EPC STORMWATER REVIEW COMMENTS IN ORANGE BOXES WITH BLACK TEXT

FINAL DRAINAGE REPORT

GRANDVIEW RESERVE FILING NO. 1

El Paso County, Colorado

PREPARED FOR:
D.R. Horton
9555 S. Kingston Court
Englewood, CO

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

DATE:
October 14, 2022

SF2311

PCD Filing No.: ~~PUDSPXXXX~~

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.

______________________________ ______________

Treven Edwards, PE #60124 Date
For and on behalf of Galloway & Company, Inc.

DEVELOPER'S CERTIFICATION

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

By:______________________________ ______________

Date

Address: D.R. Horton
9555 S. Kingston Court
Englewood, CO

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.

______________________________ ______________

Joshua Palmer, P.E. Date
~~Interim~~ County Engineer/ECM Administrator

Conditions:

TABLE OF CONTENTS

Update page #'s

Appendices:

I. Purpose

The purpose of this Final Drainage Report is to identify on and offsite drainage patterns, locate and identify tributary or downstream drainage features and facilities that impact the site, and to identify which types of drainage facilities will be needed and where they will be located. This report will remain in general compliance with the approved MDDP prepared by HR Green, dated November 2020 and Preliminary Drainage Report (PDR) prepared by Galloway & Company, Inc., dated September 09, 2022.

Verify the use of the words project and site throughout. At times it seems like these words are specific to filing 1 and sometimes they reference the entire Grandview project.

II. General Description

The project is a single-family residential development located in the Falcon area of El Paso County, Colorado. The site is located in a portion of the South half of Section 21, the North half of Section 28, Township 12 South, Range 64 West of the 6th Principal Meridian, County of El Paso, State of Colorado. The subject property is located immediately east from Eastonville Road to the west, which was studied separately in the "*Eastonville Road Final Drainage Report*", by HR Green, September 2022 (**E-FDR**). The project site is bounded by undeveloped land proposed as future development to the east, and undeveloped land within the Waterbury Development to the south. A Vicinity Map is included in **Appendix A**.

ect numbers
with each of
s

This final drainage report is the basis for the drainage facility design in conformance with the previously approved MDDP for the site prepared by HR Green, "*Grandview Reserve Master Development Drainage Plan*", HR Green, November 2020 (**MDDP**) and the approved preliminary drainage report, "*Preliminary Drainage Report - Grandview Reserve Filing No. 1",* Galloway & Company, Inc., September 09, 2022 (**PDR**). The site consists of approximately 37.564 acres and includes 125 dwelling units.

The existing soil types within the proposed site as determined by the NRCS Web Soil Survey for El Paso County Area consist of Columbine gravelly sandy loam (hydrologic soil group A) and Stapleton sandy loam (hydrologic soil group B). See the soils map included in **Appendix A**.

Final Plan and LOI state 119 lots

III. 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.

ge this section
inage
match maps.
section on
age and
ck to previous

The 100-year event was used as the major storm event. The 5-year event was used as the minor event. The UD-Inlets v5.01 spreadsheet was utilized for the sizing of the proposed sump inlets.

The UD-Detention v4.04 spreadsheet was utilized for the design of the proposed on-site water quality ponds, Ponds A, B, C, D, E, and Eastonville Pond.

Only include ponds which are being built with Filing 1

IV. Existing Drainage Conditions

This section only needs to discuss basins within Filing 1 or directly releasing onto Filing 1. All other basins can be listed and referenced back to PDR and include calcs in appendix under reference materials.

The site is contained fully within one major drain[...] tributary to Black Squirrel Creek. The site genera[...] slope of 2% outside of the channel. The rational method was used to analyze the individual basins within the site because their size permits it.

Following the preliminary drainage report (PDR), the "existing" condition for this FDR will be after the preliminary / interim grading on the site has taken place.

(overlot)

In the interim condition, overland grading operations will have taken place within the Grandview Reserve Subdivision in preparation for the ultimate proposed condition. While this activity is taking place within the proposed subdivision, no activity is anticipated west of Eastonville Road. The proposed development lies completely within the Gieck Ranch Drainage Basin and consists of six (6) larger basins (EA, A, B, C, D, & E) which have been broken down into thirteen (13) smaller sub-basins for the Interim Condition. Adjacent Off-site Basins (OS) were also analyzed in the interim condition and have been broken down into five (5) smaller sub-basins. Site runoff will be collected via swales and diverted to one of the eleven proposed temporary sediment basins. All necessary calculations can be found within the appendices of this report.

While the existing upstream tributary analysis (the areas west of Eastonville Road) was performed as part of the **E-FDR** (including basins EX1, EX2, EX3, EX4, EX5, EX6, and EX7) in the Existing Sub-basin Description, additional analysis was conducted for all of the proposed Eastonville Road in conjunction with the offsite upstream tributary areas in the Proposed Sub-basin Description. This analysis consisted of basins OS1, OS2, OS3, OS4, OS5, OS6, OS7, EA1, EA2, EA3, EA4, EA5. EA6, EA7, EA8, EA9, EA10, EA11, and EA12. See the **E-FDR** in **Appendix B** for reference.

Verify 11 TSBs are used. I could not find 11 TSBs on the GEC Plans. If less than 11 are specific to filing 1 clarify this.

Only count what is being constructed within Filing 1.

In addition to the upstream tributary analysis, the **E-FDR** also addressed the drainage analysis for all of Eastonville Road.

The proposed institutional use (**Sub-basin A-1**) area flows have been included in this analysis at a preliminary level only. The Sub-basin is located on the northwest corner of the site, East of Eastonville Rd. & south of the proposed extension of Rex Rd. In the interim condition, Sub-basin A-1 encompasses an area of 19.96 acres and interim developed runoff (imperviousness of 2.0%) for the site has been calculated to be Q_5 = 5.5 cfs, Q_{100} = 39.4 cfs. Runoff from this basin will sheet flow from the northwest to the southeast, intercepted by a proposed 4' bottom x 2' deep trapezoidal swale (Swale A-1). The interim runoff will be routed to the existing 100-year FEMA floodplain. Water quality and detention will be addressed with the future development of the institutional site.

Basin TSB-A1 (18.33 AC, Q_5 = 5.1 cfs, Q_{100} = 36.7 cfs): Located at the northern portion of the site, Basin TSB-A1 consists entirely of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the southeast where it is intercepted by proposed TSB-A1. From there, treated runoff enters a proposed 4' bottom x 2' deep trapezoidal swale (Swale A-1). The interim runoff will be routed to the existing 100-year FEMA floodplain.

Design Point 1 (Q_5 = 13.1 cfs, Q_{100} = 44.7 cfs): Located at the northern portion of the site, this design point accounts for the total combined flows from **Basins OS4 & TSB-A1**. Flows from this design point are conveyed in a proposed 4' bottom x 2' deep trapezoidal swale (Swale A-1) that conveys the flow southeast to the existing 100-year FEMA floodplain.

Design Point 2 (Q_5 = 18.7 cfs, Q_{100} = 84.1 cfs): Located at the northern portion of the site and to the southeast of Design Point 1, this design point accounts for the total combined flows from **Basins OS4, A-1, & TSB-A1**. Flows from this design point are conveyed downstream within the existing 100-year FEMA floodplain.

Basin TSB-A2 (4.51 AC, Q_5 = 1.4 cfs, Q_{100} = 10.1 cfs): Located at the northern portion of the site, Basin TSB-A2 consists of future residential lots, future roadways, and future amenity facilities. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the southeast where it is intercepted by proposed TSB-A2 at **Design Point 4**. From there, treated runoff exits the TSB and sheet flows to the existing 100-year FEMA floodplain.

Basin TSB-A3 (9.49 AC, Q_5 = 2.7 cfs, Q_{100} = 19.5 cfs): Located at the north-central portion of the site, Basin TSB-A3 consists of future residential lots, future roadways, and future amenity facilities. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the southeast where it is intercepted by proposed TSB-A3 at **Design Point 5**. From there, treated runoff exits the TSB and sheet flows to the existing 100-year FEMA floodplain.

Basin TSB-B1 (15.73 AC, Q_5 = 4.6 cfs, Q_{100} = 32.4 cfs): Located at the northwestern portion of the site, Basin TSB-B1 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the south where it is intercepted by proposed TSB-B1 at **Design Point 6**. From there, treated runoff exits the TSB and sheet flows downstream to TSB-B3.

Basin TSB-B2 (5.12 AC, Q_5 = 1.6 cfs, Q_{100} = 11.4 cfs): Located at the central portion of the site, Basin TSB-B2 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the southeast where it is intercepted by proposed TSB-B2 at **Design Point 7**. From there, treated runoff exits the TSB and sheet flows downstream to TSB-B3.

Basin TSB-B3 (9.91 AC, Q_5 = 3.0 cfs, Q_{100} = 21.2 cfs): Located at the central portion of the site, Basin TSB-B3 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the south where it is intercepted by proposed TSB-B3 at **Design Point 8**. From there, treated runoff exits the TSB and sheet flows downstream to the existing Geick Ranch Tributary-1 / Channel A (**E-FDR**).

Design Point 8 (Q_5 = 9.1.7 cfs, Q_{100} = 65.0 cfs): Located at the south-central portion of the site and to the south of Design Point 7, this design point accounts for the total combined flows from **Basins TSB-B1, TSB-B2, and TSB-B3**. Flows from this design point are conveyed downstream to the existing Geick Ranch Tributary-1 / Channel A (**E-FDR**).

Basin TSB-C1 (6.84 AC, Q_5 = 2.0 cfs, Q_{100} = 13.8 cfs): Located at the eastern portion of the site, Basin TSB-C1 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the south where it is intercepted by proposed TSB-C1 at **Design Point 9**. From there, treated runoff exits the TSB and sheet flows downstream to TSB-C3 at **Design Point 11**.

Basin TSB-C2 (17.00 AC, Q_5 = 4.8 cfs, Q_{100} = 34.0 cfs): Located at the eastern portion of the site, Basin TSB-C2 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the south where it is intercepted by proposed TSB-C2 at **Design Point 10**. From there, treated runoff exits the TSB and sheet flows downstream to TSB-C3 at **Design Point 11**.

Basin TSB-C3 (18.56.00 AC, Q_5 = 5.1 cfs, Q_{100} = 36.4 cfs): Located at the southeastern portion of the site, Basin TSB-C3 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the southeast where it is intercepted by proposed TSB-C3 at **Design Point 11**. From there, treated runoff exits the TSB and sheet flows downstream to the existing 100-year FEMA floodplain.

Design Point 11 (Q_5 = 11.8 cfs, Q_{100} = 84.3 cfs): Located at the southeastern portion of the site and to the southeast of Design Point 1, this design point accounts for the total combined flows from **Basins TSB-C1, TSB-C2, & TSB-C3**. Flows from this design point exit via sheet flow through the TSB proposed spillway and are conveyed downstream within the existing 100-year FEMA floodplain.

Basin TSB-D1 (10.86 AC, Q_5 = 3.0 cfs, Q_{100} = 21.1 cfs): Located at the southwestern portion of the site, Basin TSB-D1 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the east where it is intercepted by proposed TSB-D1 at **Design Point 12**. From there, treated runoff exits the TSB and sheet flows downstream to the existing Geick Ranch Tributary-1 / Channel A (**E-FDR**).

Only TSB-D1 & TSB-E1 appear to be in Filing 1. Other basins can be listed as being in future filings and removed from discussion, unless they drain onto Filing 1.

Basin TSB-E1 (19.42 AC, Q_5 = 5.1 cfs, Q_{100} = 36.2 cfs): Located at the southern portion of the site, Basin TSB-E1 consists of future residential lots and future roadways. In the interim overland graded phase of development, imperviousness for this sub-basin can be described as nearly bare ground (2%). Runoff from this basin will sheet flow to the east where it is intercepted by proposed TSB-E1 at **Design Point 13**. From there, treated runoff exits the TSB and sheet flows downstream to the existing Geick Ranch Tributary-1 / Channel A (**E-FDR**).

V. 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

This step 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. The Impervious Reduction Factor (IRF) method was used and calculations can be found in **Appendix E.**

Basin D-7a is treated with runoff reduction. Discuss the methodology and provide calculations in support of the runoff reduction credited for treating that basin.

2. Stabilize Channels

This step implements stabilization to channels to accommodate developed flows while protecting infrastructure and controlling sediment loading from erosion in the drainageways. Erosion protection in the form of riprap pads at all outfall points to the channel to prevent scouring of the channel from point discharges. The existing channel analysis and design for the Main Stem Tributary #2 (MST) is to be completed by others and a report for the channel improvements will be submitted for review separately.

3. Provide Water Quality Capture Volume (WQCV)

This step utilizes formalized water quality capture volume to slow the release of runoff from the site. The EURV volume will release in 72 hours, while the WQCV will release in no less than 40 hours. On-site water quality control volume detention ponds will provide water quality treatment for all of the developed areas, prior to the runoff being released into either of the major drainage ways. Refer to WQCV Plan in **Appendix F.**

4. Consider Need for Industrial and Commercial BMPs

As this project is all residential development and no commercial or industrial development is proposed, there will be no need for any specialized BMPs which would be associated with an industrial or commercial site.

VI. Proposed Drainage Conditions

The proposed development lies completely within the Gieck Ranch Drainage Basin and consists of two (2) larger basins (D & E) which have been broken down into sixteen (16) smaller sub-basins. Adjacent Off-site Basins (OS) were analyzed as part of the **E-FDR**. Site runoff will be collected via inlets & pipes and diverted to one of the two proposed full spectrum detention ponds. All necessary calculations can be found within the appendices of this report.

It appears there are no off-site flows entering Filing 1. Include a statement addressing that.

According to the **MDDP**, there are two major drainageways that run through the site. The Main Stem (MS) runs through the site conveying runoff from the northwest to the southeast. This drainageway is

Following paragraph only discuss 1 drainageway. Revise statement to reflect that.

referred to as Channel A within the **E-FDR**. Presently, this channel receives flows from two off-site basins, one from the west (west of Sub-basin OS-3 per the PDR and Basin B1 per the **MDDP;** 0.17 mi^2, Q_5 = ±67 cfs, Q_{100} = ±413 cfs).

There are no proposed major channel improvements for MS (**MDDP**) / Channel A (**E-FDR**) associated with this development. The analysis for the channel was performed by HR Green (*Grandview Reserve CLOMR Report*, HR Green; April 2022).

The site will provide two (2) Full Spectrum Extended Detention Basins (EDBs). Ponds D & E will discharge treated runoff at historic rates directly into either the MS (**MDDP**) / Channel A (**E-FDR**).

As has been mentioned previously, the site is proposed to have a land use of single family re The site will consist primarily of 1/8 Acre lots, with some 1/4 Acre and 1/3 Acre lots, public roa along with dedicated Tracts for amenity uses.

Update location of basins in regards to Filing 1, not overall Grandview site.

lets

Basin D-1 (3.48 AC, Q_5 = 5.4 cfs, Q_{100} = 12.7 cfs): Located on the southwest portion of the site, adjacent to Eastonville Road. This basin consists of residential lots and the west half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' at-grade inlet, located on the west side of Kate Meadow Lane **(DP D1)**, just south of the intersection of Kate Meadow Lane & Farm Close Court. Flows will continue downstream to Design Point **D3** within Kate Meadow Lane and further downstream to Design Point **D7** within Farm Close Court.

Basin D-2 (0.82 AC, Q_5 = 1.6 cfs, Q_{100} = 3.8 cfs): Located on the southwest portion of the site, this basin consists of residential lots and the eastern half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' flow by inlet, located on the east side of Kate Meadow Lane **(DP D2)**, just south of the intersection of Kate Meadow Lane & Farm Close Court. Flows will continue downstream to Design Point **D3** within Kate Meadow Lane and further downstream to Design Point **D7** within Farm Close Court.

Basin D-3 (3.67 AC, Q_5 = 6.0 cfs, Q_{100} = 14.0 cfs): Located on the southwest portion of the site, this basin consists of residential lots and the western half of Farm Close Court. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' inlet in sump conditions, located on the west side of Farm Close Court **(DP D4)**, southeast of the intersection of Kate Meadow Lane & Farm Close Court. Emergency overflows will overtop the crown and be routed downstream via an emergency overflow swale to the east which conveys runoff directly to Pond D.

Basin D-4 (1.82 AC, Q_5 = 3.4 cfs, Q_{100} = 7.9 cfs): Located on the southwest portion of the site, this basin consists of residential lots and the eastern half of Farm Close Court. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' inlet in sump conditions, located on the east side of Farm Close Court **(DP D5)**, just southeast of the intersection of Kate Meadow Lane & Farm Close Court. Emergency overflows will overtop curb & gutter and be routed downstream via a graded swale within the maintenance access path to Pond D.

Basin D-5 (1.45 AC, Q_5 = 1.9 cfs, Q_{100} = 5.9 cfs): Located on the southwest corner of the site, adjacent to the Main Stem channel. This basin consists partially of residential lots and the proposed (private) Full Spectrum Detention Pond D. Runoff from this basin will sheet flow directly to Pond D. Flows will then be routed to the outlet structure **(DP D9)**, via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem channel.

Basin D-6 (1.53 AC, Q_5 = 0.5 cfs, Q_{100} = 3.8 cfs): Located on the southwest corner of the site, adjacent to the Main Stem channel. This basin consists of the undeveloped area outside and downstream of the proposed (private) Full Spectrum Detention Pond D. Runoff from this basin will sheet flow directly to the Main Stem channel (MS).

Basin D-7a (0.26 AC, Q_5 = 0.2 cfs, Q_{100} = 0.8 cfs): Located on the southwest corner of the site, adjacent to the Main Stem channel. This basin consists of the back portions of residential lots. Runoff from this basin will sheet flow directly to the Main Stem Channel. All roof drains (for lots 18-20) within this sub-basin will be directed toward Farm Close Court, no impervious surfaces will be allowed within the rear lot setbacks and runoff reduction will be implemented within this sub-basin.

intercepted by Type D inle
at DP D8

Basin D-7b (0.96 AC, Q_5 = 1.6 cfs, Q_{100} = 3.9 cfs): Located on the southwest corner of the site, adjacent to the Main Stem channel. This basin consists of the back portions of residential lots and a drainage swale (Swale D-7). Runoff from this basin will sheet flow from the residential lots, into the adjacent swale and will be routed directly to Pond D.

all of Brixham Dr per map

Basin E-1 (4.91 AC, Q_5 = 7.2 cfs, Q_{100} = 19.1 cfs): Located on the southern portion of the site, this basin consists of residential lots, the southern half of Brixham Drive, Starcross Court, and the southern half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located approximately 150-feet to the northeast of the intersection between Kate Meadow Lane and Starcross Court **(DP E1)**. Bypass flows are conveyed downstream via curb & gutter to **DP E4**.

Update location of basins in regards to Filing 1, not overall Grandview site.

Basin E-2 (4.06 AC, Q_5 = 8.0 cfs, Q_{100} = 18.6 cfs): Located on the southern portion of the site, this basin consists of residential lots, a small portion of Mill Yard Circle, and the north half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located approximately 150-feet to the northeast of the intersection between Kate Meadow Lane and Starcross Court **(DP E2)**. Bypass flows are conveyed downstream via curb & gutter to **DP E4**.

Basin E-3a (2.75 AC, Q_5 = 5.4 cfs, Q_{100} = 12.6 cfs): Located on the southern portion of the site, this basin consists of residential lots the western and southern half of Mill Yard Circle as well as a portion of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located just southeast from the intersection between Kate Meadow Lane and Mill Yard Circle **(DP E4)**. Bypass flows are conveyed downstream via curb & gutter to **DP E7**.

Basin E-3b (2.17 AC, Q_5 = 3.7 cfs, Q_{100} = 8.5 cfs): Located on the southern portion of the site, this basin consists of the rear portion of residential lots along Kate Meadow Lane and full residential lots and the western half of Mill Yard Circle near the cul-de-sac. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' sump inlet, located just northeast from the cul-de-sac of Mill Yard Circle **(DP E7)**. Emergency overflows will overtop the crown and be routed downstream via an emergency overflow swale to the southeast which conveys runoff directly to Pond E via a graded emergency overflow swale.

Basin E-4a (4.68 AC, Q_5 = 6.9 cfs, Q_{100} = 16.1 cfs): Located on the southern portion of the site, this basin consists of residential lots and the northern and eastern half of Mill Yard Circle. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located just southeast from the intersection between Kate Meadow Lane and Mill Yard Circle **(DP E5)**. Bypass flows are conveyed downstream via curb & gutter to **DP E9**.

Basin E-4b (1.60 AC, Q_5 = 2.7 cfs, Q_{100} = 6.3 cfs): Located on the southern portion of the site, this basin consists of residential lots and the eastern half of Mill Yard Circle near the cul-de-sac. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' sump inlet, located just southeast from the intersection between Kate Meadow Lane and Mill Yard Circle **(DP E5)**. Emergency overflows will overtop the curb and be routed downstream via an emergency overflow swale to the southeast which conveys runoff directly to Pond E via a graded emergency overflow swale.

DP E9

Basin E-5 (1.13 AC, Q_5 = 0.4 cfs, Q_{100} = 3.0 cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists of the proposed (private) Full Spectrum Detention Pond E. Runoff from this basin will sheet flow directly to Pond E. Flows will then be routed to the outlet structure **(DP E10)**, via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem channel.

Basin E-6 (2.00 AC, Q_5 = 0.7 cfs, Q_{100} = 4.8 cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists of the undeveloped area outside and downstream of the proposed (private) Full Spectrum Detention Pond E. Runoff from this basin will sheet flow directly to the Main Stem channel (MS) and offsite to the south.

Looks like flows will go east into the Main Stem channel.

VII. Storm Sewer System

All development is anticipated to be urban and will include storm sewer & street inlets. Storm sewers collect storm water runoff and convey the water to the water quality facilities prior to discharging. Storm sewer systems will be designed to the 100-year storm and checked with the 5-year storm. Inlets will be placed at sump areas and intersections where street flow is larger than street capacity. UDFCD Inlet spreadsheet has been used to determine the size of all sump inlets.

There will be two (2) proposed storm systems within the site. Each of the two storm sewer systems will discharge storm water into its correlated WQCV pond.

Each system will consist of reinforced concrete pipe (RCP), CDOT Type 'R' inlets, and storm sewer manholes.

Furthermore, there is one (1) proposed drainage swale that runs along the back of the residential lots in Basin D-7b. The swales were analyzed using the Bentley software FlowMaster to properly size a trapezoidal channel (1' W x 1.54' D), to convey the 100-year flows from the basin to corresponding outfall location (Pond D), while providing 1.0-ft of freeboard. The sizing calculations can be found in **Appendix D.**

& sump

What about overflow swales?

This Final drainage report includes details concerning at-grade inlet locations, street capacity, storm sewer sizing, outlet protection and locations. The calculations can be found in **Appendix D**.

The other storm events shown on the MHFD-Detenion calcs should also be released at or below pre-development rates (thus "full-spectrum" detention)

VIII. Proposed Water Quality Detention Ponds

Two (2) Full Spectrum Detention Ponds will be provided for the proposed site. Both of these ponds (Ponds D & E) are private and will be maintained by the DISTRICT, once established. These detention ponds are proposed to be full spectrum and will provide water quality and detention. The WQCV and EURV release will be controlled with an orifice plate. The release rates for the WQCV and EURV will be 40-hours and 72-hours, respectively. The 100-year volume will be controlled by orifice and/or restrictor plate and will be designed to release at or below the pre-development flow rate. Outlet structures, forebays, trickle channels, etc. will be designed with the final drainage report during final plat. The required FSD pond volumes are as described below:

This is the final plat. Please revise statement accordingly

Pond D: Located centrally on the site, just west of the Main Stem channel. This pond will discharge into the Main Stem channel. The required volume WQCV and EURV are 0.244 Ac-Ft & 0.666 Ac-Ft, respectively. The provided storage for the WQCV and EURV are 0.246 Ac-Ft & 0.913 Ac-Ft, respectively. The total required detention basin volume is 1.373 Ac-Ft. The total provided detention basin storage is 1.373 Ac-Ft.

Volumes
MHFD sp

Pond E: Located on the south side of the site, just west of the Main Stem channel. This pond will discharge into the Main Stem channel. The required volume WQCV and EURV are 0.431 Ac-Ft & 1.163 Ac-Ft, respectively. The provided storage for the WQCV and EURV are 0.437 Ac-Ft & 1.601 Ac-Ft, respectively. The total required detention basin volume is 2.421 Ac-Ft. The total provided detention basin storage is 2.583 Ac-Ft.

Because this drainage report is specific to filing 1 tailor this text to filing 1. The Main Stem does not flow through the F1 site. It flows northwest to southeast along the northern boundary of filing 1.

Include discussion of release rates vs existing flow rates at both ponds.

osed Channel Improvements

According to the **MDDP**, there are two major drainageways that run through the site. The Main Stem (MS) runs through the site conveying runoff from the northwest to the southeast. This drainageway is referred to as Channel A within the **E-FDR**. Presently, this channel receives flows from two off-site basins, one from the west (west of Sub-basin OS-3 per the PDR and Basin B1 per the **MDDP;** 0.17 mi^2, Q_5 = ±67 cfs, Q_{100} = ±413 cfs). . There are no proposed major channel improvements for MS as part of this project (to be determined with CDR-22-008). An analysis has been done for the Main Stem channel (MS) with both existing and future condition flows as described within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised April 2022 (**CLOMR**). All HEC-RAS modelling, velocities, shear, depths, etc. are included within the CLOMR, which can be found in Appendix D. Both scenarios, throughout the channel fall within the channel stability criteria.

Include name of this project

Was not included in appendix. Please add with next submittal.

A majority of the developed runoff will be captured and conveyed to one of the corresponding water quality and detention facilities and release at or below historic levels. Some basins will release directly into the respective adjacent channels. These basins are contained within the backs of lots and will provide water quality through runoff reduction; impervious areas will not be permitted in the back of these lots and roof drains are to drain to the front. Therefore, there will be no adverse impact to downstream facilities. The analysis for drainageway (MS), offsite upstream tributary capture were performed by HR Green within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised April 2022 (**CLOMR**) which has been submitted separately for review. A copy of this report is included in Appendix D.

Additional channel stabilization may be required for erosion control prevention measures, pending the channel design review with the County.

as part of this filing? Ensure all text in the drainage report is clear as to what work is part of filing 1 since that is what this drainage report covers.

X. Maintenance

After completion of construction and upon the Board of County Commissioners acceptance, it is anticipated all drainage facilities within the public Right-of-Way are to be owned and maintained by El Paso County.

State what drainage facilities are in the public ROW.

Both private detention ponds are to be owned and maintained by the Grandview Reserve Metropolitan District No. 2 (DISTRICT), once established, unless an agreement is reached stating otherwise. The proposed Main Stem channel (MS) will be maintained by the DISTRICT. Maintenance access for all full spectrum detention facilities will be provided from public Right-of-Way. Maintenance access for MS will be provided along the respective eastern top of channel bank within the proposed tracts.

Remove reference to MST as it's not been mentioned previously in report

XI. Wetlands Mitigation

There are two existing wetlands on site associated with the two major channels, MS and MST. The wetlands are both contained within the existing channels with the wetland in MS being classified as jurisdictional. The wetlands USACE determination will be provided with the *Grandview Reserve CLOMR Report*, HR Green; April 2022, which can be found in Appendix D. Wetlands maintenance will be the responsibility of the Grandview Reserve Metropolitan District No. 2 (DISTRICT).

XII. Floodplain Statement

A portion of the project sit lies with Zone A Special Flood Hazard Area as defined by the FIRM Map number 08041C0552G and 08041C0556G effective December 7, 2018. A copy of the FIRM Panel is included in **Appendix A.** FEMA-approved floodplain elevations are required to be shown on final plats.

XIII. Drainage Fees & Maintenance

Gieck Ranch Basin is not listed as part of the El Paso County drainage basin fee program. Unless otherwise instructed, no drainage fees will be assessed.

Include cost estimate of proposed facilities

XIV. Conclusion

The Grandview Reserve Filing No. 1 residential subdivision lies within the Gieck Ranch Drainage Basin. Water quality for the site is provided in two on-site Full Spectrum Detention Ponds; Ponds D & E. All drainage facilities within this report were sized according to the El Paso County Drainage Criteria Manuals. The proposed facilities are adequate to protect the site from generated runoff. The site runoff will not adversely affect the downstream facilities and surrounding developments. There is one major channel passing through the site, Main Stem channel, which was evaluated by HR Green within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised April 2022. The two (2) WQCV ponds will be maintained by a newly established Grandview Reserve Metropolitan District No. 2 (DISTRICT).

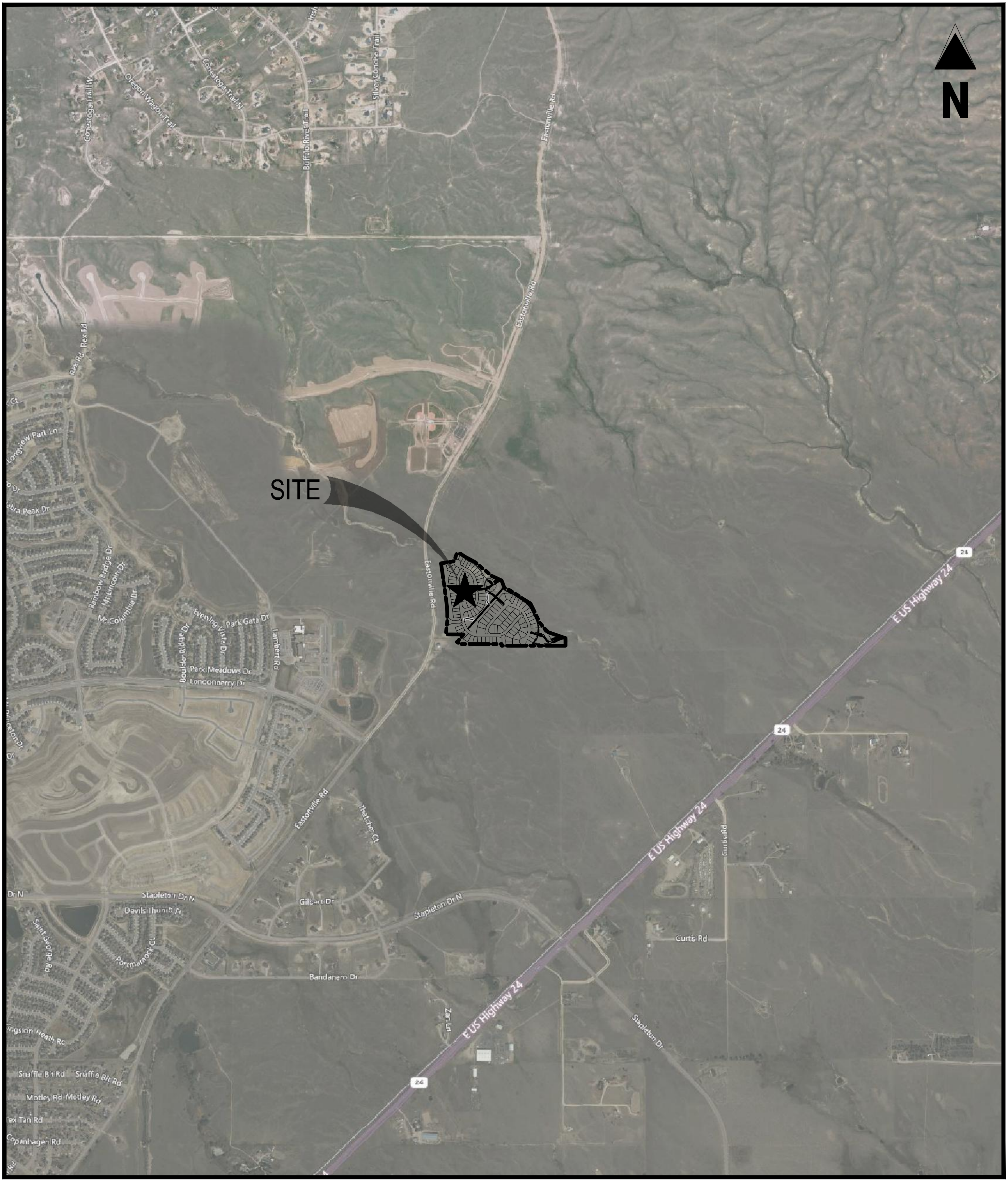
XV. References

1. *El Paso County Drainage Criteria Manual*, 1990.
2. *Drainage Criteria Manual, Volume 2*, City of Colorado Springs, 2002.
3. *El Paso County Drainage Criteria Manual Update*, 2015.
4. *El Paso County Engineering Criteria Manual*, 2020.
5. *Urban Storm Drainage Criteria Manual*, Urban Drainage and Flood Control District, January 2016 (with current revisions).
6. *Gieck Ranch Drainage Basin Study (DBPS),* Drexel Barrell, October 2010 (Not adopted by County).
7. *Grandview Reserve Master Development Drainage Plan (MDDP),* HR Green, November 2020.
8. *Grandview Reserve CLOMR Report*, HR Green; April 2022.
9. *Meridian Ranch MDDP,* January 2018*.*
10. *Preliminary Drainage Report, Grandview Reserve Filing No. 1*, Galloway & Company, Inc.; September 2022

For proposed runoff reduction measures:
In accordance with the MHFD, runoff reduction has vegetation requirements that have been overlooked in the past. Going forward the following will be required for runoff reduction:
- The runoff reduction RPA is considered a WQ Facility and requires a signed Maintenance Agreement
- All RPA/SPA areas will need to be within a no build/drainage easement (or tract) and discussed in the maintenance agreement and O&M manual.
- RPA vegetation should be turf grass (from seed [provide appropriate seed mix] or sod).
- Turf grass vegetation should have a uniform density of at least 80%.
- RPA/SPA limits must be shown on GEC Plans (not just FDR) so our SW inspectors and the QSM know that these areas are to remain pervious and vegetated (80%). Our SW inspectors do not look at drainage reports.

APPENDIX A

Exhibits and Figures



GRANDVIEW RESERVE
FILING NO. 1

EASTONVILLE RD
SCALE: 1"=2,000'

VICINITY MAP

Project No:	HRG02
Drawn By:	JDM
Checked By:	CMWJ
Date:	10/14/2022

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

possible updates 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, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

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.

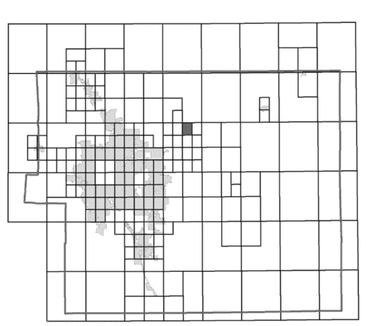
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

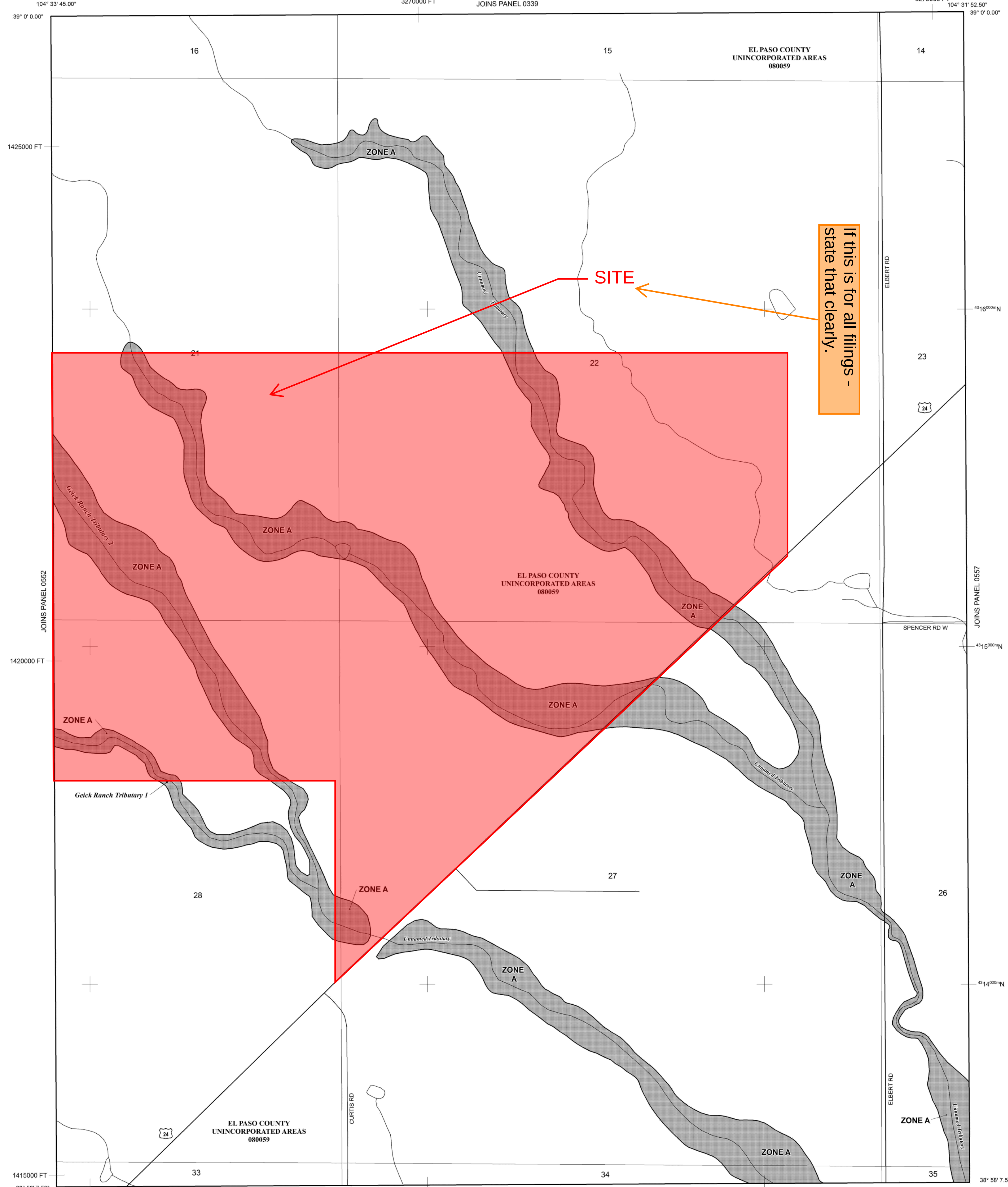
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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.



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

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0556G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 556 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0556	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
08041C0556G

MAP REVISED

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.

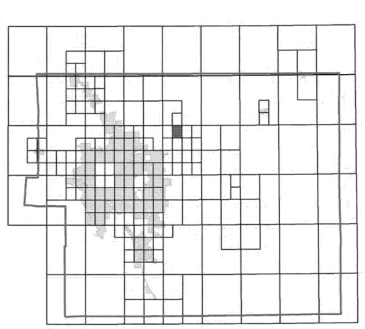
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

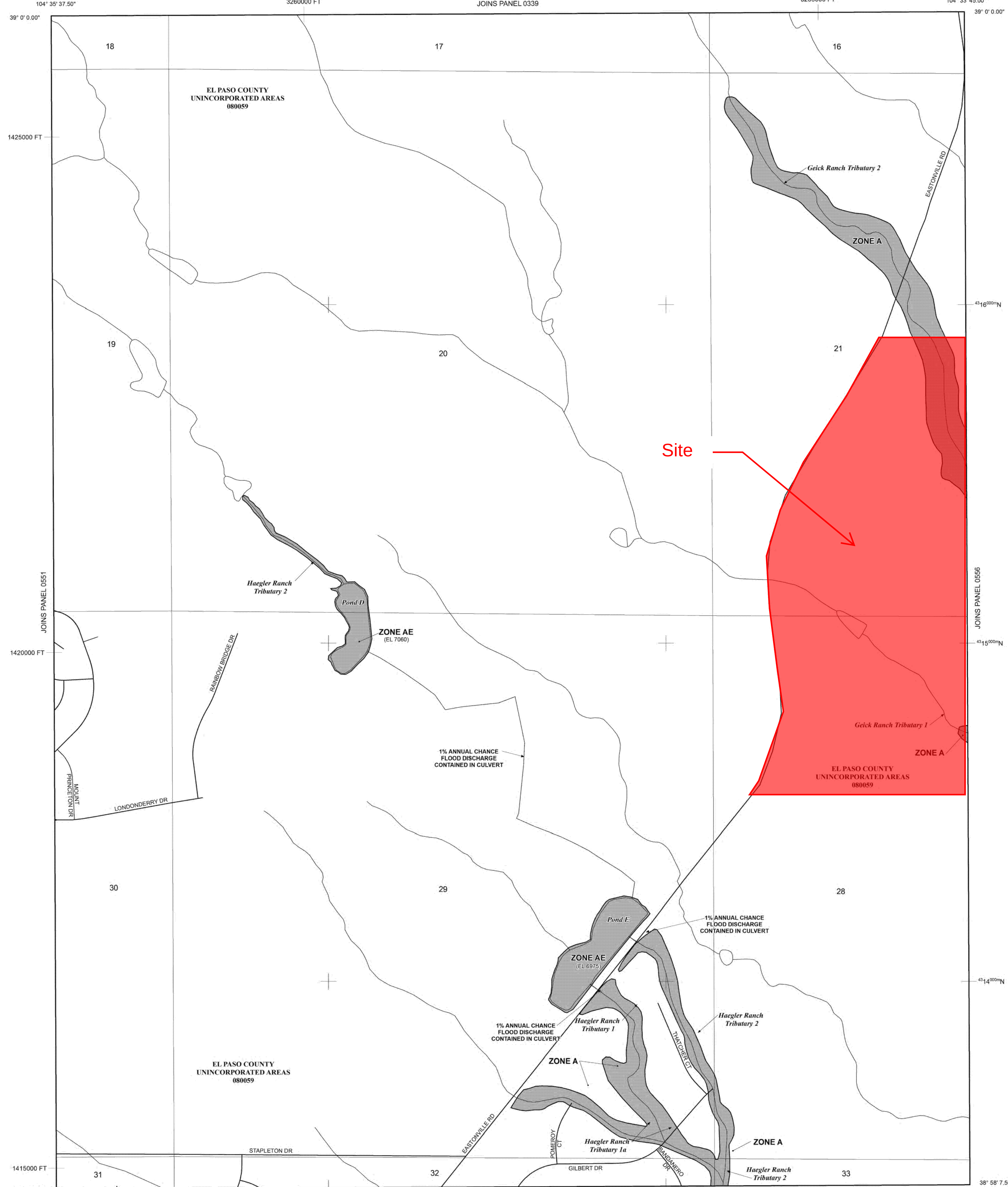
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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.



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 0552G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 552 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	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
08041C0552G

MAP REVISED

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.

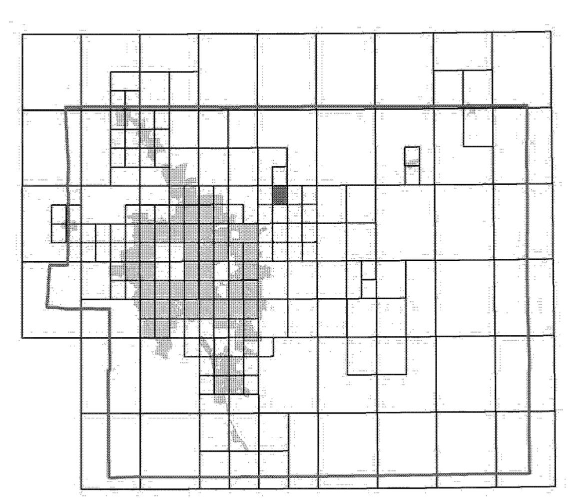
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

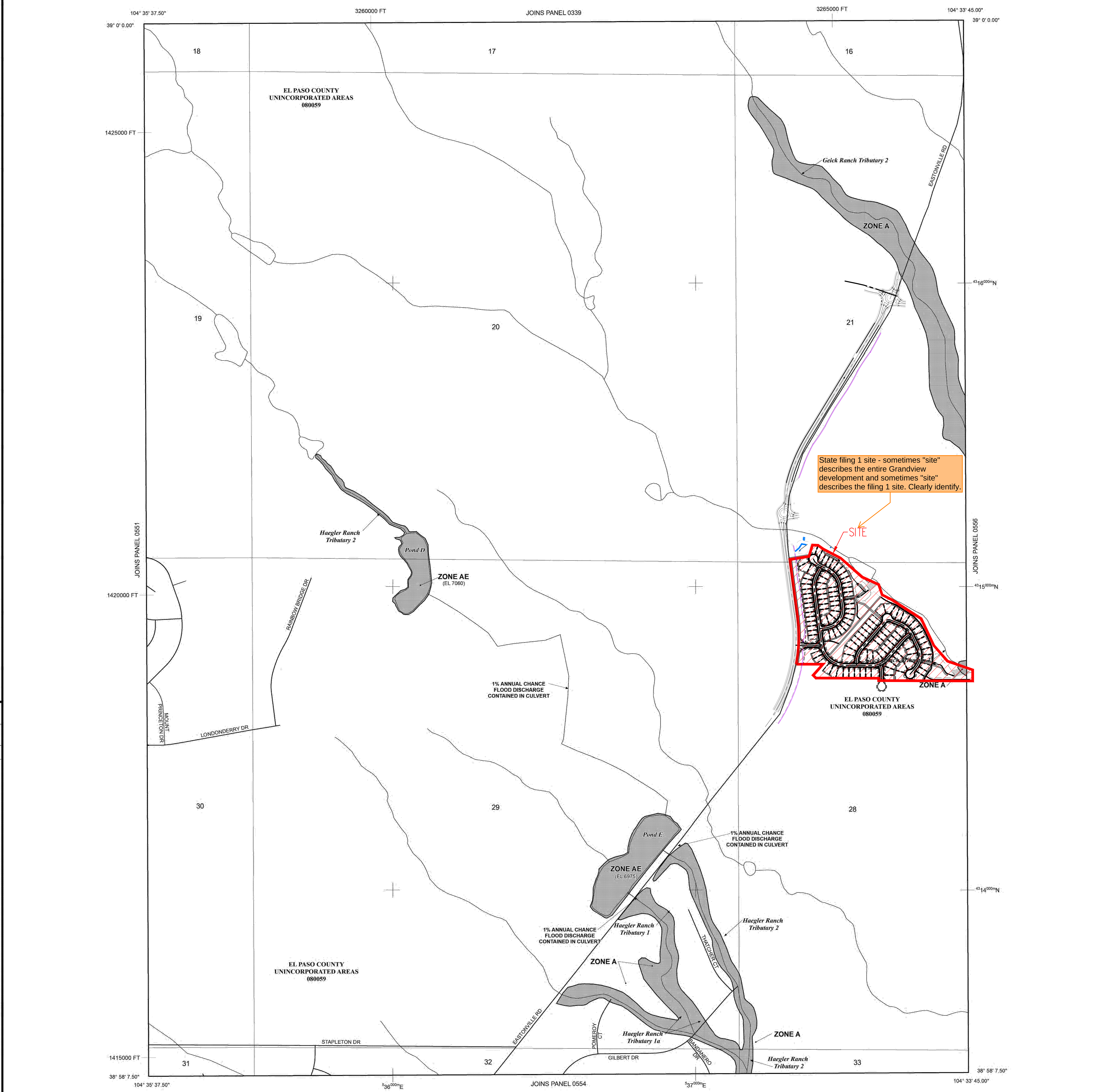
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST.

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

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0552G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 552 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

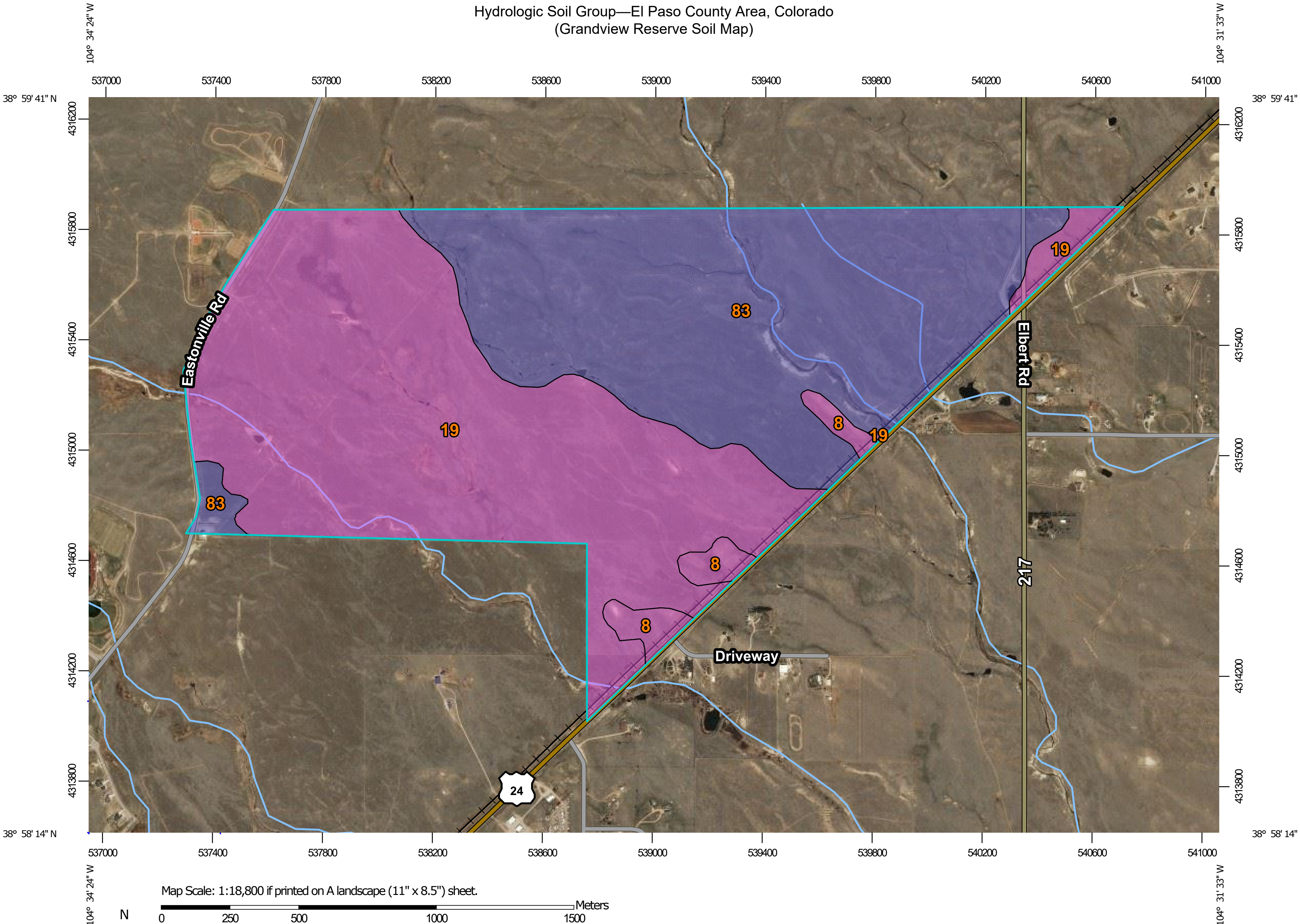
Notice to User: The **Map Number** shown below should be used when placing map orders: the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0552G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

Hydrologic Soil Group—El Paso County Area, Colorado
(Grandview Reserve Soil Map)



Map Scale: 1:18,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 250, 500, 1000, 1500

Feet: 0, 500, 1000, 2000, 3000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	22.4	2.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	450.7	52.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	385.4	44.9%
Totals for Area of Interest			**858.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOAA Atlas 14, Volume 8, Version 2
Location name: Peyton, Colorado, USA*
Latitude: 38.985°, Longitude: -104.565°
Elevation: 6975.71 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.239 (0.189-0.303)	0.291 (0.231-0.370)	0.381 (0.301-0.486)	0.461 (0.361-0.589)	0.576 (0.440-0.768)	0.671 (0.499-0.904)	0.770 (0.554-1.06)	0.875 (0.604-1.24)	1.02 (0.678-1.48)	1.14 (0.733-1.67)
10-min	0.350 (0.277-0.444)	0.426 (0.338-0.542)	0.558 (0.441-0.711)	0.674 (0.529-0.863)	0.844 (0.644-1.13)	0.982 (0.731-1.32)	1.13 (0.811-1.56)	1.28 (0.884-1.81)	1.49 (0.992-2.17)	1.66 (1.07-2.44)
15-min	0.426 (0.338-0.541)	0.520 (0.412-0.660)	0.681 (0.537-0.867)	0.823 (0.645-1.05)	1.03 (0.785-1.37)	1.20 (0.891-1.62)	1.37 (0.988-1.90)	1.56 (1.08-2.21)	1.82 (1.21-2.65)	2.03 (1.31-2.98)
30-min	0.608 (0.482-0.771)	0.740 (0.586-0.940)	0.968 (0.764-1.23)	1.17 (0.916-1.49)	1.46 (1.11-1.94)	1.70 (1.26-2.29)	1.94 (1.40-2.68)	2.21 (1.52-3.12)	2.57 (1.71-3.73)	2.86 (1.85-4.19)
60-min	0.775 (0.615-0.984)	0.933 (0.739-1.19)	1.21 (0.956-1.54)	1.46 (1.15-1.87)	1.84 (1.41-2.47)	2.16 (1.61-2.92)	2.49 (1.80-3.45)	2.85 (1.97-4.05)	3.37 (2.24-4.90)	3.78 (2.44-5.55)
2-hr	0.943 (0.754-1.19)	1.13 (0.898-1.42)	1.46 (1.16-1.84)	1.76 (1.39-2.23)	2.22 (1.72-2.97)	2.62 (1.97-3.52)	3.04 (2.21-4.19)	3.50 (2.45-4.95)	4.16 (2.80-6.03)	4.70 (3.06-6.85)
3-hr	1.03 (0.829-1.29)	1.22 (0.978-1.53)	1.57 (1.25-1.97)	1.90 (1.51-2.40)	2.41 (1.88-3.22)	2.86 (2.17-3.84)	3.35 (2.45-4.60)	3.88 (2.73-5.48)	4.66 (3.15-6.74)	5.29 (3.46-7.69)
6-hr	1.20 (0.968-1.49)	1.40 (1.13-1.74)	1.78 (1.44-2.22)	2.16 (1.73-2.70)	2.76 (2.18-3.66)	3.28 (2.52-4.39)	3.86 (2.86-5.29)	4.51 (3.21-6.34)	5.46 (3.73-7.86)	6.24 (4.12-9.01)
12-hr	1.38 (1.13-1.70)	1.61 (1.31-1.98)	2.05 (1.67-2.53)	2.48 (2.00-3.07)	3.15 (2.51-4.15)	3.74 (2.89-4.96)	4.39 (3.28-5.96)	5.12 (3.67-7.13)	6.17 (4.25-8.82)	7.04 (4.69-10.1)
24-hr	1.60 (1.31-1.95)	1.87 (1.54-2.28)	2.38 (1.94-2.91)	2.85 (2.32-3.51)	3.60 (2.88-4.67)	4.24 (3.29-5.56)	4.94 (3.71-6.63)	5.71 (4.12-7.87)	6.82 (4.73-9.66)	7.73 (5.20-11.0)
2-day	1.85 (1.54-2.24)	2.18 (1.80-2.63)	2.76 (2.28-3.35)	3.29 (2.70-4.01)	4.11 (3.30-5.27)	4.80 (3.76-6.22)	5.54 (4.19-7.36)	6.35 (4.62-8.68)	7.50 (5.25-10.5)	8.44 (5.73-11.9)
3-day	2.03 (1.69-2.44)	2.39 (1.98-2.87)	3.02 (2.50-3.64)	3.60 (2.97-4.36)	4.47 (3.60-5.69)	5.20 (4.09-6.70)	5.98 (4.55-7.90)	6.83 (4.99-9.28)	8.03 (5.65-11.2)	9.00 (6.15-12.7)
4-day	2.18 (1.82-2.61)	2.56 (2.13-3.06)	3.22 (2.68-3.87)	3.82 (3.16-4.62)	4.73 (3.83-6.00)	5.49 (4.33-7.04)	6.30 (4.81-8.30)	7.18 (5.26-9.72)	8.43 (5.95-11.7)	9.43 (6.46-13.3)
7-day	2.58 (2.17-3.07)	2.98 (2.50-3.54)	3.68 (3.08-4.39)	4.32 (3.60-5.18)	5.29 (4.31-6.65)	6.09 (4.84-7.76)	6.96 (5.34-9.09)	7.89 (5.82-10.6)	9.21 (6.55-12.8)	10.3 (7.10-14.4)
10-day	2.93 (2.48-3.47)	3.37 (2.84-3.98)	4.13 (3.47-4.90)	4.81 (4.02-5.74)	5.83 (4.76-7.29)	6.68 (5.32-8.45)	7.58 (5.85-9.86)	8.55 (6.34-11.4)	9.92 (7.09-13.7)	11.0 (7.65-15.4)
20-day	3.91 (3.33-4.58)	4.51 (3.84-5.29)	5.52 (4.68-6.50)	6.39 (5.39-7.55)	7.63 (6.25-9.37)	8.62 (6.90-10.8)	9.64 (7.47-12.4)	10.7 (7.98-14.1)	12.2 (8.74-16.6)	13.3 (9.31-18.4)
30-day	4.70 (4.02-5.47)	5.44 (4.65-6.34)	6.65 (5.66-7.78)	7.66 (6.49-9.00)	9.06 (7.44-11.0)	10.1 (8.15-12.5)	11.2 (8.74-14.3)	12.3 (9.24-16.2)	13.8 (9.98-18.7)	15.0 (10.5-20.6)
45-day	5.67 (4.88-6.57)	6.55 (5.63-7.60)	7.97 (6.82-9.27)	9.12 (7.77-10.7)	10.7 (8.79-12.9)	11.9 (9.56-14.5)	13.0 (10.2-16.4)	14.2 (10.6-18.4)	15.6 (11.3-21.0)	16.7 (11.9-23.0)
60-day	6.49 (5.60-7.48)	7.46 (6.43-8.62)	9.01 (7.74-10.4)	10.3 (8.77-11.9)	11.9 (9.82-14.3)	13.1 (10.6-16.0)	14.3 (11.2-18.0)	15.5 (11.7-20.0)	16.9 (12.3-22.6)	18.0 (12.8-24.6)

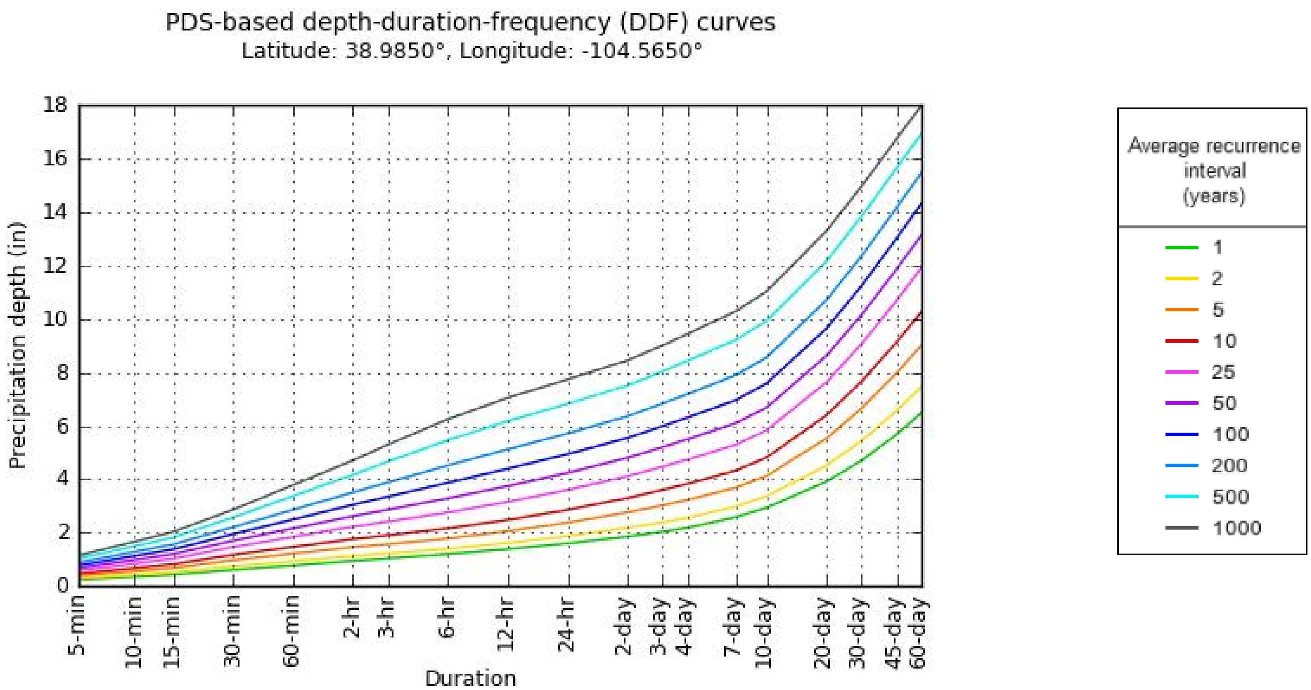
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

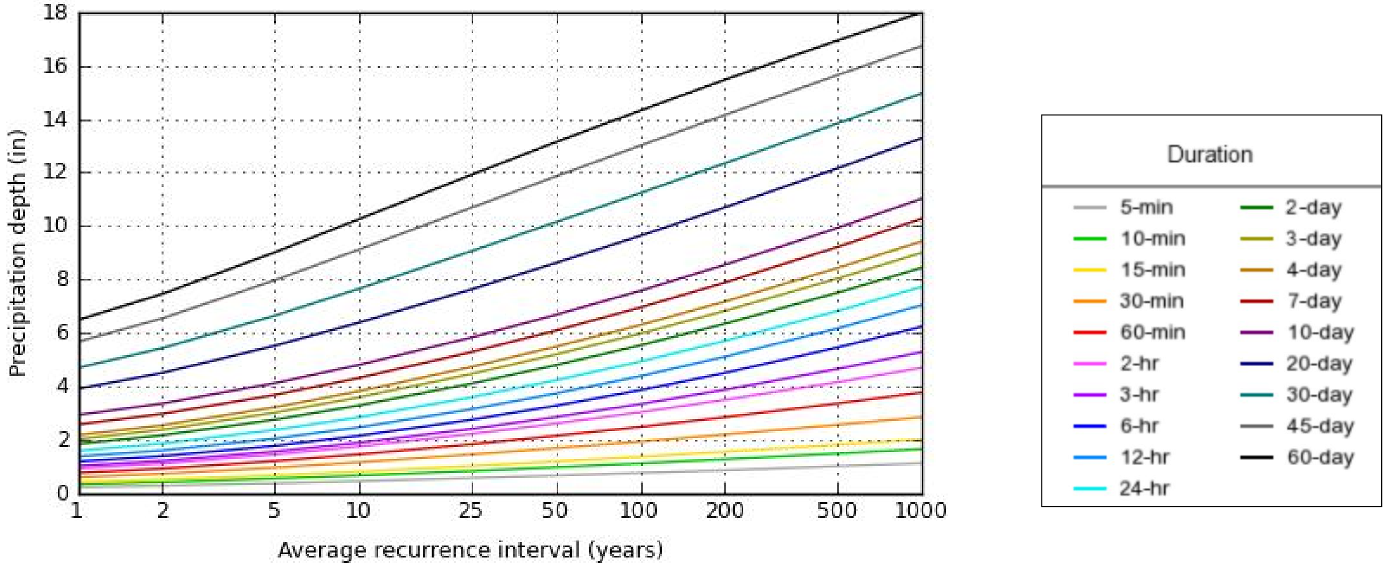
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



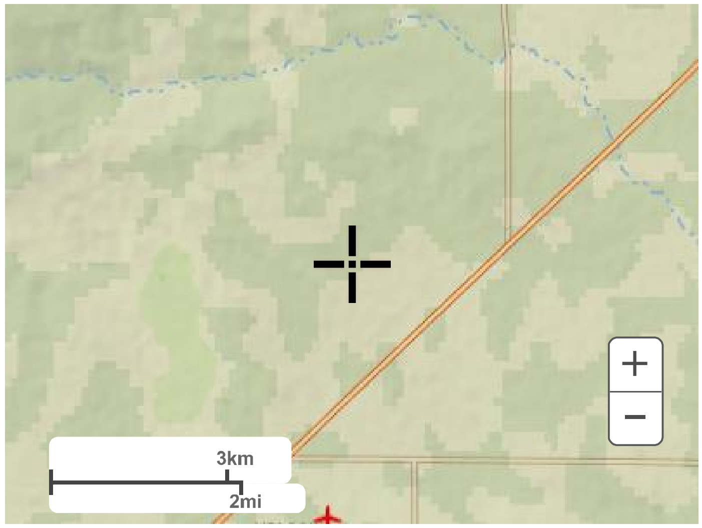


NOAA Atlas 14, Volume 8, Version 2 Created (GMT): Thu Dec 2 17:16:51 2021

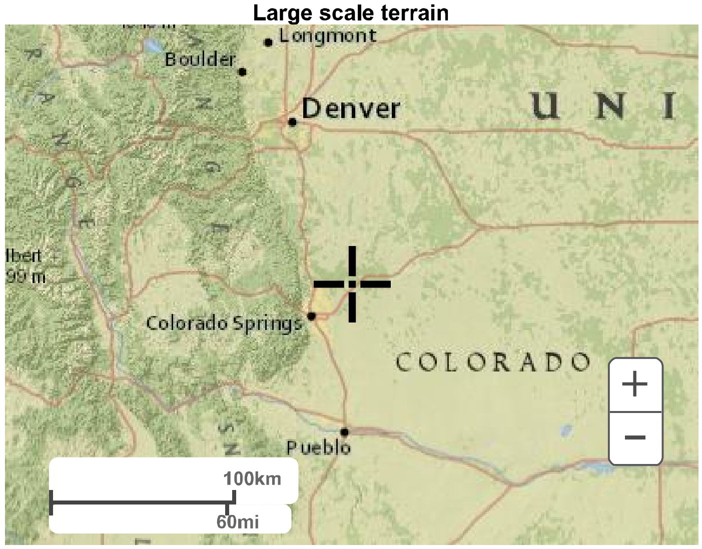
Back to Top

Maps & aerials

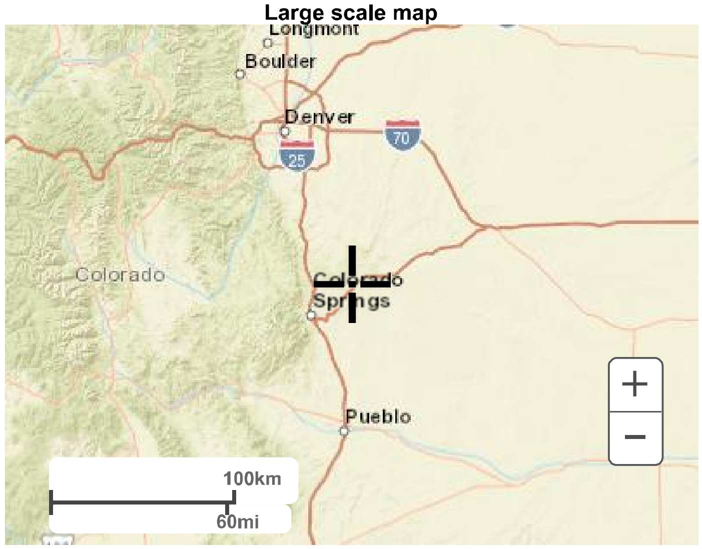
Small scale terrain



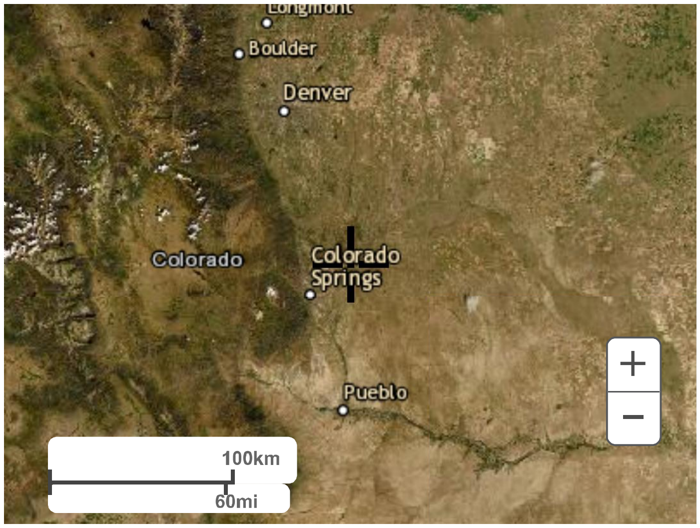
Large scale terrain



Large scale map



Large scale aerial

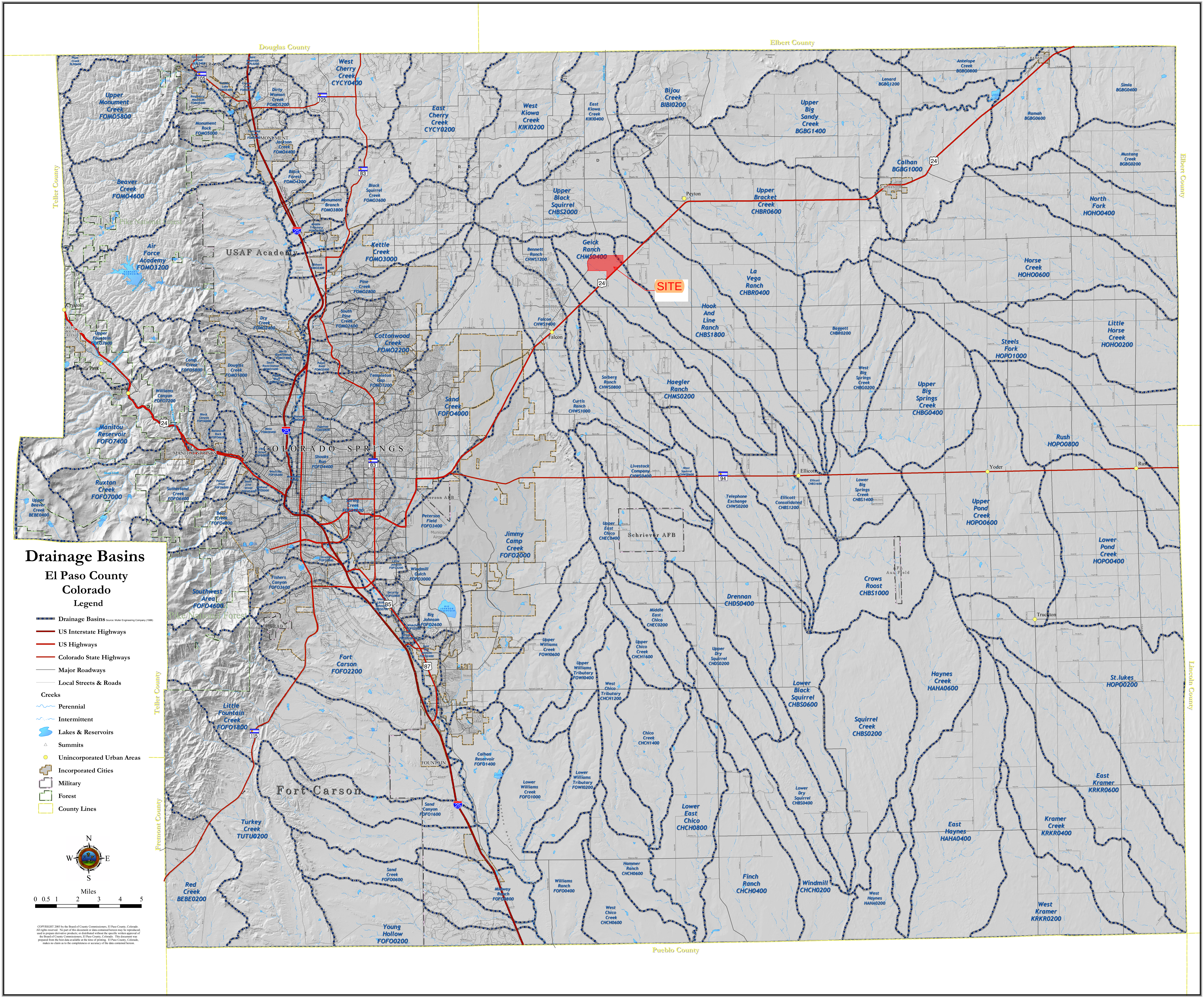


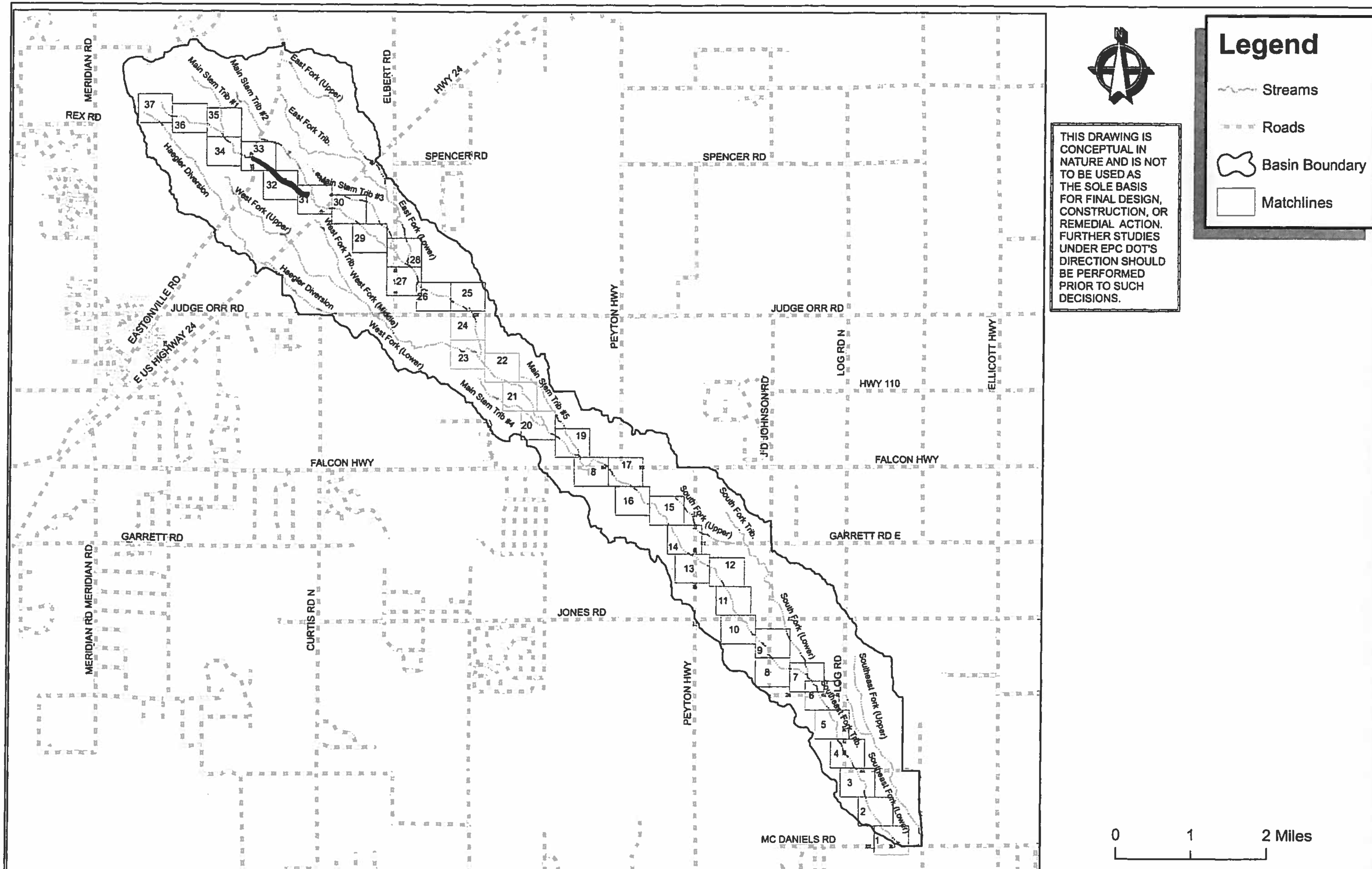
[Back to Top](#)

[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

APPENDIX B

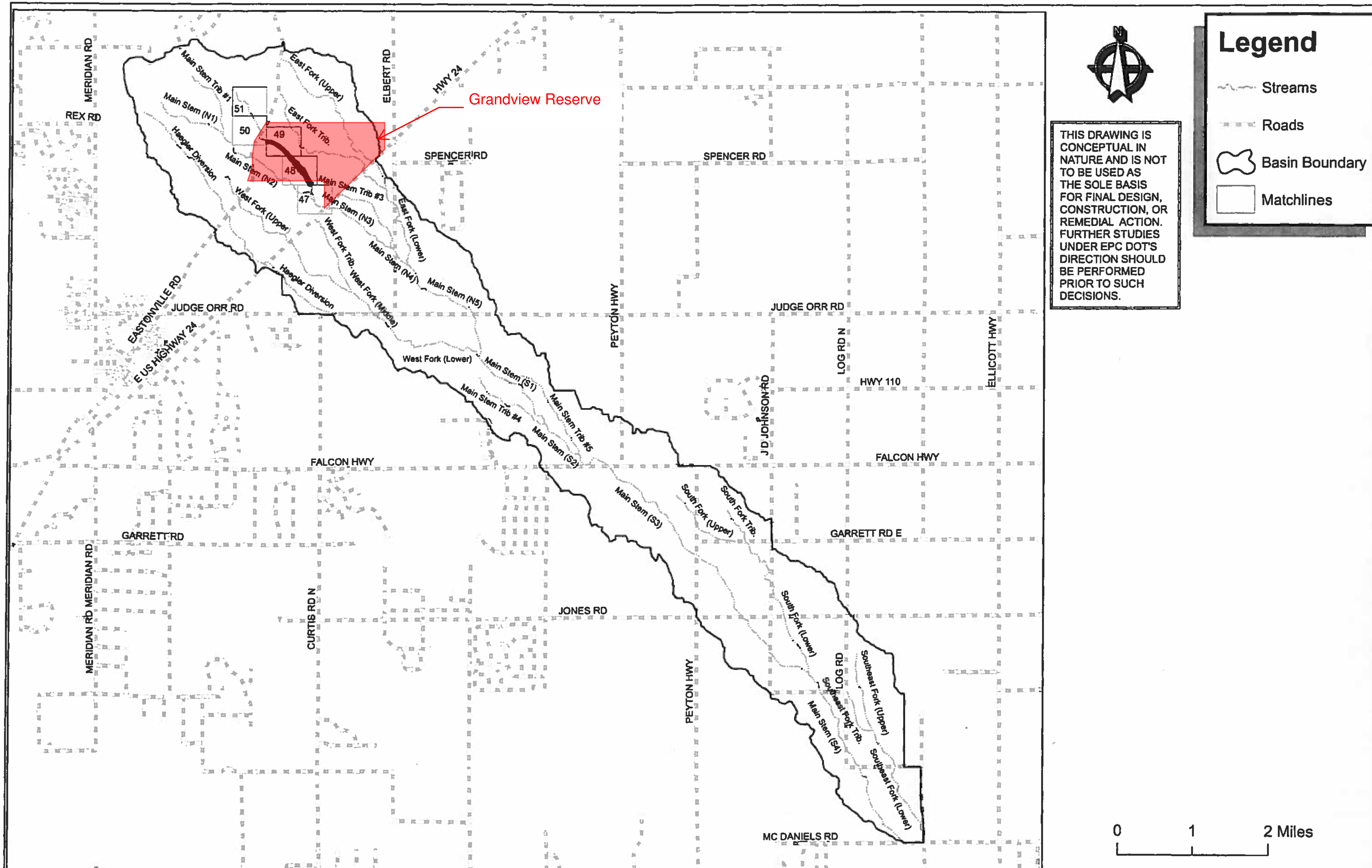
DBPS &, MDDP Sheet References


Drainage Basins
El Paso County
Colorado
Legend
Drainage Basins
US Interstate Highways
US Highways
Colorado State Highways
Major Roadways
Local Streets & Roads
Creeks
Perennial
Intermittent
Lakes & Reservoirs
Summits
Unincorporated Urban Areas
Incorporated Cities
Military
Forest
County Lines
N
W
E
S
Miles
0 0.5 1 2 3 4 5
SITE
Douglas County
Elbert County
Teller County
Fremont County
Pueblo County
Lincoln County
USAF Academy
COLORADO SPRINGS
Fort Carson
Schriever AFB
Peyton
Falcon
Calhan
Ellicott
Yoder
Rush
Truckton
Geick Ranch CHMS0400
La Vega Ranch CHBR0400
Hook And Line Ranch CHBS1800
Upper Black Squirrel CHBS2000
Upper Bracket Creek CHBR0600
Bijou Creek BIBI0200
Upper Big Sandy Creek BGBG1400
Calhan BGBG1000
North Fork HOHO0400
Horse Creek HOHO0600
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Upper Big Springs Creek CHBG0400
Haegler Ranch CHMS0200
Rush HOPO0800
Upper Pond Creek HOPO0600
Lower Pond Creek HOPO0400
Crows Roost CHBS1000
Drennan CHBS0400
Jimmy Camp Creek FOFO2000
Sand Creek FOFO4000
Cottonwood Creek FOMO2200
Kettle Creek FOMO3000
West Kiowa Creek KIKI0200
East Cherry Creek CYCY0200
West Cherry Creek CYCY0400
Upper Monument Creek FOMO5800
Beaver Creek FOMO4600
Air Force Academy FOMO3200
Manitou Reservoir FOFO7400
Ruxton Creek FOFO7000
Southwest Area FOFO4600
Fort Carson FOFO2200
Little Fountain Creek FOFO1800
Turkey Creek TUTU0200
Red Creek BEBE0200
Young Hollow FOFO0200
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Haynes Creek HAHA0600
St.lukes HOPO0200
East Kramer KRKR0600
Kramer Creek KRKR0400
West Kramer KRKR0200
East Haynes HAHA0400
Lower East Chico CHCH0800
Finch Ranch CHCH0400
Windmill Ranch CHCH0200



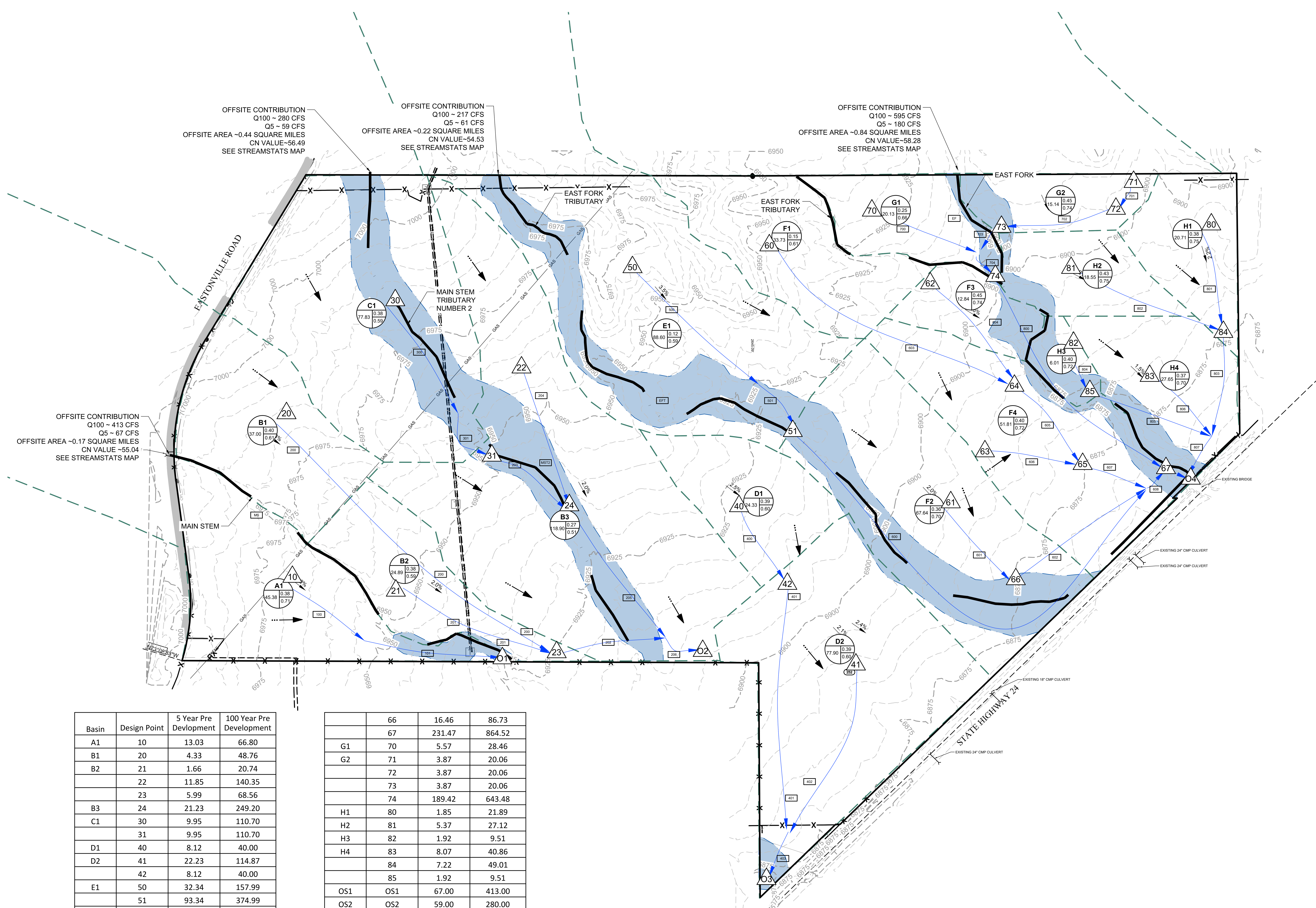
PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors 1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338 3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887 5513 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0645 CONTACT: ROBERT BENNETT	PREPARED FOR: REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 CONTACT: RAY O' SULLIVAN (719) 227-1022	PROJECT INFO: GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF CHECKED BY: RJB

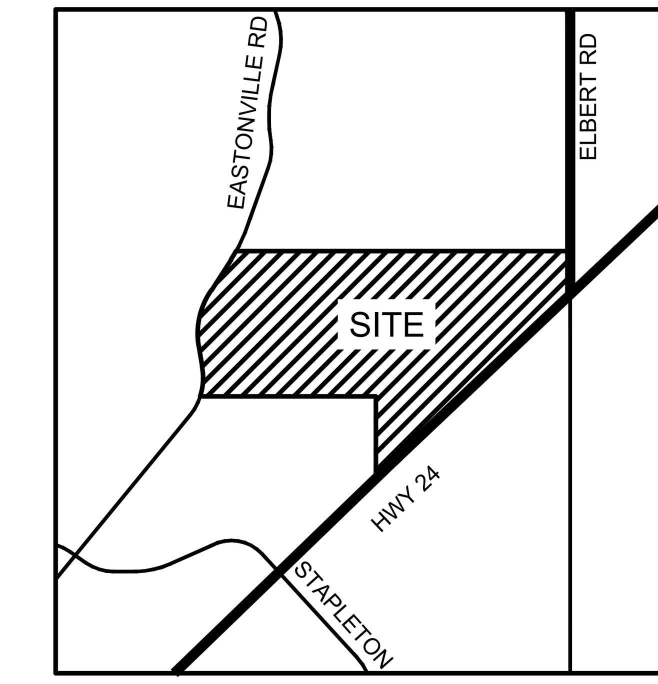
REVISION DESCRIPTIONS	DATE	DRAWING INFO:	DATE:	JOB NO:	SET
		GIECK RANCH KEY MAP MAIN STEM	AUGUST 2007	C7706-1	PL
			SCALE: H: 1" = 6000' V:	DRAWING NO.: 6D 038	SHEET K1



PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors 1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338 3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887 6513 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0645 CONTACT: ROBERT BENNETT	PREPARED FOR: REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 CONTACT: RAY O' SULLIVAN (719) 227-1022	PROJECT INFO: GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF CHECKED BY: RJB	REVISION DESCRIPTIONS / DATE	DRAWING INFO: GIECK RANCH KEY MAP MAIN STEM TRIBUTARY #2

DATE: AUGUST 2007	JOB NO: C7706-1	SET: PL
SCALE: 1" = 6000'	DRAWING NO.: 6D 038	SHEET: K5





VICINITY MAP

LEGEND:

PROPOSED MAJOR CONTOUR — 5250
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR — 5250
EXISTING MINOR CONTOUR
PROPOSED STORM DRAIN PIPE
EXISTING STORM DRAIN PIPE
PROPOSED DRAINAGE CHANNEL
PROPOSED ROAD
PROPERTY LINE
DIRECTIONAL FLOW ARROW
EMERGENCY OVERFLOW ARROW
EXISTING 100-YR FLOODWAY
EXISTING 100-YR FLOODPLAIN
PROPOSED 100-YR FLOODPLAIN
WATERSHED BOUNDARY
MAJOR BASIN LINE
100YR ZONE A FLOODPLAIN
PROPOSED DETENTION LOCATION — A
POTENTIAL WATER QUALITY LOCATION — WQ
SWMM CONVEYANCE ELEMENT — SWMM
PROPOSED PEAK FLOW RATE (CFS) — 850
DESIGN POINT — X
PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX C5; XX C100

LAND USE
LOW DENSITY
MEDIUM DENSITY
HIGH/MED DENSITY
HIGH DENSITY
CHURCH
COMMERCIAL
ELEMENTARY SCHOOL
COMMUNITY PARK

NOTES:

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
A1	10	13.03	66.80
B1	20	4.33	48.76
B2	21	1.66	20.74
	22	11.85	140.35
	23	5.99	68.56
B3	24	21.23	249.20
C1	30	9.95	110.70
	31	9.95	110.70
D1	40	8.12	40.00
D2	41	22.23	114.87
	42	8.12	40.00
E1	50	32.34	157.99
	51	93.34	374.99
F1	60	9.70	49.45
F2	61	16.46	86.73
F3	62	3.65	18.42
F4	63	12.98	67.82
	64	13.35	67.87
	65	26.04	135.62

	66	16.46	86.73
	67	231.47	864.52
G1	70	5.57	28.46
G2	71	3.87	20.06
	72	3.87	20.06
	73	3.87	20.06
	74	189.42	643.48
H1	80	1.85	21.89
H2	81	5.37	27.12
H3	82	1.92	9.51
H4	83	8.07	40.86
	84	7.22	49.01
	85	1.92	9.51
OS1	OS1	67.00	413.00
OS2	OS2	59.00	280.00
OS3	OS3	61.00	217.00
OS4	OS4	180.00	595.00
	Outfall1	80.03	479.80
	Outfall2	85.96	597.41
	Outfall3	30.00	154.35
	Outfall4	341.05	1335.77

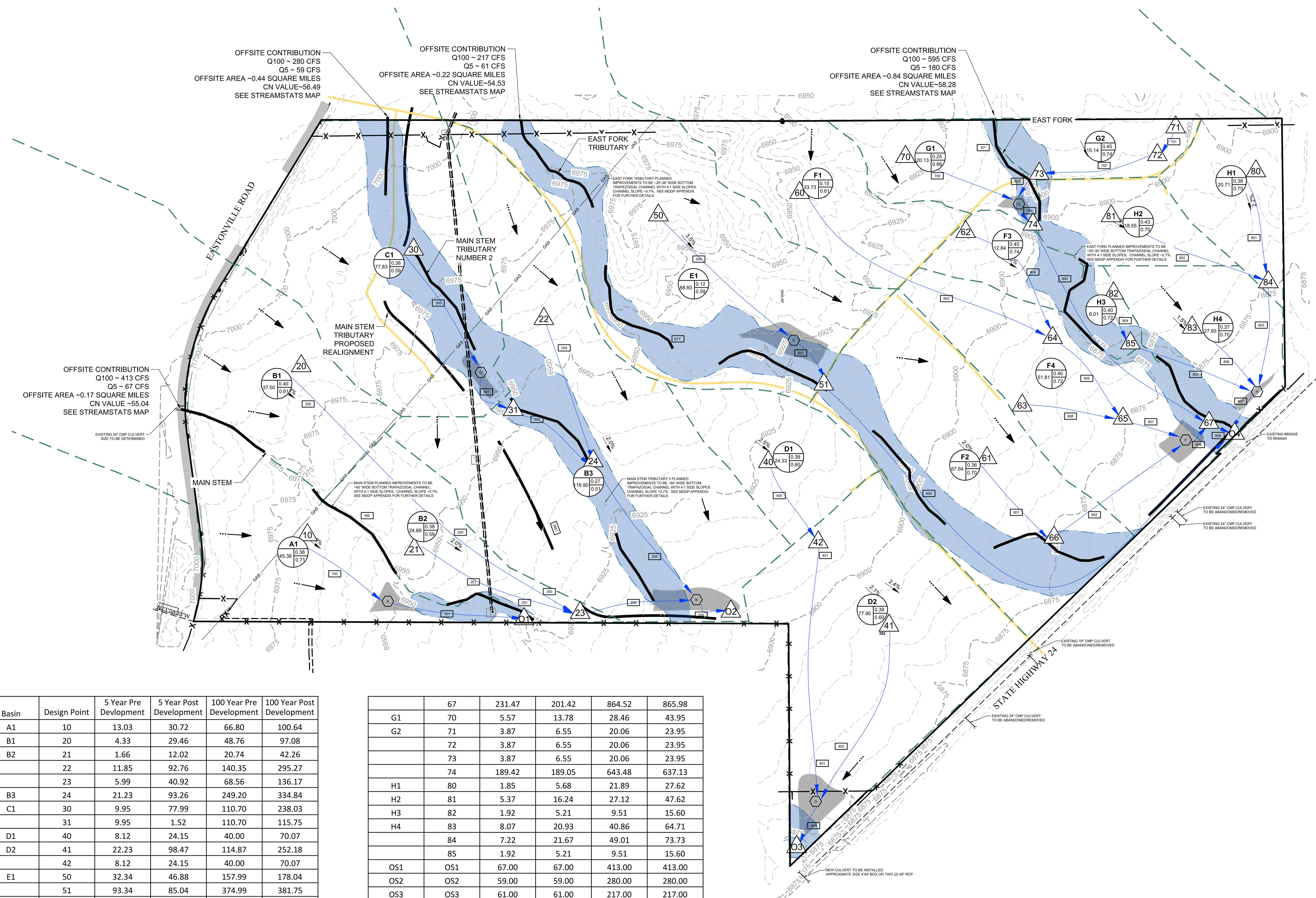
0 100 200

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

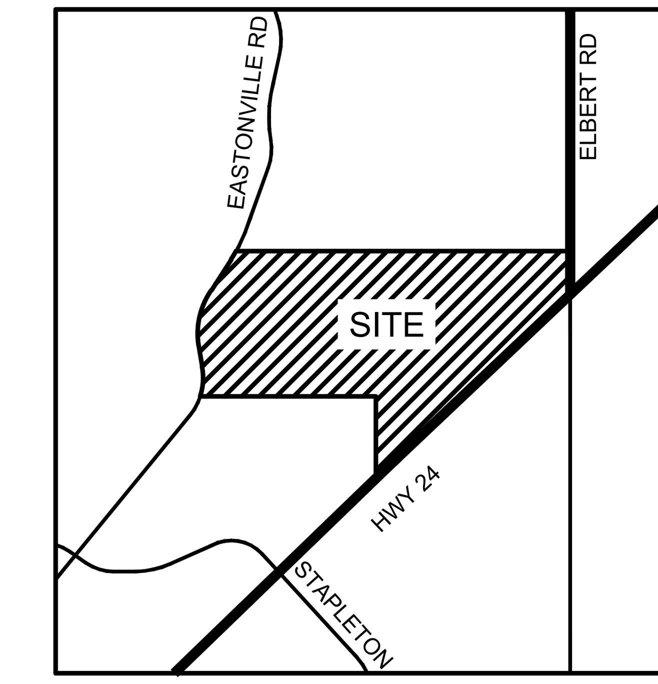
EXISTING EX1

FIG.EX1



Basin	Design Point	5 Year Pre Devlopment	5 Year Post Development	100 Year Pre Development	100 Year Post Development
A1	10	13.03	30.72	66.80	100.64
B1	20	4.33	29.46	48.76	97.08
B2	21	1.66	12.02	20.74	42.26
	22	11.85	92.76	140.35	295.27
	23	5.99	40.92	68.56	136.17
B3	24	21.23	93.26	249.20	334.84
C1	30	9.95	77.99	110.70	238.03
	31	9.95	1.52	110.70	115.75
D1	40	8.12	24.15	40.00	70.07
D2	41	22.23	98.47	114.87	252.18
	42	8.12	24.15	40.00	70.07
E1	50	32.34	46.88	157.99	178.04
	51	93.34	85.04	374.99	381.75
F1	60	9.70	16.28	49.45	58.95
F2	61	16.46	60.11	86.73	170.90
F3	62	3.65	11.36	18.42	32.93
F4	63	12.98	42.32	67.82	124.89
	64	13.35	26.88	67.87	90.88
	65	26.04	69.12	135.62	215.63
	66	16.46	60.11	86.73	170.90
	67	231.47	201.42	864.52	865.98
G1	70	5.57	13.78	28.46	43.95
G2	71	3.87	6.55	20.06	23.95
	72	3.87	6.55	20.06	23.95
	73	3.87	6.55	20.06	23.95
	74	189.42	189.05	643.48	637.13
H1	80	1.85	5.68	21.89	27.62
H2	81	5.37	16.24	27.12	47.62
H3	82	1.92	5.21	9.51	15.60
H4	83	8.07	20.93	40.86	64.71
	84	7.22	21.67	49.01	73.73
	85	1.92	5.21	9.51	15.60
OS1	OS1	67.00	67.00	413.00	413.00
OS2	OS2	59.00	59.00	280.00	280.00
OS3	OS3	61.00	61.00	217.00	217.00
OS4	OS4	180.00	180.00	595.00	595.00
	Outfall1	80.03	67.69	479.80	466.95
	Outfall2	85.96	61.68	597.41	536.11
	Outfall3	30.00	8.58	154.35	160.70*
	Outfall4	341.05	276.10	1335.77	1291.25

*THIS VALUE IS HIGHER THAN PRE-EXISTING AND WILL BE ADJUSTED TO MEET CRITERIA WITH THE PRELIMINARY DRAINAGE REPORT



VICINITY MAP

LEGEND:

PROPOSED MAJOR CONTOUR — 5250
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR — 5250
EXISTING MINOR CONTOUR
PROPOSED STORM DRAIN PIPE
EXISTING STORM DRAIN PIPE
PROPOSED DRAINAGE CHANNEL
PROPOSED ROAD
PROPERTY LINE
DIRECTIONAL FLOW ARROW
EMERGENCY OVERFLOW ARROW
EXISTING 100-YR FLOODWAY
EXISTING 100-YR FLOODPLAIN
PROPOSED 100-YR FLOODPLAIN
WATERSHED BOUNDARY
MAJOR BASIN LINE
100YR ZONE A FLOODPLAIN
PROPOSED DETENTION LOCATION — A
POTENTIAL WATER QUALITY LOCATION — WQ
SWMM CONVEYANCE ELEMENT — SWMM
PROPOSED PEAK FLOW RATE (CFS) — 850
DESIGN POINT — X
PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX C5; XX C100

LAND USE
LOW DENSITY
MEDIUM DENSITY
HIGH/MED DENSITY
HIGH DENSITY
CHURCH
COMMERCIAL
ELEMENTARY SCHOOL
COMMUNITY PARK

NOTES:

PRELIMINARY CHANNEL GEOMETRY (BY OTHERS)

MAIN STEM
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

MAIN STEM TRIBUTARY 2
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 2
BOTTOM WIDTH: 38'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 1
BOTTOM WIDTH: 25'
SIDE SLOPES: 4:1

NORTH
0 400
200

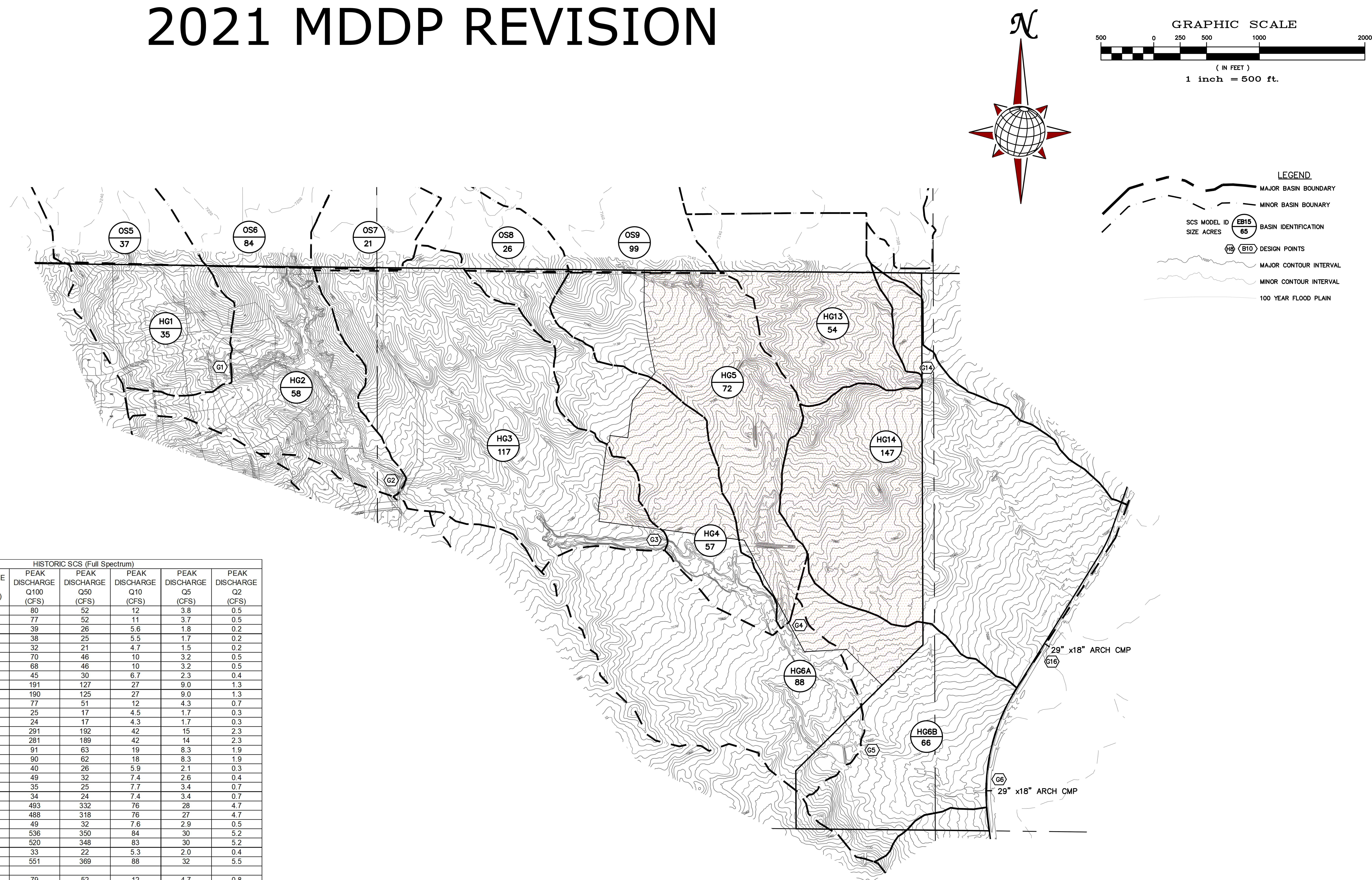
HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR1

FIG.DR1

2021 MDDP REVISION



HISTORIC SCS (Full Spectrum)						
HYDROLOGIC ELEMENT	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS06	0.1313	80	52	12	3.8	0.5
OS06-G02	0.1313	77	52	11	3.7	0.5
OS05	0.0578	39	26	5.6	1.8	0.2
OS05-G01	0.0578	38	25	5.5	1.7	0.2
HG01	0.0547	32	21	4.7	1.5	0.2
G01	0.1125	70	46	10	3.2	0.5
G01-G02	0.1125	68	46	10	3.2	0.5
HG02	0.0906	45	30	6.7	2.3	0.4
G02	0.3344	191	127	27	9.0	1.3
G02-G03	0.3344	190	125	27	9.0	1.3
HG03	0.1828	77	51	12	4.3	0.7
OS07	0.0328	25	17	4.5	1.7	0.3
OS07-G03	0.0328	24	17	4.3	1.7	0.3
G03	0.5500	291	192	42	15	2.3
G03-G04	0.5500	281	189	42	14	2.3
OS09	0.1547	91	63	19	8.3	1.9
OS09-G04	0.1547	90	62	18	8.3	1.9
HG04	0.0891	40	26	5.9	2.1	0.3
HG05	0.1125	49	32	7.4	2.6	0.4
OS08	0.0406	35	25	7.7	3.4	0.7
OS08-G04	0.0406	34	24	7.4	3.4	0.7
G04	0.9469	493	332	76	28	4.7
G04-G05	0.9469	488	318	76	27	4.7
HG06A	0.1375	49	32	7.6	2.9	0.5
G05	1.0844	536	350	84	30	5.2
G05-G06	1.0844	520	348	83	30	5.2
HG06B	0.1031	33	22	5.3	2.0	0.4
G06	1.1875	551	369	88	32	5.5
HG14	0.2297	79	52	12	4.7	0.8
HG13	0.0844	54	37	9.5	3.8	0.7
G14	0.0844	54	37	9.5	3.8	0.7
G14-G16	0.0844	53	36	9.4	3.7	0.6
G16	0.3141	117	77	19	7.4	1.4

HISTORIC CONDITION - SCS MAP

FIGURE 4

No.	Revisions	Date	Init.	Appr.	Date
-		-	-		

TECH CONTRACTORS
11886 STAPLETON DRIVE
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.3349

MERIDIAN RANCH

HISTORIC CONDITIONS - SCS MAP
2021 SKETCH PLAN AMENDMENT
REVISED MDDP

Drawn by T.W.K.
Checked by R.G.
Date MARCH 2021
Scale AS SHOWN
- of -

MERIDIAN RANCH 2021
MDDP AMENDMENT

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 500 ft.

FUTURE SCS (Full Spectrum)						
	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS06	0.1313	80	52	11.6	3.8	0.5
G1a	0.1313	80	52	11.6	3.8	0.5
G1a-G2	0.1313	79	52	11.5	3.7	0.5
OS05	0.0578	39	26	5.6	1.8	0.2
OS05-G1	0.0578	39	25	5.5	1.7	0.2
FG01	0.0538	31	22	7.0	3.4	0.9
FG01-G1	0.0538	31	22	7.0	3.4	0.9
G1	0.1116	61	41	11.0	4.9	1.1
G1-G2	0.1116	61	41	10.9	4.8	1.1
FG02	0.0391	32	22	6.4	2.7	0.5
G2	0.2820	167	112	27.3	10.3	1.9
G2-G3	0.2820	164	109	27.1	10.2	1.9
FG03	0.0203	24	17	5.9	3.0	0.8
FG04	0.0172	22	16	5.8	3.1	0.9
G3	0.3195	185	123	30.9	12.1	2.4
FG06	0.0675	56	40	12.2	5.8	1.3
FG05	0.0580	45	33	12.2	6.7	2.4
OS07ab	0.0170	14	9	2.5	0.9	0.1
OS07a-POND F	0.0170	13	9	2.3	0.9	0.1
POND F IN	0.4620	295	202	55.8	23.4	5.1
POND F	0.4620	178	122	16.4	8.1	2.1
POND F-G7	0.4620	178	121	16.4	8.1	2.1
OS07c	0.0156	15	10	2.6	1.0	0.1
OS07c-G4	0.0156	14	9	2.5	0.9	0.1
FG21a	0.0095	6	4	1.0	0.4	0.1
G4	0.0251	20	13	3.5	1.3	0.2
G4-G7	0.0251	18	13	3.3	1.2	0.2
FG21b	0.0150	21	16	6.5	3.9	1.7
G7	0.5021	192	130	18.0	8.9	2.3
G7-G8	0.5021	191	130	18.0	8.9	2.3
FG22	0.1409	125	90	32.4	17.1	5.4
OS08	0.0394	34	24	7.5	3.3	0.7
OS08-G8	0.0394	33	23	7.3	3.3	0.7
FG23a	0.0216	21	15	5.2	2.7	0.8
G8	0.7040	285	181	50.6	26.8	8.3
G8-G10	0.7040	284	181	49.7	26.2	8.1
OS09	0.1527	90	62	18.3	8.2	1.9
OS09-G9	0.1527	89	62	18.0	8.2	1.9
FG24	0.1372	134	100	41.1	24.2	10.4
G9	0.2899	200	141	44.2	24.2	10.4
G9-G10	0.2899	179	120	32.3	12.9	2.6
FG23b	0.0247	17	11	2.6	0.9	0.1
G10	1.0186	470	302	65.8	27.9	8.5
G10-G11	1.0186	466	300	65.8	27.7	8.2
FG23c	0.0113	11	7	2.4	1.1	0.2
G11	1.0299	470	302	66.4	28.3	8.3
FG25	0.1086	112	85	36.0	21.9	9.9
FG26	0.0970	101	77	35.2	22.7	11.3
FG26-POND G	0.0970	100	77	35.0	22.4	11.1
FG27	0.0614	82	65	33.8	23.7	14.0
FG28	0.0166	13	9	2.6	1.0	0.2
POND G IN	1.3135	697	449	151.5	81.3	34.8
POND G	1.3135	487	342	61.7	25.1	5.6
G12	1.3135	487	342	61.7	25.1	5.6
G12-G06	1.3135	487	342	61.6	25.1	5.6
FG29	0.0997	64	42	10.3	3.6	0.6
FG32	0.0402	72	57	28.7	19.8	11.1
FG32-G06	0.0402	69	54	26.6	18.2	10.5
G06	1.4534	514	360	66.1	27.0	10.6
FG37	0.0828	58	90	41.4	26.8	13.4
FG34	0.0516	40	86	40.6	26.5	13.1
G14	0.0516	40	67	30.9	20.1	10.2
G14-G15	0.0516	39	65	29.5	19.5	10.0
FG35	0.0263	15	36	14.3	8.3	3.2
G15	0.0779	54	36	14.0	8.0	3.2
G15-G08	0.0779	52	31	12.2	7.0	2.7
FG36	0.0273	17	215	94.1	58.8	28.7
FG36-G08	0.0273	17	77	32.4	19.8	8.6
G16	0.1880	124	59	28.1	18.6	9.8

*NOTE: PRELIMINARY STORAGE VOLUMES AND OUTFLOW QUANTITIES HAVE BEEN PROVIDED FOR EACH OF THE FUTURE DETENTION FACILITIES LOCATED WITHIN THE DEVELOPMENT. THE ACTUAL STORAGE VOLUMES AND DISCHARGE RATES WILL BE DETERMINED UPON A COMPLETE ANALYSIS FOR EACH DETENTION FACILITY PRIOR TO CONSTRUCTION. THE VALUES GIVEN FOR DISCHARGE AND VOLUME ARE ESTIMATES FOR PLANNING PURPOSES ONLY.

FUTURE CONDITIONS - SCS MAP

FIGURE 5

No.	Revisions	Date	Init.	Appr.	Date
-	-	-	-		

TECH CONTRACTORS
11886 STAPLETON DRIVE
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.3349

MERIDIAN RANCH

FUTURE CONDITIONS - SCS MAP
2021 SKETCH PLAN AMENDMENT
REVISED MDDP

Drawn by TAK
Checked by RG
Date MAR 2021
Scale AS SHOWN
- of -

APPENDIX C

Hydrologic Computations

COMPOSITE % IMPERVIOUS CALCULATIONS: EXIS

Subdivision: Grandview Reserve
Location: CO, El Paso County

1	2	3	4	5	6	7	8	12	13	14	15	16	17
		Paved/Gravel Roads			**Lawns/Undeveloped**			**Residential - 1/8 Acre**			**Residential - 1/4 Acre**		
Basin ID	**Total Area (ac)**	**% Imp.**	**Area (ac)**	**Weighted % Imp.**	**% Imp.**	**Area (ac)**	**Weighted % Imp.**	**% Imp.**	**Area (ac)**	**Weighted % Imp.**	**% Imp.**	**Area (ac)**	**Weighted % Imp.**
EXISTING													
For Existing Western Offsite Sub-basin analysis, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022													
EX-1	16.18	100	0	0	2	16.18	2	65	0	0	40	0	0
EX-2	46.06	100	0	0	2	46.06	2	65	0	0	40	0	0
EX-3	64.34	100	0	0	2	64.34	2	65	0	0	40	0	0
EX-4	2.68	100	0	0	2	2.68	2	65	0	0	40	0	0
EX-5	26.15	100	0	0	2	26.15	2	65	0	0	40	0	0
EX-6	31.53	100	0	0	2	31.53	2	65	0	0	40	0	0
INTERIM													
For Existing Western Offsite Sub-basin analysis and Proposed Eastonville Road, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022													
A-1	19.96	100	0.00	0.0	2	19.96	2.0	65.0	0.00	0.0	40	0.00	0.0
EA-1	3.98	100	0.00	0.0	2	3.98	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-A1	18.33	100	0.00	0.0	2	18.33	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-A2	4.51	100	0.00	0.0	2	4.51	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-A3	9.49	100	0.00	0.0	2	9.49	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-B1	15.73	100	0.00	0.0	2	15.73	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-B2	5.12	100	0.00	0.0	2	5.12	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-B3	9.91	100	0.00	0.0	2	9.91	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-C1	6.84	100	0.00	0.0	2	6.84	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-C2	17.00	100	0.00	0.0	2	17.00	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-C3	18.56	100	0.00	0.0	2	18.56	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-D1	10.86	100	0.00	0.0	2	10.86	2.0	65.0	0.00	0.0	40	0.00	0.0
TSB-E1	19.42	100	0.00	0.0	2	19.42	2.0	65.0	0.00	0.0	40	0.00	0.0

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

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

It appears part of spreadsheet may not have printed

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS: EXISTING & INTERIM

Subdivision: Grandview Reserve
Location: CO, El Paso County

Project Name: Grandview Subdivision PDR - Interim Conditions
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 9/9/22

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Basin ID	**Total Area (ac)**	**Paved/Gravel Roads**			**Lawns/Undeveloped**			**Roofs**			**Residential - 1/8 Acre**			**Residential - 1/4 Acre**			**Residential - 1/3 Acre**			**Residential - 1/2 Acre**			**Residential - 1 Acre**			**Composite C_5**	**Composite C_{100}**
		C_5	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**	**C_5**	**C_{100}**	**Area (ac)**		
EXISTING																											
For Existing Western Offsite Sub-basin analysis, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																											
EX-1	16.18	0.90	0.96	0.00	0.09	0.36	16.18	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-2	46.06	0.90	0.96	0.00	0.09	0.36	46.06	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36
EX-3	64.34	0.90	0.96	0.00	0.09	0.36	64.34	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	2.68	0.90	0.96	0.00	0.09	0.36	2.68	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	26.15	0.90	0.96	0.00	0.09	0.36	26.15	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	31.53	0.90	0.96	0.00	0.09	0.36	31.53	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
INTERIM																											
For Existing Western Offsite Sub-basin analysis and Proposed Eastonville Road, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																											
A-1	19.96	0.90	0.96	0.00	0.09	0.36	19.96	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
EA-1	3.98	0.90	0.96	0.00	0.09	0.36	3.98	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
TSB-A1	18.33	0.90	0.96	0.00	0.09	0.36	18.33	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
TSB-A2	4.51	0.90	0.96	0.00	0.09	0.36	4.51	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
TSB-A3	9.49	0.90	0.96	0.00	0.09	0.36	9.49	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
TSB-B1	15.73	0.90	0.96	0.00	0.09	0.36	15.73	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
TSB-B2	5.12	0.90	0.96	0.00	0.09	0.36	5.12	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	0.09	0.36
TSB-B3	9.91	0.90	0.96	0.00	0.09	0.36	9.91	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
TSB-C1	6.84	0.90	0.96	0.00	0.09	0.36	6.84	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
TSB-C2	17.00	0.90	0.96	0.00	0.09	0.36	17.00	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
TSB-C3	18.56	0.90	0.96	0.00	0.09	0.36	18.56	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
TSB-D1	10.86	0.90	0.96	0.00	0.09	0.36	10.86	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
TSB-E1	19.42	0.90	0.96	0.00	0.09	0.36	19.42	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

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: EXISTING & INTERIM
TIME OF CONCENTRATION

Subdivision: Grandview Reserve
Location: CO, El Paso County

Project Name: Grandview Subdivision PDR - Interim Conditions
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 9/9/22

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN DATA						**INITIAL/OVERLAND (T_i)**			**TRAVEL TIME (T_t)**					**Tc CHECK (T_c)**			**FINAL**
BASIN ID	**D.A. (AC)**	**Hydrologic Soils Group**	**Impervious (%)**	**C_5**	**C_{100}**	**L (FT)**	**S (%)**	**T_i (MIN)**	**L (FT)**	**S (%)**	**Cv**	**VEL. (FPS)**	**T_t (MIN)**	**COMP. T_c (MIN)**	**TOTAL LENGTH(FT)**	**Calculated T_c (MIN)**	**T_c (MIN)**
EXISTING																	
For Existing Western Offsite Sub-basin analysis, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																	
EX-1	16.18	A	2.0	0.09	0.36	300	3.3	21.6	1433	2.5	15	2.4	10.0	31.6	1732.7	19.6	31.6
EX-2	46.06	A	2.0	0.09	0.36	300	2.5	23.6	3127	2.0	15	2.1	24.7	48.3	3427.0	29.0	48.3
EX-3	64.34	A	2.0	0.09	0.36	300	3.2	21.7	3964	2.1	15	2.2	30.4	52.1	4263.6	33.7	52.1
EX-4	2.68	A	2.0	0.09	0.36	300	2.5	23.8	462	2.4	15	2.3	3.3	27.1	762.3	14.2	27.1
EX-5	26.15	A	2.0	0.09	0.36	300	3.1	22.1	2121	2.3	15	2.3	15.6	37.7	2420.8	23.4	37.7
EX-6	31.53	A	2.0	0.09	0.36	300	3.6	20.9	1488	2.1	15	2.2	11.4	32.3	1788.5	19.9	32.3
INTERIM																	
For Existing Western Offsite Sub-basin analysis and Proposed Eastonville Road, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																	
A-1	19.96	A	2.0	0.09	0.36	50	2.0	10.4	1600	3.3	10	1.8	14.8	25.2	1650.0	19.2	19.2
EA-1	3.98	A	2.0	0.09	0.36	75	5.0	9.4	1037	0.8	10	0.9	19.1	28.5	1112.0	16.2	16.2
TSB-A1	18.33	A	2.0	0.09	0.36	100	2.0	14.7	1454	3.1	10	1.8	13.7	28.4	1554.0	18.6	18.6
TSB-A2	4.51	A	2.0	0.09	0.36	216	2.0	21.6	591	1.1	10	1.1	9.3	30.9	807.0	14.5	14.5
TSB-A3	9.49	A	2.0	0.09	0.36	160	2.0	18.6	1219	1.0	10	1.0	20.3	38.9	1379.0	17.7	17.7
TSB-B1	15.73	A	2.0	0.09	0.36	230	2.0	22.3	1126	1.0	10	1.0	18.8	41.0	1356.0	17.5	17.5
TSB-B2	5.12	A	2.0	0.09	0.36	60	2.0	11.4	819	2.7	10	1.6	8.4	19.8	879.0	14.9	14.9
TSB-B3	9.91	A	2.0	0.09	0.36	152	2.0	18.1	979	3.0	10	1.7	9.4	27.5	1131.0	16.3	16.3
TSB-C1	6.84	A	2.0	0.09	0.36	65	2.0	11.8	1399	2.2	10	1.5	15.6	27.4	1464.0	18.1	18.1
TSB-C2	17.00	A	2.0	0.09	0.36	50	2.0	10.4	1506	3.2	10	1.8	14.0	24.4	1556.0	18.6	18.6
TSB-C3	18.56	A	2.0	0.09	0.36	135	2.0	17.1	1553	2.0	10	1.4	18.5	35.5	1688.0	19.4	19.4
TSB-D1	10.86	A	2.0	0.09	0.36	120	2.0	16.1	1643	1.6	10	1.2	21.9	38.0	1763.0	19.8	19.8
TSB-E1	19.42	A	2.0	0.09	0.36	75	2.5	11.8	1979	1.7	10	1.3	25.3	37.1	2054.0	21.4	21.4

NOTES:

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

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

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

Tc Check = 10+L/180

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

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

STANDARD FORM SF-3: EXISTING & INTERIM

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Grandview Reserve
Location: CO, El Paso County
Design Storm: 5-Year

Project Name: Grandview Subdivision PDR - Interim Conditions
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 9/9/22

		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
EXISTING																					
	1	EX-1	16.18	0.09	31.6	1.46	2.35	3.4				4.7									Sheet flow to Main Stem Channel Total Flow from DP 10, DP 11 & Basin EX-1
	2	EX-2	46.06	0.09	48.3	4.15	1.82	7.6				79.1									Sheet flow to Main Stem Channel Total Flow from DP 8, DP 9 & Basin EX-2
	3	EX-3	64.34	0.09	52.1	5.79	1.73	10.0				10.0									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel
	4	EX-4	2.68	0.09	27.1	0.24	2.57	0.6				0.6									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel
	5	EX-5	26.15	0.09	37.7	2.35	2.12	5.0				5.0									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel
	6	EX-6	31.53	0.09	32.3	2.84	2.32	6.6				14.6									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel Total Flow from DP 7 & EX-6
For Existing Western Offsite Sub-basin analysis, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																					
	12											89.2									Total Existing Flow offsite - outfalls to Main Stem Tributary #2 Channel
INTERIM																					
For Existing Western Offsite Sub-basin analysis and Proposed Eastonville Road, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																					
	2	A-1	19.96	0.09	19.2	1.80	3.08	5.5				5.5 18.7									Institutional Tract-Undeveloped Combined flow from DP1 and A-1
	3	EA-1	3.98	0.09	16.2	0.36	3.34	1.2				1.2 5.7									Existing Eastonville Road Combined flow from OS-3 (DP32) and EA-1 (Existing Eastonville Rd)
	1	TSB-A1	18.33	0.09	18.6	1.65	3.12	5.1				5.1 13.1									Residential Undeveloped-Overland Graded Combined flow from OS-5 (DP35) and TSB-A1
	4	TSB-A2	4.51	0.09	14.5	0.41	3.52	1.4				1.4									Residential Undeveloped-Overland Graded
	5	TSB-A3	9.49	0.09	17.7	0.85	3.21	2.7				2.7									Residential Undeveloped-Overland Graded
	6	TSB-B1	15.73	0.09	17.5	1.42	3.22	4.6				4.6									Residential Undeveloped-Overland Graded
	7	TSB-B2	5.12	0.09	14.9	0.46	3.47	1.6				1.6									Residential Undeveloped-Overland Graded
	8	TSB-B3	9.91	0.09	16.3	0.89	3.33	3.0				3.0 9.1									Residential Undeveloped-Overland Graded Combined Flows from DP6, DP7, & TSB-B3
	9	TSB-C1	6.84	0.09	18.1	0.62	3.17	2.0				2.0									Residential Undeveloped-Overland Graded
	10	TSB-C2	17.00	0.09	18.6	1.53	3.12	4.8				4.8									Residential Undeveloped-Overland Graded
	11	TSB-C3	18.56	0.09	19.4	1.67	3.06	5.1				5.1 11.8									Residential Undeveloped-Overland Graded Combined flows from DP9, DP10, & TSB-C3
	12	TSB-D1	10.86	0.09	19.8	0.98	3.03	3.0				3.0									Residential Undeveloped-Overland Graded
	13	TSB-E1	19.42	0.09	21.4	1.75	2.91	5.1				5.1									Residential Undeveloped-Overland Graded

STANDARD FORM SF-3: EXISTING & INTERIM

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Project Name: Grandview Subdivision PDR - Interim Conditions
Subdivision: Grandview Reserve
Project No.: HRG01
Location: CO, El Paso County
Calculated By: TJE
Design Storm: 100-Year
Checked By: BAS
Date: 9/9/22

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)	
EXISTING																					
	1	EX-1	16.18	0.36	31.6	5.82	4.19	24.4				33.3									Sheet flow to Main Stem Channel Total Flow from DP 10, DP 11 & Basin EX-1
	2	EX-2	46.06	0.36	48.3	16.58	3.24	53.7				497.2									Sheet flow to Main Stem Channel Total Flow from DP 8, DP 9 & Basin EX-2
	3	EX-3	64.34	0.36	52.1	23.16	3.09	71.6				71.6									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel
	4	EX-4	2.68	0.36	27.1	0.96	4.57	4.4				4.4									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel
	5	EX-5	26.15	0.36	37.7	9.41	3.77	35.5				35.5									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel
	6	EX-6	31.53	0.36	32.3	11.35	4.13	46.9				584.9									Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel Total Flow from DP 7 & EX-6
For Existing Western Offsite Sub-basin analysis, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																					
	12											976.3									Total Existing Flow offsite - outfalls to Main Stem Tributary #2 Channel
INTERIM																					
For Existing Western Offsite Sub-basin analysis and Proposed Eastonville Road, see Rational Calcs Included, from titled "Eastonville Road Final Drainage Report", by HR Green, September 2022																					
	2	A-1	19.96	0.36	19.2	7.19	5.48	39.4				39.4 84.1									Institutional Tract-Undeveloped Combined flow from DP1 and A-1
	3	EA-1	3.98	0.36	16.2	1.43	5.95	8.5				8.5 13.0									Existing Eastonville Road Combined flow from OS-3 (DP32) and EA-1 (Existing Eastonville Rd)
	1	TSB-A1	18.33	0.36	18.6	6.60	5.56	36.7				36.7 44.7									Residential Undeveloped-Overland Graded Combined flow from OS-5 (DP35) and TSB-A1
	4	TSB-A2	4.51	0.36	14.5	1.62	6.26	10.1				10.1									Residential Undeveloped-Overland Graded
	5	TSB-A3	9.49	0.36	17.7	3.42	5.71	19.5				19.5									Residential Undeveloped-Overland Graded
	6	TSB-B1	15.73	0.36	17.5	5.66	5.73	32.4				32.4									Residential Undeveloped-Overland Graded
	7	TSB-B2	5.12	0.36	14.9	1.84	6.18	11.4				11.4									Residential Undeveloped-Overland Graded
	8	TSB-B3	9.91	0.36	16.3	3.57	5.93	21.2				21.2 65.0									Residential Undeveloped-Overland Graded Combined Flows from DP6, DP7, & TSB-B3
	9	TSB-C1	6.84	0.36	18.1	2.46	5.63	13.8				13.8									Residential Undeveloped-Overland Graded
	10	TSB-C2	17.00	0.36	18.6	6.12	5.56	34.0				34.0									Residential Undeveloped-Overland Graded
	11	TSB-C3	18.56	0.36	19.4	6.68	5.45	36.4				36.4 84.3									Residential Undeveloped-Overland Graded Combined flows from DP9, DP10, & TSB-C3
	12	TSB-D1	10.86	0.36	19.8	3.91	5.39	21.1				21.1									Residential Undeveloped-Overland Graded
	13	TSB-E1	19.42	0.36	21.4	6.99	5.18	36.2				36.2									Residential Undeveloped-Overland Graded

COMPOSITE % IMPERVIOUS CALCULATIONS: PROPOSED

Subdivision: Grandview Reserve
Location: CO, El Paso County

Project Name: Grandview Subdivision PDR
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 10/6/22

1	2	3	4	5	6	7	8	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Basin ID	**Total Area (ac)**	**Paved/Gravel Roads**			**Lawns/Undeveloped**			**Residential - 1/8 Acre**			**Residential - 1/4 Acre**			**Residential - 1/3 Acre**			**Residential - 1/2 Acre**			**Residential - 1 Acre**			**Basins Total 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.**	
D-1	3.48	100	0.00	0.0	2	0.00	0.0	65.0	3.48	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
D-2	0.82	100	0.00	0.0	2	0.00	0.0	65.0	0.82	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
D-3	3.67	100	0.00	0.0	2	0.00	0.0	65.0	3.67	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
D-4	1.82	100	0.00	0.0	2	0.00	0.0	65.0	1.82	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
D-5	1.45	100	0.00	0.0	2	0.63	0.9	65.0	0.82	36.8	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	37.7
D-6	1.53	100	0.00	0.0	2	1.53	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
D-7a	0.26	100	0.02	7.7	2	0.23	1.8	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	9.5
D-7b	0.96	100	0.00	0.0	2	0.00	0.0	65.0	0.88	59.6	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	59.6
E-1	4.91	100	0.00	0.0	2	1.40	0.6	65.0	3.51	46.5	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	47.1
E-2	4.06	100	0.00	0.0	2	0.00	0.0	65.0	4.06	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
E-3a	2.75	100	0.00	0.0	2	0.00	0.0	65.0	2.75	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
E-3b	2.17	100	0.00	0.0	2	0.00	0.0	65.0	2.17	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
E-4a	4.68	100	0.00	0.0	2	0.00	0.0	65.0	4.68	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
E-4b	1.60	100	0.00	0.0	2	0.00	0.0	65.0	1.60	65.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	65.0
E-5	1.13	100	0.00	0.0	2	1.13	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0
E-6	2.00	100	0.00	0.0	2	2.00	2.0	65.0	0.00	0.0	40	0.00	0.0	30	0.00	0.0	25	0.00	0.0	20	0.00	0.0	2.0

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

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

Need to include area for roads within each basin. Such as D-1 has west half of Kate Meadow Lane.

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS: PROPOSED

Subdivision: Grandview Reserve
Location: CO, El Paso County

Project Name: Grandview Subdivision PDR
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 10/6/22

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Basin ID	Total Area (ac)	Paved/Gravel Roads			Lawns/Undeveloped			Roofs			Residential - 1/8 Acre			Residential - 1/4 Acre			Residential - 1/3 Acre			Residential - 1/2 Acre			Residential - 1 Acre			Composite C_5	Composite C_{100}
		C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)		
D-1	3.48	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	3.48	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
D-2	0.82	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.82	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
D-3	3.67	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	3.67	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
D-4	1.82	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.82	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
D-5	1.45	0.90	0.96	0.00	0.09	0.36	0.63	0.73	0.81	0.00	0.45	0.59	0.82	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.29	0.49
D-6	1.53	0.90	0.96	0.00	0.09	0.36	1.53	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
D-7a	0.26	0.90	0.96	0.02	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	0.15	0.39
D-7b	0.96	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	0.88	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	0.54
E-1	4.91	0.90	0.96	0.00	0.09	0.36	1.40	0.73	0.81	0.00	0.45	0.59	3.51	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	0.52
E-2	4.06	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	4.06	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.45	0.59
E-3a	2.75	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.75	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.45	0.59
E-3b	2.17	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	2.17	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
E-4a	4.68	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	4.68	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
E-4b	1.60	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.00	0.45	0.59	1.60	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
E-5	1.13	0.90	0.96	0.00	0.09	0.36	1.13	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-6	2.00	0.90	0.96	0.00	0.09	0.36	2.00	0.73	0.81	0.00	0.45	0.59	0.00	0.30	0.50	0.00	0.25	0.47	0.00	0.22	0.46	0.00	0.20	0.44	0.00	0.09	0.36

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

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

Need to include area for roads within each basin. Such as D-1 has west half of Kate Meadow Lane.

STANDARD FORM SF-2: PROPOSED
TIME OF CONCENTRATION

Subdivision: Grandview Reserve
Location: CO, El Paso County

Project Name: Grandview Subdivision PDR
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 10/6/22

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN DATA						**INITIAL/OVERLAND (T_i)**			**TRAVEL TIME (T_t)**					**Tc CHECK (T_c)**			**FINAL**
BASIN ID	**D.A. (AC)**	**Hydrologic Soils Group**	**Impervious (%)**	**C_5**	**C_{100}**	**L (FT)**	**S (%)**	**T_i (MIN)**	**L (FT)**	**S (%)**	**Cv**	**VEL. (FPS)**	**T_t (MIN)**	**COMP. T_c (MIN)**	**TOTAL LENGTH(FT)**	**Calculated T_c (MIN)**	**T_c (MIN)**
D-1	3.48	A	65.0	0.45	0.59	170	3.0	10.8	715	1.0	20	2.0	6.0	16.7	885.0	14.9	14.9
D-2	0.82	A	65.0	0.45	0.59	10	2.0	3.0	700	1.3	20	2.3	5.1	8.1	710.0	13.9	8.1
D-3	3.67	A	65.0	0.45	0.59	140	3.0	9.8	660	2.2	20	3.0	3.7	13.5	800.0	14.4	13.5
D-4	1.82	A	65.0	0.45	0.59	50	3.0	5.8	663	2.0	20	2.8	3.9	9.7	713.0	14.0	9.7
D-5	1.45	A	37.7	0.29	0.49	110	25.0	5.3	201	1.0	20	2.0	1.7	7.0	311.0	11.7	7.0
D-6	1.53	A	2.0	0.09	0.36	300	5.0	18.7	0	0.0	10	0.0	0.0	18.7	300.0	11.7	11.7
D-7a	0.26	A	9.5	0.15	0.39	75	5.0	8.8	0	0.0	20	0.0	0.0	8.8	75.0	10.4	8.8
D-7b	0.96	A	59.6	0.41	0.54	75	8.0	5.5	478	2.0	15	2.1	3.8	9.2	553.0	13.1	9.2
E-1	4.91	A	47.1	0.35	0.52	25	4.0	4.3	1103	3.3	20	3.6	5.1	9.4	1128.0	16.3	9.4
E-2	4.06	A	65.0	0.45	0.59	20	2.0	4.2	960	3.5	20	3.7	4.3	8.5	980.0	15.4	8.5
E-3a	2.75	A	65.0	0.45	0.59	10	2.0	3.0	786	1.5	20	2.4	5.3	8.3	796.0	14.4	8.3
E-3b	2.17	A	65.0	0.45	0.59	225	4.0	11.2	261	1.5	20	2.4	1.8	13.0	486.0	12.7	12.7
E-4a	4.68	A	65.0	0.45	0.59	305	7.0	10.9	928	1.6	20	2.5	6.1	17.0	1233.0	16.9	16.9
E-4b	1.60	A	65.0	0.45	0.59	150	2.0	11.6	261	1.5	20	2.4	1.8	13.3	411.0	12.3	12.3
E-5	1.13	A	2.0	0.09	0.36	127	25.0	7.1	315	1.0	20	2.0	2.6	9.8	442.0	12.5	9.8
E-6	2.00	A	2.0	0.09	0.36	350	2.0	27.5	113	2.0	10	1.4	1.3	28.8	463.0	12.6	12.6

NOTES:

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

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

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

Tc Check = 10+L/180

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

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

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

Project Name: Grandview Subdivision PDR
Subdivision: Grandview Reserve
Project No.: HRG01
Location: CO, El Paso County
Calculated By: TJE
Design Storm: 5-Year
Checked By: BAS
Date: 10/6/22

		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
	D1	D-1	3.48	0.45	14.9	1.57	3.47	5.4					1	0.8	4.6						On-Grade 10' CDOT Type R Inlet Qcap=4.6 cfs, Qco=0.8 cfs to DP D4
	D2	D-2	0.82	0.45	8.1	0.37	4.42	1.6					1	0.0	1.6						On-Grade 10' CDOT Type R Inlet Qcap=1.6 cfs, Qco=0 cfs to DP D4
	D3														6.2						Total Captured flows from DP D1 & D2
	D4	D-3	3.67	0.45	13.5	1.65	3.63	6.0	14.9	1.90	3.47	6.6			6.6						Receives Bypass from DP D1 & D2 Sump 15' CDOT Type R Inlet
	D5	D-4	1.82	0.45	9.7	0.82	4.14	3.4							3.4						Sump 10' CDOT Type R Inlet
	D6														10.0						Total Captured flows from DP D4 & D5
	D7														16.2						Totacl Captured flows from DP D3 & D6
	D8	D-7b	0.96	0.41	9.2	0.39	4.23	1.6							1.6						Sheet flows to Channel and Conveyed to Pond D
	D9	D-5	1.45	0.29	7.0	0.42	4.64	1.9	14.9	5.22	3.47	18.1			0.3						Pond D Outlet Structure Release - From MHFD Pond Calc
		D-6	1.53	0.09	11.7	0.14	3.86	0.5													Un-developed area - Sheet flows to MS
		D-7a	0.26	0.15	8.8	0.04	4.30	0.2													Back of Lots 18-20 - Sheet Flows to MST
	E1	E-1	4.91	0.35	9.4	1.72	4.20	7.2					3.3	0.2	7.0						On-Grade 15' CDOT Type R Inlet Qcap=7 cfs, Qco=0.2 cfs to DP E4
	E2	E-2	4.06	0.45	8.5	1.83	4.35	8.0					3.3	0.4	7.6						On-Grade 15' CDOT Type R Inlet Qcap=7.6 cfs, Qco=0.4 cfs to DP E4
	E3														14.6						Totacl Captured flows from DP E1 & E2
	E4	E-3a	2.75	0.45	8.3	1.24	4.38	5.4	9.4	1.38	4.20	5.8	1.5	0.0	5.8						On-Grade 15' CDOT Type R Inlet Qcap=5.8 cfs, Qco=0 cfs to DP E7
	E5	E-4a	4.68	0.45	16.9	2.11	3.28	6.9					1.5	0.2	6.7						On-Grade 15' CDOT Type R Inlet Qcap=6.7 cfs, Qco=0.2 cfs to DP E9
	E6														27.1						Totacl Captured flows from DP E3, E4 & E5
	E7	E-3b	2.17	0.45	12.7	0.98	3.73	3.7	12.7	0.98	3.73	3.6			3.6						Sump 15' CDOT Type R Inlet
	E8														30.7						Total Captured flows from DP E6 & E7
		E-4b	1.60	0.45	12.3	0.72	3.78	2.7	16.9	0.79	3.28	2.6			2.6						Sump 15' CDOT Type R Inlet
	E9														33.3						Total Flow to Pond E - Thru Inlet (Basin E-4b & DP E8)
	E10	E-5	1.13	0.09	9.8	0.10	4.14	0.4	16.9	8.70	3.28	28.5			0.6						Pond E Outlet Structure Release - From MHFD Pond Calc
		E-6	2.00	0.09	12.6	0.18	3.74	0.7													Un-developed area - Sheet flows to MS

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

Project Name: Grandview Subdivision PDR
Subdivision: Grandview Reserve
Project No.: HRG01
Location: CO, El Paso County
Calculated By: TJE
Design Storm: 100-Year
Checked By: BAS
Date: 10/6/22

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)	
	D1	D-1	3.48	0.59	14.9	2.05	6.18	12.7					1	5.3	7.4						On-Grade 10' CDOT Type R Inlet Qcap=7.4 cfs, Qco=5.3 cfs to DP D4
	D2	D-2	0.82	0.59	8.1	0.48	7.88	3.8					1	0.1	3.7						On-Grade 10' CDOT Type R Inlet Qcap=3.7 cfs, Qco=0.1 cfs to DP D4
	D3														11.1						Total Captured flows from DP D1 & D2
	D4	D-3	3.67	0.59	13.5	2.17	6.46	14.0	14.9	3.03	6.18	18.7			18.7						Receives Bypass from DP D1 & D2 Sump 15' CDOT Type R Inlet
	D5	D-4	1.82	0.59	9.7	1.07	7.37	7.9							7.9						Sump 10' CDOT Type R Inlet
	D6														26.6						Total Captured flows from DP D4 & D5
	D7														37.7						Totacl Captured flows from DP D3 & D6
	D8	D-7b	0.96	0.54	9.2	0.52	7.52	3.9							3.9						Sheet flows to Channel and Conveyed to Pond D
	D9	D-5	1.45	0.49	7.0	0.71	8.26	5.9	14.9	7.00	6.18	43.3			5.7						Pond D Outlet Structure
		D-6	1.53	0.36	11.7	0.55	6.87	3.8													Un-developed area - Sheet flows to MS
		D-7a	0.26	0.39	8.8	0.10	7.65	0.8													Back of Lots 18-20 - Sheet Flows to MST
	E1	E-1	4.91	0.52	9.4	2.55	7.48	19.1					3.3	6.4	12.7						On-Grade 15' CDOT Type R Inlet Qcap=12.7 cfs, Qco=6.4 cfs to DP E4
	E2	E-2	4.06	0.59	8.5	2.40	7.75	18.6					3.3	6.1	12.5						On-Grade 15' CDOT Type R Inlet Qcap=12.5 cfs, Qco=6.1 cfs to DP E4
	E3														25.2						Totacl Captured flows from DP E1 & E2
	E4	E-3a	2.75	0.59	8.3	1.62	7.80	12.6	9.4	3.26	7.48	24.4	1.5	9.8	14.6						On-Grade 15' CDOT Type R Inlet Qcap=14.6 cfs, Qco=9.8 cfs to DP E7
	E5	E-4a	4.68	0.59	16.9	2.76	5.84	16.1					1.5	4.6	11.5						On-Grade 15' CDOT Type R Inlet Qcap=11.5 cfs, Qco=4.6 cfs to DP E9
	E6														51.3						Totacl Captured flows from DP E3, E4 & E5
	E7	E-3b	2.17	0.59	12.7	1.28	6.63	8.5	12.7	2.59	6.63	17.2			17.2						Sump 15' CDOT Type R Inlet
	E8														68.5						Total Captured flows from DP E6 & E7
		E-4b	1.60	0.59	12.3	0.94	6.73	6.3	16.9	1.73	5.84	10.1			10.1						Sump 15' CDOT Type R Inlet
	E9														78.6						Total Flow to Pond E - Thru Inlet (Basin E-4b & DP E8)
	E10	E-5	1.13	0.36	9.8	0.41	7.37	3.0	16.9	11.96	5.84	69.8			10.5						Pond E Outlet Structure Release - From MHFD Pond Calc
		E-6	2.00	0.36	12.6	0.72	6.66	4.8													Un-developed area - Sheet flows to MS

APPENDIX D
Hydraulic Computations

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

Update to never version of spreadsheet

INLET NAME	Basin D-1 (DP D1)	Basin D-2 (DP D2)	Basin D-3 (DP D4)	Basin D-4 (DP D5)
Site Type (Urban or Rural)				
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	5.4	1.6	6.0	3.4
Major Q_{Known} (cfs)	12.7	3.8	14.0	7.9

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.8	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	5.4	0.0

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

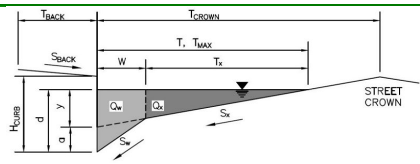
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**5.4**	**1.6**	**6.8**	**3.4**
Major Total Design Peak Flow, Q (cfs)	**12.7**	**3.8**	**19.4**	**7.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.8	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	5.3	0.1	N/A	N/A

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

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

Project: Grandview Reserve
Inlet ID: Basin D-1 (DP D1)



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	0.83	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	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

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	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	7.3	7.3	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.3	1.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**8.5**	**8.5**	**cfs**
Flow Velocity within the Gutter Section	V =	0.8	0.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.3	0.3	

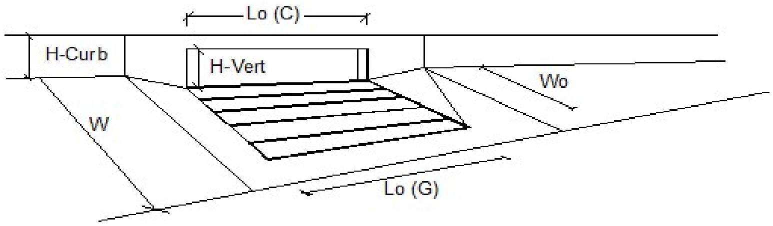
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	6.7	39.3	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	6.7	34.1	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	1.2	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	7.9	38.2	cfs
Average Flow Velocity Within the Gutter Section	V =	0.8	1.2	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.3	0.7	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**7.9**	**38.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	7.68	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	3.22	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**7.9**	**38.2**	**cfs**

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

INLEET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

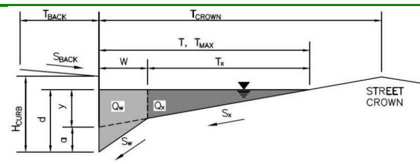


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	5.4	12.7	cfs
Water Spread Width		T =	13.4	16.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.9	5.1	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.6	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.179	0.128	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	4.4	11.1	cfs
Discharge within the Gutter Section W		Q_w =	1.0	1.6	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.24	0.32	sq ft
Velocity within the Gutter Section W		V_W =	4.1	5.0	fps
Water Depth for Design Condition		d_{LOCAL} =	6.9	8.1	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.085	0.066	ft/ft
Required Length L_T to Have 100% Interception		L_T =	14.30	24.81	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	10.00	10.00	ft
Interception Capacity		Q_i =	4.8	7.7	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.06	0.06	
Effective (Unclogged) Length		L_e =	8.75	8.75	ft
Actual Interception Capacity		**Q_a =**	**4.6**	**7.4**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.8**	**5.3**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**4.6**	**7.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.8**	**5.3**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**86**	**58**	**%**

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

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

Project: Grandview Reserve
Inlet ID: Basin D-2 (DP D2)



Gutter Geometry:

Description	Symbol	Value	Units
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	0.83	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	

Description	Symbol	Minor Storm	Major Storm	Units
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

Maximum Capacity for 1/2 Street based On Allowable Spread

Description	Symbol	Minor Storm	Major Storm	Units
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	7.3	7.3	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.3	1.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**8.5**	**8.5**	**cfs**
Flow Velocity within the Gutter Section	V =	0.8	0.8	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.3	0.3	

Maximum Capacity for 1/2 Street based on Allowable Depth

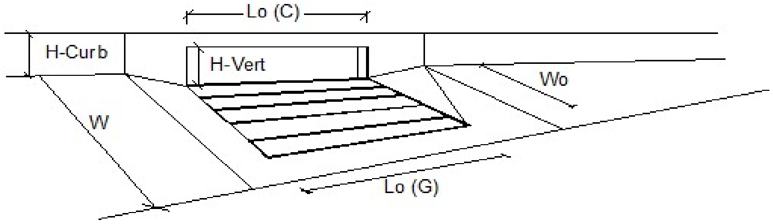
Description	Symbol	Minor Storm	Major Storm	Units
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	6.7	39.3	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	6.7	34.1	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	1.2	3.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.7	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	7.9	38.2	cfs
Average Flow Velocity Within the Gutter Section	V =	0.8	1.2	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.3	0.7	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**7.9**	**38.2**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	7.68	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	3.22	inches

	Symbol	Minor Storm	Major Storm	Units
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**7.9**	**38.2**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

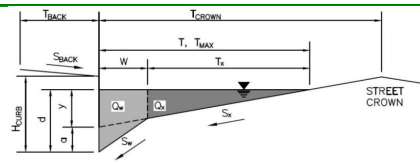


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	1.6	3.8	cfs
Water Spread Width	T =	8.4	11.8	ft
Water Depth at Flowline (outside of local depression)	d =	2.6	3.5	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.294	0.207	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	1.1	3.0	cfs
Discharge within the Gutter Section W	Q_w =	0.5	0.8	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.15	0.21	sq ft
Velocity within the Gutter Section W	V_W =	3.1	3.7	fps
Water Depth for Design Condition	d_{LOCAL} =	5.6	6.5	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.127	0.095	ft/ft
Required Length L_T to Have 100% Interception	L_T =	6.40	11.36	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	6.40	10.00	ft
Interception Capacity	Q_i =	1.6	3.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	L_e =	8.75	8.75	ft
Actual Interception Capacity	**Q_a =**	**1.6**	**3.7**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.1**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.6**	**3.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**96**	**%**

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

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

Project: Grandview Reserve
Inlet ID: Basin D-3 (DP D4)



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

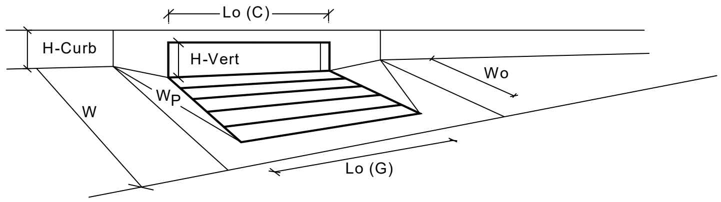
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Explain warning issue

Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Warning 1 Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	7.5	26.6	cfs
Interception with Clogging	Q_{wa} =	7.2	25.4	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	25.2	32.9	cfs
Interception with Clogging	Q_{oa} =	24.1	31.5	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	12.8	27.5	cfs
Interception with Clogging	Q_{ma} =	12.2	26.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**7.2**	**25.4**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	3.2	inches

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.41	0.72	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.67	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

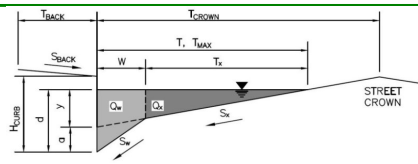
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**7.2**	**25.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.8	19.4	cfs

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

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

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

Project: Grandview Reserve
Inlet ID: Basin D-4 (DP D5)



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0		ft
Gutter Width	W =	0.83		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

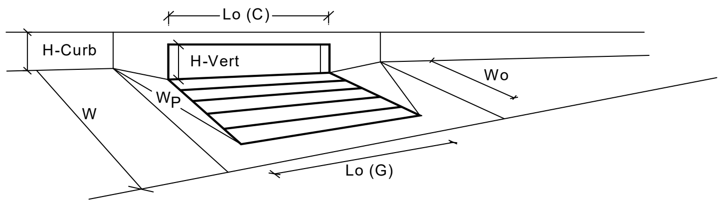
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Warning 1 Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	$\mathbf{Q_{Grate}}$ =	**N/A**	**N/A**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.1	20.2	cfs
Interception with Clogging	Q_{wa} =	5.7	18.9	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	16.8	21.9	cfs
Interception with Clogging	Q_{oa} =	15.7	20.6	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	9.4	19.6	cfs
Interception with Clogging	Q_{ma} =	8.8	18.3	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	$\mathbf{Q_{Curb}}$ =	**5.7**	**18.3**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	3.2	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.41	0.72	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.82	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**5.7**	**18.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.4	7.9	cfs

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Basin E-1 (DP E1)	Basin E-2 (DP E2)	Basin E-3a (DP E4)	Basin E-4a (DP E5)	Basin E-3b (DP E7)	Basin E-4b (DP E9)
Site Type (Urban or Rural)						
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	7.2	8.0	5.4	6.9	3.7	2.7
Major Q_{Known} (cfs)	19.1	18.6	12.6	16.1	8.5	6.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	User-Defined	No Bypass Flow Received	Basin E-3a (DP E4)	Basin E-4a (DP E5)
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.6	0.0	0.0	0.2
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	12.5	0.0	10.5	4.6

Watershed Characteristics

Subcatchment Area (acres)						
Percent Impervious						
NRCS Soil Type						

Watershed Profile

Overland Slope (ft/ft)						
Overland Length (ft)						
Channel Slope (ft/ft)						
Channel Length (ft)						

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)						
One-Hour Precipitation, P_1 (inches)						

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)						
One-Hour Precipitation, P_1 (inches)						

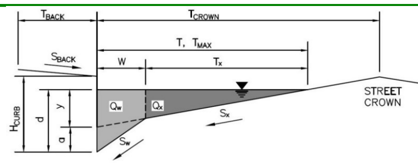
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**7.2**	**8.0**	**6.0**	**6.9**	**3.7**	**2.9**
Major Total Design Peak Flow, Q (cfs)	**19.1**	**18.6**	**25.1**	**16.1**	**19.0**	**10.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.2	0.4	0.0	0.2	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	6.4	6.1	10.5	4.6	N/A	N/A

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

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

Project: Grandview Reserve
Inlet ID: Basin E-1 (DP E1)

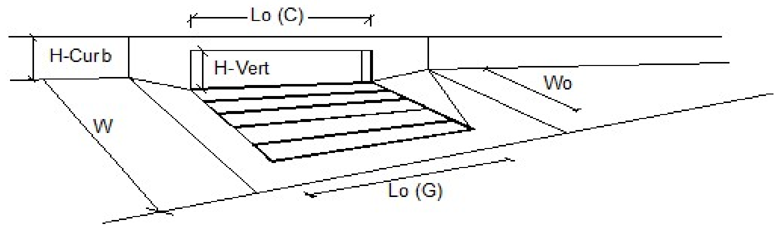


Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0		ft
Gutter Width	W =	0.83		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 =	0.033		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	
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	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	13.2	13.2	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	2.3	2.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**15.5**	**15.5**	**cfs**
Flow Velocity within the Gutter Section	V =	1.4	1.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.5	0.5	
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	12.2	71.4	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	12.2	61.9	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	2.2	6.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	1.3	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	14.4	69.4	cfs
Average Flow Velocity Within the Gutter Section	V =	1.4	2.1	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.5	1.3	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	1.00	0.56	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**14.4**	**38.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	6.15	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.68	inches
MINOR STORM Allowable Capacity is based on Depth Criterion		Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.4**	**38.8**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

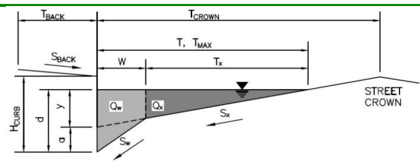


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	7.2	19.1	cfs
Water Spread Width	T =	11.9	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.5	4.8	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.3	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.203	0.137	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	5.7	16.5	cfs
Discharge within the Gutter Section W	Q_w =	1.5	2.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.21	0.30	sq ft
Velocity within the Gutter Section W	V_W =	6.9	8.7	fps
Water Depth for Design Condition	d_{LOCAL} =	6.5	7.8	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.094	0.070	ft/ft
Required Length L_T to Have 100% Interception	L_T =	16.98	31.97	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	7.1	13.0	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	**7.0**	**12.7**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.2**	**6.4**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.0**	**12.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**6.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**66**	**%**

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

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

Project: Grandview Reserve
Inlet ID: Basin E-2 (DP E2)



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	0.83	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 =	0.035	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

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	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	13.6	13.6	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	2.4	2.4	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**16.0**	**16.0**	**cfs**
Flow Velocity within the Gutter Section	V =	1.5	1.5	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.5	0.5	

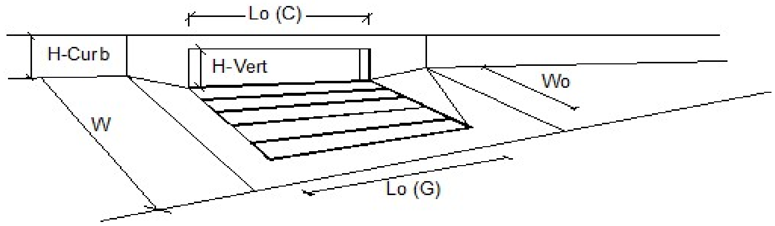
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	12.6	73.5	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	12.6	63.8	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	2.3	6.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	1.4	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	14.8	71.4	cfs
Average Flow Velocity Within the Gutter Section	V =	1.4	2.2	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.5	1.4	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	1.00	0.53	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**14.8**	**38.1**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	6.04	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	1.57	inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.8**	**38.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)

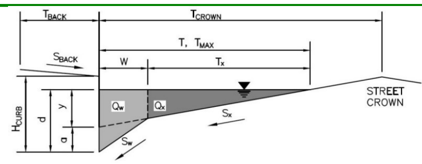


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	8.0	18.6	cfs
Water Spread Width		T =	12.3	16.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.6	4.7	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.2	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.197	0.140	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	6.4	16.0	cfs
Discharge within the Gutter Section W		Q_w =	1.6	2.6	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.22	0.30	sq ft
Velocity within the Gutter Section W		V_W =	7.2	8.8	fps
Water Depth for Design Condition		d_{LOCAL} =	6.6	7.7	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.092	0.071	ft/ft
Required Length L_T to Have 100% Interception		L_T =	18.17	31.43	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	15.00	15.00	ft
Interception Capacity		Q_i =	7.7	12.8	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	13.03	13.03	ft
Actual Interception Capacity		**Q_a =**	**7.6**	**12.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.4**	**6.1**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**7.6**	**12.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.4**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**94**	**67**	**%**

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

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

Project: Grandview Reserve
Inlet ID: Basin E-3a (DP E4)

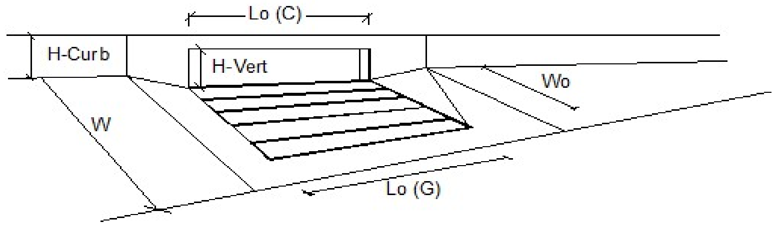


Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0		ft
Gutter Width	W =	0.83		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	
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	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	8.9	8.9	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.6	1.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	1.0	1.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	8.2	48.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	8.2	41.7	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	1.5	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.9	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	9.7	46.8	cfs
Average Flow Velocity Within the Gutter Section	V =	0.9	1.4	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.3	0.9	
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 =**	**9.7**	**46.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	7.68	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	3.22	inches
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.7**	**46.8**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	6.0	25.1	cfs
Water Spread Width	T =	13.0	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.7	6.1	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	1.6	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.186	0.108	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	4.9	22.4	cfs
Discharge within the Gutter Section W	Q_w =	1.1	2.7	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.23	0.39	sq ft
Velocity within the Gutter Section W	V_W =	4.9	6.9	fps
Water Depth for Design Condition	d_{LOCAL} =	6.7	9.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	**cfs**
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.088	0.059	ft/ft
Required Length L_T to Have 100% Interception	L_T =	15.24	37.92	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	15.00	15.00	ft
Interception Capacity	Q_i =	6.0	15.0	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L_e =	13.03	13.03	ft
Actual Interception Capacity	**Q_a =**	**6.0**	**14.6**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**10.5**	**cfs**
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.0**	**14.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**10.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**58**	**%**

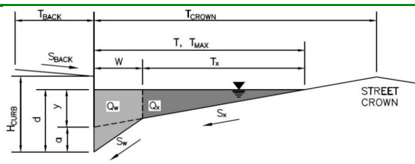
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: Grandview Reserve

Inlet ID: Basin E-4a (DP E5)



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

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	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	8.9	8.9	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.6	1.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**10.5**	**10.5**	**cfs**
Flow Velocity within the Gutter Section	V =	1.0	1.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	8.2	48.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	8.2	41.7	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	1.5	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.9	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	9.7	46.8	cfs
Average Flow Velocity Within the Gutter Section	V =	0.9	1.4	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.3	0.9	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**9.7**	**46.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	7.68	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	3.22	inches

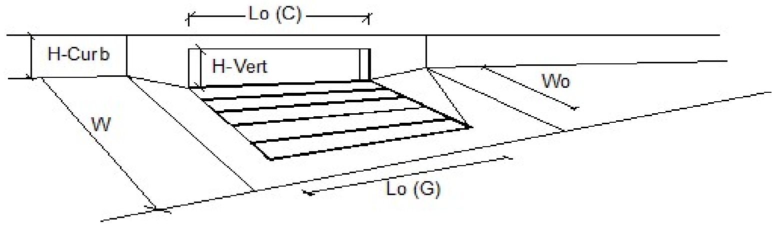
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.7**	**46.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



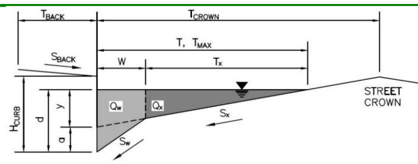
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Design Discharge for Half of Street (from *Inlet Management*)		Q_o =	6.9	16.1	cfs
Water Spread Width		T =	13.7	16.0	ft
Water Depth at Flowline (outside of local depression)		d =	3.9	5.2	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.7	inches
Ratio of Gutter Flow to Design Flow		E_o =	0.176	0.126	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	5.7	14.1	cfs
Discharge within the Gutter Section W		Q_w =	1.2	2.0	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_W =	0.24	0.33	sq ft
Velocity within the Gutter Section W		V_W =	5.0	6.2	fps
Water Depth for Design Condition		d_{LOCAL} =	6.9	8.2	inches
Grate Analysis (Calculated)			MINOR	MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition			MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		**Q_a =**	**N/A**	**N/A**	**cfs**
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)		**Q_b =**	**N/A**	**N/A**	**cfs**
Curb or Slotted Inlet Opening Analysis (Calculated)			MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.084	0.066	ft/ft
Required Length L_T to Have 100% Interception		L_T =	16.69	28.78	ft
Under No-Clogging Condition			MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		L =	15.00	15.00	ft
Interception Capacity		Q_i =	6.8	11.8	cfs
Under Clogging Condition			MINOR	MAJOR	
Clogging Coefficient		CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04	
Effective (Unclogged) Length		L_e =	13.03	13.03	ft
Actual Interception Capacity		**Q_a =**	**6.7**	**11.5**	**cfs**
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a		**Q_b =**	**0.2**	**4.6**	**cfs**
Summary			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**6.7**	**11.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.2**	**4.6**	**cfs**
Capture Percentage = Q_a/Q_o =		**C% =**	**97**	**72**	**%**

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

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

Project: Grandview Reserve

Inlet ID: Basin E-3b (DP E7)



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.7	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

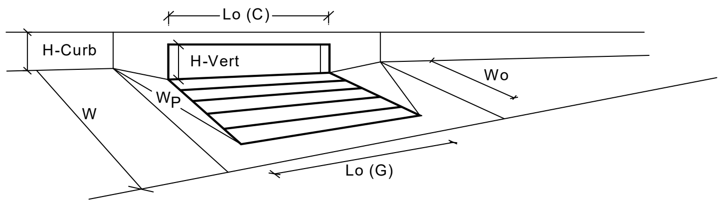
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



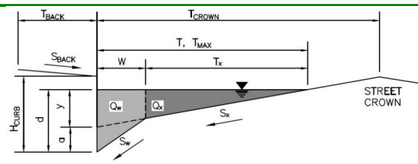
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.4	7.7	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.3	22.5	cfs
Interception with Clogging	Q_{wa} =	6.1	21.5	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	25.2	32.9	cfs
Interception with Clogging	Q_{oa} =	24.1	31.5	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	11.8	25.3	cfs
Interception with Clogging	Q_{ma} =	11.2	24.2	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**6.1**	**21.5**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	3.2	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.41	0.72	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.67	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.1**	**21.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.7	19.0	cfs

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

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

Project: Grandview Reserve
Inlet ID: Basin E-4b (DP E9)



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.0		ft
Gutter Width	W =	0.83		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.3	7.7	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

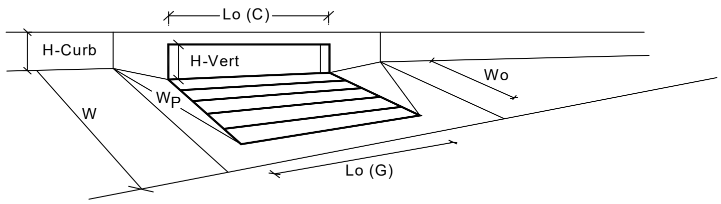
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	0.8	0.8	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.4	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	14.6	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.155	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

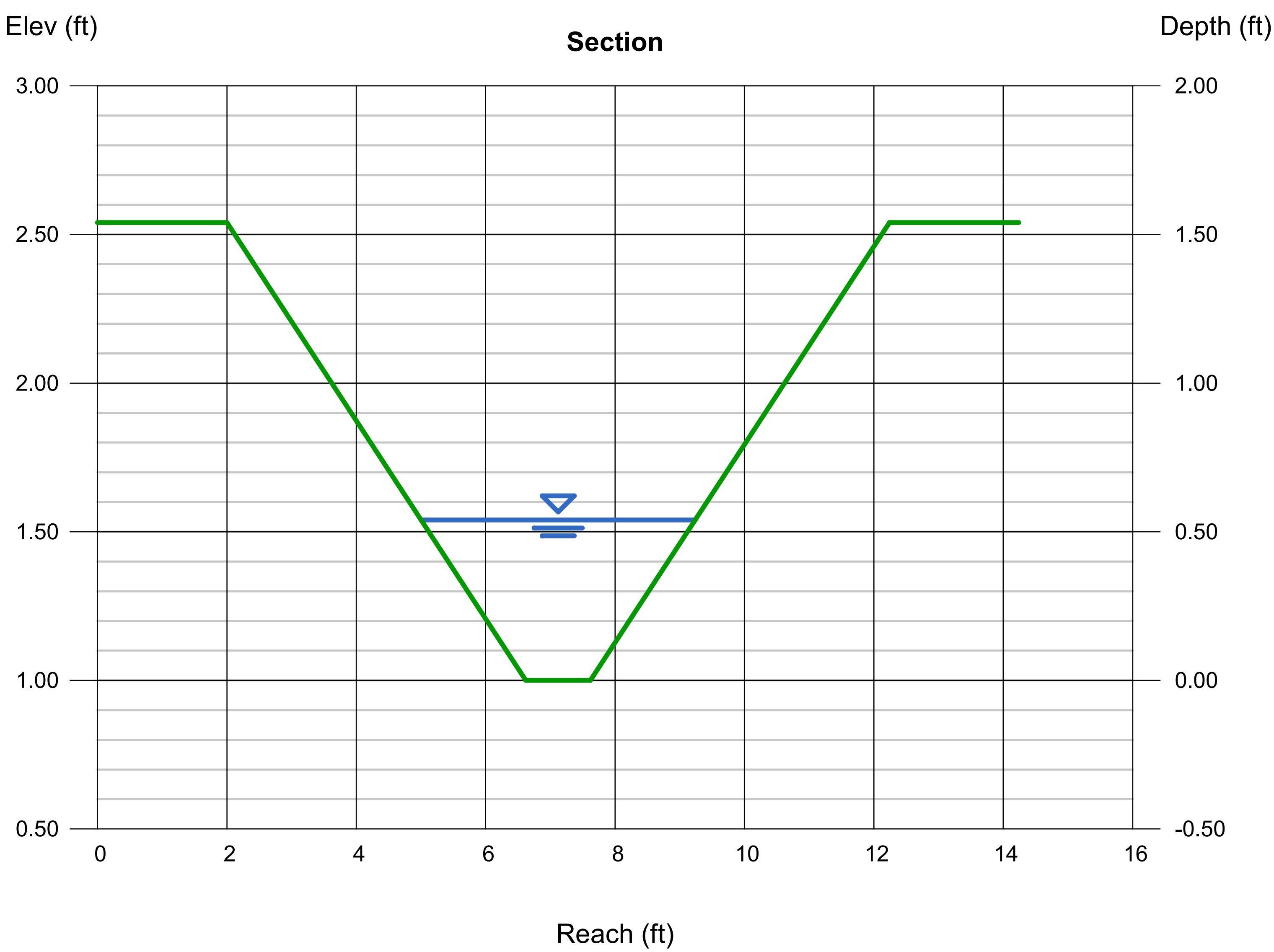


		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	0.83	0.83	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.3	22.5	cfs
Interception with Clogging	Q_{wa} =	6.1	21.5	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	25.2	32.9	cfs
Interception with Clogging	Q_{oa} =	24.1	31.5	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	11.8	25.3	cfs
Interception with Clogging	Q_{ma} =	11.2	24.2	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**6.1**	**21.5**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	3.2	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.41	0.72	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.67	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.1**	**21.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q PEAK REQUIRED =	2.9	10.9	cfs

Channel Report

Basin D-7b Swale

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 1.00	Depth (ft)	= 0.54
Side Slopes (z:1)	= 3.00, 3.00	Q (cfs)	= 3.900
Total Depth (ft)	= 1.54	Area (sqft)	= 1.41
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.76
Slope (%)	= 2.00	Wetted Perim (ft)	= 4.42
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.50
		Top Width (ft)	= 4.24
Calculations		EGL (ft)	= 0.66
Compute by:	Known Q		
Known Q (cfs)	= 3.90		



Channel Report

Due to velocity, swale will need to be lined

Pond D Emergency Overflow Swale

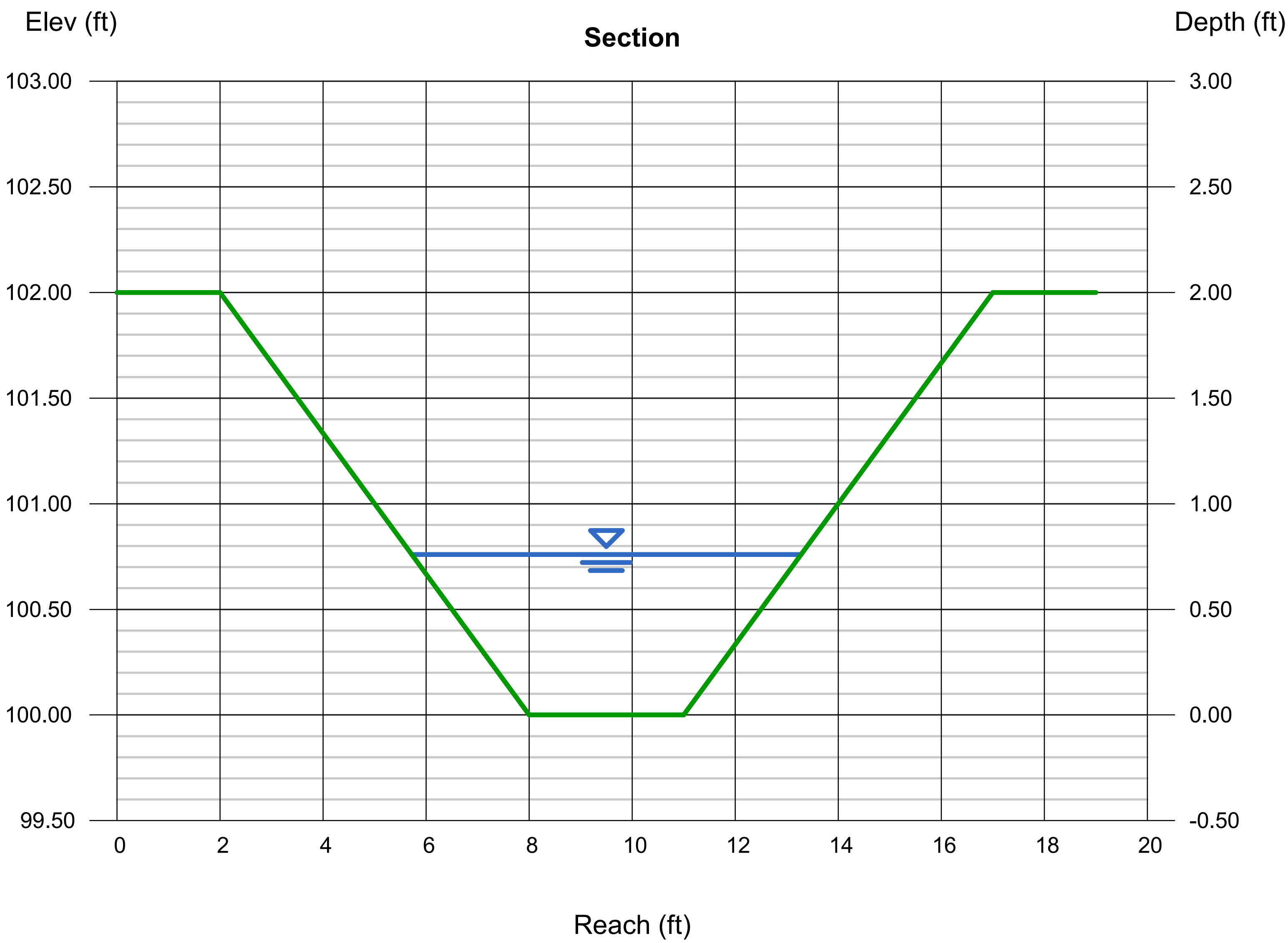
Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 3.00	Depth (ft)	= 0.76
Side Slopes (z:1)	= 3.00, 3.00	Q (cfs)	= 26.60
Total Depth (ft)	= 2.00	Area (sqft)	= 4.01
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 6.63
Slope (%)	= 2.00	Wetted Perim (ft)	= 7.81
N-Value	= 0.020	Crit Depth, Yc (ft)	= 0.98
		Top Width (ft)	= 7.56
		EGL (ft)	= 1.44

Calculations

Compute by:

Why is n-value so low? Discuss within report.

Known Q (cfs) = 26.60



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 4 2022

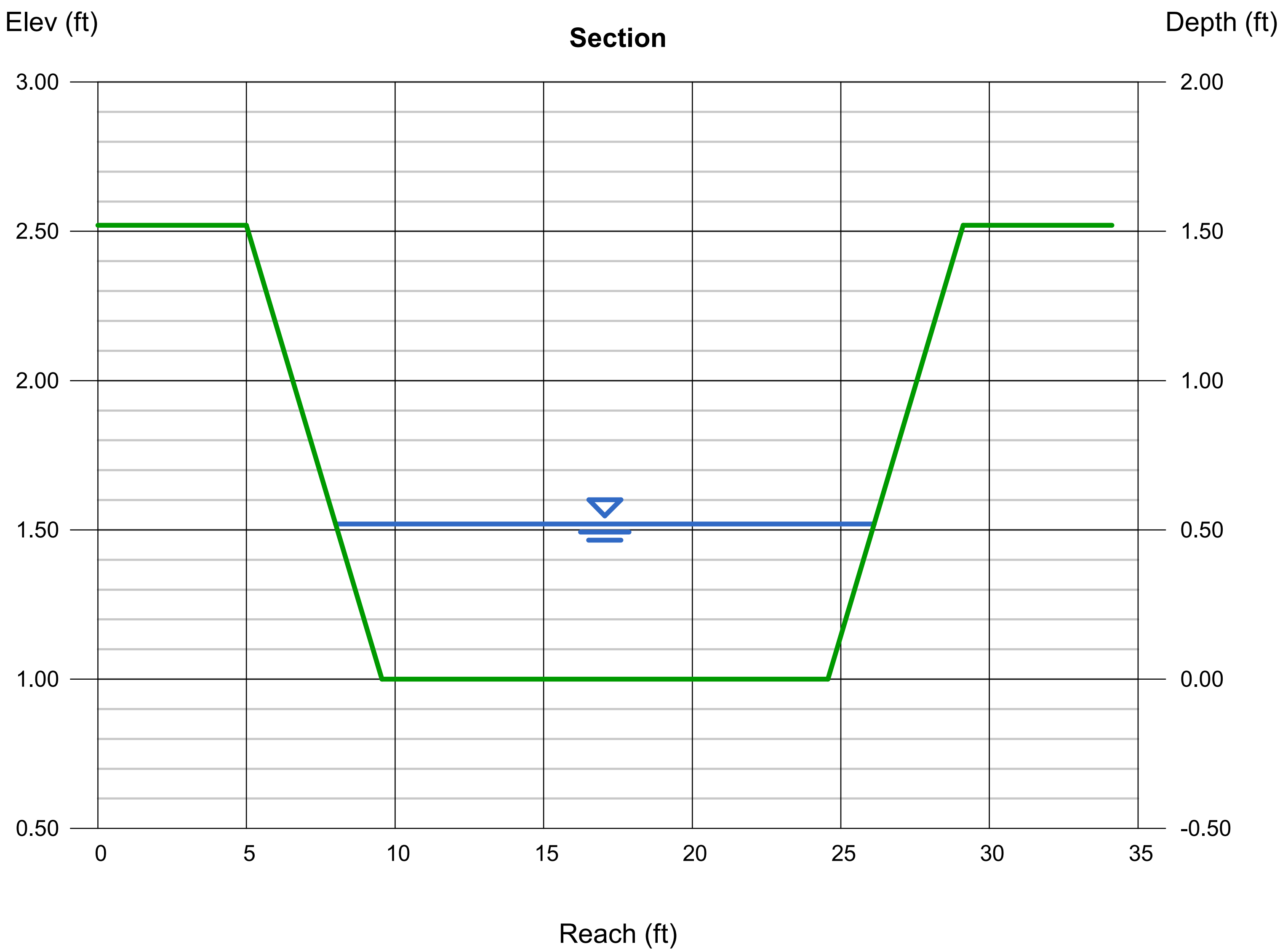
Pond E Emergency Overflow Swale

Trapezoidal	
Bottom Width (ft)	= 15.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.52
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.020
Calculations	
Compute by:	Known Q
Known Q (cfs)	= 53.80

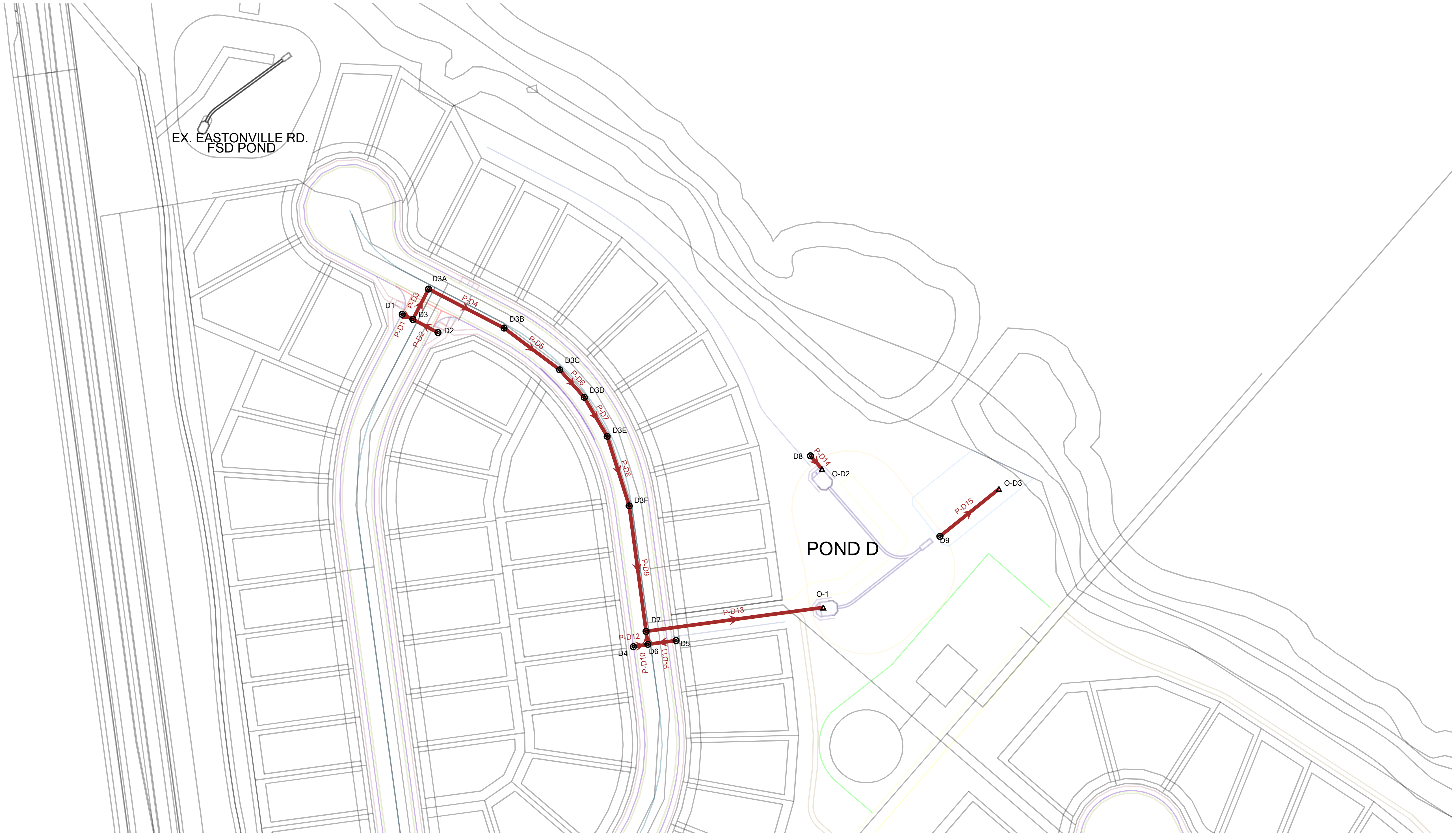
Why is n-value so low? Discuss within report.

Highlighted	
Depth (ft)	= 0.52
Q (cfs)	= 53.80
Area (sqft)	= 8.61
Velocity (ft/s)	= 6.25
Wetted Perim (ft)	= 18.29
Crit Depth, Yc (ft)	= 0.71
Top Width (ft)	= 18.12
EGL (ft)	= 1.13

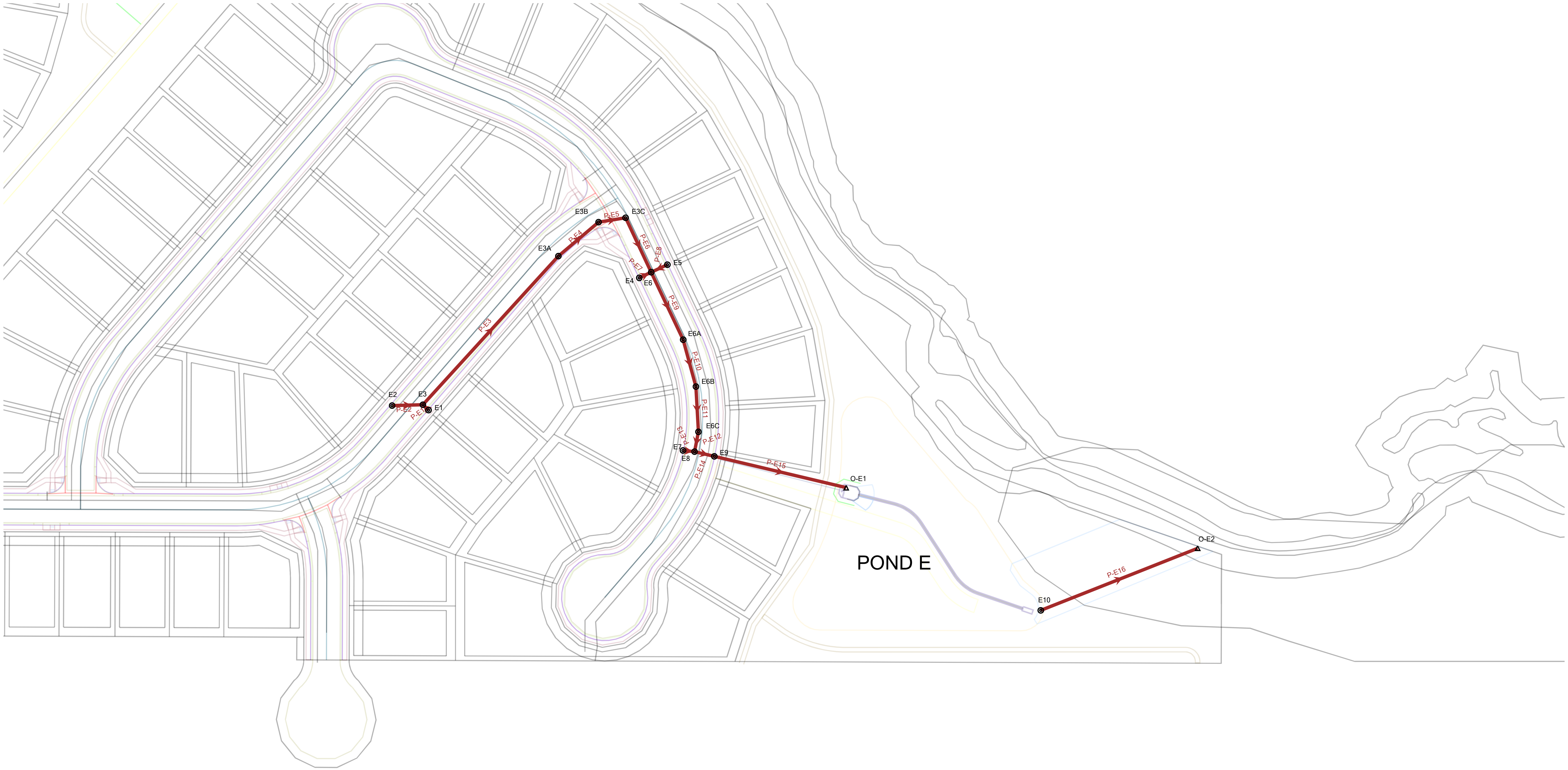
Due to velocity, swale will need to be lined



BASIN D STORMCAD
SCHEMATIC



BASIN D STORMCAD
SCHEMATIC



Grandview Reserve Filing No. 1
FlexTable: Conduit Table
Active Scenario: 5-YR Event

Label	Diameter (in)	Material	Manning's n	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (ft/s)
P-D1	24.0	Concrete	0.013	D1	6,978.34	D3	6,978.24	0.010	20.3	6,979.31	6,979.33	5.65
P-D2	24.0	Concrete	0.013	D2	6,978.54	D3	6,978.24	0.010	7.1	6,979.32	6,979.33	4.16
P-D3	24.0	Concrete	0.013	D3	6,977.94	D3A	6,977.76	0.005	38.8	6,978.82	6,978.78	4.77
P-D4	24.0	Concrete	0.013	D3A	6,977.46	D3B	6,977.03	0.005	38.8	6,978.34	6,977.89	4.77
P-D5	24.0	Concrete	0.013	D3B	6,976.93	D3C	6,976.57	0.005	38.8	6,977.81	6,977.43	4.77
P-D6	24.0	Concrete	0.013	D3C	6,976.47	D3D	6,976.28	0.005	38.8	6,977.35	6,977.14	4.77
P-D7	24.0	Concrete	0.013	D3D	6,976.18	D3E	6,975.95	0.005	38.8	6,977.06	6,976.81	4.77
P-D8	24.0	Concrete	0.013	D3E	6,975.83	D3F	6,975.46	0.005	39.0	6,976.71	6,976.33	4.75
P-D9	24.0	Concrete	0.013	D3F	6,975.36	D7	6,973.58	0.014	23.4	6,976.24	6,974.61	6.88
P-D10	18.0	Concrete	0.013	D4	6,974.45	D6	6,974.27	0.020	44.9	6,975.50	6,975.60	8.10
P-D11	18.0	Concrete	0.013	D5	6,974.45	D6	6,974.27	0.006	41.2	6,975.62	6,975.60	4.44
P-D12	24.0	Concrete	0.013	D6	6,973.77	D7	6,973.58	0.014	37.2	6,974.90	6,974.52	7.93
P-D13	36.0	Concrete	0.013	D7	6,972.58	O-1	6,970.76	0.010	24.4	6,973.87	6,972.81	7.75
P-D14	15.0	Concrete	0.013	D8	6,970.84	O-D2	6,970.75	0.005	35.0	6,972.82	6,972.81	1.30
P-D15	18.0	Concrete	0.013	D9	6,968.47	O-D3	6,968.00	0.006	4.7	6,968.70	6,968.22	2.45
P-E1	24.0	Concrete	0.013	E1	6,957.80	E3	6,957.21	0.066	12.0	6,958.74	6,958.77	12.52
P-E2	24.0	Concrete	0.013	E2	6,957.80	E3	6,957.21	0.016	26.5	6,958.78	6,958.77	7.72
P-E3	30.0	Concrete	0.013	E3	6,956.71	E3A	6,953.62	0.015	29.1	6,958.00	6,954.54	8.87
P-E4	30.0	Concrete	0.013	E3A	6,953.52	E3B	6,952.46	0.015	28.6	6,954.81	6,953.40	8.96
P-E5	30.0	Concrete	0.013	E3B	6,952.29	E3C	6,951.91	0.013	31.7	6,953.58	6,953.39	8.32
P-E6	36.0	Concrete	0.013	E3C	6,951.41	E6	6,950.58	0.012	19.6	6,953.14	6,953.20	8.17
P-E7	24.0	Concrete	0.013	E4	6,951.63	E6	6,951.48	0.016	20.0	6,953.20	6,953.20	7.20
P-E8	24.0	Concrete	0.013	E5	6,951.63	E6	6,951.48	0.005	41.3	6,953.22	6,953.20	4.92
P-E9	36.0	Concrete	0.013	E6	6,950.48	E6A	6,949.46	0.012	36.4	6,952.16	6,950.75	9.70
P-E10	36.0	Concrete	0.013	E6A	6,949.36	E6B	6,949.09	0.005	57.2	6,951.04	6,950.72	6.92
P-E11	36.0	Concrete	0.013	E6B	6,948.99	E6C	6,948.74	0.005	57.4	6,950.67	6,950.71	6.91
P-E12	36.0	Concrete	0.013	E6C	6,948.54	E8	6,948.45	0.005	59.4	6,950.69	6,950.68	6.73
P-E13	36.0	Concrete	0.013	E7	6,948.70	E8	6,948.45	0.040	2.7	6,950.68	6,950.68	8.18
P-E14	42.0	Concrete	0.013	E8	6,947.95	E9	6,947.80	0.005	42.5	6,949.66	6,949.52	7.20
P-E15	42.0	Concrete	0.013	E9	6,947.70	O-E1	6,947.00	0.005	46.7	6,949.49	6,949.12	7.29
P-E16	18.0	Concrete	0.013	E10	6,944.01	O-E2	6,943.01	0.005	7.8	6,944.30	6,943.30	2.59

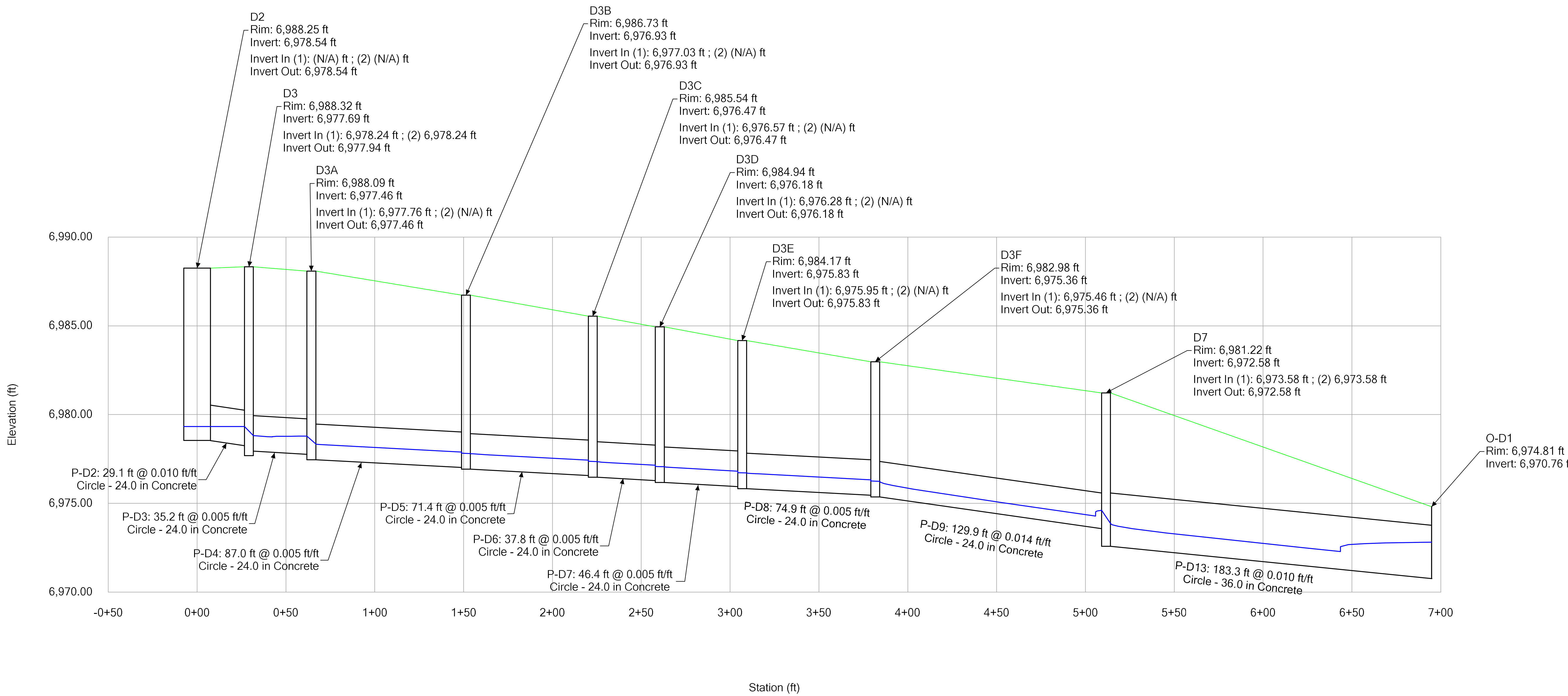
Grandview Reserve Filing No. 1
FlexTable: Manhole Table
Active Scenario: 5-YR Event

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert in 3) (ft)	Elevation (Invert Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Flow (Known) (cfs)
D1	6,988.83	(N/A)	(N/A)	(N/A)	6,978.34	Standard	0.050	4.60
D2	6,988.25	(N/A)	(N/A)	(N/A)	6,978.54	Standard	0.050	1.60
D3	6,988.32	6,978.24	6,978.24	(N/A)	6,977.94	Standard	1.520	6.20
D3A	6,988.09	6,977.76	(N/A)	(N/A)	6,977.46	Standard	1.320	6.20
D3B	6,986.73	6,977.03	(N/A)	(N/A)	6,976.93	Standard	0.050	6.20
D3C	6,985.54	6,976.57	(N/A)	(N/A)	6,976.47	Standard	0.050	6.20
D3D	6,984.94	6,976.28	(N/A)	(N/A)	6,976.18	Standard	0.050	6.20
D3E	6,984.17	6,975.95	(N/A)	(N/A)	6,975.83	Standard	0.050	6.20
D3F	6,982.98	6,975.46	(N/A)	(N/A)	6,975.36	Standard	0.050	6.20
D4	6,981.53	(N/A)	(N/A)	(N/A)	6,974.45	Standard	0.050	6.60
D5	6,981.53	(N/A)	(N/A)	(N/A)	6,974.45	Standard	0.050	3.40
D6	6,981.20	6,974.27	6,974.27	(N/A)	6,973.77	Standard	1.520	10.00
D7	6,981.22	6,973.58	6,973.58	(N/A)	6,972.58	Standard	1.520	16.20
D8	6,975.45	(N/A)	(N/A)	(N/A)	6,970.84	Standard	0.050	1.60
D9	6,973.25	(N/A)	(N/A)	(N/A)	6,968.47	Standard	0.050	0.40
E1	6,962.37	(N/A)	(N/A)	(N/A)	6,957.80	Standard	0.400	7.00
E2	6,962.72	(N/A)	(N/A)	(N/A)	6,957.80	Standard	0.050	7.60
E3	6,962.03	6,957.21	6,957.21	(N/A)	6,956.71	Standard	1.520	14.60
E3A	6,958.79	6,953.62	(N/A)	(N/A)	6,953.52	Standard	0.050	14.60
E3B	6,957.65	6,952.46	(N/A)	(N/A)	6,952.29	Standard	0.100	14.60
E3C	6,957.37	6,951.91	(N/A)	(N/A)	6,951.41	Standard	1.320	14.60
E4	6,956.87	(N/A)	(N/A)	(N/A)	6,951.63	Standard	0.050	5.80
E5	6,956.87	(N/A)	(N/A)	(N/A)	6,951.63	Standard	0.050	6.70
E6	6,956.54	6,950.58	6,951.48	6,951.48	6,950.48	Standard	1.520	27.10
E6A	6,955.51	6,949.46	(N/A)	(N/A)	6,949.36	Standard	0.050	27.10
E6B	6,954.76	6,949.09	(N/A)	(N/A)	6,948.99	Standard	0.050	27.10
E6C	6,954.30	6,948.74	(N/A)	(N/A)	6,948.54	Standard	0.050	27.10
E7	6,954.65	(N/A)	(N/A)	(N/A)	6,948.70	Standard	0.050	3.60
E8	6,954.29	6,948.45	6,948.45	(N/A)	6,947.95	Standard	1.520	30.70
E9	6,954.65	6,947.80	(N/A)	(N/A)	6,947.70	Standard	0.050	33.30
E10	6,949.01	(N/A)	(N/A)	(N/A)	6,944.01	Standard	0.050	0.60

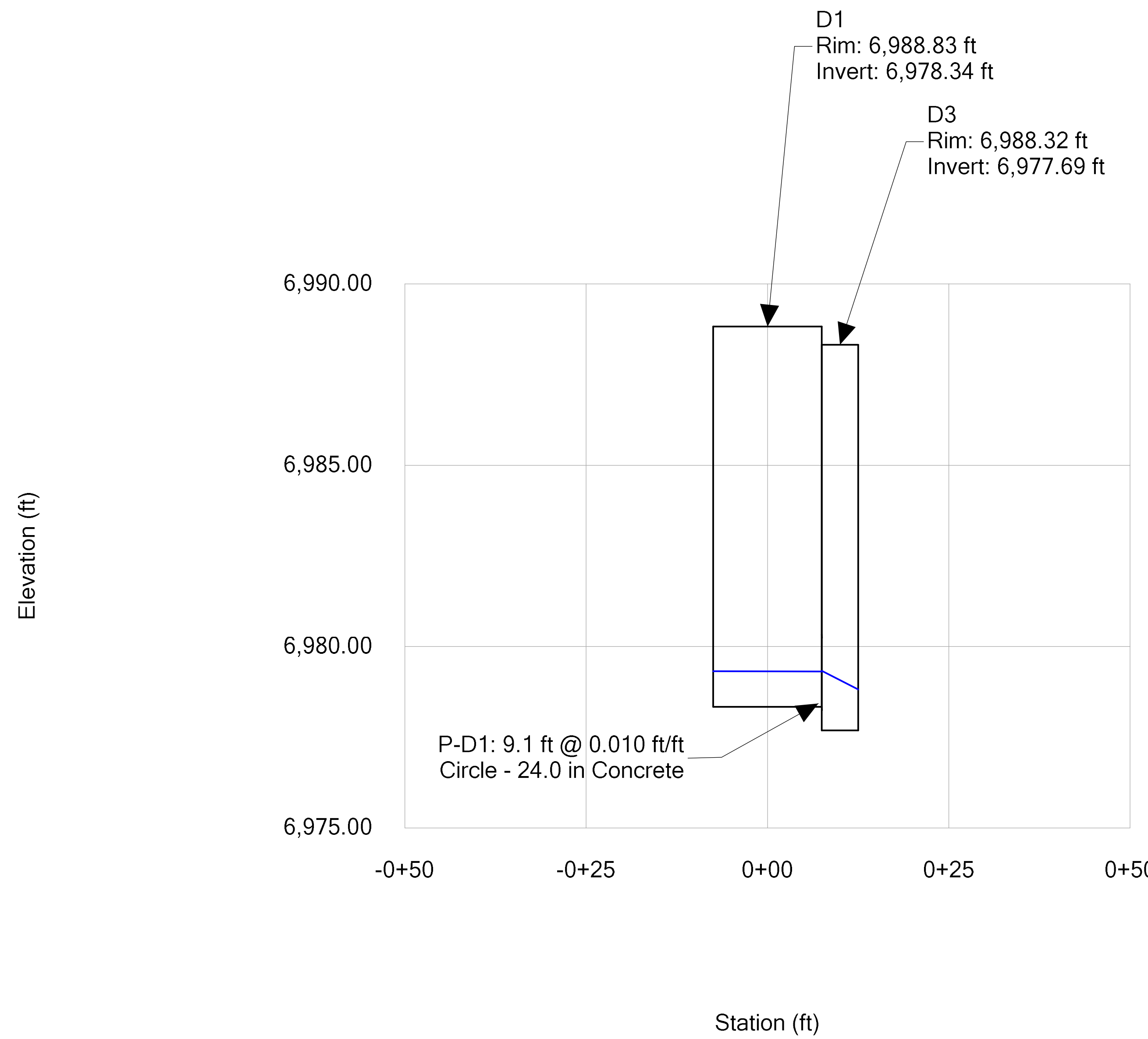
Grandview Reserve Filing No. 1
FlexTable: Outfall Table
Active Scenario: 5-YR Event

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
O-D3	6,970.21	6,968.00	Free Outfall		6,968.22	0.40
O-E2	6,945.22	6,943.01	Free Outfall		6,943.30	0.60
O-D1	6,974.81	6,970.76	User Defined Tailwater	6,972.81	6,972.81	16.20
O-D2	6,974.50	6,970.00	User Defined Tailwater	6,972.81	6,972.81	1.60
O-E1	6,951.34	6,946.25	User Defined Tailwater	6,949.12	6,949.12	33.30

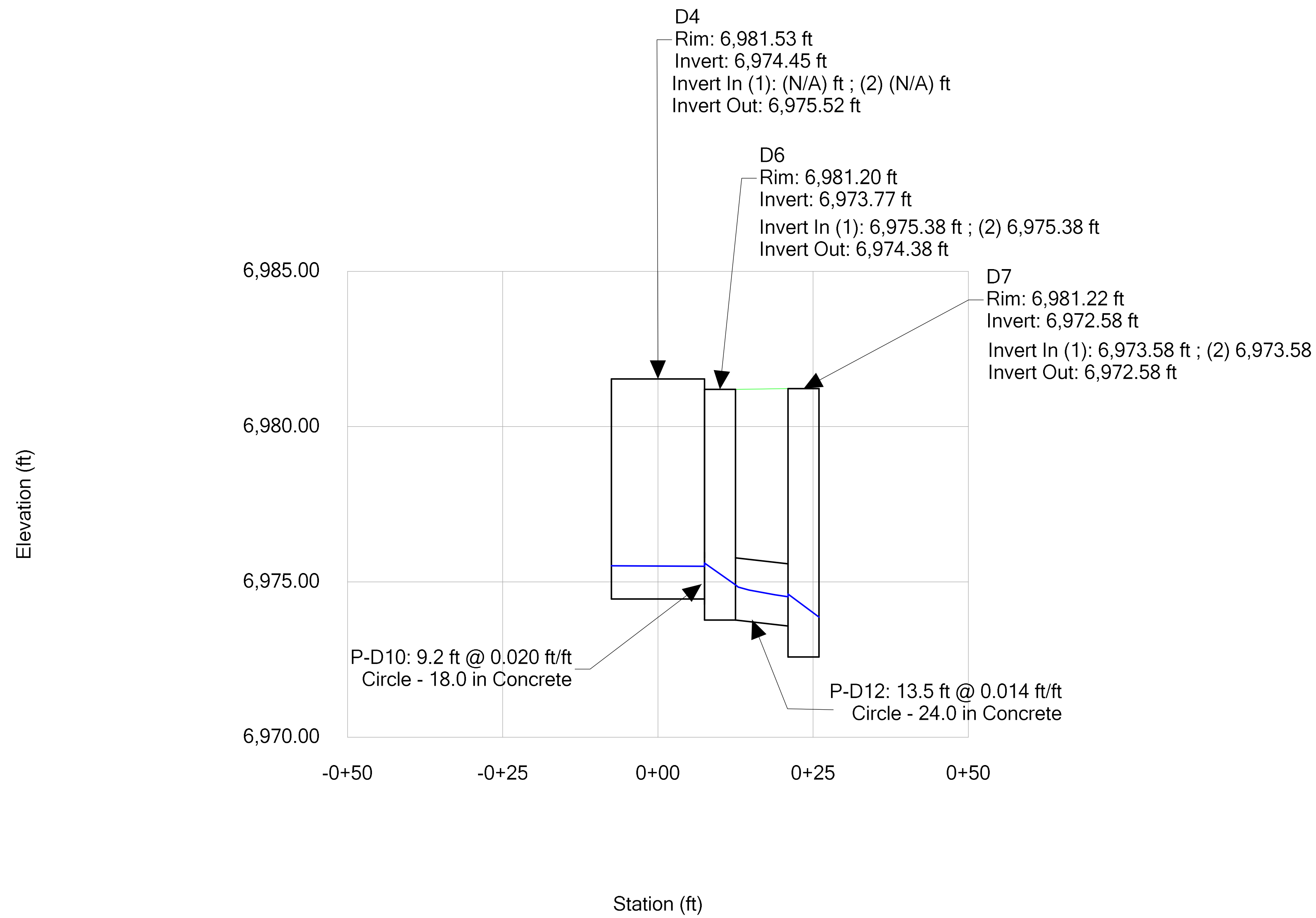
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D2 to O-1 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



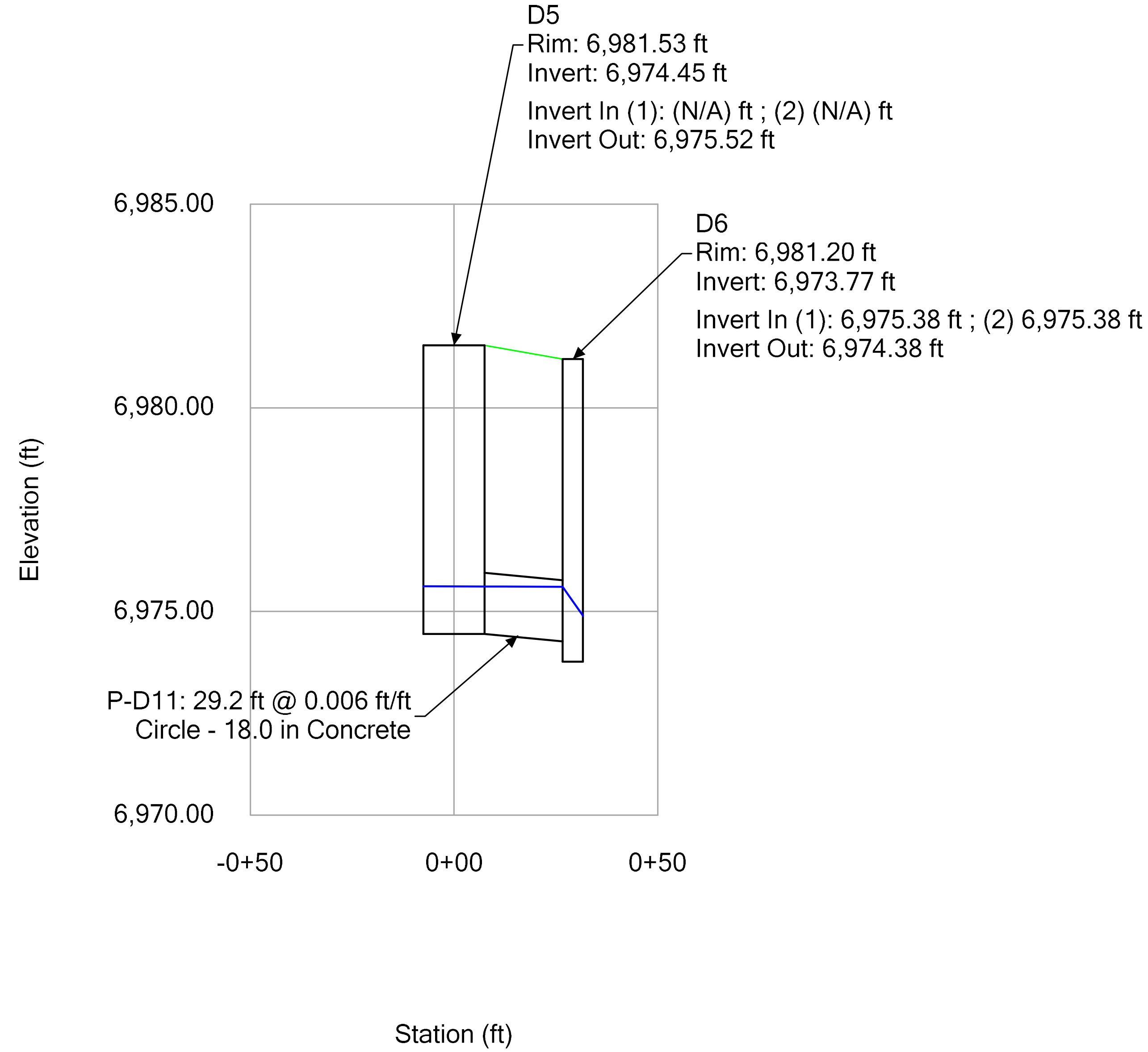
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D1 to D3 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



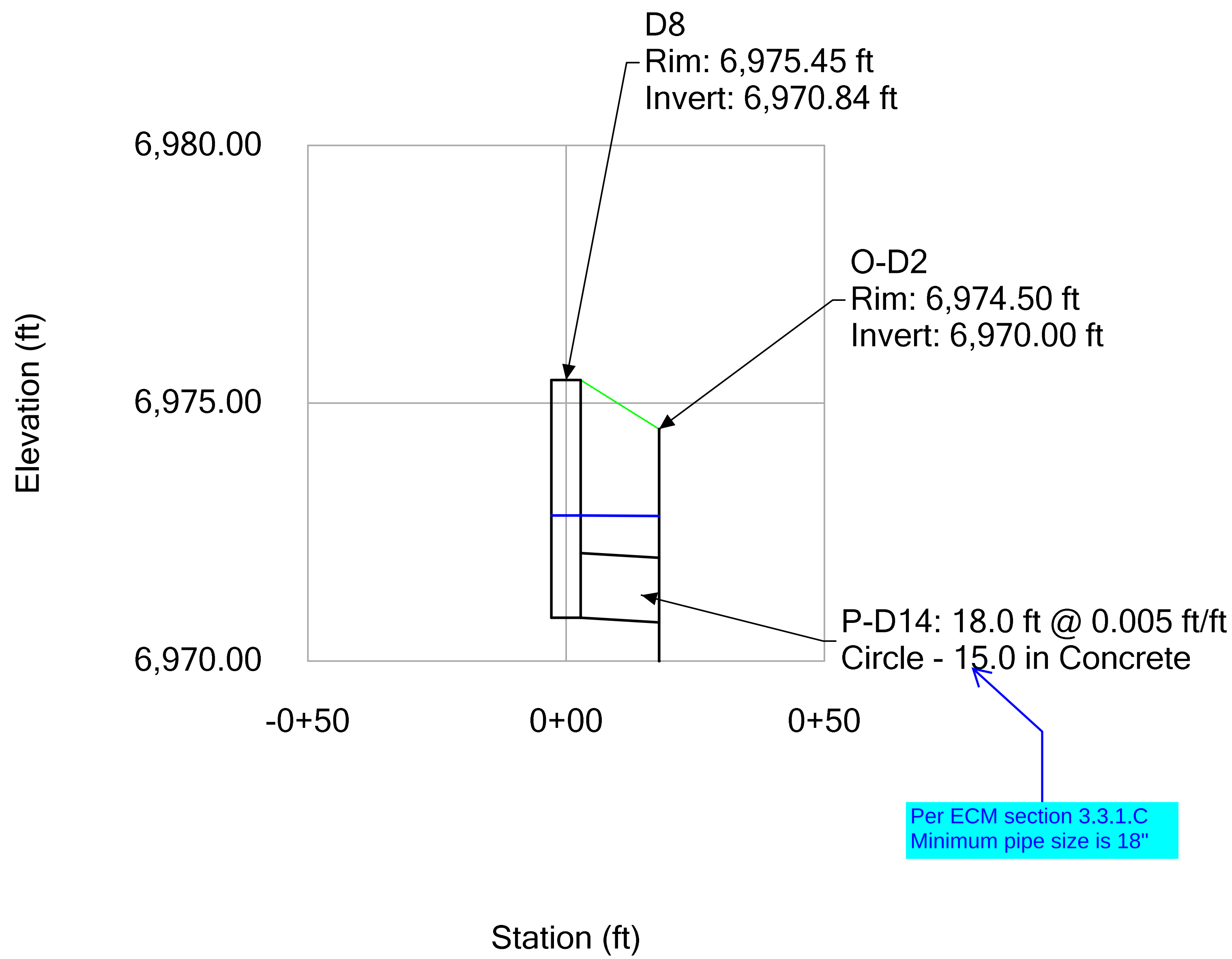
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D4 to D7 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D5 to D6 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D8 to O-D2 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event

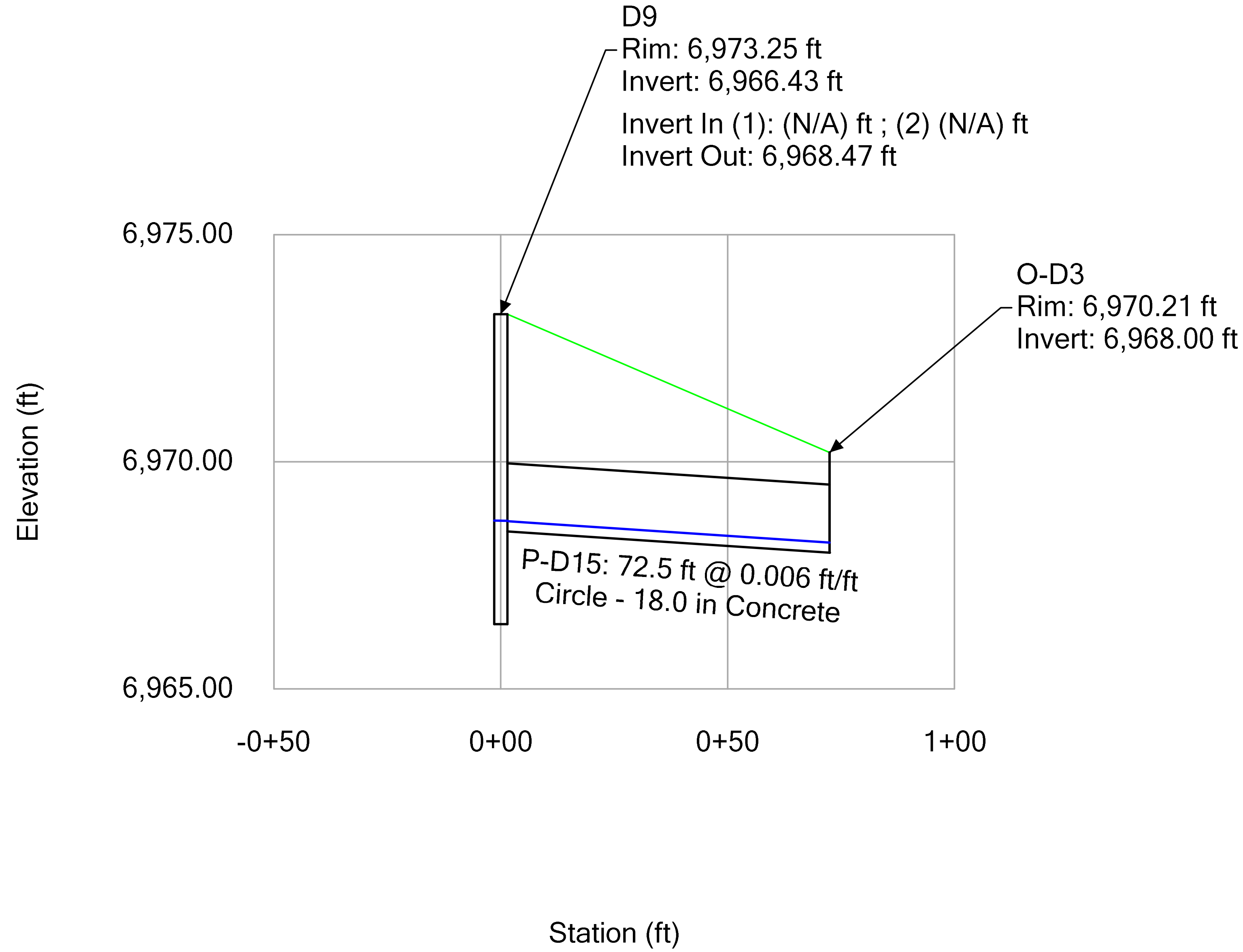


Grandview Reserve Filing No. 1

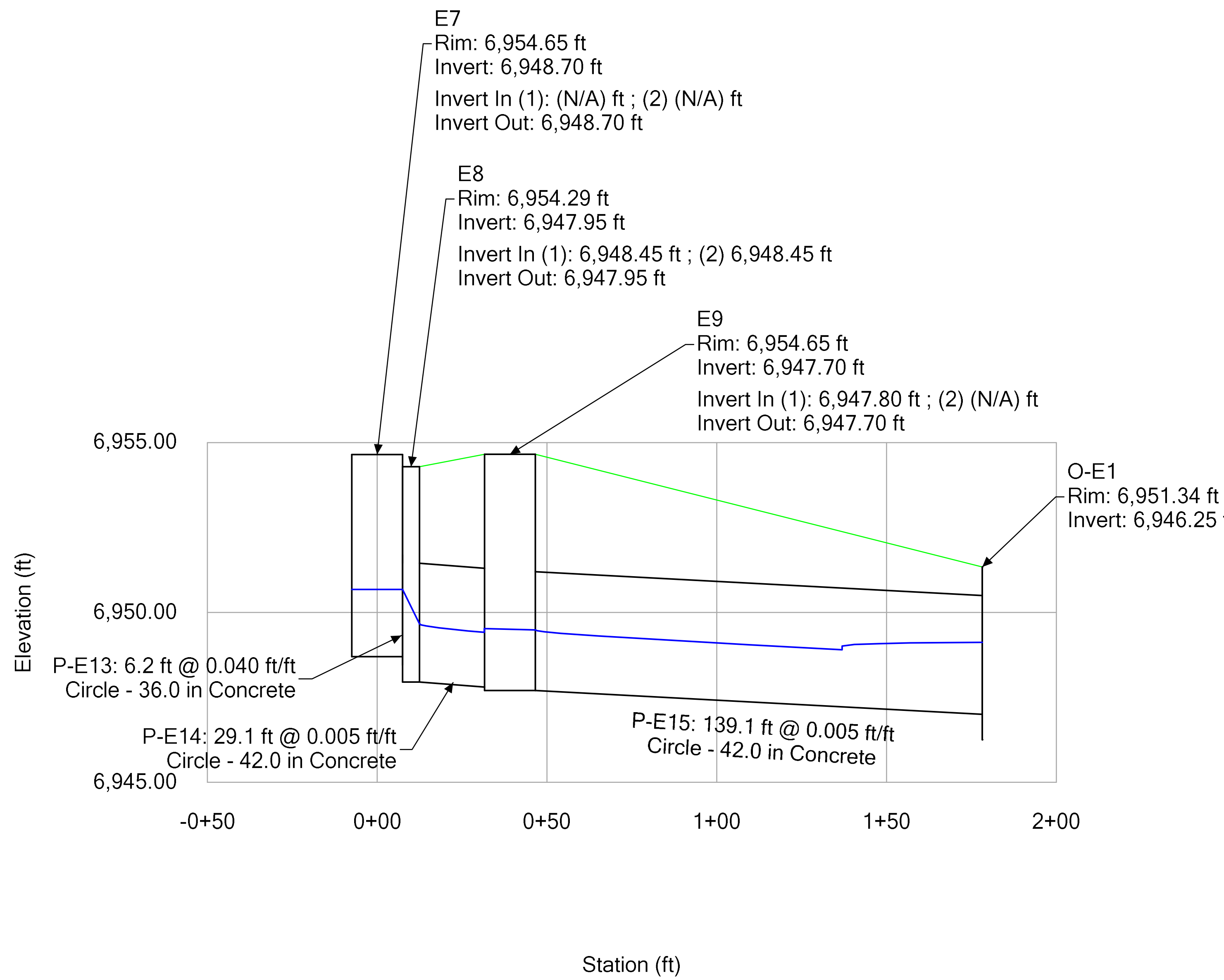
Profile Report

Engineering Profile - D9 to O-D3 (HRG02_FDR Storm Analysis.stsw)

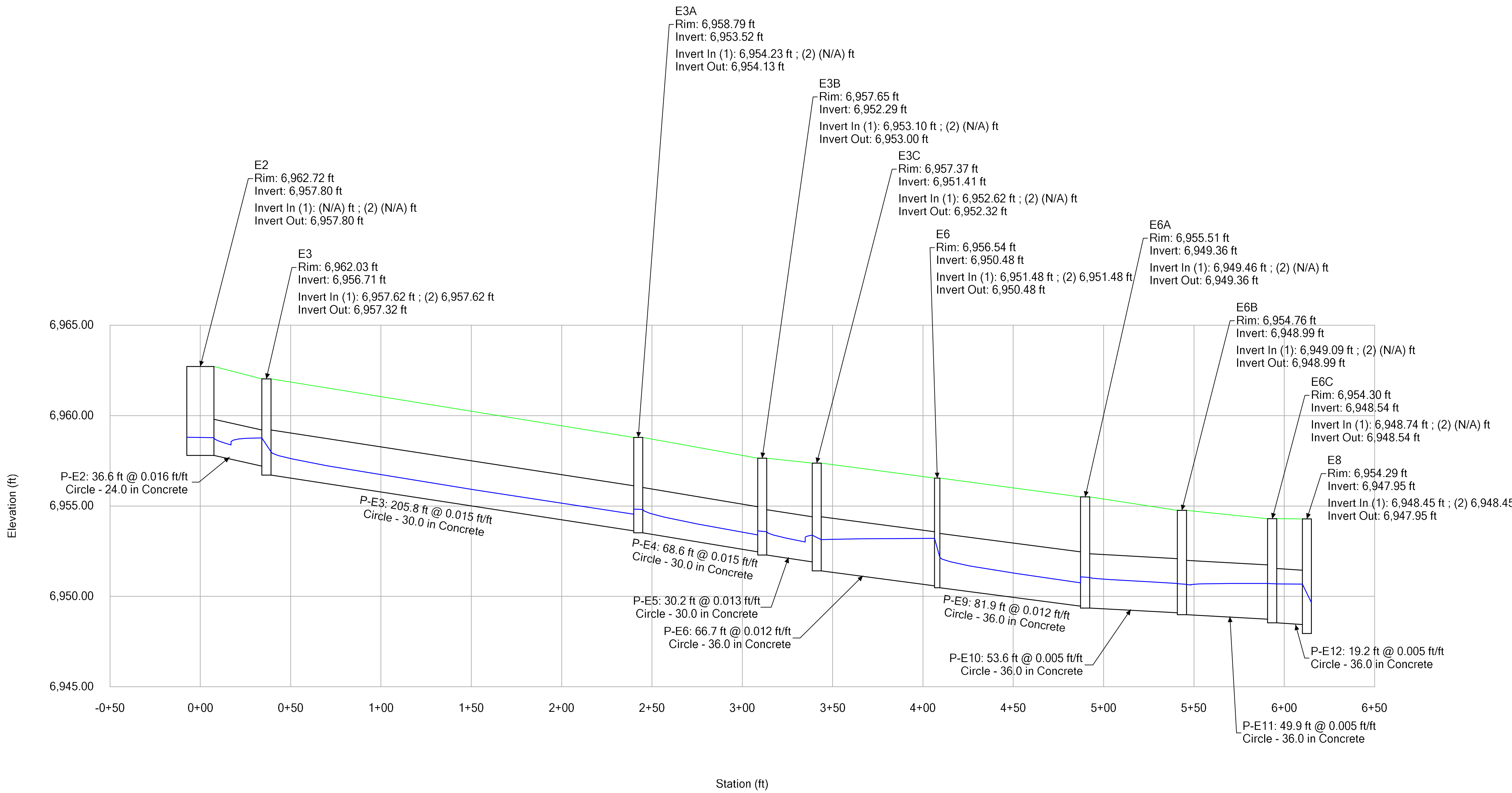
Active Scenario: 5-YR Event



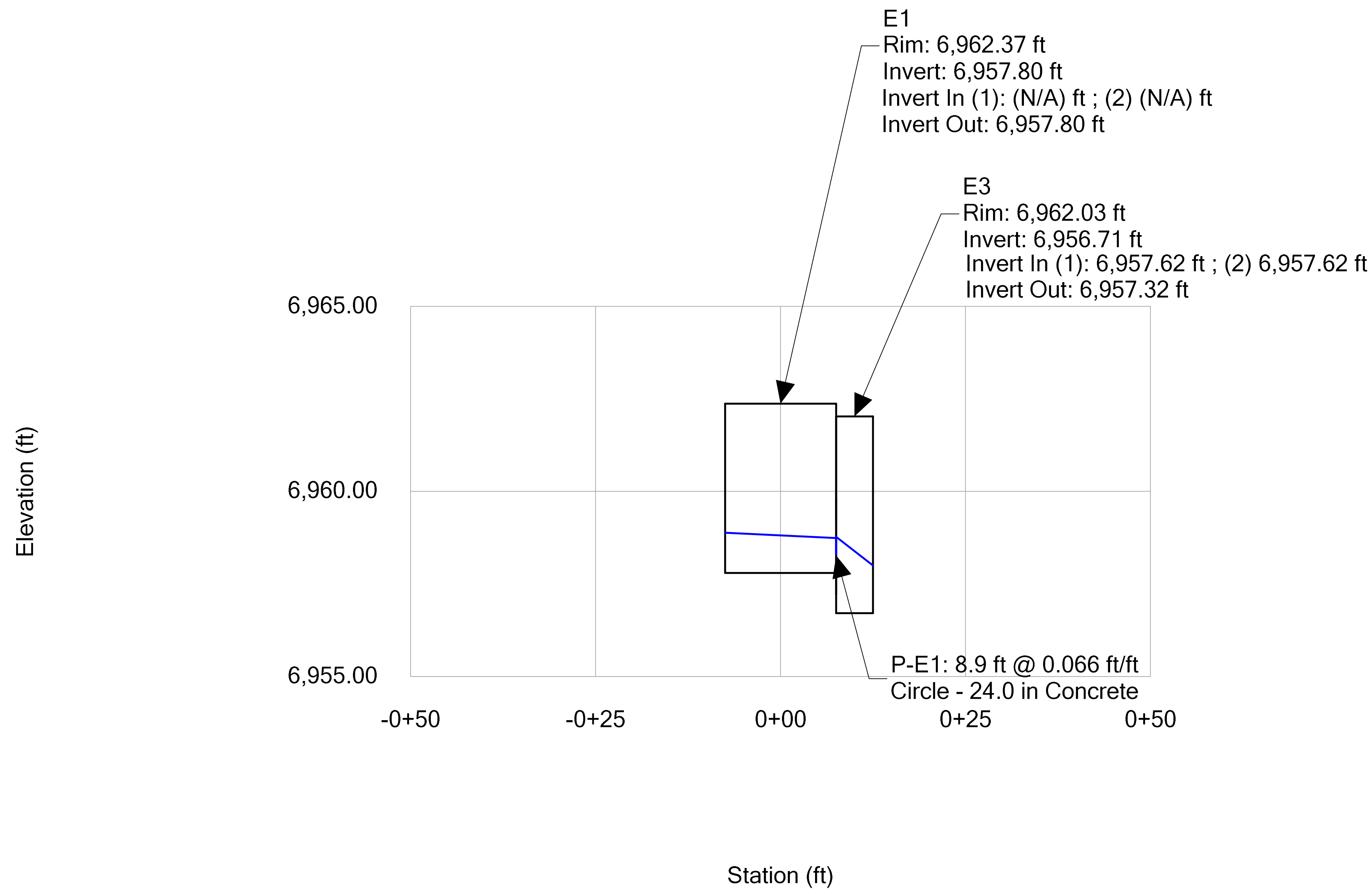
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E7 to O-E1 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



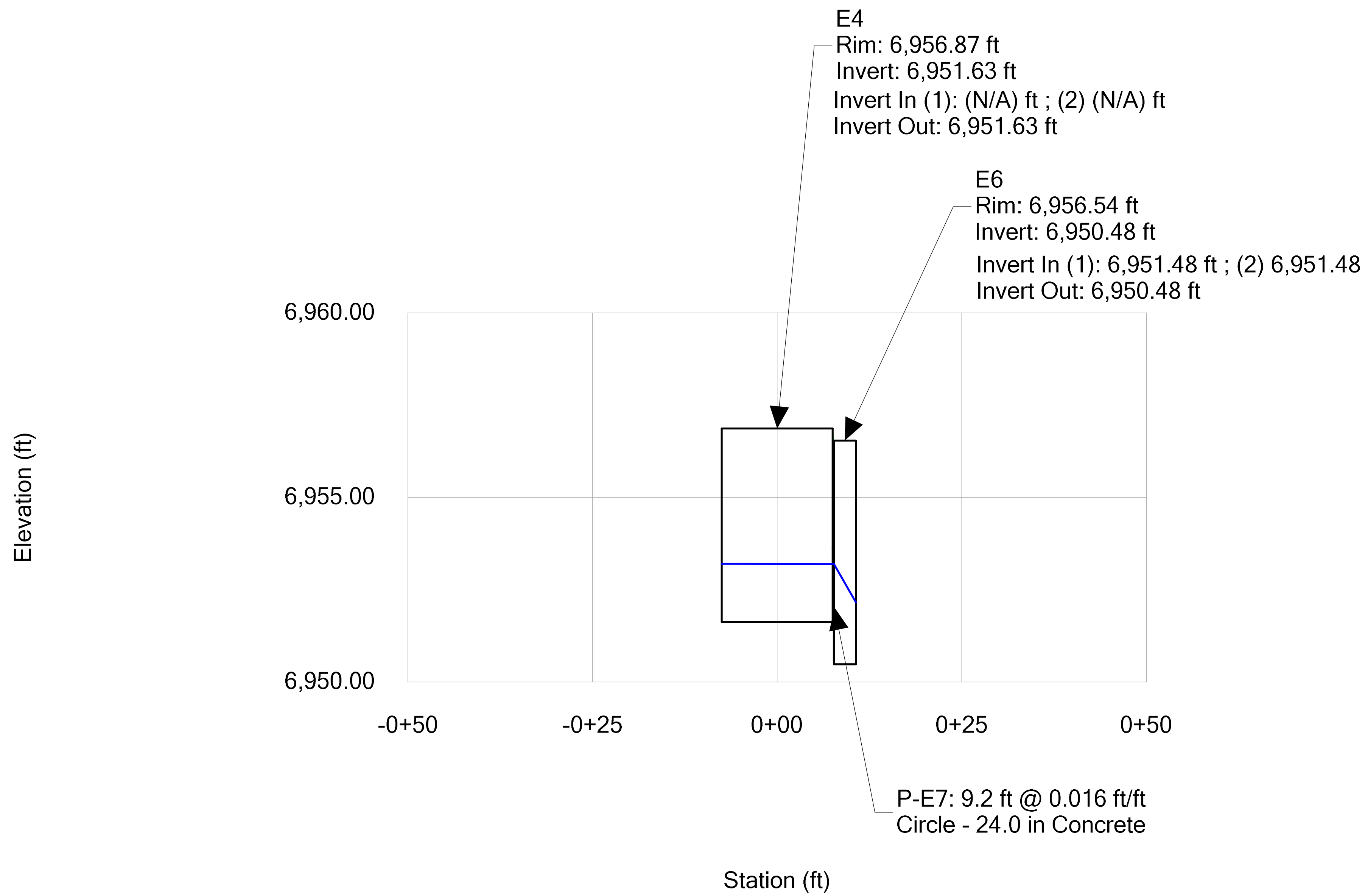
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E2 to E8 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



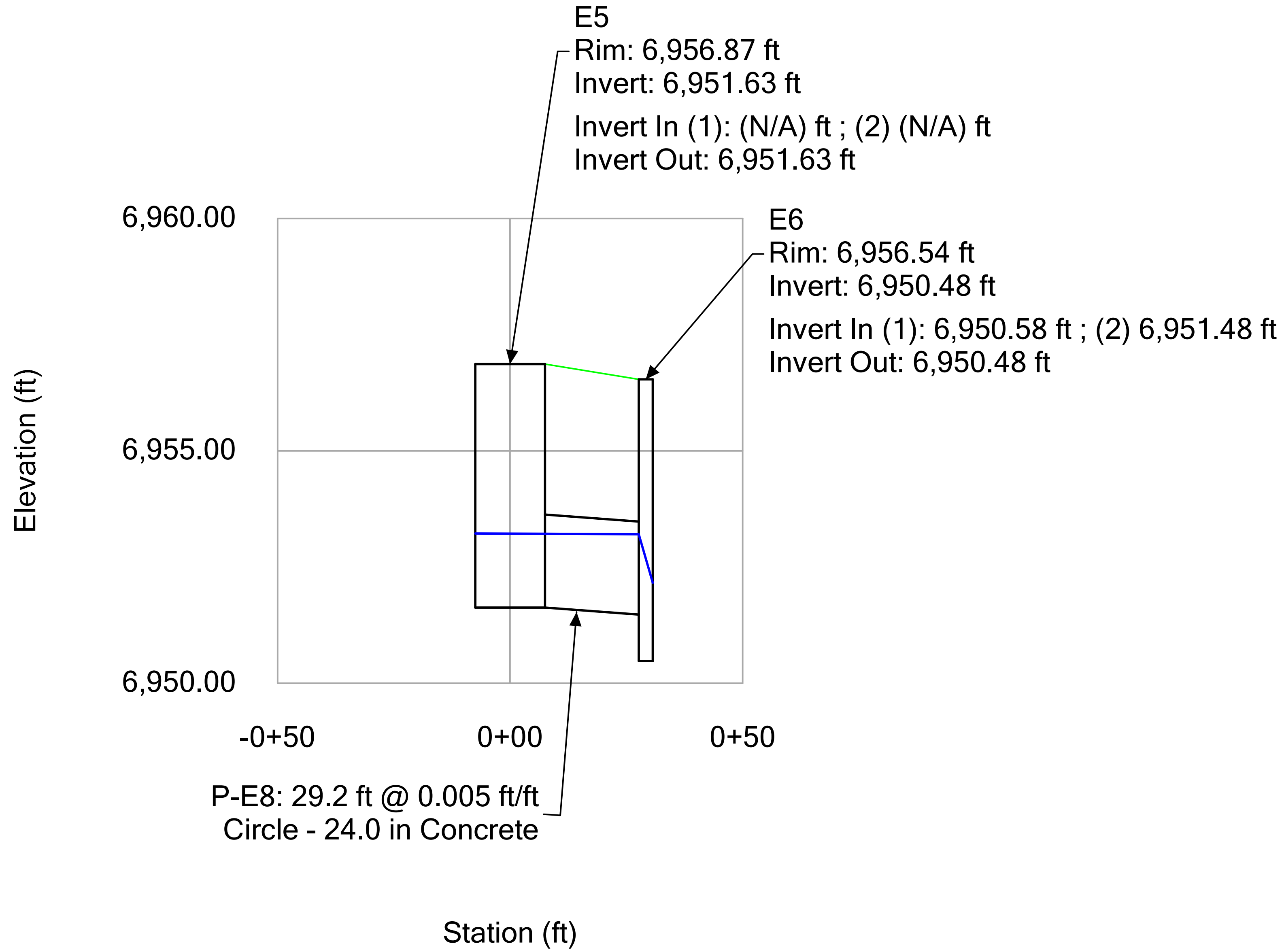
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E1 to E3 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



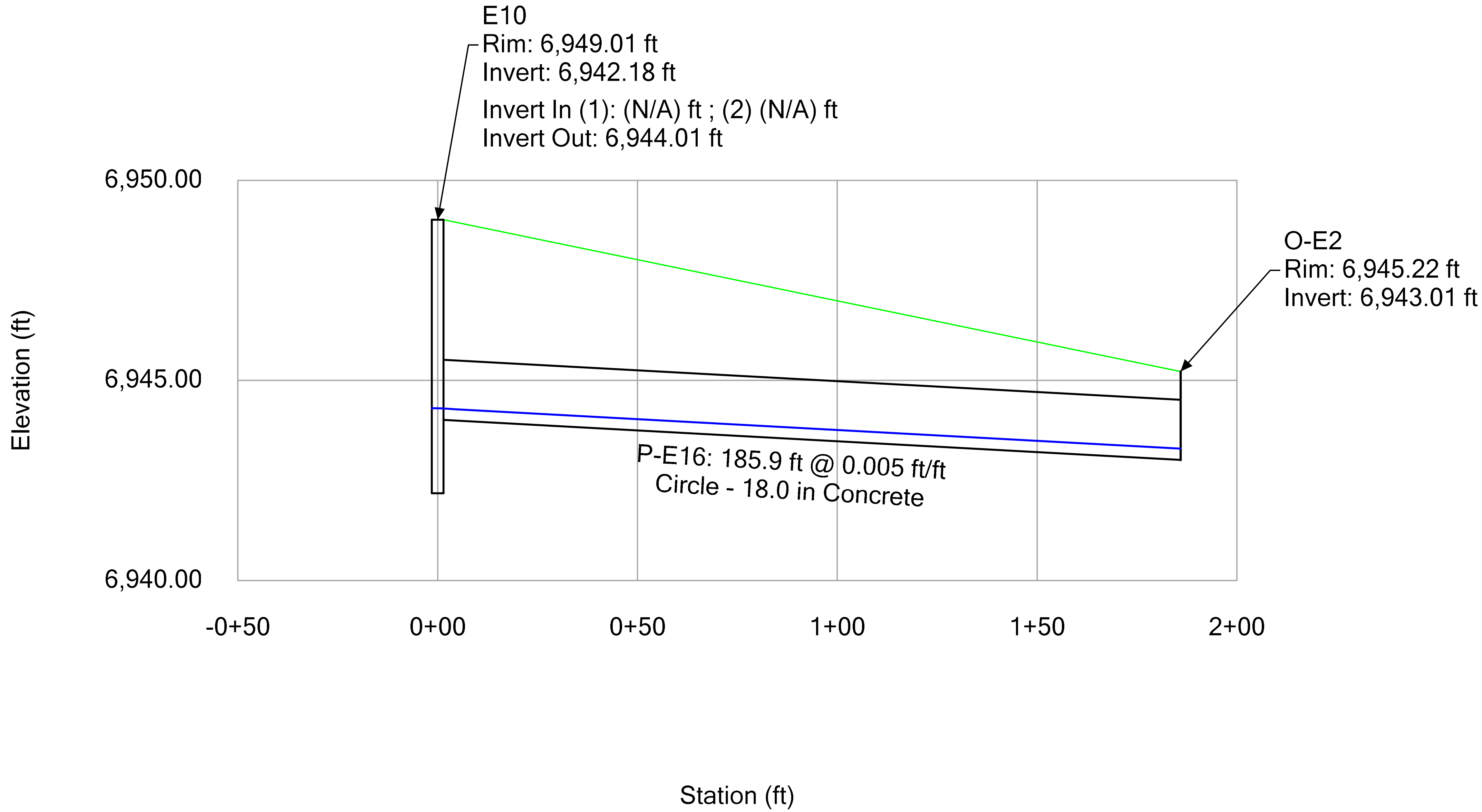
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E4 to E6 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E5 to E6 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E10 to O-E2 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 5-YR Event



Grandview Reserve Filing No. 1
FlexTable: Conduit Table
Active Scenario: 100-YR Event

Label	Diameter (in)	Material	Manning's n	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Velocity (ft/s)
P-D1	24.0	Concrete	0.013	D1	6,978.34	D3	6,978.24	0.010	32.7	6,979.87	6,979.87	6.44
P-D2	24.0	Concrete	0.013	D2	6,978.54	D3	6,978.24	0.010	16.4	6,979.87	6,979.87	5.31
P-D3	24.0	Concrete	0.013	D3	6,977.94	D3A	6,977.76	0.005	69.4	6,979.36	6,979.31	5.50
P-D4	24.0	Concrete	0.013	D3A	6,977.46	D3B	6,977.03	0.005	69.4	6,978.69	6,978.22	5.50
P-D5	24.0	Concrete	0.013	D3B	6,976.93	D3C	6,976.57	0.005	69.4	6,978.15	6,977.76	5.50
P-D6	24.0	Concrete	0.013	D3C	6,976.47	D3D	6,976.28	0.005	69.4	6,977.69	6,977.47	5.50
P-D7	24.0	Concrete	0.013	D3D	6,976.18	D3E	6,975.95	0.005	69.4	6,977.41	6,977.14	5.50
P-D8	24.0	Concrete	0.013	D3E	6,975.83	D3F	6,975.46	0.005	69.8	6,977.06	6,976.66	5.47
P-D9	24.0	Concrete	0.013	D3F	6,975.36	D7	6,973.58	0.014	41.9	6,976.56	6,975.92	8.06
P-D10	18.0	Concrete	0.013	D4	6,974.45	D6	6,974.27	0.020	127.1	6,978.09	6,977.80	10.58
P-D11	18.0	Concrete	0.013	D5	6,974.45	D6	6,974.27	0.006	95.7	6,977.97	6,977.80	4.47
P-D12	24.0	Concrete	0.013	D6	6,973.77	D7	6,973.58	0.014	99.0	6,976.11	6,975.92	8.47
P-D13	36.0	Concrete	0.013	D7	6,972.58	O-D1	6,970.76	0.010	56.8	6,974.58	6,974.08	9.69
P-D14	15.0	Concrete	0.013	D8	6,970.84	O-D2	6,970.75	0.005	85.4	6,974.15	6,974.08	3.18
P-D15	18.0	Concrete	0.013	D9	6,968.47	O-D3	6,968.00	0.006	66.2	6,969.38	6,968.89	5.12
P-E1	24.0	Concrete	0.013	E1	6,957.80	E3	6,957.21	0.066	21.8	6,959.59	6,959.59	14.84
P-E2	24.0	Concrete	0.013	E2	6,957.80	E3	6,957.21	0.016	43.5	6,959.69	6,959.59	8.82
P-E3	30.0	Concrete	0.013	E3	6,956.71	E3A	6,953.62	0.015	50.1	6,958.42	6,956.08	10.24
P-E4	30.0	Concrete	0.013	E3A	6,953.52	E3B	6,952.46	0.015	49.4	6,956.06	6,955.80	5.13
P-E5	30.0	Concrete	0.013	E3B	6,952.29	E3C	6,951.91	0.013	54.8	6,955.76	6,955.64	5.13
P-E6	36.0	Concrete	0.013	E3C	6,951.41	E6	6,950.58	0.012	33.9	6,955.38	6,955.29	3.57
P-E7	24.0	Concrete	0.013	E4	6,951.63	E6	6,951.48	0.016	50.5	6,955.32	6,955.29	4.65
P-E8	24.0	Concrete	0.013	E5	6,951.63	E6	6,951.48	0.005	70.9	6,955.36	6,955.29	3.66
P-E9	36.0	Concrete	0.013	E6	6,950.48	E6A	6,949.46	0.012	68.9	6,954.04	6,953.56	7.26
P-E10	36.0	Concrete	0.013	E6A	6,949.36	E6B	6,949.09	0.005	108.4	6,953.52	6,953.20	7.26
P-E11	36.0	Concrete	0.013	E6B	6,948.99	E6C	6,948.74	0.005	108.7	6,953.16	6,952.86	7.26
P-E12	36.0	Concrete	0.013	E6C	6,948.54	E8	6,948.45	0.005	112.4	6,952.82	6,952.71	7.26
P-E13	36.0	Concrete	0.013	E7	6,948.70	E8	6,948.45	0.040	12.9	6,952.71	6,952.71	2.43
P-E14	42.0	Concrete	0.013	E8	6,947.95	E9	6,947.80	0.005	94.8	6,951.51	6,951.38	7.12
P-E15	42.0	Concrete	0.013	E9	6,947.70	O-E1	6,947.00	0.005	110.1	6,951.33	6,950.48	8.17
P-E16	18.0	Concrete	0.013	E10	6,944.01	O-E2	6,943.01	0.005	136.3	6,946.24	6,944.26	5.94

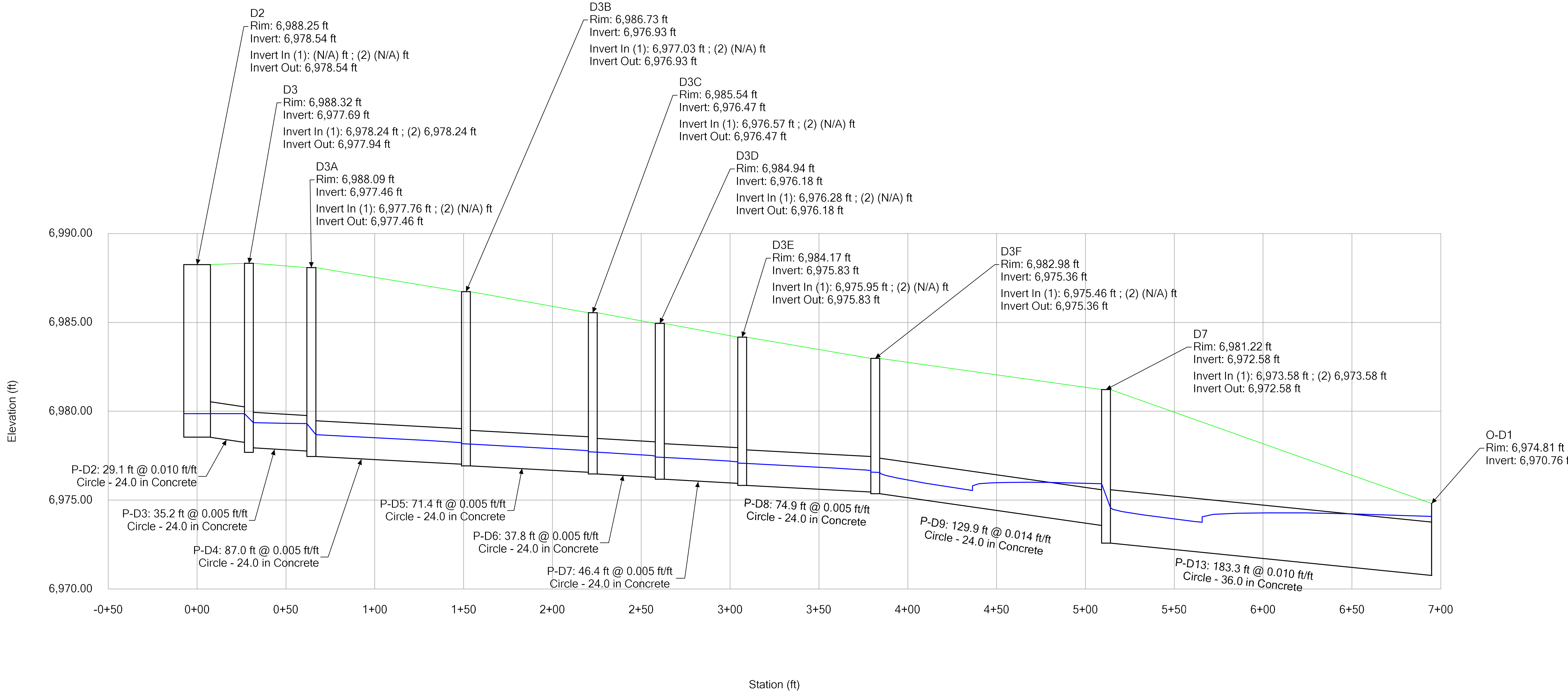
Grandview Reserve Filing No. 1
FlexTable: Manhole Table
Active Scenario: 100-YR Event

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert in 3) (ft)	Elevation (Invert Out) (ft)	Headloss Method	Headloss Coefficient (Standard)	Flow (Known) (cfs)
D1	6,988.83	(N/A)	(N/A)	(N/A)	6,978.34	Standard	0.050	7.40
D2	6,988.25	(N/A)	(N/A)	(N/A)	6,978.54	Standard	0.050	3.70
D3	6,988.32	6,978.24	6,978.24	(N/A)	6,977.94	Standard	1.520	11.10
D3A	6,988.09	6,977.76	(N/A)	(N/A)	6,977.46	Standard	1.320	11.10
D3B	6,986.73	6,977.03	(N/A)	(N/A)	6,976.93	Standard	0.050	11.10
D3C	6,985.54	6,976.57	(N/A)	(N/A)	6,976.47	Standard	0.050	11.10
D3D	6,984.94	6,976.28	(N/A)	(N/A)	6,976.18	Standard	0.050	11.10
D3E	6,984.17	6,975.95	(N/A)	(N/A)	6,975.83	Standard	0.050	11.10
D3F	6,982.98	6,975.46	(N/A)	(N/A)	6,975.36	Standard	0.050	11.10
D4	6,981.53	(N/A)	(N/A)	(N/A)	6,974.45	Standard	0.050	18.70
D5	6,981.53	(N/A)	(N/A)	(N/A)	6,974.45	Standard	0.050	7.90
D6	6,981.20	6,974.27	6,974.27	(N/A)	6,973.77	Standard	1.520	26.60
D7	6,981.22	6,973.58	6,973.58	(N/A)	6,972.58	Standard	1.520	37.70
D8	6,975.45	(N/A)	(N/A)	(N/A)	6,970.84	Standard	0.050	3.90
D9	6,973.25	(N/A)	(N/A)	(N/A)	6,968.47	Standard	0.050	5.60
E1	6,962.37	(N/A)	(N/A)	(N/A)	6,957.80	Standard	0.400	12.70
E2	6,962.72	(N/A)	(N/A)	(N/A)	6,957.80	Standard	0.050	12.50
E3	6,962.03	6,957.21	6,957.21	(N/A)	6,956.71	Standard	1.520	25.20
E3A	6,958.79	6,953.62	(N/A)	(N/A)	6,953.52	Standard	0.050	25.20
E3B	6,957.65	6,952.46	(N/A)	(N/A)	6,952.29	Standard	0.100	25.20
E3C	6,957.37	6,951.91	(N/A)	(N/A)	6,951.41	Standard	1.320	25.20
E4	6,956.87	(N/A)	(N/A)	(N/A)	6,951.63	Standard	0.050	14.60
E5	6,956.87	(N/A)	(N/A)	(N/A)	6,951.63	Standard	0.050	11.50
E6	6,956.54	6,950.58	6,951.48	6,951.48	6,950.48	Standard	1.520	51.30
E6A	6,955.51	6,949.46	(N/A)	(N/A)	6,949.36	Standard	0.050	51.30
E6B	6,954.76	6,949.09	(N/A)	(N/A)	6,948.99	Standard	0.050	51.30
E6C	6,954.30	6,948.74	(N/A)	(N/A)	6,948.54	Standard	0.050	51.30
E7	6,954.65	(N/A)	(N/A)	(N/A)	6,948.70	Standard	0.050	17.20
E8	6,954.29	6,948.45	6,948.45	(N/A)	6,947.95	Standard	1.520	68.50
E9	6,954.65	6,947.80	(N/A)	(N/A)	6,947.70	Standard	0.050	78.60
E10	6,949.01	(N/A)	(N/A)	(N/A)	6,944.01	Standard	0.050	10.50

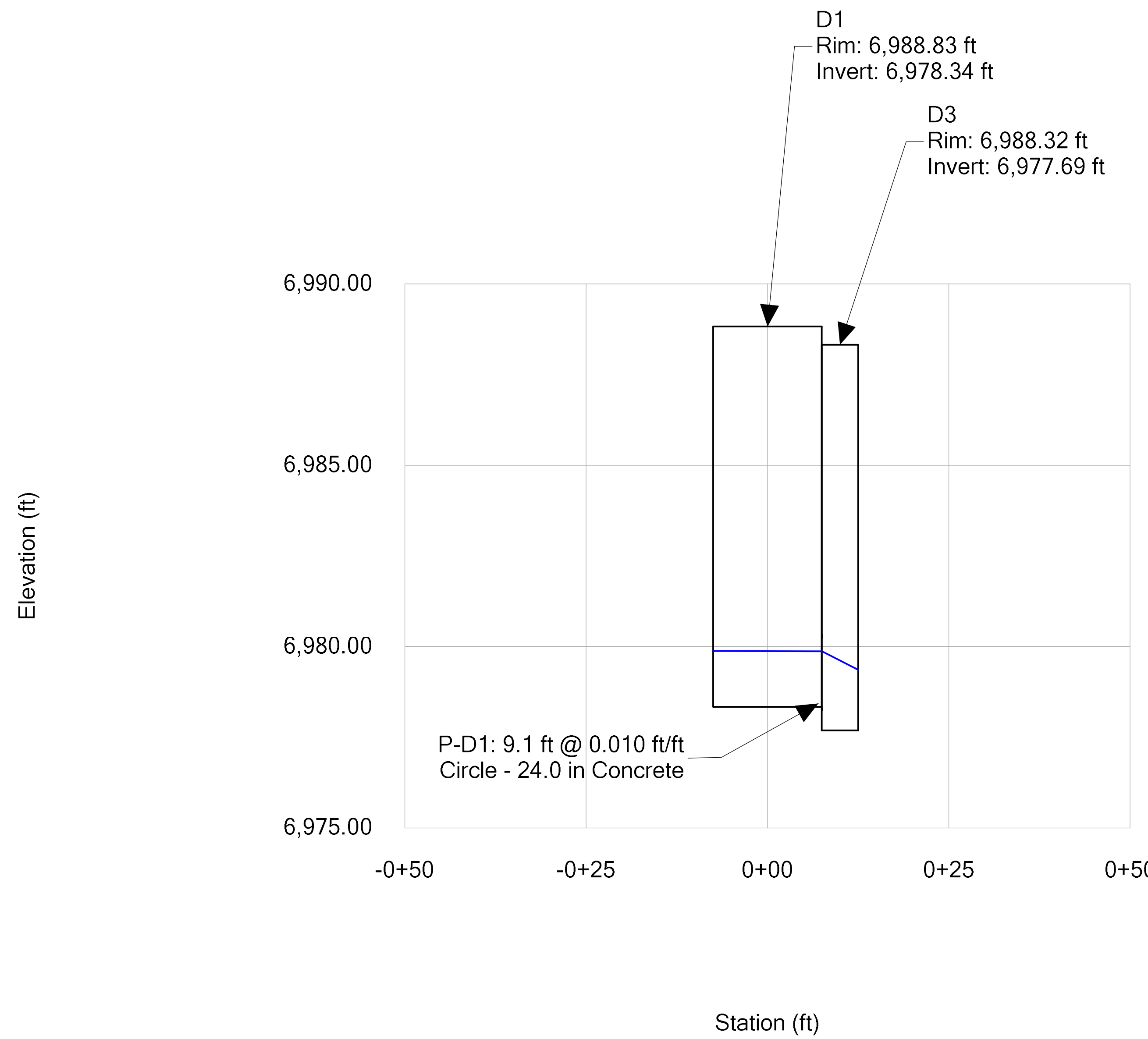
Grandview Reserve Filing No. 1
FlexTable: Outfall Table
Active Scenario: 100-YR Event

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
O-D3	6,970.21	6,968.00	Free Outfall		6,968.89	5.60
O-E2	6,945.22	6,943.01	Free Outfall		6,944.26	10.50
O-D1	6,974.81	6,970.76	User Defined Tailwater	6,974.08	6,974.08	37.70
O-D2	6,974.50	6,970.00	User Defined Tailwater	6,974.08	6,974.08	3.90
O-E1	6,951.34	6,946.25	User Defined Tailwater	6,950.48	6,950.48	78.60

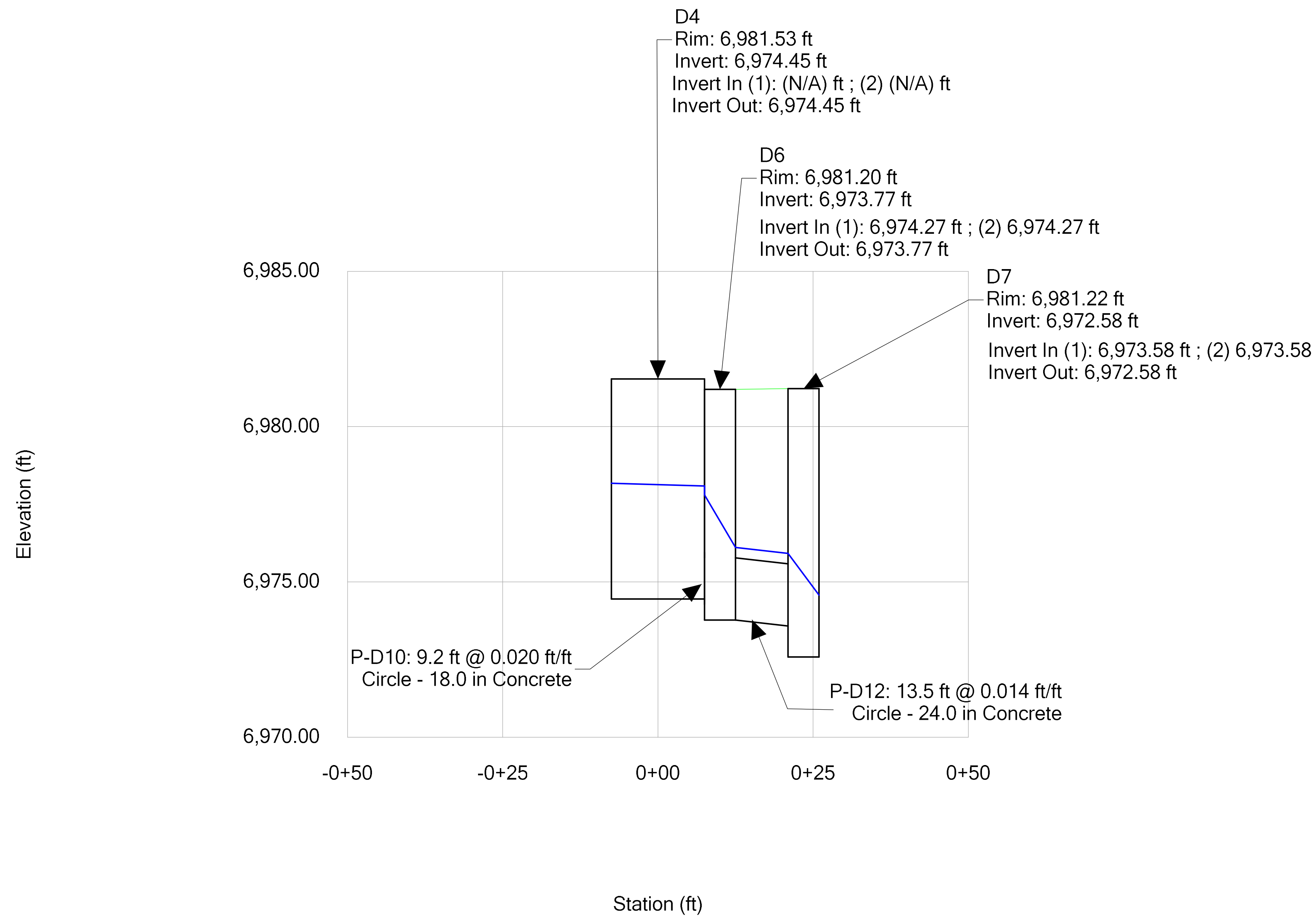
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D2 to O-1 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event



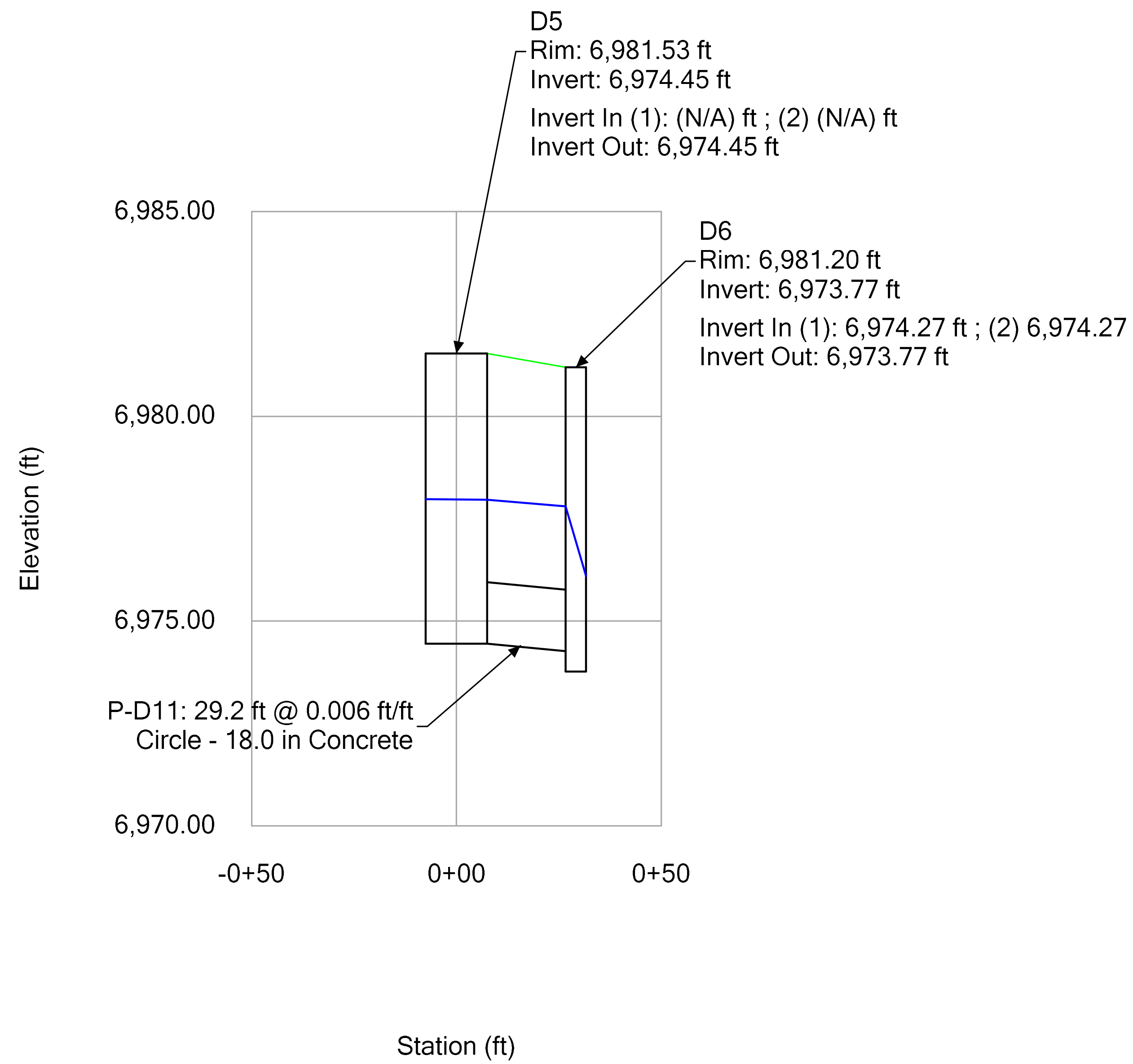
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D1 to D3 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D4 to D7 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D5 to D6 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event

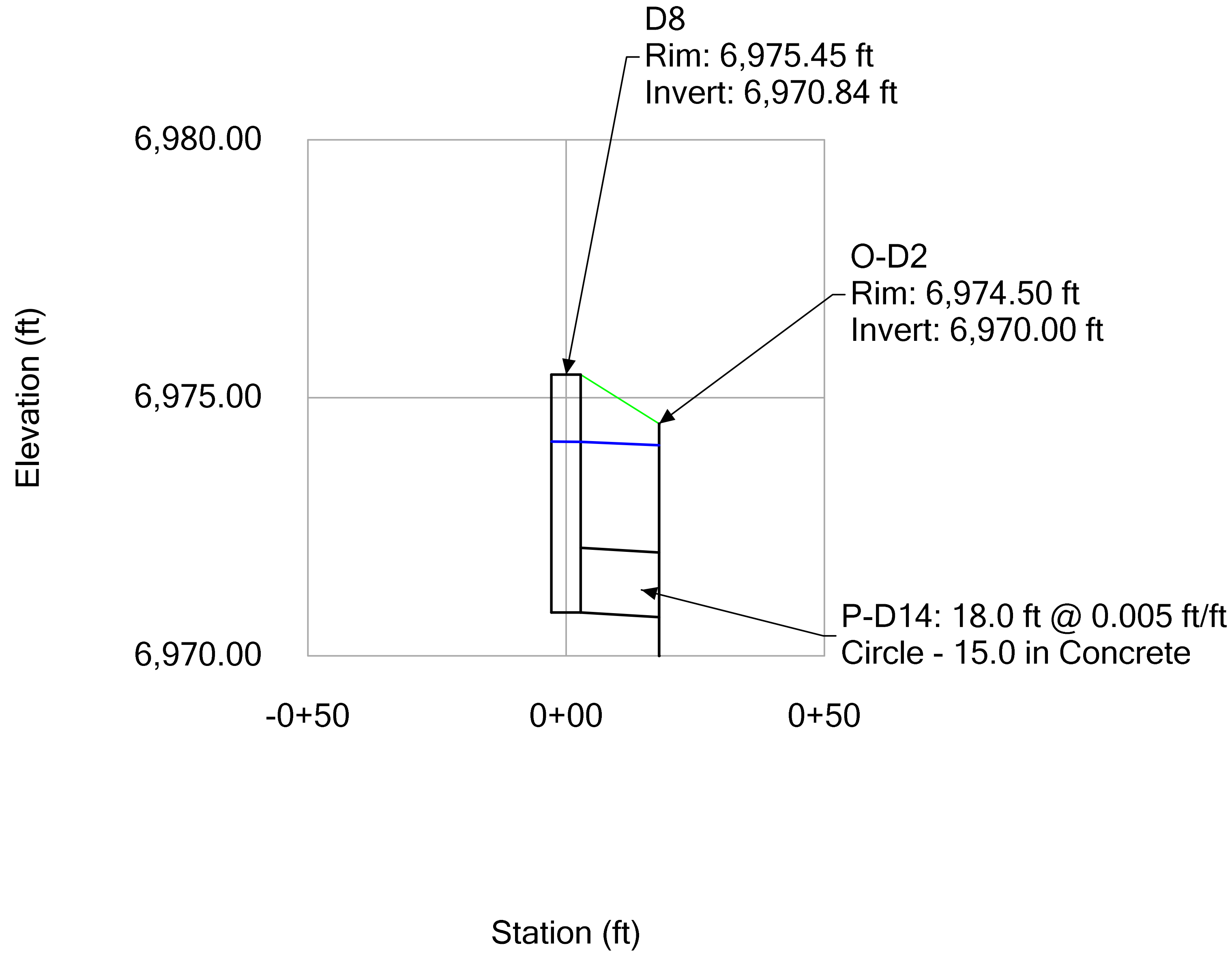


Grandview Reserve Filing No. 1

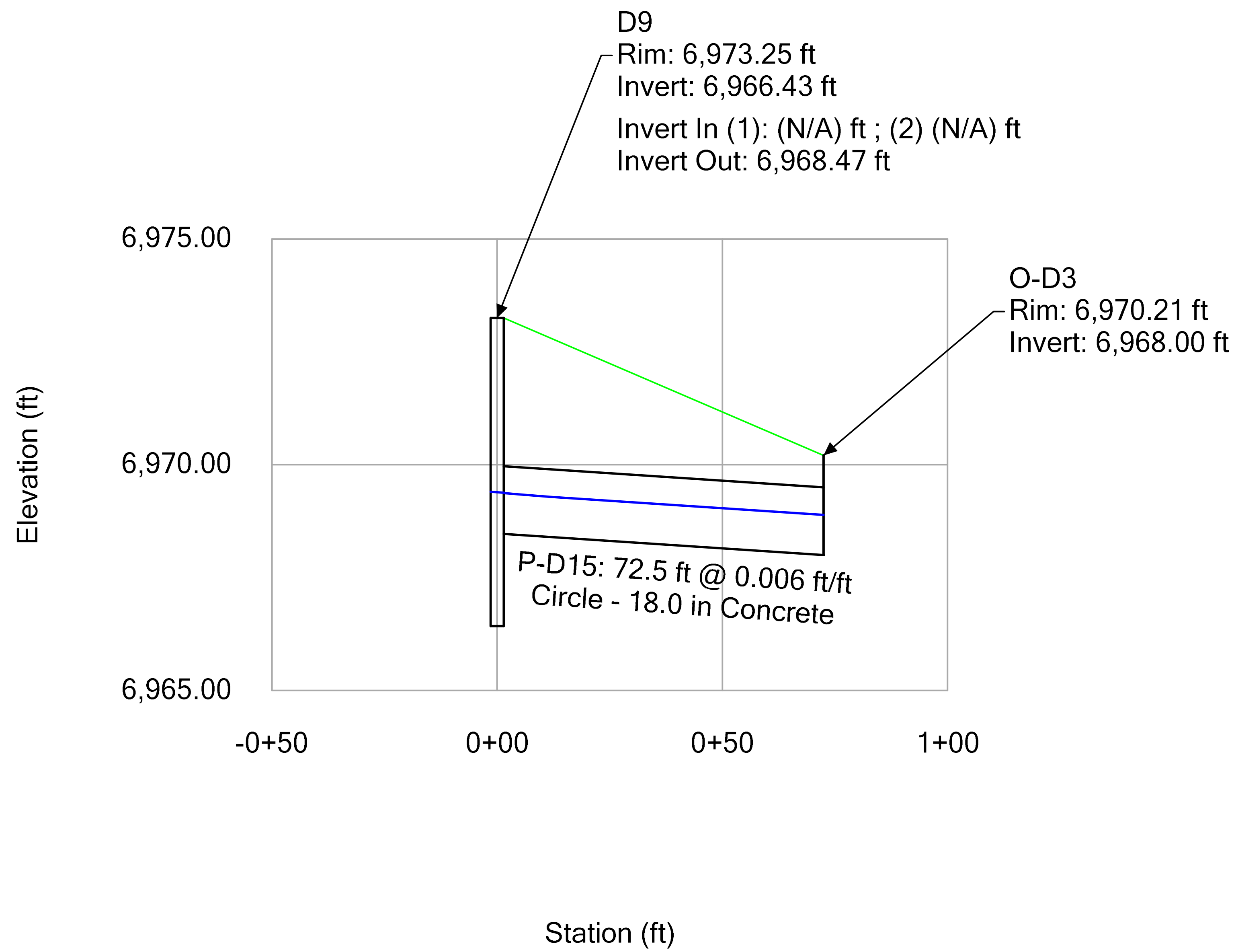
Profile Report

Engineering Profile - D8 to O-D2 (HRG02_FDR Storm Analysis.stsw)

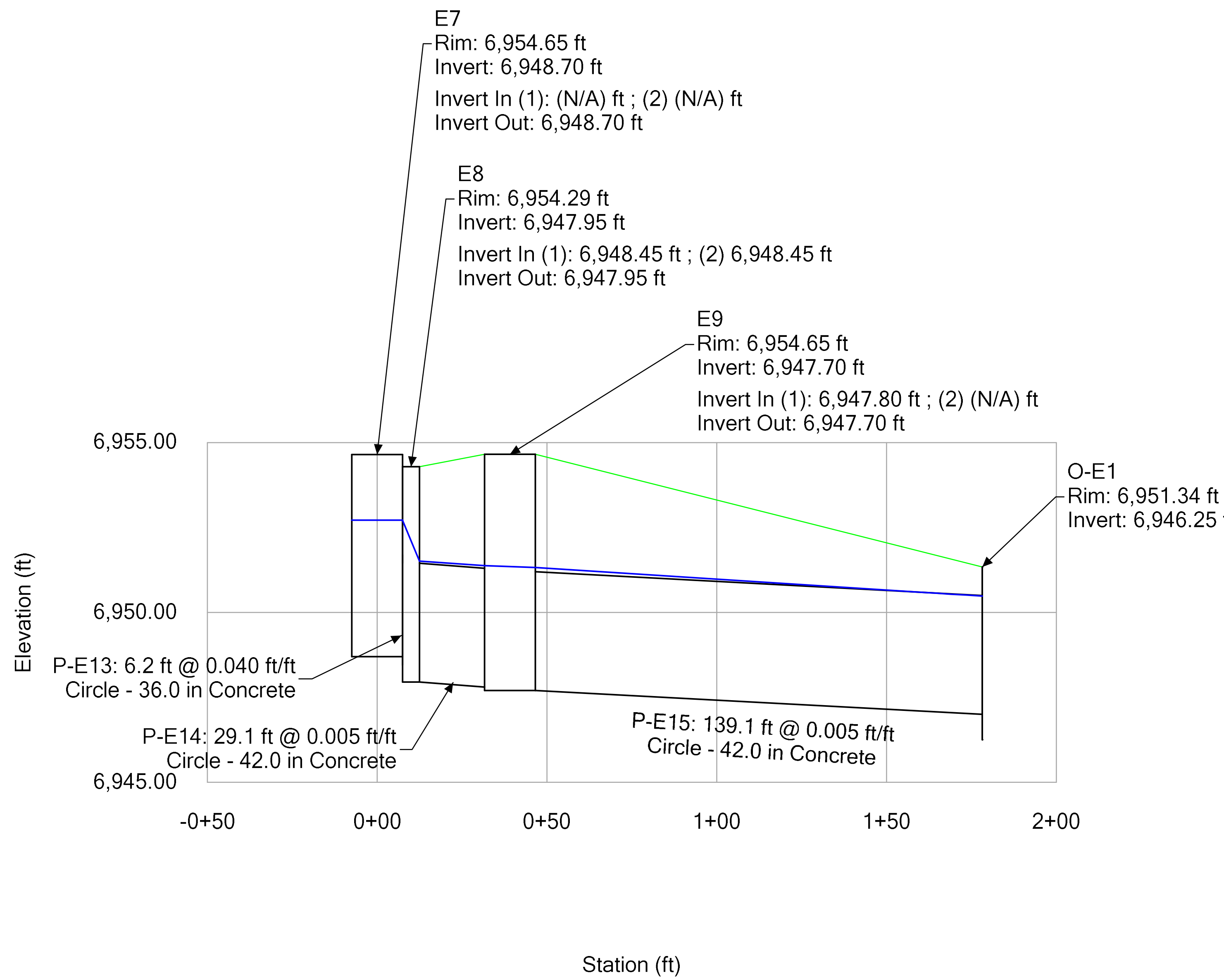
Active Scenario: 100-YR Event



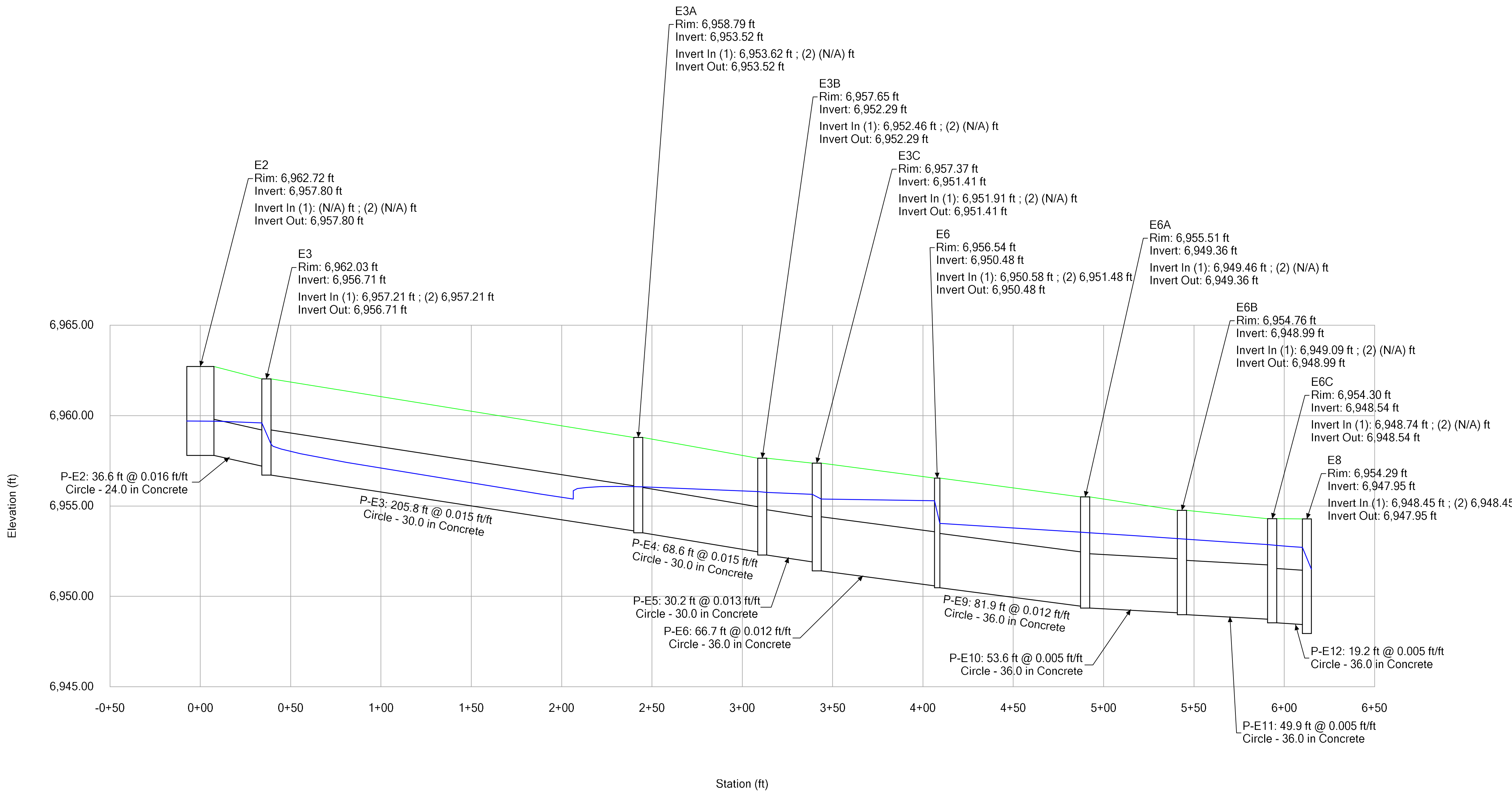
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - D9 to O-D3 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event



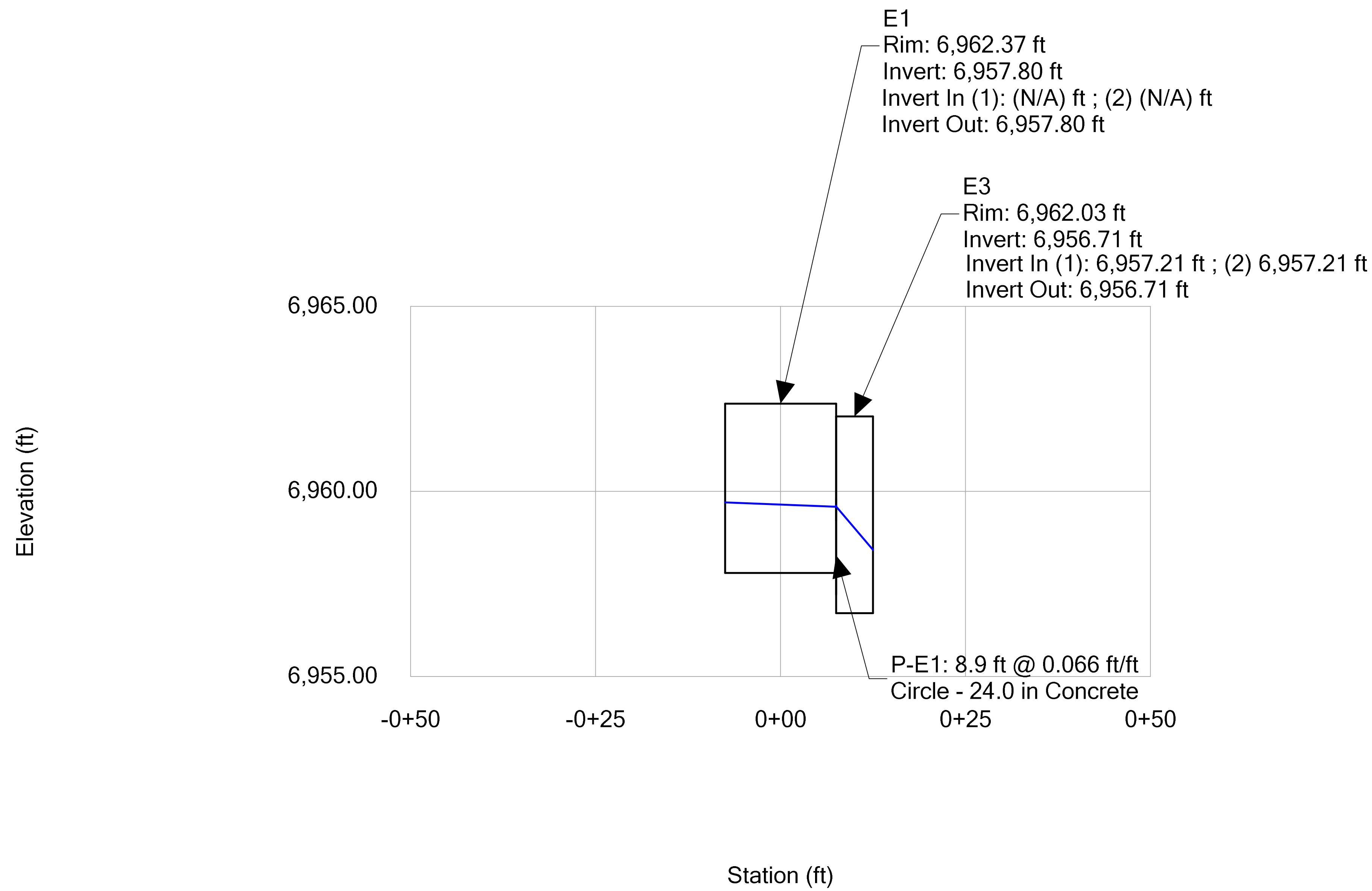
Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E7 to O-E1 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E2 to E8 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event



Grandview Reserve Filing No. 1
Profile Report
Engineering Profile - E1 to E3 (HRG02_FDR Storm Analysis.stsw)
Active Scenario: 100-YR Event

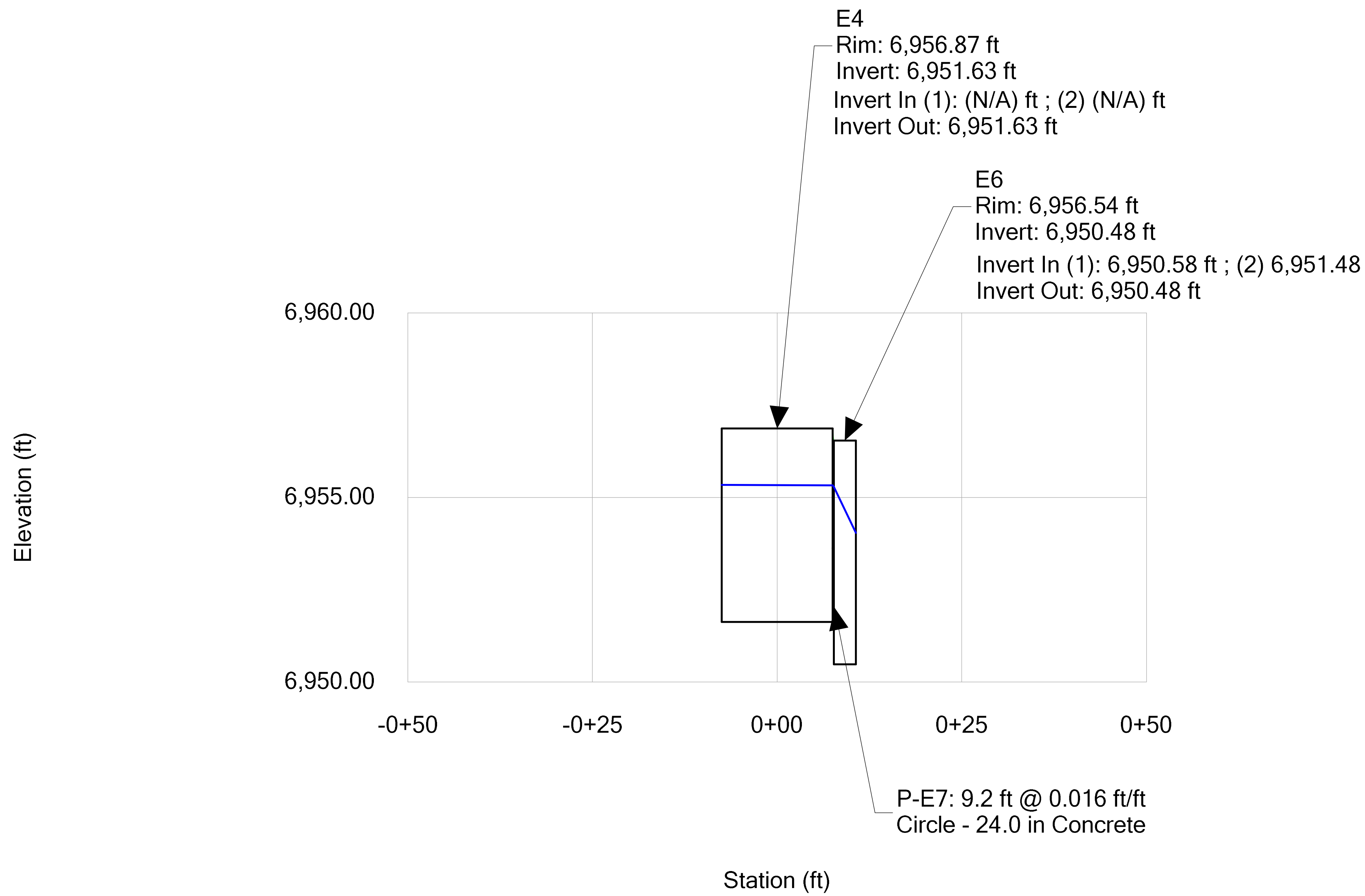


Grandview Reserve Filing No. 1

Profile Report

Engineering Profile - E4 to E6 (HRG02_FDR Storm Analysis.stsw)

Active Scenario: 100-YR Event

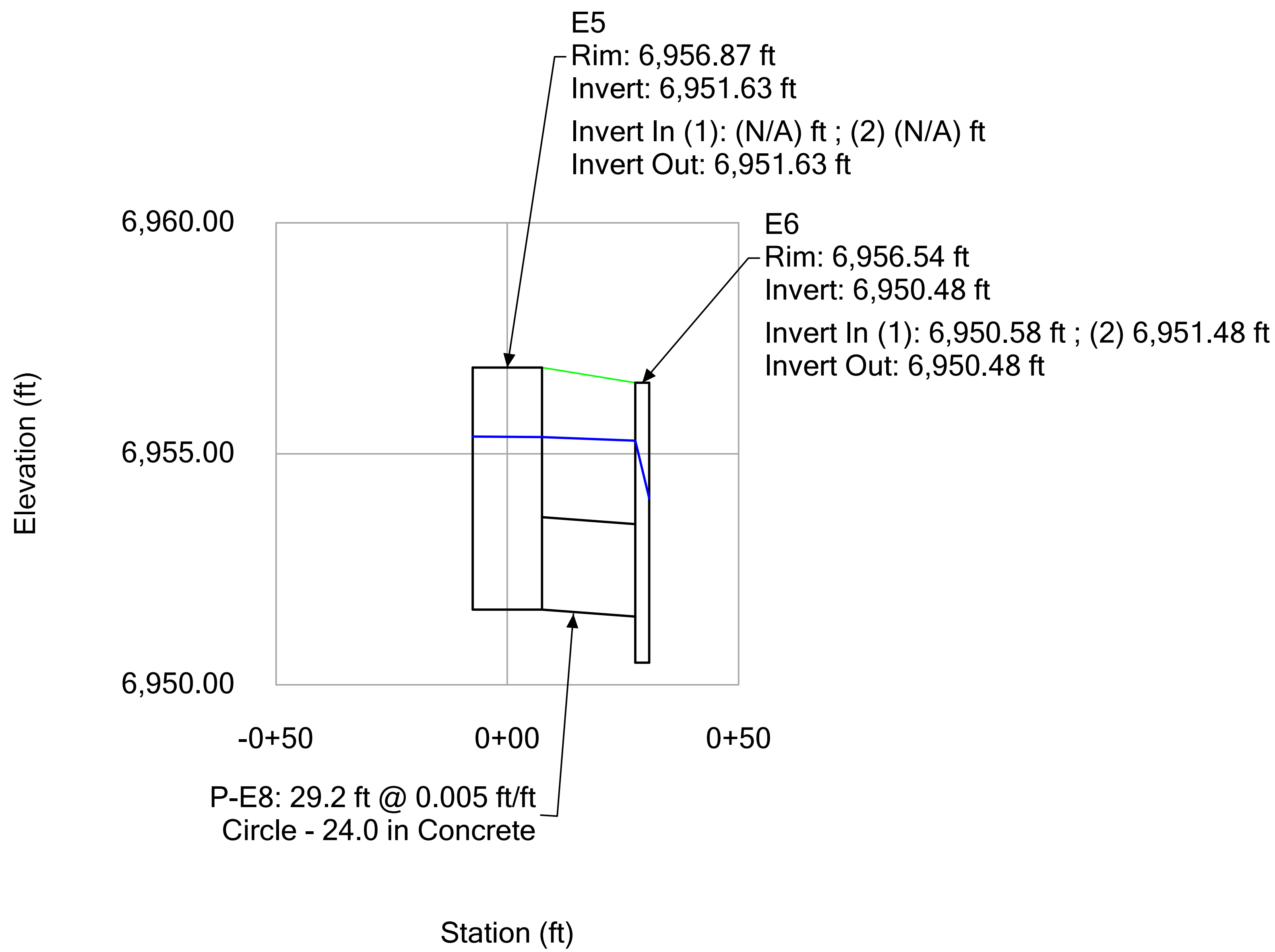


Grandview Reserve Filing No. 1

Profile Report

Engineering Profile - E5 to E6 (HRG02_FDR Storm Analysis.stsw)

Active Scenario: 100-YR Event

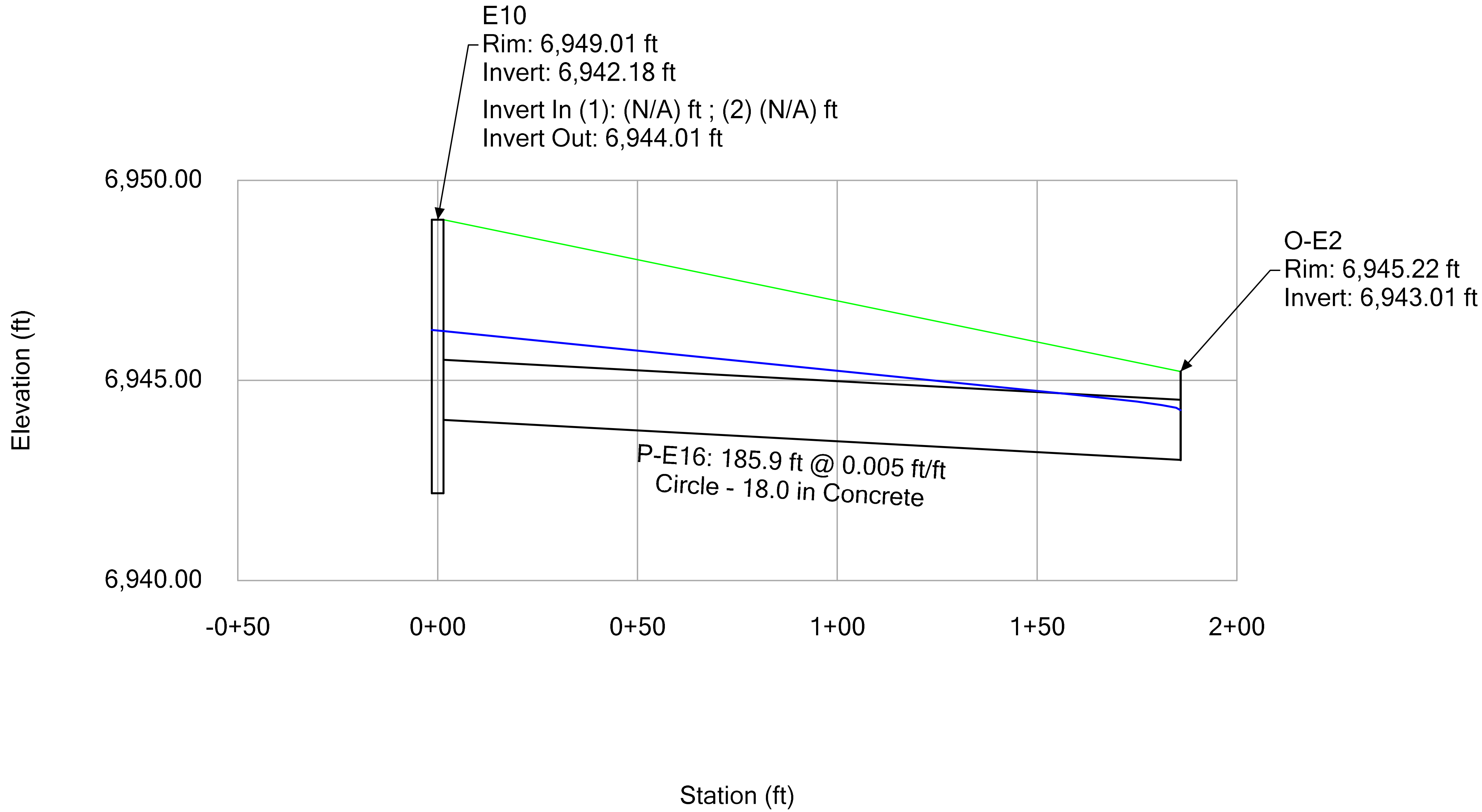


Grandview Reserve Filing No. 1

Profile Report

Engineering Profile - E10 to O-E2 (HRG02_FDR Storm Analysis.stsw)

Active Scenario: 100-YR Event



APPENDIX E

Water Quality Computations

Detention Pond Tributary Areas

Subdivision:	Grandview Reserve	**Project Name:**	Grandview Reserve
Location:	CO, El Paso County	**Project No.:**	HRG01
		Calculated By:	TJE
		Checked By:	BAS
		Date:	10/6/22

Pond D

Basin	Area	% Imp
D-1	3.48	65
D-2	0.82	65
D-3	3.67	65
D-4	1.82	65
D-5	1.45	37.7
D-7b	0.96	59.6
Total	**12.20**	**61.3**

Pond E

Basin	Area	% Imp
E-1	4.91	47.1
E-2	4.06	65
E-3a	2.75	65
E-3b	2.17	65
E-4a	4.68	65
E-4b	1.60	65
E-5	1.13	2
Total	**21.30**	**57.5**

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

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

Designer: TJE
Company: Galloway & Co.
Date: September 30, 2022
Project: Grandview Reserve
Location: Pond D

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	D-1	D-2	D-3	D-4	D-5	D-7b								
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam								
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	3.480	0.820	3.670	1.820	1.450	0.960								
Directly Connected Impervious Area (DCIA, acres)	2.262	0.533	2.386	1.183	0.547	0.572								
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000								
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000								
Separate Pervious Area (SPA, acres)	1.218	0.287	1.285	0.637	0.903	0.388								
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C								

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	3.480	0.820	3.670	1.820	1.450	0.960								
Directly Connected Impervious Area (DCIA, %)	65.0%	65.0%	65.0%	65.0%	37.7%	59.6%								
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%								
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%								
Separate Pervious Area (SPA, %)	35.0%	35.0%	35.0%	35.0%	62.3%	40.4%								
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000	0.000								
I_a Check	1.000	1.000	1.000	1.000	1.000	1.000								
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7								
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5								
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3								
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	1.00								
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00								
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00								
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	65.0%	65.0%	65.0%	65.0%	37.7%	59.6%								
Effective Imperviousness for WQCV Event:	65.0%	65.0%	65.0%	65.0%	37.7%	59.6%								
Effective Imperviousness for 5-Year Event:	65.0%	65.0%	65.0%	65.0%	37.7%	59.6%								
Effective Imperviousness for 100-Year Event:	65.0%	65.0%	65.0%	65.0%	37.7%	59.6%								
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

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

Total Site Imperviousness:	**61.3%**
Total Site Effective Imperviousness for WQCV Event:	**61.3%**
Total Site Effective Imperviousness for 5-Year Event:	**61.3%**
Total Site Effective Imperviousness for 100-Year Event:	**61.3%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

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

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

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

Designer: TJE
Company: Galloway & Co.
Date: September 30, 2022
Project: Grandview Reserve
Location: Pond E

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

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**E-1**	**E-2**	**E-3**	**E-4**	**E-5**									
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam									
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	5.200	5.230	3.460	6.280	1.130									
Directly Connected Impervious Area (DCIA, acres)	3.380	3.400	2.249	4.082	0.023									
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000									
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000									
Separate Pervious Area (SPA, acres)	1.820	1.831	1.211	2.198	1.107									
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C									

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	5.200	5.230	3.460	6.280	1.130									
Directly Connected Impervious Area (DCIA, %)	65.0%	65.0%	65.0%	65.0%	2.0%									
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%									
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%									
Separate Pervious Area (SPA, %)	35.0%	35.0%	35.0%	35.0%	98.0%									
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000									
I_a Check	1.000	1.000	1.000	1.000	1.000									
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7									
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5									
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3									
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00									
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00									
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00									
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	65.0%	65.0%	65.0%	65.0%	2.0%									
Effective Imperviousness for WQCV Event:	65.0%	65.0%	65.0%	65.0%	2.0%									
Effective Imperviousness for 5-Year Event:	65.0%	65.0%	65.0%	65.0%	2.0%									
Effective Imperviousness for 100-Year Event:	65.0%	65.0%	65.0%	65.0%	2.0%									
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	-354.7%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**61.7%**
Total Site Effective Imperviousness for WQCV Event:	**61.7%**
Total Site Effective Imperviousness for 5-Year Event:	**61.7%**
Total Site Effective Imperviousness for 100-Year Event:	**61.7%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

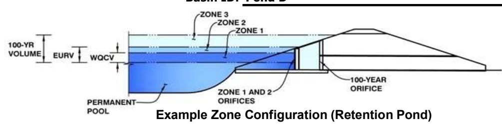
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Update to newest version of spreadsheet

Project: Grandview Reserve Filing No. 1

Basin ID: Pond D



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	12.20	acres		
Watershed Length =	1,200	ft		
Watershed Length to Centroid =	600	ft		
Watershed Slope =	0.020	ft/ft		
Watershed Imperviousness =	61.30%	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) =	0.245	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.913	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.669	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.880	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.049	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.277	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.502	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.777	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.928	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.592	acre-feet		
Approximate 5-yr Detention Volume =	0.776	acre-feet		
Approximate 10-yr Detention Volume =	0.938	acre-feet		
Approximate 25-yr Detention Volume =	1.132	acre-feet		
Approximate 50-yr Detention Volume =	1.251	acre-feet		
Approximate 100-yr Detention Volume =	1.379	acre-feet		

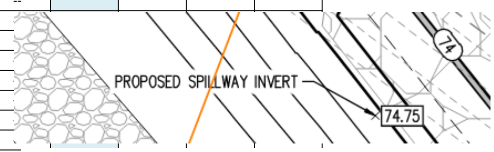
Define Zones and Basin Geometry

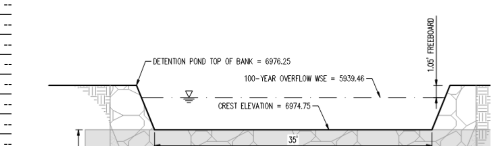
Zone 1 Volume (WQCV) =	0.245	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.668	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.466	acre-feet
Total Detention Basin Volume =	1.379	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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)
6968.75	**Top of Micropool**	--	0.00	--	--	--	72	0.002		
6969.25	**Trickle Chan. Inv.**	--	0.50	--	--	--	72	0.002	36	0.001
	6970	--	1.25	--	--	--	1,150	0.026	494	0.011
	6971	--	2.25	--	--	--	13,763	0.316	7,951	0.183
	6972	--	3.25	--	--	--	15,727	0.361	22,696	0.521
	6973	--	4.25	--	--	--	17,699	0.406	39,409	0.905
	6974	--	5.25	--	--	--	19,766	0.454	58,141	1.335
	6975	--	6.25	--	--	--	22,002	0.505	79,025	1.814
6975.25	**Spillway Invert**	--	6.50	--	--	--	22,565	0.518	84,596	1.942
	6976	--	7.25	--	--	--	24,290	0.558	102,167	2.345
6976.75	**Top of Pond**	--	8.00	--	--	--	26,073	0.599	121,053	2.779
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				

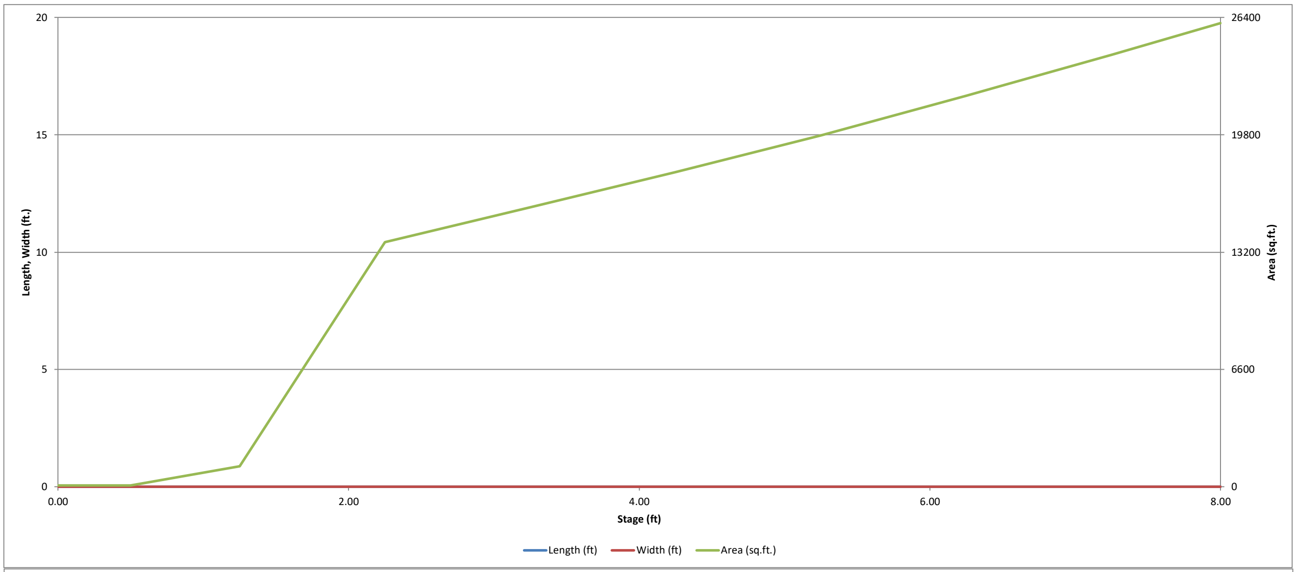
Update plans or worksheet to match.

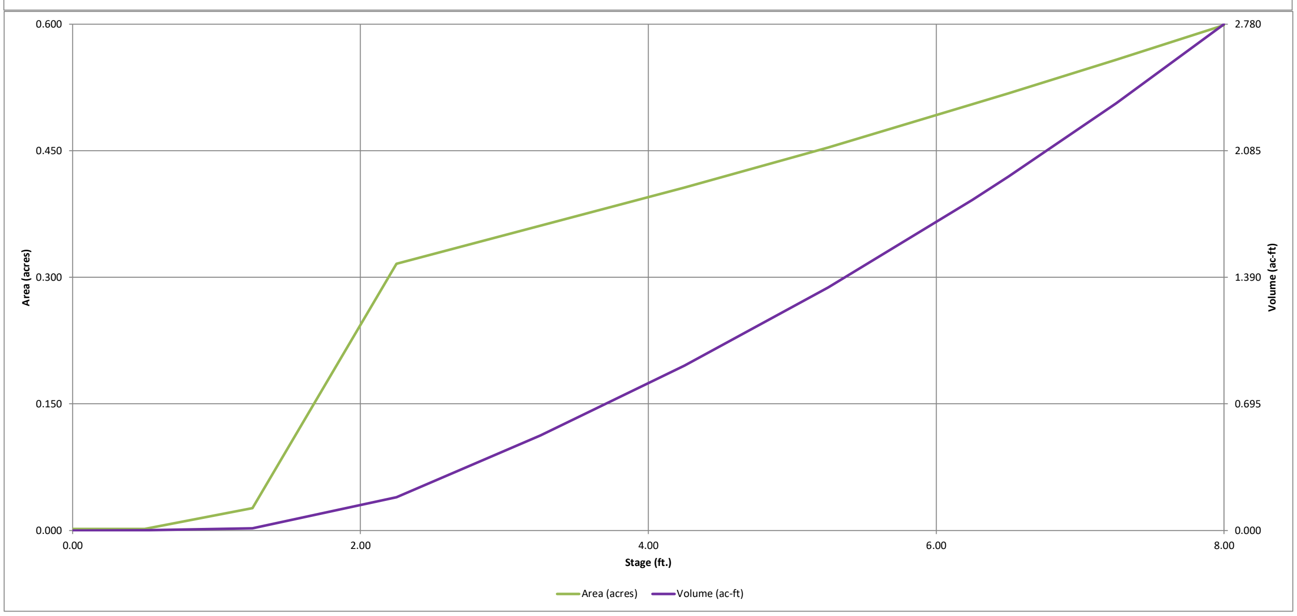




DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

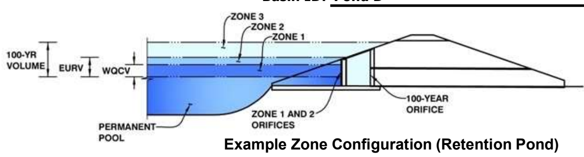




DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Grandview Reserve Filing No. 1
Basin ID: Pond D



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.45	0.245	Orifice Plate
Zone 2 (EURV)	4.28	0.668	Circular Orifice
Zone 3 (100-year)	5.35	0.466	Weir&Pipe (Restrict)
Total (all zones)		1.379	

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)

Calculated Parameters for Plate

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	6.181E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.45	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 =	0.89	sq. inches (diameter = 1-1/16 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)	0.89	0.89	0.89					

	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)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.03	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.28	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.10	N/A	feet
Vertical Orifice Diameter =	2.34	N/A	inches				

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.23	N/A	feet
Overflow Weir Front Edge Length =	2.92	N/A	feet	Overflow Weir Slope Length =	3.01	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	11.86	N/A	
Horiz. Length of Weir Sides =	2.92	N/A	feet	Overflow Grate Open Area w/o Debris =	6.12	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	6.12	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.52	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inche		0.29	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.00		inche		1.23	N/A	radians

This flow should be closer to rational flows calculated on hydrology spreadsheets (DP 7 & DP 8). Try adjusting watershed length to centroid, watershed length or slope.

User Input: Emergency Spillway (Rectangular or Trapezoidal)

...lated Parameters for Spillway

Spillway Invert Stage=	6.50	6.00	ft (relative to basin botto		0.32	feet
Spillway Crest Length =	50.00	35	feet		7.82	feet
Spillway End Slopes =	4.00		H:V	Basin Area at Top of Freeboard =	0.59	acres
Freeboard above Max Water Surface =	1.00	1.05	feet	Basin Volume at Top of Freeboard =	2.67	acre-ft

Per GEC Plan sheet G7.4. Revise to remove discrepancies.

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) =	0.245	0.913	0.669	0.880	1.049	1.277	1.502	1.777	2.928
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.669	0.880	1.049	1.277	1.502	1.777	2.928
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.2	2.0	4.0	6.5	16.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.16	0.33	0.53	1.38
Peak Inflow Q (cfs) =	N/A	N/A	9.9	13.0	15.3	19.8	23.8	28.9	47.7
Peak Outflow Q (cfs) =	0.1	0.3	0.3	0.3	0.4	1.7	3.4	5.7	17.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.2	1.7	0.8	0.9	0.9	1.1
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	0.9	1.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	61	68	72	74	73	71	66
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	65	72	77	79	79	79	77
Maximum Ponding Depth (ft) =	2.45	4.28	3.53	4.06	4.46	4.83	5.03	5.33	6.68
Area at Maximum Ponding Depth (acres) =	0.32	0.41	0.37	0.40	0.42	0.43	0.44	0.46	0.53
Maximum Volume Stored (acre-ft) =	0.247	0.917	0.624	0.824	0.987	1.144	1.232	1.367	2.031

35ft per detail on G6.4 but actually 50ft on plan view on G7.1.

Verify - ratio should be around 1

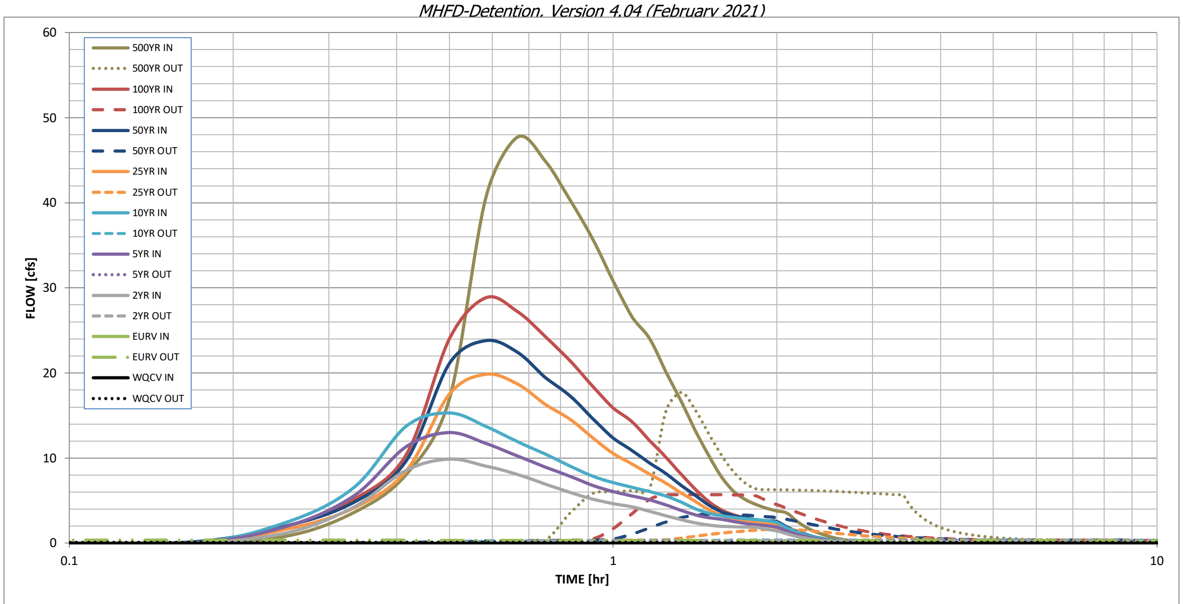
100-yr volume provided does not meet 100-yr required volume (1.379 ac-ft)

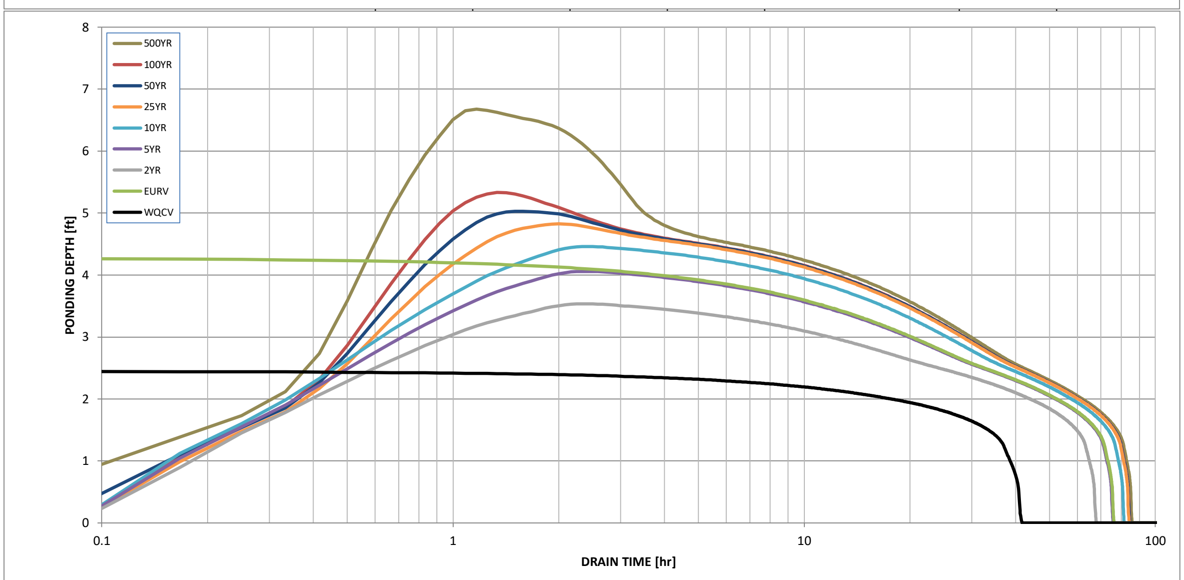
Revise inputs to get values or explain in report text the suitability of the outfall to handle the increased flowrates. See next page for more.

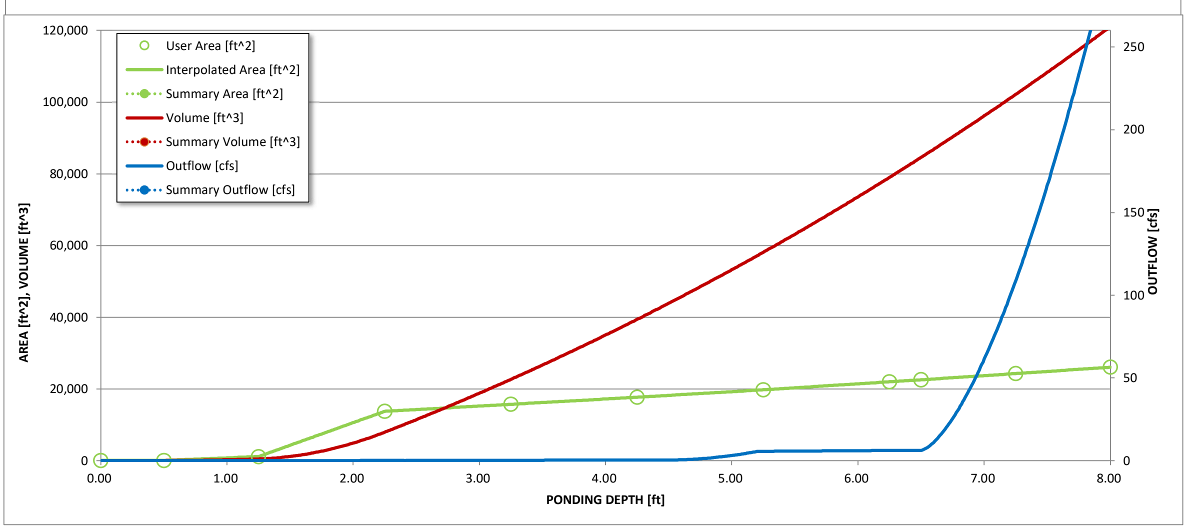
Per ECM Chap 3.2.8.B, “The proposed project or developed land use shall not change historical runoff values, cause downstream damage, or adversely impact adjacent properties.” Increases from the historical flowrates are allowable (with or without full spectrum detention) if it is shown (via text and/or calcs) that the flow increase can be accommodated downstream (i.e., show that there is a suitable outfall, per ECM Chap 3.2.4). If applicable, reference the downstream facilities in a DBPS or MDDP.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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	0.14	0.01	0.81
	0:15:00	0.00	0.00	1.20	1.95	2.42	1.63	2.03	1.99	3.60
	0:20:00	0.00	0.00	4.25	5.56	6.54	4.13	4.81	5.15	8.07
	0:25:00	0.00	0.00	8.58	11.36	13.74	8.50	9.70	10.42	16.97
	0:30:00	0.00	0.00	9.88	13.00	15.30	17.52	21.13	24.04	40.61
	0:35:00	0.00	0.00	9.07	11.74	13.71	19.83	23.79	28.85	47.71
	0:40:00	0.00	0.00	8.09	10.26	11.94	18.72	22.43	27.22	44.90
	0:45:00	0.00	0.00	6.95	8.95	10.47	16.33	19.49	24.30	40.31
	0:50:00	0.00	0.00	5.97	7.85	9.06	14.55	17.31	21.41	35.79
	0:55:00	0.00	0.00	5.19	6.79	7.87	12.39	14.66	18.45	30.83
	1:00:00	0.00	0.00	4.67	6.07	7.12	10.55	12.37	15.91	26.62
	1:05:00	0.00	0.00	4.29	5.55	6.57	9.31	10.88	14.28	24.06
	1:10:00	0.00	0.00	3.74	5.09	6.06	8.12	9.44	12.07	20.15
	1:15:00	0.00	0.00	3.23	4.50	5.54	7.06	8.18	10.11	16.70
	1:20:00	0.00	0.00	2.77	3.86	4.83	5.91	6.81	8.10	13.24
	1:25:00	0.00	0.00	2.39	3.34	4.06	4.90	5.62	6.36	10.25
	1:30:00	0.00	0.00	2.13	2.99	3.52	3.93	4.47	4.89	7.74
	1:35:00	0.00	0.00	2.00	2.82	3.22	3.26	3.68	3.89	6.09
	1:40:00	0.00	0.00	1.93	2.54	3.02	2.87	3.23	3.33	5.15
	1:45:00	0.00	0.00	1.89	2.32	2.88	2.62	2.95	2.97	4.52
	1:50:00	0.00	0.00	1.86	2.16	2.78	2.46	2.76	2.73	4.10
	1:55:00	0.00	0.00	1.64	2.04	2.65	2.34	2.64	2.56	3.79
	2:00:00	0.00	0.00	1.45	1.89	2.42	2.27	2.55	2.43	3.58
	2:05:00	0.00	0.00	1.11	1.44	1.84	1.73	1.95	1.84	2.68
	2:10:00	0.00	0.00	0.83	1.08	1.37	1.28	1.44	1.35	1.97
	2:15:00	0.00	0.00	0.62	0.80	1.01	0.95	1.07	1.00	1.46
	2:20:00	0.00	0.00	0.46	0.59	0.74	0.70	0.79	0.75	1.08
	2:25:00	0.00	0.00	0.33	0.42	0.54	0.51	0.57	0.54	0.78
	2:30:00	0.00	0.00	0.24	0.30	0.39	0.36	0.41	0.39	0.56
	2:35:00	0.00	0.00	0.17	0.21	0.28	0.26	0.29	0.28	0.41
	2:40:00	0.00	0.00	0.11	0.14	0.19	0.18	0.20	0.19	0.28
	2:45:00	0.00	0.00	0.06	0.09	0.12	0.12	0.13	0.12	0.17
	2:50:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.07	0.09
	2:55:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.04
	3:00:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

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'.

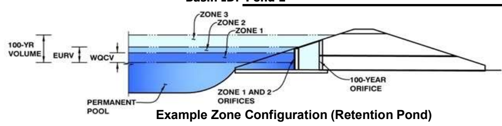
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Grandview Reserve Filing No. 1**

Basin ID: **Pond E**



Example Zone Configuration (Retention Pond)

% impervious does not match with value given on first sheet of Pond calculations

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	21.30	acres
Watershed Length =	1,800	ft
Watershed Length to Centroid =	900	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	61.70%	percent
Percentage Hydrologic Soil Group A =	90.0%	percent
Percentage Hydrologic Soil Group B =	10.0%	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.

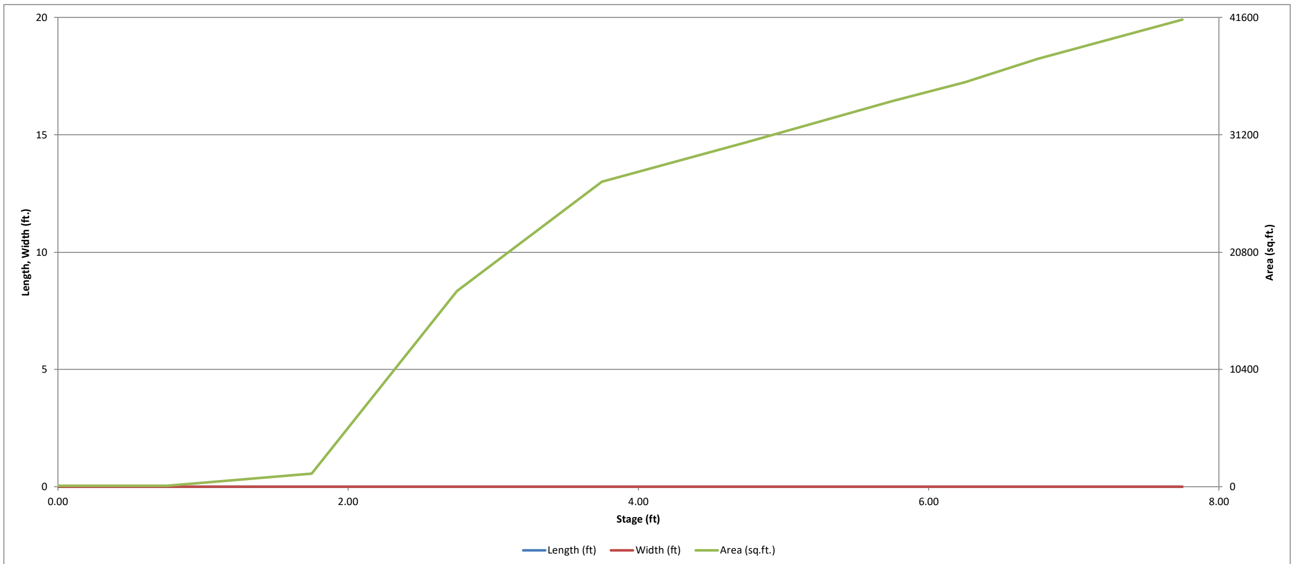
			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.430	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.589	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.205	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.581	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.882	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.340	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.743	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.251	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	5.323	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	1.049	acre-feet		
Approximate 5-yr Detention Volume =	1.378	acre-feet		
Approximate 10-yr Detention Volume =	1.676	acre-feet		
Approximate 25-yr Detention Volume =	1.999	acre-feet		
Approximate 50-yr Detention Volume =	2.195	acre-feet		
Approximate 100-yr Detention Volume =	2.415	acre-feet		

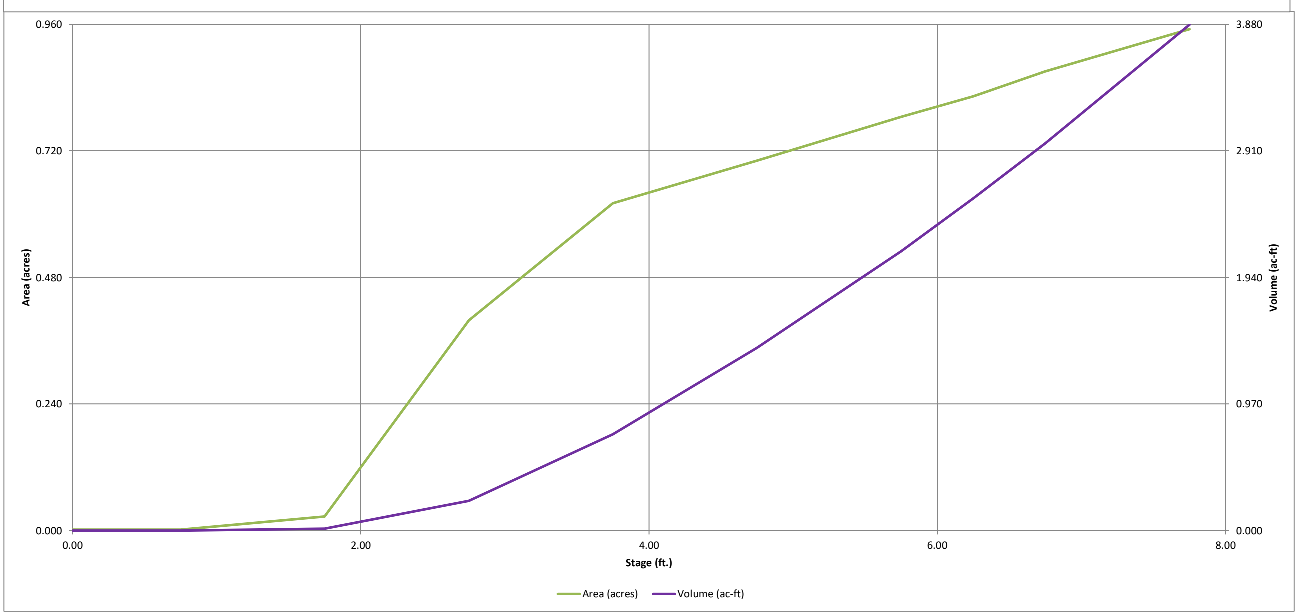
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.430	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.160	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.825	acre-feet
Total Detention Basin Volume =	2.415	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)
69					--	--	90	0.002		
					--	--	90	0.002	68	0.002
					--	--	1,166	0.027	695	0.016
					--	--	17,359	0.399	9,958	0.229
					--	--	27,043	0.621	32,159	0.738
					--	--	30,550	0.701	60,955	1.399
	6950	--	5.75	--	--	--	34,177	0.785	93,319	2.142
6950.50	**Spillway Invert**	--	6.25	--	--	--	35,863	0.823	110,829	2.544
	6951	--	6.75	--	--	--	37,928	0.871	129,277	2.968
6952.00	**Top of Pond**	--	7.75	--	--	--	41,408	0.951	168,945	3.878
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				
		--		--	--	--				

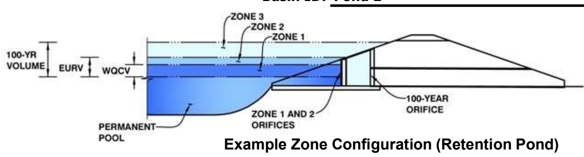

Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)


Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Grandview Reserve Filing No. 1
Basin ID: Pond E



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.20	0.430	Orifice Plate
Zone 2 (EURV)	5.02	1.160	Circular Orifice
Zone 3 (100-year)	6.10	0.825	Weir&Pipe (Restrict)
Total (all zones)		2.415	

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

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

Calculated Parameters for Underdrain

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

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.20	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	1.46	sq. inches (diameter = 1-3/8 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.014E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	3.00					
Orifice Area (sq. inches)	1.46	1.46	1.46					

	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	
Invert of Vertical Orifice =	3.20	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.02	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	3.20	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.06	N/A	ft^2
Vertical Orifice Centroid =	0.13	N/A	feet

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	
Overflow Weir Front Edge Height, Ho =	5.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.92	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	0%	N/A	%

Label on plans.

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H
Overflow Weir Slope Length
Grate Open Area / 100-yr Orifice Area
Overflow Grate Open Area w/o Debris
Overflow Grate Open Area w/ Debris

This flow should be closer to rational flo
calculated on hydrology spreadsheets (
7 & DP 8). Try adjusting watershed len
to centroid, watershed length or slope.

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	9.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.88	N/A	ft^2
Outlet Orifice Centroid =	0.43	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.57	N/A	radians

6' per plans.

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.25	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	60.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00 1.05	feet

Planview on sheet G6.1 shows 60' but the detail on G6.4 shows 70'. Verify dimension and update so all match.

Label on plans.

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.40	feet
Stage at Top of Freeboard =	7.65	feet
Basin Area at Top of Freeboard =	0.94	acres
Basin Volume at Top of Freeboard =	3.78	acre-ft

Routed Hydrograph Results

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

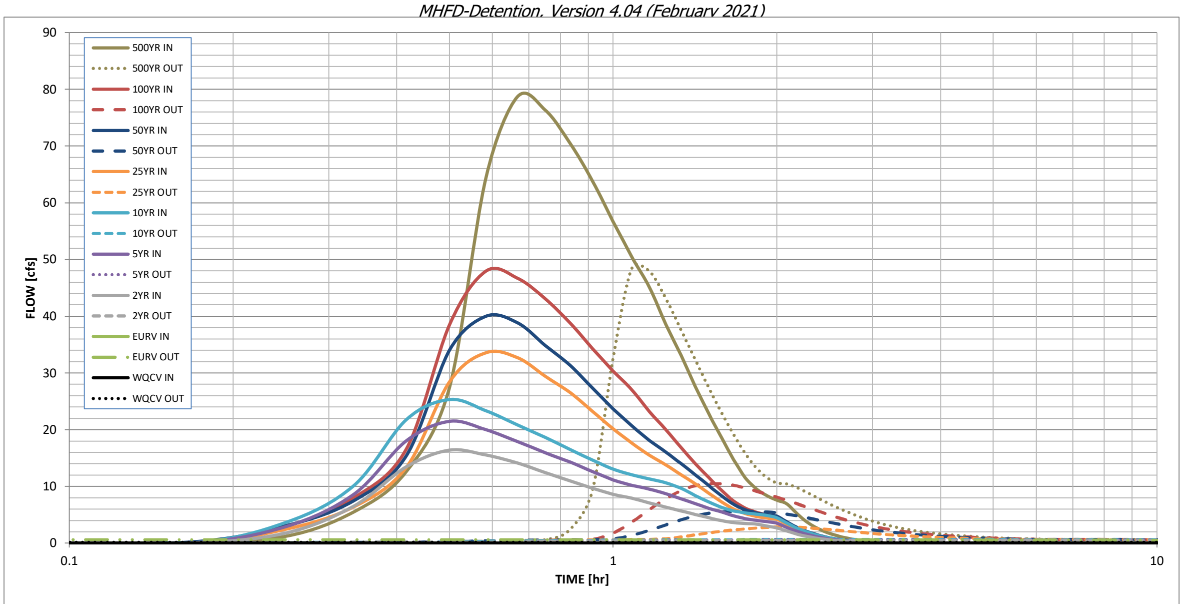
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.430	1.589	1.205	1.581	1.882	2.340	2.743	3.251	5.323
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.205	1.581	1.882	2.340	2.743	3.251	5.323
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	4.6	7.6	12.0	28.6
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	0.22	0.36	0.56	1.34
Peak Inflow Q (cfs) =	N/A	N/A	16.4	21.5	25.3	33.6	40.0	47.9	78.7
Peak Outflow Q (cfs) =	0.2	0.6	0.5	0.6	0.7	2.9	5.6	10.5	48.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.2	1.8	0.6	0.7	0.9	1.7
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.4	0.8	1.6	1.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	62	69	74	75	74	73	67
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	65	73	78	80	80	80	77
Maximum Ponding Depth (ft) =	3.20	5.02	4.35	4.87	5.27	5.69	5.93	6.23	6.60
Area at Maximum Ponding Depth (acres) =	0.50	0.72	0.67	0.71	0.74	0.78	0.80	0.82	0.86
Maximum Volume Stored (acre-ft) =	0.430	1.592	1.119	1.477	1.768	2.095	2.277	2.528	2.830

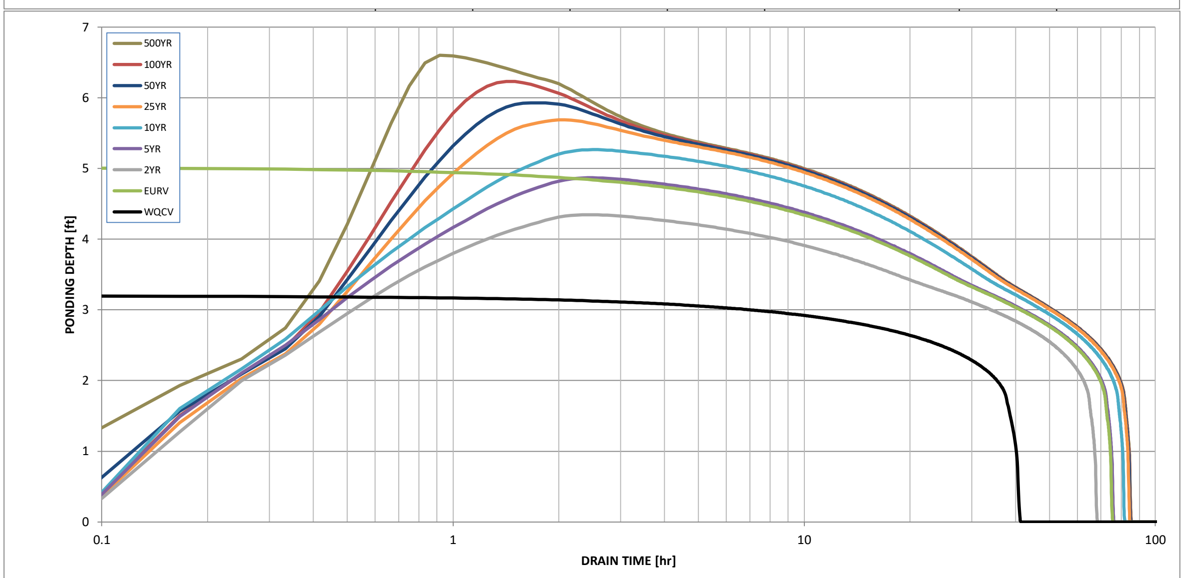
Verify - ratio should be around 1

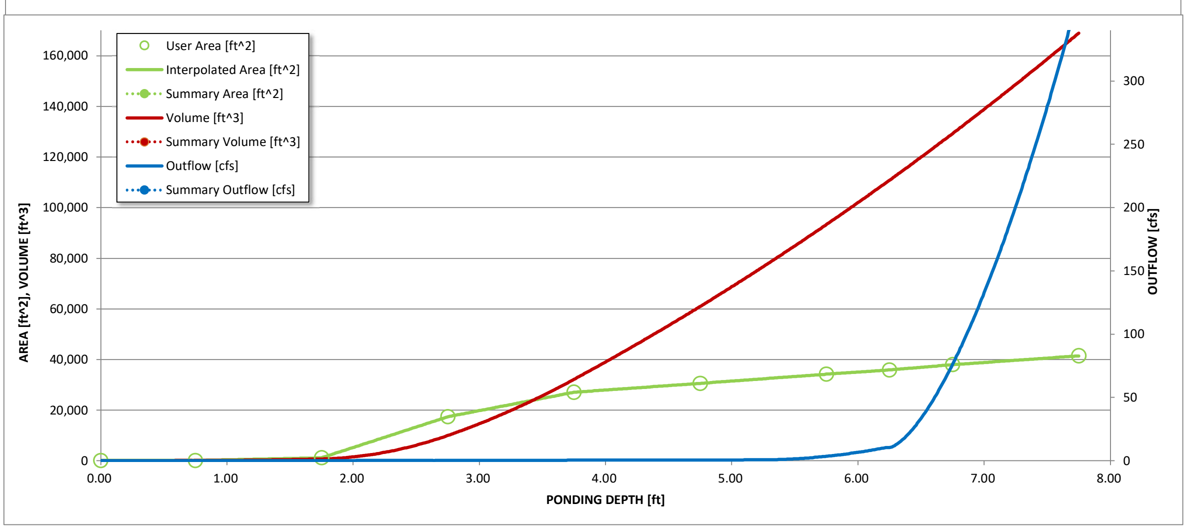
See comments on Pond D calc sheets for more.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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	0.20	0.02	1.21
	0:15:00	0.00	0.00	1.80	2.93	3.64	2.45	3.07	2.99	5.51
	0:20:00	0.00	0.00	6.53	8.61	10.15	6.42	7.49	8.01	12.62
	0:25:00	0.00	0.00	13.44	18.03	21.75	13.34	15.40	16.59	27.43
	0:30:00	0.00	0.00	16.39	21.49	25.32	28.44	34.00	38.44	64.40
	0:35:00	0.00	0.00	15.53	20.00	23.35	33.58	39.99	47.93	78.67
	0:40:00	0.00	0.00	14.13	17.90	20.85	32.71	38.87	46.73	76.33
	0:45:00	0.00	0.00	12.44	15.94	18.64	29.41	34.85	43.09	70.50
	0:50:00	0.00	0.00	10.96	14.29	16.52	26.54	31.33	38.80	63.82
	0:55:00	0.00	0.00	9.69	12.61	14.64	23.22	27.33	34.31	56.72
	1:00:00	0.00	0.00	8.63	11.17	13.06	20.17	23.70	30.35	50.41
	1:05:00	0.00	0.00	7.91	10.21	12.05	17.64	20.66	27.02	45.09
	1:10:00	0.00	0.00	7.10	9.53	11.33	15.50	18.11	23.17	38.58
	1:15:00	0.00	0.00	6.36	8.73	10.66	13.81	16.07	20.00	33.09
	1:20:00	0.00	0.00	5.69	7.82	9.67	12.08	14.00	16.86	27.65
	1:25:00	0.00	0.00	5.06	6.94	8.40	10.44	12.06	14.02	22.79
	1:30:00	0.00	0.00	4.46	6.15	7.24	8.79	10.10	11.52	18.53
	1:35:00	0.00	0.00	3.96	5.49	6.30	7.28	8.32	9.28	14.71
	1:40:00	0.00	0.00	3.63	4.80	5.69	6.02	6.83	7.40	11.54
	1:45:00	0.00	0.00	3.47	4.33	5.34	5.21	5.89	6.19	9.59
	1:50:00	0.00	0.00	3.38	4.02	5.11	4.72	5.33	5.47	8.38
	1:55:00	0.00	0.00	3.03	3.78	4.86	4.42	4.99	5.00	7.57
	2:00:00	0.00	0.00	2.70	3.52	4.48	4.21	4.75	4.67	6.98
	2:05:00	0.00	0.00	2.15	2.81	3.57	3.36	3.78	3.66	5.43
	2:10:00	0.00	0.00	1.66	2.16	2.76	2.58	2.90	2.76	4.05
	2:15:00	0.00	0.00	1.29	1.67	2.12	1.98	2.22	2.08	3.03
	2:20:00	0.00	0.00	0.99	1.28	1.62	1.51	1.69	1.58	2.30
	2:25:00	0.00	0.00	0.75	0.97	1.22	1.14	1.28	1.20	1.74
	2:30:00	0.00	0.00	0.57	0.72	0.91	0.85	0.95	0.90	1.30
	2:35:00	0.00	0.00	0.42	0.53	0.67	0.63	0.70	0.67	0.97
	2:40:00	0.00	0.00	0.31	0.39	0.50	0.47	0.53	0.51	0.73
	2:45:00	0.00	0.00	0.22	0.28	0.36	0.34	0.38	0.37	0.53
	2:50:00	0.00	0.00	0.14	0.19	0.24	0.24	0.26	0.25	0.36
	2:55:00	0.00	0.00	0.08	0.12	0.15	0.15	0.16	0.16	0.22
	3:00:00	0.00	0.00	0.04	0.06	0.08	0.08	0.09	0.08	0.12
	3:05:00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.03	0.04
	3:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

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).

Put this spreadsheet before the pond related spreadsheets. It's harder to find this when it is in between pond related documents.

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

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

Designer: TJE
Company: Galloway & Co.
Date: September 30, 2022
Project: Grandview Reserve
Location: Basin D-7a

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	**D-7a**													
Receiving Pervious Area Soil Type	Sandy Loam													
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.260													
Directly Connected Impervious Area (DCIA, acres)	0.000													
Unconnected Impervious Area (UIA, acres)	0.025													
Receiving Pervious Area (RPA, acres)	0.235													
Separate Pervious Area (SPA, acres)	0.000													
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C													

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.260													
Directly Connected Impervious Area (DCIA, %)	0.0%													
Unconnected Impervious Area (UIA, %)	9.8%													
Receiving Pervious Area (RPA, %)	90.2%													
Separate Pervious Area (SPA, %)	0.0%													
A_R (RPA / UIA)	9.204													
I_a Check	0.100													
f / I for WQCV Event:	1.7													
f / I for 5-Year Event:	0.5													
f / I for 100-Year Event:	0.3													
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	0.26													
IRF for 5-Year Event:	0.42													
IRF for 100-Year Event:	0.44													
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	9.8%													
Effective Imperviousness for WQCV Event:	2.6%													
Effective Imperviousness for 5-Year Event:	4.1%													
Effective Imperviousness for 100-Year Event:	4.3%													
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	70.9%	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
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	69.7%	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
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**9.8%**
Total Site Effective Imperviousness for WQCV Event:	**2.6%**
Total Site Effective Imperviousness for 5-Year Event:	**4.1%**
Total Site Effective Imperviousness for 100-Year Event:	**4.3%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

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

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

FOREBAY SIZING CALCULATIONS

Subdivision: Grandview Reserve
Location: CO, El Paso County

Project Name: Grandview Subdivision PDR
Project No.: HRG01
Calculated By: TJE
Checked By: BAS
Date: 10/6/22

Also label as "North" to match plans

Also label as "West" to match plans

	Pond D Forebay D-1	Pond D Forebay D-2	Pond E Forebay E-1	
Impervious % (I)	61.5%	59.60%	61.70%	Total impervious area of contributing upstream basins
WQCV Drain Time Coeff (a)	1	1	1	a = 1 for 40 Hr WQCV Drain Time
Tributary Area (Ac)	11.24	0.96	21.30	
Forebay Depth (Ft)	1.50	1.50	2.50	(see Table EDB-4 of the USDCM Volume 3 for depth requirement)
% of WQCV for Forebay Volume	3.0%	2.0%	3.0%	(see Table EDB-4 of the USDCM Volume 3 for requirement)
100-year Discharge (Q)	38.4	3.90	69.20	100-Year Flow entering Forebay (un-detained)
WQCV Depth (in)	0.24	0.23	0.24	WQCV Depth = $a(0.91*I^3 - 1.19*I^2 + 0.78*I)$
WQCV Volume (Ac-Ft)	0.23	0.02	0.43	
Forebay Volume (Cu. Ft.)	295	16	561	
Forebay Discharge (Q)	0.77	0.08	1.38	(Release 2% of 100-year discharge via notch or berm/pipe configuration)
Forebay Notch Height (in)	15.00	15.00	27.00	(3" depression @ top of forebay assumed per COS DCM Volume 1, 13-30)
Forebay Deisgn Results				
Minimum Forebay Area (Sq. Ft.)	**197**	**11**	**225**	
Forebay Notch width (in)	**3**	**3**	**3**	From $Q=C_w*W*H^{1.5}$ assuming C_w=3.33 for sharp-crested weir - **If notch width <3", use 3" minimum.**

Would suggest only using 12" deep forebay as contributing area is under an acre

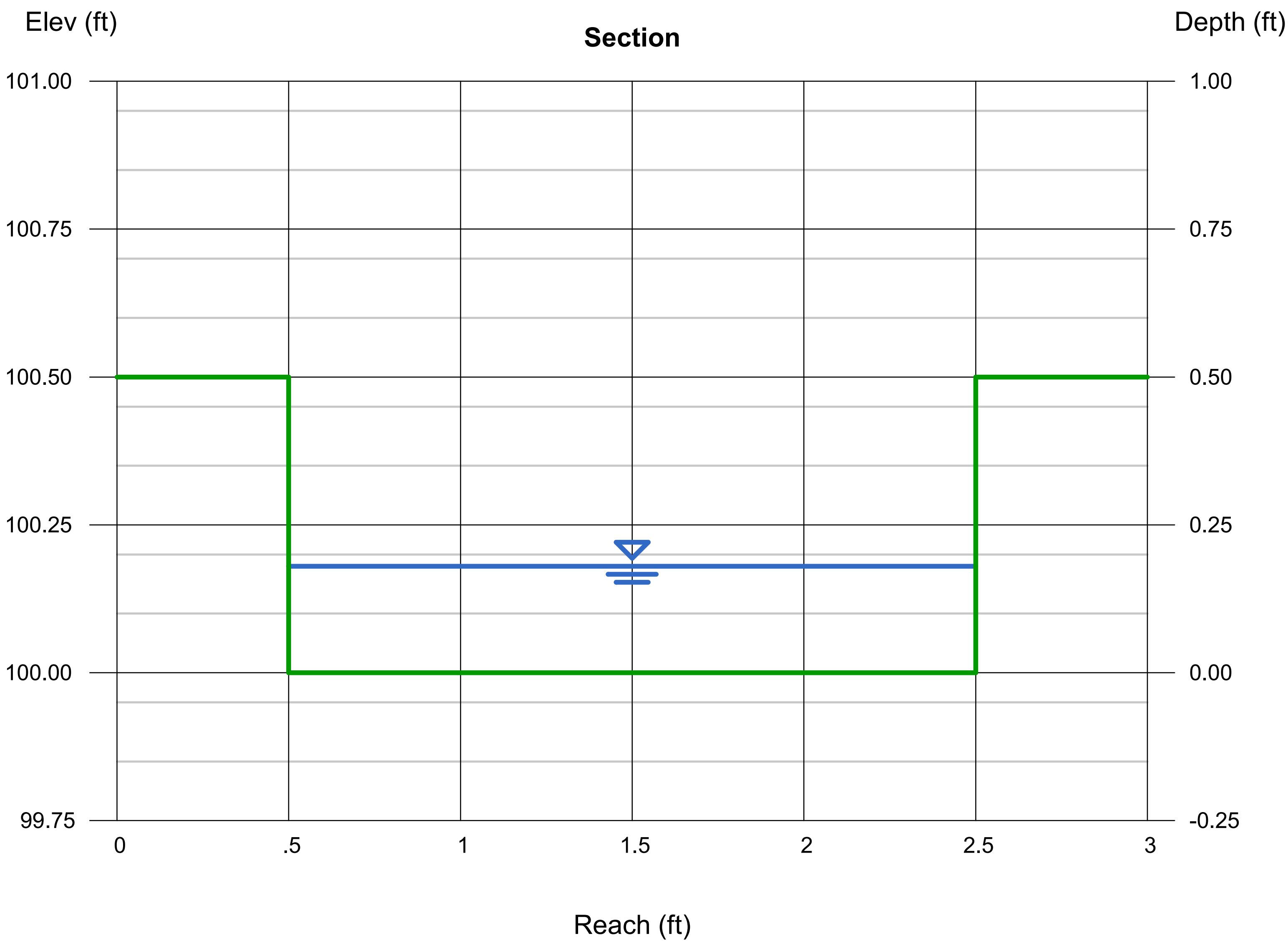
Galloway

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. | Monday, Oct 3 2022

Pond D Trickle Channel

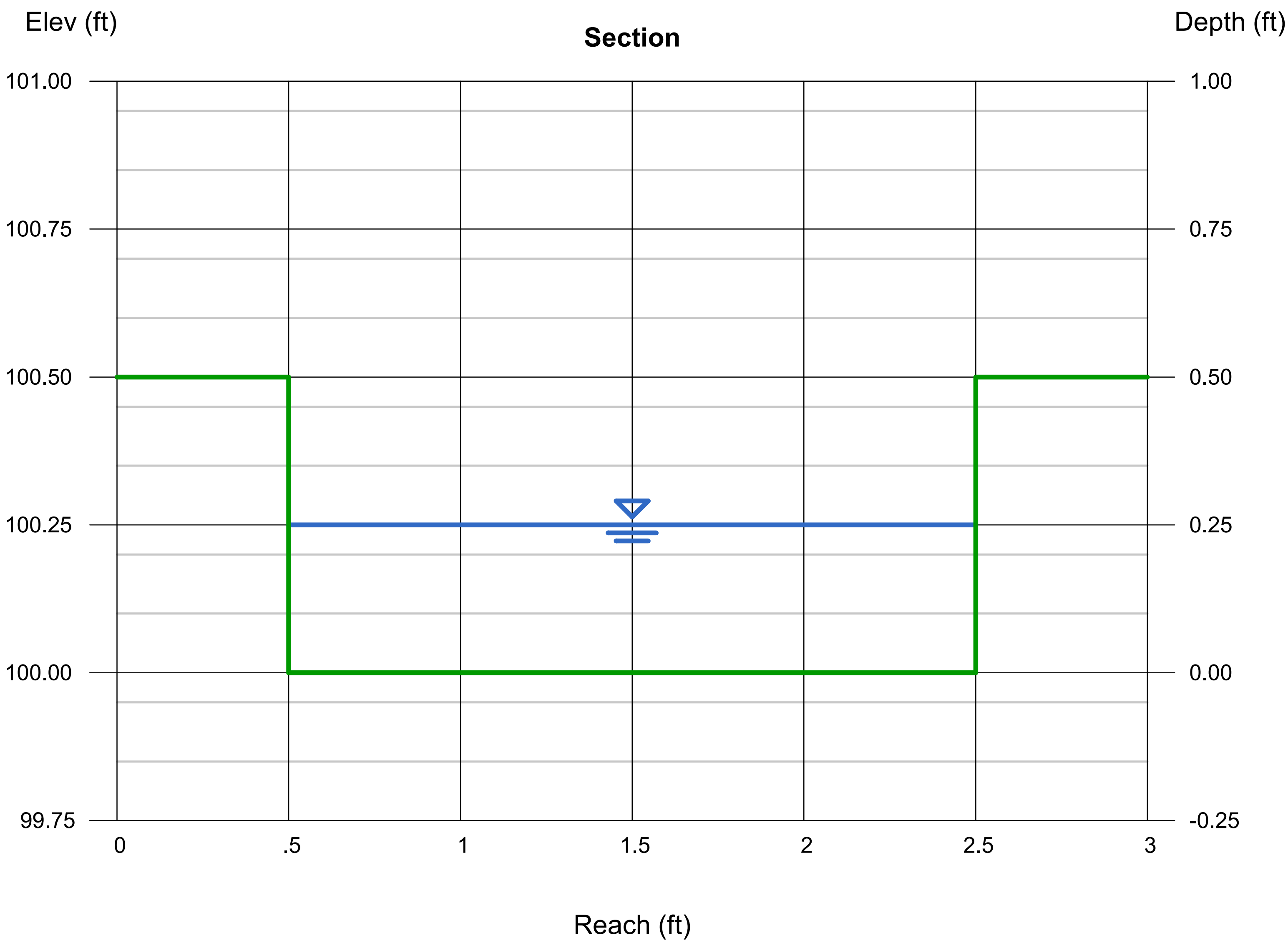
Rectangular		**Highlighted**	
Bottom Width (ft)	= 2.00	Depth (ft)	= 0.18
Total Depth (ft)	= 0.50	Q (cfs)	= 0.770
		Area (sqft)	= 0.36
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.14
Slope (%)	= 0.50	Wetted Perim (ft)	= 2.36
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.17
		Top Width (ft)	= 2.00
Calculations		EGL (ft)	= 0.25
Compute by:	Known Q		
Known Q (cfs)	= 0.77		



Channel Report

Pond E Trickle Channel

Rectangular		**Highlighted**	
Bottom Width (ft)	= 2.00	Depth (ft)	= 0.25
Total Depth (ft)	= 0.50	Q (cfs)	= 1.380
		Area (sqft)	= 0.50
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.76
Slope (%)	= 0.50	Wetted Perim (ft)	= 2.50
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.25
		Top Width (ft)	= 2.00
Calculations		EGL (ft)	= 0.37
Compute by:	Known Q		
Known Q (cfs)	= 1.38		



Micropool/ISV SIZING CALCULATIONS

Subdivision: Grandview Reserve
Location: CO, El Paso County

Grandview Subdivision PDR
HRG01
TJE
BAS
10/6/22

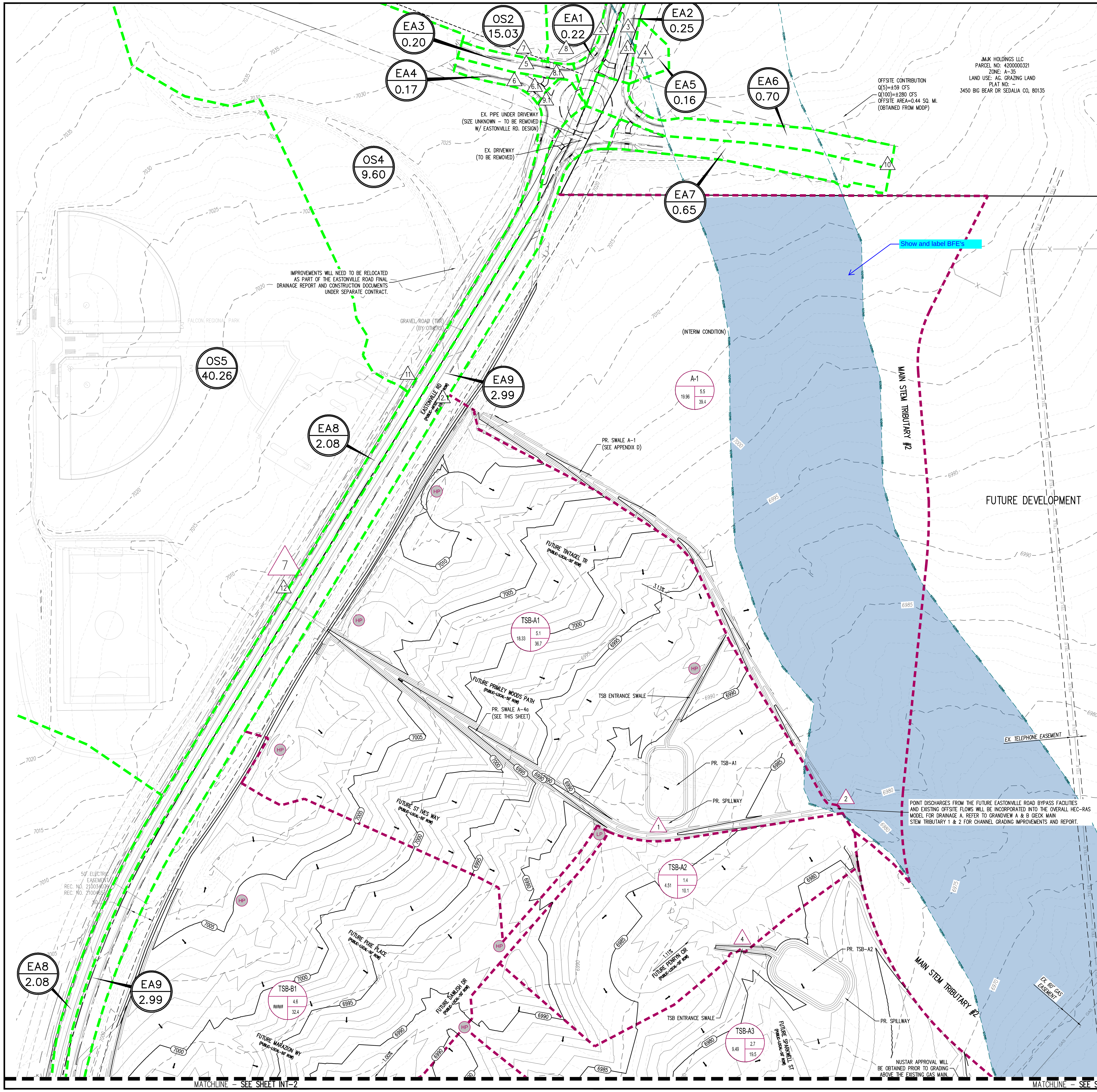
	Pond D	Pond E	
WQCV Volume (Ac-Ft)	0.245	0.430	From MHFD-Detention Spreadsheet
Provided ISV Depth (in)	6.00	9.00	4" Min. per USDCM, Volume 3
Provided Micropool/ISV Area (Sq. Ft.)	78.00	93.00	
Provided ISV Volume (Cu. Ft.)	39.00	69.75	
Micropool/ISV Deisgn Results			
Minimum Micropool Area (Sq. Ft.)	**64**	**75**	Assuming ISV above - Min. 10 ft^2 per USDCM, Volume 3
Required ISV Volume (Cu. Ft.)	**32**	**56**	0.3% of WQCV, per USDCM, Volume 3
Is Required Micropool Area Met?	**YES**	**YES**	
Is Required ISV Volume Met?	**YES**	**YES**	

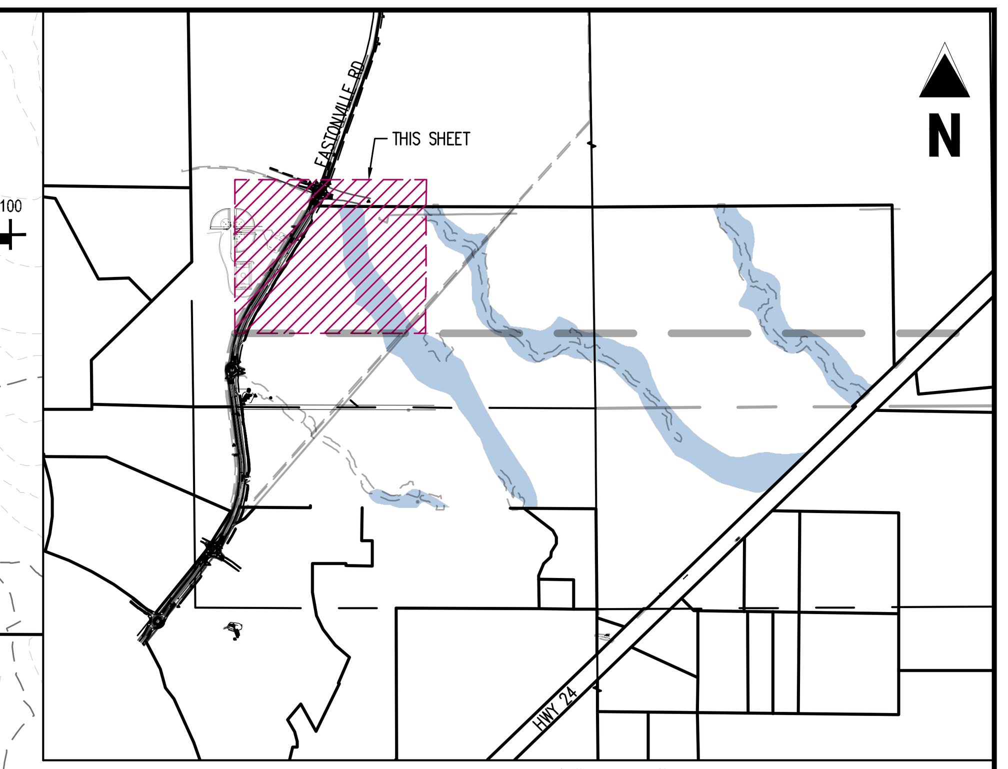
Include calculations for sizing of riprap for spillways

Galloway

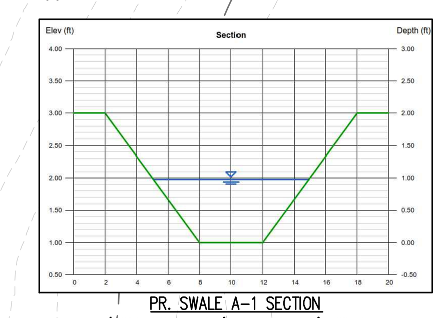
APPENDIX F

Drainage Maps

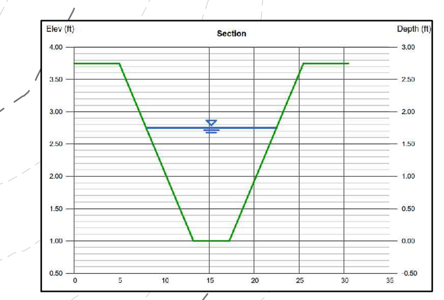




KEY MAP SCALE: (1"=2,000')



PR. SWALE A-1 SECTION
(BTM WIDTH: 4.0'; DEPTH: 1.0'; SIDE SLOPES: 3:1; SLOPE: 2.0%; Q: 31.1 cfs)



PR. SWALE A-4a SECTION
(BTM WIDTH: 4.0'; DEPTH: 1.75'; SIDE SLOPES: 3:1; SLOPE: 1.0%; Q: 125.0 cfs)

FUTURE DEVELOPMENT

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- 6480 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 6480 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100YR 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- 1 / 1.8 / 4.8 / 0.71: BASIN DESIGNATION; 5-YEAR RUNOFF IN CUBIC FEET PER SECOND; 100-YEAR RUNOFF IN CUBIC FEET PER SECOND; BASIN AREA IN ACRES
- 1 DESIGN POINT
- DIRECTION OF RUNOFF

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD FINAL DRAINAGE REPORT", BY HR GREEN, SEPTEMBER 2022.

NOTE:

1. PROPOSED CHANNEL DESIGN AND ANALYSIS FOR BOTH ON-SITE TRIBUTARIES (MAIN STEM AND MAIN STEM TRIBUTARY NUMBER 2) IS PROVIDED IN A SEPARATE REPORT "GRANDVIEW RESERVE CLOMR REPORT", BY HR GREEN, JULY 2022. ALL CHANNEL CULVERTS ARE SHOWN FOR REFERENCE ONLY AND ACTUAL SIZING AND ANALYSIS IS PROVIDED WITHIN THE CLOMR REPORT.

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
A-1	19.96	5.5	39.4
TSB-A1	18.33	5.1	36.7
TSB-A2	4.51	1.4	10.1
TSB-A3	9.49	2.7	19.5
TSB-B1	15.73	4.6	32.4
OS-4	112.71	19.5	134.6
OS-5	51.01	8.0	125.0

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	13.1	44.7
2	18.7	84.1
4	1.4	10.1
7	8.0	125.0

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

PRELIMINARY
NOT FOR BIDDING
NOT FOR CONSTRUCTION

PRELIMINARY DRAINAGE PLAN GRANDVIEW RESERVE FILING NO. 1

FOR HR GREEN, INC

EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

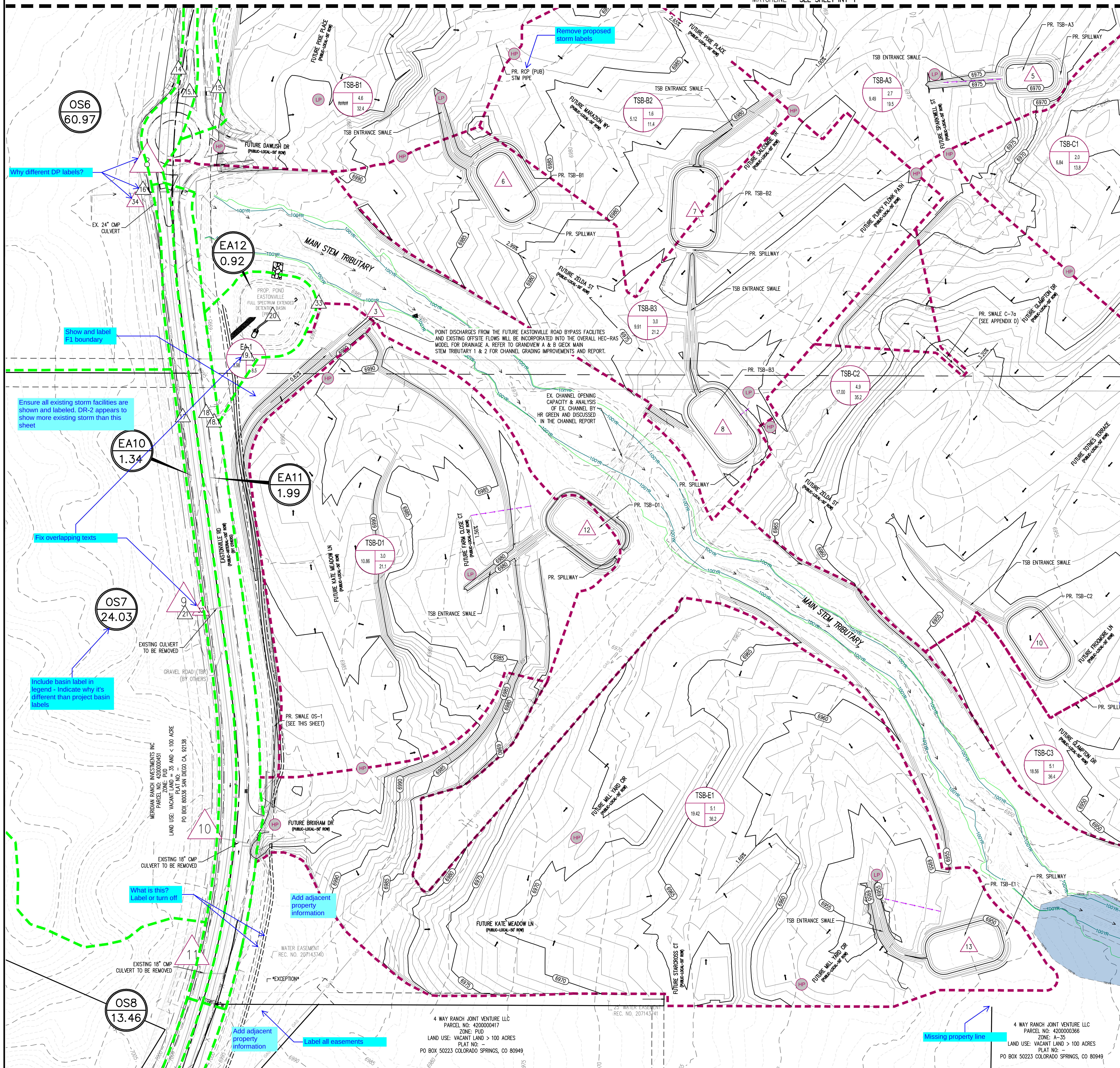
#	Date	Issue / Description	Init.

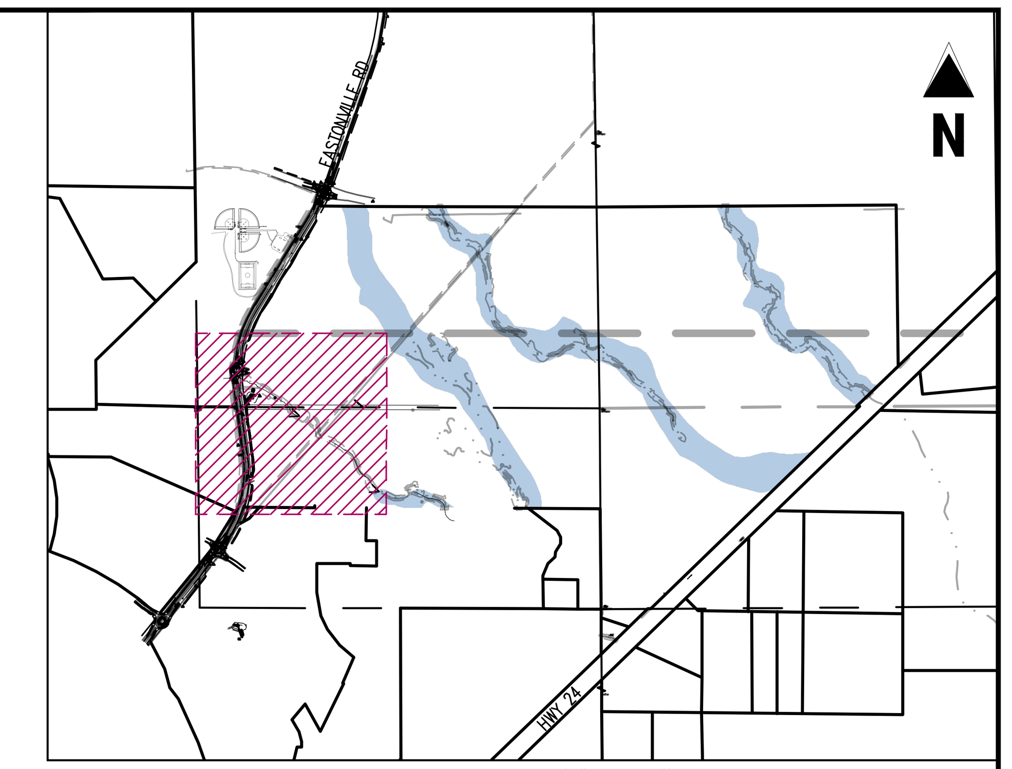
Project No: HRG 1.20
Drawn By: TJE
Checked By: GRD
Date: 9/9/2022

INTERIM DRAINAGE MAP

INT-1

Sheet 1 of 3





KEY MAP SCALE: (1"=2,000')

SCALE: 1"=100'

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD FINAL DRAINAGE REPORT", BY HR GREEN, SEPTEMBER 2022.

NOTE:

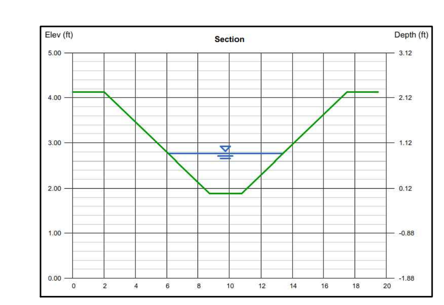
1. PROPOSED CHANNEL DESIGN AND ANALYSIS FOR BOTH ON-SITE TRIBUTARIES (MAIN STEM AND MAIN STEM TRIBUTARY NUMBER 2) IS PROVIDED IN A SEPARATE REPORT "GRANDVIEW RESERVE CLOMR REPORT", BY HR GREEN, JULY 2022. ALL CHANNEL CULVERTS ARE SHOWN FOR REFERENCE ONLY AND ACTUAL SIZING AND ANALYSIS IS PROVIDED WITHIN THE CLOMR REPORT.

DESIGN POINT SUMMARY TABLE

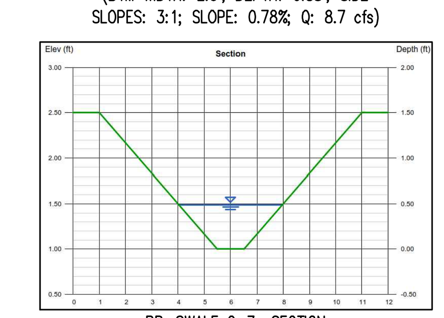
Design Point	Q_5 (cfs)	Q_{100} (cfs)
3	5.7	13.0
5	2.7	19.5
6	4.6	32.4
7	1.6	11.4
8	9.1	65.0
10	4.8	34.0
12	3.0	21.1
13	5.1	36.2
32	3.6	24.0
35	8.0	125.0

RUNOFF SUMMARY TABLE

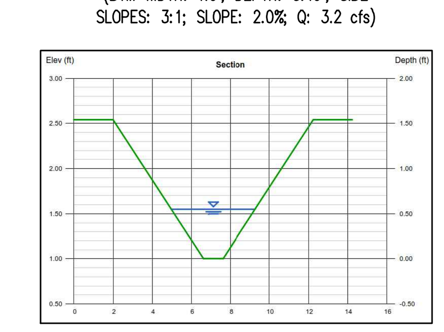
Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
EA-1	3.98	1.2	8.5
TSB-A3	9.49	2.7	19.5
TSB-B1	15.73	4.6	32.4
TSB-B2	5.12	1.6	11.4
TSB-B3	9.91	3.0	21.2
TSB-C1	6.84	2.0	13.8
TSB-C2	17.00	4.8	34.0
TSB-C3	18.56	5.1	36.4
TSB-D1	10.86	3.0	21.1
TSB-E1	19.42	5.1	36.2
OS-1	1.57	0.5	3.6
OS-2	2.86	0.8	5.3
OS-3	21.61	4.5	30.5
OS-4	112.71	19.5	134.6



PR. SWALE OS-1 SECTION
(BTM WIDTH: 2.0'; DEPTH: 0.88'; SIDE SLOPES: 3:1; SLOPE: 0.78%; Q: 8.7 cfs)



PR. SWALE C-7a SECTION
(BTM WIDTH: 1.0'; DEPTH: 0.49'; SIDE SLOPES: 3:1; SLOPE: 2.0%; Q: 3.2 cfs)



PR. SWALE D-7 SECTION
(BTM WIDTH: 1.0'; DEPTH: 0.55'; SIDE SLOPES: 3:1; SLOPE: 2.0%; Q: 4.0 cfs)

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

PRELIMINARY
NOT FOR BIDDING
NOT FOR CONSTRUCTION

PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE FILING NO. 1
FOR
HR GREEN, INC

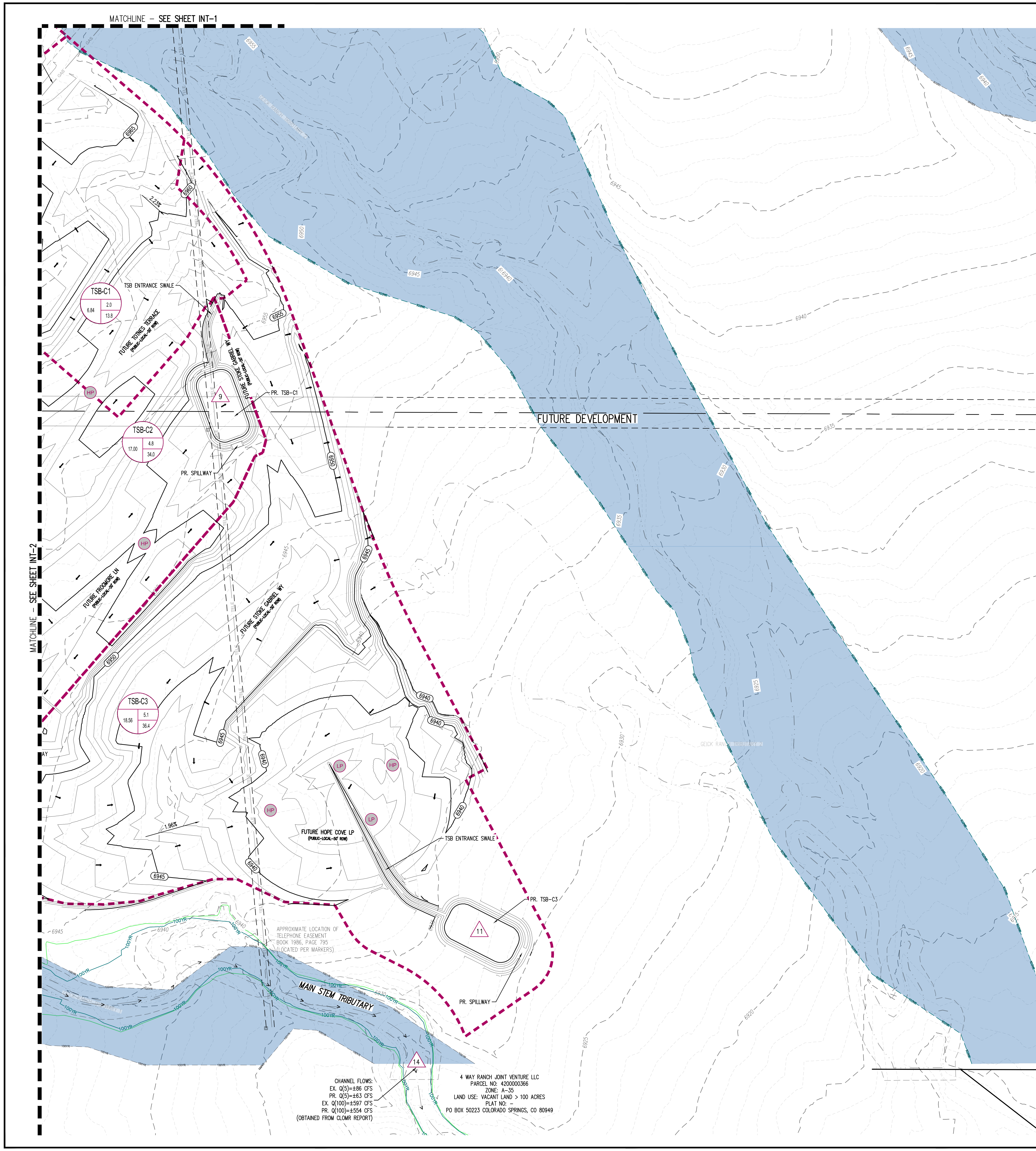
EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

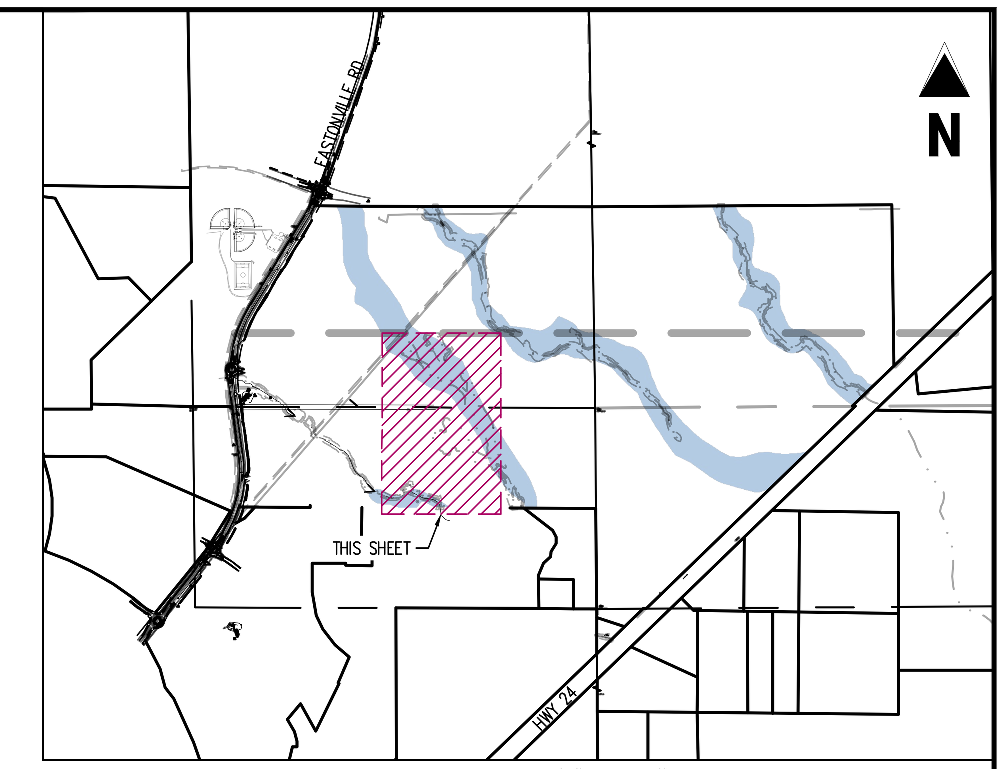
#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	9/9/2022

INTERIM DRAINAGE MAP

INT-2





KEY MAP SCALE: (1"=2,000')

DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- LOT BOUNDARY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

NOTE:

1. FOR EXISTING WESTERN OFFSITE SUB-BASIN ANALYSIS AS WELL AS PROPOSED EASTONVILLE ROAD SUB-BASIN ANALYSIS, SEE "EASTONVILLE ROAD FINAL DRAINAGE REPORT", BY HR GREEN, SEPTEMBER 2022.

NOTE:

1. PROPOSED CHANNEL DESIGN AND ANALYSIS FOR BOTH ON-SITE TRIBUTARIES (MAIN STEM AND MAIN STEM TRIBUTARY NUMBER 2) IS PROVIDED IN A SEPARATE REPORT "GRANDVIEW RESERVE CLOMR REPORT", BY HR GREEN, JULY 2022. ALL CHANNEL CULVERTS ARE SHOWN FOR REFERENCE ONLY AND ACTUAL SIZING AND ANALYSIS IS PROVIDED WITHIN THE CLOMR REPORT.

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
TSB-C1	6.84	2.0	13.8
TSB-C2	17.00	4.8	34.0
TSB-C3	18.56	5.1	36.4

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
9	2.0	13.8
11	11.8	84.3
14	86.0	597.0

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

PRELIMINARY
NOT FOR BIDDING
NOT FOR CONSTRUCTION

PRELIMINARY DRAINAGE PLAN
GRANDVIEW RESERVE FILING NO. 1
FOR
HR GREEN, INC

EASTONVILLE RD
EL PASO COUNTY, PEYTON, CO 80831

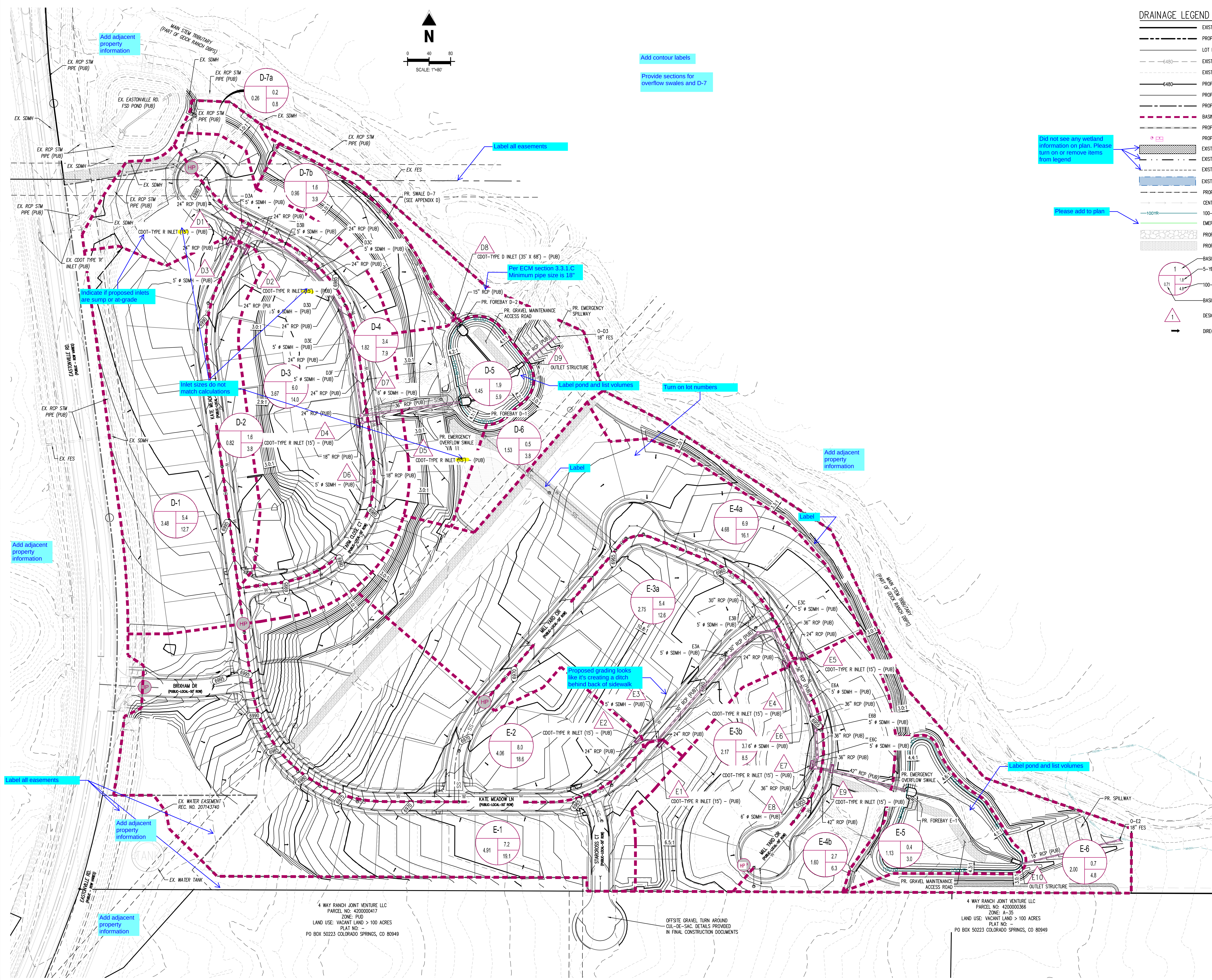
#	Date	Issue / Description	Init.

Project No:	HRG 1.20
Drawn By:	TJE
Checked By:	GRD
Date:	9/9/2022

INTERIM DRAINAGE MAP

INT-3

Sheet 3 of 3



DRAINAGE LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE /ROW
- LOT BOUNDARY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- PROPOSED STORM SEWER
- PROPOSED STORM STRUCTURES
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- PROPOSED EMERGENCY OVERFLOW ROUTE
- CENTERLINE OF STREAM
- 100-YEAR WATER SURFACE ELEVATION AND FLOODPLAIN
- EMERGENCY FLOW CONDITION HIGH WATER LIMIT (100-YR)
- PROPOSED RIPRAP
- PROPOSED GRAVEL ACCESS
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
D-1	3.48	5.4	12.7
D-2	0.82	1.6	3.8
D-3	3.67	6.0	14.0
D-4	1.82	3.4	7.9
D-5	1.45	1.9	5.9
D-6	1.53	0.5	3.8
D-7a	0.26	0.2	0.8
D-7b	0.96	1.6	3.9
E-1	4.91	7.2	19.1
E-2	4.06	8.0	18.6
E-3a	2.75	5.4	12.6
E-3b	2.17	3.7	8.5
E-4a	4.68	6.9	16.1
E-4b	1.60	2.7	6.3
E-5	1.13	0.4	3.0
E-6	2.00	0.7	4.8

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
D1	4.6	7.4
D2	1.6	3.7
D3	6.2	11.1
D4	6.6	18.7
D5	3.4	7.9
D6	10.0	26.6
D7	16.2	37.7
D8	1.6	3.9
D9	0.3	5.7
E1	7.0	12.7
E2	7.6	12.5
E3	14.6	25.2
E4	5.8	14.6
E5	6.7	11.5
E6	27.1	51.3
E7	3.6	17.2
E8	30.7	68.5
E9	33.3	78.6
E10	0.6	10.5

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

DRAINAGE MAPS
GRANDVIEW RESERVE FILING NO. 1
4 SITE INVESTMENTS, LLC (D.R. HORTON)

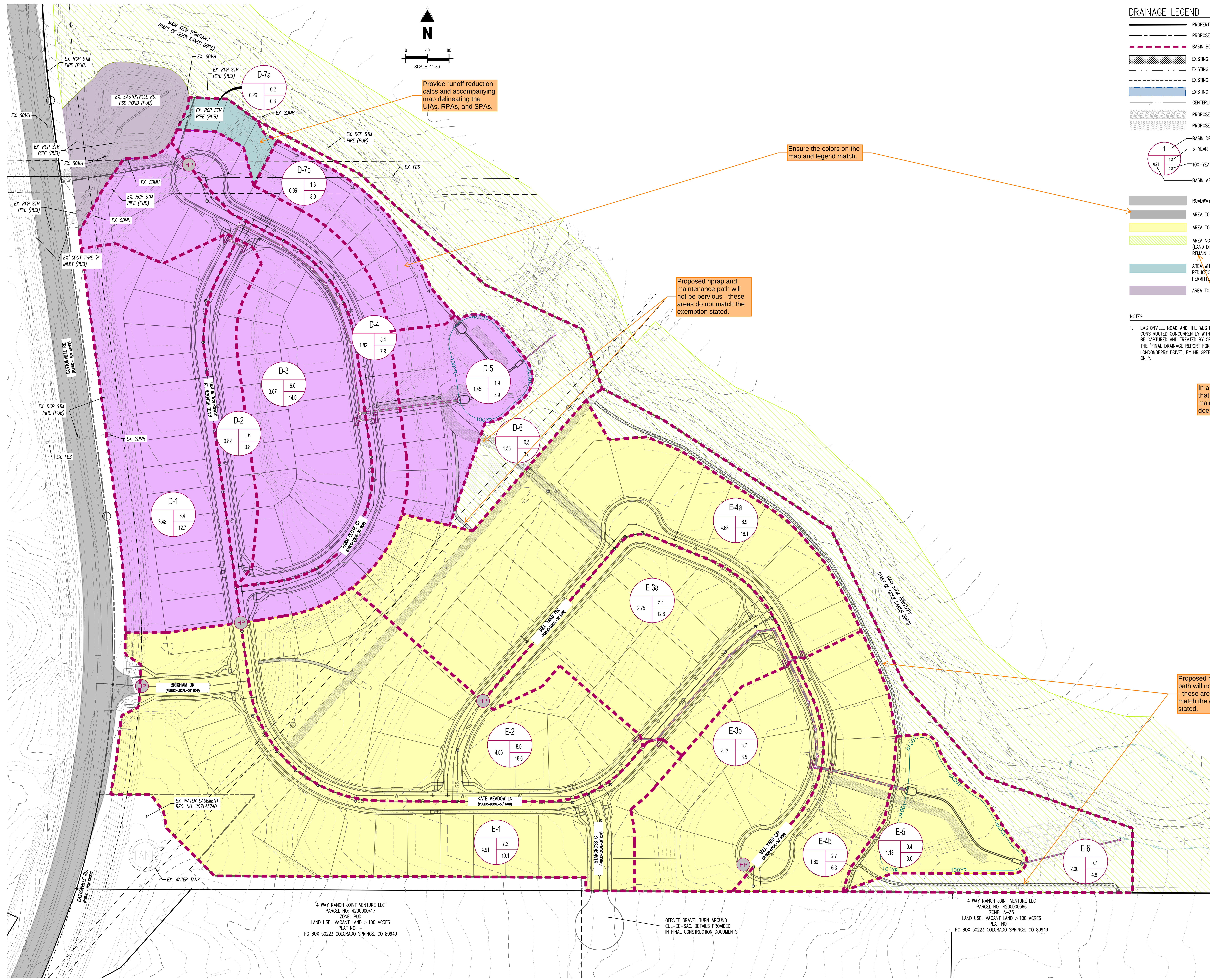
EASTONVILLE RD & REX RD
EL PASO COUNTY, FALCON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG02
Drawn By:	TJE
Checked By:	BAS
Date:	10/14/2022

PROPOSED DRAINAGE MAP

DR-2



DRAINAGE LEGEND

- PROPERTY LINE
- PROPOSED ROAD CENTERLINE
- BASIN BOUNDARY LINE
- EXISTING WETLANDS
- EXISTING LIMITS OF WETLAND
- EXISTING WETLAND SETBACK
- EXISTING FEMA FLOOD PLAIN, ZONE A
- CENTERLINE OF STREAM
- PROPOSED RIPRAP
- PROPOSED MAINTENANCE ACCESS
- BASIN DESIGNATION (1)
- 5–YEAR RUNOFF IN CUBIC FEET PER SECOND (1.8)
- 100–YEAR RUNOFF IN CUBIC FEET PER SECOND (4.8)
- BASIN AREA IN ACRES (0.71)
- ROADWAY (DESIGN BY OTHERS – SEE NOTE 1)
- AREA TO BE DETAINED IN PBMP (POND D)
- AREA TO BE DETAINED IN PBMP (POND E)
- AREA NOT TO BE DETAINED IN PBMP PER SECTION I.7.1.B.7 (LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED)
- AREA WHERE WATER QUALITY IS ACHIEVED THROUGH RUNOFF REDUCTION (ROOF DRAINS & IMPERVIOUS SURFACES NOT PERMITTED ON BACK OF THESE LOTS)
- AREA TO BE DETAINED IN PUBLIC PBMP (EASTONVILLE ROAD)

NOTES:

1. EASTONVILLE ROAD AND THE WESTERN PORTION OF REX ROAD AT EASTONVILLE IS TO BE CONSTRUCTED CONCURRENTLY WITH THIS DEVELOPMENT. DRAINAGE FOR THESE AREAS WILL BE CAPTURED AND TREATED BY OFFSITE INFRASTRUCTURE AND PONDS AS DESCRIBED IN THE "FINAL DRAINAGE REPORT FOR EASTONVILLE ROAD FROM FUTURE REX ROAD TO LONDONDERRY DRIVE", BY HR GREEN, MARCH 2022. BASIN SHOWN ARE FOR REFERENCE ONLY.

In all of the areas there are land that will be developed - riprap or a maintenance path. This exclusion does not work for those elements.

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

DRAINAGE MAPS
GRANDVIEW RESERVE FILING NO. 1
4 SITE INVESTMENTS, LLC (D.R. HORTON)

EASTONVILLE RD & REX RD
EL PASO COUNTY, FALCON, CO 80831

#	Date	Issue / Description	Init.

Project No:	HRG02
Drawn By:	TJE
Checked By:	BAS
Date:	10/14/2022

PROPOSED WATER QUALITY MAP

DR-3