	4.1	9.4
7	2.9	5.5
8	25.3	62.1
13	19.0	42.5
14	6.4	12.5
10	23.6	52.2
10A	6.0	21.9
15	37.5	90.8
15A	12.2	37.0
AA	259.6	1141.2
BB	258.9	1139.4
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	13.9	29.9
22	10.5	26.0
23	12.2	59.7
24	2.9	21.1
25	3.3	10.7
26	8.8	46.4
42	7.5	16.5
43	10.0	21.8
44	1.2	4.5
45	53.6	175.7
45A	1.1	45.8
CC	260.0	1147.0
30	2.7	72.6
31	6.1	92.5
32	6.7	88.0
32A	4.9	34.5
32A-N	4.9	33.2
32A-S	12.5	3.6
BG 1a-Os	0.0	0.0
BG 1a-Ose	0.0	0.0
BG 1a-Osw	0.0	0.0
BG 4a	0.6	1.5
BG 1b	1.3	2.8
BG 1c	3.3	7.1
BG 1	8.3	17.6
BG 2e	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	3.8	9.0
BG 4	4.0	9.5
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	14.7	49.7
BG 6	5.4	13.2
BG POND1	0.3	2.9
BG 14n	8.3	42.7
BG 15n	8.0	40.9
BG 50	280.0	850.0
BG 20	291.7	909.3
BG 14s	15.0	7.8
BG 15s	16.8	12.4
BG 21	303.8	915.3
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	251.3	751.4

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BENT GRASS DEVELOPMENT
FOR
CHALLENGER COMMUNITIES, LLC

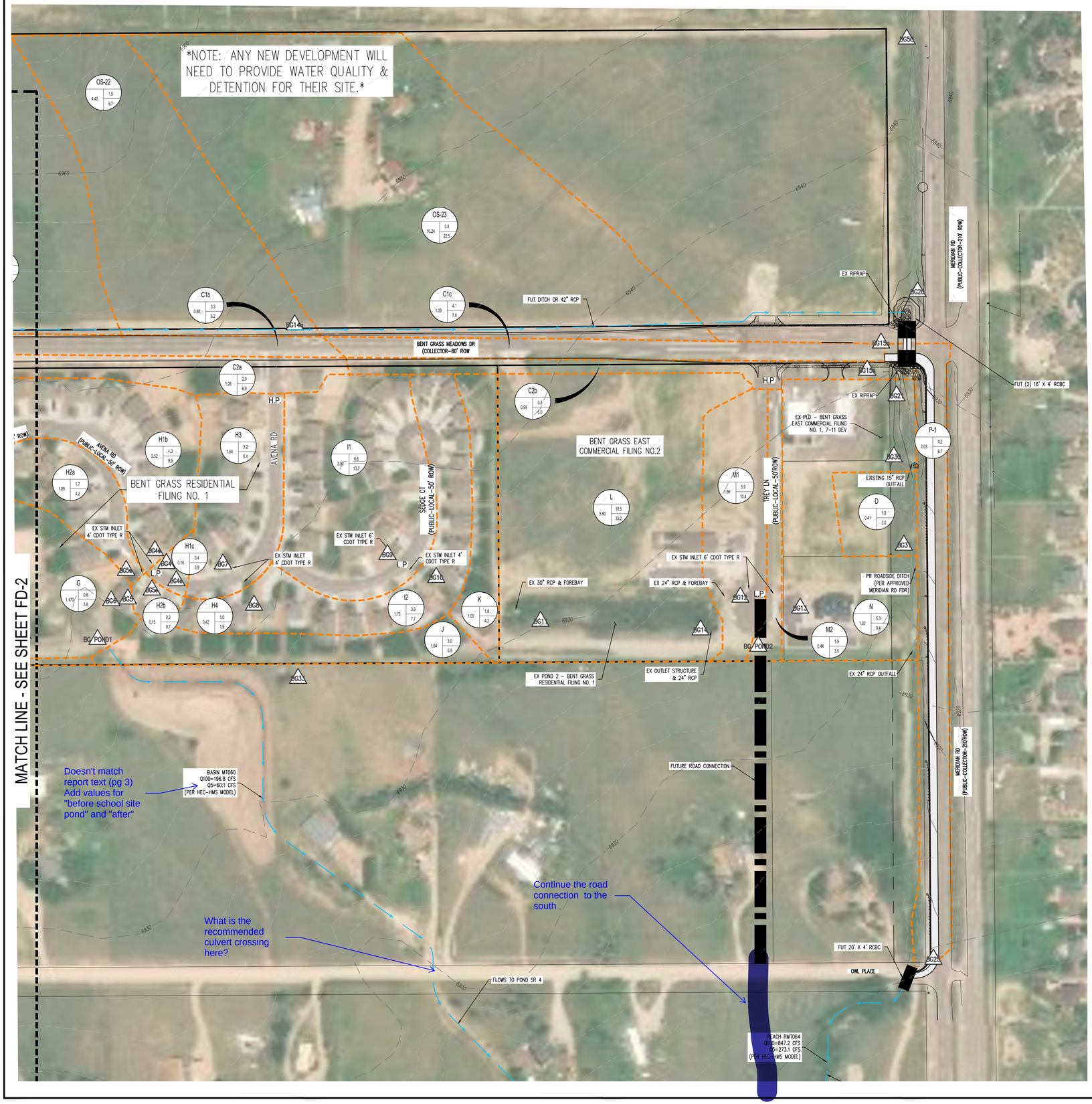
FALCON, CO - EL PASO COUNTY

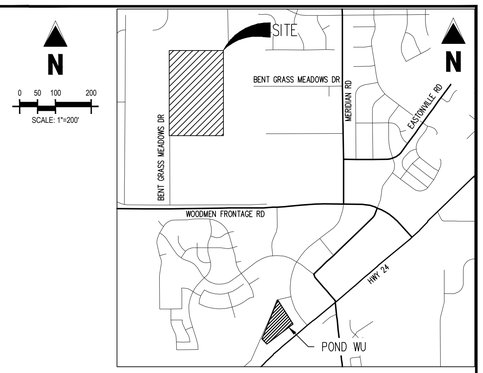
#	Date	Issue / Description	Init.

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

FUTURE CONDITIONS DRAINAGE MAP

FD-2
Sheet 2 OF 5





VICINITY MAP

DRAINAGE LEGEND 1"=2,000'

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE 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

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
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.43	2.6	10.8
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.35	4.1	9.0
CC-3	1.88	6.4	12.1
CC-4	4.34	6.5	17.8
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	6.72	14.3	29.6
D-3	2.03	0.8	2.3
D-4	4.36	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	14.2	63.6
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
9	1.1	2.4
11	6.0	15.5
12	7.6	19.0
5	10.9	27.1
6	4.1	9.4
7	2.9	5.5
8	25.3	62.1
13	19.0	42.5
14	6.4	12.5
10	23.6	52.2
10A	6.0	21.9
15	37.5	90.8
15A	12.2	37.0
AA	259.6	1141.2
BB	258.9	1139.4
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	13.9	29.9
22	10.5	26.0
23	12.2	59.7
24	2.9	21.1
25	3.3	10.7
26	8.8	46.4
42	7.5	16.5
43	10.0	21.8
44	1.2	4.5
45	53.6	175.7
45A	1.1	45.8
CC	260.0	1147.0
30	2.7	72.6
31	6.1	92.5
32	6.7	88.0
32A	4.9	34.5
32A-N	4.9	33.2
32A-S	12.5	3.6
BG 1a-Os	0.0	0.0
BG 1a-Osw	0.0	0.0
BG 1a-Osw	0.0	0.0
BG 4a	0.6	1.5
BG 1b	1.3	2.8
BG 1c	3.3	7.1
BG 1	8.3	17.6
BG 2a	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4e	0.4	0.9
BG 4w	3.8	9.0
BG 4	4.0	9.5
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	14.7	49.7
BG 6	5.4	13.2
BG POND1	0.3	2.9
BG 14n	8.3	42.7
BG 15n	8.0	40.9
BG 50	280.0	850.0
BG 20	291.7	909.3
BG 14s	15.0	7.8
BG 15s	16.8	12.4
BG 21	303.8	915.3
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	251.3	751.4

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CHALLENGER HOMES

DRAINAGE PLAN BENT GRASS DEVELOPMENT FOR CHALLENGER COMMUNITIES, LLC

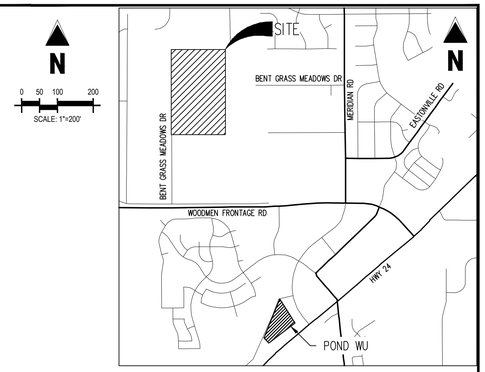
FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

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

FUTURE CONDITIONS DRAINAGE MAP

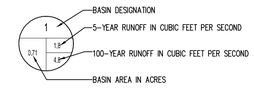
FD-3
Sheet 3 OF 5



VICINITY MAP

DRAINAGE LEGEND 1"=2,000'

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE MINOR CONTOUR
- BASIN BOUNDARY LINE
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- CENTERLINE OF STREAM



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
MT060	185.60	2.7	72.6
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-24	2.64	0.8	5.1
OS-25	14.13	5.1	29.0
OS-26	5.81	1.9	12.6
H5	11.30	2.1	13.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
O	0.41	1.8	3.0
OS-1	32.28	15.1	65.1
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
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
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.43	2.6	10.8
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.35	4.1	9.0
CC-3	1.88	6.4	12.1
CC-4	4.34	6.5	17.8
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	6.72	14.3	29.6
D-3	2.03	0.8	2.3
D-4	4.38	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
40	14.2	63.6
1	3.1	8.6
2	4.3	11.9
3	5.9	15.9
4	8.3	22.3
9	1.1	2.4
11	6.0	15.5
12	7.6	19.0
5	10.9	27.1
6	4.1	9.4
7	2.9	5.5
8	25.3	62.1
13	19.0	42.5
14	6.4	12.5
10	23.6	52.2
10A	6.0	21.9
15	37.5	90.8
15A	12.2	37.0
AA	259.6	1141.2
BB	258.9	1139.4
16	12.7	30.2
17	8.1	20.5
18	10.6	32.2
19	9.5	29.7
20	1.3	4.6
20A	18.6	58.7
20B	21.3	66.0
28	8.6	42.8
29	12.2	60.9
21	13.9	29.9
22	10.5	26.0
23	12.2	59.7
24	2.9	21.1
25	3.3	10.7
26	8.8	46.4
42	7.5	16.5
43	10.0	21.8
44	1.2	4.5
45	53.6	175.7
45A	1.1	45.8
CC	260.0	1147.7
30	2.7	72.6
31	6.1	92.8
32	6.7	88.0
32A	4.9	34.5
32A-N	4.9	33.2
32A-S	12.5	3.6
BG 1a-Os	0.0	0.0
BG 1a-Ose	0.0	0.0
BG 1a-Osw	0.0	0.0
BG 4a	0.6	1.5
BG 1b	1.3	2.8
BG 1c	3.3	7.1
BG 1	8.3	17.6
BG 2b	1.8	5.0
BG 2w	1.0	2.4
BG 2	2.8	7.3
BG 4a	0.4	0.9
BG 4w	3.8	9.0
BG 4	4.0	9.5
BG 5e	0.3	0.7
BG 5w	1.7	4.2
BG 5	1.9	4.7
BG 3	14.7	49.7
BG 6	5.4	13.2
BG POND1	0.3	2.9
BG 14n	8.3	42.7
BG 15n	8.0	40.9
BG 50	280.0	850.0
BG 20	291.7	909.3
BG 14s	15.0	7.8
BG 15s	16.8	12.4
BG 21	303.8	915.3
BG 32	2.6	6.1
BG 33	2.9	7.0
BG 7	3.1	6.4
BG 8	1.0	2.0
BG 9	6.5	13.4
BG 10	3.8	7.9
BG 11	13.5	27.8
BG 12	5.8	10.7
BG 13	7.0	13.0
BG 14	12.3	22.8
BG 15	42.2	82.0
BG POND2	0.4	10.0
BG 30	3.0	5.0
BG 31	1.8	3.1
BG 25	251.3	751.4

(values were not cross-checked against plans and calculations)

how did this go down?

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CHALLENGER HOMES

DRAINAGE PLAN
BENT GRASS DEVELOPMENT
FOR
CHALLENGER COMMUNITIES, LLC

FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH00014.20
Drawn By:	CMWJ
Checked By:	SMB
Date:	OCTOBER 2019

FUTURE CONDITIONS MAP

FD-4
Sheet 4 OF 5

discrepancy between these values

166.5 is not right - the UDFCD pond spreadsheet is maxed out.

The HMS Model needs to be used.

Label flows of 59 cfs / 261 cfs in

Revise the values based on correct "sediment basin" modeling

How is 63.8 conveyed when 33 is capacity?

N

0 10 30 60

SCALE: 1"=60'

EX SEDIMENT POND
(SCHOOL POND)
Q5 OUT = 85.4 CFS
Q100 OUT = 166.5 CFS

FLOWS WILL OVERTOP CENTERLINE OF BGMD

FLOWS WILL SPLIT @ SEA OATS DR

FLOWS WILL SPLIT @ BGMD & SEA OATS DR

BENT GRASS MEADOWS DR
(COLLECTOR-80' ROW)

AVENA RD
(PUBLIC-LOCAL-50' ROW)

SEA OATS DR
(PUBLIC-LOCAL-50' ROW)

BENT GRASS RESIDENTIAL FILING NO. 1

BENT GRASS RESIDENTIAL FILING NO. 2

BENT GRASS EAST COMMERCIAL FILING NO.2

EX POND 1 - BENT GRASS RESIDENTIAL FILING NO. 1

BASIN MTO60
Q100=196.8 CFS
Q5=60.1 CFS
(PER HEC-HMS MODEL)

EX STM INLET 10' CDOT TYPE R

EX STM INLET 4' CDOT TYPE R

EX STM INLET 6' CDOT TYPE R

H.P.

L.P.

Galloway

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CHALLENGER HOMES

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FOR
CHALLENGER COMMUNITIES, LLC

FALCON, CO - EL PASO COUNTY

#	Date	Issue / Description	Init.

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

SPLIT FLOW EXHIBIT
BENT GRASS RES FILING NO. 1

EX-1

Sheet 1 of 1