



IRON RIDGE SUBDIVISION FILING NO. 1 & 2

FINAL DRAINAGE REPORT

PCD FILE NO: SF2612 & SF2613
ALL TERRAIN ENGINEERING PROJECT NO: 25009
JUNE 2026

PREPARED FOR:
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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 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.

05/28/2026

Ryan E. Burns, PE

Date

State of Colorado No. 59273

For and on behalf of All Terrain Engineering LLC

DEVELOPER'S STATEMENT

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

Jake DeCoto, Manager

Date

Atticus Land, LLC

PO Box 88010, Colorado Springs, CO 80908

EL PASO COUNTY ONLY

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 _____

County Engineer/ECM Administrator

Conditions:



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I. General Purpose, Location & Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for IRON RIDGE SUBDIVISION FILING NO. 1 & 2 is to describe the site's onsite and offsite drainage patterns, existing and proposed storm infrastructure, and to safely route developed stormwater to adequate outfalls. Iron

b. Location

IRON RIDGE SUBDIVISION FILING NO. 1 & 2, referred to as 'the site' herein, is in a portion of southeast quarter of Section 13, Township 11 South, Range 66 West of the 6th P.m., County of El Paso, State of Colorado. The site is bound by Walker Road to the north, Equine Meadows Subdivision to the east and undeveloped parcels to the west and south. A vicinity map is presented in Appendix A.

c. Description of Property

The site is comprised of (3) existing Parcels. Parcel 1 is 43.47 acres, Parcel 2 is 42.52 acres and Parcel 3 is 35.14 acres for a total of approximately 121.14 acres of undeveloped land. The development of Iron Ridge Subdivision will occur on Parcel 1 and 2. Parcel 3 will remain undeveloped. Existing vegetation consists of prairie grasses based upon aerial imagery. The approximate disturbed area is 9.2 acres. The development will plat (28) 2.5 acre+ "Large Lot single family residential lots" & public R.O.W. for an extension of Colt Court and proposed Brown Road, both Rural Local EPC cross sections with a 60' R.O.W.

Proposed improvements include Rural Local Roadways, associated road-side swales, culverts, (2) full spectrum extended detention basins, and grading. The residential lots will be served by private wells and OWTS.

In general, Parcel 1 slopes southeasterly towards an unnamed tributary of East Cherry Creek. East Cherry Creek is the ultimate receiving water for the site. The confluence of the unnamed tributary and East Cherry Creek is approximately 3.2 miles northeast of the site. Parcel 2 drains northwesterly towards the same tributary. Onsite elevations range from 7,450' – 7,560' with slopes ranging 1 – 80%. Per a NRCS soil survey, the site is made up of Type B Peyton sandy loam, Type B Peyton-Pring complex, Type B Tomah-Crowfoot loamy sands. The NRCS soil survey is presented in Appendix A.

An unnamed tributary of East Cherry Creek bisects the site and flows northeasterly. This tributary will be referred to as Tributary #1 from herein. There are no existing utilities located on site. An existing drainage map is presented in Appendix F.

d. Floodplain Statement

Based on FEMA Firm map 08041C0305G dated December 7, 2018, the site is Zone X, which are areas determined to be outside the 0.2% annual chance flood.

II. Drainage Basins

a. Major Basin Description

The site is located within the East Cherry Creek Drainage Basin. There is not a Drainage Basin Planning Study available for the East Cherry Creek Drainage Basin.

b. Existing Subbasin Description

The existing site's drainage patterns are relatively uniform. Tributary #1 bisects the site and conveys stormwater northeasterly towards Walker Road. An existing impoundment structure, The "Franktown Parker Reservoir FPE-5" is located approximately 850' upstream of Walker Road. The proposed development will

not have impacts on the impoundment structure. A portion of the site in the southeast area drains easterly to a separate tributary. An existing drainage map is presented in Appendix F.

Basin OS1 is 723.2 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS1 hydrologic parameters. Existing stormwater from this basin ($Q_5 = 33.9$ cfs $Q_{100} = 199$ cfs) is collected offsite in Tributary #1 and flows onsite at DPOS1 ($Q_5 = 34.6$ cfs $Q_{100} = 202.5$ cfs) where it combines with flows from DPOS2. Flows from DPOS1 continue through the site via Tributary 1 to DP5 ($Q_5 = 48.7$ cfs $Q_{100} = 291.5$ cfs) at Walker Road.

Basin OS2 is 38.4 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS2 hydrologic parameters. Existing stormwater from this basin ($Q_5 = 3.5$ cfs $Q_{100} = 16.4$ cfs) is collected offsite in Tributary #2 and flows onsite at DPOS2 ($Q_5 = 3.5$ cfs $Q_{100} = 16.4$ cfs) and continues across Basin EX1 and off-site again, where it joins Tributary 1 at DPOS1 ($Q_5 = 34.6$ cfs $Q_{100} = 202.5$ cfs).

Basin OS3 is 53.9 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS3 hydrologic parameters. Existing stormwater from this basin ($Q_5 = 4.3$ cfs $Q_{100} = 20.4$ cfs) is collected offsite in Tributary #3 and flows onsite at DPOS3 ($Q_5 = 4.3$ cfs $Q_{100} = 20.4$ cfs). Flows continue through the SE corner of basin EX9 and flow off-site in Tributary 3 to DP7 ($Q_5 = 7.7$ cfs $Q_{100} = 42.0$ cfs).

Basin EX1 is 14.90 acres of undeveloped land and Walker Road. Existing stormwater from this basin ($Q_5 = 3.5$ cfs $Q_{100} = 21.3$ cfs) is collected in Tributary#1 at DP1 ($Q_5 = 3.5$ cfs $Q_{100} = 21.3$ cfs) and continue in Tributary 1, see Basin OS1 description above.

Basin EX2 is 6.91 acres of undeveloped land. Existing stormwater from this basin ($Q_5 = 1.9$ cfs $Q_{100} = 12.6$ cfs) is collected in Tributary#1 at DP2 ($Q_5 = 3.9$ cfs $Q_{100} = 24.4$ cfs). Flows continue NE in Tributary 1 to DP3. See Basin EX4 description below.

Basin EX3 is 17.98 acres of undeveloped land and Walker Road. Existing stormwater from this basin ($Q_5 = 4.5$ cfs $Q_{100} = 27.4$ cfs) is collected in Tributary#1 at DP3 ($Q_5 = 11.6$ cfs $Q_{100} = 74.4$ cfs). Flows at DP3 continue in Tributary 1 to DP4, see basin EX4 description below.

Basin EX4 is 6.94 acres of undeveloped land. Existing stormwater from this basin ($Q_5 = 2.0$ cfs $Q_{100} = 13.1$ cfs) is collected in Tributary#1 at DP4 ($Q_5 = 12.5$ cfs $Q_{100} = 80.8$ cfs) where it combines with flows from DP3 and basin EX5. Flows at DP4, pass through the "Franktown Parker Reservoir FPE-5" via a concrete outlet structure and outfall pipe and continue in Tributary 1 to DP5. See basin EX7 description below. It is assumed flows pass through the reservoir unrestricted for the purposes of hydrologic routing.

Basin EX5 is 39.65 acres of undeveloped land. Existing stormwater from this basin ($Q_5 = 9.1$ cfs $Q_{100} = 61.2$ cfs) is collected in Tributary#1 at DP4 ($Q_5 = 12.5$ cfs $Q_{100} = 80.8$ cfs) where they combine with flows from DP3 and Basin EX4. Flows at DP4, pass through the "Franktown Parker Reservoir FPE-5" via a concrete outlet structure and outfall pipe and continue in Tributary 1 to DP5. See basin EX6, EX7, & EX8 descriptions below. It is assumed flows pass through the reservoir unrestricted for the purposes of hydrologic routing.

Basin EX6 is 1.43 acres of undeveloped land and Walker Road. Existing stormwater from this basin ($Q_5 = 1.2$ cfs $Q_{100} = 4.3$ cfs) is collected in a swale along Walker Road before discharging into Tributary#1 at DP5 ($Q_5 = 14.0$ cfs $Q_{100} = 89.0$ cfs, excludes off-site flows for comparison purposes) where they combine with flows from DP4 and basins EX7 & EX8, see description below.

Basin EX7 is 3.54 acres of undeveloped land adjacent to Walker Road. Existing stormwater from this basin ($Q_5 = 0.9$ cfs $Q_{100} = 6.3$ cfs) is collected in Tributary#1 at DP5 ($Q_5 = 14.0$ cfs $Q_{100} = 89.0$ cfs, excludes off-site flows for comparison purposes) where they combine with flows from DP4 and basins EX6 & EX8, see description below.

Basin EX8 is 26.55 acres of undeveloped land. Existing stormwater from this basin ($Q_5 = 5.5$ cfs $Q_{100} = 34.7$ cfs) is collected in Tributary#1 at DP5 ($Q_5 = 14.0$ cfs $Q_{100} = 89.0$ cfs, excludes off-site flows for comparison purposes) where they combine with flows from DP4 and basins EX6 & EX7.

The total flow at DP5 including the off-site flow from basin's OS1 and OS2 is ($Q_5 = 48.7$ cfs $Q_{100} = 291.5$ cfs).

Basin EX9 is 12.23 acres of undeveloped land. Existing stormwater from this basin ($Q_5 = 2.7$ cfs $Q_{100} = 18.4$ cfs) flows offsite and is collected in Tributary#3 at DP6 ($Q_5 = 2.7$ cfs $Q_{100} = 18.4$ cfs). Flows at DP6 continue in Tributary 3 to DP7 where they combine with flows from basins EX10 and EX11, see description below.

Basin EX10 is 2.15 acres of undeveloped land. Existing stormwater from this basin ($Q_5 = 0.7$ cfs $Q_{100} = 4.5$ cfs) flows offsite and is collected in Tributary#3 at DP7 ($Q_5 = 3.5$ cfs $Q_{100} = 20.3$ cfs, excludes off-site flows for comparison purposed) where they combine with flows from DP6 and basin EX11.

Basin EX11 is 2.85 acres of undeveloped land and Colt Court. Existing stormwater from this basin ($Q_5 = 1.5$ cfs $Q_{100} = 6.8$ cfs) flows offsite and is collected in Tributary#3 at DP7 ($Q_5 = 3.5$ cfs $Q_{100} = 20.3$ cfs, excludes off-site flows for comparison purposed) where they combine with flows from DP6 and basin EX10.

The total flow at DP7 including the off-site flow from basin OS3 is ($Q_5 = 7.8$ cfs $Q_{100} = 40.7$ cfs).

c. Proposed Subbasin Description

The proposed site has been divided into 30 subbasins for analysis. Areas designated 'no-build' have been analyzed as 'Pasture/Meadow/Lawns' in the proposed condition. Basin OS1 – OS3 are excluded from the design point flows presented in Basin A – Basin V descriptions. However, Basin OS1 - OS3 flows will be included in the stability analysis of Tributary #1 - #3. The offsite flows are analyzed separately to accurately quantify the change in onsite flow from the existing to proposed condition.

In general, the site was designed to preserve existing drainage patterns to the extent possible and minimize the disturbance area to allow for the lots to remain in a natural condition. Developed stormwater from the proposed roadways will be captured in road-side swales and conveyed to full-spectrum detention pond 1 or 2. The proposed lots are considered "large lot single family" sites which do not require water quality per Appendix I.6.1.B.5. Lot areas that are tributary to the proposed roads or ponds, will be treated and detained, however, lots that are not tributary to the roadways or ponds will flow off-site undetained per the existing drainage patterns.

Basin OS1 is 723.2 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS1 hydrologic parameters. Existing stormwater from this basin ($Q_5 = 33.9$ cfs $Q_{100} = 199$ cfs) is collected offsite in Tributary #1 and flows onsite at DPOS1 ($Q_5 = 34.6$ cfs $Q_{100} = 202.5$ cfs) where it combines with flows from DPOS2. Flows from DPOS1 continue through the site via Tributary 1 to DP15 ($Q_5 = 46.3$ cfs $Q_{100} = 287.7$ cfs) a 72" CMP public culvert at Walker Road.

Basin OS2 is 38.4 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS2 hydrologic parameters. Existing stormwater from this basin ($Q_5 = 3.5$ cfs $Q_{100} = 16.4$ cfs) is collected offsite in Tributary #2 and flows onsite at DPOS2 ($Q_5 = 3.5$ cfs $Q_{100} = 16.4$ cfs) and continues across Basin A and off-site again at DP1.1 ($Q_5 = 5.8$ cfs, $Q_{100} = 29.1$ cfs, includes Basin A1/A2 flows for stability analysis of on-site Tributary 2), where it joins Tributary 1 at DPOS1 ($Q_5 = 34.6$ cfs $Q_{100} = 202.5$ cfs). Flows from DPOS1 continue through the site via Tributary 1 to DP15 ($Q_5 = 46.3$ cfs $Q_{100} = 287.7$ cfs) a 72" CMP culvert at Walker Road.

Basin OS3 is 53.9 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS3 hydrologic parameters. Existing stormwater from this basin ($Q_5 = 4.3$ cfs $Q_{100} = 20.4$ cfs) is collected offsite in Tributary #3 and flows onsite at DPOS3 ($Q_5 = 4.3$ cfs $Q_{100} = 20.4$ cfs). Flows continue through the SE corner of basin L1 and flow off-site @ DP7 ($Q_5 = 5.4$ cfs, $Q_{100} = 26.6$ cfs, includes Basin L1 flows for stability analysis of on-site Tributary 3), and continues in Tributary 3 to DP11 ($Q_5 = 8.4$ cfs $Q_{100} = 40.8$ cfs).

Basin A1 is 8.74 acres of proposed 2.5+ acre lots and a portion of existing Walker Road. Basin A1 stormwater ($Q_5 = 2.6$ cfs $Q_{100} = 14.9$ cfs) follows historic drainage patterns south to DP1 ($Q_5 = 2.6$ cfs $Q_{100} = 14.9$ cfs) where it enters Basin A2 via proposed swale DP1 and continues per Basin A2 drainage patterns. Basin A1 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin A2 is 5.68 acres of proposed 2.5+ acre lots and a portion of existing Walker Road. Basin A stormwater ($Q_5 = 2.2$ cfs $Q_{100} = 11.9$ cfs) follows historic drainage patterns and is collected in Tributary #2 and directed to DP1.1 ($Q_5 = 5.8$ cfs $Q_{100} = 29.1$ cfs, includes Basin OS2 flows for stability analysis of on-site Tributary 2)) where it combines with flows from DP1 and continues offsite. Flow at DP1.1 continues via Tributary 2 to DPOS1, where flows continue back onsite via Tributary 1 and continue to DP5, see Basins B-G descriptions below. Basin A2 will not be detained in Pond 1. Basin A2 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin B1 is 6.83 acres of proposed 2.5+ acres lots, a small portion of proposed Brown Road & associated roadside swale B and a portion of existing Walker Road. Basin B1 stormwater ($Q_5 = 3.0$ cfs $Q_{100} = 14.2$ cfs) is captured in Roadside Swale B @ DP2 ($Q_5 = 5.9$ cfs $Q_{100} = 23.7$ cfs) where it combines with flows from Basin B2 & C and enter a 30" CMP culvert (public) and is piped under Brown Road to DP3, see Basin description below. Basin B1 will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin B2 is 1.13 acres of a small portion of proposed 2.5+ acres lots, proposed Brown Road & associated roadside swale B. Basin B2 stormwater ($Q_5 = 1.3$ cfs $Q_{100} = 3.6$ cfs) is captured in Roadside Swale B and is conveyed to DP2 ($Q_5 = 5.9$ cfs $Q_{100} = 23.7$ cfs) where it combines with flows from Basin B1 & C and enter a 30" CMP culvert (public) and is piped under Brown Road to DP3, see Basin description below. Basin B2 will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin C is 2.84 acres of proposed 2.5+ acres lots, a portion of proposed Brown Road and associated roadside swale C and Walker Road. Basin C stormwater ($Q_5 = 1.9$ cfs $Q_{100} = 7.2$ cfs) is captured in Roadside Swale C and conveyed to DP2 ($Q_5 = 5.9$ cfs $Q_{100} = 23.7$ cfs) where it combines with flows from Basin B1 & B2 and enter a 30" CMP culvert (public) and is piped under Brown Road to DP3, see Basin description below. Basin C will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin D is 0.86 acres of proposed Brown Road and associated roadside swale D. Basin D stormwater ($Q_5 = 1.3$ cfs $Q_{100} = 3.1$ cfs) is captured in Roadside Swale D and conveyed to DP3.1 ($Q_5 = 7.4$ cfs $Q_{100} = 27.2$ cfs) via an 18" CMP culvert (private) underneath the proposed Pond 1 maintenance access road where it combines with flows from DP3 in proposed "DP3.1 - DP4" Swale. Basin D will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin E is 0.47 acres of proposed Brown Road and associated roadside swale E. Basin E stormwater ($Q_5 = 0.8$ cfs $Q_{100} = 2.0$ cfs) is captured in Roadside Swale E and conveyed to DP3 ($Q_5 = 6.4$ cfs $Q_{100} = 25.1$ cfs) where it combines with flows from DP2 in swale "DP3 - DP3.1" and continues in the swale to DP3.1 ($Q_5 = 7.4$ cfs $Q_{100} = 27.2$ cfs). DP3 is conveyed to Pond 1 in swale "DP3.1 - DP4". Basin E will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin F is 2.87 acres of proposed 2.5+ acres lots and Pond 1. Basin F stormwater ($Q_5 = 1.3$ cfs $Q_{100} = 6.0$ cfs) overland flows to Pond 1 at DP4 ($Q_5 = 8.4$ cfs $Q_{100} = 32.2$ cfs) and combines in the pond with flows from DP3.1. Basin F will be captured and detained in Pond 1 for full spectrum water quality and detention. Detained flows at DP4 are released via a full-spectrum outlet structure and 24" CMP pipe (private) and low tail-water basin at DP4.1 ($Q_5 = 0.1$ cfs $Q_{100} = 23.9$ cfs). Released flows are conveyed to Tributary 1 via "DP4.1 outfall swale" at DP5 (~~$Q_5 = 4.2$ cfs $Q_{100} = 38.9$ cfs~~) where they combine with flows from Basins A, G, and K and continue to DP6, see basin descriptions below.

$Q_5=8.4$ cfs, $Q_{100}=64.5$ cfs per Appendix B calculations.

Basin G is 8.16 acres of proposed 2.5+ acres lots and undevelopable land within Tributary #1. Basin G stormwater ($Q_5 = 2.2$ cfs $Q_{100} = 12.5$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 ($Q_5 = 8.4$ cfs $Q_{100} = 64.5$ cfs) where it combines with flows from Basins A1, A2, K, U1-3, and DP4.1. Flows continue in Tributary 1 to DP5.1, see basin descriptions below. Basin G will not be detained in Pond 1. Basin G is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin H is 9.25 acres of 2.5+ acre lots and undevelopable land within Tributary #1. Basin H stormwater ($Q_5 = 3.0$ cfs $Q_{100} = 17.7$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP6 ($Q_5 = 9.5$ cfs $Q_{100} = 76.3$ cfs) where it combines with flows from DP5.1, DP14.1, and basins U5. Flows at DP6, pass through the "Franktown Parker Reservoir FPE-5" via an existing, concrete outlet structure and outfall pipe and continue to DP15, a 72" CMP public culvert at Walker Road. It is assumed flows pass through the reservoir unrestricted for the purposes of hydrologic routing. Basin H will not be detained in Pond 1. Basin H is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin I is 3.54 acres of undevelopable land within Tributary #1. Basin I stormwater ($Q_5 = 0.9$ cfs $Q_{100} = 6.3$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP15 ($Q_5 = 11.6$ cfs $Q_{100} = 85.3$ cfs), a 72" CMP public culvert at Walker Road where it combines with flows from DP6, basin J and basin V. Basin I will remain undeveloped and will not be detained in Pond 1.

Basin J is 1.35 acres of existing Walker Road and undevelopable land within Tributary #1. Basin J stormwater ($Q_5 = 1.4$ cfs $Q_{100} = 4.1$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP15 ($Q_5 = 11.6$ cfs $Q_{100} = 85.3$ cfs), a 72" CMP public culvert at Walker Road where it combines with flows from DP6, basin H and basin V. Basin I will remain undeveloped and will not be detained in Pond 1.

Basin K is 0.89 acres of proposed 2.5+ acres lots. Basin K stormwater ($Q_5 = 0.4$ cfs $Q_{100} = 2.4$ cfs) flows offsite and is captured in Tributary #1 and conveyed to DP5 ($Q_5 = 8.4$ cfs $Q_{100} = 64.5$ cfs) where it combines with flows from DP4.1, DP1.1, & Basins G, U1-3. Flows continue in Tributary 1 to DP5.1, see basin descriptions below. Basin K will not be detained in Pond 1. Basin K is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin L1 is 4.82 acres of proposed 2.5+ acres lots. Basin L stormwater ($Q_5 = 1.4$ cfs $Q_{100} = 7.8$ cfs) follows historic drainage patterns and is collected in Tributary #3 at DP7 ($Q_5 = 5.4$ cfs $Q_{100} = 26.6$ cfs, includes offsite flow from OS3 for stability analysis of on-site Tributary 3) where flows combine with flows from DP OS3. Flows continue offsite in Tributary 3 to DP11, see basin descriptions below. Basin L1 will not be detained in Pond 2. Basin L is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin L2 is 7.18 acres of proposed 2.5+ acres lots. Basin L2 stormwater ($Q_5 = 2.2$ cfs $Q_{100} = 12.6$ cfs) follows historic drainage patterns and flows offsite at DP7.1 ($Q_5 = 2.2$ cfs $Q_{100} = 12.6$ cfs). Flows continue into off-site Tributary 3 and are carried to DP11, see basin descriptions below. Basin L2 will not be detained in Pond 2. Basin L2 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin M is 2.06 acres of proposed 2.5+ acres lots. Basin M stormwater ($Q_5 = 0.9$ cfs $Q_{100} = 5.0$ cfs) follows historic drainage patterns to the east and offsite at DP8 ($Q_5 = 0.9$ cfs $Q_{100} = 5.0$ cfs) and continues into Tributary 3 where it is carried to DP11, see basin descriptions below. Basin M will not be detained in Pond 2. Basin M is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin N1 is 1.18 acres of existing residential area and Colt Court. Basin ~~N~~ stormwater ($Q_5 = 1.3$ cfs $Q_{100} = 3.9$ cfs) is collected in roadside swale N1 and is transported to DP9 ($Q_5 = 2.3$ cfs $Q_{100} = 7.7$ cfs) where it combines with flows from Basin N2 and enters an 18" CMP culvert (public). Flows are piped under Colt Court and continue to DP10 per Basin O drainage patterns described below. There is no proposed development within Basin N1, however; Colt Court will be extended to Iron Ridge from its current terminus. Per EPC ECM Section I.7.1.3.A.1, the developed area within Basin N1 will be excluded from permanent water quality management. The total excluded area is 0.24 acres encompassing the paved portion of Colt Court. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2. Water quality for the remaining 0.94 acres is excluded under EPC ECM Section 1.6.1.B.5. Coordination is ongoing with the property owners along Colt Court to facilitate the improvements required within the basin.

N2

Basin N2 is 1.25 acres of existing residential area and Colt Court. Basin ~~N~~ stormwater ($Q_5 = 1.1$ cfs $Q_{100} = 3.8$ cfs) is collected in roadside swale N2 and is transported to DP9 ($Q_5 = 2.3$ cfs $Q_{100} = 7.7$ cfs) where it combines with flows from Basin N1 and enters an 18" CMP culvert (public). Flows are piped under Colt Court and continue to DP10 per Basin O drainage patterns described below. There is no proposed development within Basin N2, however; Colt Court will be extended to Iron Ridge from its current terminus. Per EPC ECM Section I.6.1.3.A.1, the developed area within Basin N will be excluded from permanent water quality management. The total excluded area is 0.15 acres encompassing the paved portion of Colt Court. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2. Water quality for the remaining 1.1 acres is excluded under EPC ECM Section 1.6.1.B.5. Coordination is ongoing with the property owners along Colt Court to facilitate the improvements required within the basin.

Basin O is 0.60 acres of existing Colt Court. Basin O stormwater ($Q_5 = 0.6$ cfs $Q_{100} = 2.0$ cfs) follows historic drainage patterns to DP10 ($Q_5 = 2.9$ cfs $Q_{100} = 9.6$ cfs) where flows combine in the DP10 EX Swale with piped flows from DP9. There is no proposed development within Basin O, however; Colt Court will be extended through Basin O to Iron Ridge. Stormwater continues per existing drainage patterns to the historic outfall within Tributary #3 at DP11 ($Q_5 = 4.1$ cfs $Q_{100} = 20.4$ cfs) where flows combine with flow from DP7 (basin L1), DP7.1 (basin L2) and DP8 (basin M). Per EPC ECM Section I.6.1.3.A.1, the developed area within Basin O will be excluded from permanent water quality management. The total excluded area is 0.11 acres encompassing the paved portion of Colt Court. Water quality for the remaining .49 acres is excluded under EPC ECM Section 1.6.1.B.5. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2. Coordination is ongoing with the property owners along Colt Court to facilitate the improvements within this basin.

Basin P is 5.00 acres of proposed 2.5+ acres lots, Colt Court and associated roadside swale P. Basin P stormwater ($Q_5 = 2.8$ cfs $Q_{100} = 11.7$ cfs) is captured in Roadside Swale P and conveyed to DP12 ($Q_5 = 2.9$ cfs $Q_{100} = 14.8$ cfs) where it combines with flows from basin Q and enters a 24" CMP culvert (public) which

transports flows under Colt Court to DP13, see basin descriptions below. Basin P will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin Q is 1.21 acres of proposed 2.5+ acres lots, Colt Court and associated roadside swale Q. Basin Q stormwater ($Q_5 = 1.1$ cfs $Q_{100} = 3.8$ cfs) is captured in Roadside Swale Q and conveyed to DP12 ($Q_5 = 2.9$ cfs $Q_{100} = 14.8$ cfs), where it combines with flows from basin P and enters a 24" CMP culvert (public) which transports flows under Colt Court to DP13, see basin descriptions below. Basin Q will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin R is 1.82 acres of proposed 2.5+ acres lots, Colt Court and associated roadside swale R. Basin R stormwater ($Q_5 = 1.8$ cfs $Q_{100} = 5.5$ cfs) is captured in Roadside Swale R and conveyed to DP13 ($Q_5 = 4.7$ cfs $Q_{100} = 21.5$ cfs) where flows combine with piped flows from DP12 and basin S flows. DP13 flow is conveyed to Pond 2 at DP14 in "swale DP13 – DP14". Basin R will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin S is 0.57 acres of proposed 2.5+ acres lots, Colt Court and roadside swale S. Basin R stormwater ($Q_5 = 0.9$ cfs $Q_{100} = 2.2$ cfs) is captured in Roadside Swale S and conveyed to DP13 ($Q_5 = 4.7$ cfs $Q_{100} = 21.5$ cfs) where flows combine with piped flows from DP12 and basin R flows. DP13 flow is conveyed to Pond 2 at DP14 in "swale DP13 – DP14". Basin S will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin T is 0.97 acres of proposed 2.5+ acres lots, "Swale DP13-14" and Pond 2. Basin F stormwater ($Q_5 = 0.5$ cfs $Q_{100} = 2.6$ cfs) overland flows to Pond 2 at DP14 ($Q_5 = 4.8$ cfs $Q_{100} = 22.7$ cfs) where it combines with flows transported in the swale from DP13. Basin T will be captured and detained in Pond 2 for full spectrum water quality and detention. Pond 2 will release flows through a full-spectrum outlet structure via a 24" CMP storm sewer (private) into a low-tailwater basin and connected "DP14.1 outfall swale" @ DP14.1 ($Q_5 = 0.1$ cfs $Q_{100} = 14.4$ cfs). "DP14.1 outfall swale" transports flows through basin U to Tributary 1 @ DP5.1 ($Q_5 = 8.5$ cfs $Q_{100} = 72.3$ cfs), where flows combine with flows from basin H, basin U4, and DP5.

Basin U1 is 6.63 acres of proposed 2.5+ acres lots, offsite area, and undevelopable land within Tributary #1. Basin U1 stormwater ($Q_5 = 1.5$ cfs $Q_{100} = 9.9$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 ($Q_5 = 8.4$ cfs $Q_{100} = 64.5$ cfs), where flows combine with flows Basin U2, U3, basin G, K, and DP4.1. Flows continue in Tributary 1 to DP5.1. Basin U1 will not be detained in Pond 1. Basin U1 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U2 is 7.43 acres of proposed 2.5+ acres lots. Basin U2 stormwater ($Q_5 = 2.6$ cfs $Q_{100} = 14.1$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 ($Q_5 = 8.4$ cfs $Q_{100} = 64.5$ cfs), where flows combine with flows Basin U1, U3, basin G, K, and DP4.1. Flows continue in Tributary 1 to DP5.1. Basin U2 will not be detained in Pond 1. Basin U2 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U3 is 8.41 acres of proposed 2.5+ acres lots, offsite area, and undevelopable land within Tributary #1. Basin U3 stormwater ($Q_5 = 2.2$ cfs $Q_{100} = 12.6$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 ($Q_5 = 8.4$ cfs $Q_{100} = 64.5$ cfs), where flows combine with flows Basin U1, U2, basin G, K, and DP4.1. Flows continue in Tributary 1 to DP5.1. Basin U3 will not be detained in Pond 1. Basin U3 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U4 is 4.00 acres of proposed 2.5+ acres lots, offsite area, and undevelopable land within Tributary #1. Basin U4 stormwater ($Q_5 = 1.7$ cfs $Q_{100} = 7.8$ cfs) flows towards proposed DP14.1 outfall swale and is directed in the swale to DP5.1 ($Q_5 = 8.5$ cfs $Q_{100} = 72.3$ cfs) in Tributary #1 where flows combine with flows from DP5, DP14.1 (Pond 2 controlled release). Flows continue in Tributary 1 to DP6. Basin U4 will not be detained in Pond 1. Basin U4 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. Proposed DP14.1 Outfall Swale disturbance area is excluded per EPC ECM Section 1.6.1.B.7. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U5 is 5.31 acres of a portion of lot 16 within the pond 2 drainage easement, offsite area, and undevelopable land within Tributary #1. Basin U5 stormwater ($Q_5 = 1.5$ cfs $Q_{100} = 9.7$ cfs) flows overland towards proposed DP6 ($Q_5 = 9.5$ cfs $Q_{100} = 76.3$ cfs) within Tributary 1 where flows combine with flows from DP5.1 & Basin H. Flows continue in Tributary 1 to DP15. Basin U5 will not be detained in Pond 1. Basin U5 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin V is 24.97 acres of proposed 2.5+ acres lots, offsite 2.5+ acre lots and undevelopable land within Tributary #1. Basin V stormwater ($Q_5 = 6.1$ cfs $Q_{100} = 37.7$ cfs) follows historic drainage patterns and is collected in Tributary #1 at DP15 ($Q_5 = 11.6$ cfs $Q_{100} = 85.33$ cfs), a 72" CMP public culvert at Walker Road where it combines with flows from DP6, basin I, & J. Basin V will not be detained in Pond 1. Basin V is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

The total flow @ DP15, including offsite flows from Tributaries 1 & 2 is ($Q_5 = 46.3$ cfs $Q_{100} = 287.7$ cfs).

The total flow @ DP11, including offsite flows from Tributary 3 is ($Q_5 = 8.4$ cfs $Q_{100} = 40.8$ cfs)

EXISTING V. PROPOSED DESIGN POINT COMPARISON						
Ex/Pr DP	Ex Q_5 (cfs)	Ex Q_{100} (cfs)	Pr Q_5 (cfs)	Pr Q_{100} (cfs)	Q_5 Change	Q_{100} Change
5/15	14.0	89.0	11.6	85.3	-17.1%	-4.2%
7/11	3.5	20.3	4.1	20.4	18.2%	0.3%

Existing Design Point 5 and Proposed Design Point 15 represent the site's outfall within Tributary #1. Existing Design Point 7 and Proposed Design Point 11 represent the site's outfall within Tributary #3. See below for flow change descriptions. It should be noted while some onsite basins demonstrate a peak flow increase in the proposed condition, the site's overall peak discharge is less than historic at DP15 & is within 1% of the existing flow at DP11.

- The decrease in 5-year flow at DP5/15 can be attributed to the decrease in 5-year discharge occurring at Pond 1 and Pond 2 as well as an increase in the time of concentration for the developed condition. The 5-year discharge is 0.1 cfs, which is less than historic. The decrease in the 5-yr storm was necessary to achieve the required pond drain times.
- The decrease in 100-year flow at DP5/15 can be attributed to the increased time of concentration for the site in the developed condition. The flow after development is reduced at the existing 72" CMP public culvert at DP5/15 and it conveys the 100-yr flows within El Paso County criteria. Culvert analysis is included in Appendix C. Additionally, the total flow within the existing Tributary's 1 and 2, has remained unchanged or decreased as a result of this project.

- The increase in 5-year and 100-year at DP7/11 can be attributed to the extension of Colt Court. The flow increase is less than a cfs in both scenarios and is negligible. A stability analysis of the DP10 outfall and Tributary #3 is provided within appendix C.

III. Drainage Design Criteria

a. Development Criteria Reference

The drainage analysis follows the criteria from the “Drainage Criteria Manual County of El Paso, Colorado” Volumes 1 and 2,” as amended.

b. Hydrologic Criteria

Hydrologic criteria and runoff calculations are per the “Drainage Criteria Manual County of El Paso, Colorado Volume 1 Update” – Chapter 6 Hydrology. Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event). 1-hr duration rainfall depths from NOAA Atlas 14 are utilized for pond sizing. Private, full spectrum pond design was completed using the latest version of Mile High Flood District’s (MHFD) UD-Detention. The detention pond allowable release rates will be limited to historic rates.

d. Hydraulic Criteria

Hydraulic criteria for storm sewer and open channel sizing were obtained from the “Drainage Criteria Manual County of El Paso, Colorado” Chapter 9 Culvert Design and Chapter 10 Open Channels and Structures. Culvert and swale calculations were performed using Hydraflow Express AutoCAD extension.

IV. Drainage Facility Design

a. General Concept

Proposed roadway stormwater will be captured and conveyed with roadside swales to onsite, full spectrum water quality and detention ponds (Pond 1 and Pond 2). In areas where existing topography makes it feasible, 2.5+ acre lots are captured and detained in Pond 1 and Pond 2. Pond 1 and Pond 2 will discharge at less than historic rates to Tributary #1.

Swales:

Roadside swales will convey stormwater to proposed culverts and ponds. Roadside swales match the County typical section for a rural local roadway, consisting of a 2.5’ deep v shaped swale with 4:1 and 3:1 side slopes with the exception of roadside swales N1 and N2. These swales have a reduced depth in order to fit within the existing R.O.W. as no easement exists in this area. Swale N1 and N2 remain stable while conveying the 100-yr design flow with adequate freeboard. Swales will remain stable while conveying the 100-yr design flow. Swales with velocities of 5fps or less & Froude #'s of 0.9 or less for the 100 design storm will be grass lined, while swales exceeding 5 fps or 0.9 Froude # will be armored/mitigated with Rock Check Dams to slow flow to non-erosive velocities. Swales will also convey stormwater from the roadside swales to Ponds 1 and 2 and from ponds 1 and 2 to Tributary 1. Swales outside of the ROW that exceed 5-fps or 0.9 Froude # for the 100-yr design storm will be armored with Turf Reinforcement Mat. See appendix C for hydraulic calcs.

Culverts:

Culverts will convey stormwater underneath roadways and future driveways. All future driveways shall use an 18” culvert. All culverts have been sized to convey the 100-yr flow without over-topping and with a HW-D ratio of less than 1.5. Culvert inlets and outlets are stabilized with riprap pads where necessary. All culverts include PES’s or headwalls at each end.

Please line road side ditch in these sections with TRM in addition to Rock Check Dams and update GEC Plan and FAE accordingly.

Per driveway culvert sizing calculations in Appendix C, all future driveways shall use an 18" culvert with the exception of Lots 12 and 13 in Filing No. 2 that shall use 24" culverts.



b. Water Quality & Detention

Pond 1

Water quality and detention for Basins B-F is provided in Pond 1: a private, full spectrum detention pond south of Brown Road along Tributary #1. A total of 14.99 acres at 15.7% imperviousness will be detained in Pond 1. The WQCV is 0.121 ac-ft, the EURV is 0.229 ac-ft, and the 100-year volume is 0.677 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 59 and 62 hours, respectively. A concrete bottom forebay will be located at the swale outfall into Pond 1. A 2.0' concrete trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate future maintenance of the pond facilities. The pond and its components are located in a permanent easement. A 16' riprap lined, emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0'+ of freeboard towards Tributary #1.

Pond 2

Water quality and detention for Basins P-T is provided in Pond 2: a private, full spectrum detention pond north of Colt Court. A total of 9.57 acres at 17.0% imperviousness will be detained in Pond 2. The WQCV is 0.082 ac-ft, the EURV is 0.078 ac-ft, and the 100-year volume is 0.291 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 60 and 61 hours, respectively. A concrete bottom forebay will be located at the swale outfall into Pond 2. A 2.0' concrete trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate future maintenance of the pond facilities. The pond and its components are located in a permanent easement. A 10' riprap lined, emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Tributary #1.

See below Water Quality Summary table.

WATER QUALITY SUMMARY TABLE						
Sub-basin	Area (acres)	WQ Source				
		Pond	Exclusion I.6.			Undeveloped
A1	8.74		1.B.5			
A2	5.68		1.B.5			
B1	6.83	Pond 1				
B2	1.13	Pond 1				
C	2.84	Pond 1				
D	0.86	Pond 1				
E	0.47	Pond 1				
F	2.87	Pond 1				
G	8.15		1.B.5			
H	9.25		1.B.5			
I	3.54					X
J	1.35					X
K	0.89		1.B.5			
L1	4.82		1.B.5			
L2	7.18		1.B.5			
M	2.06		1.B.5			
N1	1.18		1.B.5		3.A.1	
N2	1.25		1.B.5		3.A.1	
O	0.60		1.B.5		3.A.1	
P	5.00	Pond 2				
Q	1.21	Pond 2				
R	1.82	Pond 2				
S	0.57	Pond 2				
T	0.97	Pond 2				
U1	6.63		1.B.5			X
U2	7.43		1.B.5			
U3	8.41		1.B.5			
U4	4.00		1.B.5	1.B.7		
U5	5.31		1.B.5			X
V	24.97		1.B.5			X
TOTAL	136.01	24.56	75.37	0.46	0.50	35.12

c. Major Drainageways

Tributary #1, an unnamed tributary to East Cherry Creek, bisects the site and conveys stormwater. Tributary #2 is located in the southwest corner of the site and conveys stormwater to Tributary #1. Tributary 3 crosses the southeast corner of the site and is the outfall for basin L-O. A stability analysis of Tributary #1-3 is included in appendix C.

d. Operations & Maintenance

An Operations and Maintenance Manual for Pond 1 and Pond 2 is provided with the this project. All drainage facilities including ponds, swales, and culverts will be located within Public R.O.W. or permanent easements. See the drainage map and final plat for easement and R.O.W. locations. Facilities within the Public R.O.W. will be maintained by El Paso County and facilities outside of the R.O.W. will be maintained by the HOA.

e. Grading & Erosion Control Plan

Due to the project disturbance area, a separate Grading and Erosion Control plan is included with this project.

f. **Four Step Method**

Step 1 – Reducing Runoff Volumes: Roof drains will route across landscape areas whenever possible to promote infiltration. In addition, grass lined drainage swales are used as the primary stormwater conveyance. The site disturbance was minimized to the extent possible to preserve vegetation which helps to slow runoff and promotes infiltration.

Step 2 – Treat and slowly release the WQCV: Onsite, private full spectrum detention ponds provide water quality treatment for the site. The WQCV is released over a period of 40 hours.

Step 3 – Stabilize stream channels: All new and re-development projects are required to construct or participate in the funding of channel stabilization measures. Drainage basin fees paid, at the time of platting, go towards channel stabilization with the drainage basin. Drainage channels will be lined with non-erosive soils and permanently seeded to provide stabilization. Where required due to erosive velocities, turf reinforcement mat will provide stabilization. Stormwater discharge points will be adequately stabilized with riprap pads and low-tailwater basins.

Step 4 – Consider the need for source controls: No industrial or commercial uses are proposed within this development and therefore no source controls are proposed.

g. **Drainage Basin & Bridge Fees**

The site is located within the East Cherry Creek Drainage Basin. There is not an established basin and bridge fee for East Cherry Creek.

h. **Engineer's Opinion of Probable Cost**

An engineer's opinion of probable costs is provided within appendix E.

V. Summary

IRON RIDGE SUBDIVISION FILING NO. 1 & 2 remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements. The proposed development will not adversely affect downstream stormwater infrastructure or surrounding developments. This report meets the latest EL Paso County criteria.

VI. References

- I. El Paso County – Drainage Criteria Manual, 2018 as amended.
- II. Urban Storm Drainage Criteria Manual, Mile High Flood District, March 2024.
- III. USGS - Colorado StreamStats, <https://www.usgs.gov/streamstats/colorado-streamstats>.
- IV. TopoZone – Topo Map of Stream in El Paso County, Colorado, <https://www.topozone.com/colorado/el-paso-co/stream>.
- V. Federal Emergency Management Agency, Flood Map Service Center - <https://msc.fema.gov/portal/home>, September 2024.
- VI. Web Soil Survey, Natural Resources Conservation Service - <https://websoilsurvey.nrcs.usda.gov/app/>, September 2024.



APPENDIX A – VICINITY MAP, FEMA MAP, NRCS WEB SOIL SURVEY & NOAA ATLAS 14

[illegible]

1000 500 0 1000 2000

ORIGINAL SCALE: 1" = 1000'

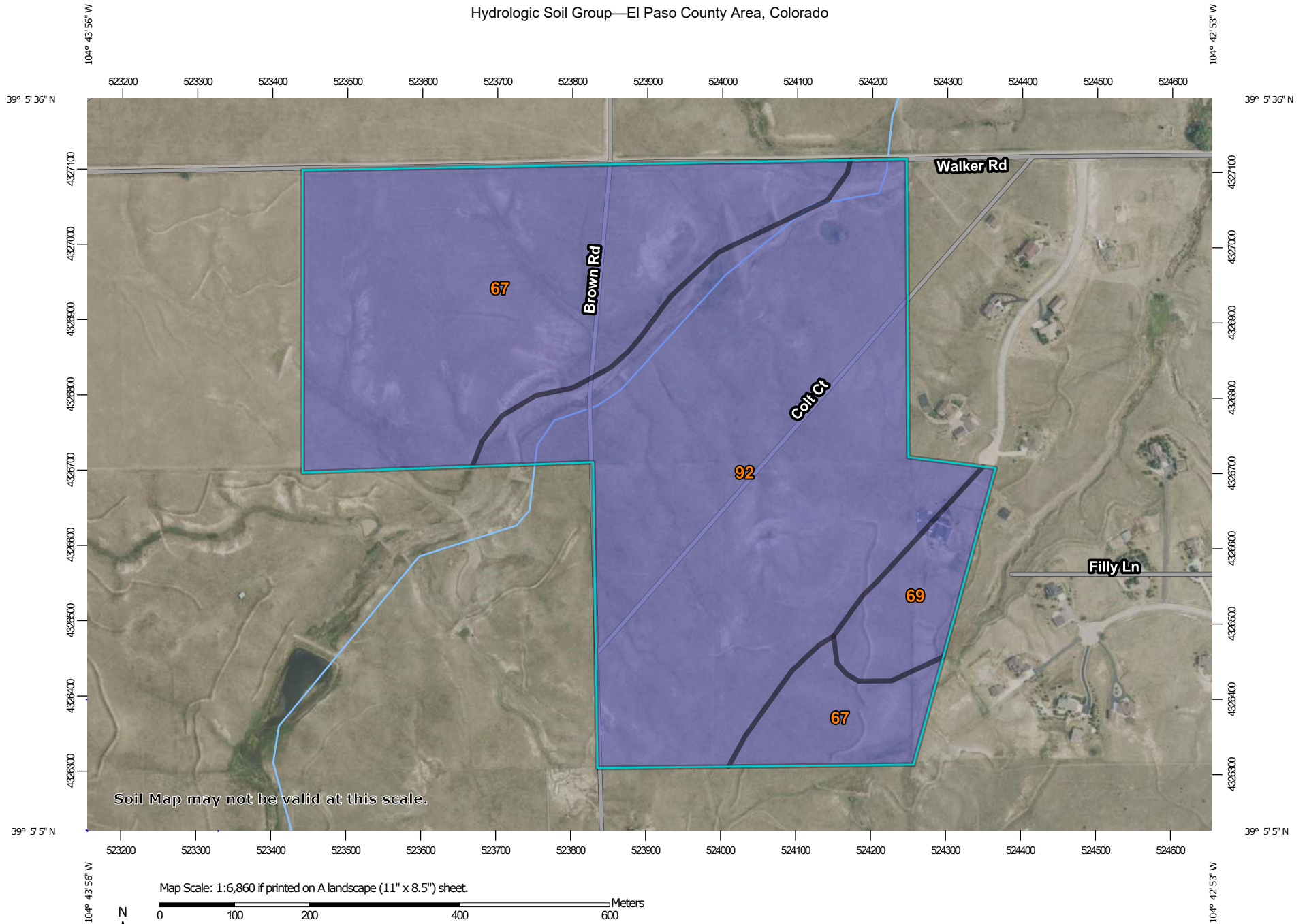
IRON RIDGE SUB.
JOB NO. 25009
LOCATION: EPC
09/17/2025
SHEET: 1

SHEET



1004 WEST VAN BUREN STREET
COLORADO SPRINGS, CO 80907

Hydrologic Soil Group—El Paso County Area, Colorado



MAP LEGEND**Area of Interest (AOI)**
 Area of Interest (AOI)
Soils**Soil Rating Polygons**

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features
 Streams and Canals
Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background
 Aerial Photography
MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
 Survey Area Data: Version 22, Sep 3, 2024

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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
67	Peyton sandy loam, 5 to 9 percent slopes	B	54.2	42.4%
69	Peyton-Pring complex, 8 to 15 percent slopes	B	6.8	5.3%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	67.0	52.3%
Totals for Area of Interest			127.9	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.



NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.0884°, Longitude: -104.7191°
Elevation: 7510 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 & aerals](#)

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	0.237 (0.195-0.291)	0.286 (0.235-0.351)	0.372 (0.304-0.457)	0.448 (0.364-0.553)	0.560 (0.442-0.722)	0.653 (0.502-0.849)	0.750 (0.556-0.999)	0.855 (0.606-1.17)	1.00 (0.680-1.40)	1.12 (0.737-1.58)
10-min	0.347 (0.285-0.425)	0.419 (0.344-0.514)	0.544 (0.445-0.669)	0.656 (0.533-0.809)	0.820 (0.648-1.06)	0.956 (0.735-1.24)	1.10 (0.814-1.46)	1.25 (0.887-1.71)	1.47 (0.996-2.05)	1.64 (1.08-2.31)
15-min	0.423 (0.348-0.519)	0.511 (0.420-0.627)	0.664 (0.543-0.816)	0.800 (0.650-0.987)	1.00 (0.790-1.29)	1.16 (0.896-1.52)	1.34 (0.993-1.78)	1.53 (1.08-2.08)	1.79 (1.22-2.50)	2.00 (1.32-2.82)
30-min	0.609 (0.501-0.746)	0.734 (0.603-0.900)	0.952 (0.779-1.17)	1.15 (0.932-1.41)	1.43 (1.13-1.85)	1.67 (1.28-2.17)	1.92 (1.42-2.55)	2.19 (1.55-2.98)	2.56 (1.74-3.58)	2.86 (1.88-4.04)
60-min	0.772 (0.635-0.946)	0.923 (0.758-1.13)	1.20 (0.978-1.47)	1.44 (1.17-1.78)	1.82 (1.44-2.35)	2.13 (1.64-2.79)	2.47 (1.84-3.30)	2.84 (2.02-3.89)	3.36 (2.29-4.72)	3.78 (2.50-5.34)
2-hr	0.935 (0.773-1.14)	1.11 (0.919-1.36)	1.44 (1.18-1.76)	1.74 (1.42-2.13)	2.20 (1.76-2.84)	2.60 (2.02-3.38)	3.03 (2.26-4.02)	3.49 (2.50-4.76)	4.16 (2.86-5.81)	4.71 (3.13-6.61)
3-hr	1.02 (0.844-1.24)	1.20 (0.996-1.46)	1.55 (1.28-1.88)	1.88 (1.54-2.29)	2.39 (1.92-3.09)	2.84 (2.21-3.69)	3.33 (2.50-4.42)	3.86 (2.78-5.26)	4.64 (3.20-6.47)	5.28 (3.52-7.38)
6-hr	1.18 (0.985-1.42)	1.38 (1.15-1.66)	1.76 (1.46-2.12)	2.13 (1.75-2.58)	2.72 (2.21-3.50)	3.24 (2.55-4.20)	3.82 (2.89-5.06)	4.47 (3.24-6.06)	5.42 (3.76-7.51)	6.20 (4.16-8.61)
12-hr	1.39 (1.16-1.66)	1.61 (1.34-1.92)	2.02 (1.69-2.43)	2.44 (2.02-2.94)	3.10 (2.52-3.96)	3.68 (2.91-4.73)	4.33 (3.30-5.68)	5.05 (3.68-6.79)	6.11 (4.27-8.41)	6.98 (4.72-9.63)
24-hr	1.63 (1.37-1.94)	1.90 (1.60-2.26)	2.40 (2.01-2.86)	2.86 (2.39-3.43)	3.60 (2.94-4.54)	4.23 (3.35-5.37)	4.92 (3.76-6.39)	5.67 (4.15-7.55)	6.77 (4.76-9.23)	7.66 (5.21-10.5)
2-day	1.90 (1.60-2.24)	2.25 (1.90-2.66)	2.87 (2.42-3.40)	3.42 (2.86-4.06)	4.24 (3.45-5.26)	4.91 (3.90-6.16)	5.63 (4.31-7.22)	6.39 (4.69-8.41)	7.47 (5.27-10.1)	8.33 (5.70-11.3)
3-day	2.09 (1.77-2.45)	2.47 (2.09-2.90)	3.14 (2.65-3.70)	3.73 (3.13-4.41)	4.59 (3.75-5.66)	5.30 (4.22-6.60)	6.04 (4.64-7.71)	6.84 (5.03-8.94)	7.94 (5.62-10.7)	8.82 (6.06-12.0)
4-day	2.24 (1.91-2.63)	2.64 (2.24-3.10)	3.33 (2.82-3.92)	3.94 (3.32-4.65)	4.83 (3.96-5.94)	5.57 (4.44-6.92)	6.34 (4.88-8.06)	7.16 (5.28-9.34)	8.30 (5.89-11.1)	9.21 (6.35-12.5)
7-day	2.64 (2.26-3.08)	3.06 (2.61-3.57)	3.79 (3.22-4.43)	4.44 (3.75-5.21)	5.39 (4.43-6.58)	6.17 (4.94-7.62)	6.99 (5.41-8.83)	7.86 (5.84-10.2)	9.08 (6.48-12.1)	10.0 (6.97-13.5)
10-day	2.98 (2.55-3.46)	3.43 (2.94-3.99)	4.21 (3.59-4.90)	4.90 (4.15-5.72)	5.90 (4.86-7.17)	6.72 (5.40-8.26)	7.58 (5.88-9.54)	8.49 (6.32-11.0)	9.76 (6.99-12.9)	10.8 (7.50-14.4)
20-day	3.94 (3.39-4.54)	4.52 (3.88-5.21)	5.48 (4.69-6.34)	6.30 (5.37-7.32)	7.48 (6.18-8.99)	8.42 (6.80-10.2)	9.39 (7.32-11.7)	10.4 (7.78-13.3)	11.8 (8.48-15.5)	12.9 (9.01-17.1)
30-day	4.74 (4.09-5.44)	5.43 (4.68-6.23)	6.56 (5.64-7.56)	7.52 (6.42-8.69)	8.84 (7.31-10.5)	9.87 (7.98-11.9)	10.9 (8.53-13.5)	12.0 (8.99-15.2)	13.4 (9.68-17.5)	14.5 (10.2-19.2)
45-day	5.74 (4.97-6.56)	6.59 (5.70-7.54)	7.95 (6.85-9.11)	9.06 (7.77-10.4)	10.6 (8.73-12.5)	11.7 (9.46-14.0)	12.8 (10.0-15.7)	13.9 (10.5-17.6)	15.4 (11.1-19.9)	16.4 (11.6-21.7)
60-day	6.61 (5.73-7.53)	7.58 (6.57-8.65)	9.13 (7.89-10.4)	10.4 (8.91-11.9)	12.0 (9.94-14.1)	13.2 (10.7-15.8)	14.4 (11.3-17.6)	15.5 (11.7-19.5)	16.9 (12.3-21.8)	18.0 (12.7-23.6)

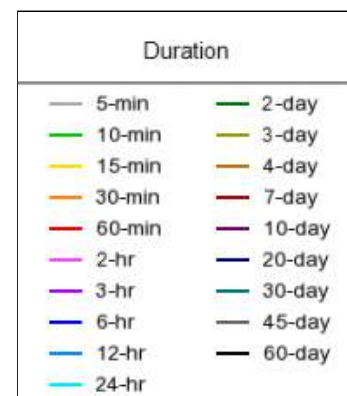
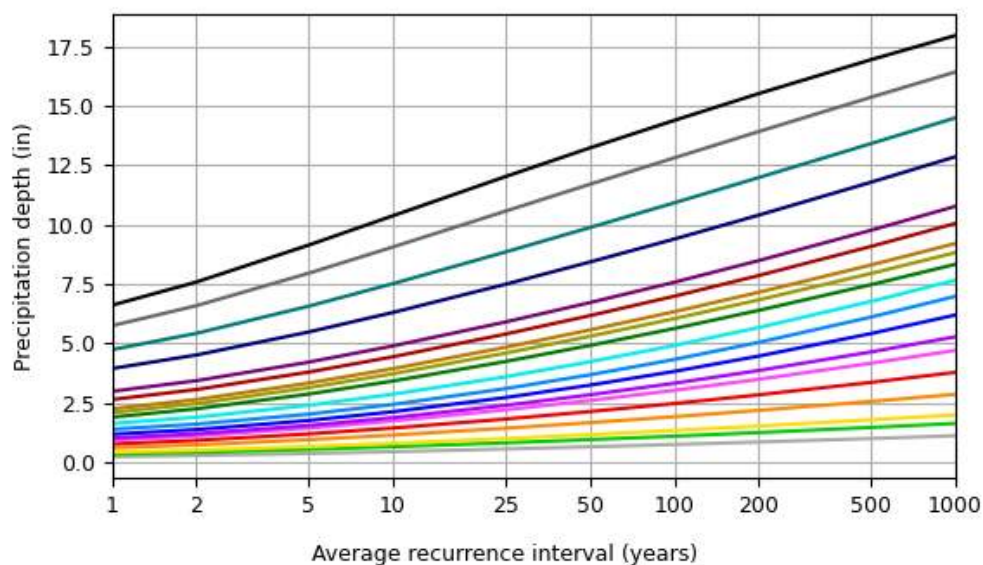
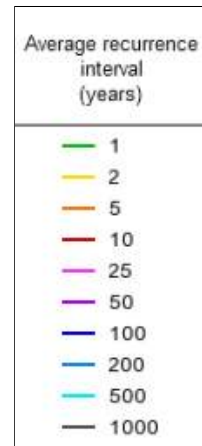
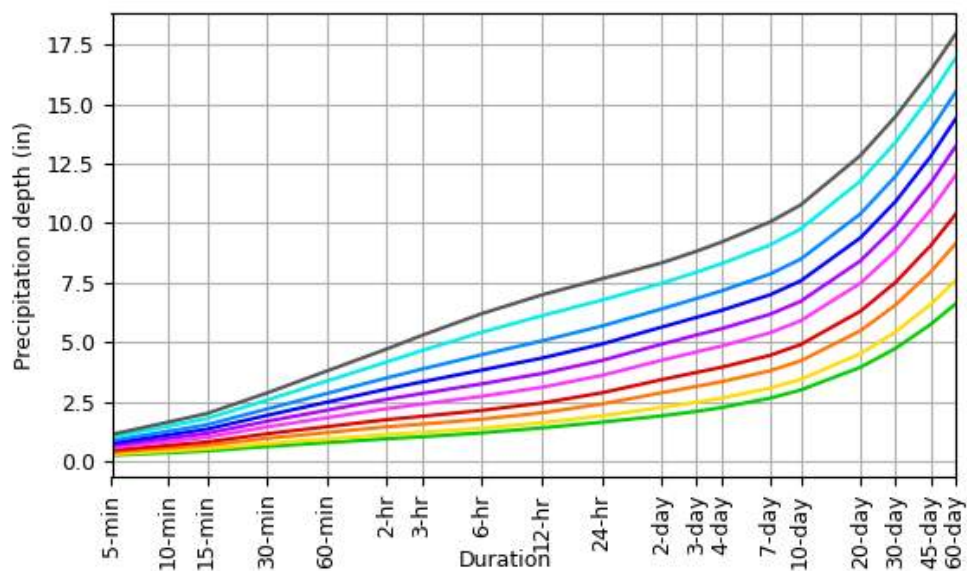
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and 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.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

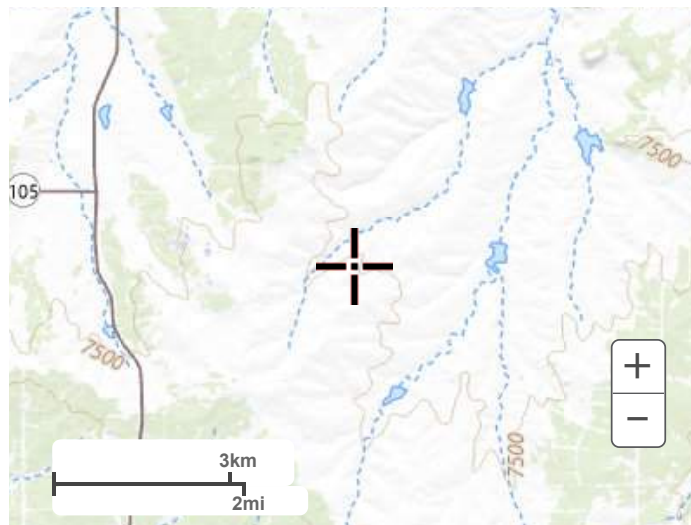
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NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Thu Jun 19 01:06:57 2025

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**Large scale terrain****Large scale map****Large scale aerial**



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

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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 **Floodway Data** 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 to landward of 0.0' North American Vertical Datum of 1988 (NAVD83). 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. 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 the map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zone codes used in the production of FIRM 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 (NAVD83)**. 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
NGA, NAD83
National Geodetic Survey
SSMCC-3, W022
1315 East-Need 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 (202) 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 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 the map represent the hydraulic modeling baselines that match the flood profile 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 data for each community as well as a listing of the panels on which each community is located.

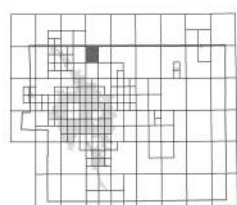
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-368-9620 and its website at <http://www.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>.

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.	

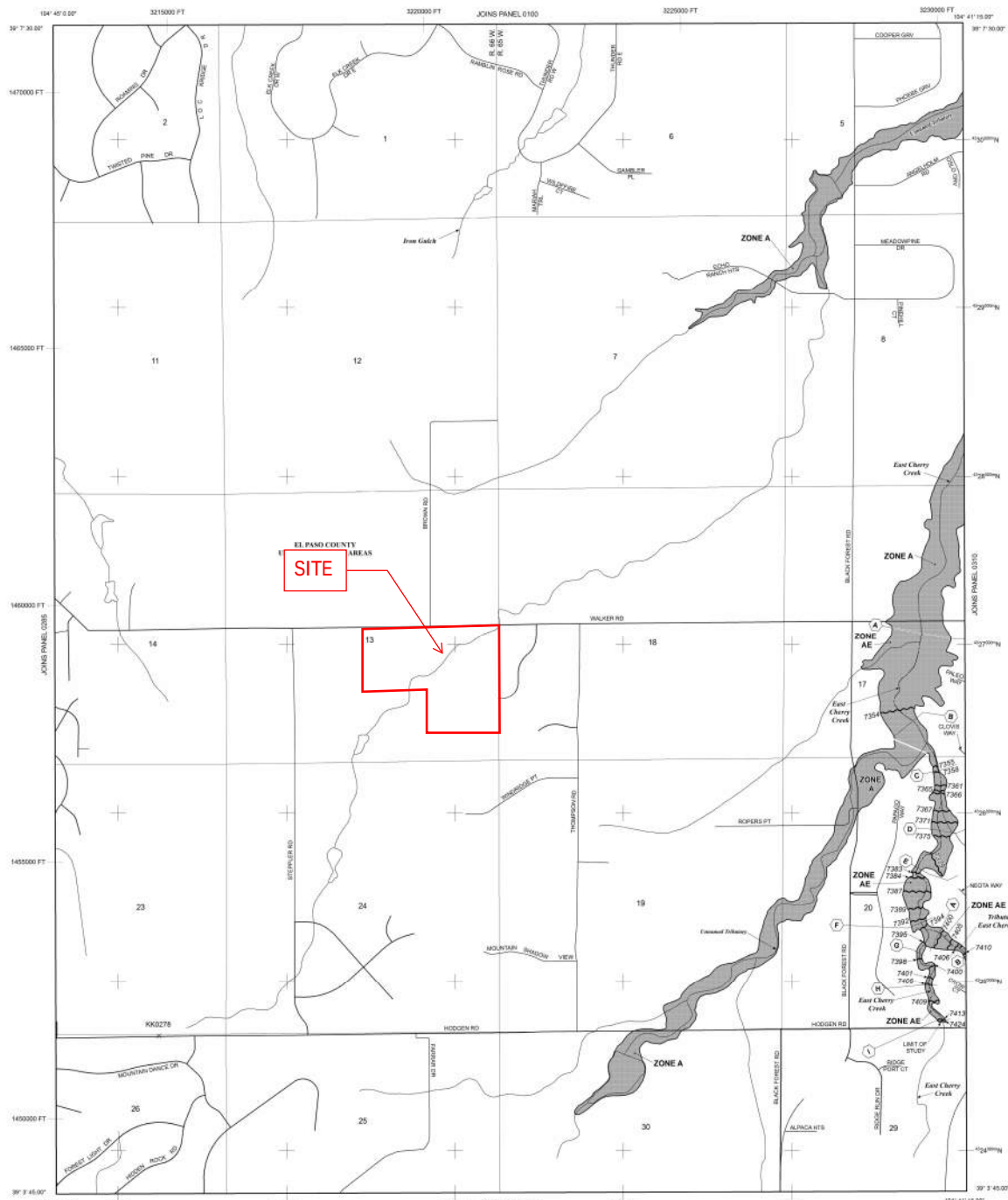
Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperative Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWC) 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 11 SOUTH, RANGE 85 WEST, AND TOWNSHIP 11 SOUTH, RANGE 86 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO FLOODING 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, AV, V, and VE. The **base flood elevation** is the water surface elevation of the 1% annual chance flood.

ZONE A: No base flood elevation determined.

ZONE AE: Base flood elevations determined.

ZONE AH: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of actual 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 abandoned. Zone AR indicates that the former flood control system is being retained to provide protection from the 1% annual chance flood.

ZONE AV: Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; see Base Flood Elevation Determination.

ZONE V: Coastal flood zone with velocity hazard (wave action); see Base Flood Elevation Determination.

ZONE VE: Coastal flood zone with velocity hazard (wave action); see Base Flood Elevation Determination.

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 less than 1 square mile; and areas protected by levees from 1% annual chance flood.

UTHER AREAS:

ZONE X: Areas determined to be outside the 0.2% annual chance floodplains.

ZONE D: Areas in which flood heights 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.

— Base Flood Elevation line and value; elevation in feet.

— Base Flood Elevation value where uniform within zone; elevation in feet.

* Referenced to the North American Vertical Datum of 1988 (NAVD83).

— Cross section line

— Transect line

— Geographic coordinates referenced to the North American Vertical Datum of 1988 (NAVD83).

— 1000-meter Universal Transverse Mercator grid lines, zone 13.

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APPENDIX B – HYDROLOGIC CALCULATIONS

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Project Name: Iron Ridge Subdivision
Project Number: 25009
Calculated By: NQJ
Checked By: REB
Date: 9/1/2026

EXISTING CONDITIONS - BASIN SUMMARY TABLE							
Sub-basin	Area (ac)	Impervious	C ₅	C ₁₀₀	t _c (min)	Q _{5-YR} (cfs)	Q _{100-YR} (cfs)
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4
EX1	14.90	3.4%	0.10	0.37	33.7	3.5	21.3
EX2	6.91	2.0%	0.09	0.36	21.1	1.9	12.6
EX3	17.98	3.4%	0.10	0.37	30.3	4.5	27.4
EX4	6.94	2.0%	0.09	0.36	19.5	2.0	13.1
EX5	39.65	2.0%	0.09	0.36	28.5	9.1	61.2
EX6	1.43	22.2%	0.22	0.45	11.1	1.2	4.3
EX7	3.54	2.0%	0.09	0.36	21.7	0.9	6.3
EX8	26.55	3.4%	0.10	0.37	38.3	5.5	34.7
EX9	12.23	2.0%	0.09	0.36	30.0	2.7	18.4
EX10	2.15	2.0%	0.09	0.36	15.9	0.7	4.5
EX11	2.85	11.3%	0.15	0.41	15.8	1.5	6.8
EX12	0.89	16.7%	0.20	0.44	15.2	0.6	2.3

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE		
DP#	Q _{5-YR}	Q _{100-YR}
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	3.5	21.3
2	3.9	24.4
3	11.6	74.4
4	12.5	80.8
5 (ONSITE)	14.0	89.0
5 (TOTAL)	48.7	291.5
6	2.7	18.4
7 (ONSITE)	3.5	20.3
7 (TOTAL)	7.8	40.7

COMPOSITE % IMPERVIOUS CALCULATIONS - EXISTING CONDITIONS

Subdivision: Iron Ridge Subdivision
 Location: El Paso County

Project Name: Iron Ridge Subdivision
 Project No.: 25009.00
 Calculated By: NQJ
 Checked By: REB
 Date: 9/1/26

Basin ID	Total Area (ac)	Gravel Drives				Paved				2.5+ Acre Lots				Historic				Weighted C ₅ & C ₁₀₀		Basins Total Weighted % Imp.
		C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	
OS1	723.20	See Basin OS1 Streamstats data in Appendix B																		-
OS2	38.40	See Basin OS2 Streamstats data in Appendix B																		-
OS3	53.90	See Basin OS3 Streamstats data in Appendix B																		-
EX1	14.90	0.59	0.70	0.00	80.0%	0.90	0.96	0.22	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	14.68	2.0%	0.10	0.37	3.4%
EX2	6.91	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	6.91	2.0%	0.09	0.36	2.0%
EX3	17.98	0.59	0.70	0.00	80.0%	0.90	0.96	0.25	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	17.73	2.0%	0.10	0.37	3.4%
EX4	6.94	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	6.94	2.0%	0.09	0.36	2.0%
EX5	39.65	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	39.65	2.0%	0.09	0.36	2.0%
EX6	1.43	0.59	0.70	0.37	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	1.06	2.0%	0.22	0.45	22.2%
EX7	3.54	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	3.54	2.0%	0.09	0.36	2.0%
EX8	26.55	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	7.18	7.0%	0.09	0.36	19.36	2.0%	0.10	0.37	3.4%
EX9	12.23	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	12.23	2.0%	0.09	0.36	2.0%
EX10	2.15	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	2.15	2.0%	0.09	0.36	2.0%
EX11	2.85	0.59	0.70	0.08	80.0%	0.90	0.96	0.07	100.0%	0.12	0.39	2.70	7.0%	0.09	0.36	0.00	2.0%	0.15	0.41	11.3%
EX12	0.89	0.59	0.70	0.08	80.0%	0.90	0.96	0.07	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.74	2.0%	0.20	0.44	16.7%
EX1-EX9	136.01																			3.0%

STANDARD FORM SF-2 - EXISTING CONDITIONS

TIME OF CONCENTRATION

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/1/26

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					t _c CHECK			FINAL	
DATA						(T _i)			(T _t)					(NON-URBANIZED BASINS)				
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C ₅	Weighted C ₁₀₀	Impervious (%)	L (ft)	S _o (%)	t _i (min)	L _t (ft)	S _t (%)	K	VEL. (ft/s)	t _t (min)	COMP. t _c (min)	TOTAL LENGTH (ft)	Urbanized t _c (min)		t _c (min)
OS1	723.20	See Basin OS1 Streamstats data in Appendix B																129.0
OS2	38.40	See Basin OS2 Streamstats data in Appendix B																62.4
OS3	53.90	See Basin OS3 Streamstats data in Appendix B																41.4
EX1	14.90	B	0.10	0.37	3.4%	300	6.6%	16.7	1490	4.4%	7.0	1.5	16.9	33.7	1790.0	37.9	33.7	
EX2	6.91	B	0.09	0.36	2.0%	300	10.0%	14.8	1142	4.0%	15.0	3.0	6.3	21.1	1442.0	35.9	21.1	
EX3	17.98	B	0.10	0.37	3.4%	300	8.3%	15.5	1390	5.0%	7.0	1.6	14.8	30.3	1690.0	36.4	30.3	
EX4	6.94	B	0.09	0.36	2.0%	300	10.0%	14.8	520	6.9%	7.0	1.8	4.7	19.5	820.0	29.2	19.5	
EX5	39.65	B	0.09	0.36	2.0%	300	5.0%	18.6	2064	5.3%	15.0	3.5	10.0	28.5	2364.0	41.8	28.5	
EX6	1.43	B	0.22	0.45	22.2%	20	2.0%	5.7	1388	7.9%	15.0	4.2	5.5	11.1	1408.0	29.0	11.1	
EX7	3.54	B	0.09	0.36	2.0%	200	10.0%	12.1	870	1.0%	15.0	1.5	9.7	21.7	1070.0	41.3	21.7	
EX8	26.55	B	0.10	0.37	3.4%	300	2.7%	22.6	1600	4.8%	7.0	1.5	17.4	40.0	1900.0	38.3	38.3	
EX9	12.23	B	0.09	0.36	2.0%	300	3.4%	21.0	890	5.6%	7.0	1.7	8.9	30.0	1190.0	32.4	30.0	
EX10	2.15	B	0.09	0.36	2.0%	155	4.9%	13.4	254	5.9%	7.0	1.7	2.5	15.9	409.0	27.5	15.9	
EX11	2.85	B	0.15	0.41	11.3%	205	7.3%	12.7	257	3.9%	7.0	1.4	3.1	15.8	462.0	26.1	15.8	
EX12	0.89	B	0.20	0.44	16.7%	205	7.3%	12.1	257	3.9%	7.0	1.4	3.1	15.2	462.0	25.1	15.2	

NOTES:

$$t_c = t_i + t_t$$

$$Eq \quad t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.333}}$$

Equation 6-3

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

Where:

t_i = overland (initial) flow time (minutes)

C₅ = runoff coefficient for 5-year frequency (from Table 6-4)

L_i = length of overland flow (ft)

S_o = average slope along the overland flow path (ft/ft).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

$$Equation \ 6-4 \ 2(6 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Equation 6-5

Where:

t_t = channelized flow time (travel time, min)

L_t = waterway length (ft)

S_o = waterway slope (ft/ft)

V_t = travel time velocity (ft/sec) = K√S_o

K = NRCS conveyance factor (see Table 6-2).

or:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.

L_t = length of channelized flow path (ft)

i = imperviousness (expressed as a decimal)

S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

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

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Project Name: Iron Ridge Subdivision

Project No.: 25009.00

Calculated By: NQJ

Checked By: REB

Date: 5/19/26

Subdivision: Iron Ridge Subdivision

Location: El Paso County

Design Storm: 5-Year

DESCRIPTION	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_c (min)	
	OS1	OS1	723.20	-	129.0	115.59	0.29	33.9															BASIN OS1 @ DPOS1
	OS2	OS2	38.40	-	62.4	2.53	1.38	3.5					3.5	2.53	3					661	1.2	9.1	BASIN OS1 @ DPOS2
	OS1								129.0	118.12	0.29	34.6	34.6	118.12	0.8					2300	0.6	61.2	COMBINED OS1 AND OS2 FLOW @ DPOS1, CONTINUES TO DP5
	1	EX1	14.49	0.10	33.7	1.48	2.31	3.4	33.7	1.48	2.31	3.4	3.4	1.48	2.8					905	1.2	12.9	BASIN EX1 @ DP1, DRAINAGEWAY FLOW TO DP2
		EX2	6.91	0.09	21.1	0.62	3.01	1.9															BASIN EX2 @ DP2
	2								46.5	2.10	1.82	3.8	3.8	2.10	2.2					610	1.0	9.8	DP1 & BASIN EX2 COMBINED @ DP2, DRAINAGEWAY TO DP3
		EX3	17.98	0.10	30.3	1.82	2.46	4.5															BASIN EX3 @ DP3
		EX5	39.65	0.09	28.5	3.57	2.56	9.1															BASIN EX5 @ DP3
	3								56.3	7.49	1.54	11.5	11.5	7.49	0.9					476	0.7	11.9	DP2, BASIN EX3 & EX5 COMBINED @ DP3, DRAINAGEWAY FLOW TO DP4
		EX4	6.94	0.09	19.5	0.62	3.13	2.0															BASIN EX4 @ DP4
	4								56.3	8.12	1.54	12.5	12.5	8.12	2					750	1.0	12.6	DP3 & BASIN EX4 COMBINED @ DP4, DRAINAGEWAY FLOW TO DP5
		EX6	1.43	0.22	11.1	0.31	3.97	1.2															BASIN EX6 @ DP5
		EX7	3.54	0.09	21.7	0.32	2.97	0.9															BASIN EX7 @ DP5
		EX8	26.55	0.10	38.3	2.60	2.12	5.5															BASIN EX8 @ DP5
	5								68.9	11.35	1.23	14.0											TOTAL SITE FLOW @ DP5 (<u>EXCLUDES</u> BASIN OS1 & OS2)
	5											48.6											TOTAL SITE & OFFSITE FLOW @ DP5 (<u>INCLUDES</u> BASIN OS1 & OS2)

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge Subdivision

Location: El Paso County

Design Storm: 5-Year

Project Name: Iron Ridge Subdivision

Project No.: 25009.00

Calculated By: NQJ

Checked By: REB

Date: 5/19/26

DESCRIPTION	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_c (min)	
	OS3	OS3	53.90	-	41.4	2.15	2.00	4.3															BASIN OS3 FLOW @ DPOS3
	6	EX9	12.23	0.09	28.5	1.10	2.56	2.8					2.8	1.10	4.4					1010	1.5	11.5	BASIN EX9 FLOW @ DP6, DRAINAGEWAY FLOW TO DP5
		EX10	2.15	0.09	15.9	0.19	3.43	0.7															BASIN EX10 @ DP7
		EX11	2.85	0.12	16.2	0.35	3.41	1.2															BASIN EX11 @ DP7
		EX12	0.89	0.20	15.2	0.18	3.50	0.6															BASIN EX12 (Flows off-site)
	7								40.0	1.65	2.05	3.4											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (<u>EXCLUDES</u> BASIN OS3)
	7											7.7											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (<u>INCLUDES</u> BASIN OS3)

Notes:

Street, Pipe, & OS Basin C*A values are determined by Q/i using the catchment's intensity value.

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

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/1/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	Q_{direct} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS1	OS1	723.20	-	129.0	407.6	0.49	199.0															BASIN OS1 @ DPOS1
	OS2	OS2	38.40	-	62.4	7.07	2.32	16.4					3.5	7.07	3					661	1.2	9.1	BASIN OS1 @ DPOS2
	OS1								129.0	414.63	0.49	202.5											COMBINED OS1 AND OS2 FLOW @ DPOS1, CONTINUES TO DP5
	1	EX1	14.90	0.37	33.7	5.50	3.87	21.3	33.7	5.50	3.87	21.3	21.3	5.50	2.8					905	1.2	12.9	BASIN EX1 @ DP1, DRAINAGEWAY FLOW TO DP2
		EX2	6.91	0.36	21.1	2.49	5.05	12.6															BASIN EX2 @ DP2
	2								46.5	7.98	3.06	24.4	24.4	7.98	2.2					610	1.0	9.8	DP1 & BASIN EX2 COMBINED @ DP2, DRAINAGEWAY TO DP3
		EX3	17.98	0.37	30.3	6.62	4.14	27.4															BASIN EX3 @ DP3
		EX5	39.65	0.36	28.5	14.27	4.29	61.2															BASIN EX5 @ DP3
	3								56.3	28.88	2.58	74.4	74.4	28.88	0.9					476	0.7	11.9	DP2, BASIN EX3 & EX5 COMBINED @ DP3, DRAINAGEWAY FLOW TO DP4
		EX4	6.94	0.36	19.5	2.50	5.25	13.1															BASIN EX4 @ DP4
	4								56.3	31.38	2.58	80.8	80.8	31.38	2					750	1.0	12.6	DP3 & BASIN EX4 COMBINED @ DP4, DRAINAGEWAY FLOW TO DP5
		EX6	1.43	0.45	11.1	0.64	6.66	4.3															BASIN EX6 @ DP5
		EX7	3.54	0.36	21.7	1.27	4.98	6.3															BASIN EX7 @ DP5
		EX8	26.55	0.37	38.3	9.77	3.55	34.7															BASIN EX8 @ DP5
	5								69.0	43.06	2.07	89.0											TOTAL SITE FLOW @ DP5 (EXCLUDES BASIN OS1 & OS2)
	5											291.5											TOTAL SITE & OFFSITE FLOW @ DP5 (INCLUDES BASIN OS1 & OS2)

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

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/1/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	Q_{direct} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS3	OS3	53.90	-	41.4	6.09	3.35	20.4															BASIN OS3 FLOW @ DPOS3
	6	EX9	12.23	0.36	30.0	4.40	4.17	18.4					18.4	4.40	2.5					931	1.1	14.0	BASIN EX9 FLOW @ DP6, DRAINAGEWAY FLOW TO DP5
		EX10	2.15	0.36	15.9	0.77	5.76	4.5															BASIN EX10 @ DP7
		EX11	2.85	0.41	15.8	1.18	5.78	6.8															BASIN EX11 @ DP7
		EX12	0.89	0.44	15.2	0.39	5.88	2.3															BASIN EX12 (Flows off-site)
	7								44.0	6.36	3.20	20.3											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (EXCLUDES BASIN OS3)
	7											40.7											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (<u>INCLUDES</u> BASIN OS3)

Notes:
Street, Pipe, & OS Basin C*A values are determined by Q/i using the catchment's intensity value.

Subdivision: Iron Ridge
Location: El Paso County
Project Name: Iron Ridge
Project Number: 25009
Calculated By: NOJ
Checked By: REB
Date: 9/10/2026

PROPOSED CALCS - BASIN SUMMARY TABLE							
Tributary	Area	Percent	C _s	C ₁₀₀	t _c	Q _c	Q ₁₀₀
Sub-basin	(acres)	Impervious			(min)	(cfs)	(cfs)
A1	8.74	3.8%	0.11	0.37	25.4	2.6	14.9
A2	5.68	7.0%	0.12	0.39	18.5	2.2	11.9
B1	6.83	9.9%	0.14	0.41	20.7	3.0	14.2
B2	1.13	32.3%	0.34	0.55	15.9	1.3	3.6
C	2.84	16.2%	0.20	0.45	16.4	1.9	7.2
D	0.86	41.9%	0.42	0.60	14.6	1.3	3.1
E	0.47	42.7%	0.43	0.60	9.5	0.8	2.0
F	2.87	4.3%	0.14	0.41	20.4	1.3	6.0
G	8.15	5.5%	0.11	0.38	31.7	2.2	12.5
H	9.25	3.1%	0.10	0.37	19.9	3.0	17.7
I	3.54	2.0%	0.09	0.36	21.8	0.9	6.3
J	1.35	27.1%	0.30	0.51	14.9	1.4	4.1
K	0.89	7.0%	0.12	0.39	9.6	0.4	2.4
L1	4.82	6.4%	0.12	0.39	29.5	1.4	7.8
L2	7.18	4.1%	0.11	0.37	24.3	2.2	12.6
M	2.06	6.9%	0.12	0.39	13.3	0.9	5.0
N1	1.18	25.7%	0.27	0.50	11.3	1.3	3.9
N2	1.25	18.2%	0.21	0.46	11.2	1.1	3.8
O	0.60	22.4%	0.24	0.47	10.1	0.6	2.0
P	5.00	13.2%	0.17	0.43	17.8	2.8	11.7
Q	1.21	21.1%	0.24	0.47	11.7	1.1	3.8
R	1.82	24.8%	0.27	0.50	14.3	1.8	5.5
S	0.57	36.8%	0.37	0.57	9.8	0.9	2.2
T	0.97	5.2%	0.12	0.37	9.5	0.5	2.6
U1	6.63	0.0%	0.09	0.35	28.7	1.5	9.9
U2	7.43	7.0%	0.12	0.39	22.7	2.6	14.1
U3	8.41	5.2%	0.11	0.38	32.7	2.2	12.6
U4	4.00	0.8%	0.09	0.35	17.7	1.2	7.8
U5	5.31	0.0%	0.09	0.35	19.8	1.5	9.7
V	24.97	3.9%	0.10	0.37	31.2	6.1	37.7
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4

DESIGN POINT SUMMARY TABLE		
DP#	Q _c -yr	Q ₁₀₀ -yr
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	2.6	14.9
1.1	5.8	29.1
2	5.9	23.7
3	6.4	25.1
3.1	7.4	27.2
4	8.4	32.2
4.1	0.1	23.9
5	8.4	64.5
5.1	8.5	0.0
6	9.5	76.3
7	5.4	26.6
7.1	2.2	12.6
8	0.9	5.0
9	2.3	7.7
10	2.9	9.6
11 (ONSITE)	4.1	20.4
11 (TOTAL)	8.4	40.8
12	2.9	14.8
13	4.7	21.5
14	4.8	22.7
14.1	0.1	14.4
15 (ONSITE)	11.6	85.3
15 (TOTAL)	46.3	287.7

WATER QUALITY SUMMARY TABLE					
Sub-basin	Area (acres)	WQ Source			
		Pond	Exclusion I.6.		Undeveloped
A1	8.74		1.8.5		
A2	5.68		1.8.5		
B1	6.83	Pond 1			
B2	1.13	Pond 1			
C	2.84	Pond 1			
D	0.86	Pond 1			
E	0.47	Pond 1			
F	2.87	Pond 1			
G	8.15		1.8.5		
H	9.25		1.8.5		
I	3.54				X
J	1.35				X
K	0.89		1.8.5		
L1	4.82		1.8.5		
L2	7.18		1.8.5		
M	2.06		1.8.5		
N1	1.18		1.8.5	3.A.1	
N2	1.25		1.8.5	3.A.1	
O	0.60		1.8.5	3.A.1	
P	5.00	Pond 2			
Q	1.21	Pond 2			
R	1.82	Pond 2			
S	0.57	Pond 2			
T	0.97	Pond 2			
U1	6.63		1.8.5		X
U2	7.43		1.8.5		
U3	8.41		1.8.5		
U4	4.00		1.8.5	1.B.7	
U5	5.31		1.8.5		X
V	24.97		1.8.5		X
TOTAL	136.01	24.56	75.37	0.46	0.50
					35.12

EXISTING V. PROPOSED DESIGN POINT COMPARISON						
Ex/Pr DP	Ex Q _c (cfs)	Ex Q ₁₀₀ (cfs)	Pr Q _c (cfs)	Pr Q ₁₀₀ (cfs)	Q _c Change	Q ₁₀₀ Change
5/15	14.0	89.0	11.6	85.3	-17.1%	-4.2%
7/11	3.5	20.3	4.1	20.4	18.2%	0.3%

COMPOSITE % IMPERVIOUS CALCULATIONS - PROPOSED CONDITIONS

Subdivision: Iron Ridge
Location: El Paso County

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: NQJ
Date: 9/10/26

Basin ID	Total Area (ac)	Gravel				Paved				Pasture/Meadow/Lawns				2.5+ Large Lots				Historic				Weighted C ₅ & C ₁₀₀		Basins Total Weighted % Imp.
		C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	Area (ac)	% Imp.	C ₅	C ₁₀₀	
																						C ₅	C ₁₀₀	
OS1	723.20	See Basin OS1 Streamstats data in Appendix B																						-
OS2	38.40	See Basin OS2 Streamstats data in Appendix B																						-
OS3	53.90	See Basin OS3 Streamstats data in Appendix B																						-
A1	8.74	0.59	0.70	0.00	80.0%	0.90	0.96	0.06	100.0%	0.09	0.35	4.85	0.0%	0.12	0.39	3.83	7.0%	0.09	0.36	0.00	2.0%	0.11	0.37	3.8%
A2	5.68	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	5.68	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	7.0%
B1	6.83	0.59	0.70	0.04	80.0%	0.90	0.96	0.18	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	6.60	7.0%	0.09	0.36	0.00	2.0%	0.14	0.41	9.9%
B2	1.13	0.59	0.70	0.00	80.0%	0.90	0.96	0.33	100.0%	0.09	0.35	0.37	0.0%	0.12	0.39	0.42	7.0%	0.09	0.36	0.00	2.0%	0.34	0.55	32.3%
C	2.84	0.59	0.70	0.02	80.0%	0.90	0.96	0.28	100.0%	0.09	0.35	0.22	0.0%	0.12	0.39	2.31	7.0%	0.09	0.36	0.00	2.0%	0.20	0.45	16.2%
D	0.86	0.59	0.70	0.04	80.0%	0.90	0.96	0.32	100.0%	0.09	0.35	0.33	0.0%	0.12	0.39	0.17	7.0%	0.09	0.36	0.00	2.0%	0.42	0.60	41.9%
E	0.47	0.59	0.70	0.03	80.0%	0.90	0.96	0.18	100.0%	0.09	0.35	0.24	0.0%	0.12	0.39	0.02	7.0%	0.09	0.36	0.00	2.0%	0.43	0.60	42.7%
F	2.87	0.59	0.70	0.09	80.0%	0.90	0.96	0.03	100.0%	0.09	0.35	0.03	0.0%	0.12	0.39	2.71	7.0%	0.09	0.36	0.00	2.0%	0.14	0.41	10.3%
G	8.15	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	1.71	0.0%	0.12	0.39	6.44	7.0%	0.09	0.36	0.00	2.0%	0.11	0.38	5.5%
H	9.25	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	5.18	0.0%	0.12	0.39	4.07	7.0%	0.09	0.36	0.00	2.0%	0.10	0.37	3.1%
I	3.54	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	3.54	2.0%	0.09	0.36	2.0%
J	1.35	0.59	0.70	0.00	80.0%	0.90	0.96	0.34	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.10	7.0%	0.09	0.36	0.91	2.0%	0.30	0.51	27.1%
K	0.89	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.89	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	7.0%
L1	4.82	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.43	0.0%	0.12	0.39	4.39	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	6.4%
L2	7.18	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	2.94	0.0%	0.12	0.39	4.24	7.0%	0.09	0.36	0.00	2.0%	0.11	0.37	4.1%
M	2.06	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.04	0.0%	0.12	0.39	2.02	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	6.9%
N1	1.18	0.59	0.70	0.03	80.0%	0.90	0.96	0.22	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.94	7.0%	0.09	0.36	0.00	2.0%	0.27	0.50	25.7%
N2	1.25	0.59	0.70	0.01	80.0%	0.90	0.96	0.14	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	1.09	7.0%	0.09	0.36	0.00	2.0%	0.21	0.46	18.2%
O	0.60	0.59	0.70	0.04	80.0%	0.90	0.96	0.07	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.49	7.0%	0.09	0.36	0.00	2.0%	0.24	0.47	22.4%
P	5.00	0.59	0.70	0.04	80.0%	0.90	0.96	0.34	100.0%	0.09	0.35	0.55	0.0%	0.12	0.39	4.07	7.0%	0.09	0.36	0.00	2.0%	0.17	0.43	13.2%
Q	1.21	0.59	0.70	0.03	80.0%	0.90	0.96	0.18	100.0%	0.09	0.35	0.26	0.0%	0.12	0.39	0.75	7.0%	0.09	0.36	0.00	2.0%	0.24	0.47	21.1%
R	1.82	0.59	0.70	0.04	80.0%	0.90	0.96	0.35	100.0%	0.09	0.35	0.39	0.0%	0.12	0.39	1.04	7.0%	0.09	0.36	0.00	2.0%	0.27	0.50	24.8%
S	0.57	0.59	0.70	0.03	80.0%	0.90	0.96	0.17	100.0%	0.09	0.35	0.24	0.0%	0.12	0.39	0.12	7.0%	0.09	0.36	0.00	2.0%	0.37	0.57	36.8%
T	0.97	0.59	0.70	0.05	80.0%	0.90	0.96	0.01	100.0%	0.09	0.35	0.91	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.00	2.0%	0.12	0.37	5.2%
U1	6.63	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	6.63	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.00	2.0%	0.09	0.35	0.0%
U2	7.43	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	7.43	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	7.0%
U3	8.41	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	2.15	0.0%	0.12	0.39	6.26	7.0%	0.09	0.36	0.00	2.0%	0.11	0.38	5.2%
U4	4.00	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	2.39	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	1.60	2.0%	0.09	0.35	0.8%
U5	5.31	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	5.26	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.06	2.0%	0.09	0.35	0.0%
V	24.97	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	9.58	7.0%	0.09	0.36	15.39	2.0%	0.10	0.37	3.9%
A-V TOTAL	136.01																							6.9%
Pond 1 (B-F)	14.99																							15.7%
Pond 2 (P-T)	9.57																							17.0%

STANDARD FORM SF-2 - PROPOSED CONDITIONS

TIME OF CONCENTRATION

Subdivision: Iron Ridge
 Location: El Paso County

Project Name: Iron Ridge
 Project No.: 25009.00
 Calculated By: NQJ
 Checked By: NQJ
 Date: 9/10/26

SUB-BASIN					INITIAL/OVERLAND			TRAVEL TIME					tc CHECK			FINAL
DATA					(T _i)			(T _t)					(URBANIZED BASINS)			
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C ₅	Impervious (%)	L (ft)	S _o (%)	t _i (min)	L _t (ft)	S _t (%)	K	VEL. (ft/s)	t _t (min)	COMP. t _c (min)	TOTAL LENGTH (ft)	Urbanized t _c (min)	t _c (min)
OS1	723.20	B	See Basin OS1 Streamstats data in Appendix B													129.0
OS2	38.40	B	See Basin OS2 Streamstats data in Appendix B													62.4
OS3	53.90	B	See Basin OS3 Streamstats data in Appendix B													41.4
A1	8.74	B	0.11	3.8%	300	8.6%	15.2	903	4.5%	7.0	1.5	10.1	25.4	1203.0	32.8	25.4
A2	5.68	B	0.12	7.0%	175	6.3%	12.8	530	4.8%	7.0	1.5	5.8	18.5	705.0	28.8	18.5
B1	6.83	B	0.14	9.9%	300	5.7%	16.8	832	5.6%	15.0	3.5	3.9	20.7	1132.0	30.0	20.7
B2	1.13	B	0.34	32.3%	134	2.0%	12.6	693	5.6%	15.0	3.5	3.3	15.9	827.0	24.1	15.9
C	2.84	B	0.20	16.2%	250	5.6%	14.6	413	6.0%	15.0	3.7	1.9	16.4	663.0	25.7	16.4
D	0.86	B	0.42	41.9%	127	1.7%	11.6	631	5.8%	15.0	3.6	2.9	14.6	758.0	21.8	14.6
E	0.47	B	0.43	42.7%	65	3.8%	6.3	530	3.4%	15.0	2.8	3.2	9.5	595.0	21.9	9.5
F	2.87	B	0.14	4.3%	240	4.1%	16.8	507	11.0%	7.0	2.3	3.6	20.4	747.0	27.9	20.4
G	8.15	B	0.11	5.5%	300	7.3%	16.0	1396	4.5%	7.0	1.5	15.7	31.7	1696.0	36.3	31.7
H	9.25	B	0.10	3.1%	205	7.1%	13.5	658	5.9%	7.0	1.7	6.4	19.9	863.0	30.3	19.9
I	3.54	B	0.09	2.0%	300	10.8%	14.4	665	1.0%	15.0	1.5	7.4	21.8	965.0	37.6	21.8
J	1.35	B	0.30	27.1%	99	6.0%	8.0	1257	4.1%	15.0	3.0	6.9	14.9	1356.0	29.5	14.9
K	0.89	B	0.12	7.0%	60	8.3%	6.8	270	5.5%	7.0	1.6	2.7	9.6	330.0	26.7	9.6
L1	4.82	B	0.12	6.4%	300	3.4%	20.5	895	5.6%	7.0	1.7	9.0	29.5	1195.0	31.3	29.5
L2	7.18	B	0.11	4.1%	300	3.7%	20.2	415	5.8%	7.0	1.7	4.1	24.3	715.0	28.3	24.3
M	2.06	B	0.12	6.9%	125	8.0%	10.0	272	3.7%	7.0	1.3	3.4	13.3	397.0	27.2	13.3
N1	1.18	B	0.27	25.7%	175	7.0%	10.4	152	3.4%	15.0	2.8	0.9	11.3	327.0	22.7	11.3
N2	1.25	B	0.21	18.2%	200	8.7%	11.1	30	5.0%	15.0	3.4	0.1	11.2	230.0	23.1	11.2
O	0.60	B	0.24	22.4%	150	9.0%	9.2	80	1.0%	15.0	1.5	0.9	10.1	230.0	23.3	10.1
P	5.00	B	0.17	13.2%	300	6.6%	15.5	448	4.7%	15.0	3.3	2.3	17.8	748.0	26.9	17.8
Q	1.21	B	0.24	21.1%	132	8.3%	8.9	375	2.2%	15.0	2.2	2.8	11.7	507.0	25.9	11.7
R	1.82	B	0.27	24.8%	112	3.5%	10.5	794	5.3%	15.0	3.5	3.8	14.3	906.0	26.4	14.3
S	0.57	B	0.37	36.8%	30	2.0%	5.7	543	2.2%	15.0	2.2	4.1	9.8	573.0	24.1	9.8
T	0.97	B	0.12	5.2%	50	5.0%	7.3	244	6.9%	7.0	1.8	2.2	9.5	294.0	26.7	9.5
U1	6.63	B	0.09	0.0%	250	8.1%	14.5	1252	6.0%	6.0	1.5	14.2	28.7	1502.0	35.5	28.7

STANDARD FORM SF-2 - PROPOSED CONDITIONS

TIME OF CONCENTRATION

Subdivision: Iron Ridge
 Location: El Paso County

Project Name: Iron Ridge
 Project No.: 25009.00
 Calculated By: NQJ
 Checked By: NQJ
 Date: 9/10/26

SUB-BASIN					INITIAL/OVERLAND			TRAVEL TIME					t _c CHECK			FINAL
DATA					(T _i)			(T _t)					(URBANIZED BASINS)			
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C ₅	Impervious (%)	L (ft)	S _o (%)	t _i (min)	L _t (ft)	S _t (%)	K	VEL. (ft/s)	t _t (min)	COMP. t _c (min)	TOTAL LENGTH (ft)	Urbanized t _c (min)	t _c (min)
U2	7.43	B	0.12	7.0%	300	5.8%	17.2	524	5.0%	7.0	1.6	5.6	22.7	824.0	28.7	22.7
U3	8.41	B	0.11	5.2%	300	4.3%	19.1	1428	6.2%	7.0	1.7	13.7	32.7	1728.0	34.9	32.7
U4	4.00	B	0.09	0.8%	220	7.3%	14.0	829	6.4%	15.0	3.8	3.6	17.7	1049.0	31.9	17.7
U5	5.31	B	0.09	0.0%	300	10.0%	14.8	450	6.2%	6.0	1.5	5.0	19.8	750.0	29.3	19.8
V	24.97	B	0.10	3.9%	300	10.0%	14.6	1379	3.9%	7.0	1.4	16.6	31.2	1679.0	37.5	31.2

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)

L_t = waterway length (ft)

S_o = waterway slope (ft/ft)

V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$

K = NRCS conveyance factor (see Table 6-2).

$$\text{Eq } t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)

C_s = runoff coefficient for 5-year frequency (from Table 6-4)

L_i = length of overland flow (ft)

S_o = average slope along the overland flow path (ft/ft).

$$\text{Equation 6-4 } t_c = 16 - 17i + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

∴

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.

L_t = length of channelized flow path (ft)

i = imperviousness (expressed as a decimal)

S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

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

Equation 6-5

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

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

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NOJ
Checked By: REB
Date: 9/1/26

Please revise.

DESCRIPTION	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t _c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t _t (min)	
	OS1	OS1	723.20	-	129.0	115.59	0.29	33.9					3.5	2.53	3					661	1.2	9.1	BASIN OS1 @ DPOS1
	OS2	OS2	38.40	-	62.4	2.53	1.38	3.5															BASIN OS1 @ DPOS2
	OS1								129.0	118.12	0.29	34.6	#####	118.12	0.8					2300	0.6	61.2	COMBINED OS1 AND OS2 FLOW @ DPOS1, CONTINUES TO DP5
	1	EX1	14.90	0.10	33.7	1.52	2.31	3.5	33.7	1.52	2.31	3.5	3.5	1.52	2.8					905	1.2	12.9	BASIN EX1 @ DP1, DRAINAGEWAY FLOW TO DP2
		EX2	6.91	0.09	21.1	0.62	3.01	1.9															BASIN EX2 @ DP2
	2								46.5	2.14	1.82	3.9	3.9	2.14	2.2					610	1.0	9.8	DP1 & BASIN EX2 COMBINED @ DP2, DRAINAGEWAY TO DP3
		EX3	17.98	0.10	30.3	1.82	2.46	4.5															BASIN EX3 @ DP3
		EX5	39.65	0.09	28.5	3.57	2.56	9.1															BASIN EX5 @ DP3
	3								56.3	7.53	1.54	11.6	11.6	7.53	0.9					476	0.7	11.9	DP2, BASIN EX3 & EX5 COMBINED @ DP3, DRAINAGEWAY FLOW TO DP4
		EX4	6.94	0.09	19.5	0.62	3.13	2.0															BASIN EX4 @ DP4
	4								56.3	8.15	1.54	12.5	12.5	8.15	2					750	1.0	12.6	DP3 & BASIN EX4 COMBINED @ DP4, DRAINAGEWAY FLOW TO DP5
		EX6	1.43	0.22	11.1	0.31	3.97	1.2															BASIN EX6 @ DP5
		EX7	3.54	0.09	21.7	0.32	2.97	0.9															BASIN EX7 @ DP5
		EX8	26.55	0.10	38.3	2.60	2.12	5.5															BASIN EX8 @ DP5
	5								69.0	11.39	1.23	14.0											TOTAL SITE FLOW @ DP5 (EXCLUDES BASIN OS1 & OS2)
	5											48.7											TOTAL SITE & OFFSITE FLOW @ DP5 (INCLUDES BASIN OS1 & OS2)

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

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NOJ
Checked By: REB
Date: 9/1/26

DESCRIPTION	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS3	OS3	53.90	-	41.4	2.15	2.00	4.3															BASIN OS3 FLOW @ DPOS3
	6	EX9	12.23	0.09	30.0	1.10	2.48	2.7					2.7	1.10	4.4					931	1.5	10.6	BASIN EX9 FLOW @ DP6, DRAINAGEWAY FLOW TO DP5
		EX10	2.15	0.09	15.9	0.19	3.43	0.7															BASIN EX10 @ DP7
		EX11	2.85	0.15	15.8	0.43	3.44	1.5															BASIN EX11 @ DP7
		EX12	0.89	0.20	15.2	0.18	3.50	0.6															BASIN EX12 (Flows off-site)
	7								40.5	1.73	2.03	3.5											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (EXCLUDES BASIN OS3)
	7											7.8											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (INCLUDES BASIN OS3)

Notes:
Street, Pipe, & OS Basin C*A values are determined by Q/i using the catchment's intensity value.

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

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t _c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t _t (min)	
	OS1	OS1	723.20	-	129.0	407.6	0.49	199.0															BASIN OS1 FLOW @ DPOS1,CONTINUES TO DP15
	OS2	OS2	38.40	-	62.4	7.07	2.32	16.4					3.5	7.07	3					661	1.2	9.1	BASIN OS2 FLOW @ DPOS2, CONTINUES TO DP15
	OS1							129.0	414.63	0.49	202.5												COMBINED OS1 AND OS2 FLOW @ DP0S1, CONTINUES TO DP15
	1	A1	8.74	0.37	25.4	3.25	4.59	14.9	25.4	3.25	4.59	14.9	14.9	3.25	4.9					260	1.5	2.8	BASIN A FLOW @ DP1, Continues through Basin A2 to DP1.1 where it combines with Basin A2 flows.
	1.1	A2	5.68	0.39	18.5	2.22	5.38	11.9	28.2	5.46	4.32	23.6	23.6	5.46	1.8					1369	0.9	24.3	BASIN A2 flows to DP1.1, combines with Basin A1 & OS2 flows and continues into Trbiutary 1 to DP5
	1.1								62.4	12.54	2.32	29.1	29.1	12.54	1.8					1369	0.9	24.3	TOTAL FLOW @ DP1.1 (includes off-site flow from OS2)
		B1	6.83	0.41	20.7	2.78	5.09	14.2															BASIN B1 FLOW @ DP2
		B2	1.13	0.55	15.9	0.62	5.77	3.6															BASIN B2 FLOW @ DP2
		C	2.84	0.45	16.4	1.26	5.68	7.2															BASIN C FLOW @ DP2
	2								20.7	4.66	5.09	23.7				23.7	4.66	1.0	18	65	13.4	0.1	BASIN B & C COMBINED FLOW @ DP2, ENTERS 30" RCP CULVERT, PIPED TO DP3
		D	0.86	0.60	14.6	0.51	5.99	3.1								3.1	0.51	1.0	18	40	5.1	0.1	BASIN D FLOW IN ROADSIDE SWALE D, ENTERS 18" RCP CULVERT, PIPED TO DP3.1
		E	0.47	0.60	9.5	0.28	7.05	2.0															BASIN E FLOW, COMBINES IN SWALE @ DP3 WITH PIPED FLOWS FROM DP2, CONTINUES IN SWALE TO DP 3.1
	3								20.8	4.94	5.08	25.1	25.1	4.94	1.25					80	1.7	0.8	DP2, BASIN E & D @ DP3, SWALE FLOW TO DP4 (POND 1)
	3.1								21.6	5.46	4.99	27.2	27.2	5.46	6.4					240	3.8	1.1	DP2, BASIN E & D @ DP3, SWALE FLOW TO DP4 (POND 1)
		F	2.87	0.41	20.4	1.16	5.13	6.0															BASIN F FLOW ENTERS POND @ DP4
	4								22.7	6.62	4.87	32.2											COMBINED DP3.1 & BASIN F FLOWS @ DP4 (POND 1)
	4.1								32.7	6.05	3.95	23.9											CONTROLLED RELEASE FROM POND 1, TRAVELS OVERLAND TO DP5

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

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t _t (min)	
		G	8.15	0.38	31.7	3.11	4.03	12.5															BASIN G FLOW @ DP5
		H	9.25	0.37	19.9	3.40	5.19	17.7															BASIN H FLOW @ DP6
		I	3.54	0.36	21.8	1.27	4.97	6.3															BASIN I FLOW @ DP15
		J	1.35	0.51	14.9	0.69	5.93	4.1															BASIN J FLOW @ DP15
		K	0.89	0.39	9.6	0.35	7.05	2.4				2.4	0.35	5.7						1902	1.7	19.0	BASIN K @ DP5
	5	U1	6.63	0.35	28.7	2.32	4.28	9.9															BASIN U1 FLOW, ENTERS TRIBUTARY 1, CONTINUES TO DP5
	5	U2	7.43	0.39	22.7	2.90	4.86	14.1															BASIN U2 FLOW ENTERS TRIBUTARY 1 WITHIN BASIN U1, CONTINUES IN TRIBUTARY 1 TO DP5
	5	U3	8.41	0.38	32.7	3.19	3.94	12.6															BASIN U3 FLOW ENTERS TRIBUTARY 1 @ DP5
	5								52.5	23.39	2.76	64.5	64.5	23.39	1.0					176	0.7	4.2	DP1, BASIN G, BASIN K, Basin U1-U3, & POND 1 CONTROLLED RELEASE (DP4.1) FLOWS @ DP5, DRAINAGEWAY FLOW TO DP6
	5.1	U4	4.00	0.35	17.7	1.42	5.50	7.8															BASIN U4 FLOW ENTERS DP14.1 OUTFALL SWALE, COMBINES W. POND 2 CONTROLLED RELEASE AND CONTINUES IN SWALE TO TRIBUTARY 1 @ DP5.1
	5.1								56.7	28.22	2.56	72.3	72.3	28.22	2.0					400	1.0	6.7	DP5, BASIN H, BASIN U1-4 & POND 2 DISCHARGE @ DP5.1, DRAINAGEWAY FLOW TO DP6
	6	U5	5.31	0.35	19.8	1.86	5.21	9.7															BASIN U5 FLOW ENTERS TRIBUTARY 1 @ DP6
	6								63.4	33.48	2.28	76.3	76.3	33.48	2					600	1.0	10.1	DP5, BASIN H, BASIN U & POND 2 DISCHARGE @ DP6, DRAINAGEWAY FLOW TO DP15
	OS3	OS3	53.90	-	41.4	6.09	3.35	20.4															BASIN OS3 @ DPOS3, DRAINAGEWAY TO DP11
	7	L1	4.82	0.39	29.5	1.86	4.20	7.8					7.8	1.86	2.5					1196	1.1	18.0	BASIN L1 @ DP7, OFFSITE FLOW EAST TO DP11 via TRIBUTARY 3
	7								41.4	7.95	3.35	26.6	26.6	7.95	2.5					1196	1.1	18.0	TOTAL FLOW @ DP7 (includes off-site flow from OS3)
	7.1	L2	7.18	0.37	24.3	2.68	4.70	12.6					12.6	2.68	2.5					650	1.1	9.8	BASIN L2 @ DP7.1, OFFSITE FLOW EAST TO DP11 via TRIBUTARY 3
	8	M	2.06	0.39	13.3	0.80	6.21	5.0					5.0	0.80	2.5					525	1.1	7.9	BASIN M @ DP8, OFFSITE FLOW EAST TO DP11
		N1	1.18	0.50	11.3	0.59	6.62	3.9															BASIN N1 FLOW IN SWALE @ DP9
		N2	1.25	0.46	11.2	0.57	6.64	3.8															BASIN N2 FLOW IN SWALE @ DP9
															7.7	1.16	1.0	18	40	6.5	0.1		COMBINED FLOW IN SWALE @ DP9, ENTERS 18" RCP CULVERT, PIPED TO BASIN O, CONTINUES OVERLAND TO

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

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	9							11.3	1.16	6.62	7.7												DP10
		O	0.60	0.47	10.1	0.28	6.91	2.0															BASIN O @ DP10
	10							11.4	1.45	6.60	9.6	9.6	1.45	10						350	2.2	2.6	DP9 & BASIN O @ DP10, OVERLAND FLOW TO DP11
	11							47.5	6.79	3.00	20.4												DP7, DP8 & DP10 COMBINED @ DP11 (EXCLUDES BASIN OS3)
	11										40.8												DP7, DP8, DP10 & DPOS3 COMBINED @ DP11 (INCLUDES BASIN OS3)
		P	5.00	0.43	17.8	2.14	5.47	11.7															BASIN P FLOW @ DP12

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

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

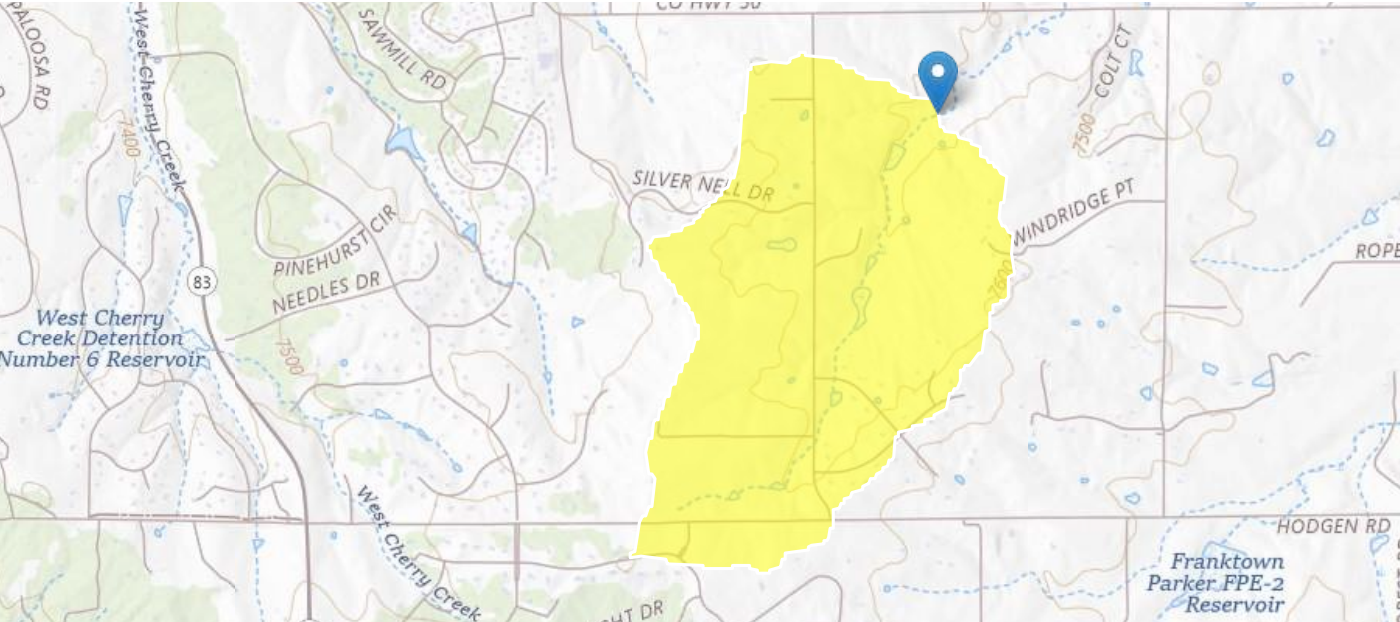
Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t _c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	γ (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t _t (min)	
		Q	1.21	0.47	11.7	0.57	6.54	3.8															BASIN Q FLOW @ DP12
	12								17.8	2.71	5.47	14.8				14.8	2.71	1.0	18	65	8.4	0.1	COMBINED BASIN P & Q FLOW @ DP12, ENTERS 24" RCP CULVERT, PIPED TO DP 13
		R	1.82	0.50	14.3	0.91	6.03	5.5															BASIN R FLOW @ DP13
		S	0.57	0.57	9.8	0.32	6.99	2.2															BASIN S FLOW @ DP13
	13								18.0	3.94	5.46	21.5	21.5	3.94	10					185	2.2	1.4	DP12, BASIN R & S COMBINED FLOW @ DP13 IN SWALE T, CONTINUE IN SWALE TO DP14 (POND 2)
		T	0.97	0.37	9.5	0.36	7.05	2.6															BASIN T FLOW @ DP14
	14								19.4	4.30	5.27	22.7											COMBINED DP13 & BASIN T FLOW @ DP14 (POND 2)
	14.1								29.4	3.41	4.22	14.4											CONTROLLED RELEASE FROM POND 1 @ DP14.1, TRAVELS OVERLAND TO DP5
		V	24.97	0.37	31.2	9.28	4.06	37.7															BASIN V @ DP15
	15								73.5	44.73	1.91	85.3											TOTAL SITE FLOW @ DP15 (EXCLUDES BASIN OS1 & OS2)
	15											287.7											TOTAL SITE & OFFSITE FLOW @ DP15 (INCLUDES BASIN OS1 & OS2)

Notes:
Street, Pipe, & OS Basin C*A values are determined by Q/i using the catchment's intensity value.

Iron Ridge Subdivision - DPOS1 - Offsite Drainage Basin South

Region ID: CO
Workspace ID: CO20250911180450987000
Clicked Point (Latitude, Longitude): 39.08832, -104.72674
Time: 2025-09-11 12:05:15 -0600



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Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	7	percent
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	99.4	feet per mi
DRNAREA	Area that drains to a point on a stream	1.13	square miles
EL7500	Percent of area above 7500 ft	97	percent
ELEV	Mean Basin Elevation	7588	feet
ELEVMAX	Maximum basin elevation	7700	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.96	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.92	inches
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.83	inches
I6H2Y	Maximum 6-hour precipitation that occurs on average once in 2 years	1.38	inches
LAT_OUT	Latitude of Basin Outlet	39.088337	degrees
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	3.9	percent

Parameter Code	Parameter Description	Value	Unit
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	0.6	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	69	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	4	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	26.5	percent
LC11SNOIC	Percent snow and ice from NLCD 2011 class 12	0	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0	percent
LFPLENGTH	Length of longest flow path	1.96	miles
LONG_OUT	Longitude of Basin Outlet	-104.726713	degrees
MINBELEV	Minimum basin elevation	7470	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7474	feet
PRECIP	Mean Annual Precipitation	21.75	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	61.76	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.25	dimensionless
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	100	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent
STATSCLAY	Percentage of clay soils from STATSGO	16.3	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	1.1	percent
TOC	Time of concentration in hours	2.15	hours

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.13	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.83	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	7474	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	11.8	ft^3/s	117
20-percent AEP flood	33.9	ft^3/s	87

Statistic	Value	Unit	ASEp
10-percent AEP flood	57.6	ft ³ /s	80
4-percent AEP flood	100	ft ³ /s	80
2-percent AEP flood	143	ft ³ /s	83
1-percent AEP flood	199	ft ³ /s	88
0.5-percent AEP flood	263	ft ³ /s	94
0.2-percent AEP flood	368	ft ³ /s	104

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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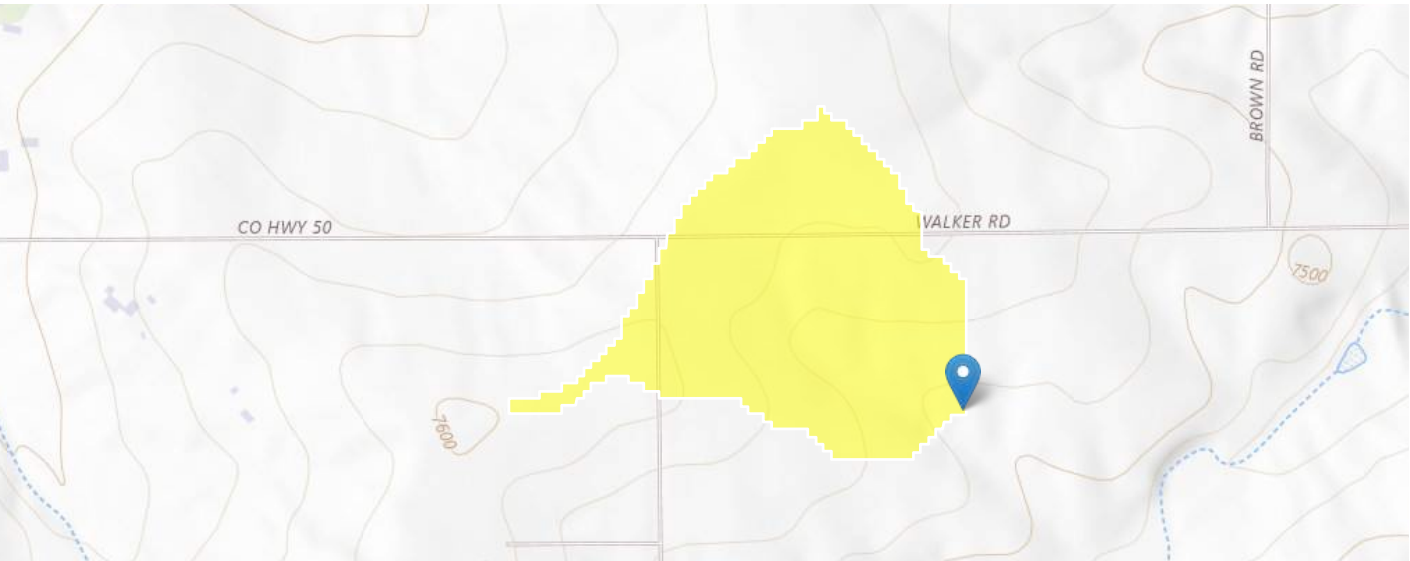
Application Version: 4.29.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Iron Ridge Subdivision - DPOS2 - Offsite Drainage Basin West

Region ID: CO
Workspace ID: CO20250911180928394000
Clicked Point (Latitude, Longitude): 39.09053, -104.72889
Time: 2025-09-11 12:09:51 -0600



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Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	5	percent
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	146.3	feet per mi
DRNAREA	Area that drains to a point on a stream	0.0576	square miles
EL7500	Percent of area above 7500 ft	100	percent
ELEV	Mean Basin Elevation	7556	feet
ELEVMAX	Maximum basin elevation	7600	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.93	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.91	inches
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3	inches
I6H2Y	Maximum 6-hour precipitation that occurs on average once in 2 years	1.38	inches
LAT_OUT	Latitude of Basin Outlet	39.090594	degrees
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	10.2	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	0	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	78.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	10.3	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	11.7	percent
LC11SNOIC	Percent snow and ice from NLCD 2011 class 12	0	percent

Parameter Code	Parameter Description	Value	Unit
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0	percent
LFPLENGTH	Length of longest flow path	0.61	miles
LONG_OUT	Longitude of Basin Outlet	-104.728901	degrees
MINBELEV	Minimum basin elevation	7500	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7504	feet
PRECIP	Mean Annual Precipitation	21.86	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	60.17	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.25	dimensionless
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	100	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent
STATSCLAY	Percentage of clay soils from STATSGO	16.3	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0	percent
TOC	Time of concentration in hours	1.04	hours

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0576	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	7504	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5

Peak-Flow Statistics Disclaimers [Foothills Region Peak Flow 2016 5099]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

Statistic	Value	Unit
50-percent AEP flood	1.28	ft^3/s
20-percent AEP flood	3.46	ft^3/s
10-percent AEP flood	5.6	ft^3/s
4-percent AEP flood	9.1	ft^3/s
2-percent AEP flood	12.3	ft^3/s
1-percent AEP flood	16.4	ft^3/s
0.5-percent AEP flood	20.8	ft^3/s
0.2-percent AEP flood	27.8	ft^3/s

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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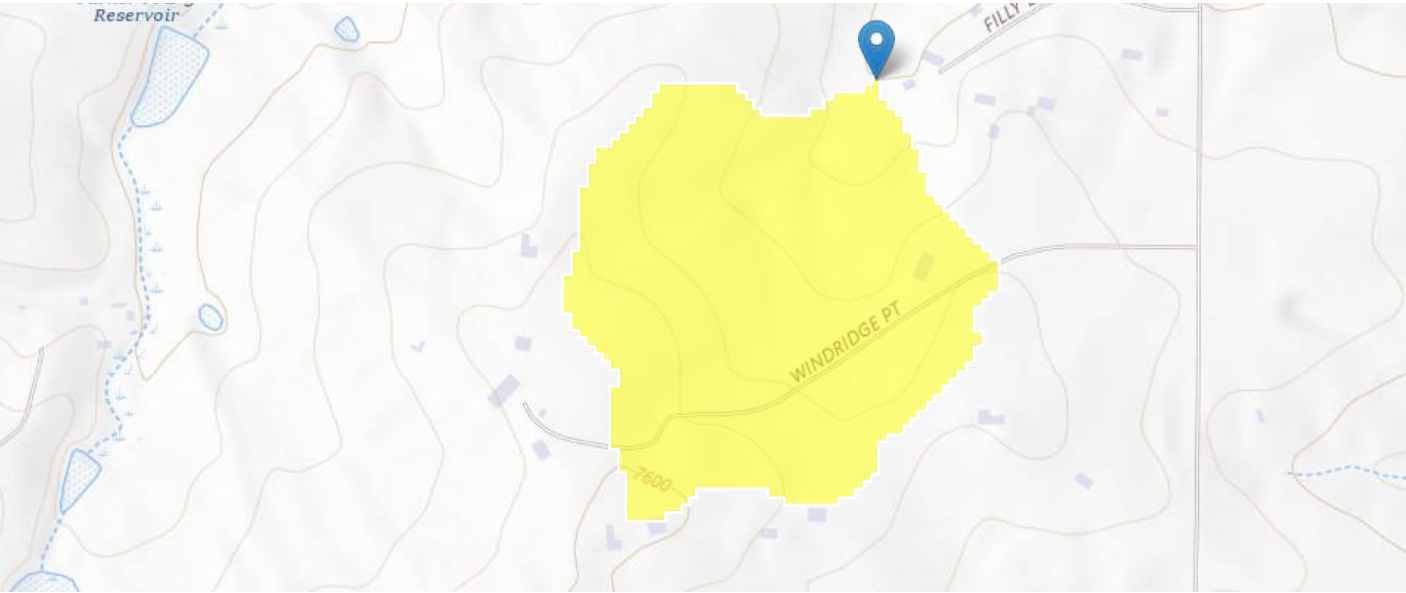
Application Version: 4.29.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Iron Ridge Subdivision - DPOS3 - Offsite Drainage Basin South

Region ID: CO
Workspace ID: C020250916210122474000
Clicked Point (Latitude, Longitude): 39.08654, -104.71870
Time: 2025-09-16 15:01:34 -0600



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Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	6	percent
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	268.2	feet per mi
DRNAREA	Area that drains to a point on a stream	0.0843	square miles
EL7500	Percent of area above 7500 ft	100	percent
ELEV	Mean Basin Elevation	7557	feet
ELEVMAX	Maximum basin elevation	7610	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.93	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.9	inches
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3	inches
I6H2Y	Maximum 6-hour precipitation that occurs on average once in 2 years	1.38	inches
LAT_OUT	Latitude of Basin Outlet	39.086515	degrees
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	0	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	0	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	70	percent

Parameter Code	Parameter Description	Value	Unit
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	30	percent
LC11SNOIC	Percent snow and ice from NLCD 2011 class 12	0	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0	percent
LFPLENGTH	Length of longest flow path	0.43	miles
LONG_OUT	Longitude of Basin Outlet	-104.718741	degrees
MINBELEV	Minimum basin elevation	7500	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7501	feet
PRECIP	Mean Annual Precipitation	21.46	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	61.66	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.24	dimensionless
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	100	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent
STATSCLAY	Percentage of clay soils from STATSGO	16.3	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0	percent
TOC	Time of concentration in hours	0.69	hours

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0843	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	7501	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5

Peak-Flow Statistics Disclaimers [Foothills Region Peak Flow 2016 5099]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

Statistic	Value	Unit
50-percent AEP flood	1.63	ft^3/s
20-percent AEP flood	4.34	ft^3/s
10-percent AEP flood	7	ft^3/s
4-percent AEP flood	11.4	ft^3/s

Statistic	Value	Unit
2-percent AEP flood	15.4	ft ³ /s
1-percent AEP flood	20.4	ft ³ /s
0.5-percent AEP flood	25.9	ft ³ /s
0.2-percent AEP flood	34.5	ft ³ /s

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A., 2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (<http://dx.doi.org/10.3133/sir20165099>)

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Application Version: 4.29.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1



APPENDIX C – HYDRAULIC CALCULATIONS

Subdivision: Iron Ridge
Location: El Paso County
Project Name: Iron Ridge
Project Number: 25009
Calculated By: REB
Checked By: NQJ
Date: 9/1/2026

Proposed Conditions - Drainageway/Swale Summary Table												
Swale Section/DP/ BASIN	Section Slope, ft/ft	100-year Depth, ft	100-year Velocity, ft/s	100-year Hydraulic Radius, ft	Froude, 100-yr	Shear Stress, 100-yr (lb/ft ²)	5-year Depth, ft	5-year Velocity, ft/s	5-year Hydraulic Radius, ft	Froude, 5-yr	Shear Stress, 5-yr (lb/ft ²)	COMMENT
DP1	0.0235	0.98	3.88	0.49	0.69	0.7	0.51	2.5	0.25	0.62	0.4	
DP1.1	0.0320	0.35	2.86	0.24	0.85	0.5	0.16	1.68	0.12	0.74	0.2	
B1	0.0990	0.46	4.86	0.22	1.26	1.4	0.32	3.63	0.15	1.13	1.0	MAX SLOPE
B2	0.0125	1.14	3.12	0.55	0.51	0.4	0.64	2.09	0.31	0.46	0.2	PROP. SWALE
C	0.0371	0.72	3.97	0.34	0.82	0.8	0.44	2.8	0.21	0.74	0.5	
D	0.0990	0.44	4.57	0.21	1.21	1.3	0.32	3.63	0.15	1.13	1.0	
E	0.0371	0.45	2.82	0.22	0.74	0.5	0.32	2.23	0.15	0.69	0.4	
N1	0.0655	0.52	4.12	0.25	1.01	1.0	0.34	3.21	0.16	0.97	0.7	MAX SLOPE
N1-1	0.0500	0.55	3.68	0.26	0.87	0.8					0.0	STABLE SLOPE
N2	0.0135	0.65	2.25	0.32	0.49	0.3	0.35	2.57	0.17	0.77	0.1	
P	0.0800	0.71	5.80	0.35	1.21	1.7	0.44	4.13	0.21	1.10	1.1	MAX SLOPE
P1	0.0400	0.85	4.63	0.41	0.89	1.0					0.0	STABLE SLOPE
Q	0.0200	0.61	2.55	0.30	0.58	0.4	0.4	1.96	0.19	0.55	0.2	
R	0.0800	0.54	4.72	0.26	1.13	1.3	0.37	3.76	0.18	1.09	0.9	
R	0.0500	0.63	3.96	0.30	0.88	0.9						
S	0.0200	0.49	2.29	0.24	0.58	0.3	0.37	1.88	0.18	0.54	0.2	
3-3.1	0.0125	1.34	3.49	0.65	0.53	0.5	0.8	2.50	0.39	0.49	0.3	
3.1-4	0.0633	1.08	6.88	0.52	1.17	2.1	0.66	4.82	0.32	1.05	1.3	
4.1	0.0400	0.66	4.96	0.45	1.08	1.1	0.13	1.18	0.06	0.58	0.2	
DP7	0.0340	0.48	3.51	0.32	0.89	0.7	0.26	1.97	0.14	0.68	0.3	OS3 - DP7 (TOTAL FLOW)
9-10	0.1550	0.28	4.34	0.14	1.44	1.4	0.18	3.17	0.09	1.32	0.9	
13-14 (1)	0.1000	0.87	7.50	0.42	1.42	2.6	0.49	5.00	0.24	1.26	1.5	MAX SLOPE
13-14 (2)	0.0170	1.21	3.88	0.59	0.62	0.6	0.68	2.60	0.33	0.56	0.3	CAPACITY
14.1 S1	0.0590	0.43	4.98	0.34	1.34	1.2	0.03	0.65	0.03	0.66	0.1	
14.1 S2	0.0752	0.41	5.29	0.32	1.46	1.5	0.03	0.65	0.03	0.66	0.1	
14.1 S3	0.0411	0.48	4.34	0.37	1.10	1.0	0.03	0.65	0.03	0.66	0.1	

Channel Report

ROAD-SIDE SWALE B - Q5

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

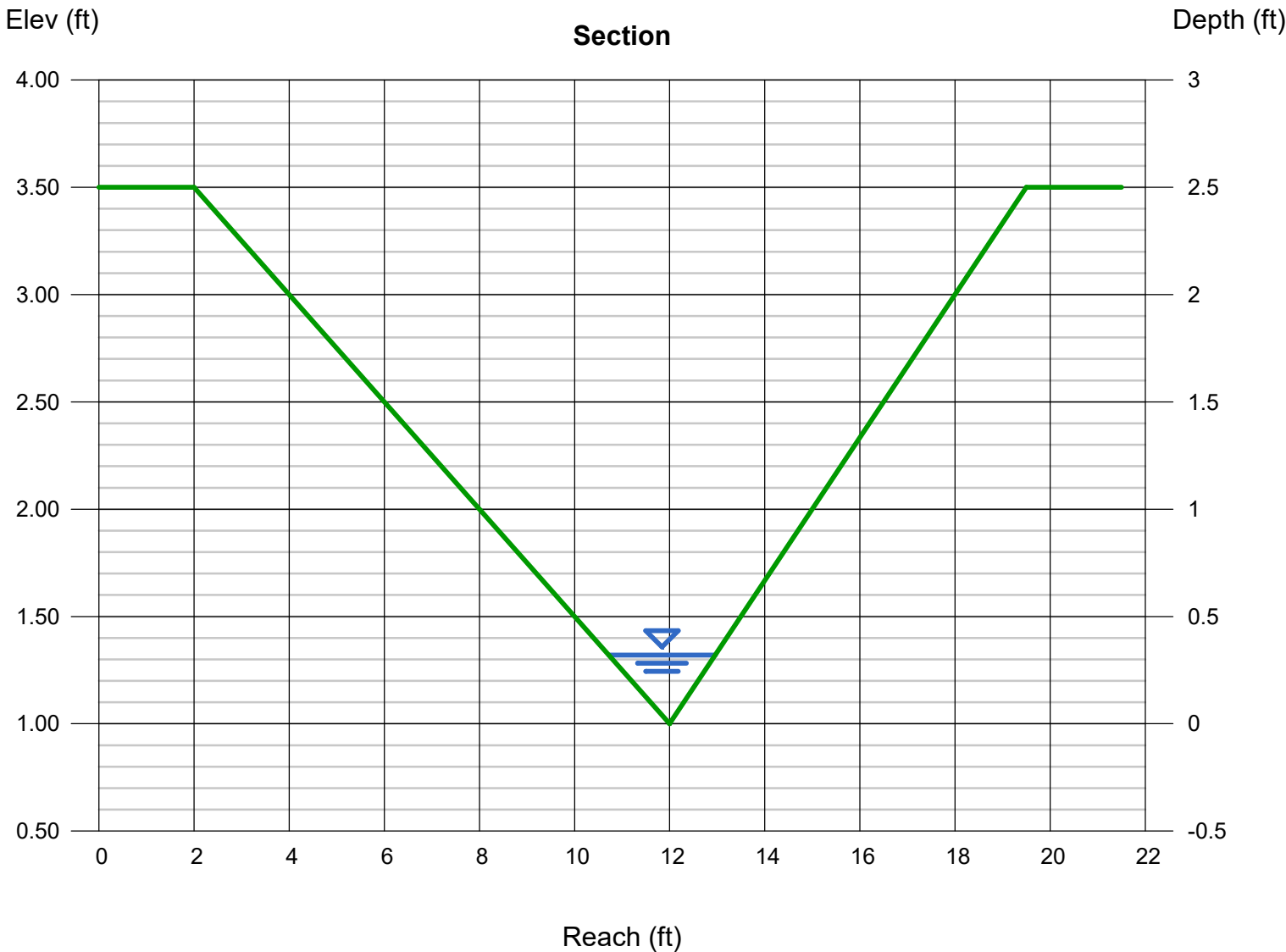
Invert Elev (ft) = 1.00
Slope (%) = 9.99
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.30

Highlighted

Depth (ft) = 0.32
Q (cfs) = 1.300
Area (sqft) = 0.36
Velocity (ft/s) = 3.63
Wetted Perim (ft) = 2.33
Crit Depth, Yc (ft) = 0.39
Top Width (ft) = 2.24
EGL (ft) = 0.52



Channel Report

ROAD-SIDE SWALE B - Q100

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

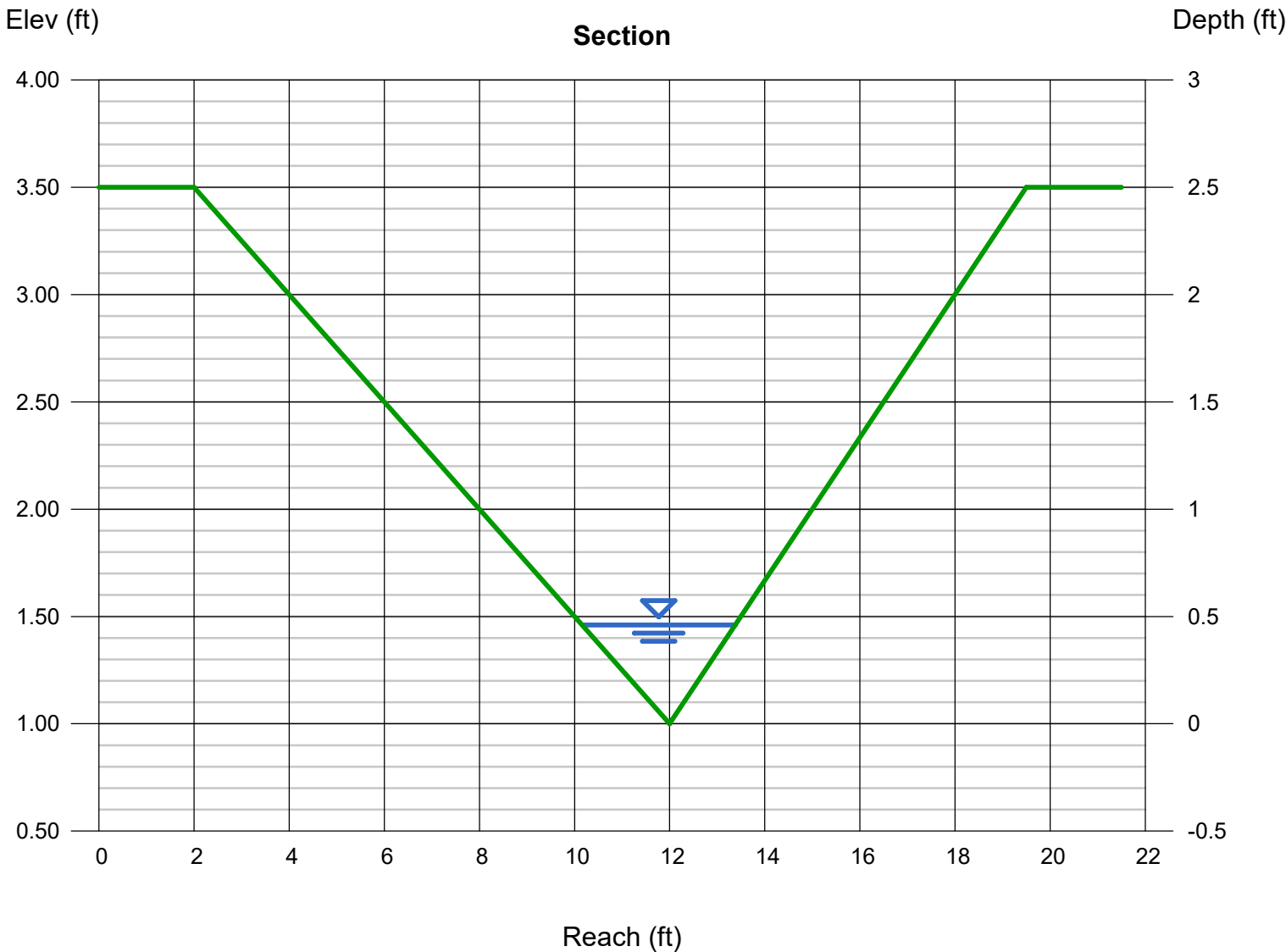
Invert Elev (ft) = 1.00
Slope (%) = 9.99
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.60

Highlighted

Depth (ft) = 0.46
Q (cfs) = 3.600
Area (sqft) = 0.74
Velocity (ft/s) = 4.86
Wetted Perim (ft) = 3.35
Crit Depth, Yc (ft) = 0.59
Top Width (ft) = 3.22
EGL (ft) = 0.83



Channel Report

B1

B2

SWALE BASIN B2 - Q5

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

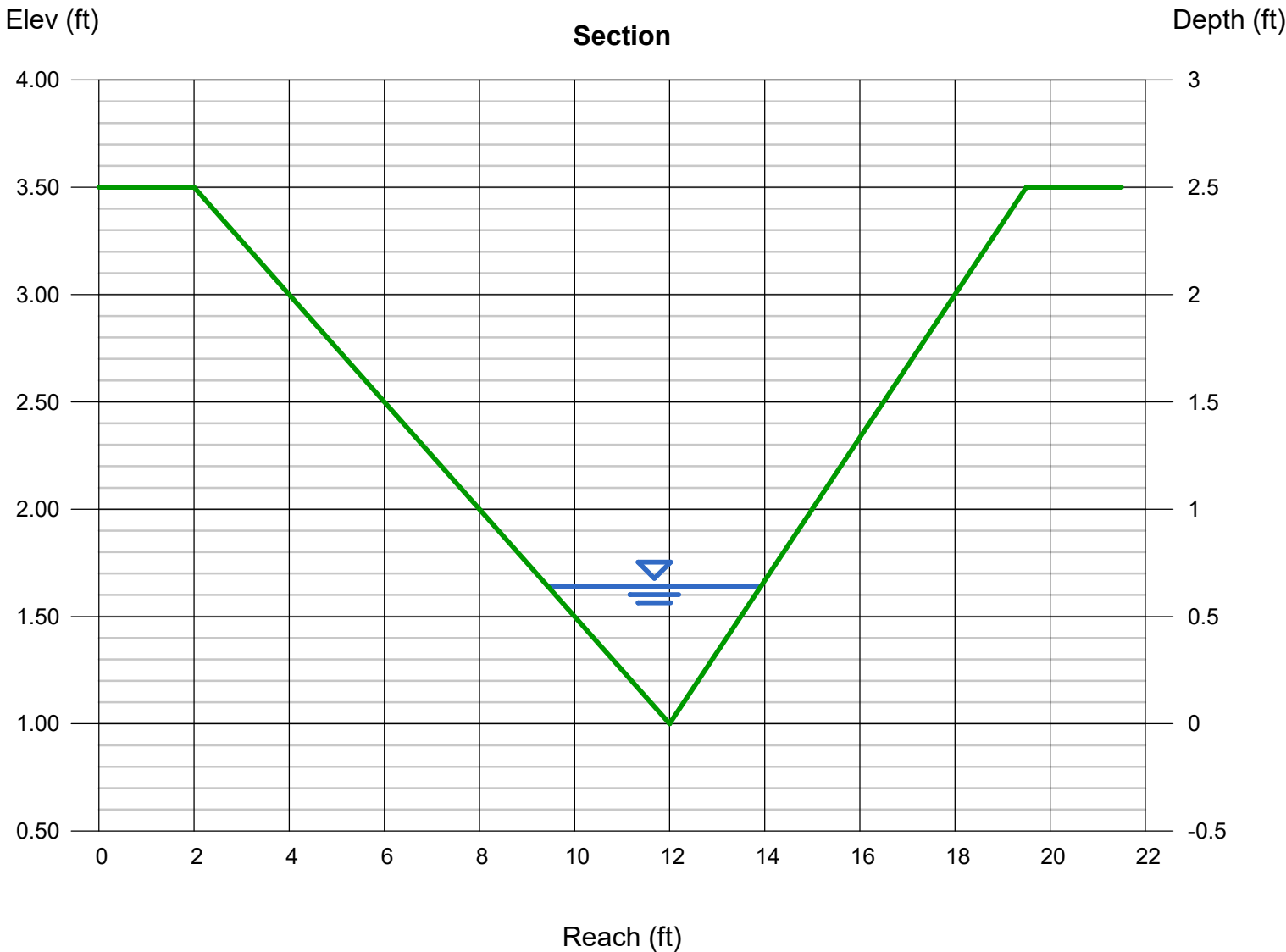
Invert Elev (ft) = 1.00
Slope (%) = 1.25
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.00

Highlighted

Depth (ft) = 0.64
Q (cfs) = 3.000
Area (sqft) = 1.43
Velocity (ft/s) = 2.09
Wetted Perim (ft) = 4.66
Crit Depth, Yc (ft) = 0.54
Top Width (ft) = 4.48
EGL (ft) = 0.71



Channel Report

B1

SWALE BASIN B2 - Q100

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

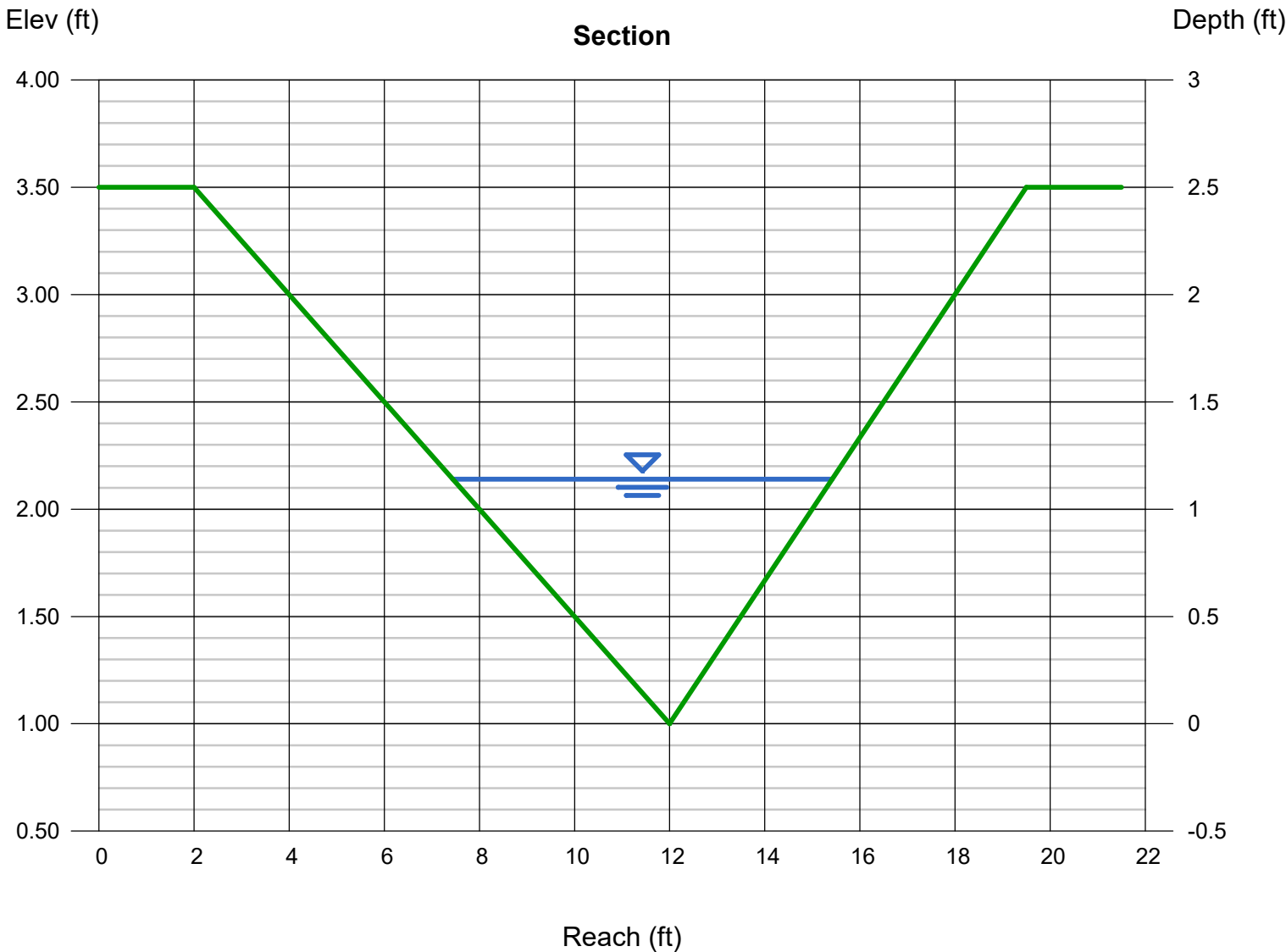
Invert Elev (ft) = 1.00
Slope (%) = 1.25
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 14.20

Highlighted

Depth (ft) = 1.14
Q (cfs) = 14.20
Area (sqft) = 4.55
Velocity (ft/s) = 3.12
Wetted Perim (ft) = 8.31
Crit Depth, Yc (ft) = 1.01
Top Width (ft) = 7.98
EGL (ft) = 1.29



Channel Report

ROAD-SIDE SWALE B - Q5

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

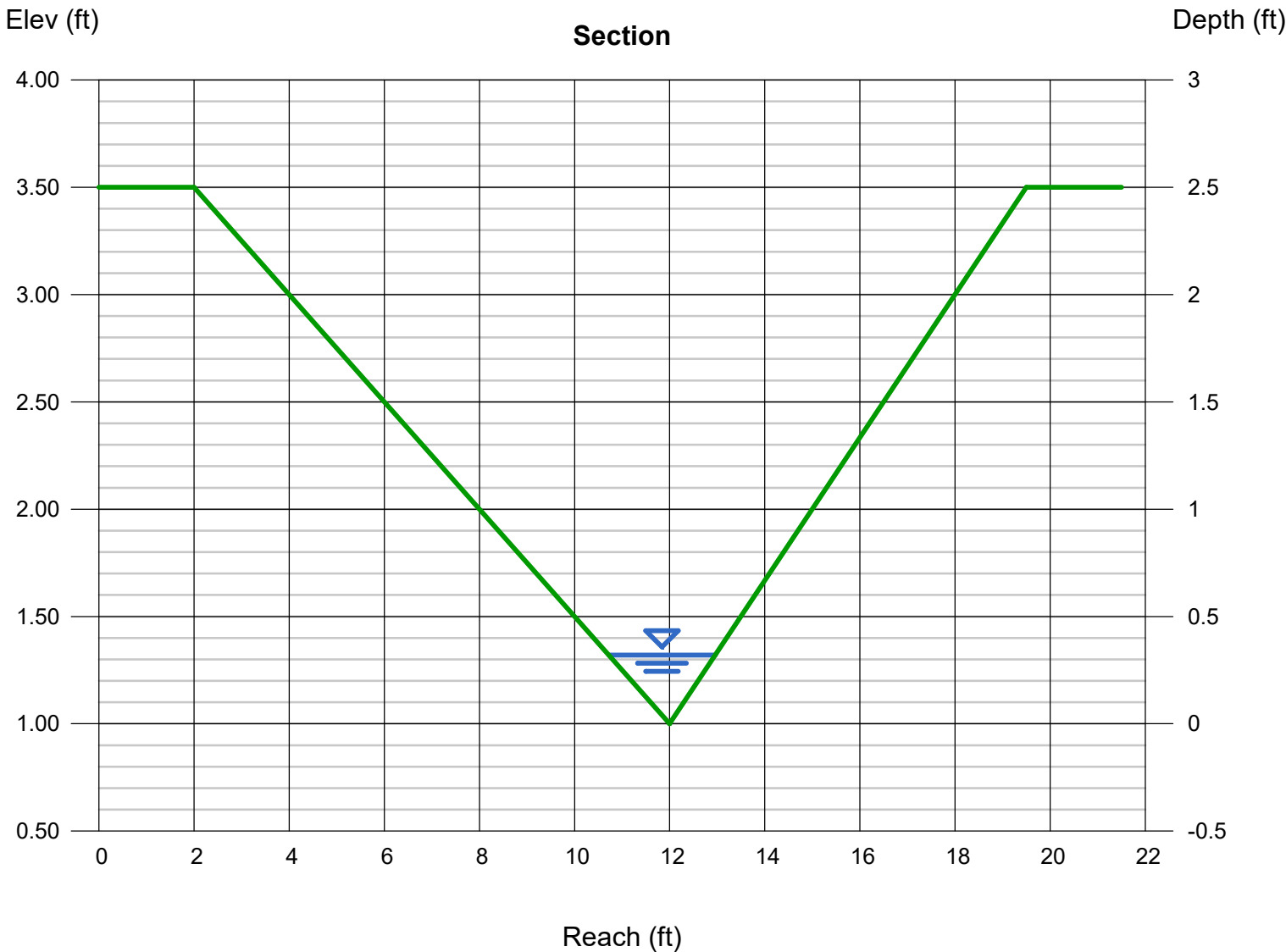
Invert Elev (ft) = 1.00
Slope (%) = 9.99
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.30

Highlighted

Depth (ft) = 0.32
Q (cfs) = 1.300
Area (sqft) = 0.36
Velocity (ft/s) = 3.63
Wetted Perim (ft) = 2.33
Crit Depth, Yc (ft) = 0.39
Top Width (ft) = 2.24
EGL (ft) = 0.52



Channel Report

ROAD-SIDE SWALE B - Q100

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

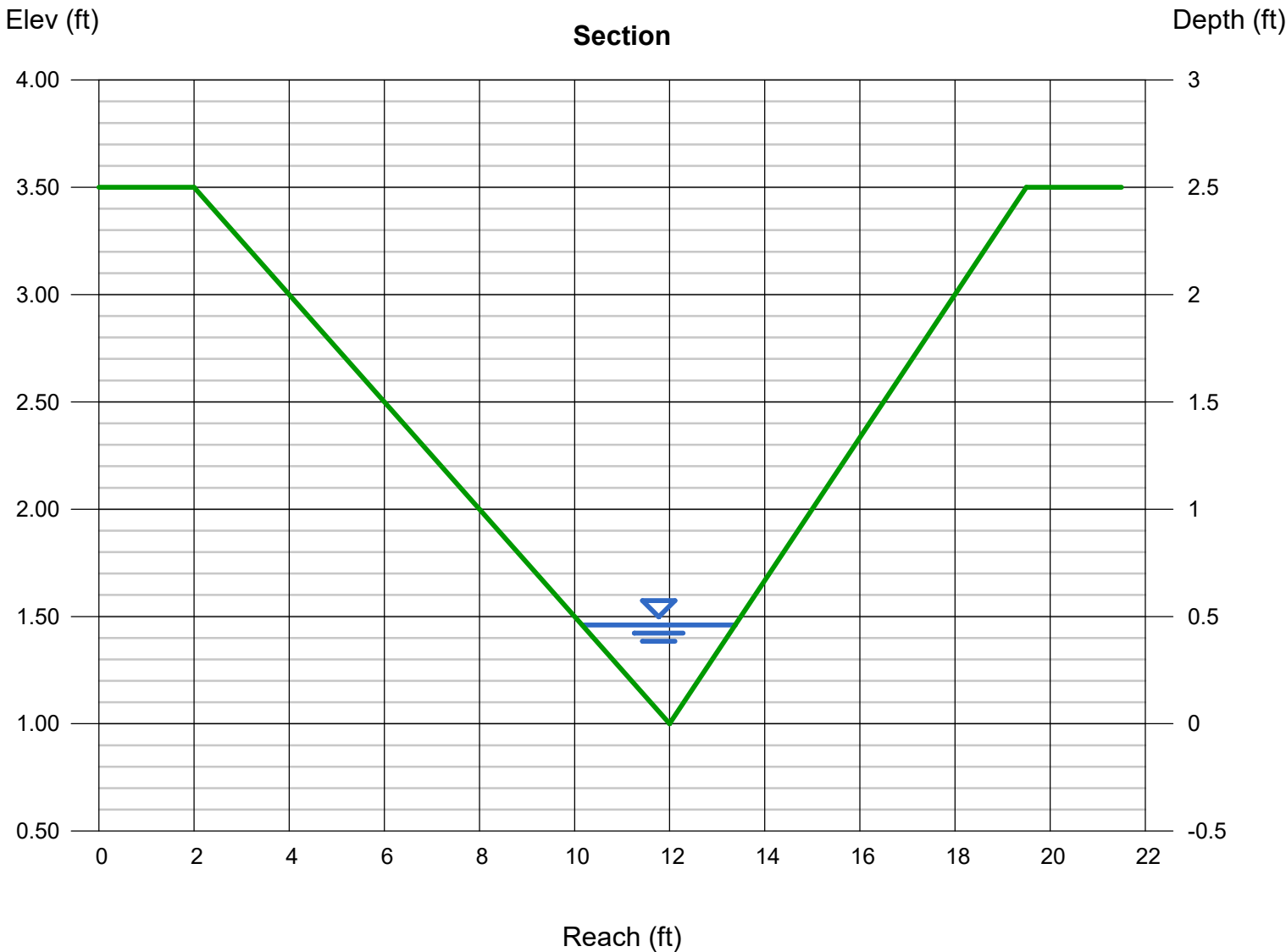
Invert Elev (ft) = 1.00
Slope (%) = 9.99
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.60

Highlighted

Depth (ft) = 0.46
Q (cfs) = 3.600
Area (sqft) = 0.74
Velocity (ft/s) = 4.86
Wetted Perim (ft) = 3.35
Crit Depth, Yc (ft) = 0.59
Top Width (ft) = 3.22
EGL (ft) = 0.83



Channel Report

ROAD-SIDE SWALE C - Q5

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

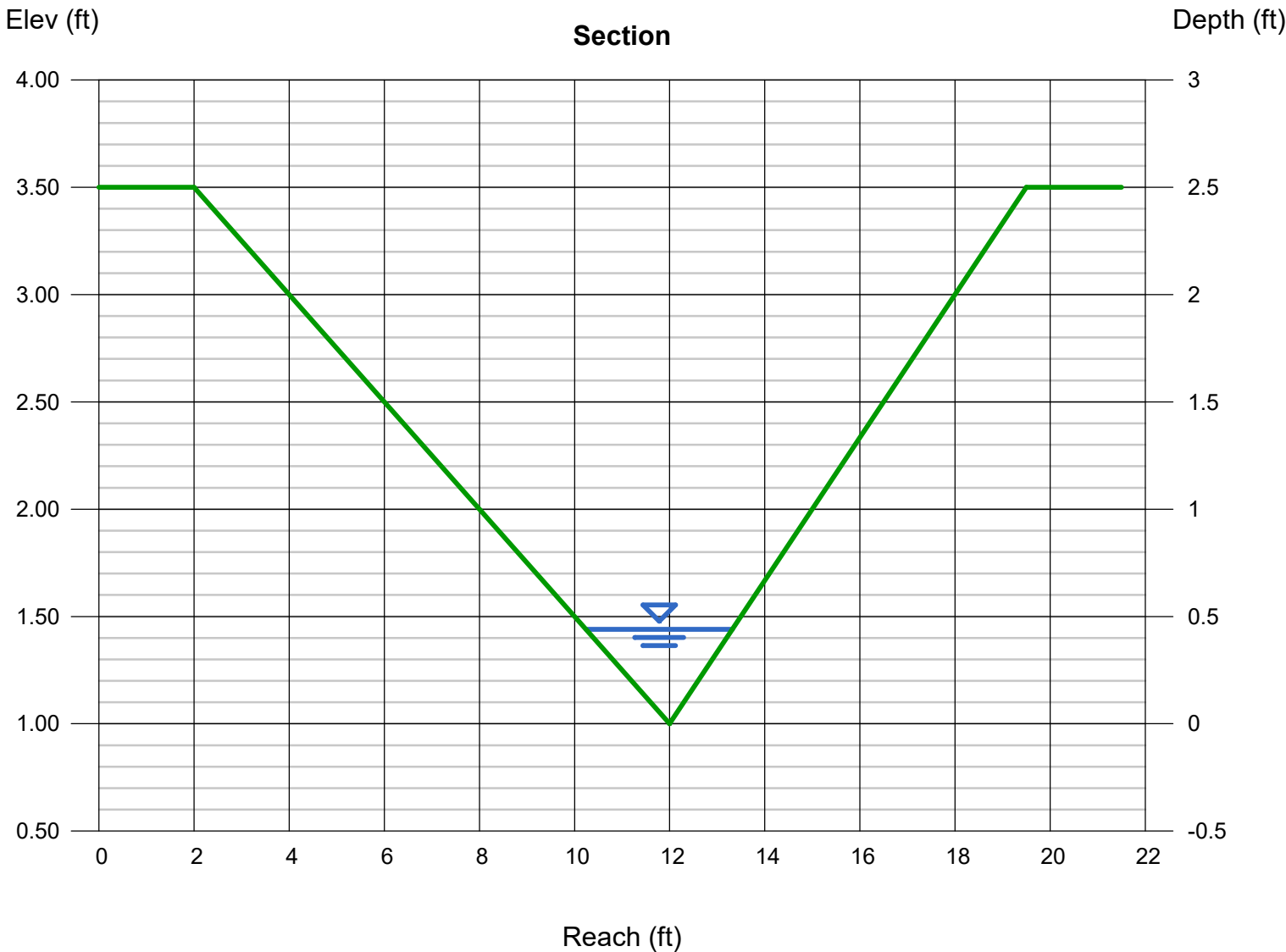
Invert Elev (ft) = 1.00
Slope (%) = 3.71
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.90

Highlighted

Depth (ft) = 0.44
Q (cfs) = 1.900
Area (sqft) = 0.68
Velocity (ft/s) = 2.80
Wetted Perim (ft) = 3.21
Crit Depth, Yc (ft) = 0.45
Top Width (ft) = 3.08
EGL (ft) = 0.56



Channel Report

ROAD-SIDE SWALE C - Q100

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

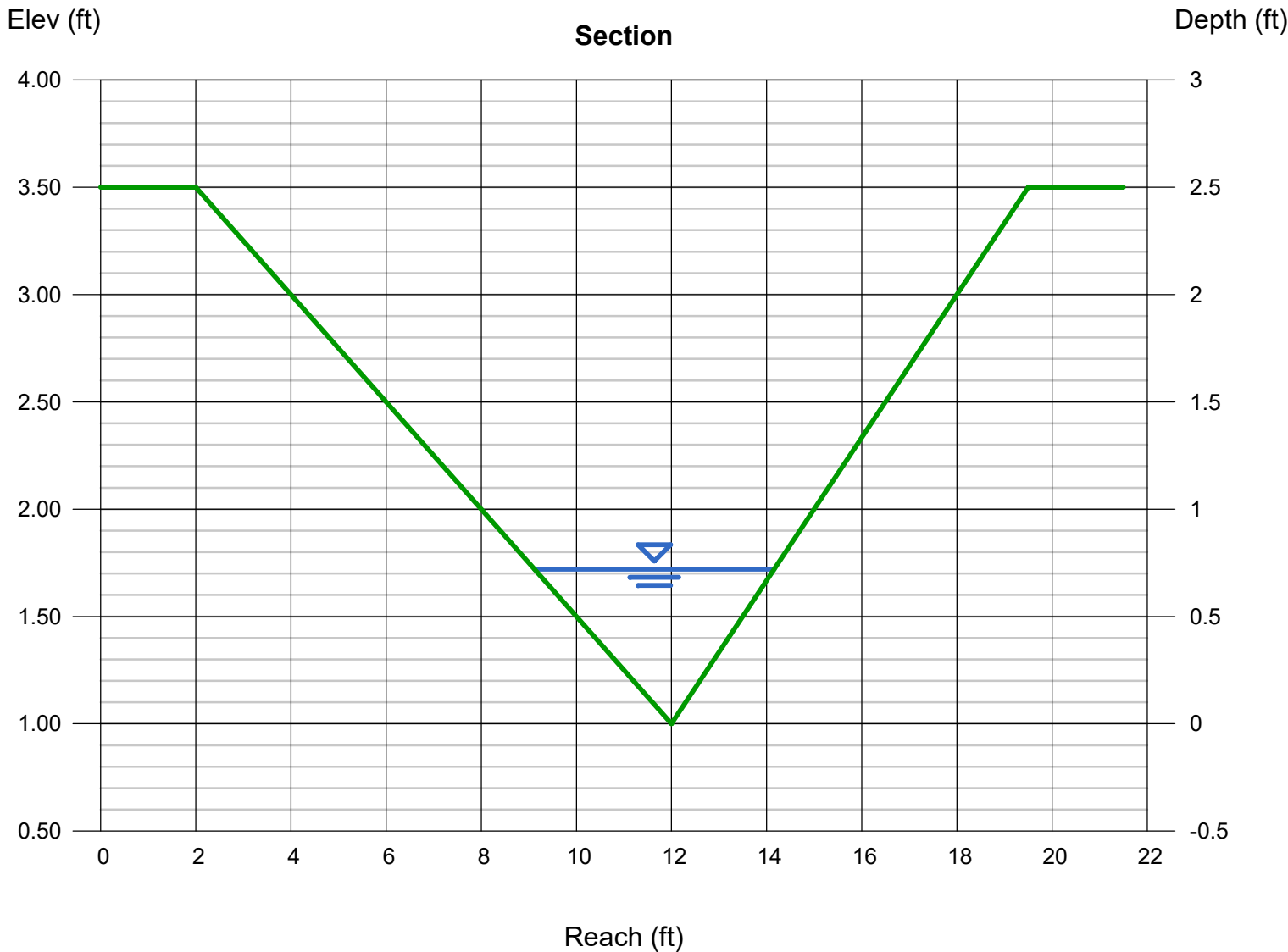
Invert Elev (ft) = 1.00
Slope (%) = 3.71
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 7.20

Highlighted

Depth (ft) = 0.72
Q (cfs) = 7.200
Area (sqft) = 1.81
Velocity (ft/s) = 3.97
Wetted Perim (ft) = 5.25
Crit Depth, Yc (ft) = 0.77
Top Width (ft) = 5.04
EGL (ft) = 0.96



Channel Report

ROAD-SIDE SWALE D - Q5

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

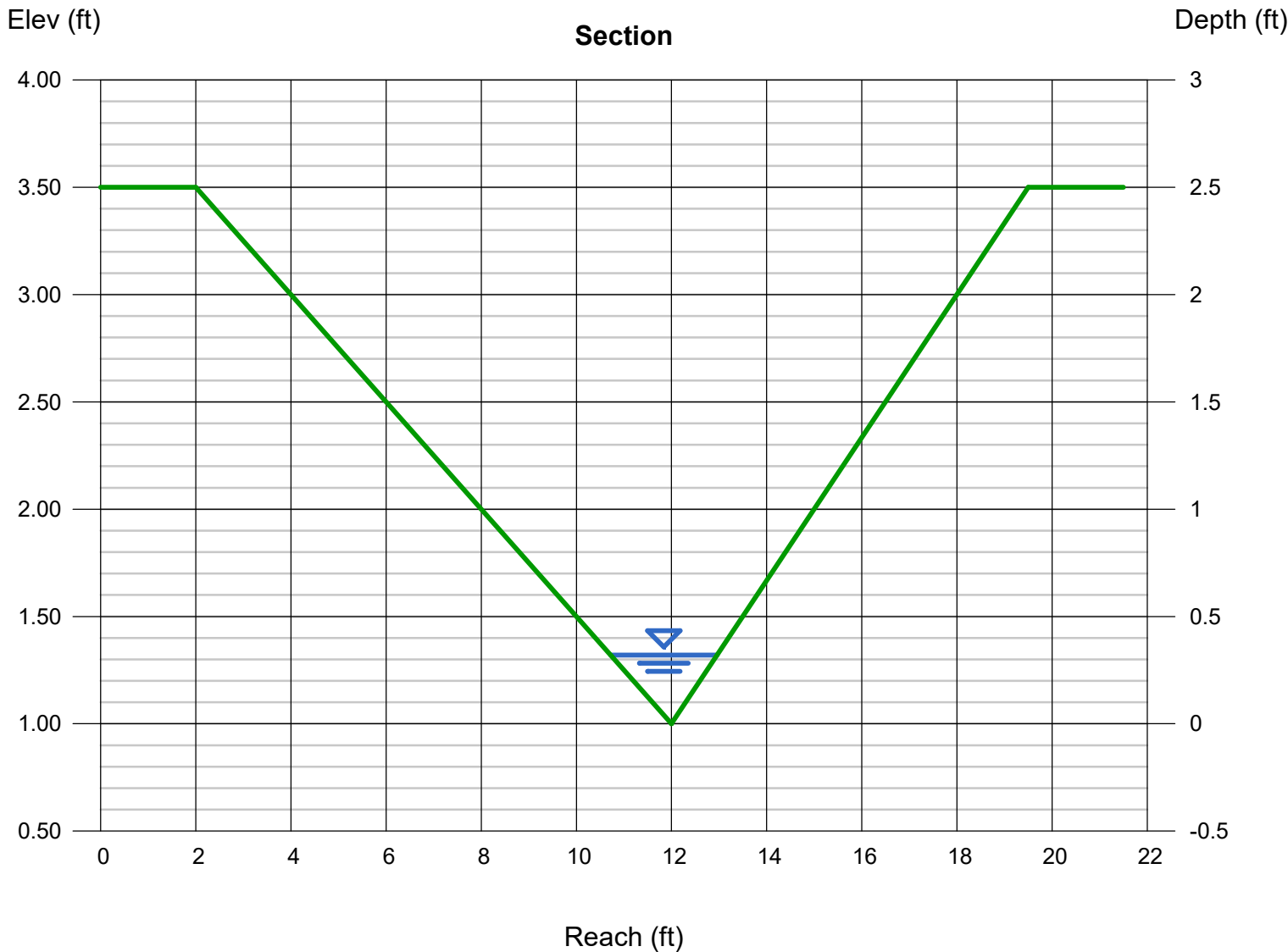
Invert Elev (ft) = 1.00
Slope (%) = 9.99
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.30

Highlighted

Depth (ft) = 0.32
Q (cfs) = 1.300
Area (sqft) = 0.36
Velocity (ft/s) = 3.63
Wetted Perim (ft) = 2.33
Crit Depth, Yc (ft) = 0.39
Top Width (ft) = 2.24
EGL (ft) = 0.52



Channel Report

ROADSIDE SWALE D - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

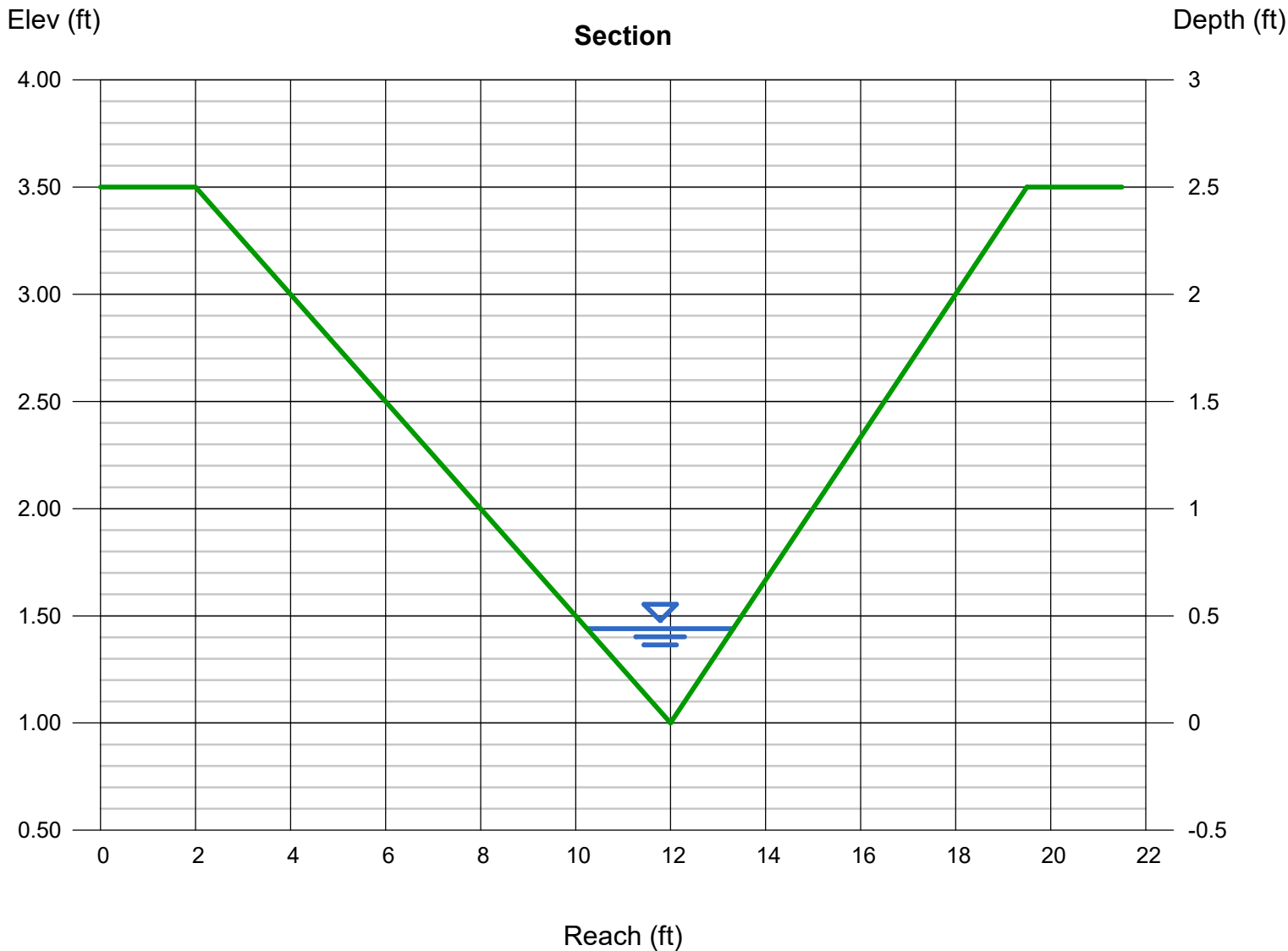
Invert Elev (ft) = 1.00
Slope (%) = 9.99
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.10

Highlighted

Depth (ft) = 0.44
Q (cfs) = 3.100
Area (sqft) = 0.68
Velocity (ft/s) = 4.57
Wetted Perim (ft) = 3.21
Crit Depth, Yc (ft) = 0.55
Top Width (ft) = 3.08
EGL (ft) = 0.77



Channel Report

ROAD-SIDE SWALE E - Q5

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

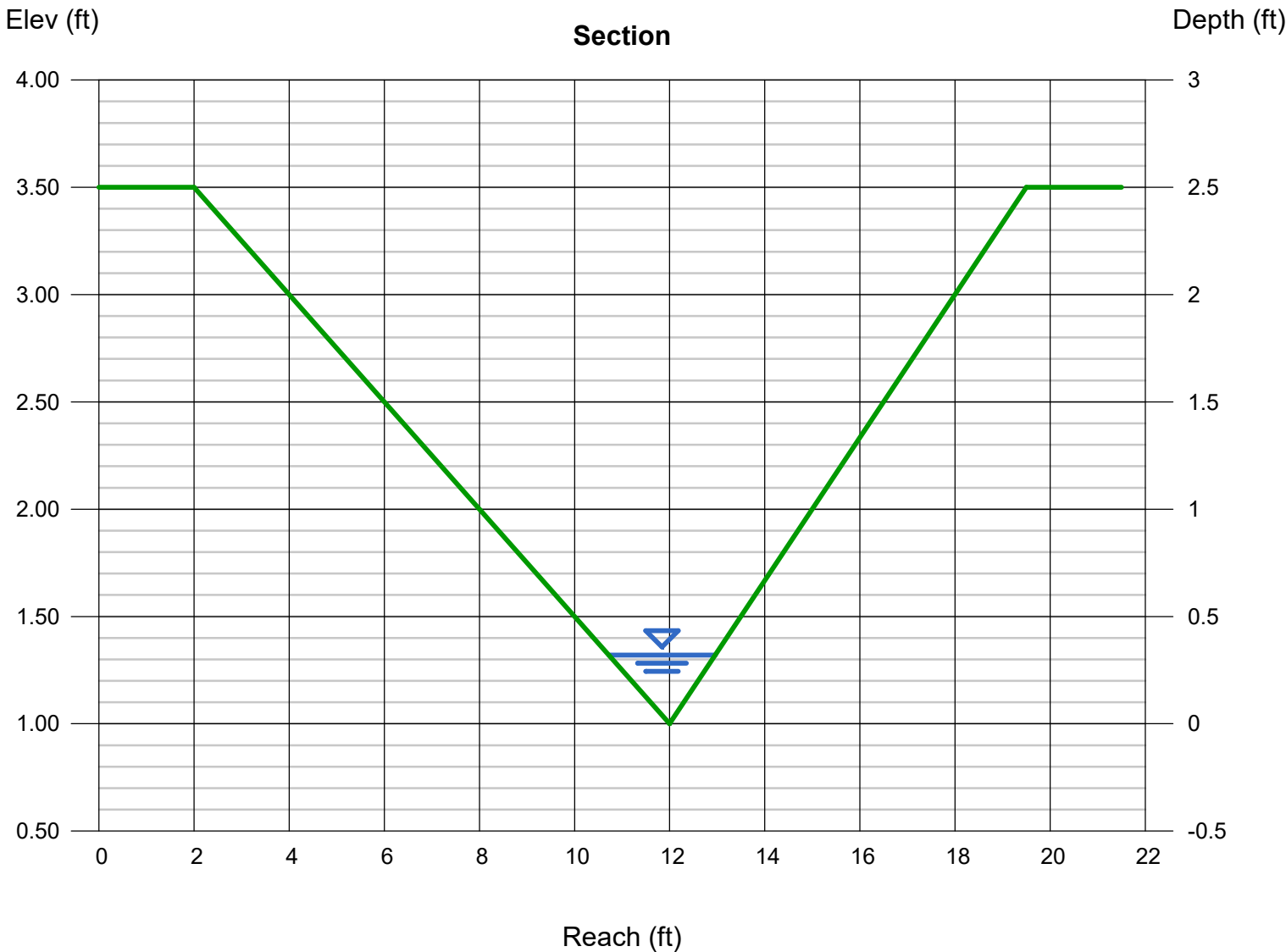
Invert Elev (ft) = 1.00
Slope (%) = 3.71
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 0.80

Highlighted

Depth (ft) = 0.32
Q (cfs) = 0.800
Area (sqft) = 0.36
Velocity (ft/s) = 2.23
Wetted Perim (ft) = 2.33
Crit Depth, Yc (ft) = 0.32
Top Width (ft) = 2.24
EGL (ft) = 0.40



Channel Report

ROADSIDE SWALE E - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

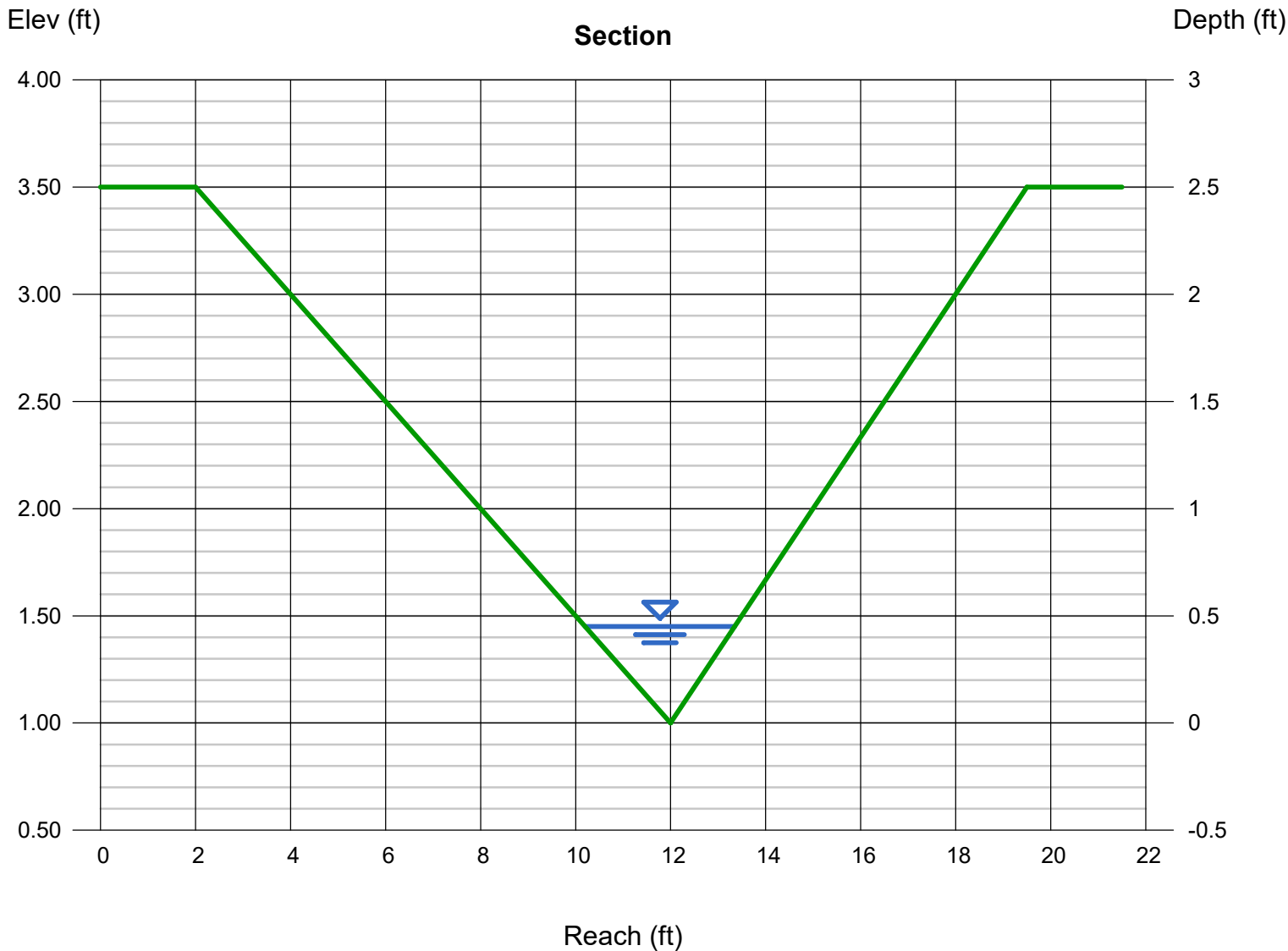
Invert Elev (ft) = 1.00
Slope (%) = 3.71
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 2.00

Highlighted

Depth (ft) = 0.45
Q (cfs) = 2.000
Area (sqft) = 0.71
Velocity (ft/s) = 2.82
Wetted Perim (ft) = 3.28
Crit Depth, Yc (ft) = 0.46
Top Width (ft) = 3.15
EGL (ft) = 0.57



Channel Report

ROAD-SIDE SWALE N1 (Q5)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

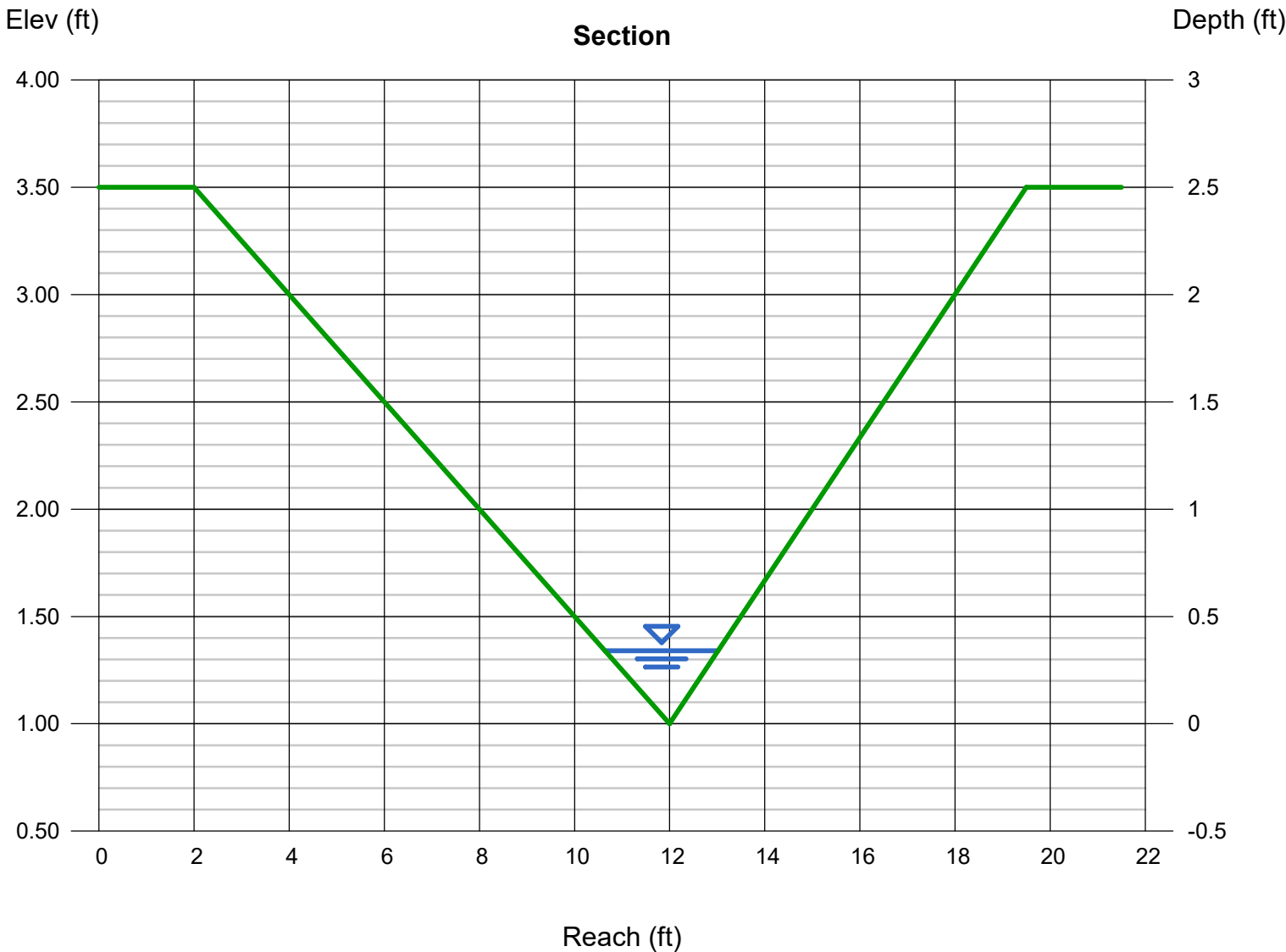
Invert Elev (ft) = 1.00
Slope (%) = 6.55
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.30

Highlighted

Depth (ft) = 0.34
Q (cfs) = 1.300
Area (sqft) = 0.40
Velocity (ft/s) = 3.21
Wetted Perim (ft) = 2.48
Crit Depth, Yc (ft) = 0.39
Top Width (ft) = 2.38
EGL (ft) = 0.50



Channel Report

ROAD-SIDE SWALE N1 (Q100)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

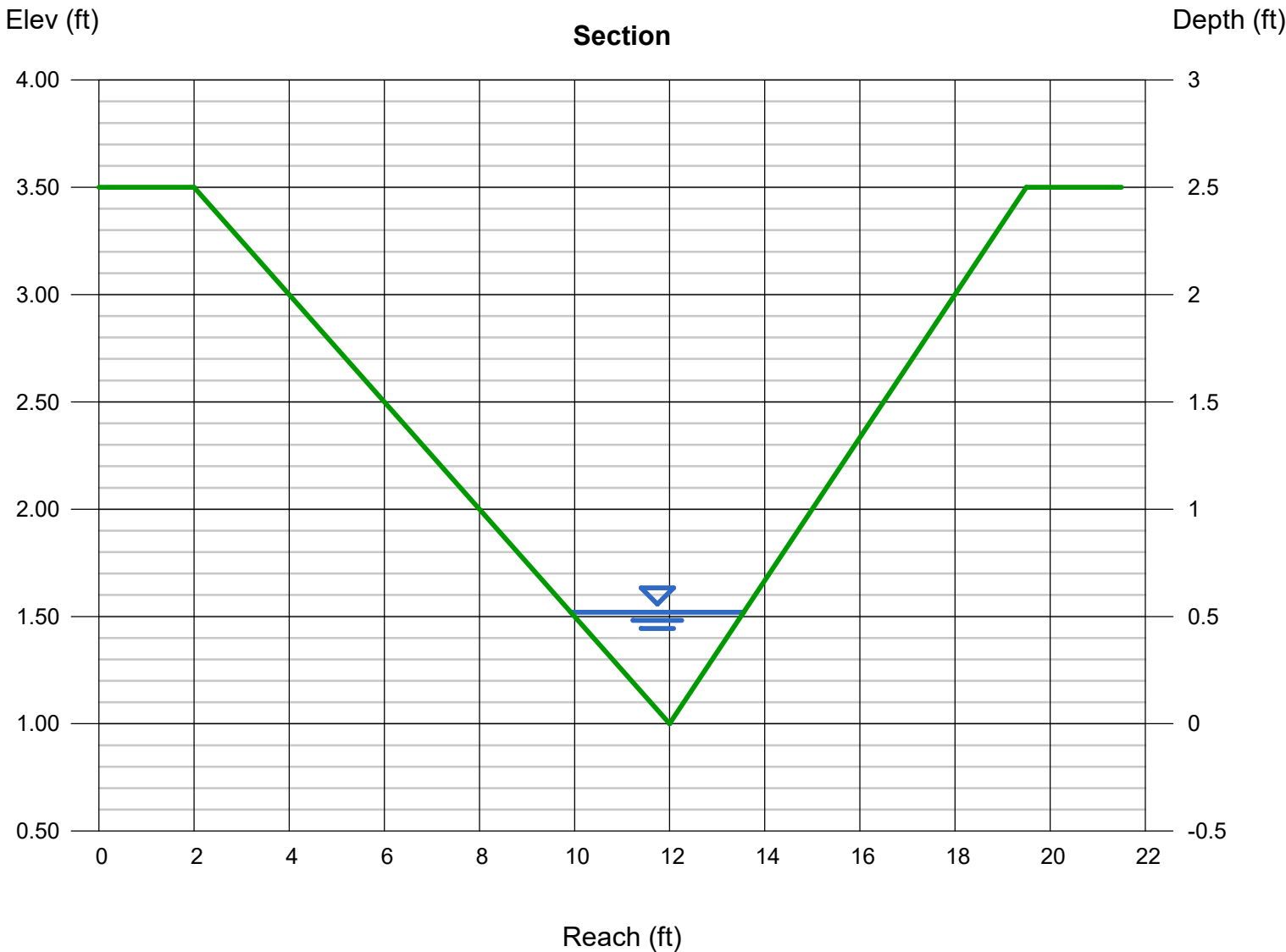
Invert Elev (ft) = 1.00
Slope (%) = 6.55
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.90

Highlighted

Depth (ft) = 0.52
Q (cfs) = 3.900
Area (sqft) = 0.95
Velocity (ft/s) = 4.12
Wetted Perim (ft) = 3.79
Crit Depth, Yc (ft) = 0.60
Top Width (ft) = 3.64
EGL (ft) = 0.78



Channel Report

ROAD-SIDE SWALE N1-1 (Q100) STABLE SLOPE

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

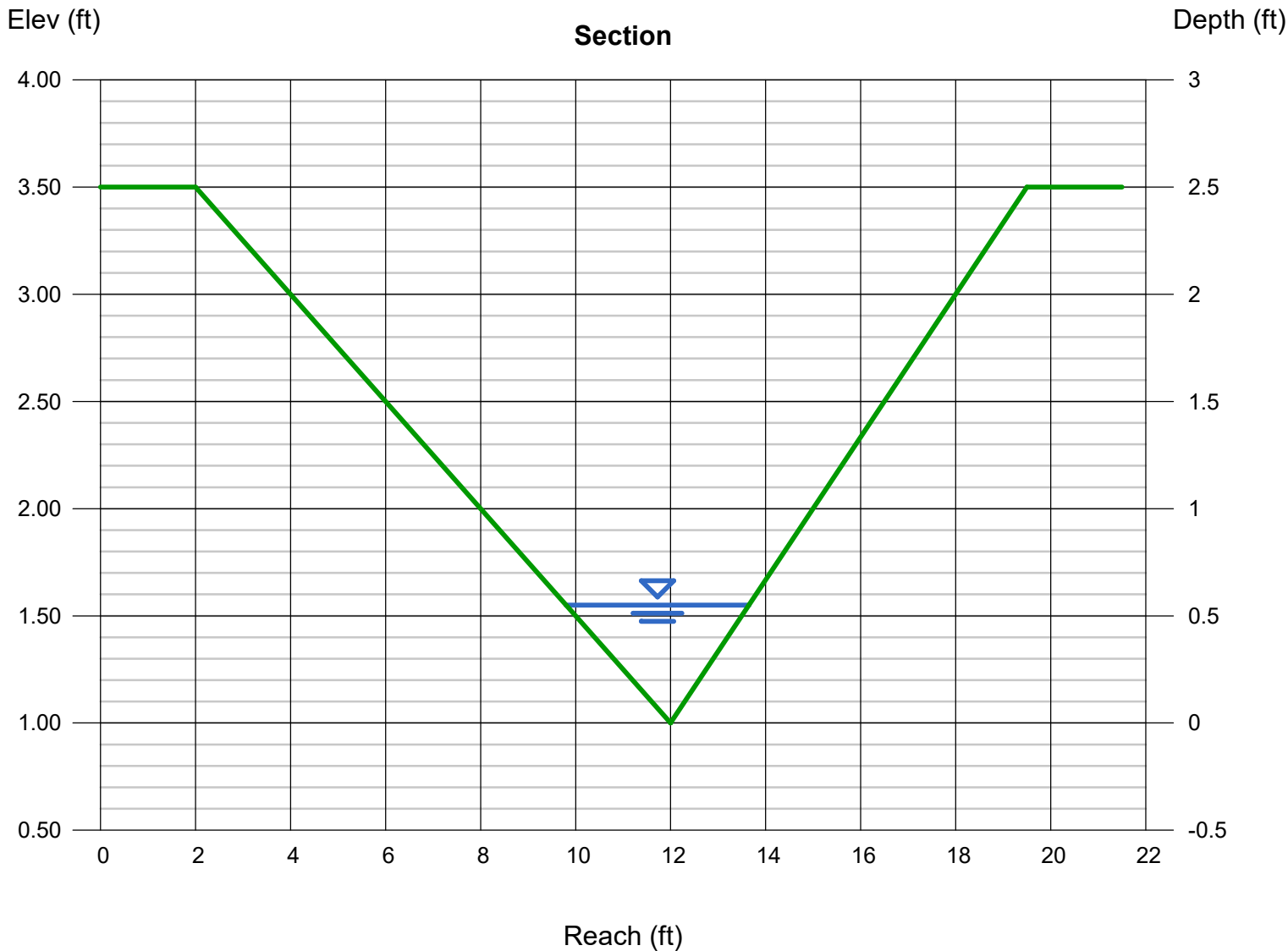
Invert Elev (ft) = 1.00
Slope (%) = 4.50
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.90

Highlighted

Depth (ft) = 0.55
Q (cfs) = 3.900
Area (sqft) = 1.06
Velocity (ft/s) = 3.68
Wetted Perim (ft) = 4.01
Crit Depth, Yc (ft) = 0.60
Top Width (ft) = 3.85
EGL (ft) = 0.76



Channel Report

ROAD-SIDE SWALE N2 (Q5)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

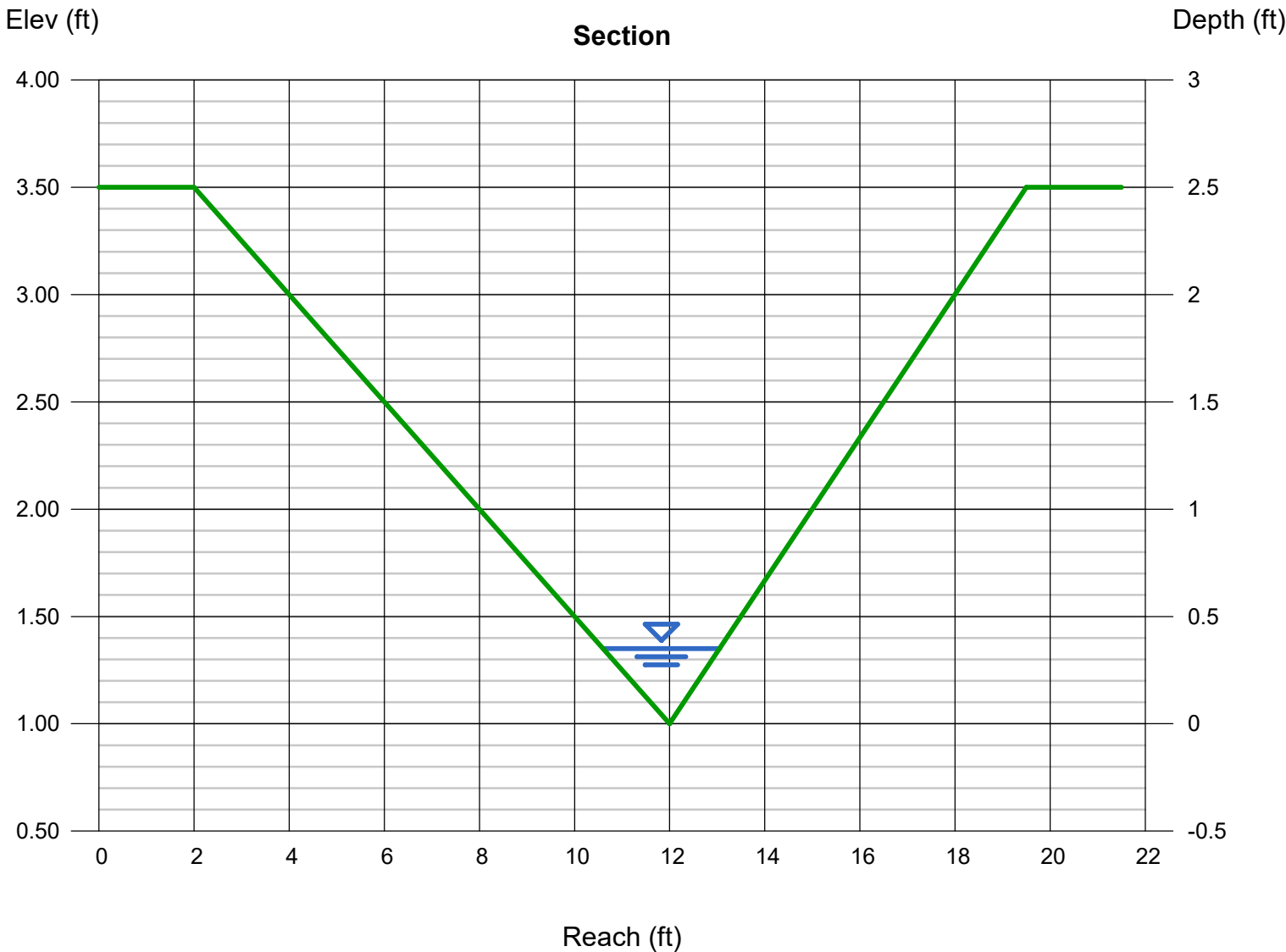
Invert Elev (ft) = 1.00
Slope (%) = 4.50
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.10

Highlighted

Depth (ft) = 0.35
Q (cfs) = 1.100
Area (sqft) = 0.43
Velocity (ft/s) = 2.57
Wetted Perim (ft) = 2.55
Crit Depth, Yc (ft) = 0.37
Top Width (ft) = 2.45
EGL (ft) = 0.45



Channel Report

ROADSIDE SWALE N2 - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 1.25

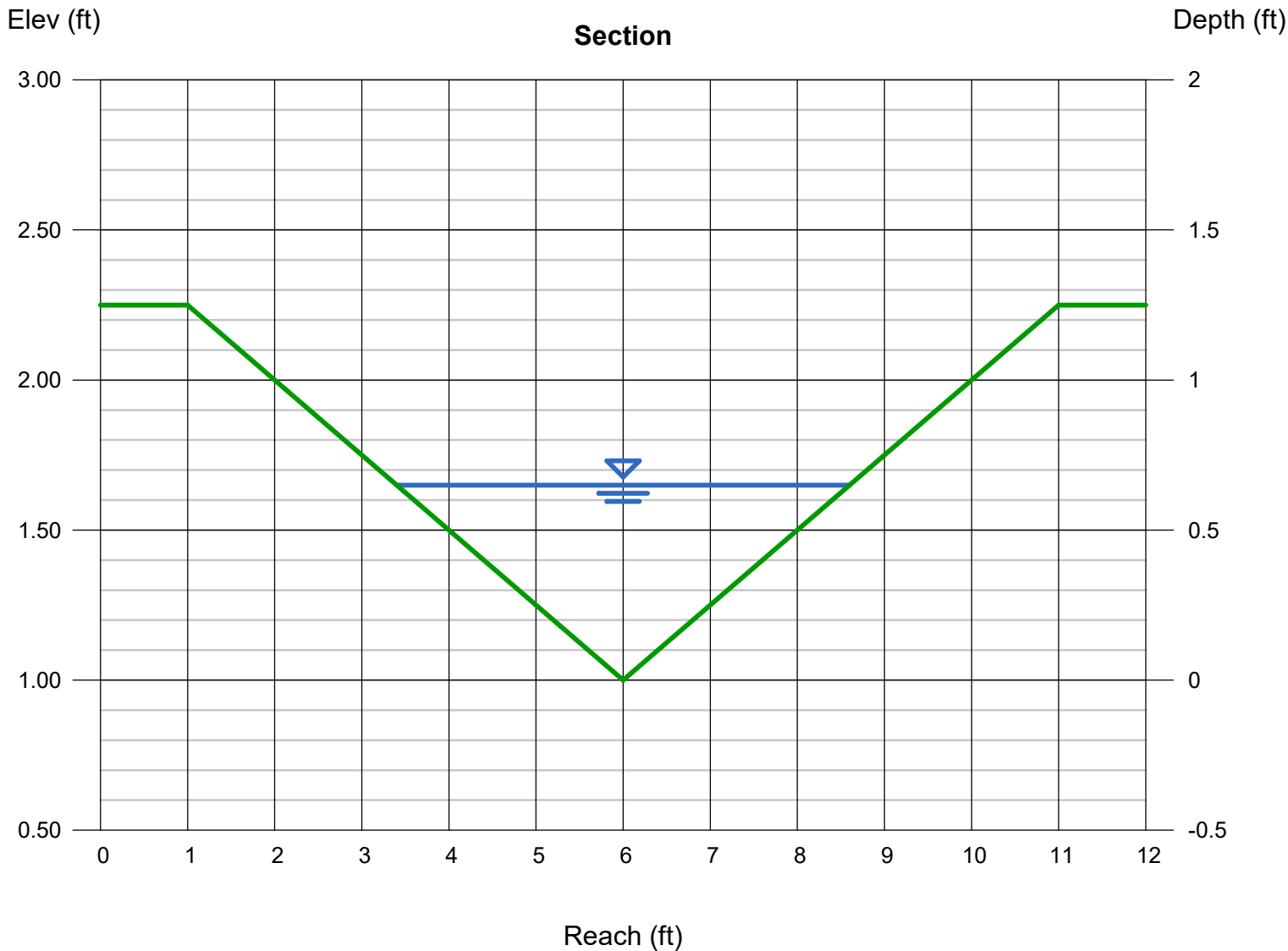
Invert Elev (ft) = 1.00
Slope (%) = 1.35
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.80

Highlighted

Depth (ft) = 0.65
Q (cfs) = 3.800
Area (sqft) = 1.69
Velocity (ft/s) = 2.25
Wetted Perim (ft) = 5.36
Crit Depth, Yc (ft) = 0.57
Top Width (ft) = 5.20
EGL (ft) = 0.73



Channel Report

ROAD-SIDE SWALE P (Q5)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

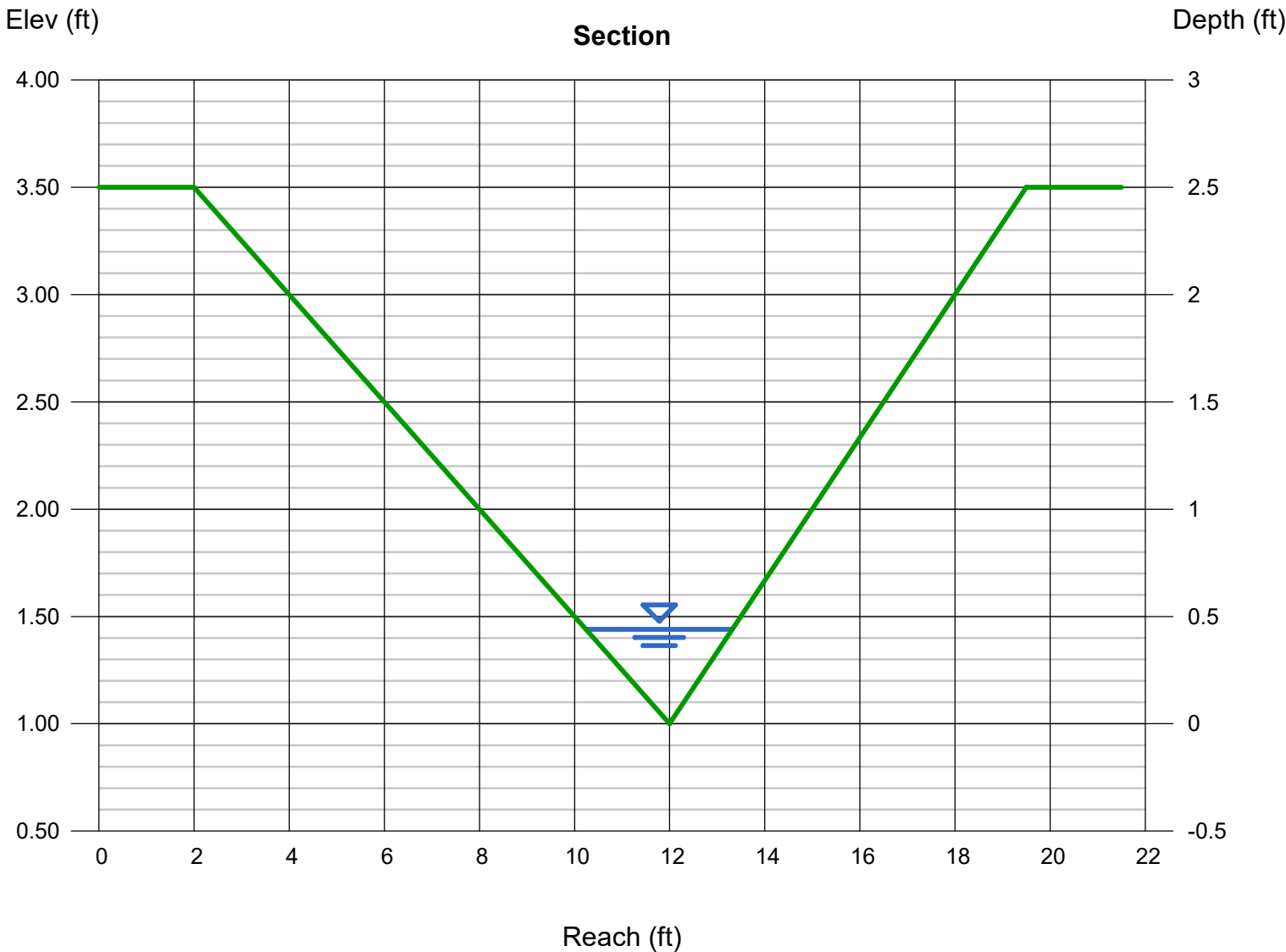
Invert Elev (ft) = 1.00
Slope (%) = 8.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 2.80

Highlighted

Depth (ft) = 0.44
Q (cfs) = 2.800
Area (sqft) = 0.68
Velocity (ft/s) = 4.13
Wetted Perim (ft) = 3.21
Crit Depth, Yc (ft) = 0.53
Top Width (ft) = 3.08
EGL (ft) = 0.71



Channel Report

ROAD-SIDE SWALE P1 (Q100) - STABLE SLOPE

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

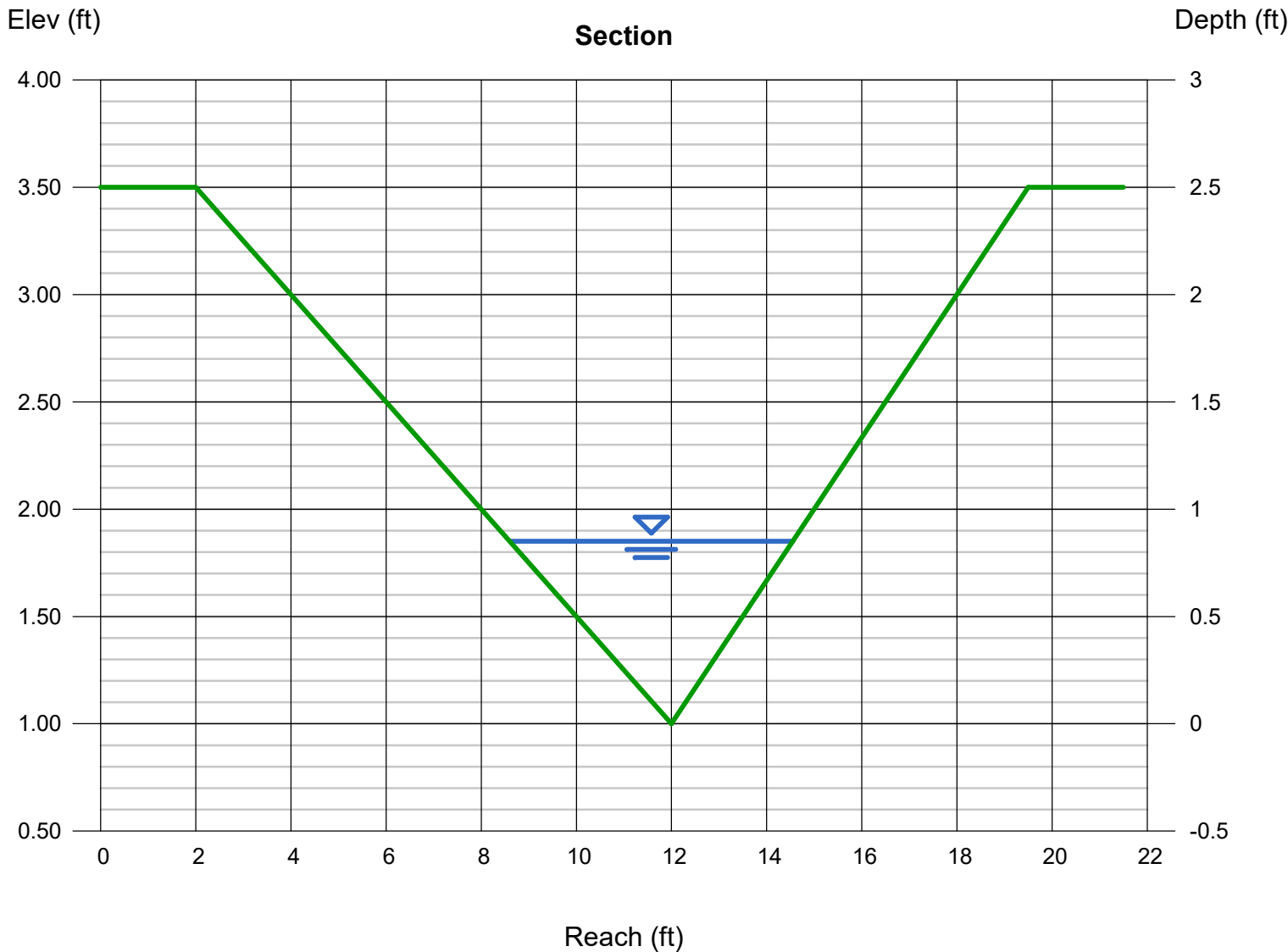
Invert Elev (ft) = 1.00
Slope (%) = 4.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 11.70

Highlighted

Depth (ft) = 0.85
Q (cfs) = 11.70
Area (sqft) = 2.53
Velocity (ft/s) = 4.63
Wetted Perim (ft) = 6.19
Crit Depth, Yc (ft) = 0.93
Top Width (ft) = 5.95
EGL (ft) = 1.18



Channel Report

ROADSIDE SWALE P - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

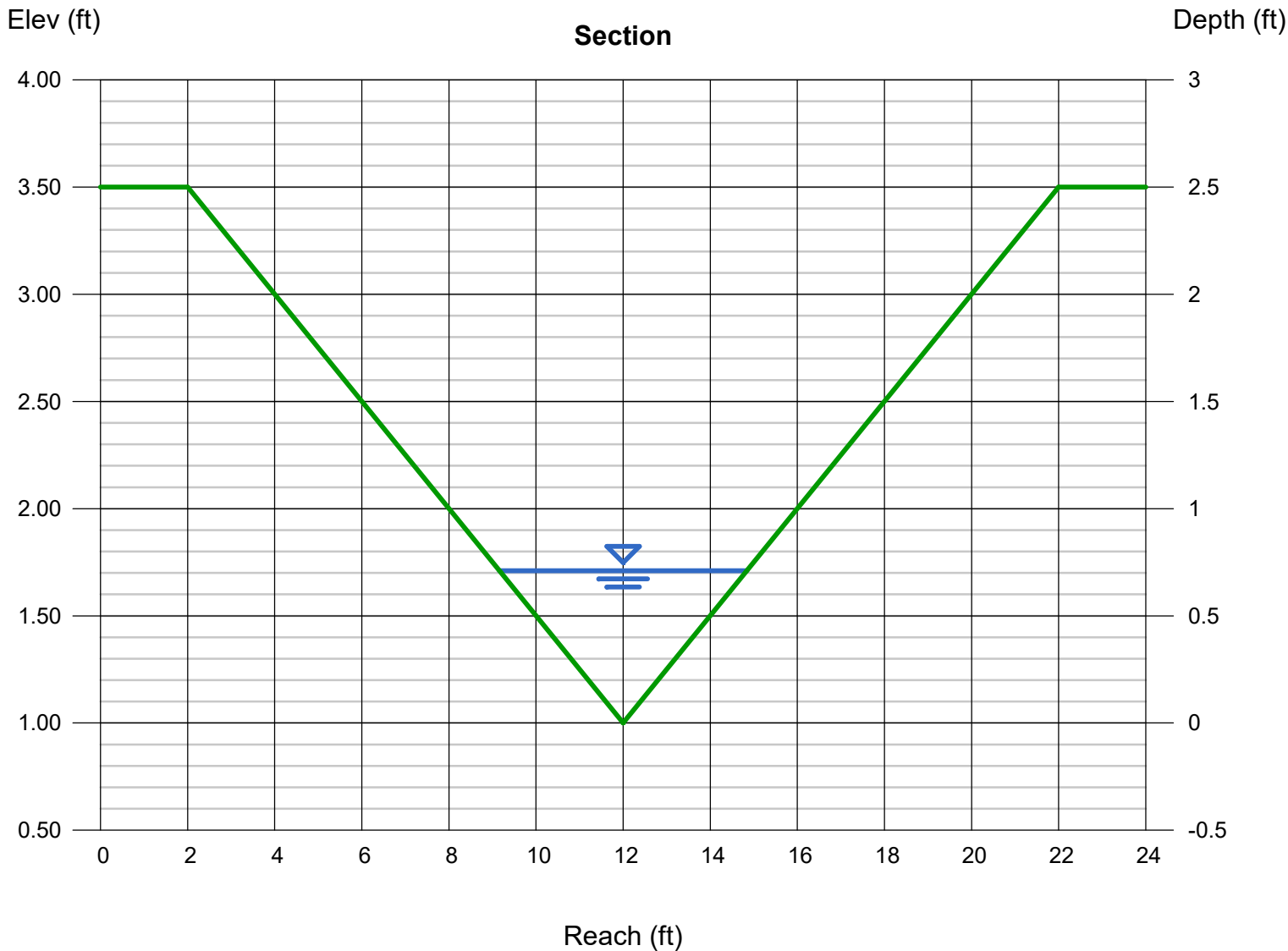
Invert Elev (ft) = 1.00
Slope (%) = 8.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 11.70

Highlighted

Depth (ft) = 0.71
Q (cfs) = 11.70
Area (sqft) = 2.02
Velocity (ft/s) = 5.80
Wetted Perim (ft) = 5.85
Crit Depth, Yc (ft) = 0.89
Top Width (ft) = 5.68
EGL (ft) = 1.23



Channel Report

ROAD-SIDE SWALE Q (Q5)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

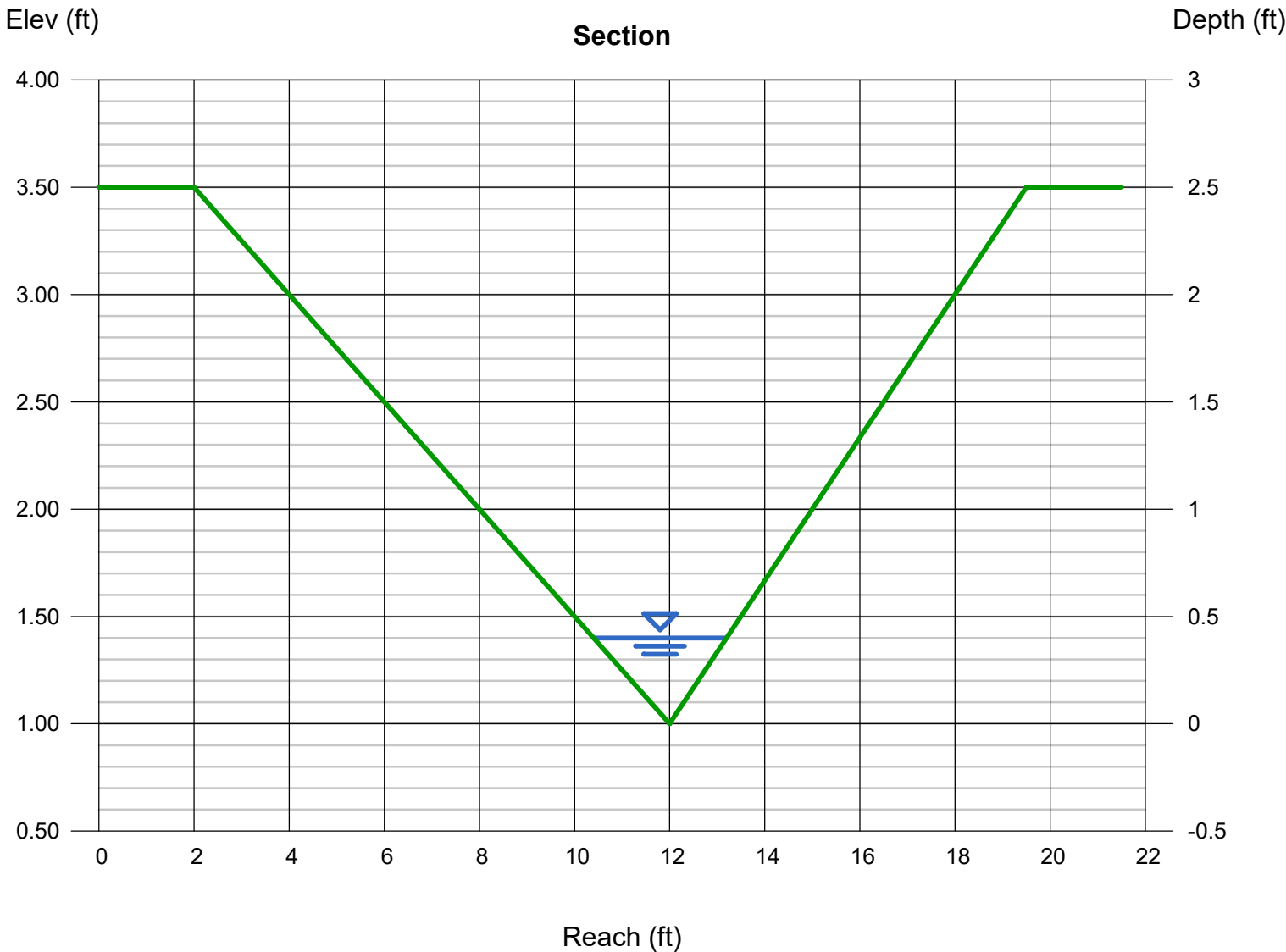
Invert Elev (ft) = 1.00
Slope (%) = 2.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.10

Highlighted

Depth (ft) = 0.40
Q (cfs) = 1.100
Area (sqft) = 0.56
Velocity (ft/s) = 1.96
Wetted Perim (ft) = 2.91
Crit Depth, Yc (ft) = 0.37
Top Width (ft) = 2.80
EGL (ft) = 0.46



Channel Report

ROADSIDE SWALE Q - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

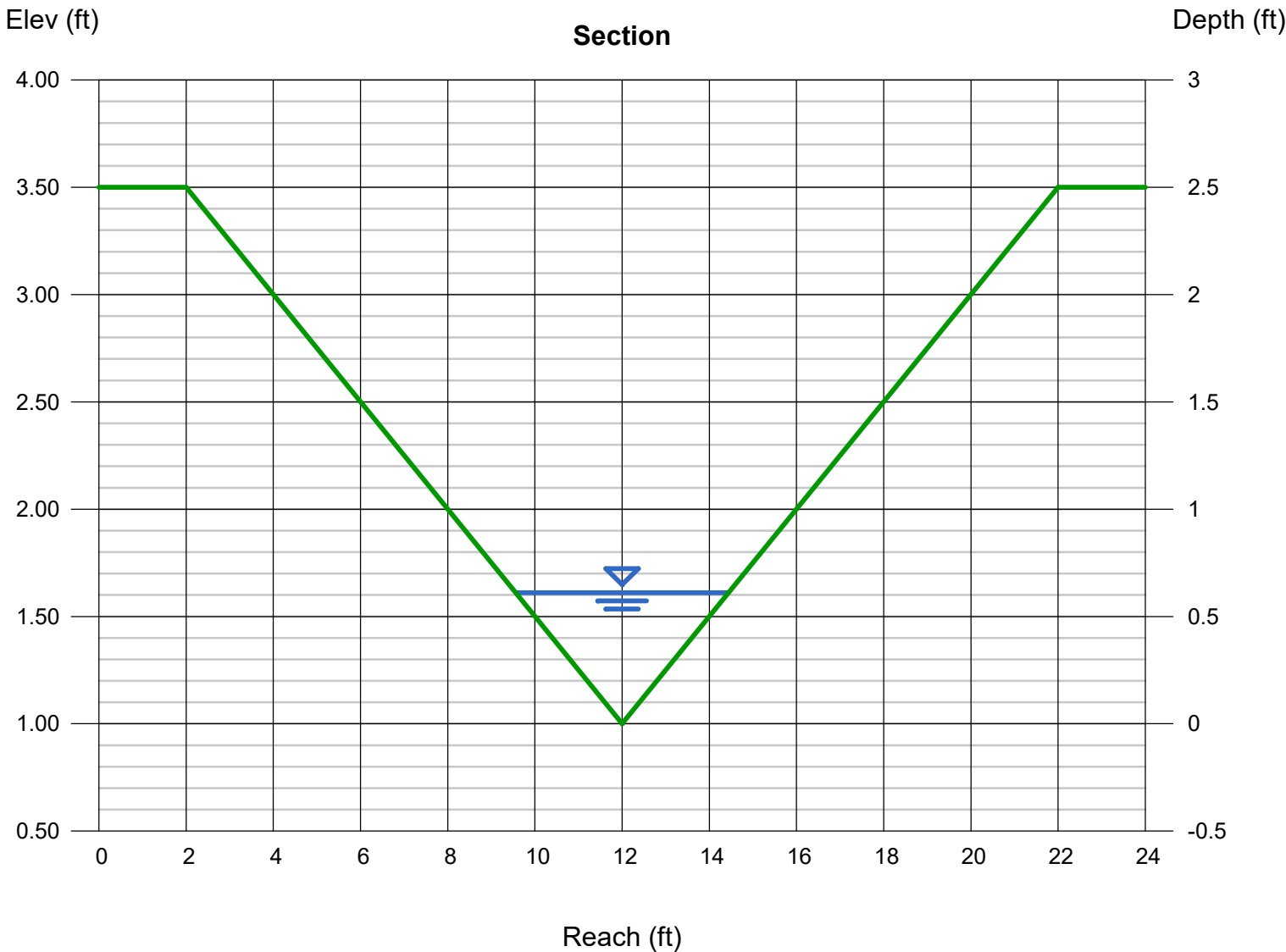
Invert Elev (ft) = 1.00
Slope (%) = 2.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 3.80

Highlighted

Depth (ft) = 0.61
Q (cfs) = 3.800
Area (sqft) = 1.49
Velocity (ft/s) = 2.55
Wetted Perim (ft) = 5.03
Crit Depth, Yc (ft) = 0.57
Top Width (ft) = 4.88
EGL (ft) = 0.71



Channel Report

ROAD-SIDE SWALE R (Q5)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

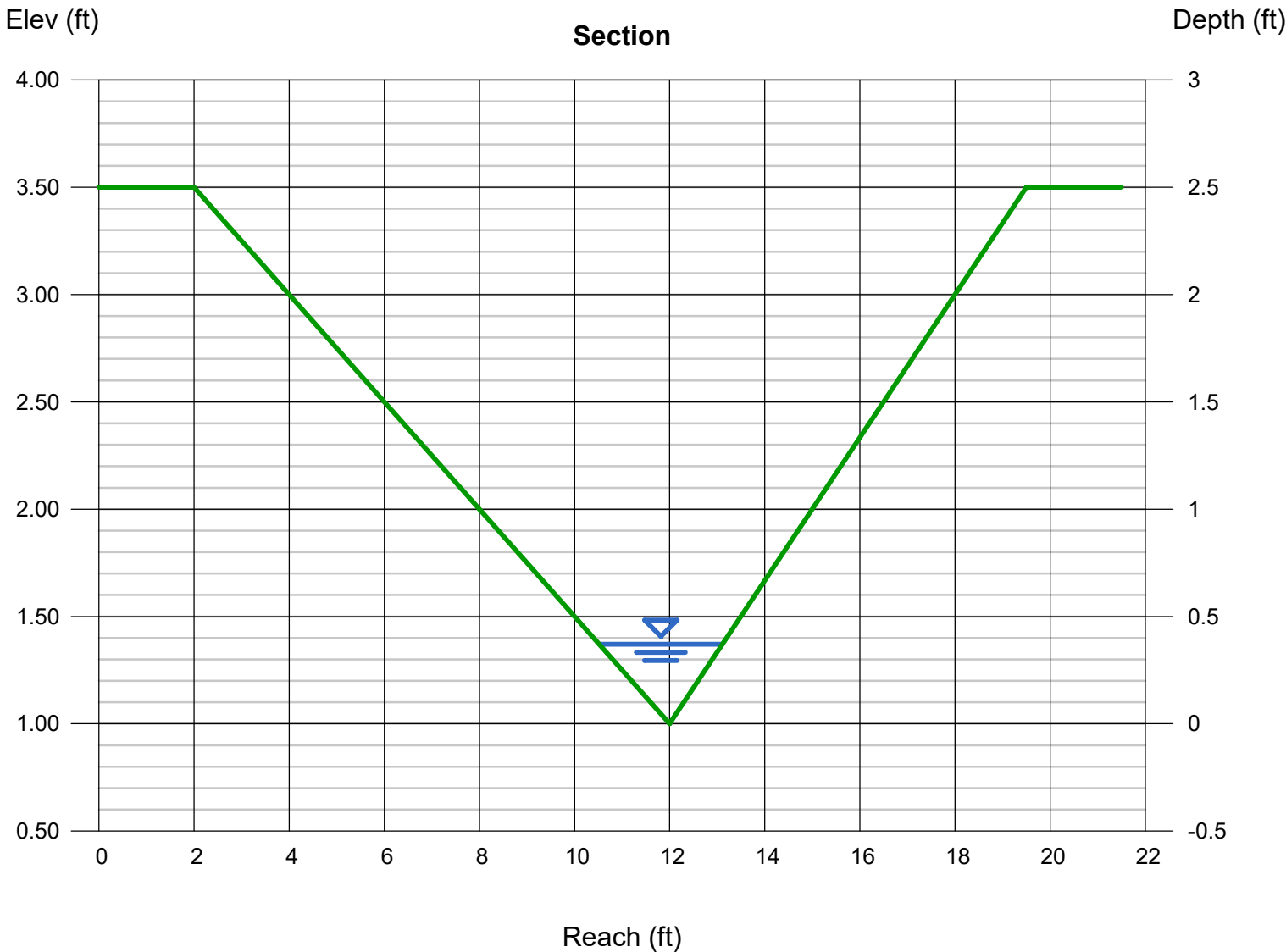
Invert Elev (ft) = 1.00
Slope (%) = 8.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 1.80

Highlighted

Depth (ft) = 0.37
Q (cfs) = 1.800
Area (sqft) = 0.48
Velocity (ft/s) = 3.76
Wetted Perim (ft) = 2.70
Crit Depth, Yc (ft) = 0.44
Top Width (ft) = 2.59
EGL (ft) = 0.59



Channel Report

ROAD-SIDE SWALE R (Q100) - STABLE SLOPE

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

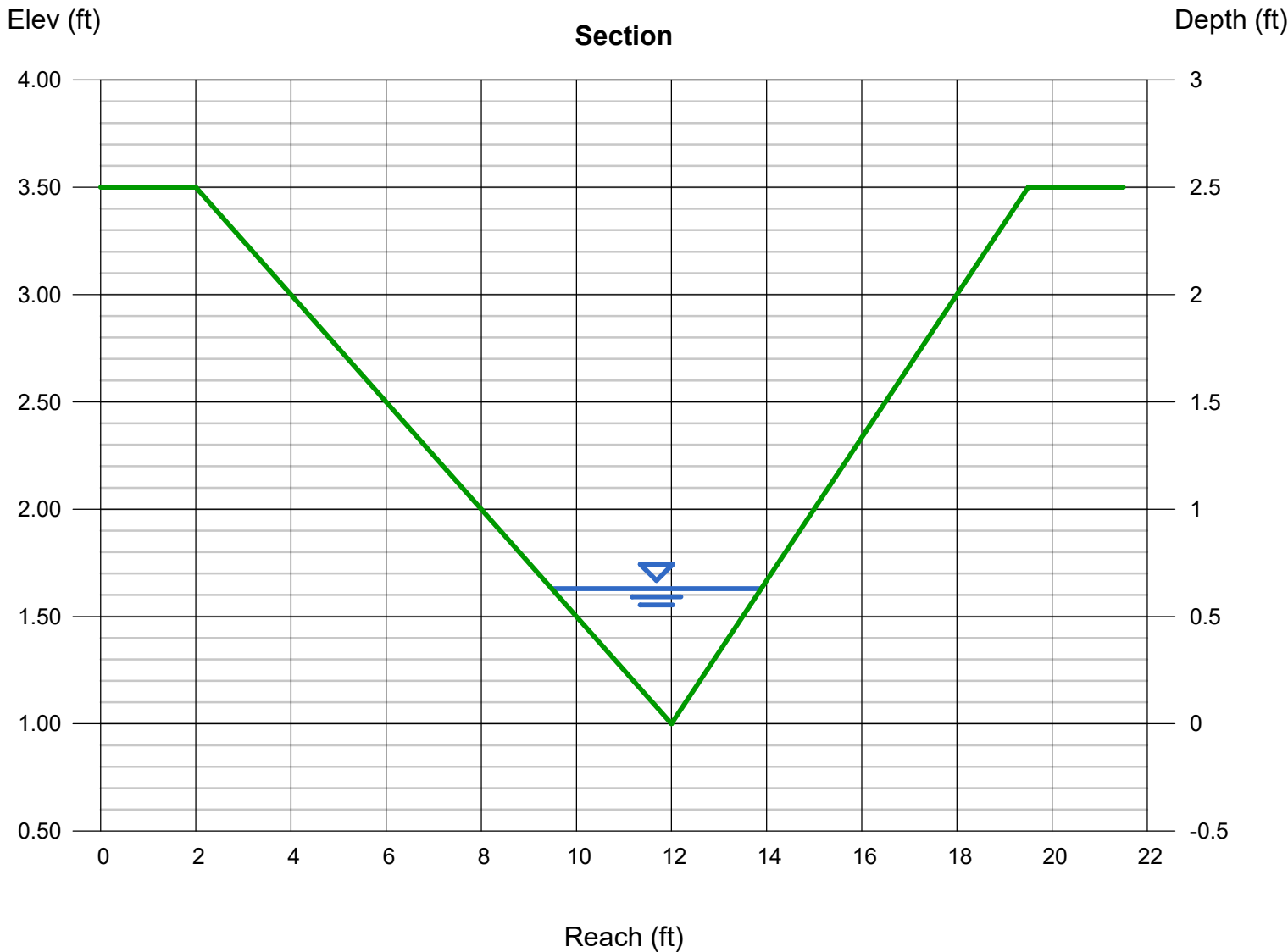
Invert Elev (ft) = 1.00
Slope (%) = 4.50
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 5.50

Highlighted

Depth (ft) = 0.63
Q (cfs) = 5.500
Area (sqft) = 1.39
Velocity (ft/s) = 3.96
Wetted Perim (ft) = 4.59
Crit Depth, Yc (ft) = 0.69
Top Width (ft) = 4.41
EGL (ft) = 0.87



Channel Report

ROADSIDE SWALE R - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

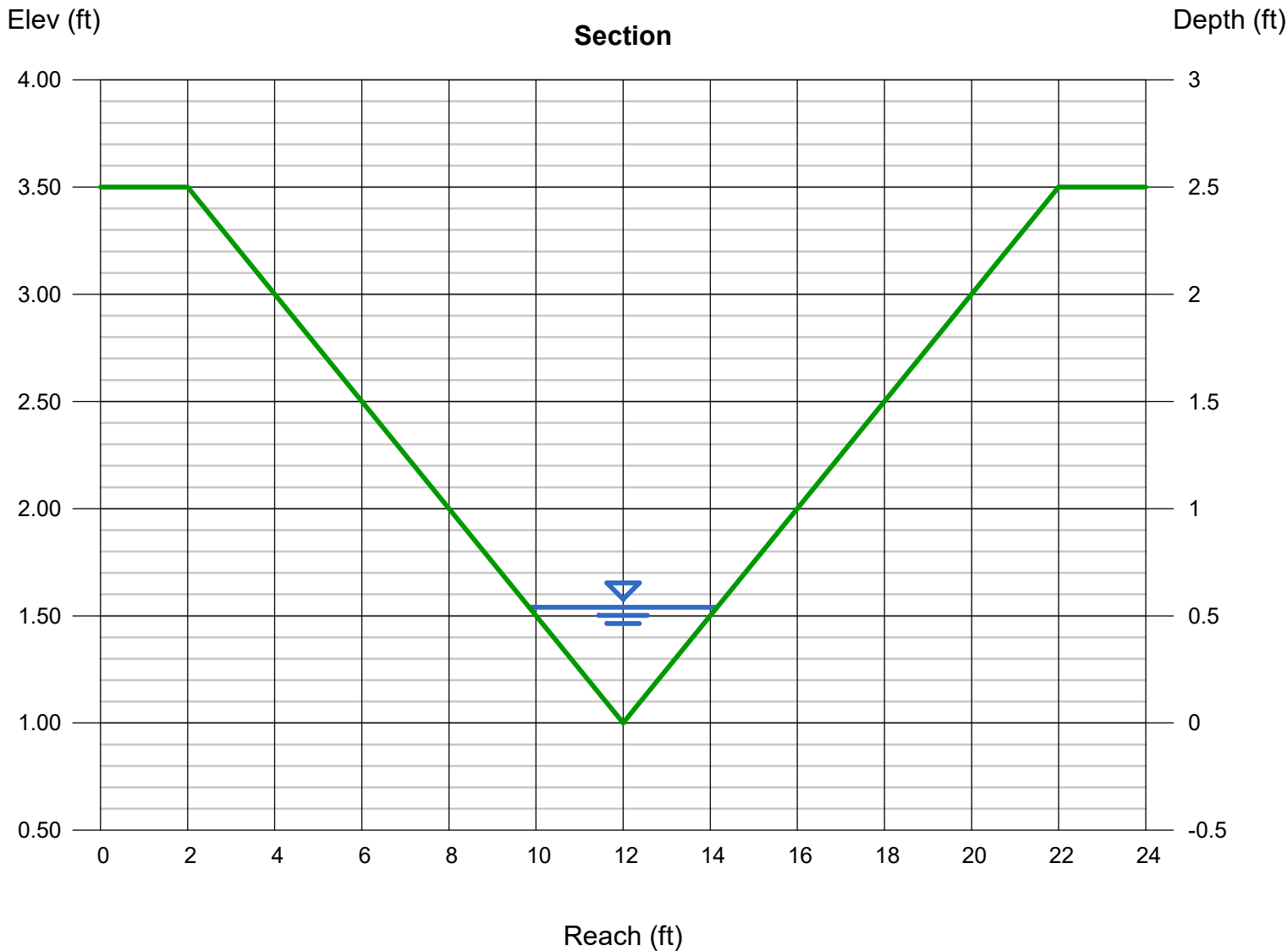
Invert Elev (ft) = 1.00
Slope (%) = 8.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 5.50

Highlighted

Depth (ft) = 0.54
Q (cfs) = 5.500
Area (sqft) = 1.17
Velocity (ft/s) = 4.72
Wetted Perim (ft) = 4.45
Crit Depth, Yc (ft) = 0.66
Top Width (ft) = 4.32
EGL (ft) = 0.89



Channel Report

ROAD-SIDE SWALE S (Q5)

Triangular

Side Slopes (z:1) = 4.00, 3.00
Total Depth (ft) = 2.50

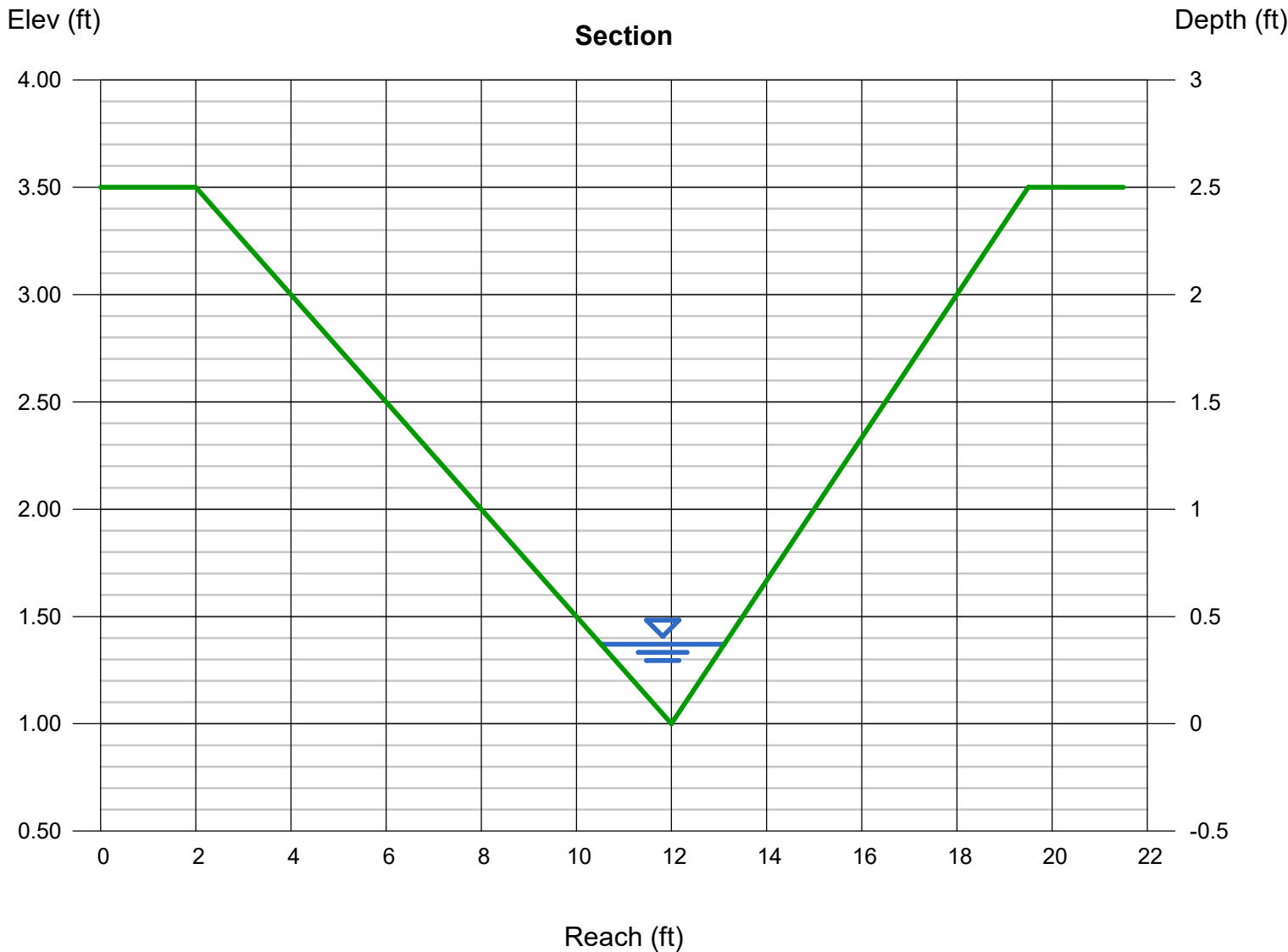
Invert Elev (ft) = 1.00
Slope (%) = 2.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 0.90

Highlighted

Depth (ft) = 0.37
Q (cfs) = 0.900
Area (sqft) = 0.48
Velocity (ft/s) = 1.88
Wetted Perim (ft) = 2.70
Crit Depth, Yc (ft) = 0.34
Top Width (ft) = 2.59
EGL (ft) = 0.42



Channel Report

ROADSIDE SWALE S - MAX SLOPE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

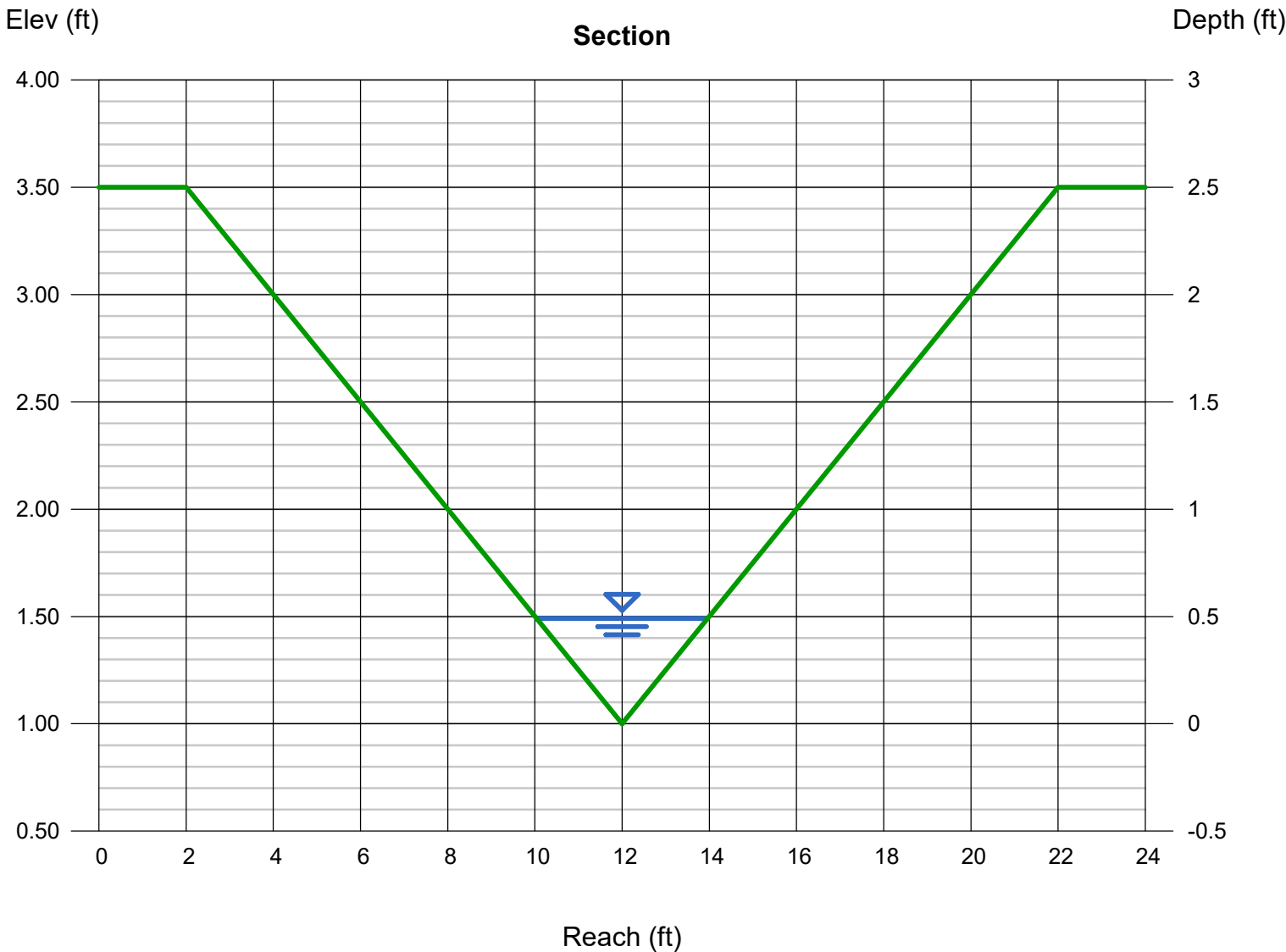
Invert Elev (ft) = 1.00
Slope (%) = 2.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 2.20

Highlighted

Depth (ft) = 0.49
Q (cfs) = 2.200
Area (sqft) = 0.96
Velocity (ft/s) = 2.29
Wetted Perim (ft) = 4.04
Crit Depth, Yc (ft) = 0.46
Top Width (ft) = 3.92
EGL (ft) = 0.57



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Monday, 00 31 2026

Is this supposed to be DP1 Swale (Q100)? All of the input values match the Channel Report for DP1 Swale (Q100). Please review and revise as necessary.

DP1.1 EX SWALE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 1.50

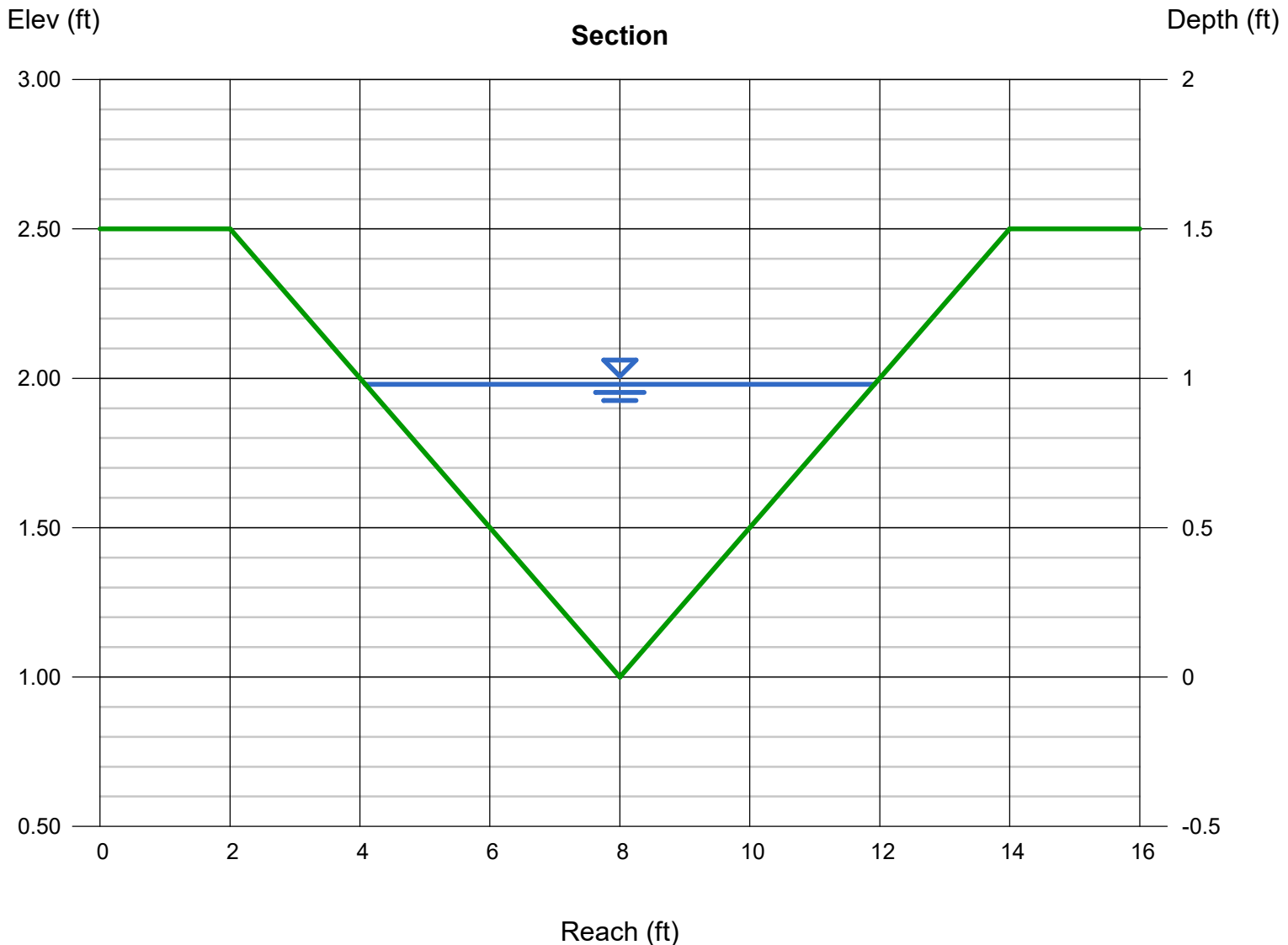
Invert Elev (ft) = 1.00
Slope (%) = 2.35
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 14.90

Highlighted

Depth (ft) = 0.98
Q (cfs) = 14.90
Area (sqft) = 3.84
Velocity (ft/s) = 3.88
Wetted Perim (ft) = 8.08
Crit Depth, Yc (ft) = 0.98
Top Width (ft) = 7.84
EGL (ft) = 1.21



Channel Report

DP1 SWALE Q5

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 1.50

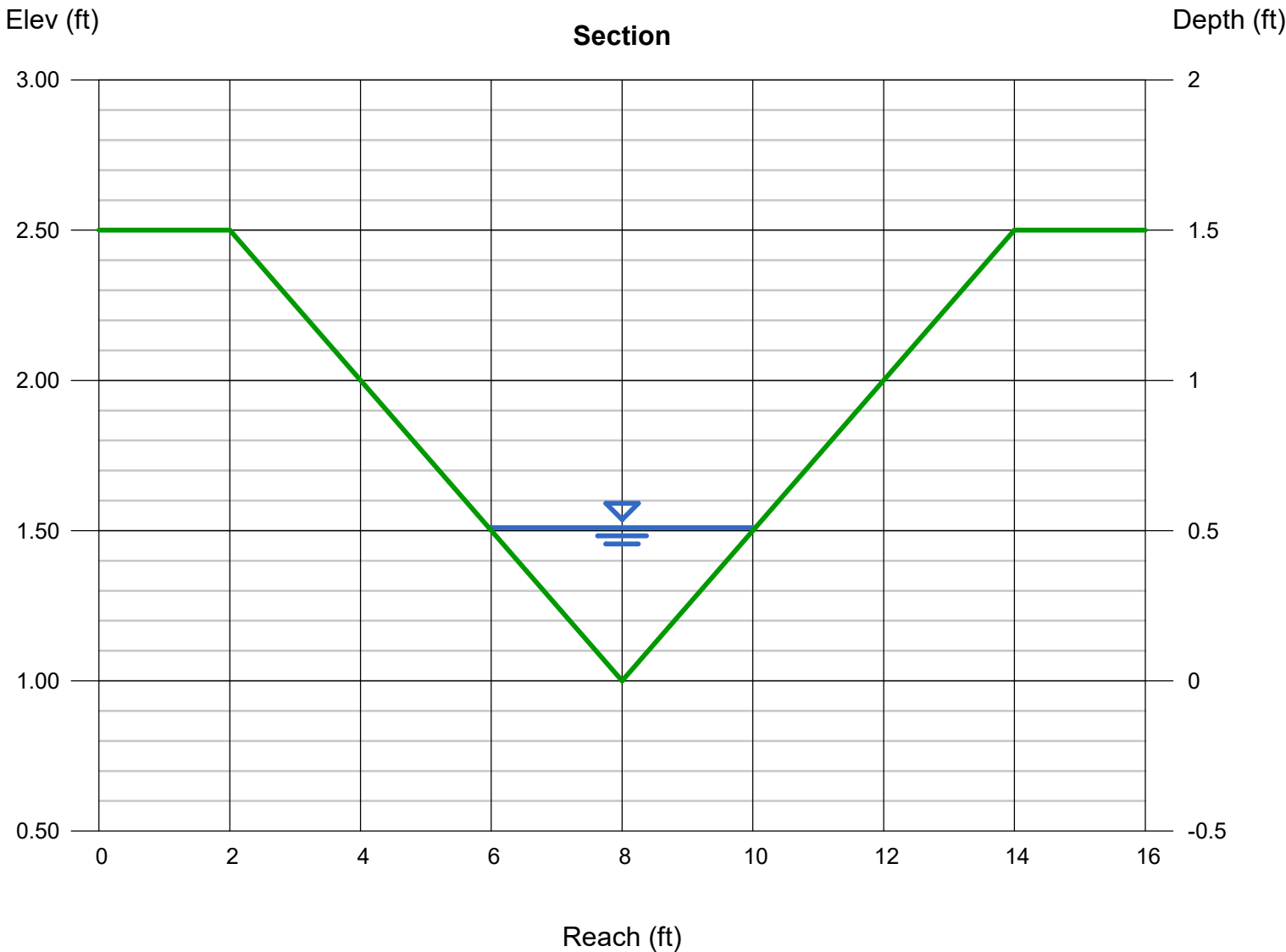
Invert Elev (ft) = 1.00
Slope (%) = 2.35
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 2.60

Highlighted

Depth (ft) = 0.51
Q (cfs) = 2.600
Area (sqft) = 1.04
Velocity (ft/s) = 2.50
Wetted Perim (ft) = 4.21
Crit Depth, Yc (ft) = 0.49
Top Width (ft) = 4.08
EGL (ft) = 0.61



Channel Report

DP1 SWALE Q100

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 1.50

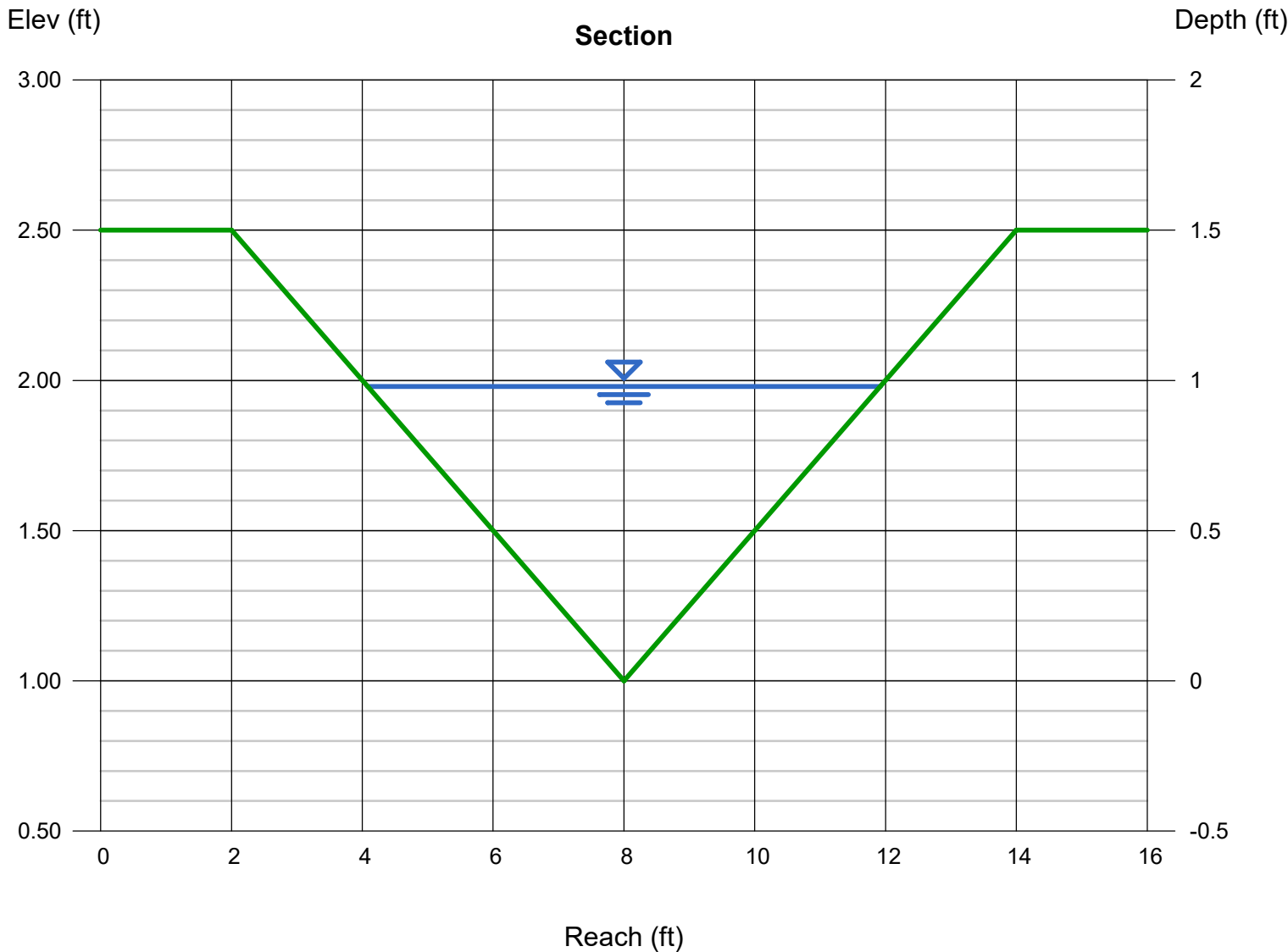
Invert Elev (ft) = 1.00
Slope (%) = 2.35
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 14.90

Highlighted

Depth (ft) = 0.98
Q (cfs) = 14.90
Area (sqft) = 3.84
Velocity (ft/s) = 3.88
Wetted Perim (ft) = 8.08
Crit Depth, Yc (ft) = 0.98
Top Width (ft) = 7.84
EGL (ft) = 1.21



Channel Report

DP1.1 EX SWALE (Q100)

User-defined

Invert Elev (ft)

= 91.98

Slope (%)

= 3.20

N-Value

= 0.035

Highlighted

Depth (ft)

= 0.32

Q (cfs)

= 23.60

Area (sqft)

= 8.93

Velocity (ft/s)

= 2.64

Wetted Perim (ft)

= 40.13

Crit Depth, Yc (ft)

= 0.32

Top Width (ft)

= 40.11

EGL (ft)

= 0.43

Calculations

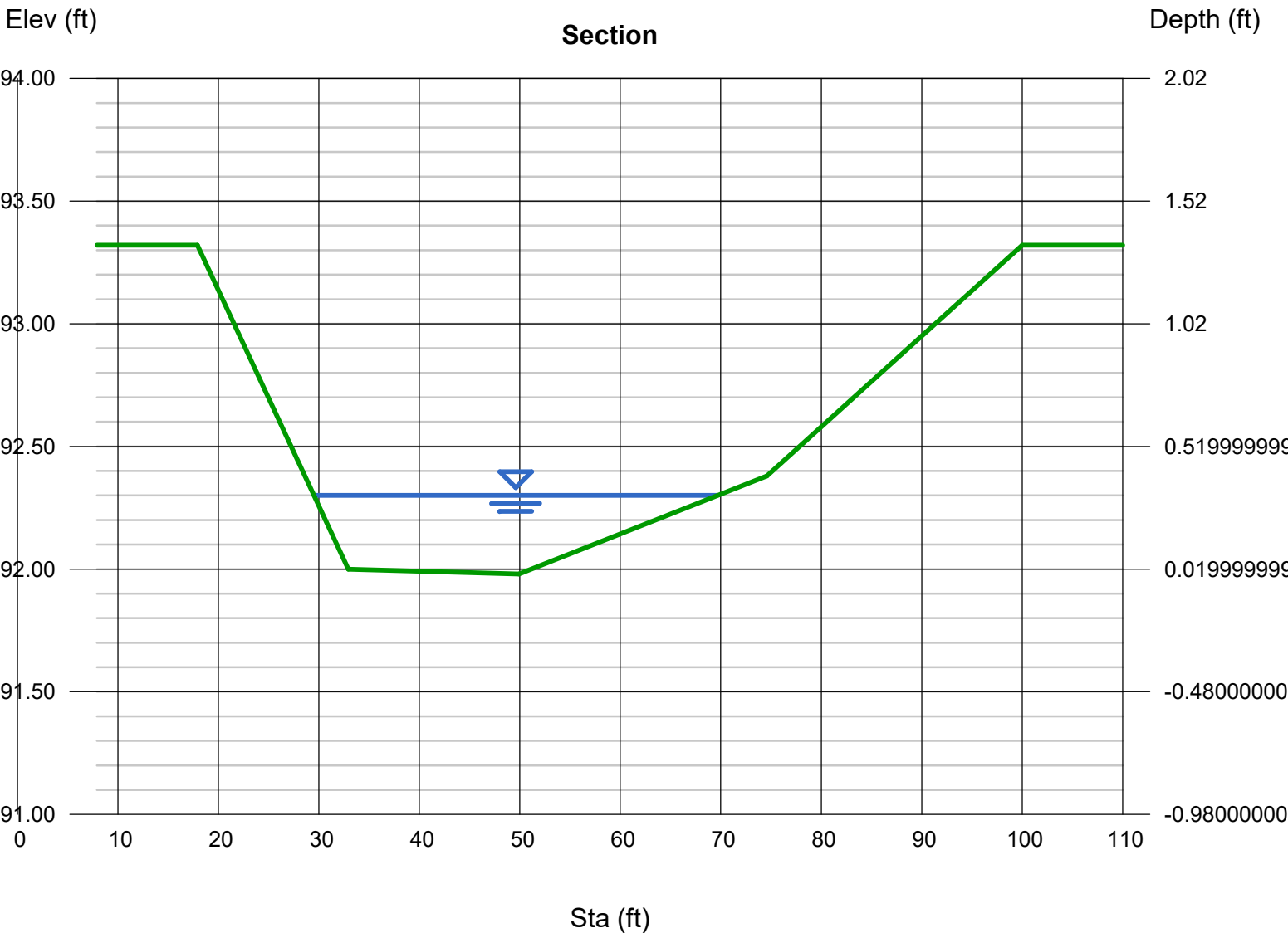
Compute by:Known Q

Known Q (cfs)

= 23.60

(Sta, El, n)-(Sta, El, n)...

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)



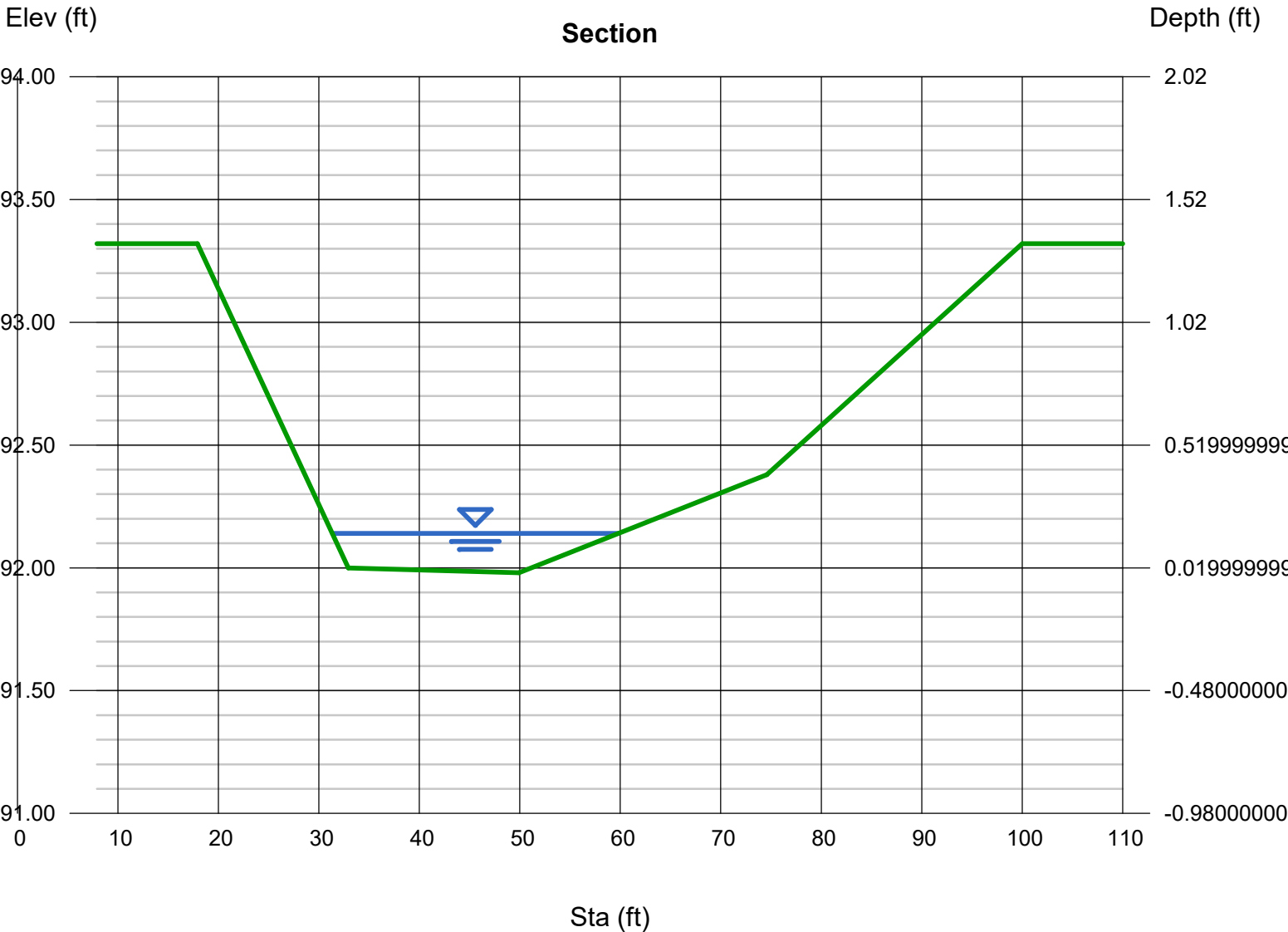
Channel Report

Ex Swale Tributary 2 @ DP1.1 (total flow) Q5

User-defined		Highlighted	
Invert Elev (ft)	= 91.98	Depth (ft)	= 0.16
Slope (%)	= 3.20	Q (cfs)	= 5.800
N-Value	= 0.035	Area (sqft)	= 3.45
		Velocity (ft/s)	= 1.68
		Wetted Perim (ft)	= 28.44
		Crit Depth, Yc (ft)	= 0.15
		Top Width (ft)	= 28.43
		EGL (ft)	= 0.20

(Sta, El, n)-(Sta, El, n)...

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)



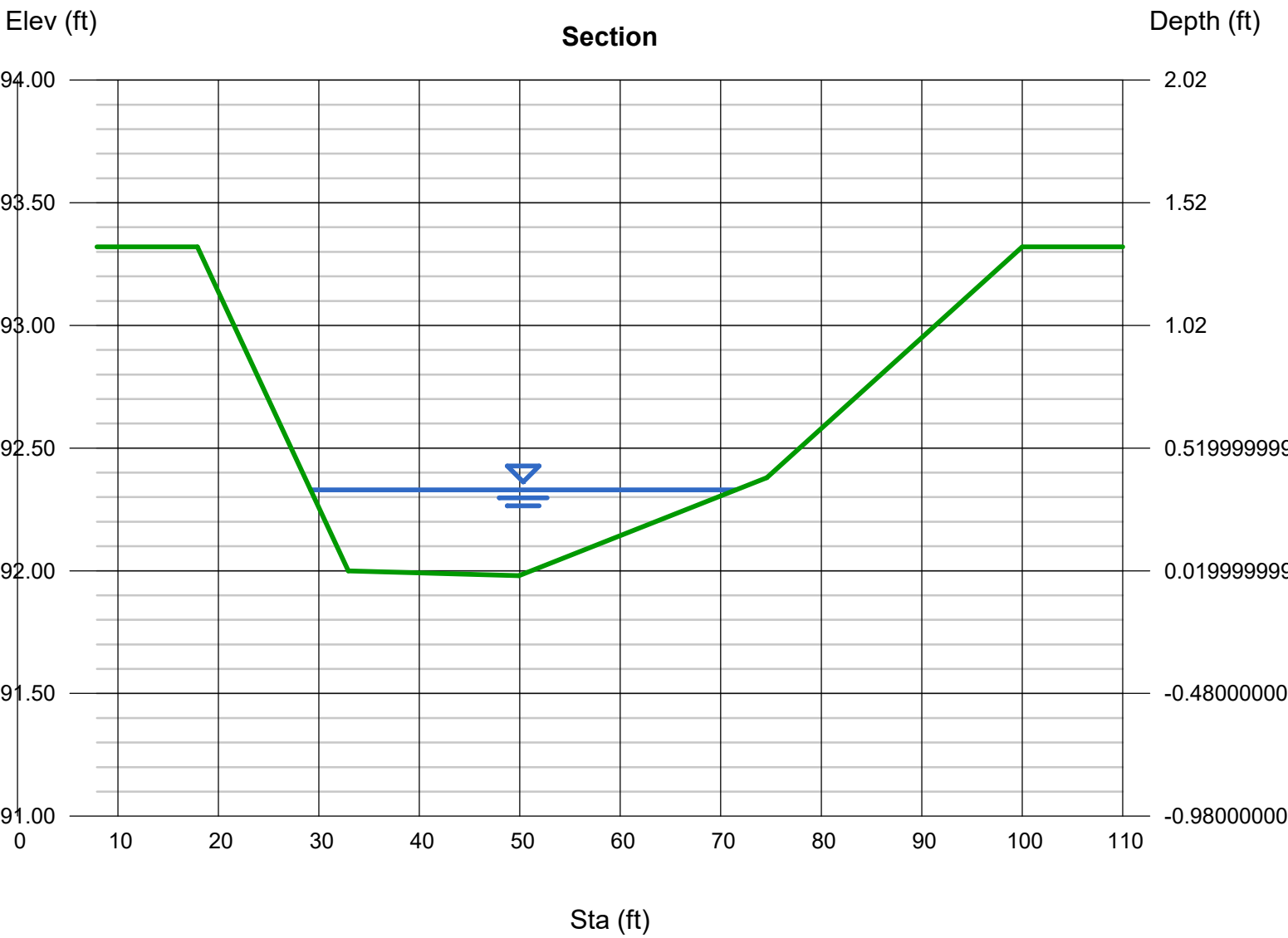
Channel Report

Ex Swale Tributary 2 @ DP1.1 (total flow) Q100

User-defined		Highlighted	
Invert Elev (ft)	= 91.98	Depth (ft)	= 0.35
Slope (%)	= 3.20	Q (cfs)	= 29.10
N-Value	= 0.035	Area (sqft)	= 10.17
		Velocity (ft/s)	= 2.86
		Wetted Perim (ft)	= 42.32
		Crit Depth, Yc (ft)	= 0.36
		Top Width (ft)	= 42.31
		EGL (ft)	= 0.48

(Sta, El, n)-(Sta, El, n)...

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)

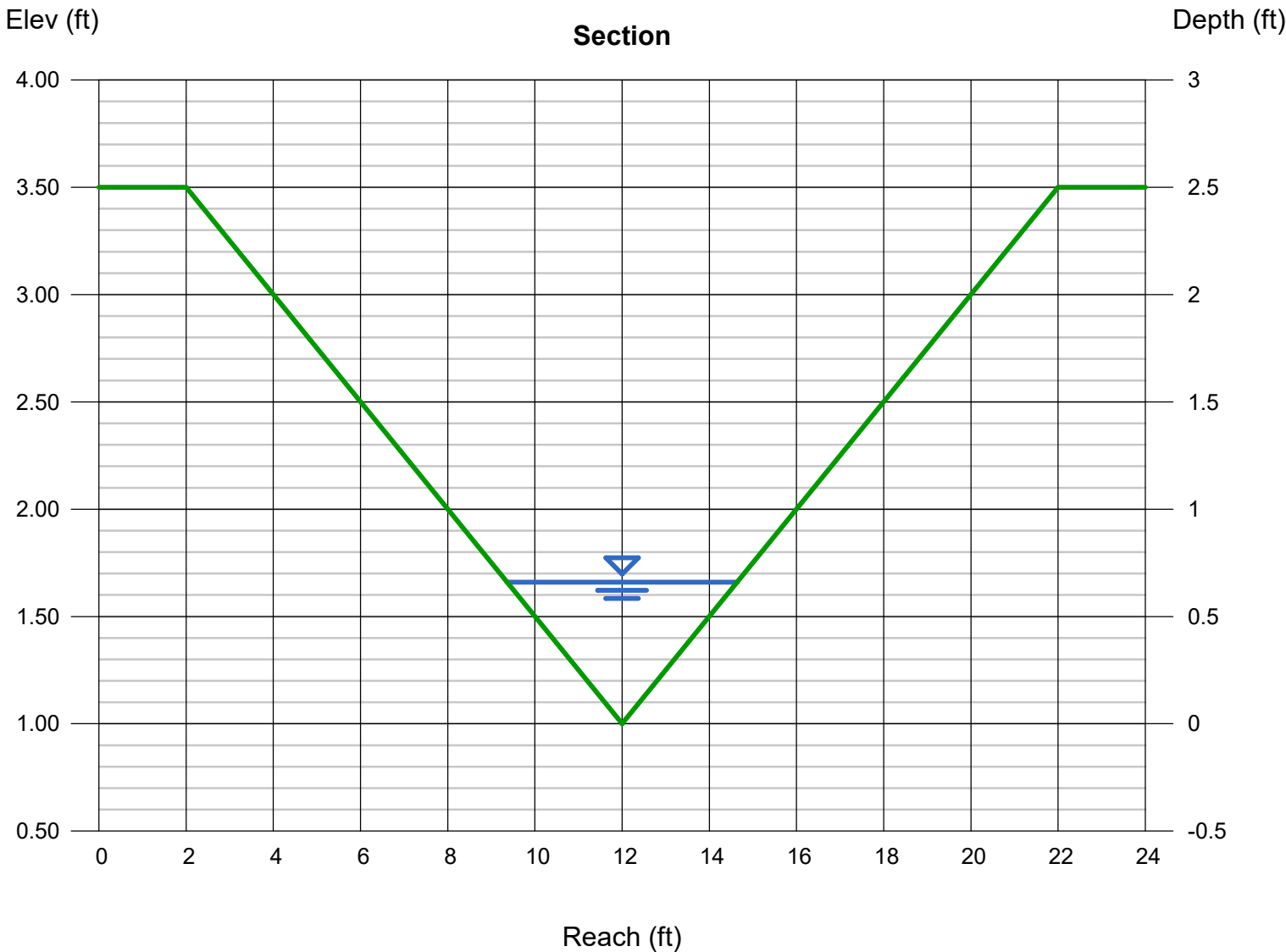


Channel Report

DP3.1 - DP4 SWALE (Q5)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Triangular		Highlighted	
Side Slopes (z:1)	= 4.00, 4.00	Depth (ft)	= 0.66
Total Depth (ft)	= 2.50	Q (cfs)	= 8.400
		Area (sqft)	= 1.74
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.82
Slope (%)	= 6.33	Wetted Perim (ft)	= 5.44
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.78
		Top Width (ft)	= 5.28
		EGL (ft)	= 1.02
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 8.40		

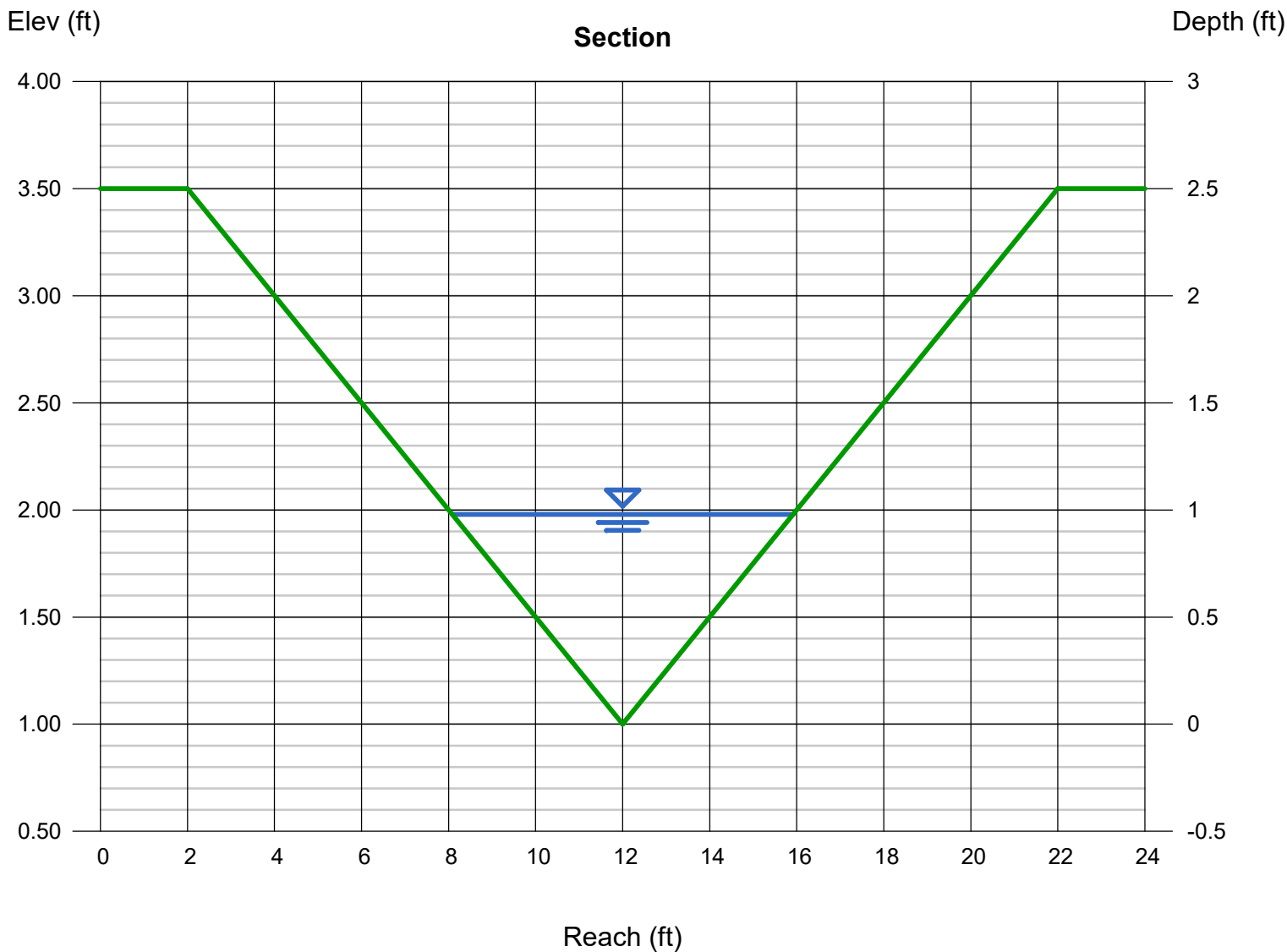


Channel Report

DP3.1 - DP4 MAX SLOPE (Q100)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Triangular		Highlighted	
Side Slopes (z:1)	= 4.00, 4.00	Depth (ft)	= 0.98
Total Depth (ft)	= 2.50	Q (cfs)	= 32.10
		Area (sqft)	= 3.84
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 8.36
Slope (%)	= 10.90	Wetted Perim (ft)	= 8.08
N-Value	= 0.035	Crit Depth, Yc (ft)	= 1.32
		Top Width (ft)	= 7.84
		EGL (ft)	= 2.07
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 32.10		



Channel Report

DP3.1 - DP4 (Q100)

GRASS LINED W/ TURF REINFORCEMENT MAT

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

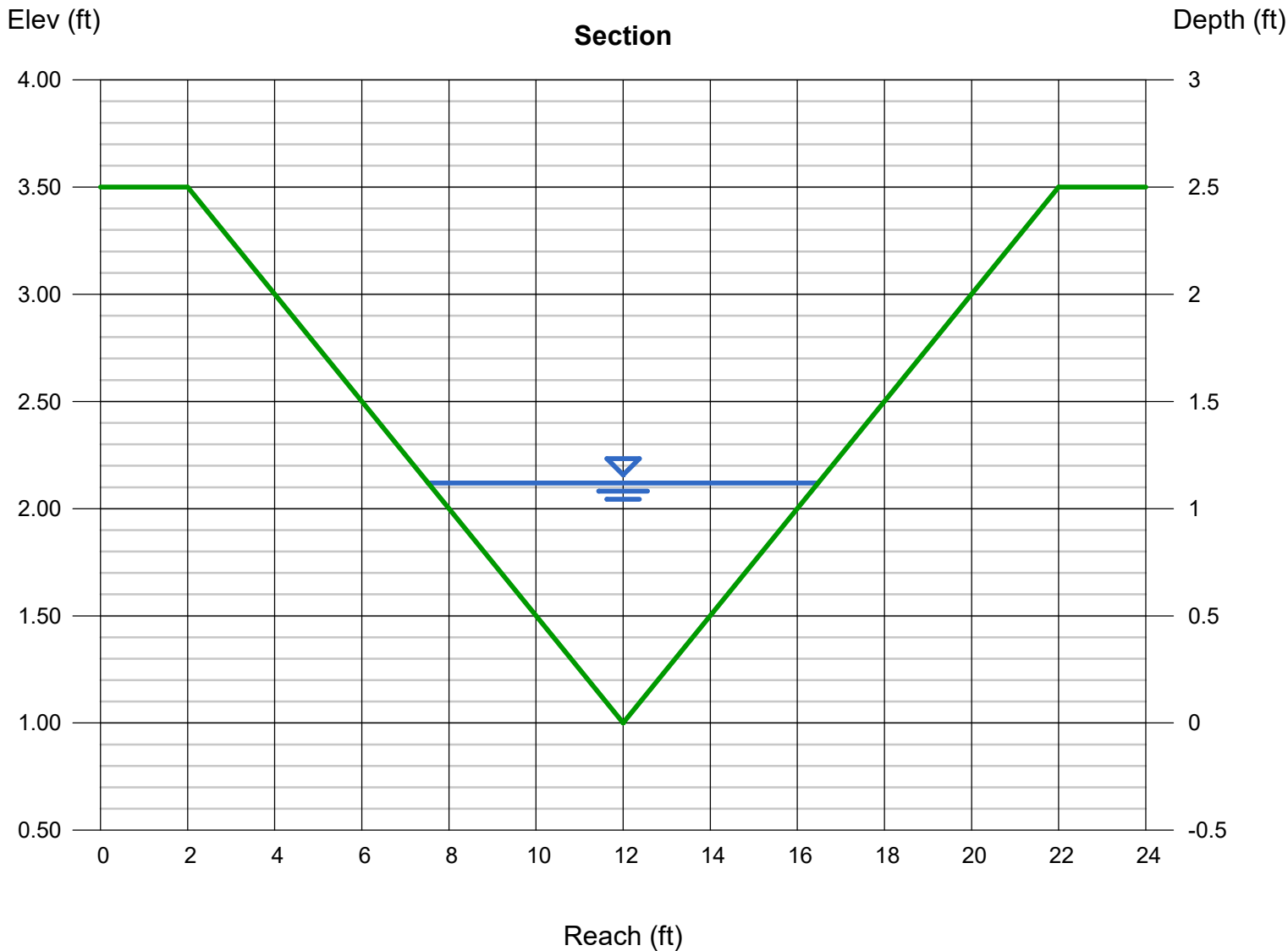
Invert Elev (ft) = 1.00
Slope (%) = 5.20
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 32.10

Highlighted

Depth (ft) = 1.12
Q (cfs) = 32.10
Area (sqft) = 5.02
Velocity (ft/s) = 6.40
Wetted Perim (ft) = 9.24
Crit Depth, Yc (ft) = 1.32
Top Width (ft) = 8.96
EGL (ft) = 1.76



Channel Report

DP3 - DP3.1 SWALE (Q5)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

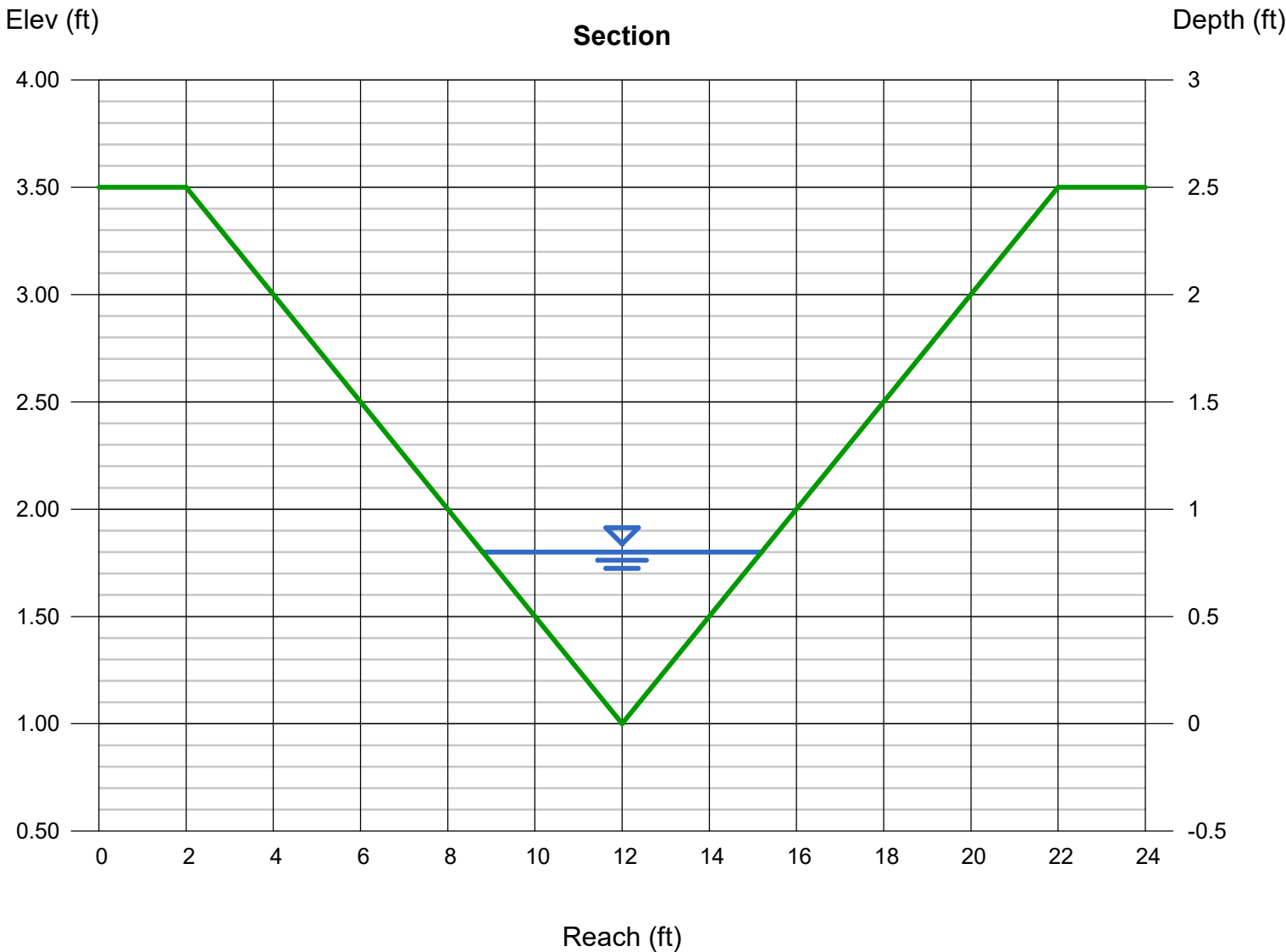
Invert Elev (ft) = 1.00
Slope (%) = 1.25
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 6.40

Highlighted

Depth (ft) = 0.80
Q (cfs) = 6.400
Area (sqft) = 2.56
Velocity (ft/s) = 2.50
Wetted Perim (ft) = 6.60
Crit Depth, Yc (ft) = 0.70
Top Width (ft) = 6.40
EGL (ft) = 0.90



Channel Report

DP3 - DP3.1 SWALE (Q100)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

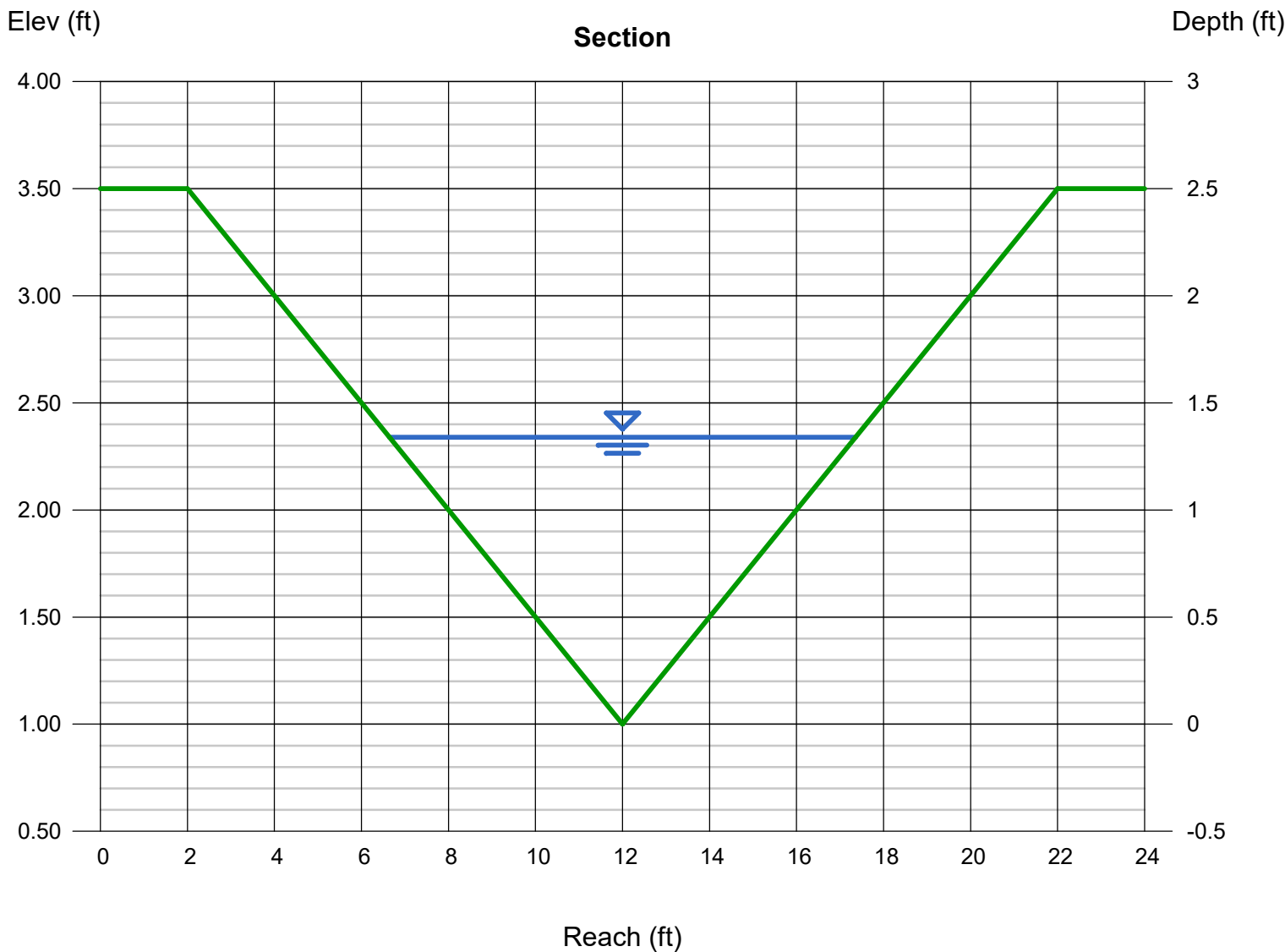
Invert Elev (ft) = 1.00
Slope (%) = 1.25
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 25.10

Highlighted

Depth (ft) = 1.34
Q (cfs) = 25.10
Area (sqft) = 7.18
Velocity (ft/s) = 3.49
Wetted Perim (ft) = 11.05
Crit Depth, Yc (ft) = 1.20
Top Width (ft) = 10.72
EGL (ft) = 1.53

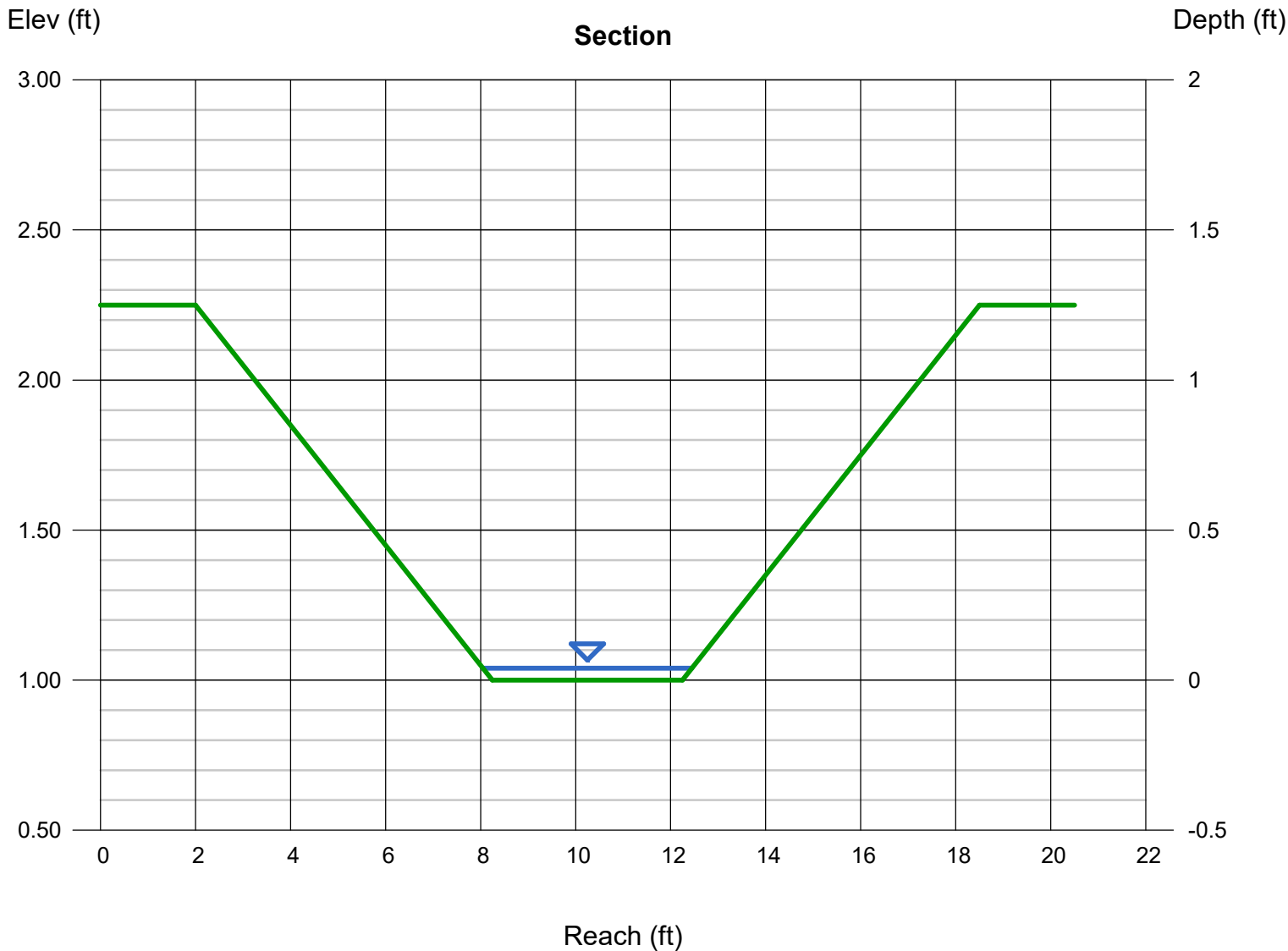


Channel Report

DP4.1 - POND 1 OUTFALL SWALE (Q5)

GRASS LINED W/ TURF REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.04
Side Slopes (z:1)	= 5.00, 5.00	Q (cfs)	= 0.100
Total Depth (ft)	= 1.25	Area (sqft)	= 0.17
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 0.60
Slope (%)	= 4.00	Wetted Perim (ft)	= 4.41
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.03
Calculations		Top Width (ft)	= 4.40
Compute by:	Known Q	EGL (ft)	= 0.05
Known Q (cfs)	= 0.10		

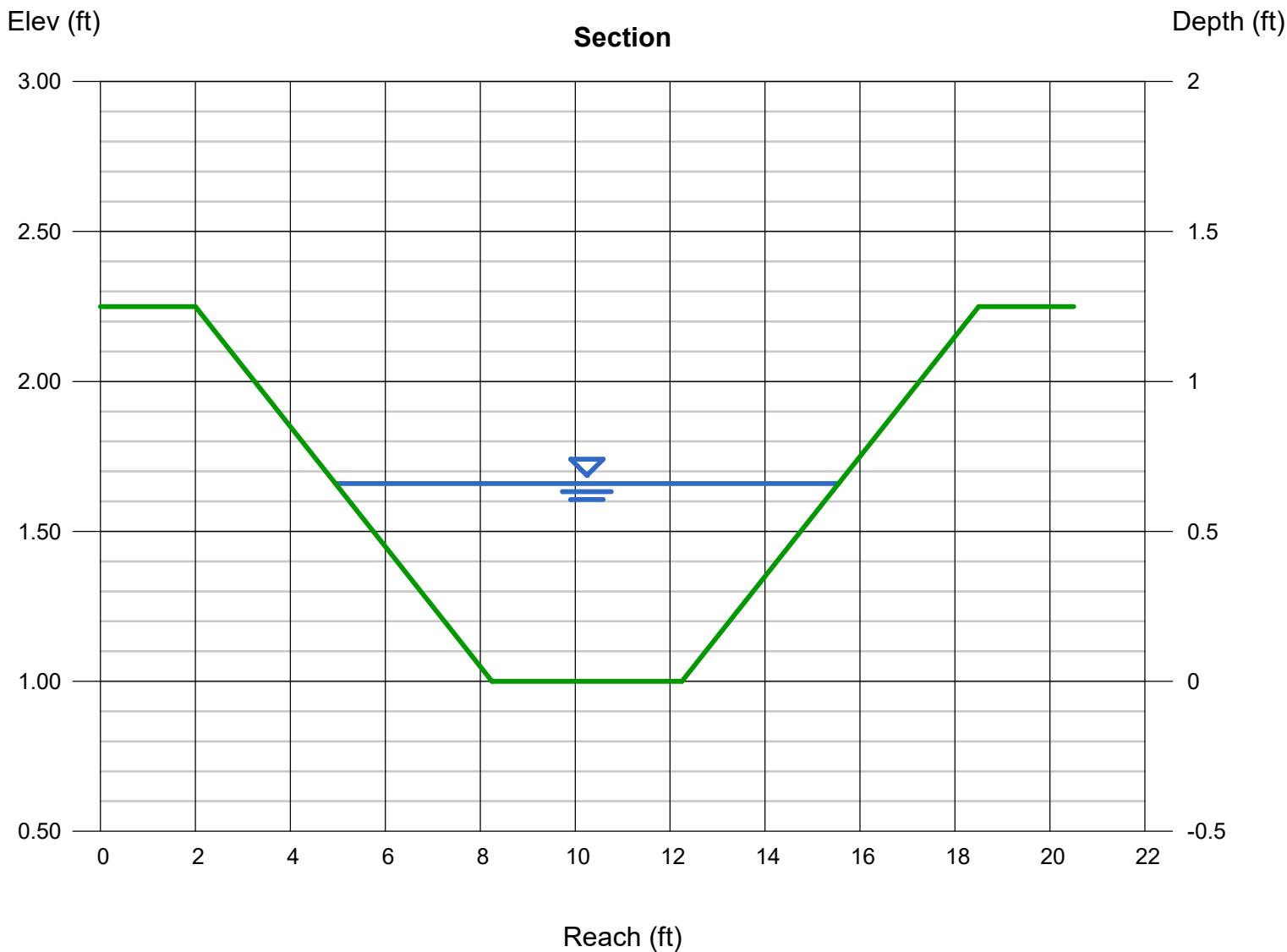


Channel Report

DP4.1 - POND 1 OUTFALL SWALE

GRASS LINED W/ TURF
REINFORCEMENT MAT

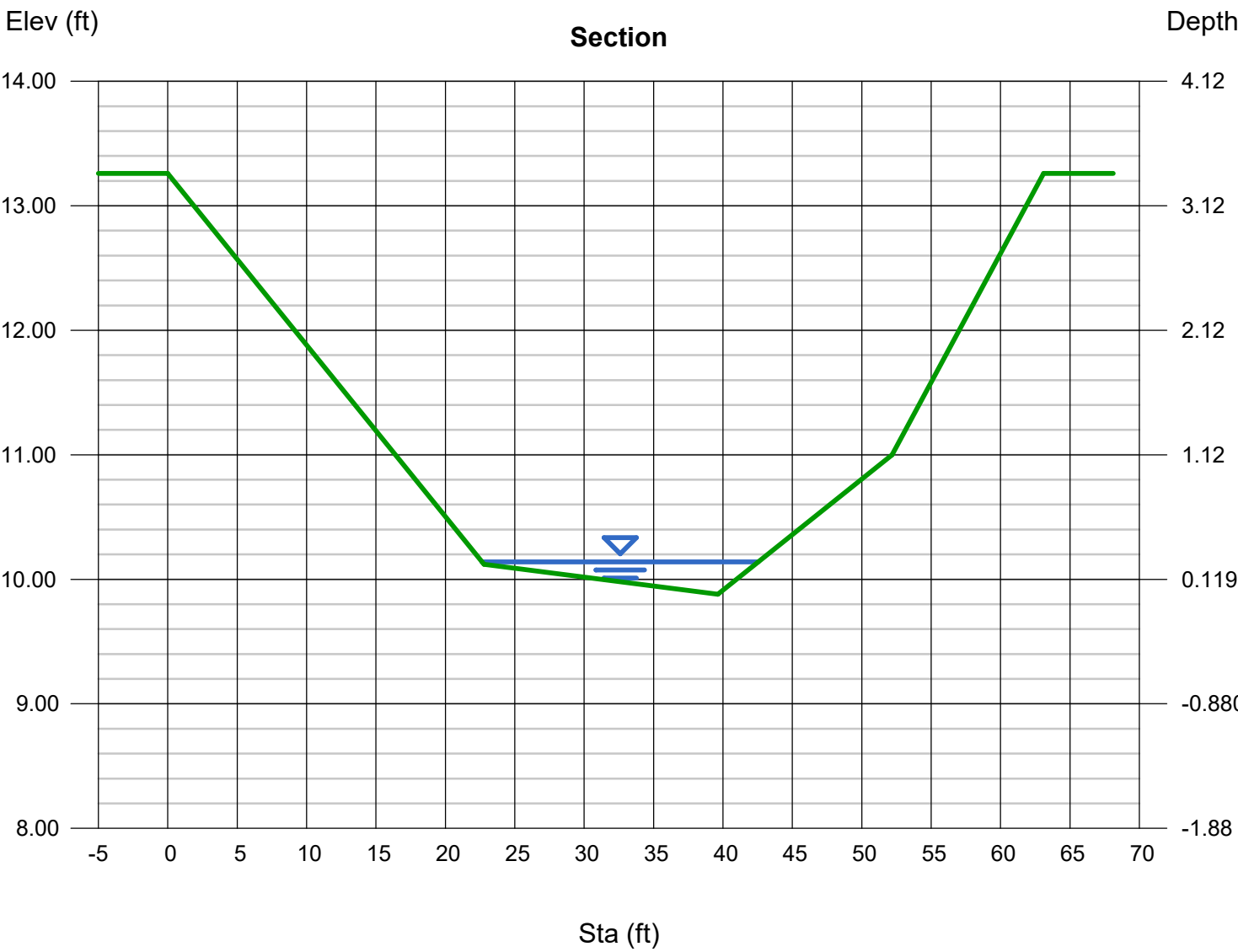
Trapezoidal		Highlighted	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.66
Side Slopes (z:1)	= 5.00, 5.00	Q (cfs)	= 23.90
Total Depth (ft)	= 1.25	Area (sqft)	= 4.82
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.96
Slope (%)	= 4.00	Wetted Perim (ft)	= 10.73
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.76
Calculations		Top Width (ft)	= 10.60
Compute by:	Known Q	EGL (ft)	= 1.04
Known Q (cfs)	= 23.90		



Channel Report

Ex Swale Tributary 3 @ DP7 (total flow) Q5

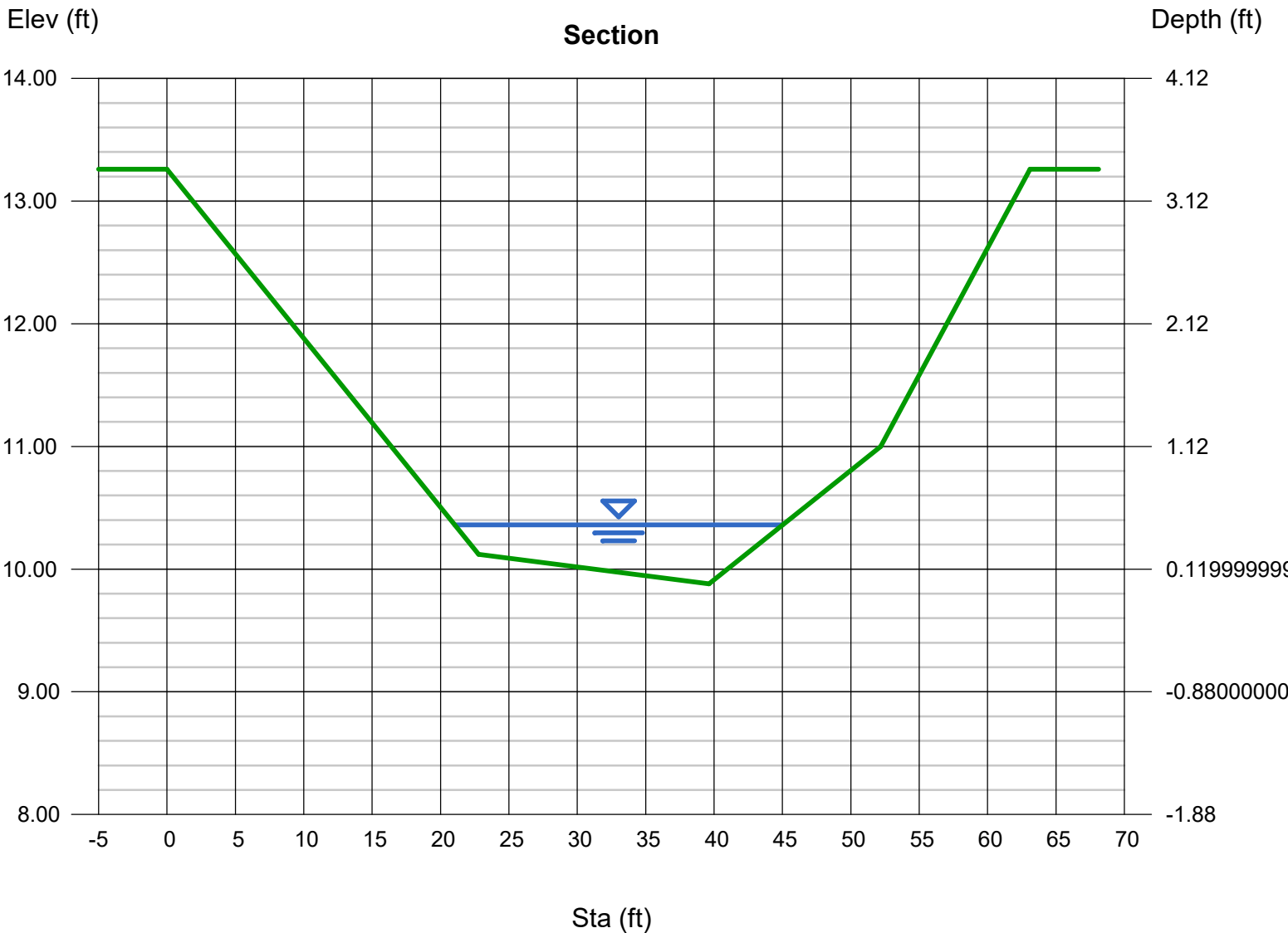
User-defined			Highlighted		
Invert Elev (ft)	=	9.88	Depth (ft)	=	0.26
Slope (%)	=	3.40	Q (cfs)	=	5.400
N-Value	=	0.035	Area (sqft)	=	2.74
Calculations			Velocity (ft/s)	=	1.97
Compute by:	Known Q		Wetted Perim (ft)	=	19.93
Known Q (cfs)	=	5.40	Crit Depth, Yc (ft)	=	0.26
			Top Width (ft)	=	19.92
			EGL (ft)	=	0.32
(Sta, El, n)-(Sta, El, n)...					
(0.00, 13.26)-(22.78, 10.12, 0.035)-(39.64, 9.88, 0.035)-(52.18, 11.00, 0.035)-(63.11, 13.26, 0.035)					



Channel Report

Ex Swale Tributary 3 @ DP7 (total flow) Q100

User-defined		Highlighted	
Invert Elev (ft)	= 9.88	Depth (ft)	= 0.48
Slope (%)	= 3.40	Q (cfs)	= 26.60
N-Value	= 0.035	Area (sqft)	= 7.57
Calculations		Velocity (ft/s)	= 3.51
Compute by:	Known Q	Wetted Perim (ft)	= 24.01
Known Q (cfs)	= 26.60	Crit Depth, Yc (ft)	= 0.51
		Top Width (ft)	= 23.98
		EGL (ft)	= 0.67
(Sta, El, n)-(Sta, El, n)...			
(0.00, 13.26)-(22.78, 10.12, 0.035)-(39.64, 9.88, 0.035)-(52.18, 11.00, 0.035)-(63.11, 13.26, 0.035)			



Channel Report

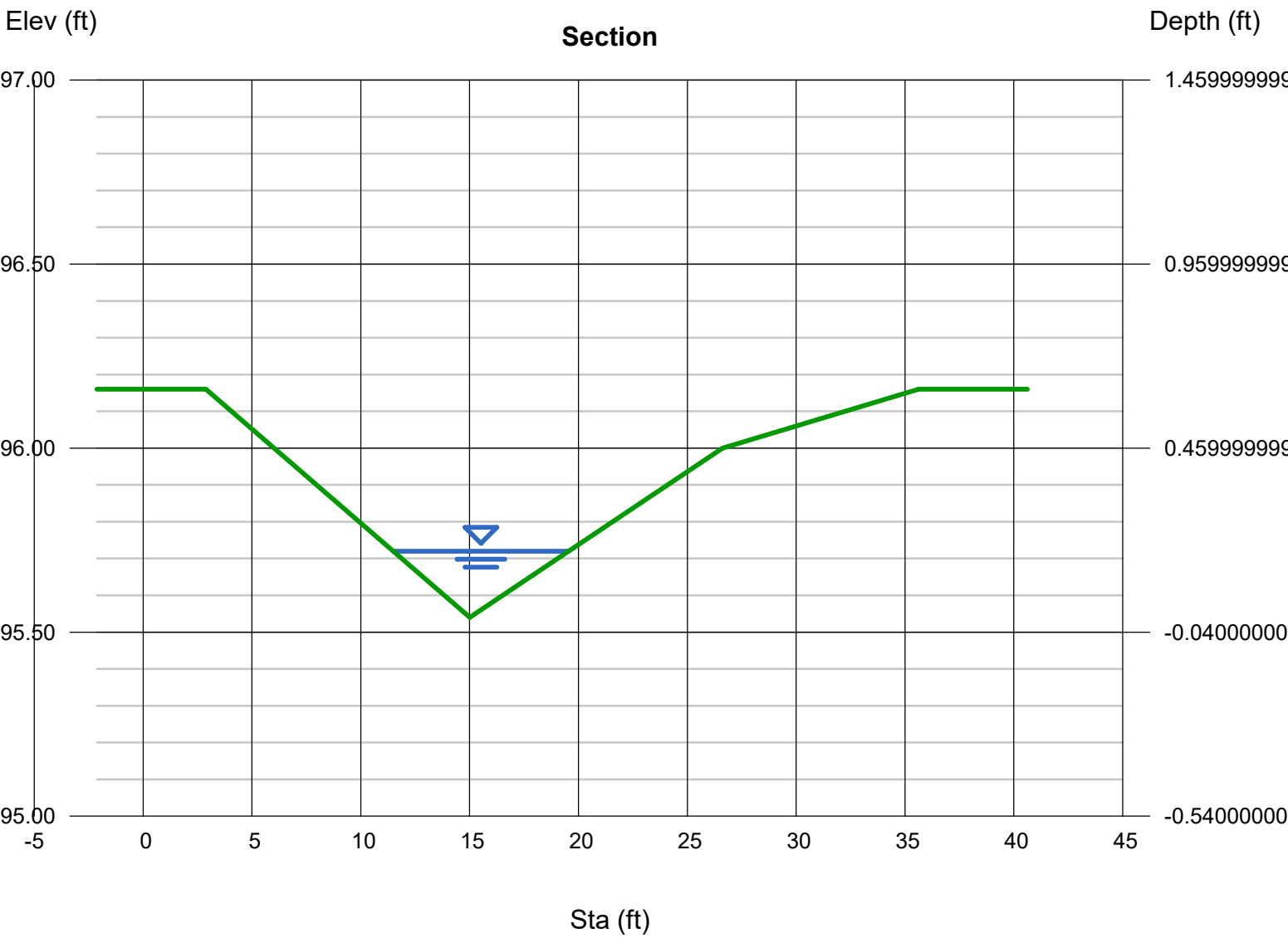
DP9 - DP10 EX SWALE Q5

GRASS LINED W/ TURF
REINFORCEMENT MAT

User-defined		Highlighted	
Invert Elev (ft)	= 95.54	Depth (ft)	= 0.18
Slope (%)	= 15.50	Q (cfs)	= 2.300
N-Value	= 0.035	Area (sqft)	= 0.73
		Velocity (ft/s)	= 3.17
		Wetted Perim (ft)	= 8.07
		Crit Depth, Yc (ft)	= 0.24
		Top Width (ft)	= 8.06
		EGL (ft)	= 0.34

(Sta, El, n)-(Sta, El, n)...

(2.88, 96.16)-(15.01, 95.54, 0.035)-(26.62, 96.00, 0.035)-(35.62, 96.16, 0.035)



Channel Report

DP9 - DP10 EX SWALE Q100

GRASS LINED W/ TURF
REINFORCEMENT MAT

User-defined

Invert Elev (ft) = 95.54
Slope (%) = 15.50
N-Value = 0.035

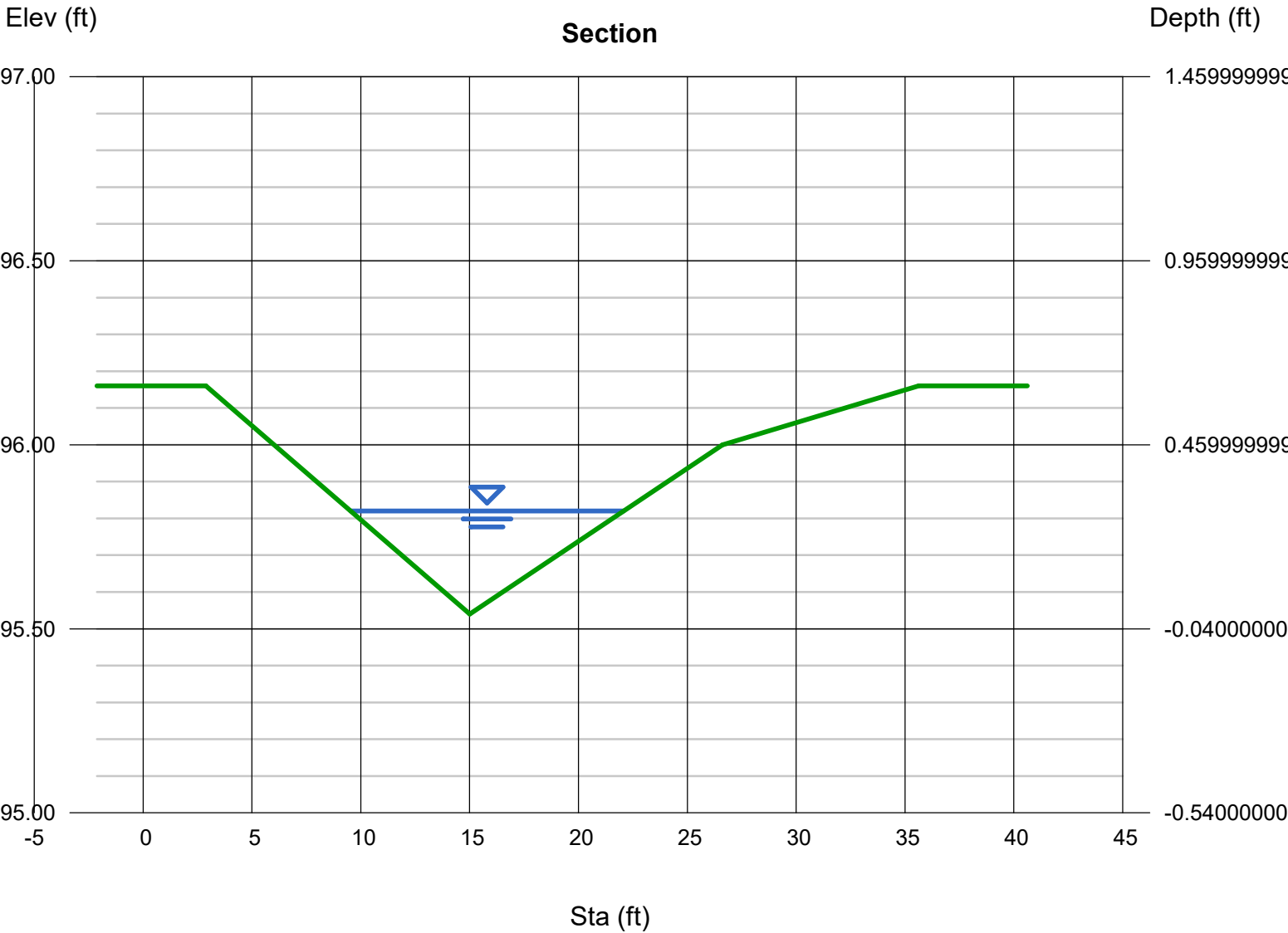
Calculations

Compute by: Known Q
Known Q (cfs) = 7.70

Highlighted

Depth (ft) = 0.28
Q (cfs) = 7.700
Area (sqft) = 1.76
Velocity (ft/s) = 4.38
Wetted Perim (ft) = 12.56
Crit Depth, Yc (ft) = 0.38
Top Width (ft) = 12.54
EGL (ft) = 0.58

(Sta, El, n)-(Sta, El, n)...
(2.88, 96.16)-(15.01, 95.54, 0.035)-(26.62, 96.00, 0.035)-(35.62, 96.16, 0.035)



Channel Report

DP13 - DP14 SWALE Q5 (CAPACITY)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

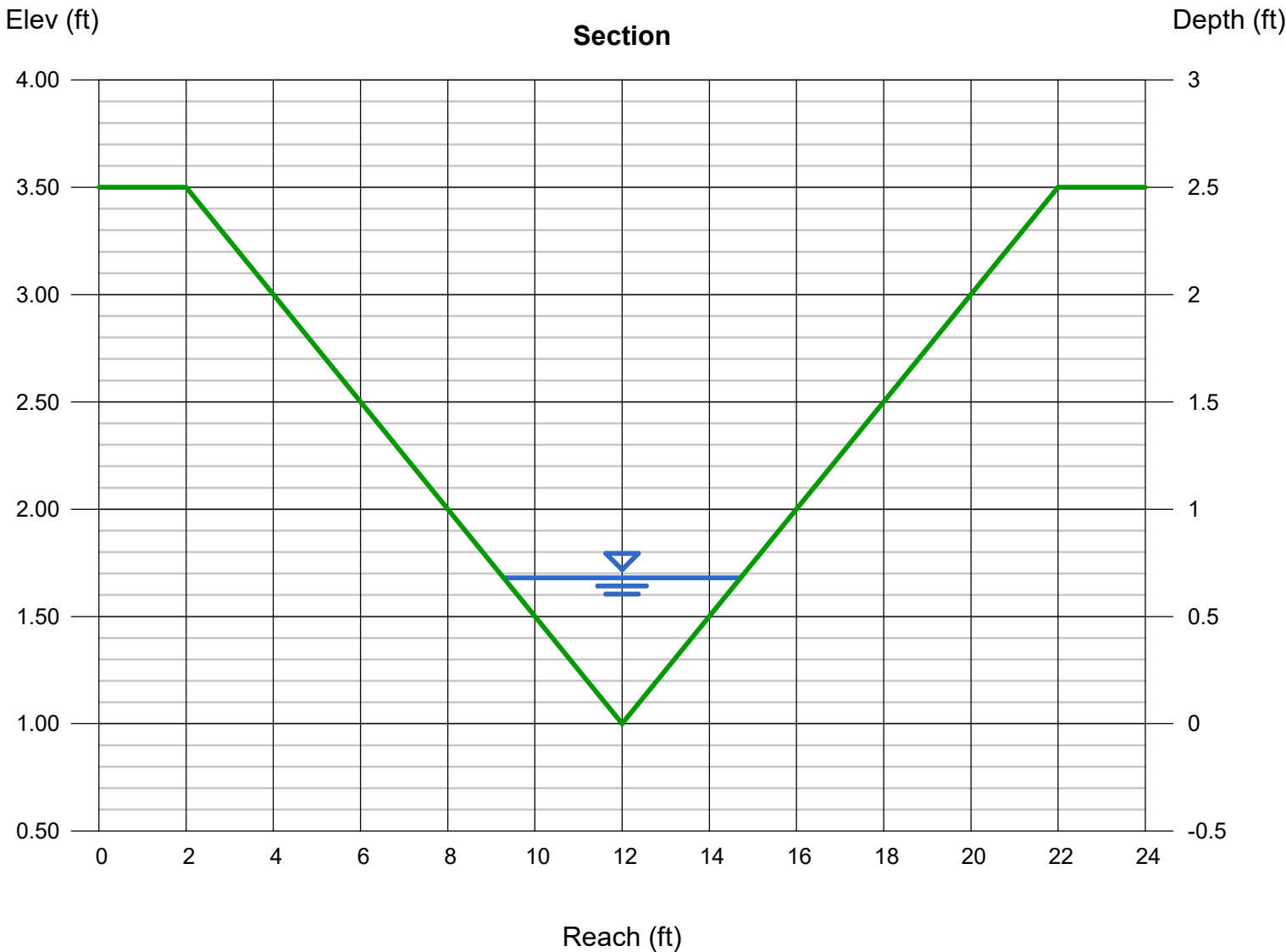
Invert Elev (ft) = 1.00
Slope (%) = 1.70
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 4.80

Highlighted

Depth (ft) = 0.68
Q (cfs) = 4.800
Area (sqft) = 1.85
Velocity (ft/s) = 2.60
Wetted Perim (ft) = 5.61
Crit Depth, Yc (ft) = 0.62
Top Width (ft) = 5.44
EGL (ft) = 0.78



Channel Report

DP13 - DP14 SWALE Q5

GRASS LINED W/ TURF REINFORCEMENT MAT

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

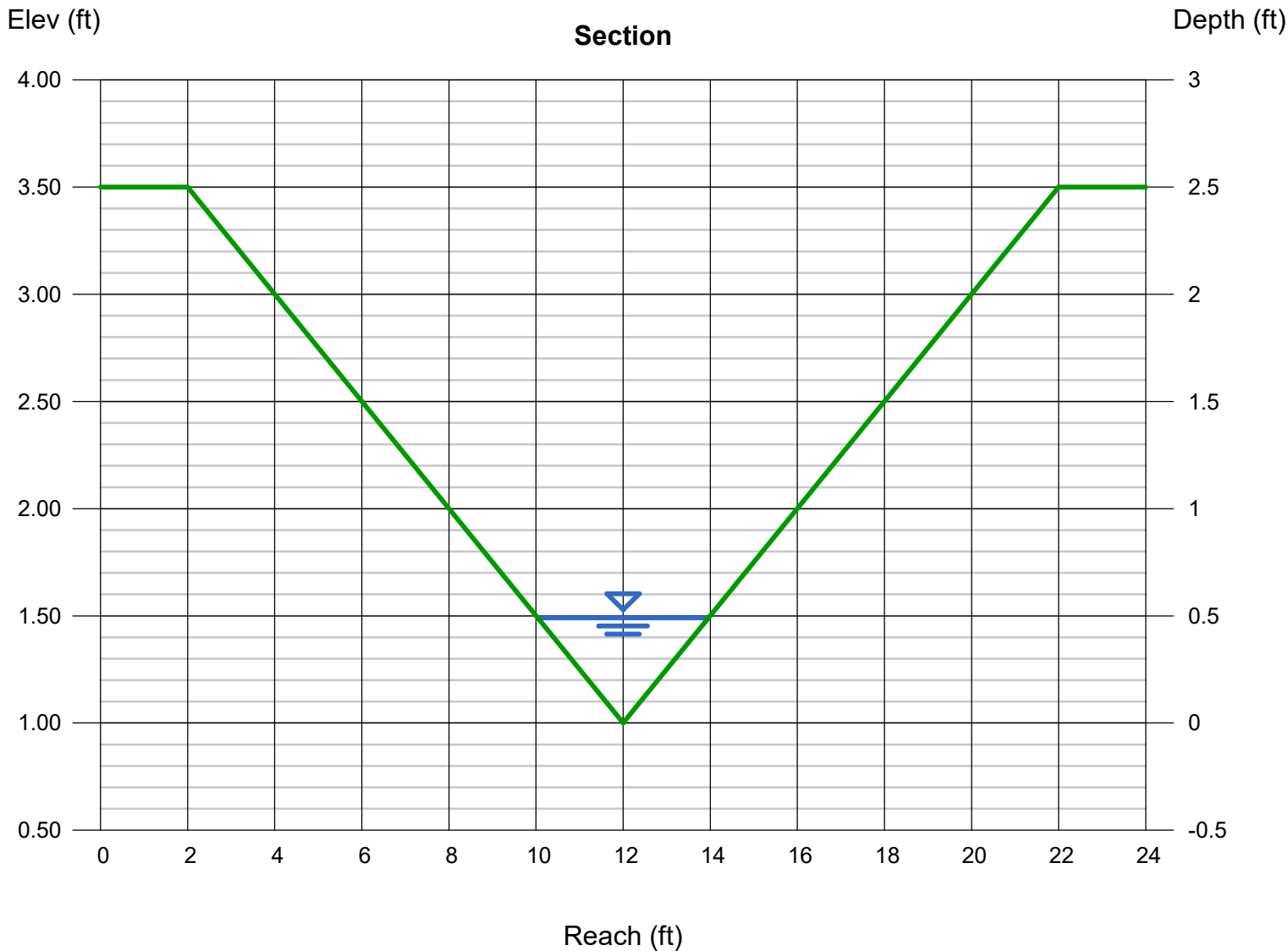
Invert Elev (ft) = 1.00
Slope (%) = 10.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 4.80

Highlighted

Depth (ft) = 0.49
Q (cfs) = 4.800
Area (sqft) = 0.96
Velocity (ft/s) = 5.00
Wetted Perim (ft) = 4.04
Crit Depth, Yc (ft) = 0.62
Top Width (ft) = 3.92
EGL (ft) = 0.88



Channel Report

DP13 - DP14 SWALE Q100 (CAPACITY)

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

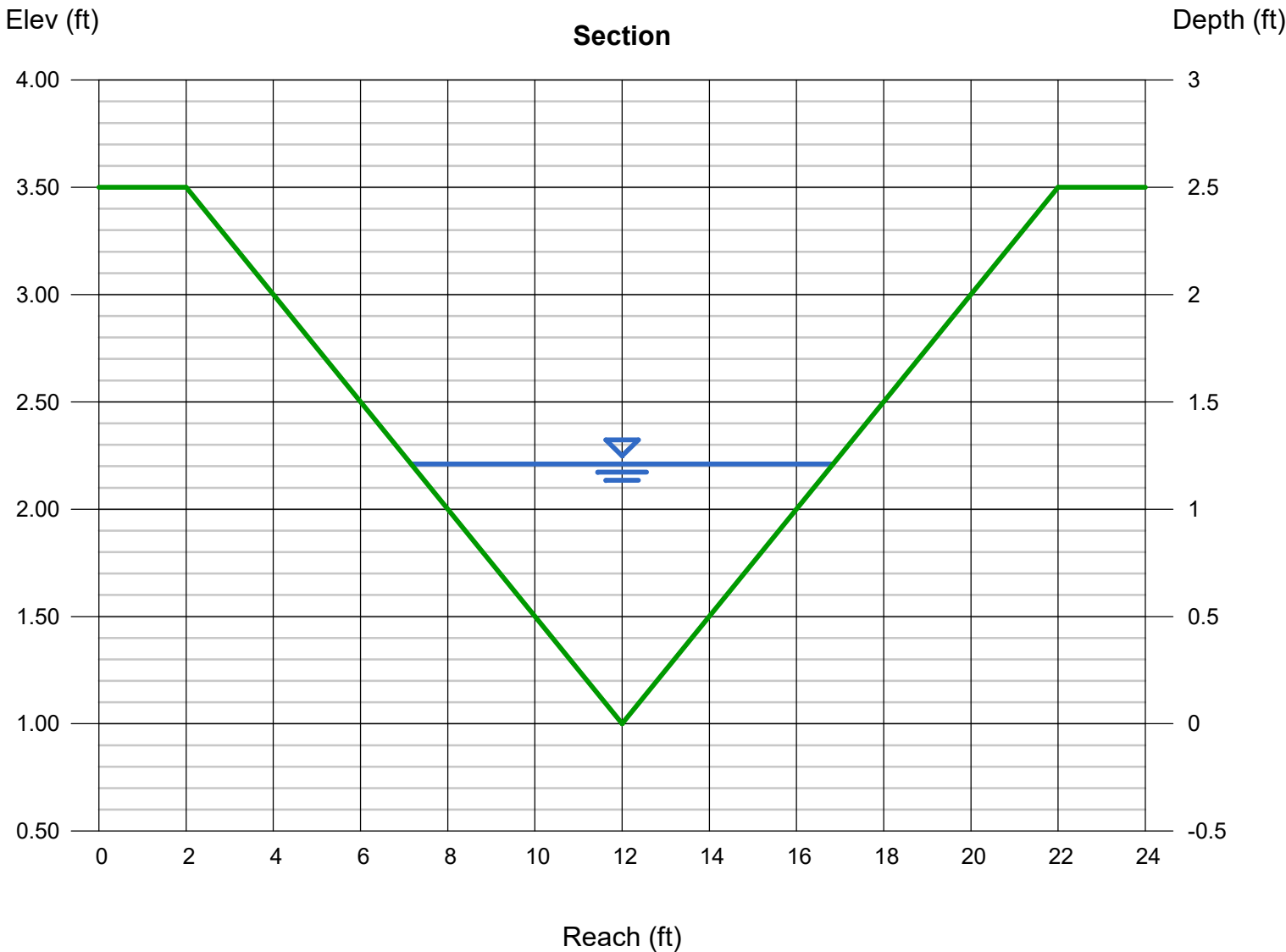
Invert Elev (ft) = 1.00
Slope (%) = 1.70
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 22.70

Highlighted

Depth (ft) = 1.21
Q (cfs) = 22.70
Area (sqft) = 5.86
Velocity (ft/s) = 3.88
Wetted Perim (ft) = 9.98
Crit Depth, Yc (ft) = 1.15
Top Width (ft) = 9.68
EGL (ft) = 1.44



Channel Report

DP13 - DP14 SWALE Q100

GRASS LINED W/ TURF
REINFORCEMENT MAT

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 2.50

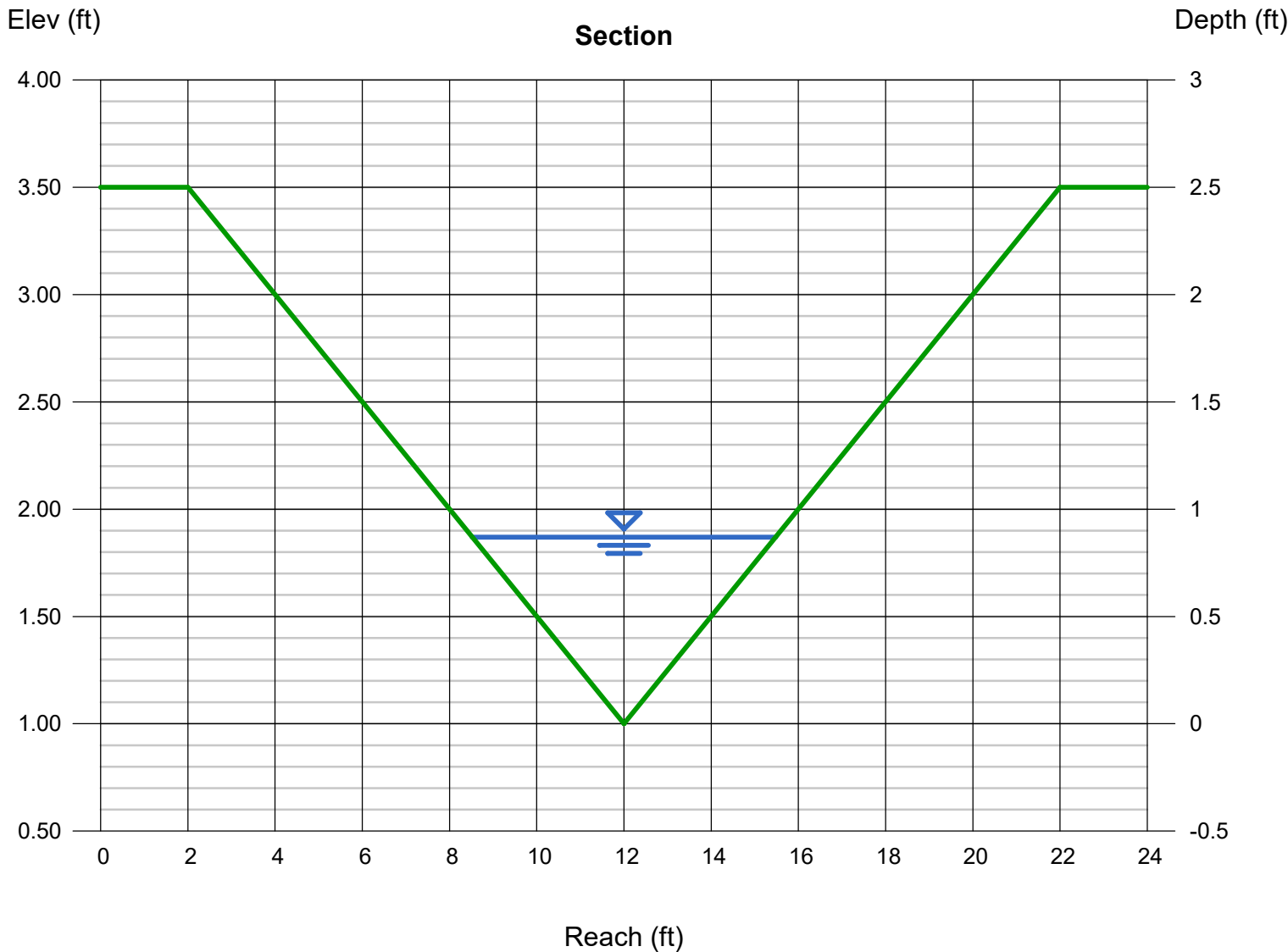
Invert Elev (ft) = 1.00
Slope (%) = 10.00
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 22.70

Highlighted

Depth (ft) = 0.87
Q (cfs) = 22.70
Area (sqft) = 3.03
Velocity (ft/s) = 7.50
Wetted Perim (ft) = 7.17
Crit Depth, Yc (ft) = 1.15
Top Width (ft) = 6.96
EGL (ft) = 1.74

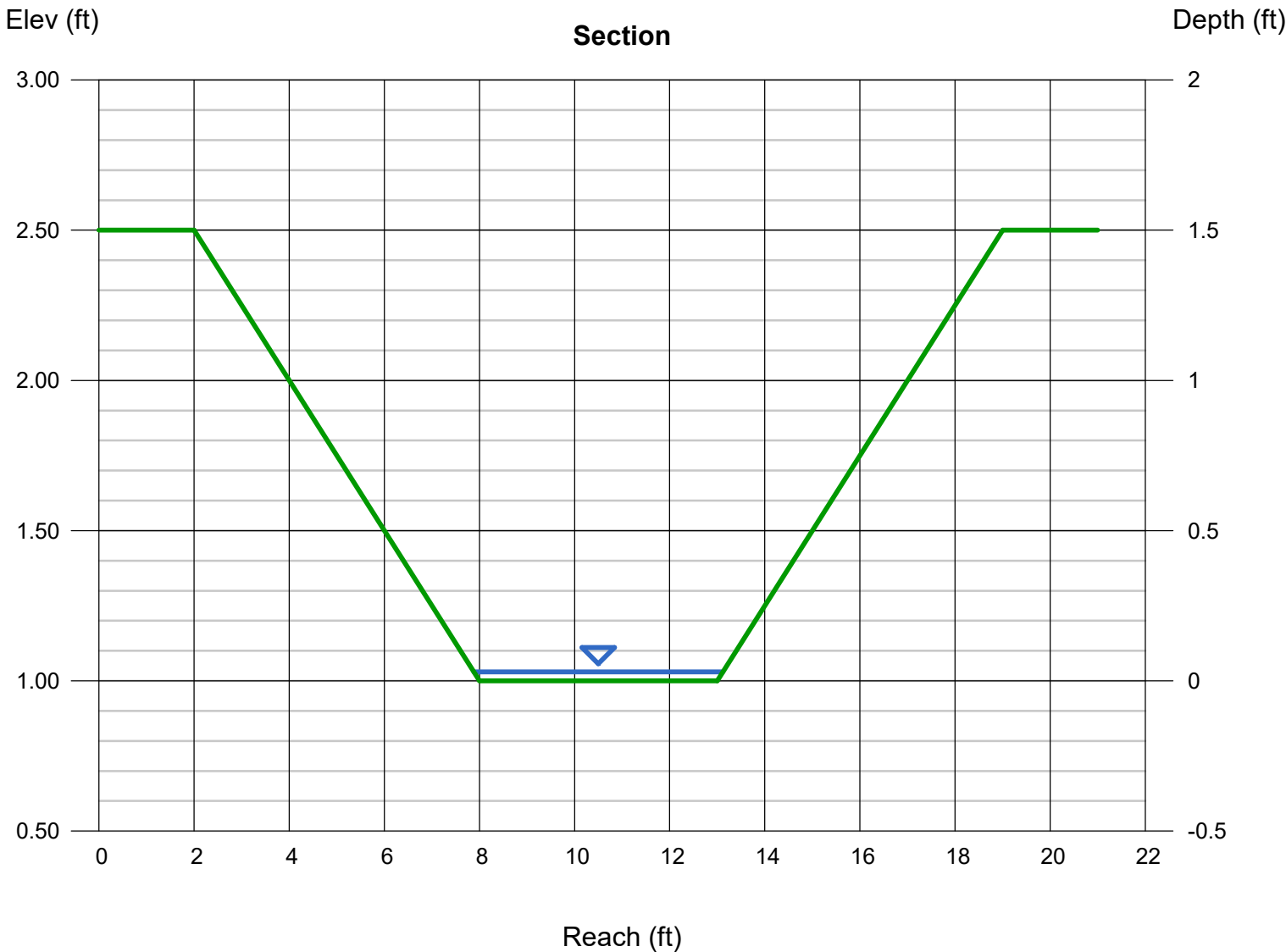


Channel Report

DP14.1 OUTFALL SEC 1 (Q5)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 0.03
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 0.100
Total Depth (ft)	= 1.50	Area (sqft)	= 0.15
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 0.65
Slope (%)	= 5.90	Wetted Perim (ft)	= 5.25
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.03
Calculations		Top Width (ft)	= 5.24
Compute by:	Known Q	EGL (ft)	= 0.04
Known Q (cfs)	= 0.10		

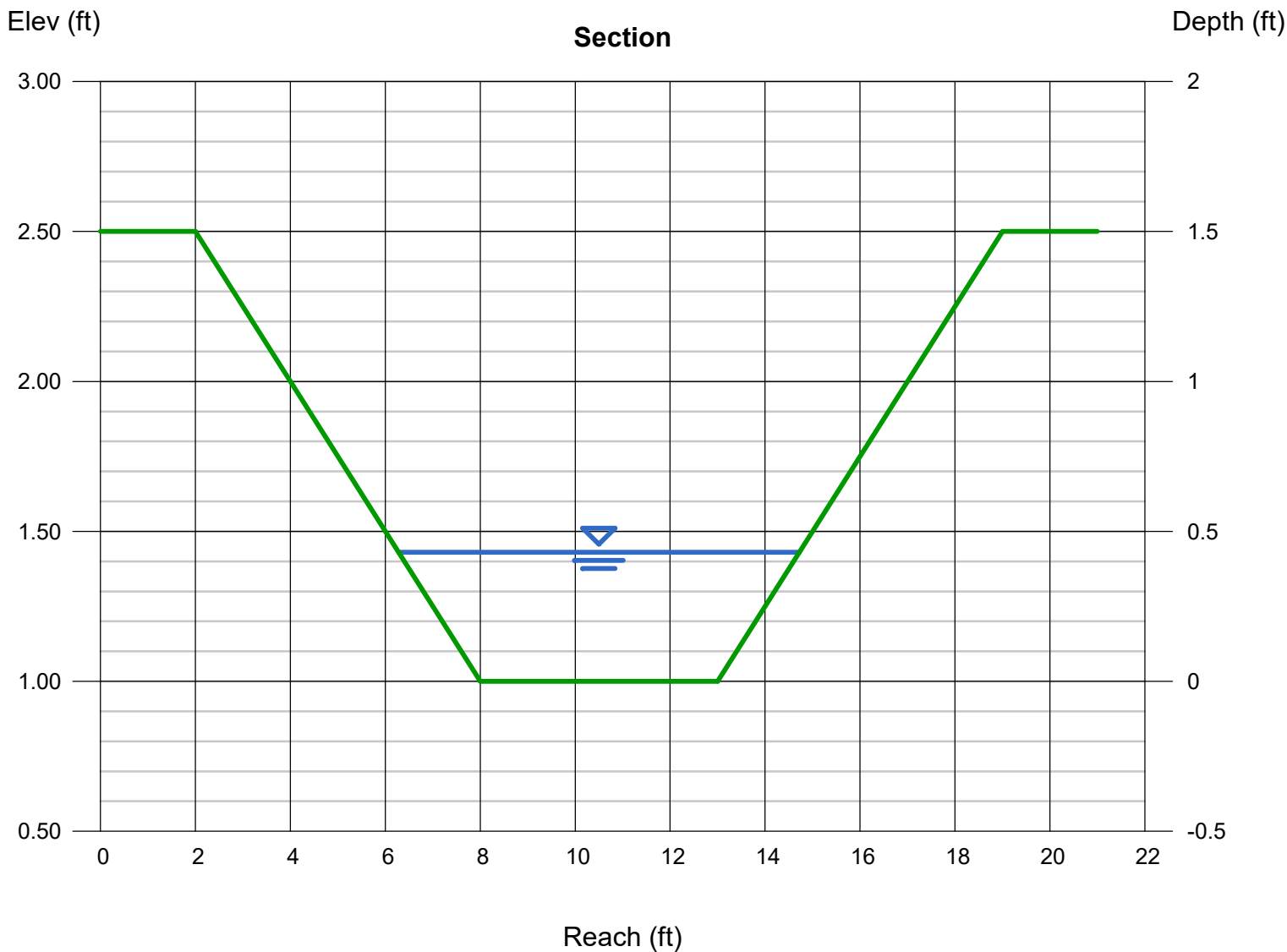


Channel Report

DP14.1 OUTFALL SEC. 1 (Q100)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 0.43
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 14.40
Total Depth (ft)	= 1.50	Area (sqft)	= 2.89
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.98
Slope (%)	= 5.90	Wetted Perim (ft)	= 8.55
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.55
Calculations		Top Width (ft)	= 8.44
Compute by:		EGL (ft)	= 0.82
Known Q (cfs)	= 14.40		

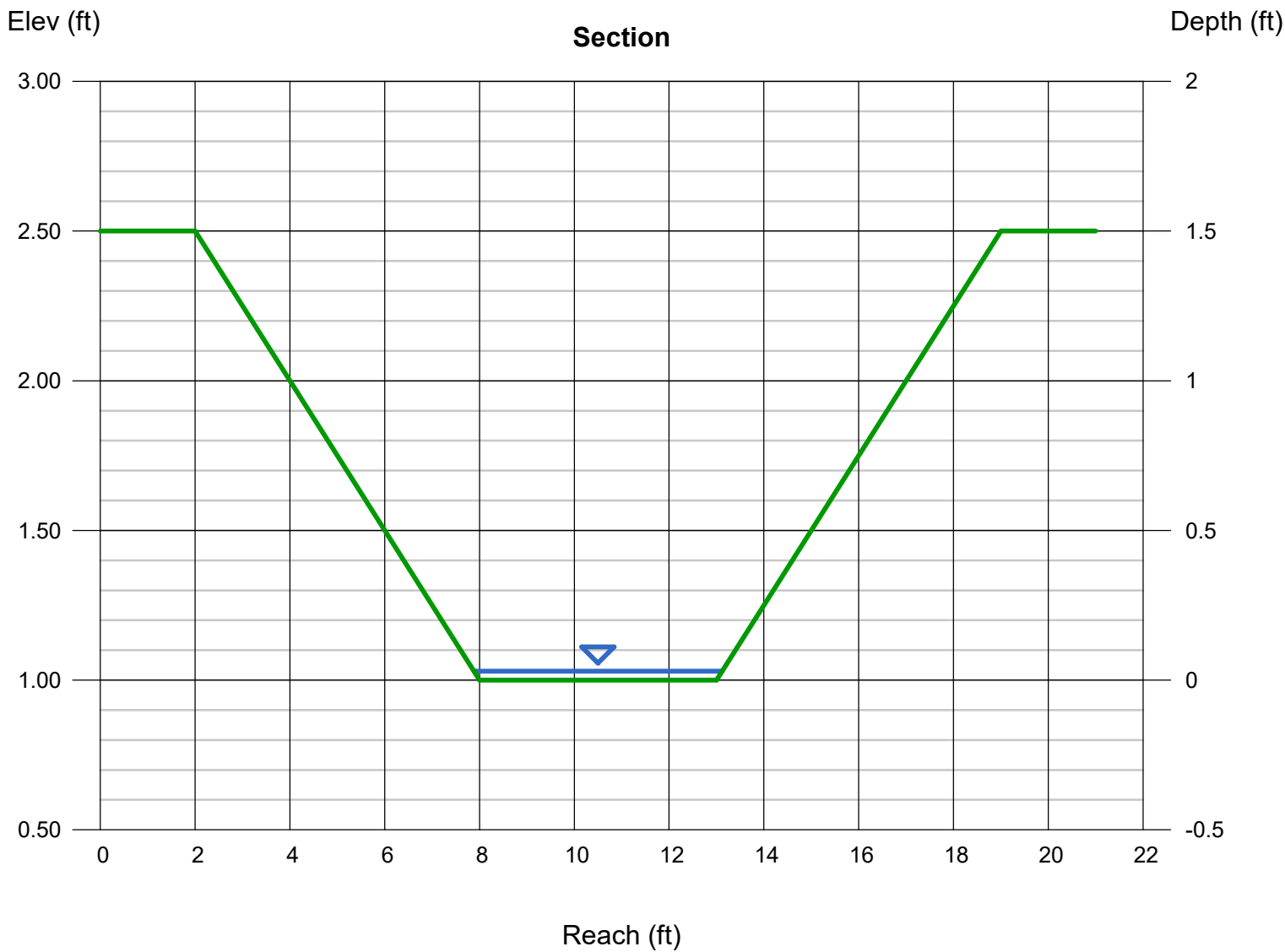


Channel Report

DP14.1 OUTFALL SEC 2 (Q5)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 0.03
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 0.100
Total Depth (ft)	= 1.50	Area (sqft)	= 0.15
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 0.65
Slope (%)	= 7.52	Wetted Perim (ft)	= 5.25
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.03
Calculations		Top Width (ft)	= 5.24
Compute by:	Known Q	EGL (ft)	= 0.04
Known Q (cfs)	= 0.10		

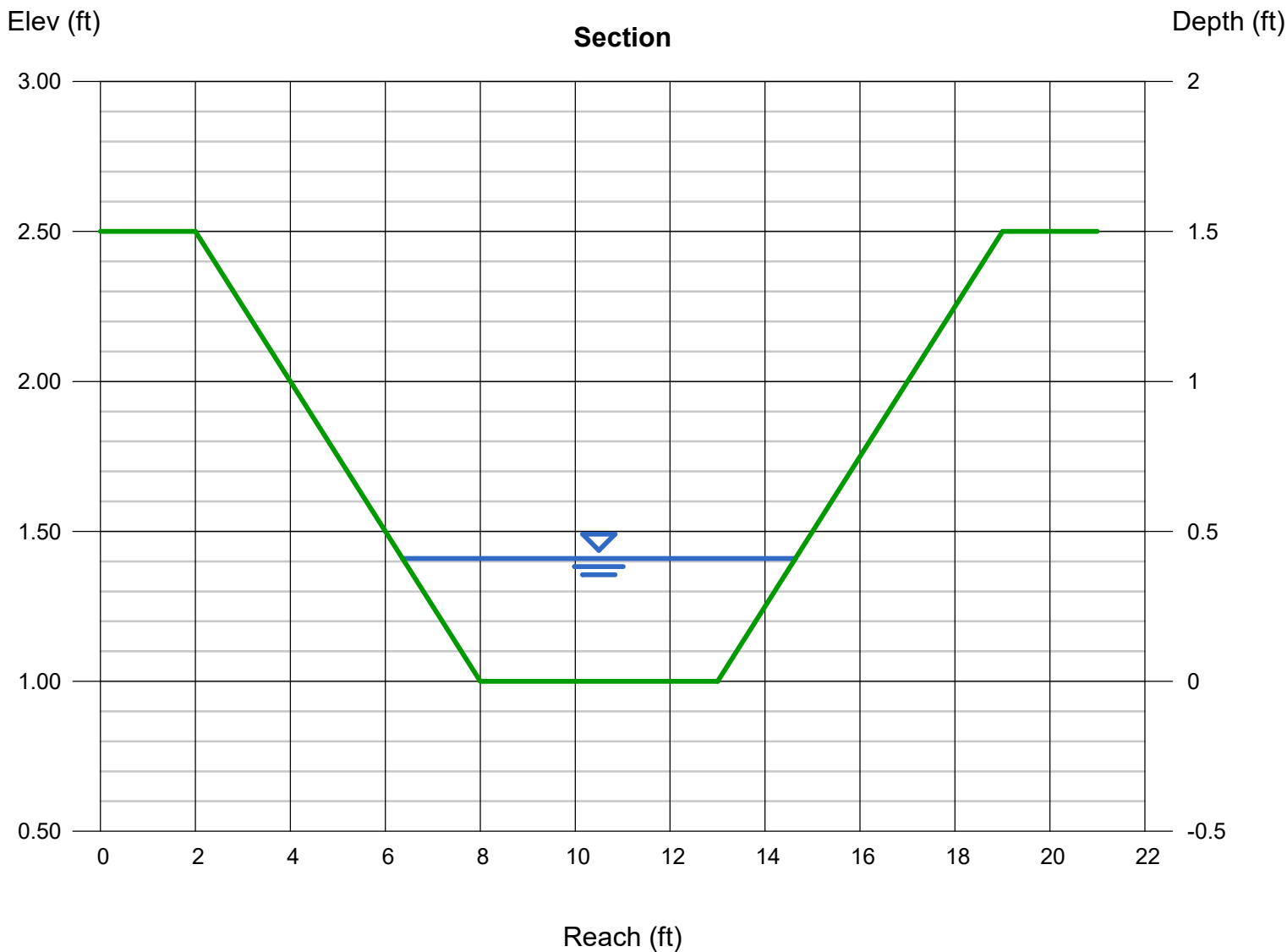


Channel Report

DP14.1 OUTFALL SEC. 2 (Q100)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 0.41
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 14.40
Total Depth (ft)	= 1.50	Area (sqft)	= 2.72
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 5.29
Slope (%)	= 7.52	Wetted Perim (ft)	= 8.38
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.55
Calculations		Top Width (ft)	= 8.28
Compute by:		EGL (ft)	= 0.84
Known Q (cfs)	= 14.40		

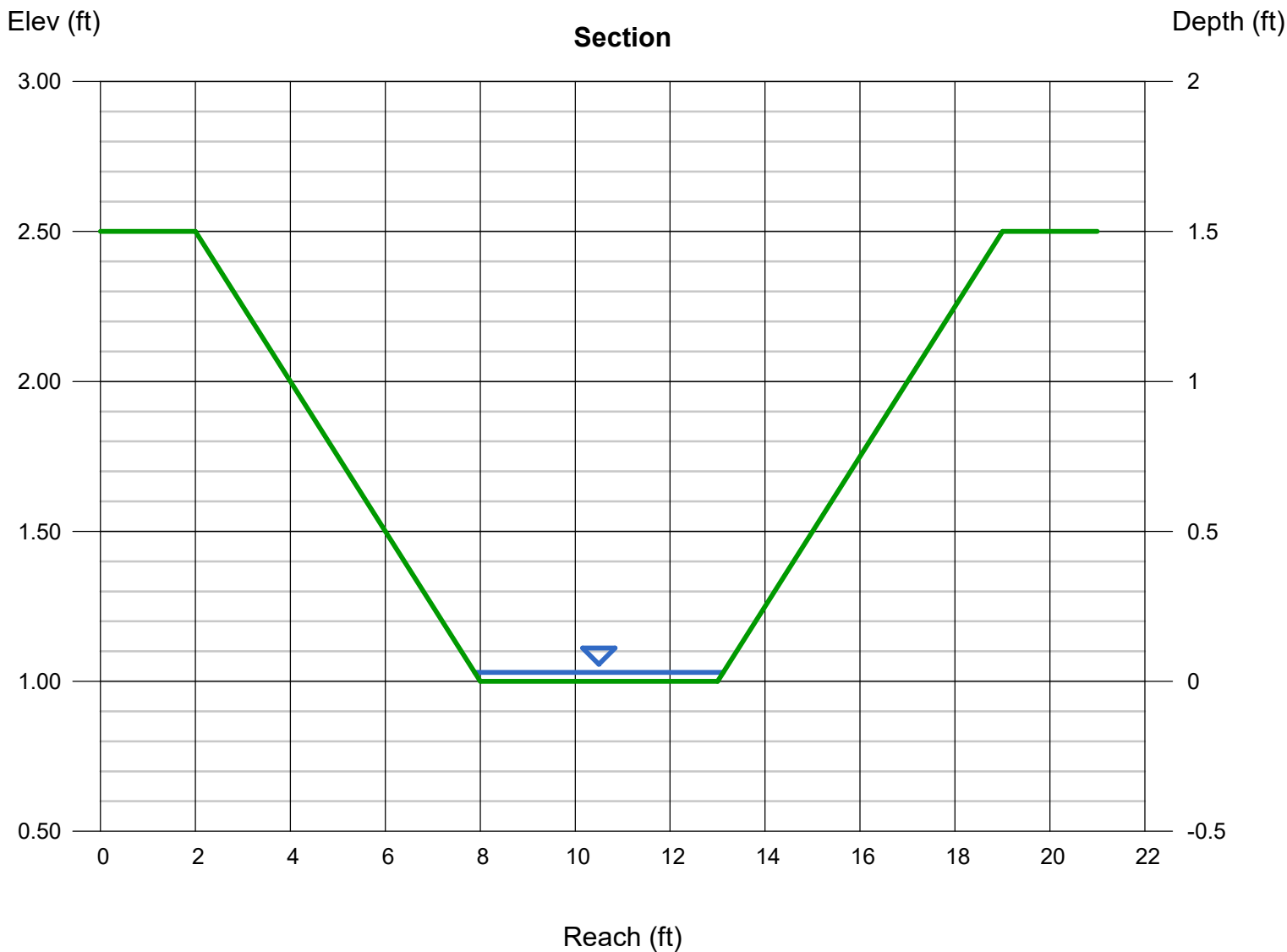


Channel Report

DP14.1 OUTFALL SEC 3 (Q5)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 0.03
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 0.100
Total Depth (ft)	= 1.50	Area (sqft)	= 0.15
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 0.65
Slope (%)	= 4.11	Wetted Perim (ft)	= 5.25
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.03
Calculations		Top Width (ft)	= 5.24
Compute by:	Known Q	EGL (ft)	= 0.04
Known Q (cfs)	= 0.10		

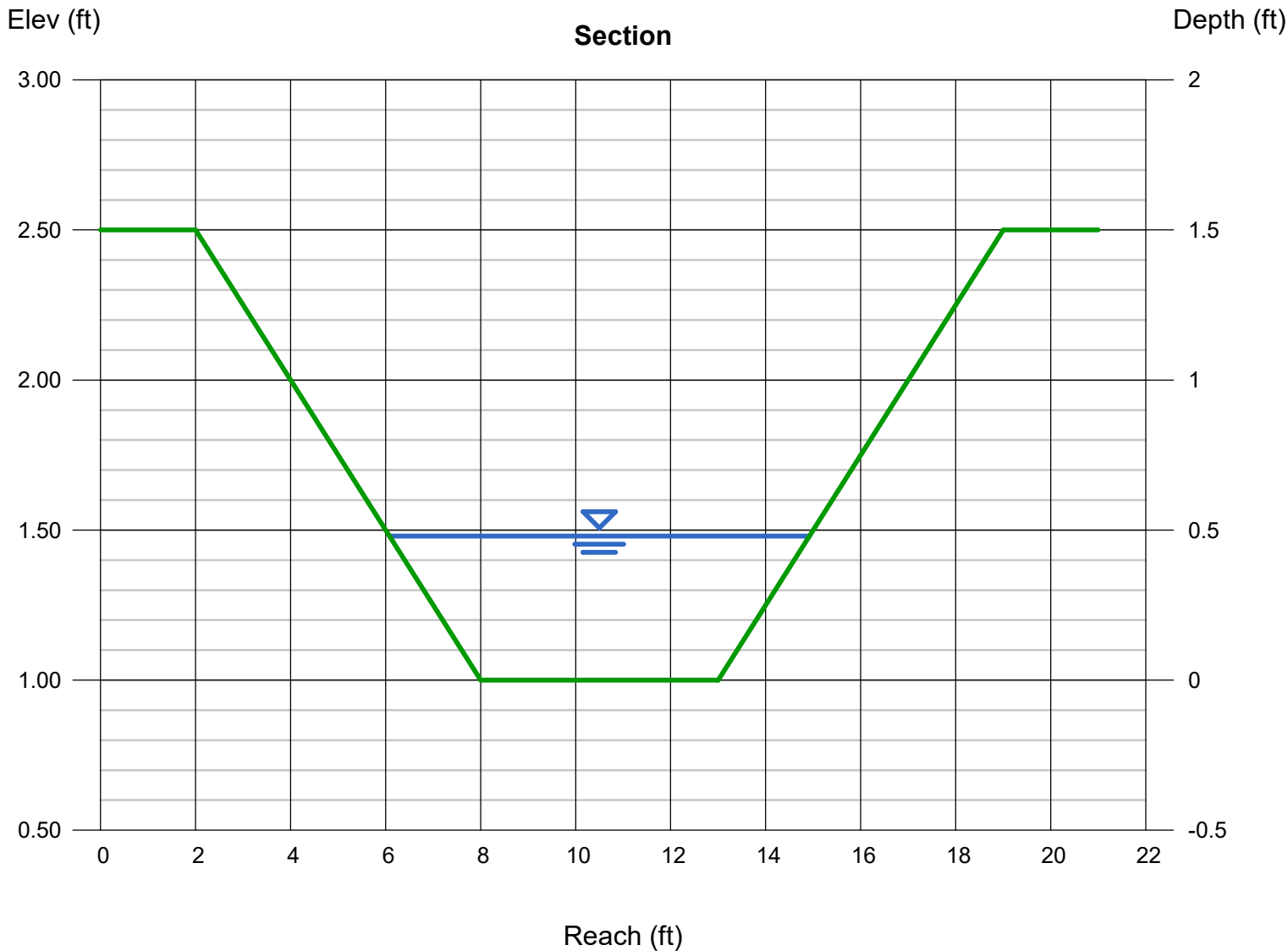


Channel Report

DP14.1 OUTFALL SEC. 3 (Q100)

GRASS LINED W/ TURF
REINFORCEMENT MAT

Trapezoidal		Highlighted	
Bottom Width (ft)	= 5.00	Depth (ft)	= 0.48
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 14.40
Total Depth (ft)	= 1.50	Area (sqft)	= 3.32
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.34
Slope (%)	= 4.11	Wetted Perim (ft)	= 8.96
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.55
Calculations		Top Width (ft)	= 8.84
Compute by:		EGL (ft)	= 0.77
Known Q (cfs)	Known Q		
	= 14.40		



MATERIAL PROPERTY DATA SHEET



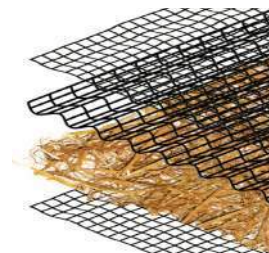
VMax® SC250™

Permanent • Triple Net • Organic Fiber Matrix •
Turf Reinforcement Mat

DESCRIPTION

SC250 Turf Reinforcement Mat (TRM) is composed of 70% straw and 30% coconut fibers mechanically (stitch) bound between a three-dimensional UV stabilized, synthetic net structure. Stitching is secured on two-inch centers using UV stabilized, synthetic thread. SC250 is a permanent, three-dimensional TRM that provides immediate erosion protection and long-term turf reinforcement and is intended for applications requiring erosion protection for greater than thirty-six months.

Each roll of SC250 is made in the USA and manufactured under Western Green's Quality Assurance Program to ensure a continuous distribution of fibers and consistent thickness.



Material Content	
Matrix	Straw/Coconut
Netting	Top Net: Mediumweight, UV stable
	Middle Net: Corrugated Ultra-Heavyweight, UV stable
	Bottom Net: Mediumweight, UV stable
Thread	Synthetic, UV Stable

Standard Roll Sizes				
Width	8 ft	(2.4 m)	6.5 ft	(2.0 m)
Length	90 ft	(27.4 m)	55.5 ft	(17.0 m)
Weight ± 10%	70 lb	(32.0 kg)	34 lb	(15.5 kg)
Area	80 sy	(66.9 m ²)	40 sy	(33.4 m ²)

Material available in custom roll sizes

Approvals & Classification	
Classification	FHWA: Type 5.C / ECTC: Type 5.C
TTI Approvals	Class 2 Type H
NTPEP Number	ECP-2019-03-014

Disclaimer: The information contained herein may represent product index data, performance ratings, bench scale testing or other material utility quantifications. Each representation may have unique utility and limitations. Every effort has been made to ensure accuracy, however, no warranty is claimed and no liability shall be assumed by Western Green or its affiliates regarding the completeness, accuracy or fitness of these values for any particular application or interpretation. While testing methods are provided for reference, values shown may be derived from interpolation or adjustment to be representative of intended use. For further information, please feel free to contact Western Green.

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Index Property	Test Method	Typical	
Thickness	ASTM D6525	0.58 in.	(15 mm)
Mass/Unit Area	ASTM D6566	15.0 oz/sy	(500 g/sm)
Tensile Strength – MD	ASTM D6818	700 lbs/ft	(10.2 kN/m)
Tensile Strength – TD	ASTM D6818	675 lbs/ft	(9.9 kN/m)
Elongation - MD	ASTM D6818	30%	
Elongation – TD	ASTM D6818	20%	
UV Stability	ASTM D4355	80% @1000 hr	
Light Penetration	ASTM D6567	5%	
Biomass Improvement	ASTM D7322	400%	
Specific Gravity	ASTM D792	57.4 lb/ft ³	(0.92 g/cm ³)
Porosity	ECTC	N/A	

Design Parameters		
Property	Unvegetated	Vegetated ³
RUSLE C Factor ²	0.05	N/A
Slope Maximum Gradient ¹	0.5H:1V	0.5H:1V
Permissible Shear Stress ²	3.0 psf (145 Pa)	10.0 psf (480 Pa)
Permissible Velocity ²	9.5 fps (2.9 m/s)	15 fps (4.6 m/s)
τ_{veg} / τ_{TRM} (HEC-15)	N/A	0.67

τ_{lower}	τ_{mid}	τ_{upper}
0.038	0.032	0.027

1 Maximum Gradient a recommendation for typical installations.

2 Hydraulic thresholds compliant with ASTM D6459/D6460 but generalized for typical applications.

3 Vegetated values dependent on established stand of vegetation



Rev. 4.2023

Scan for additional and updated product information,
or [click here](#).





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SOLUTIONS WE SUPPLY

Filter Fabrics

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Geogrids

- Road Grids
- Wall Grids
- Slope Stabilization

Specialty Fabrics

Composite Geomembranes

- GCLs, PVC, HDPE, LLDPE, EPDM, Granular Bentonite

SEDIMENT CONTROL

Inlet Protection

- Grated Inlet, Curb Inlet, Area Inlet Protection

Ditch Checks

- Triangle Silt Dike
- GeoRidge

Perimeter Protection

- High and Low-Porosity Silt Fence, Straw Wattles, Silt Socks
- Safety Fence

Flocculants & Water Treatment

- Polymer-Based & Natural Flocculants

Sediment Basin Skimmers

Dewatering Bags

Trackout Control

- FODS
- Rumble Grates

Turbidity Curtains

EROSION CONTROL

Basic Hydraulically Applied Mulches

- Wood
- Paper
- Blends
- Straw

High-Performance Hydraulically

Applied Products

- BFM
- FGM
- Additives & Tackifiers

Temporary Erosion Control Blankets

- Coir & Jute Mat/Nettings
- Short-Term ECBs
- Extended-Term ECBs

Permanent Erosion Control Blankets

- Turf Reinforcement Mats
- HP-TRMs
- Anchor Reinforced Vegetation System

Structural BMPs

- Transition Mats
- Geoweb Cellular Confinement
- Composite Vegetated Armor System
- Flex MSE Vegetated Wall System
- Articulated Concrete Block
- Gabions
- Grout-Filled Geotextile Mats

Vegetation Establishment

- Native Seed & Turf Seed
- Fertilizers
- Organic Soil Additives
- Stratavault Soil Cells

STORMWATER MANAGEMENT

Water Quality

- Inlet Filter Boxes
- Pre-Treatment Chamber
- Nutrient Separating Baffle Boxes
- High-Flow Biofiltration Media
- Hydrodynamic Separators
- Stratavault

Water Quantity

- Modular Underground Storage Systems
- Chamber Detention Systems

Drainage

- HDPE Swale Liner
- Pipe & Fittings
- Drainage Composites
- Strip Drain

Inlet Structures

- PVC
- Drain Basins, In-Line Drains
- Landscape

Permeable Pavers

- Permeable Articulating Concrete Block
- Grass Pavers
- Gravel Pavers
- Concrete Pavers

SPECIALTY

Natural & Synthetic Coir Fiber Logs

Vegetated Reinforced Soil Slopes

Soil Anchors

Root Barrier System

AquaBlok

Muscle Wall

We are full line distributors of construction materials for all project types. Contact us for assistance with a project. From specification and development to installation and completion, we're here to help with all of your site solution needs.

**GEOSYNTHETICS | EROSION CONTROL | STORMWATER MANAGEMENT
SEDIMENT CONTROL | REVEGETATION & SOIL AMENDMENTS**

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, 00 9 2026

BASIN D - CULVERT (Q5)

Invert Elev Dn (ft) = 7478.77
Pipe Length (ft) = 40.20
Slope (%) = 3.05965282022953
Invert Elev Up (ft) = 7480.00
Rise (in) = 18.0
Shape = Circular
Span (in) = 18.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Corrugate Metal Pipe
Culvert Entrance = Mitered to slope (C)
Coeff. K,M,c,Y,k = 0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

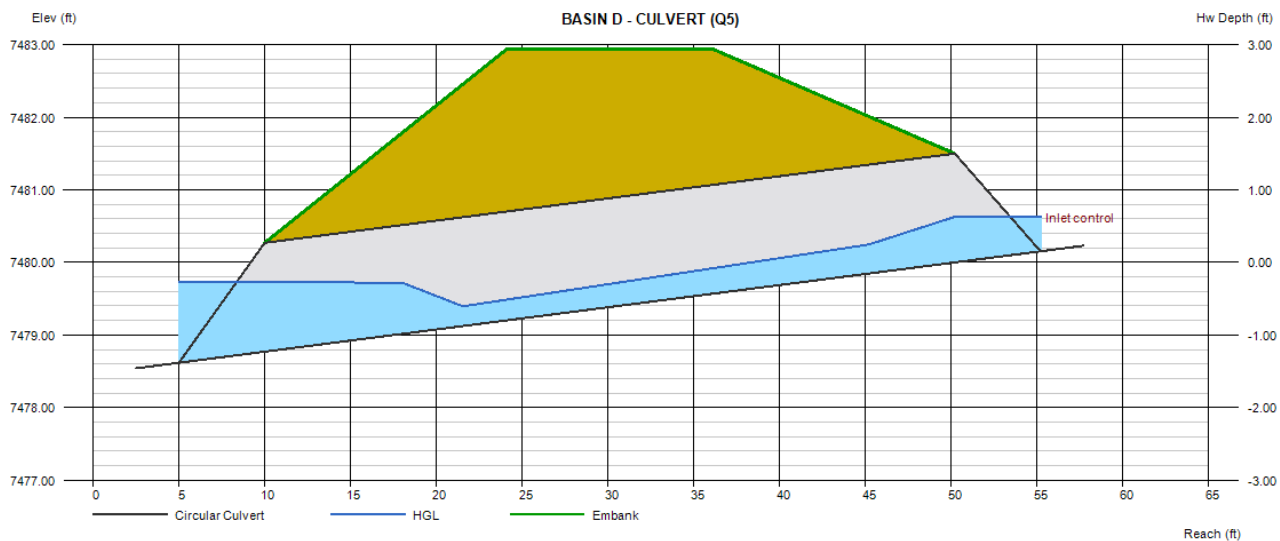
Top Elevation (ft) = 7482.94
Top Width (ft) = 12.00
Crest Width (ft) = 20.00

Calculations

Qmin (cfs) = 1.30
Qmax (cfs) = 1.30
Tailwater Elev (ft) = (dc+D)/2

Highlighted

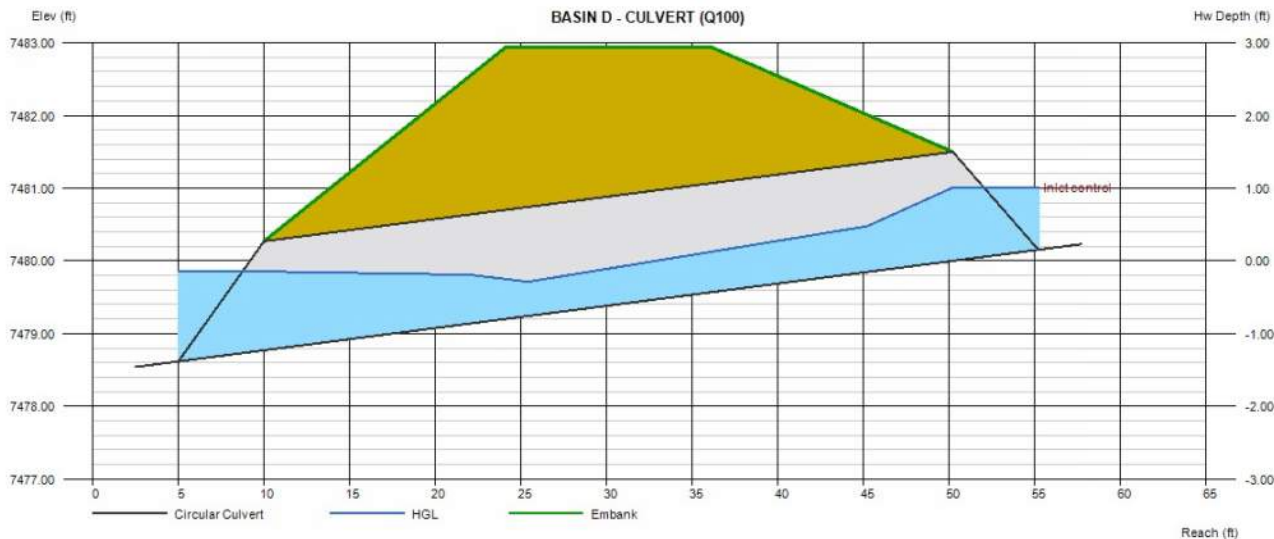
Qtotal (cfs) = 1.30
Qpipe (cfs) = 1.30
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 1.08
Veloc Up (ft/s) = 3.14
HGL Dn (ft) = 7479.73
HGL Up (ft) = 7480.43
Hw Elev (ft) = 7480.63
Hw/D (ft) = 0.42
Flow Regime = Inlet Control



Culvert Report

BASIN D - CULVERT (Q100)

Invert Elev Dn (ft)	= 7478.77	Calculations	
Pipe Length (ft)	= 40.20	Qmin (cfs)	= 3.10
Slope (%)	= 3.05965282022953	Qmax (cfs)	= 3.11
Invert Elev Up (ft)	= 7480.00	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 18.0		
Shape	= Circular	Highlighted	
Span (in)	= 18.0	Qtotal (cfs)	= 3.10
No. Barrels	= 1	Qpipe (cfs)	= 3.10
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Corrugate Metal Pipe	Veloc Dn (ft/s)	= 2.27
Culvert Entrance	= Mitered to slope (C)	Veloc Up (ft/s)	= 4.06
Coeff. K,M,c,Y,k	= 0.021, 1.33, 0.0463, 0.75, 0.7	HGL Dn (ft)	= 7479.85
		HGL Up (ft)	= 7480.67
		Hw Elev (ft)	= 7481.01
		Hw/D (ft)	= 0.67
		Flow Regime	= Inlet Control
Embankment			
Top Elevation (ft)	= 7482.94		
Top Width (ft)	= 12.00		
Crest Width (ft)	= 20.00		



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, 00 9 2026

DP2 - CULVERT (Q5)

Invert Elev Dn (ft) = 7477.25
Pipe Length (ft) = 77.76
Slope (%) = 0.964506156742573
Invert Elev Up (ft) = 7478.00
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Corrugate Metal Pipe
Culvert Entrance = Mitered to slope (C)
Coeff. K,M,c,Y,k = 0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

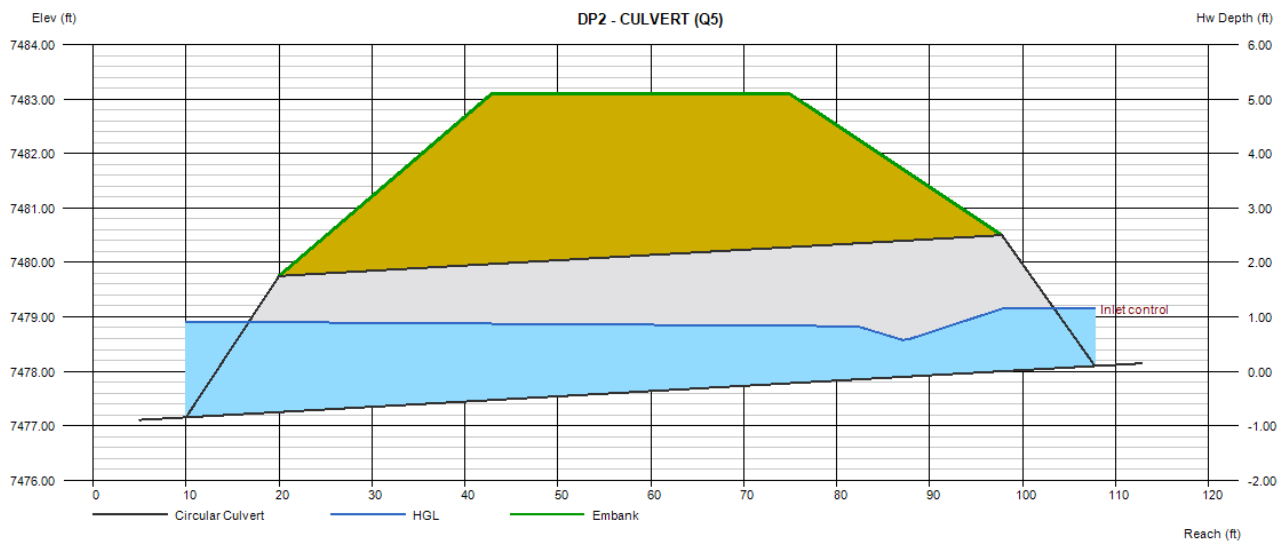
Top Elevation (ft) = 7483.10
Top Width (ft) = 32.00
Crest Width (ft) = 50.00

Calculations

Qmin (cfs) = 5.90
Qmax (cfs) = 5.90
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 5.90
Qpipe (cfs) = 5.90
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 1.71
Veloc Up (ft/s) = 4.34
HGL Dn (ft) = 7478.90
HGL Up (ft) = 7478.80
Hw Elev (ft) = 7479.15
Hw/D (ft) = 0.46
Flow Regime = Inlet Control



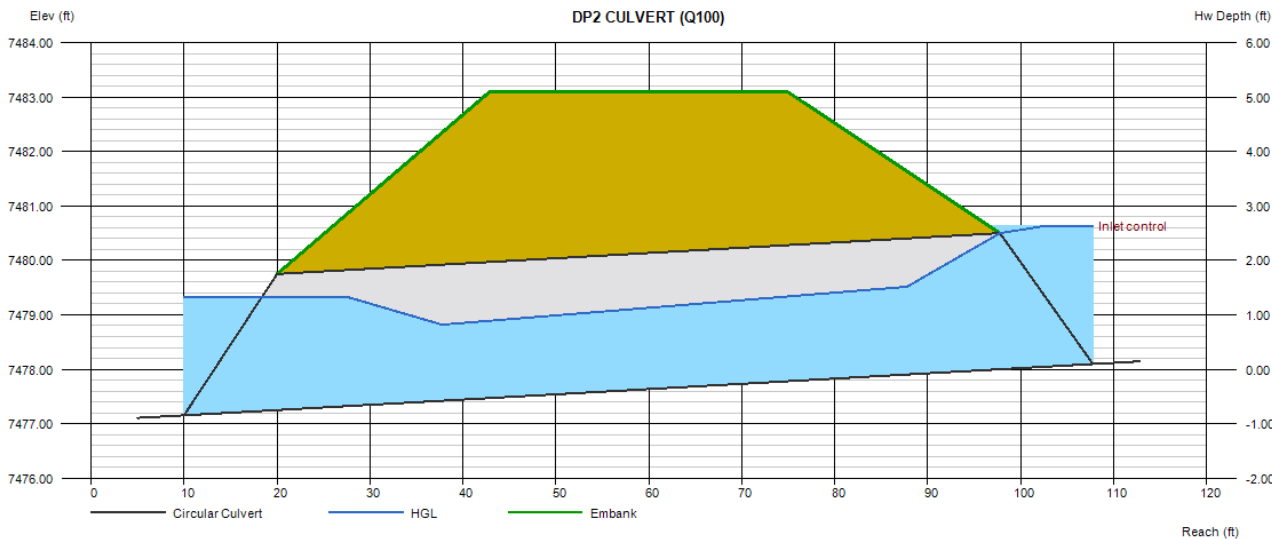
Culvert Report

DP2 CULVERT (Q100)

Invert Elev Dn (ft)	= 7477.25
Pipe Length (ft)	= 77.76
Slope (%)	= 0.964506156742573
Invert Elev Up (ft)	= 7478.00
Rise (in)	= 30.0
Shape	= Circular
Span (in)	= 30.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Corrugate Metal Pipe
Culvert Entrance	= Mitered to slope (C)
Coeff. K,M,c,Y,k	= 0.021, 1.33, 0.0463, 0.75, 0.7

Embankment	
Top Elevation (ft)	= 7483.10
Top Width (ft)	= 32.00
Crest Width (ft)	= 50.00

Calculations	
Qmin (cfs)	= 23.70
Qmax (cfs)	= 23.70
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 23.70
Qpipe (cfs)	= 23.70
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 5.43
Veloc Up (ft/s)	= 6.87
HGL Dn (ft)	= 7479.33
HGL Up (ft)	= 7479.66
Hw Elev (ft)	= 7480.64
Hw/D (ft)	= 1.06
Flow Regime	= Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, 00 9 2026

BASIN S - CULVERT (Q5)

Invert Elev Dn (ft) = 7502.55
Pipe Length (ft) = 31.39
Slope (%) = 1.97552461177111
Invert Elev Up (ft) = 7503.17
Rise (in) = 18.0
Shape = Circular
Span (in) = 18.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Corrugate Metal Pipe
Culvert Entrance = Mitered to slope (C)
Coeff. K,M,c,Y,k = 0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

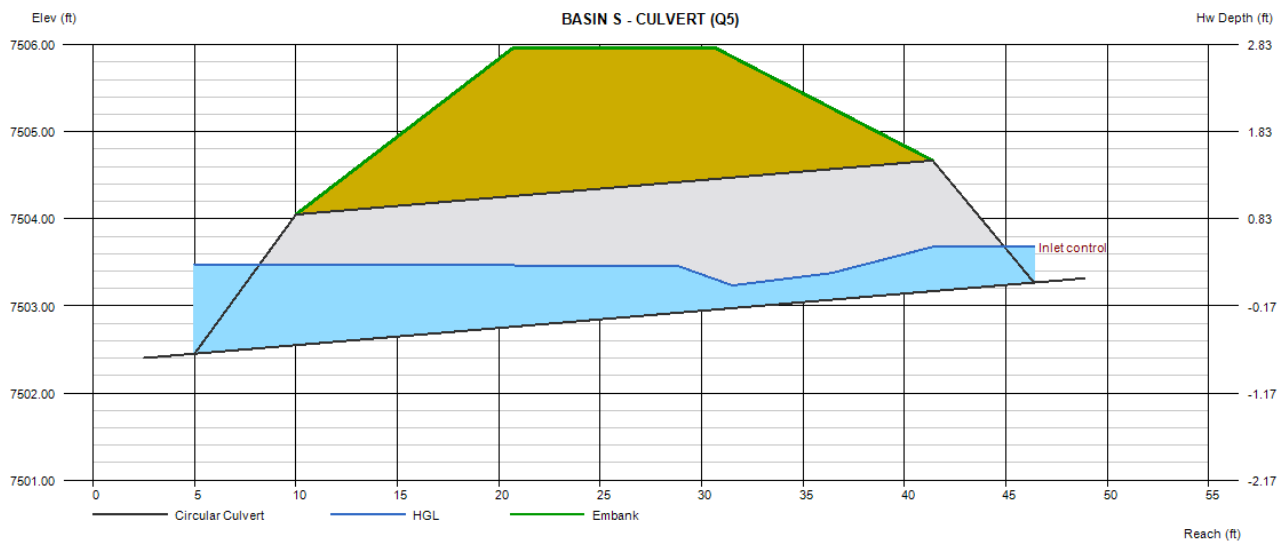
Top Elevation (ft) = 7505.96
Top Width (ft) = 10.00
Crest Width (ft) = 15.00

Calculations

Qmin (cfs) = 0.90
Qmax (cfs) = 0.90
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 0.90
Qpipe (cfs) = 0.90
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 0.79
Veloc Up (ft/s) = 2.84
HGL Dn (ft) = 7503.48
HGL Up (ft) = 7503.52
Hw Elev (ft) = 7503.68
Hw/D (ft) = 0.34
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Thursday, 00 3 2026

BASIN S CULVERT (Q100)

Invert Elev Dn (ft) = 7502.55
Pipe Length (ft) = 31.39
Slope (%) = 1.97552461177111
Invert Elev Up (ft) = 7503.17
Rise (in) = 18.0
Shape = Circular
Span (in) = 18.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Corrugate Metal Pipe
Culvert Entrance = Mitered to slope (C)
Coeff. K,M,c,Y,k = 0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

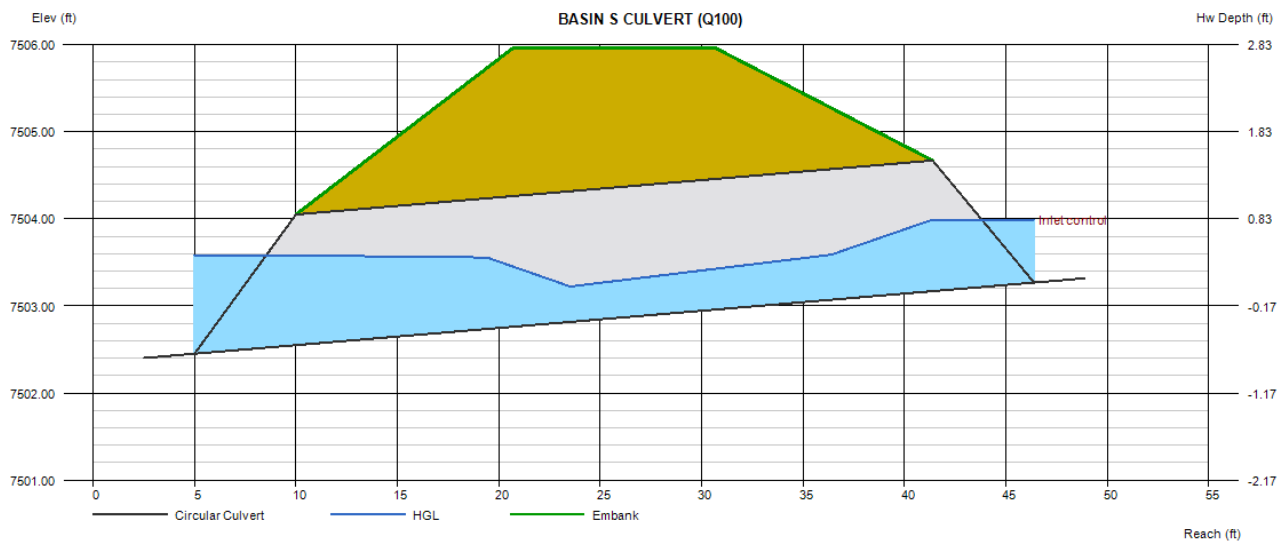
Top Elevation (ft) = 7505.96
Top Width (ft) = 10.00
Crest Width (ft) = 15.00

Calculations

Qmin (cfs) = 2.20
Qmax (cfs) = 2.20
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 2.20
Qpipe (cfs) = 2.20
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 1.70
Veloc Up (ft/s) = 3.66
HGL Dn (ft) = 7503.58
HGL Up (ft) = 7503.73
Hw Elev (ft) = 7503.99
Hw/D (ft) = 0.55
Flow Regime = Inlet Control



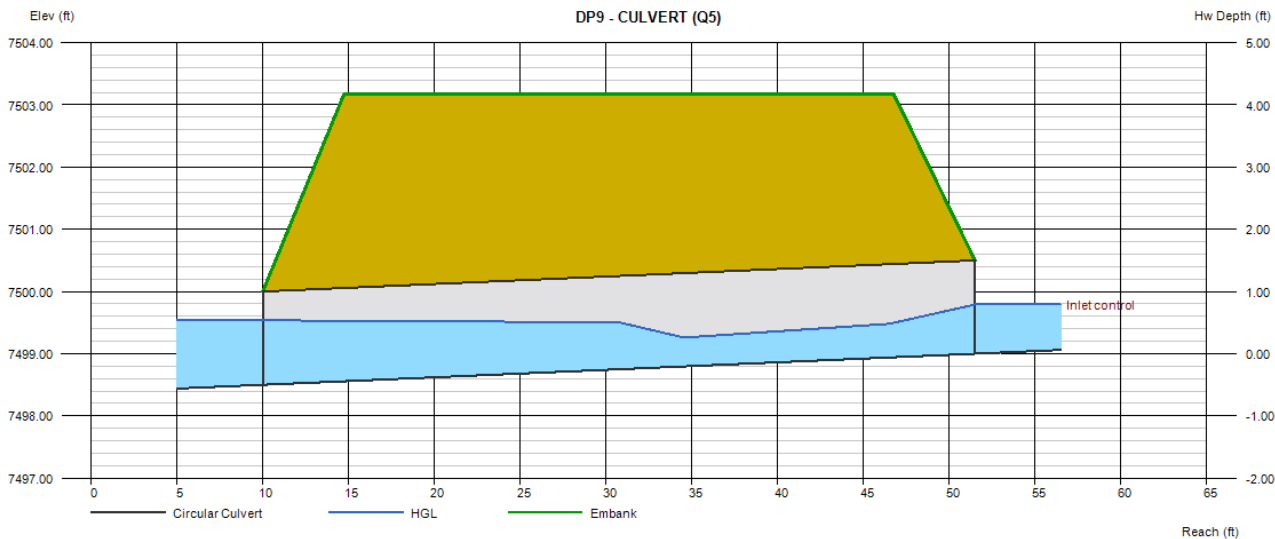
Culvert Report

DP9 - CULVERT (Q5)

Invert Elev Dn (ft)	= 7498.50
Pipe Length (ft)	= 41.50
Slope (%)	= 1.20481923222542
Invert Elev Up (ft)	= 7499.00
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Corrugate Metal Pipe
Culvert Entrance	= Headwall
Coeff. K,M,c,Y,k	= 0.0078, 2, 0.0379, 0.69, 0.5

Embankment	
Top Elevation (ft)	= 7503.18
Top Width (ft)	= 32.00
Crest Width (ft)	= 50.00

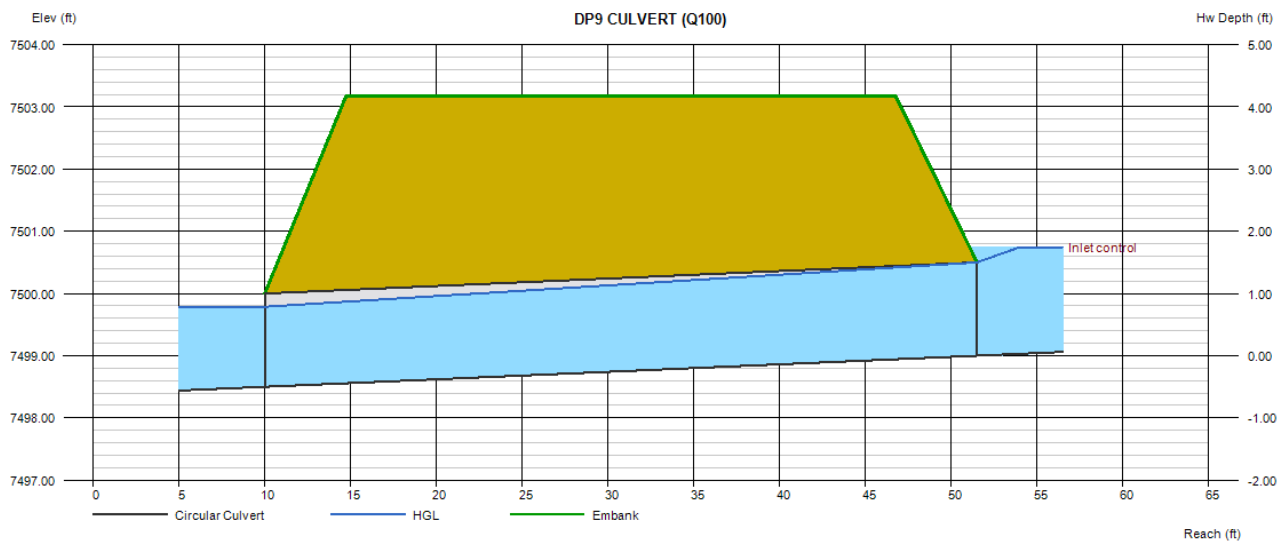
Calculations	
Qmin (cfs)	= 2.30
Qmax (cfs)	= 2.30
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 2.30
Qpipe (cfs)	= 2.30
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 1.77
Veloc Up (ft/s)	= 3.71
HGL Dn (ft)	= 7499.54
HGL Up (ft)	= 7499.57
Hw Elev (ft)	= 7499.79
Hw/D (ft)	= 0.53
Flow Regime	= Inlet Control



Culvert Report

DP9 CULVERT (Q100)

Invert Elev Dn (ft)	= 7498.50	Calculations	
Pipe Length (ft)	= 41.50	Qmin (cfs)	= 7.70
Slope (%)	= 1.20481923222542	Qmax (cfs)	= 7.70
Invert Elev Up (ft)	= 7499.00	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 18.0		
Shape	= Circular	Highlighted	
Span (in)	= 18.0	Qtotal (cfs)	= 7.70
No. Barrels	= 1	Qpipe (cfs)	= 7.70
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Corrugate Metal Pipe	Veloc Dn (ft/s)	= 4.77
Culvert Entrance	= Headwall	Veloc Up (ft/s)	= 4.36
Coeff. K,M,c,Y,k	= 0.0078, 2, 0.0379, 0.69, 0.5	HGL Dn (ft)	= 7499.79
		HGL Up (ft)	= 7500.50
Embankment		Hw Elev (ft)	= 7500.75
Top Elevation (ft)	= 7503.18	Hw/D (ft)	= 1.16
Top Width (ft)	= 32.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 50.00		

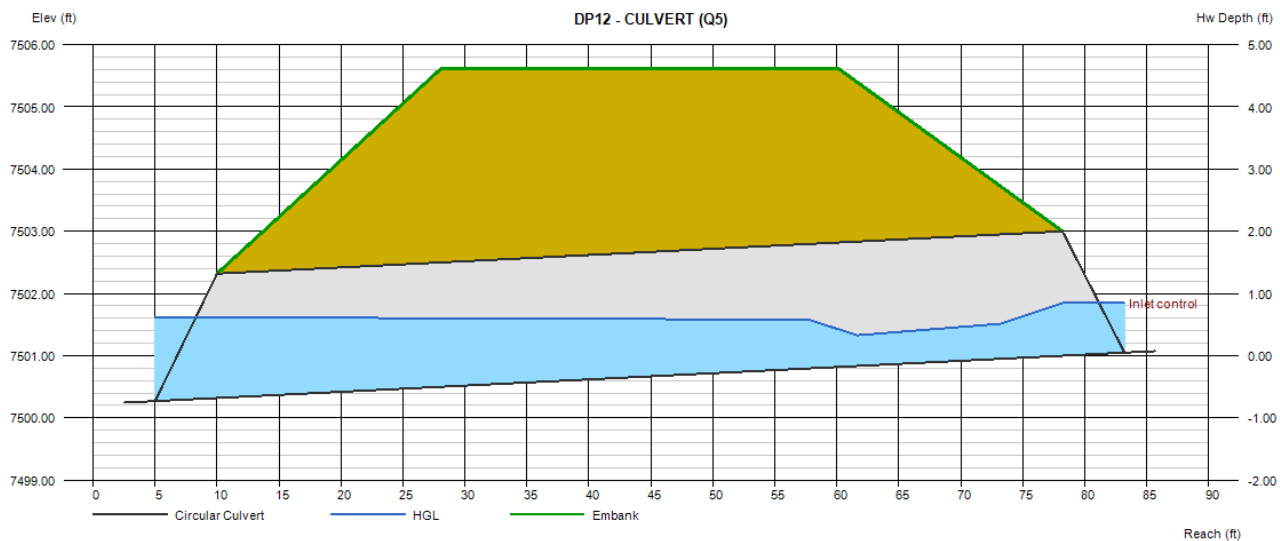


DP12 - CULVERT (Q5)

Calculations	
Qmin (cfs)	= 2.90
Qmax (cfs)	= 2.90
Tailwater Elev (ft)	= (dc+D)/2
Highlighted	
Qtotal (cfs)	= 2.90
Qpipe (cfs)	= 2.90
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 1.35
Veloc Up (ft/s)	= 3.72
HGL Dn (ft)	= 7501.62
HGL Up (ft)	= 7501.59
Hw Elev (ft)	= 7501.85
Hw/D (ft)	= 0.42
Flow Regime	= Inlet Control

Embankment

Top Elevation (ft) = 7505.62
Top Width (ft) = 32.00
Crest Width (ft) = 50.00



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Thursday, 00 3 2026

DP12 CULVERT (Q100)

Invert Elev Dn (ft) = 7500.32
Pipe Length (ft) = 68.20
Slope (%) = 0.997325219213963
Invert Elev Up (ft) = 7501.00
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Corrugate Metal Pipe
Culvert Entrance = Mitered to slope (C)
Coeff. K,M,c,Y,k = 0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

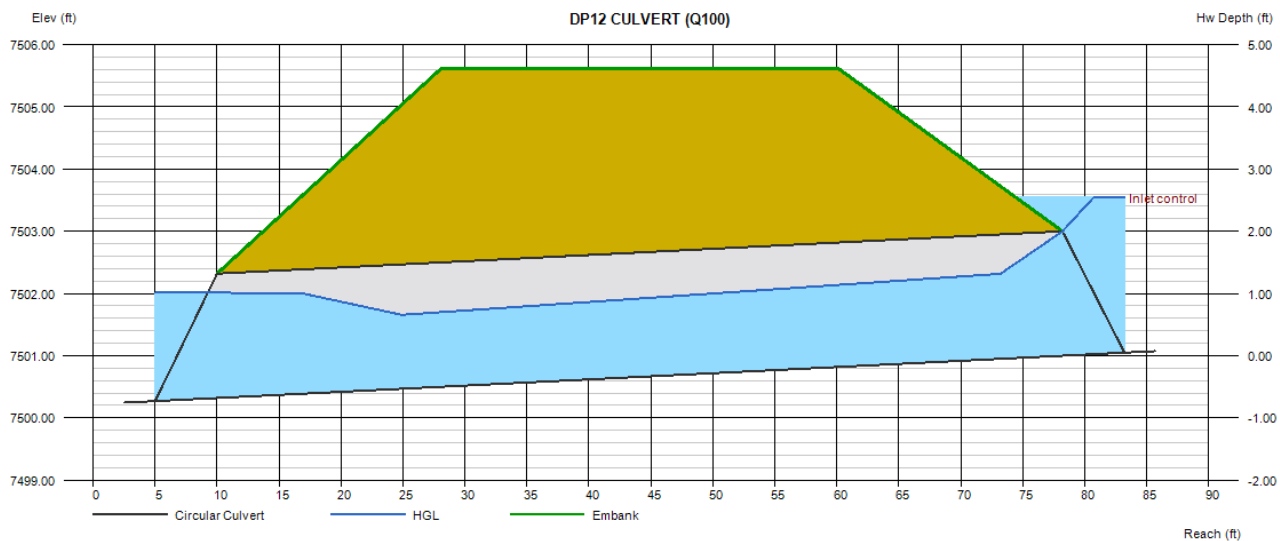
Top Elevation (ft) = 7505.62
Top Width (ft) = 32.00
Crest Width (ft) = 50.00

Calculations

Qmin (cfs) = 14.80
Qmax (cfs) = 14.80
Tailwater Elev (ft) = (dc+D)/2

Highlighted

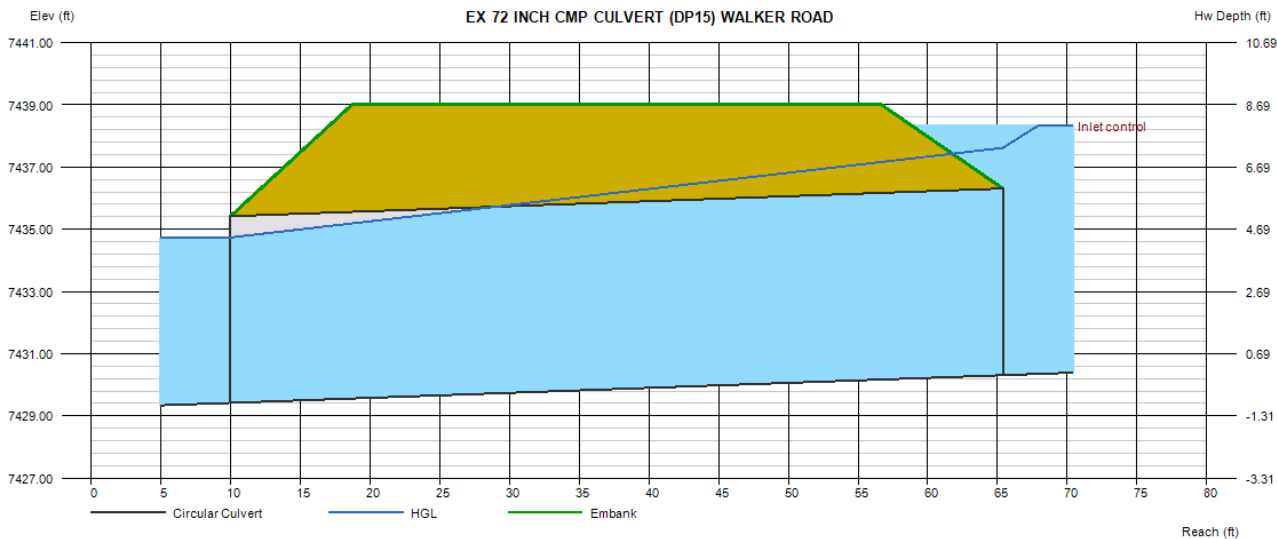
Qtotal (cfs) = 14.80
Qpipe (cfs) = 14.80
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 5.22
Veloc Up (ft/s) = 6.37
HGL Dn (ft) = 7502.01
HGL Up (ft) = 7502.39
Hw Elev (ft) = 7503.54
Hw/D (ft) = 1.27
Flow Regime = Inlet Control



Culvert Report

EX 72 INCH CMP CULVERT (DP15) WALKER ROAD

Invert Elev Dn (ft)	= 7429.42	Calculations	
Pipe Length (ft)	= 55.38	Qmin (cfs)	= 287.70
Slope (%)	= 1.6073253005743	Qmax (cfs)	= 287.70
Invert Elev Up (ft)	= 7430.31	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 72.0		
Shape	= Circular	Highlighted	
Span (in)	= 72.0	Qtotal (cfs)	= 287.70
No. Barrels	= 1	Qpipe (cfs)	= 287.70
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Corrugate Metal Pipe	Veloc Dn (ft/s)	= 10.86
Culvert Entrance	= Headwall	Veloc Up (ft/s)	= 10.18
Coeff. K,M,c,Y,k	= 0.0078, 2, 0.0379, 0.69, 0.5	HGL Dn (ft)	= 7434.74
		HGL Up (ft)	= 7437.62
Embankment		Hw Elev (ft)	= 7438.33
Top Elevation (ft)	= 7439.00	Hw/D (ft)	= 1.34
Top Width (ft)	= 38.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 100.00		



Culvert Report

DRIVEWAY CULVERT SIZING

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Tuesday, Feb 4 2025

**ALL LOTS SHALL USE AN 18" CULVERT EXCEPT
FOR LOTS 12 & 13 FILING NO. 2 SHALL USE 24"**

18 inch Culvert - Max Flow 11 cfs

Invert Elev Dn (ft)	= 7245.33
Pipe Length (ft)	= 74.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 7246.07
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Concrete
Culvert Entrance	= Groove end projecting (C)
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

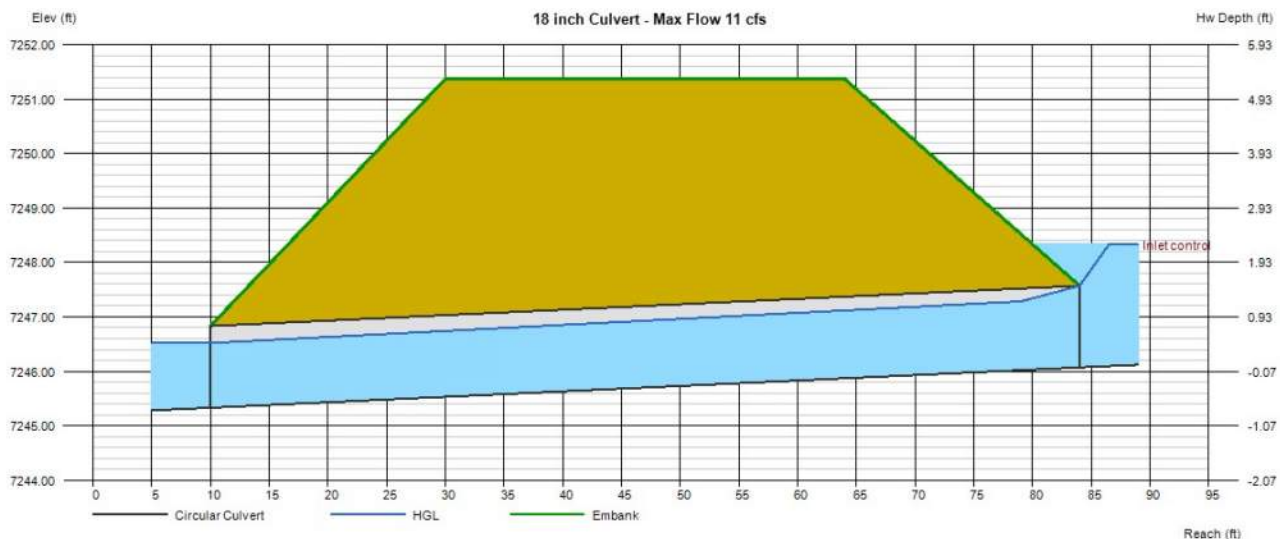
Top Elevation (ft)	= 7251.37
Top Width (ft)	= 34.00
Crest Width (ft)	= 50.00

Calculations

Qmin (cfs)	= 7.00
Qmax (cfs)	= 11.00
Tailwater Elev (ft)	= Normal

Highlighted

Qtotal (cfs)	= 11.00
Qpipe (cfs)	= 11.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 7.33
Veloc Up (ft/s)	= 6.90
HGL Dn (ft)	= 7246.52
HGL Up (ft)	= 7247.34
Hw Elev (ft)	= 7248.33
Hw/D (ft)	= 1.50
Flow Regime	= Inlet Control



Culvert Report

DRIVEWAY CULVERT SIZING

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Tuesday, Feb 4 2025

24 inch Culvert - Max Flow 22 cfs

ALL LOTS SHALL USE AN 18" CULVERT EXCEPT
FOR LOTS 12 & 13 FILING NO. 2 SHALL USE 24"

Invert Elev Dn (ft)	= 7245.33
Pipe Length (ft)	= 74.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 7246.07
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Concrete
Culvert Entrance	= Groove end projecting (C)
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

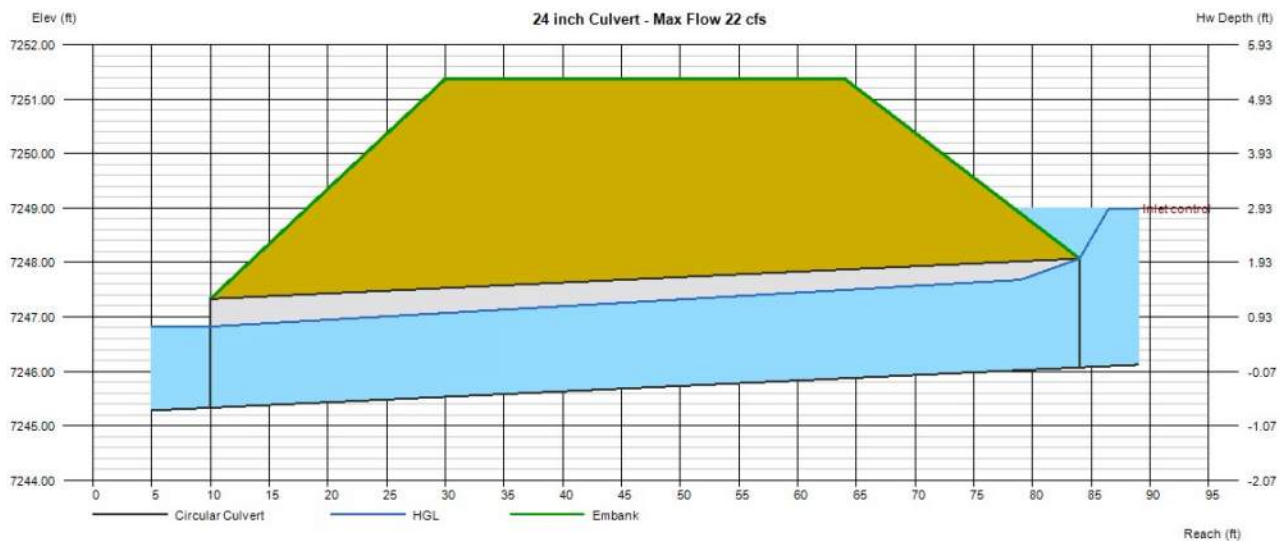
Top Elevation (ft)	= 7251.37
Top Width (ft)	= 34.00
Crest Width (ft)	= 50.00

Calculations

Qmin (cfs)	= 7.00
Qmax (cfs)	= 22.00
Tailwater Elev (ft)	= Normal

Highlighted

Qtotal (cfs)	= 22.00
Qpipe (cfs)	= 22.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 8.75
Veloc Up (ft/s)	= 7.84
HGL Dn (ft)	= 7246.82
HGL Up (ft)	= 7247.74
Hw Elev (ft)	= 7248.99
Hw/D (ft)	= 1.46
Flow Regime	= Inlet Control



PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: REB
Checked By: _____
Date: 5/15/26

	STORM DRAIN SYSTEM			Notes
	DP2	Basin D	DP4.1	
Q_{100} (cfs):	23.7	3.1	23.9	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c , Pipe Diameter (in):	30	18	24	
W , Box Width (ft):	N/A	N/A	N/A	
H , Box Height (ft):	N/A	N/A	N/A	
Y_t , Tailwater Depth (ft):	1.41	0.60	0.80	If unknown, use Y_t/D_c (or H)=0.4
Y_t/D_c or Y_t/H	0.56	0.40	0.40	***Use Low-tailwater basin for 4.1
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.40	1.12	4.22	
Supercritical?	No	No	No	
Y_n , Normal Depth (ft) [Supercritical]:				
D_a , H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	3.29	1.40	7.00	
Required Riprap Size:	L	L	L	Fig. 9-38 or Fig. 9-36
d_{50} (in):	9	9	9	
Expansion Factor, $1/(2 \tan \theta)$:	6.60	6.50	3.40	Read from Fig. 9-35 or 9-36
θ :	0.08	0.08	0.15	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft ²):	3.39	0.44	3.41	$A_t=Q/V$
Length of Protection, L_p (ft):	-0.7	-5.0	7.7	$L=(1/(2 \tan \theta))(A_t/Y_t - D)$
Min Length (ft)	7.5	4.5	6.0	Min L=3D or 3H
Max Length (ft)	25.0	15.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	2.4	0.7	4.3	$T=2*(L_p*\tan \theta)+W$
Design Length (ft)	7.5	4.5	8.0	
Design Width (ft)	2.4	0.7	4.3	
Riprap Depth (in)	18	18	18	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

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

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Iron Ridge Subdivision
 Location: El Paso County

Project Name: Iron Ridge Subdivision
 Project No.: 25009.00
 Calculated By: REB
 Checked By: _____
 Date: 5/15/26

	STORM DRAIN SYSTEM			Notes
	DP9	Basin S	DP12	
Q_{100} (cfs):	7.7	2.2	14.9	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c , Pipe Diameter (in):	18	18	24	
W , Box Width (ft):	N/A	N/A	N/A	
H , Box Height (ft):	N/A	N/A	N/A	
Y_t , Tailwater Depth (ft):	0.60	0.60	0.87	If unknown, use Y_t/D_c (or H)=0.4
Y_t/D_c or Y_t/H	0.40	0.40	0.44	***Use Low-tailwater basin for 4.1
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.79	0.80	2.63	
Supercritical?	No	No	No	
Y_n , Normal Depth (ft) [Supercritical]:				
D_a , H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	3.47	0.99	3.95	
Required Riprap Size:	L	L	L	Fig. 9-38 or Fig. 9-36
d_{50} (in):	9	9	9	
Expansion Factor, $1/(2 \tan \theta)$:	5.00	6.60	5.00	Read from Fig. 9-35 or 9-36
θ :	0.10	0.08	0.10	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft ²):	1.10	0.31	2.13	$A_t=Q/V$
Length of Protection, L_p (ft):	1.7	-6.4	2.2	$L=(1/(2 \tan \theta))(A_t/Y_t - D)$
Min Length (ft)	4.5	4.5	6.0	Min L=3D or 3H
Max Length (ft)	15.0	15.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.8	0.5	2.4	$T=2*(L_p*\tan \theta)+W$
Design Length (ft)	4.5	4.5	6.0	
Design Width (ft)	1.8	0.5	2.4	
Riprap Depth (in)	18	18	18	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

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

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Iron Ridge Subdivision
 Location: El Paso County

Project Name: Iron Ridge Subdivision
 Project No.: 25009.00
 Calculated By: REB
 Checked By: _____
 Date: 9/2/26

	STORM DRAIN SYSTEM			Notes
	DP14.1			
Q ₁₀₀ (cfs):	14.4			Flows are the greater of proposed vs. future
Conduit	Pipe			
D _c , Pipe Diameter (in):	24			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y _t , Tailwater Depth (ft):	0.80			If unknown, use Y _t /D _c (or H)=0.4
Y _t /D _c or Y _t /H	0.40			*Use Low-tailwater basin for 14.1
Q/D ^{2.5} or Q/(WH ^{3/2})	2.55			
Supercritical?	No			
Y _n , Normal Depth (ft) [Supercritical]:				
D _a , H _a (in) [Supercritical]:	N/A			D _a =(D _c +Y _n)/2
Riprap d ₅₀ (in) [Supercritical]:	N/A			
Riprap d ₅₀ (in) [Subcritical]:	4.22			
Required Riprap Size:	L			Fig. 9-38 or Fig. 9-36
d₅₀ (in):	9			
Expansion Factor, 1/(2 tan θ):	4.90			Read from Fig. 9-35 or 9-36
θ:	0.10			
Erosive Soils?	No			
Area of Flow, A _t (ft ²):	2.06			A _t =Q/V
Length of Protection, L _p (ft):	2.8			L=(1/(2 tan θ))(A _t /Y _t - D)
Min Length (ft)	6.0			Min L=3D or 3H
Max Length (ft)	20.0			Max L=10D or 10H
Min Bottom Width, T (ft):	2.6			T=2*(L _p *tanθ)+W
Design Length (ft)	6.0			
Design Width (ft)	2.6			
Riprap Depth (in)	18			Depth=2(d ₅₀)
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

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

* For use when the flow in the culvert is supercritical (and less than full).

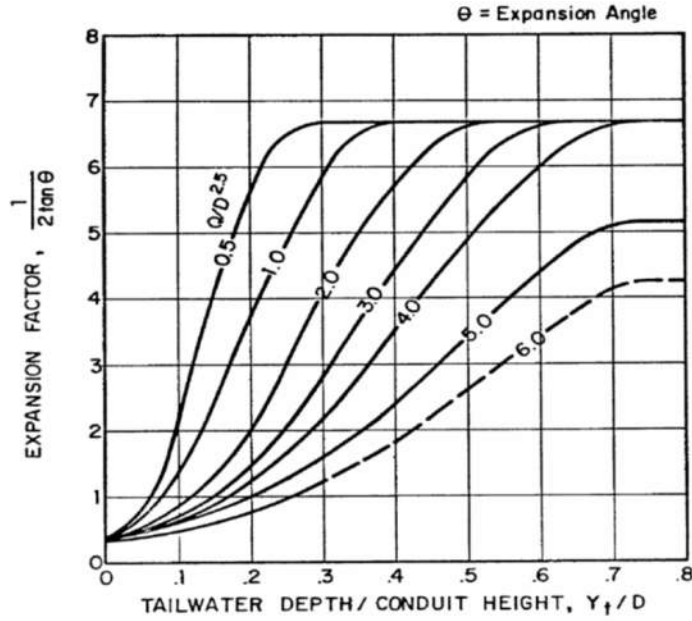


Figure 9-35. Expansion factor for circular conduits

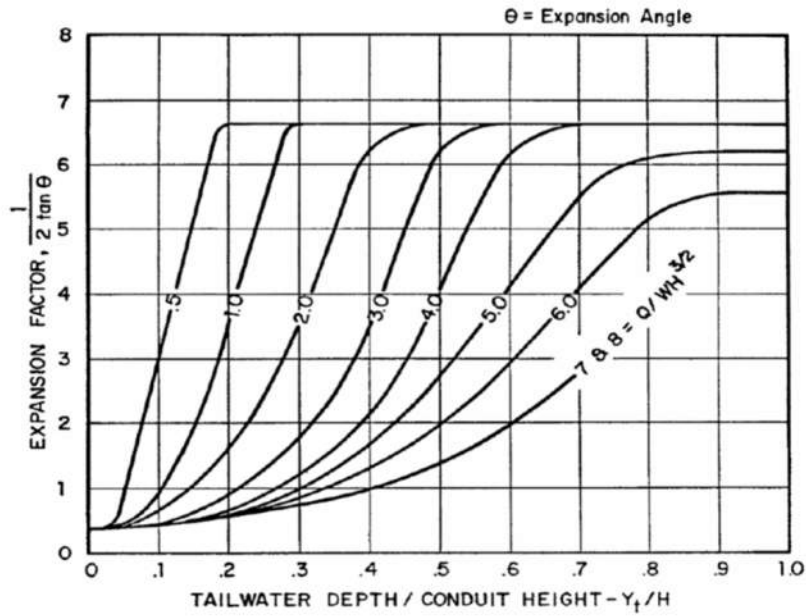


Figure 9-36. Expansion factor for rectangular conduits

Channel Report

DP15 - TRIBUTARY 1 Q100

User-defined

Invert Elev (ft) = 7437.00
Slope (%) = 1.60
N-Value = 0.035

Calculations

Compute by: Known Q
Known Q (cfs) = 279.50

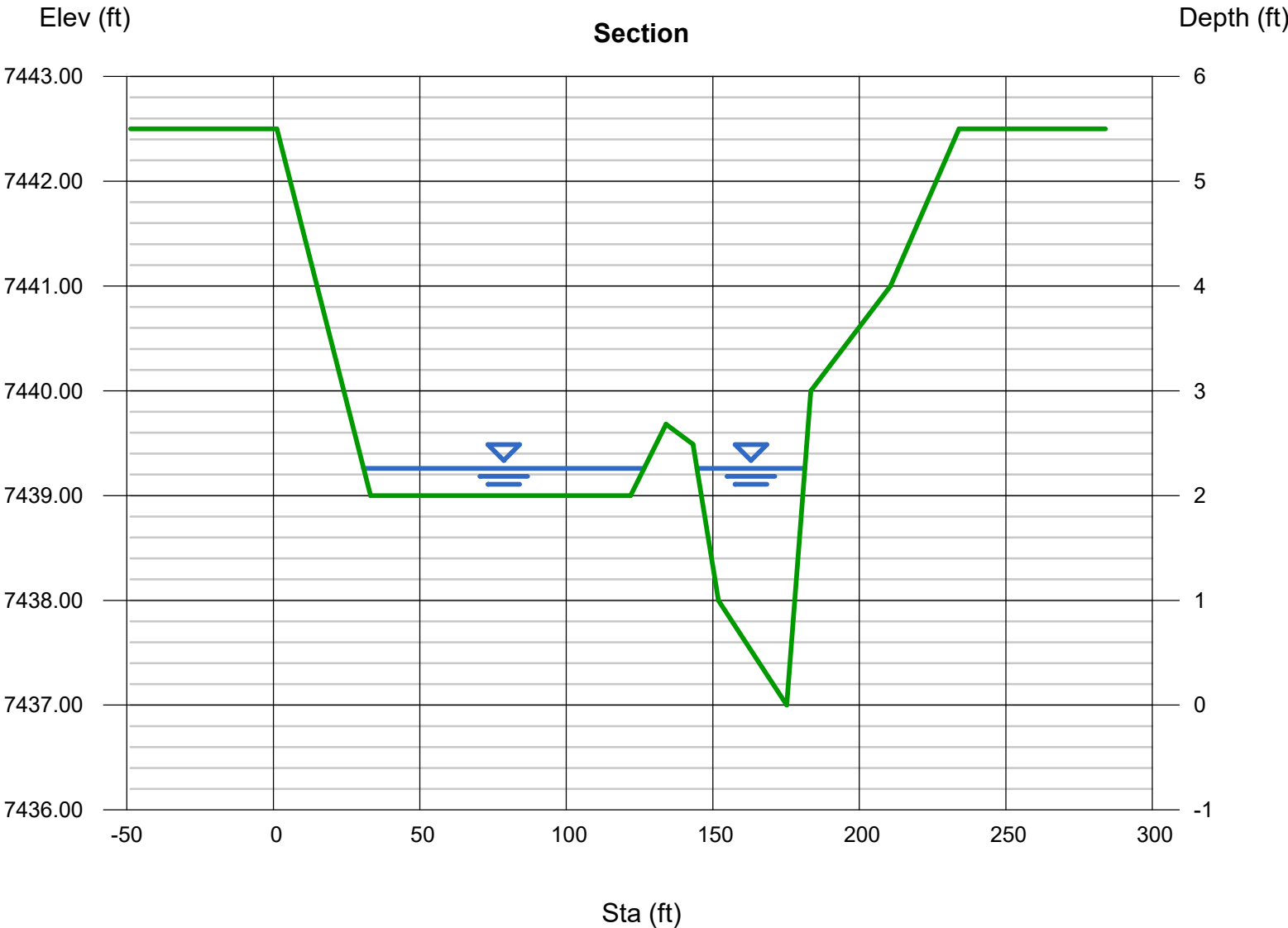
Highlighted

Depth (ft) = 2.26
Q (cfs) = 279.50
Area (sqft) = 76.63
Velocity (ft/s) = 3.65
Wetted Perim (ft) = 133.19
Crit Depth, Yc (ft) = 2.20
Top Width (ft) = 132.65
EGL (ft) = 2.47

(Sta, El, n)-(Sta, El, n)...

(1.23, 7442.50)-(33.14, 7439.00, 0.035)-(121.92, 7439.00, 0.035)-(134.06, 7439.68, 0.035)-(143.24, 7439.49, 0.035)-(151.90, 7438.00, 0.035)-(175.19, 7437.00, 0.035)-(183.49, 7440.00, 0.035)-(210.68, 7441.00, 0.035)-(234.03, 7442.50, 0.035)

Q₁₀₀ = 287.7 cfs at DP15 per
Appendix B calculations.
Please revise.



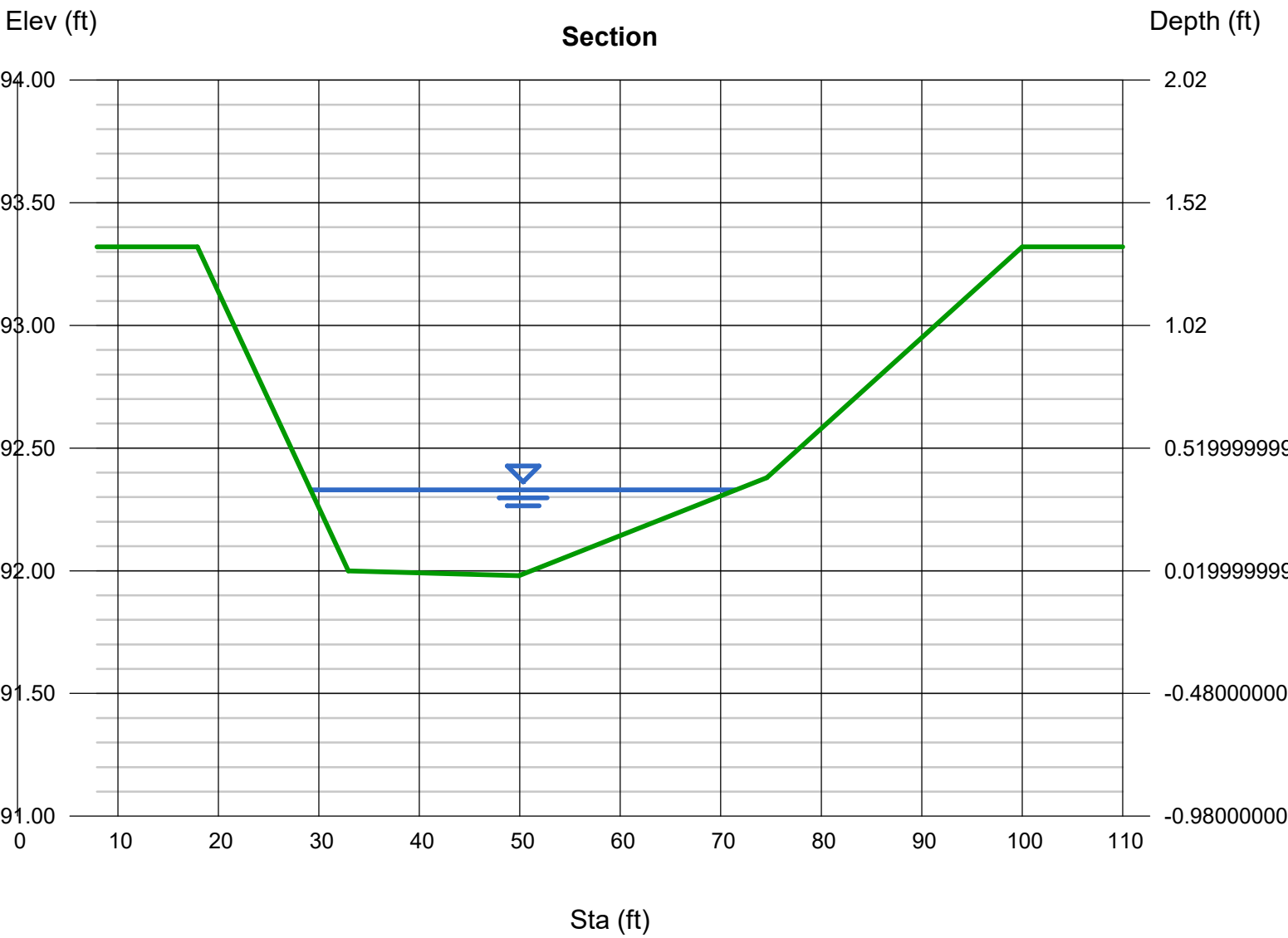
Channel Report

Ex Swale Tributary 2 @ DP1.1 (total flow) Q100

User-defined		Highlighted	
Invert Elev (ft)	= 91.98	Depth (ft)	= 0.35
Slope (%)	= 3.20	Q (cfs)	= 29.10
N-Value	= 0.035	Area (sqft)	= 10.17
		Velocity (ft/s)	= 2.86
		Wetted Perim (ft)	= 42.32
		Crit Depth, Yc (ft)	= 0.36
		Top Width (ft)	= 42.31
		EGL (ft)	= 0.48

(Sta, El, n)-(Sta, El, n)...

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)



Channel Report

DP11 - TRIBUTARY 3 Q100

User-defined

Invert Elev (ft)

= 7458.80

Slope (%)

= 2.00

N-Value

= 0.035

Highlighted

Depth (ft)

= 1.43

Q (cfs)

= 43.30

Area (sqft)

= 9.28

Velocity (ft/s)

= 4.66

Wetted Perim (ft)

= 13.44

Crit Depth, Yc (ft)

= 1.42

Top Width (ft)

= 12.98

EGL (ft)

= 1.77

Calculations

Compute by:

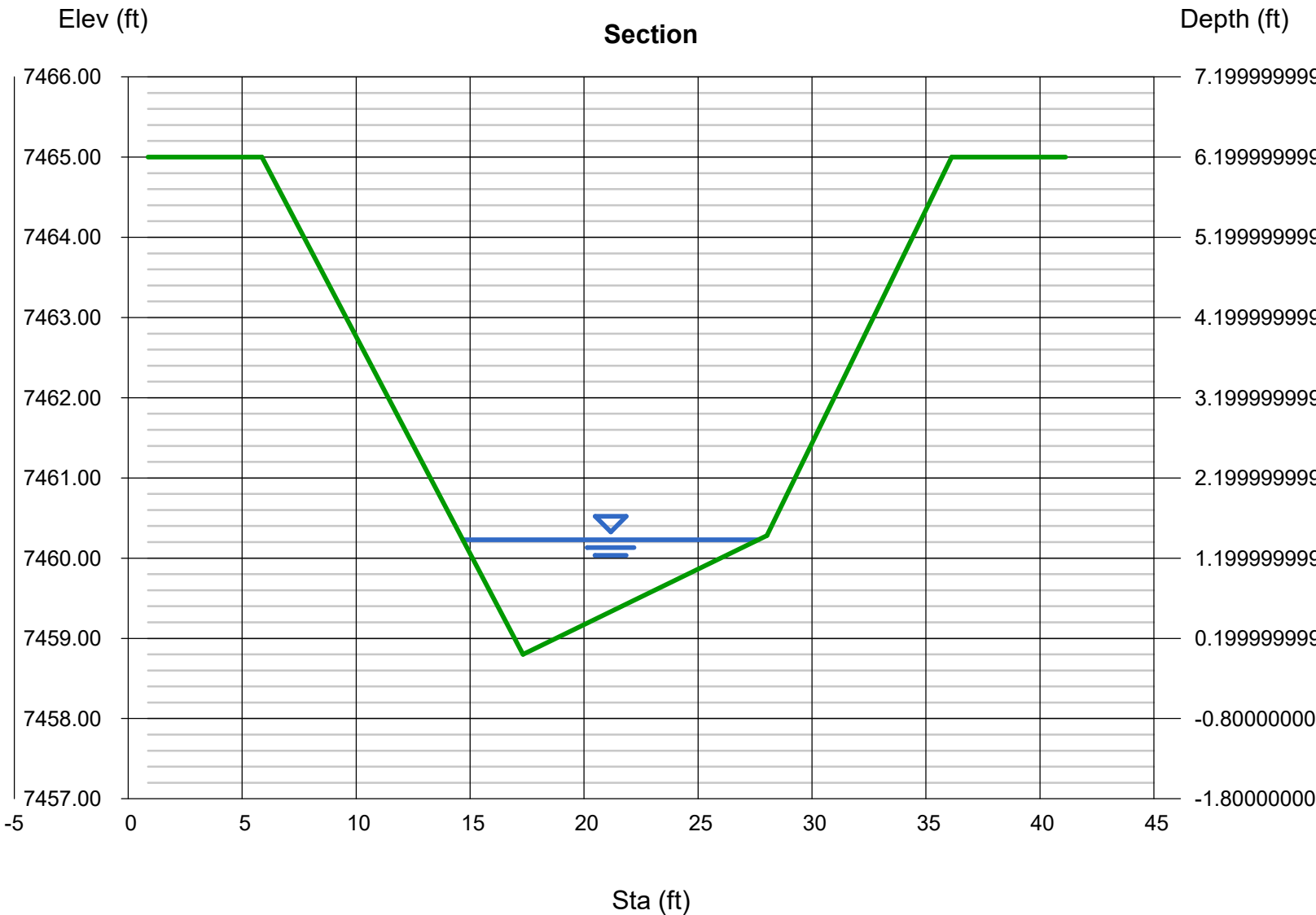
Known Q (cfs)

= 43.30

(Sta, El, n)-(Sta, El, n)...

(5.87, 7465.00)-(17.32, 7458.80, 0.035)-(28.02, 7460.28, 0.035)-(36.13, 7465.00, 0.035)

Q₁₀₀ = 40.8 cfs at DP 11 per
Appendix B calculations.
Please revise.

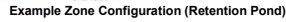




APPENDIX D – WATER QUALITY & DETENTION

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: Pond 1



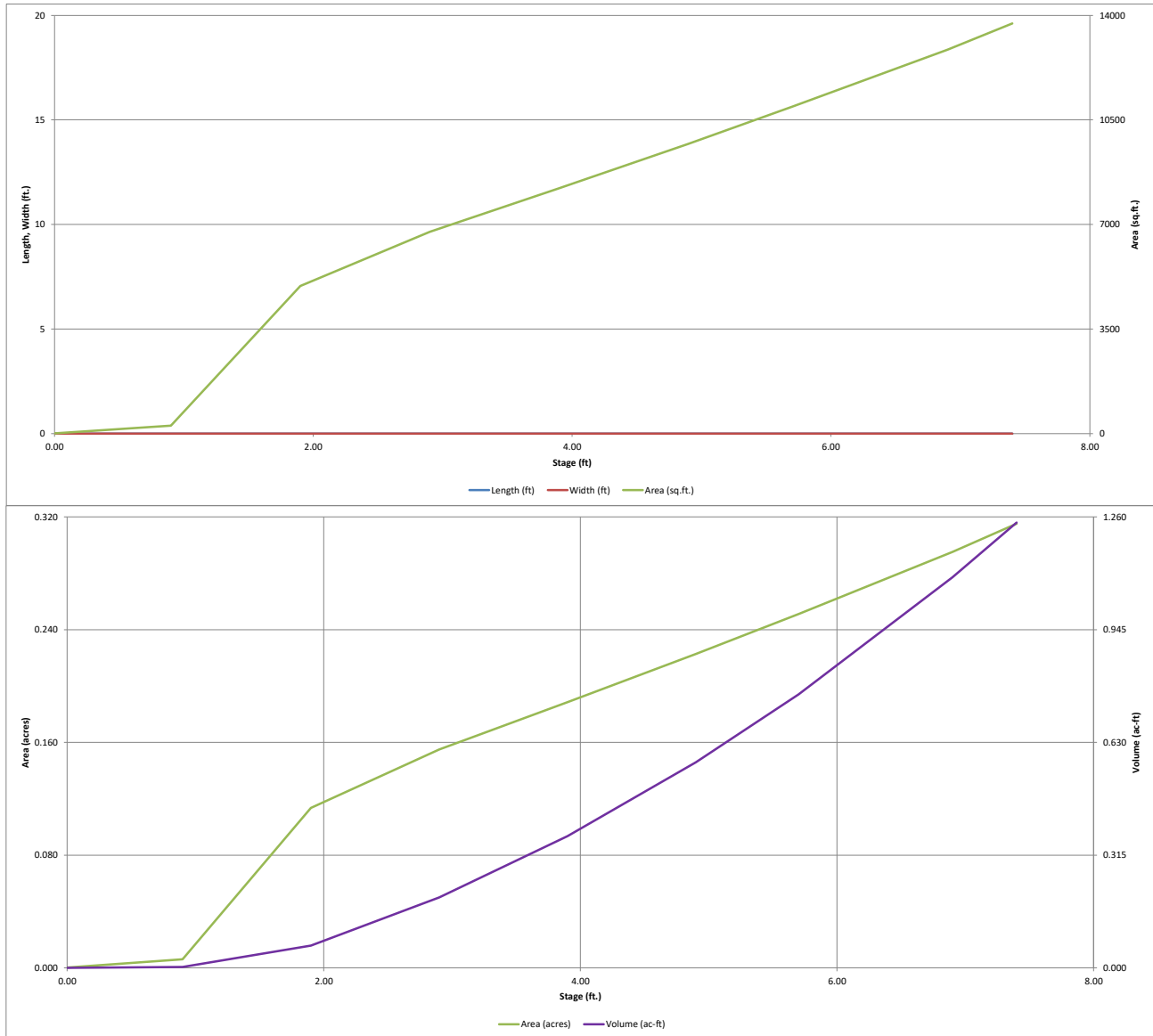
Initial Surcharge Area (A_{ISV})	=	user	ft ²
Surcharge Volume Length (L_{ISV})	=	user	ft
Surcharge Volume Width (W_{ISV})	=	user	ft
Depth of Basin Floor (H_{FLOOR})	=	user	ft
Length of Basin Floor (L_{FLOOR})	=	user	ft
Width of Basin Floor (W_{FLOOR})	=	user	ft
Area of Basin Floor (A_{FLOOR})	=	user	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

	acre-feet
	acre-feet
0.92	inches
1.20	inches
1.44	inches
1.82	inches
2.13	inches
2.47	inches
3.36	inches

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

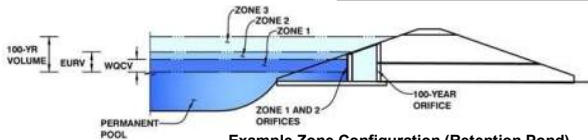


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Iron Ridge Subdivision

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.38	0.121	Orifice Plate
Zone 2 (EURV)	3.11	0.109	Orifice Plate
Zone 3 (100-year)	5.35	0.448	Weir&Pipe (Restrict)
Total (all zones)		0.677	

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 ft²
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)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 3.11 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = N/A sq. inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.60	3.00					
Orifice Area (sq. inches)	0.60	0.79	0.38					

	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)

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

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = N/A ft²
Vertical Orifice Centroid = N/A feet

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

Overflow Weir Front Edge Height, H_o = 3.83 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 4.00 feet
Overflow Weir Grate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 5.00 feet
Overflow Grate Type = Close Mesh Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_t = 3.83 feet
Overflow Weir Slope Length = 5.00 feet
Grate Open Area / 100-yr Orifice Area = 7.81
Overflow Grate Open Area w/o Debris = 15.82 ft²
Overflow Grate Open Area w/ Debris = 7.91 ft²

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

Depth to Invert of Outlet Pipe = 2.00 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 24.00 inches
Restrictor Plate Height Above Pipe Invert = 14.75 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 2.03 ft²
Outlet Orifice Centroid = 0.70 feet
Half-Central Angle of Restrictor Plate on Pipe = 1.80 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 5.70 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 16.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.63 feet
Stage at Top of Freeboard = 7.33 feet
Basin Area at Top of Freeboard = 0.31 acres
Basin Volume at Top of Freeboard = 1.22 acre-ft

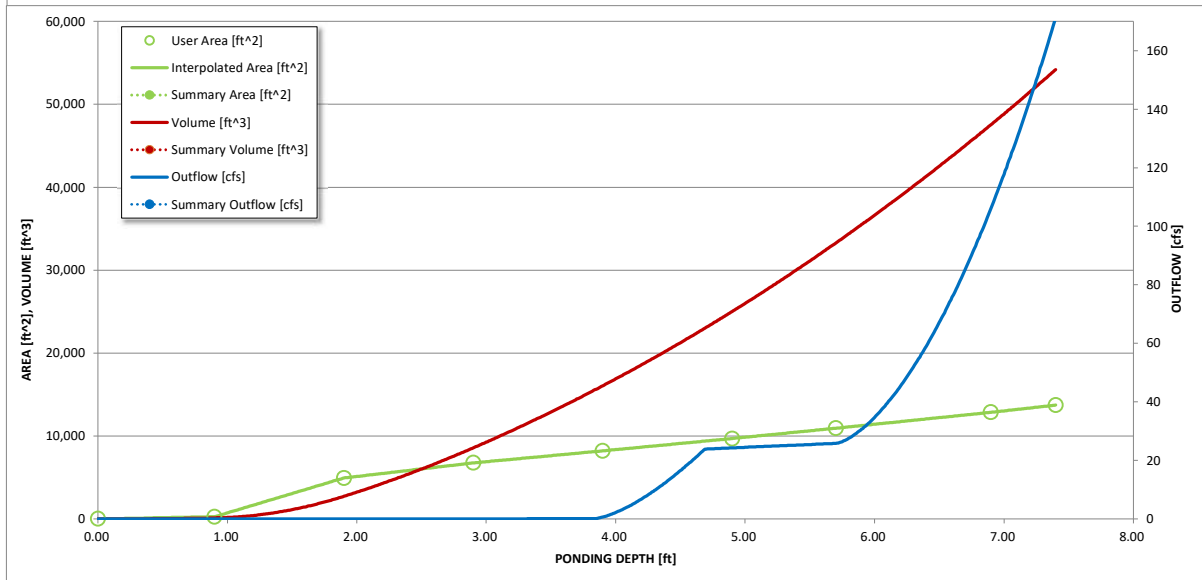
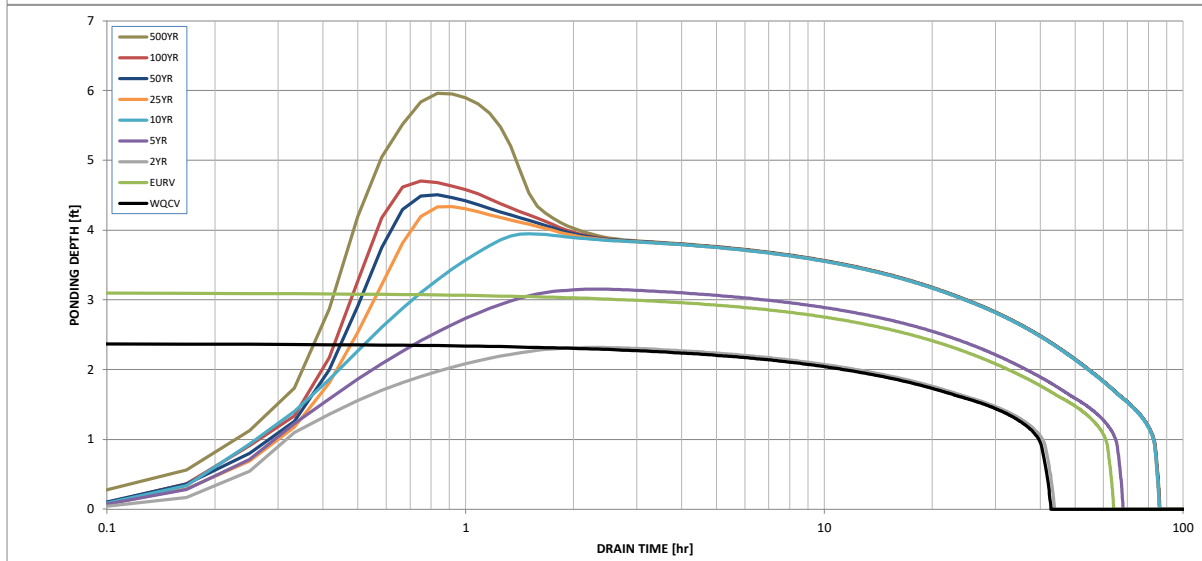
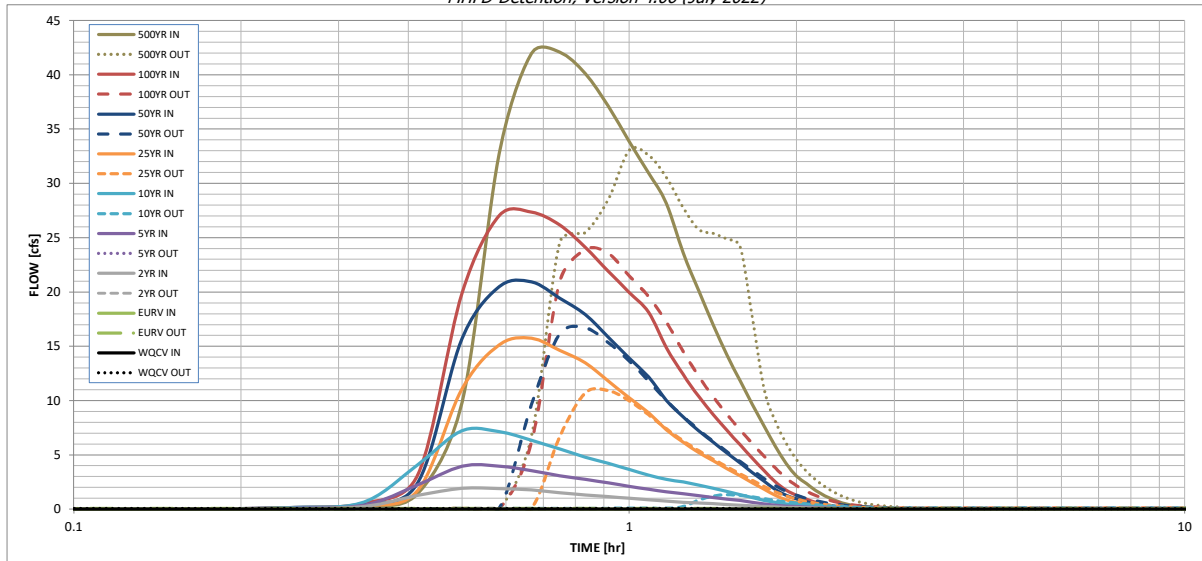
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.92	1.20	1.44	1.82	2.13	2.47	3.36
One-Hour Rainfall Depth (in) =	N/A	N/A	0.123	0.249	0.441	0.975	1.330	1.822	2.918
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.123	0.249	0.441	0.975	1.330	1.822	2.918
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.2	1.7	4.8	13.5	18.6	24.9	39.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.02	0.12	0.32	0.90	1.24	1.66	2.63
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.02	0.12	0.32	0.90	1.24	1.66	2.63
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	1.9	4.0	7.2	15.8	20.9	27.3	42.1
Peak Inflow Q (cfs) =	N/A	N/A	0.1	0.1	1.3	10.9	16.7	23.9	33.0
Peak Outflow Q (cfs) =	N/A	N/A	0.1	0.1	0.3	0.8	0.9	1.0	0.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.3	0.8	0.9	1.0	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	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	0.1	0.7	1.1	1.5	1.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	59	41	63	78	70	65	60	51
Time to Drain 99% of Inflow Volume (hours) =	42	62	43	66	83	80	78	75	70
Maximum Ponding Depth (ft) =	2.38	3.11	2.32	3.15	3.95	4.34	4.51	4.70	5.96
Area at Maximum Ponding Depth (acres) =	0.13	0.16	0.13	0.16	0.19	0.20	0.21	0.22	0.26
Maximum Volume Stored (acre-ft) =	0.122	0.230	0.113	0.237	0.376	0.453	0.488	0.530	0.830

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

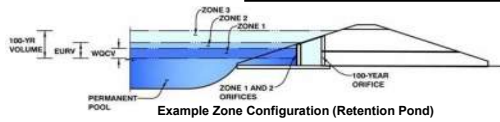
Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
	0:15:00	0.00	0.00	0.05	0.10	0.14	0.11	0.16	0.16	0.27
	0:20:00	0.00	0.00	0.25	0.36	0.66	0.31	0.39	0.57	1.46
	0:25:00	0.00	0.00	1.27	2.23	4.10	1.74	2.45	3.18	9.81
	0:30:00	0.00	0.00	1.92	3.95	7.22	11.08	15.71	19.90	32.75
	0:35:00	0.00	0.00	1.90	3.97	7.13	15.14	20.48	27.02	41.97
	0:40:00	0.00	0.00	1.76	3.53	6.35	15.75	20.93	27.34	42.09
	0:45:00	0.00	0.00	1.51	3.09	5.54	14.61	19.43	26.16	40.11
	0:50:00	0.00	0.00	1.31	2.74	4.80	13.49	17.92	24.11	37.10
	0:55:00	0.00	0.00	1.15	2.42	4.21	11.79	15.83	21.90	33.86
	1:00:00	0.00	0.00	1.00	2.11	3.66	10.25	13.92	19.97	30.95
	1:05:00	0.00	0.00	0.87	1.82	3.13	8.89	12.19	18.13	28.17
	1:10:00	0.00	0.00	0.73	1.60	2.74	7.31	10.03	14.88	23.62
	1:15:00	0.00	0.00	0.64	1.42	2.50	6.16	8.50	12.40	20.16
	1:20:00	0.00	0.00	0.56	1.24	2.23	5.23	7.22	10.40	16.95
	1:25:00	0.00	0.00	0.50	1.08	1.91	4.46	6.15	8.70	14.18
	1:30:00	0.00	0.00	0.43	0.93	1.61	3.72	5.15	7.25	11.81
	1:35:00	0.00	0.00	0.37	0.79	1.33	3.06	4.24	5.93	9.65
	1:40:00	0.00	0.00	0.31	0.63	1.07	2.43	3.38	4.69	7.64
	1:45:00	0.00	0.00	0.25	0.48	0.82	1.83	2.56	3.53	5.78
	1:50:00	0.00	0.00	0.20	0.36	0.62	1.27	1.81	2.50	4.18
	1:55:00	0.00	0.00	0.17	0.29	0.48	0.85	1.26	1.74	3.05
	2:00:00	0.00	0.00	0.14	0.25	0.41	0.61	0.96	1.28	2.35
	2:05:00	0.00	0.00	0.11	0.20	0.32	0.43	0.69	0.91	1.71
	2:10:00	0.00	0.00	0.09	0.15	0.26	0.31	0.50	0.63	1.22
	2:15:00	0.00	0.00	0.07	0.12	0.20	0.22	0.36	0.43	0.86
	2:20:00	0.00	0.00	0.06	0.09	0.15	0.16	0.26	0.28	0.58
	2:25:00	0.00	0.00	0.04	0.07	0.12	0.11	0.19	0.18	0.39
	2:30:00	0.00	0.00	0.03	0.05	0.09	0.08	0.14	0.12	0.27
	2:35:00	0.00	0.00	0.03	0.04	0.06	0.06	0.10	0.09	0.20
	2:40:00	0.00	0.00	0.02	0.03	0.05	0.04	0.08	0.07	0.15
	2:45:00	0.00	0.00	0.02	0.02	0.03	0.03	0.06	0.06	0.12
	2:50:00	0.00	0.00	0.01	0.02	0.03	0.02	0.04	0.04	0.09
	2:55:00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.06
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.04
	3:05:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.03
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	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
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	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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

MHFD-Detention, Version 4.06 (July 2022)

Basin ID: POND 2

Example Zone Configuration (Retention Pond)

Optional User Overrides

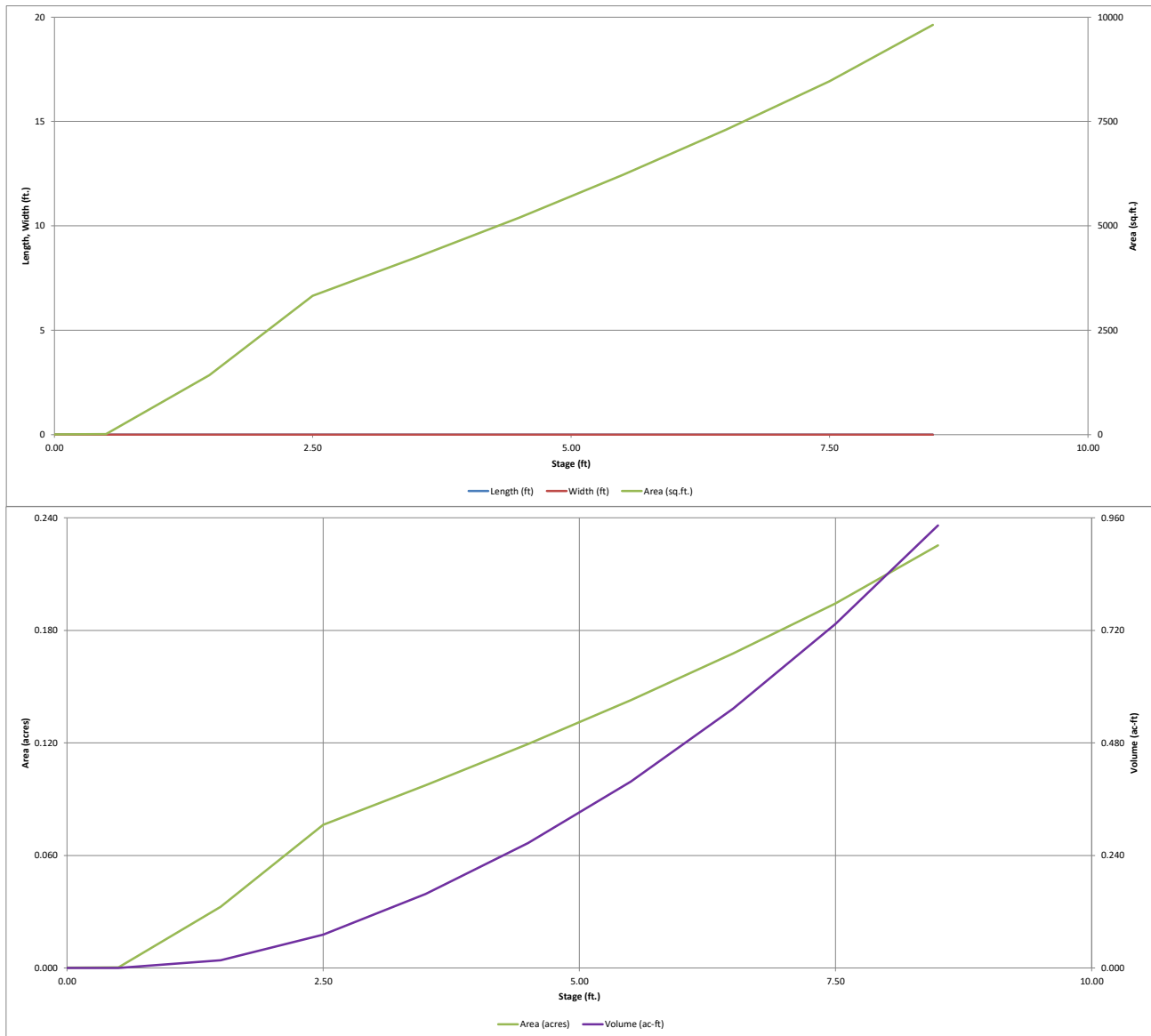
	acre-feet
	acre-feet
0.92	inches
1.20	inches
1.44	inches
1.82	inches
2.13	inches
2.47	inches
3.36	inches

Initial Surchage Area (A_{ISV}) =	<u>user</u>	ft ²
Surchage Volume Length (L_{ISV}) =	<u>user</u>	ft
Surchage Volume Width (W_{ISV}) =	<u>user</u>	ft
Depth of Basin Floor (H_{FLOOR}) =	<u>user</u>	ft
Length of Basin Floor (L_{FLOOR}) =	<u>user</u>	ft
Width of Basin Floor (W_{FLOOR}) =	<u>user</u>	ft
Area of Basin Floor (A_{FLOOR}) =	<u>user</u>	ft ²
Volume of Basin Floor (V_{FLOOR}) =	<u>user</u>	ft ³
Depth of Main Basin (H_{MAIN}) =	<u>user</u>	ft
Length of Main Basin (L_{MAIN}) =	<u>user</u>	ft
Width of Main Basin (W_{MAIN}) =	<u>user</u>	ft
Area of Main Basin (A_{MAIN}) =	<u>user</u>	ft ²
Volume of Main Basin (V_{MAIN}) =	<u>user</u>	ft ³
Calculated Total Basin Volume (V_{OBS}) =	user	acre-feet

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

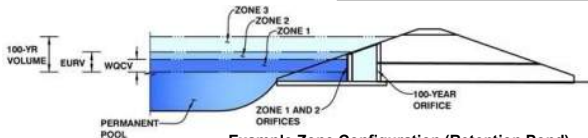


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **IRON RIDGE SUBDIVISION**

Basin ID: **POND 2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.64	0.082	Orifice Plate
Zone 2 (EURV)	3.52	0.078	Circular Orifice
Zone 3 (100-year)	5.86	0.291	Weir&Pipe (Restrict)
Total (all zones)		0.451	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

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

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.75						
Orifice Area (sq. inches)	0.44	0.44						

	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)

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

Calculated Parameters for Vertical Orifice
Zone 2 Circular Not Selected
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Grate Upper Edge, H_t = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = 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).

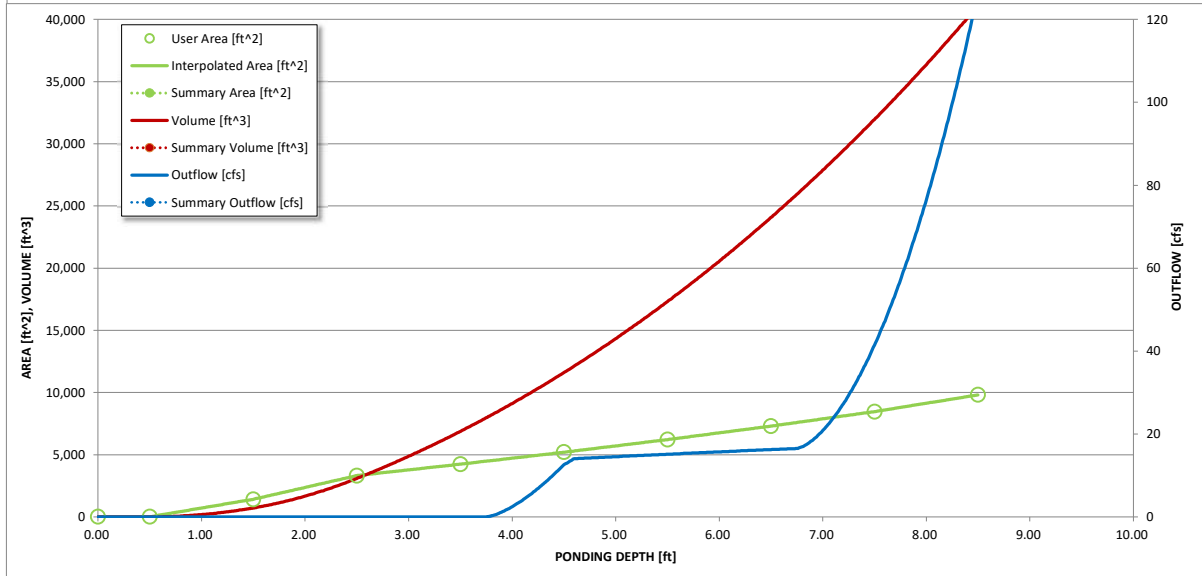
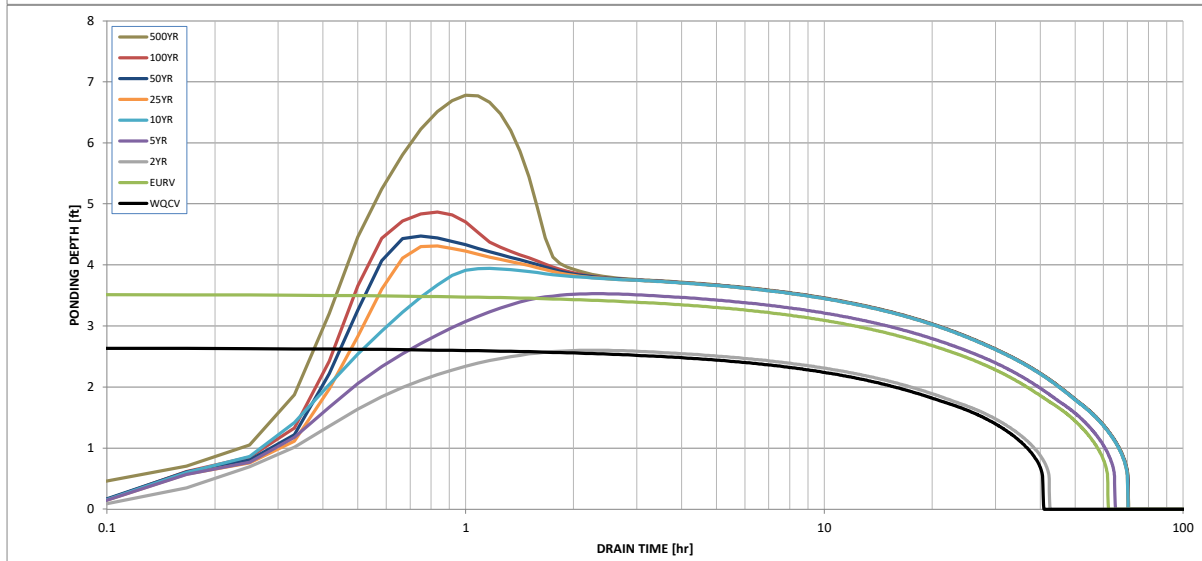
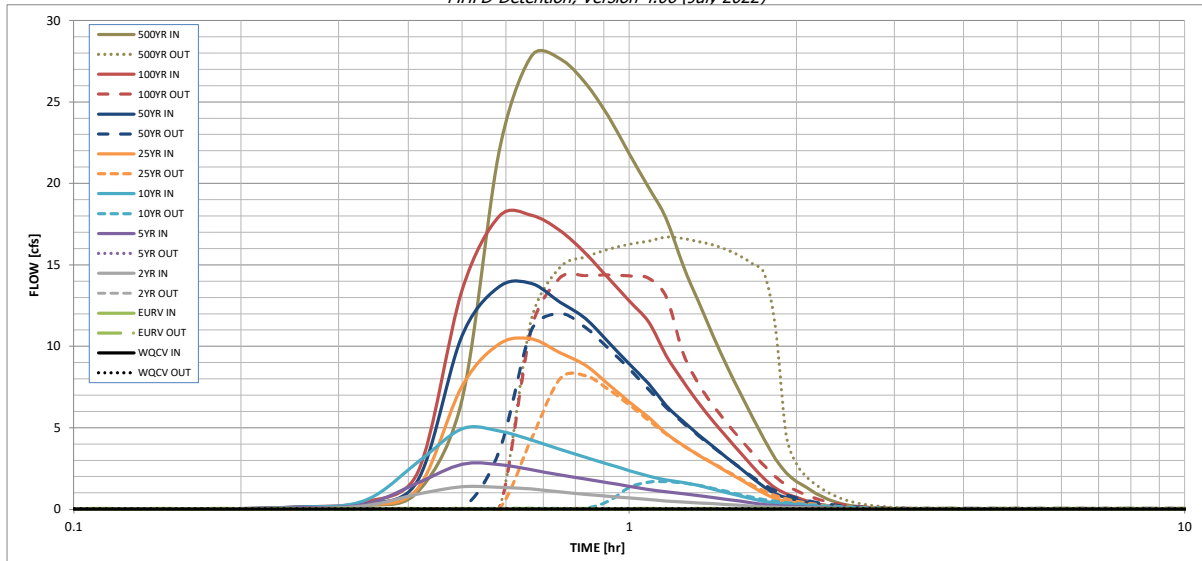
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.92	1.20	1.44	1.82	2.13	2.47	3.36
One-Hour Rainfall Depth (in) =	0.082	0.160	0.086	0.169	0.293	0.632	0.858	1.170	1.867
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.086	0.169	0.293	0.632	0.858	1.170	1.867
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	1.1	3.2	8.7	12.0	16.1	25.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.12	0.33	0.91	1.26	1.69	2.67
Peak Inflow Q (cfs) =	N/A	N/A	1.4	2.8	4.9	10.5	13.8	18.0	27.8
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	1.7	8.2	12.0	14.4	16.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.5	0.9	1.0	0.9	0.7
Structure Controlling Flow =	Plate	Vertical Orifice 1	Plate	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	0.3	1.3	1.9	2.3	2.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	58	40	60	63	56	52	47	39
Time to Drain 99% of Inflow Volume (hours) =	40	60	42	63	67	65	63	61	56
Maximum Ponding Depth (ft) =	2.64	3.53	2.60	3.53	3.94	4.31	4.48	4.67	6.78
Area at Maximum Ponding Depth (acres) =	0.08	0.10	0.08	0.10	0.11	0.12	0.12	0.13	0.17
Maximum Volume Stored (acre-ft) =	0.082	0.161	0.079	0.161	0.203	0.244	0.263	0.311	0.599

Please revise the outlet structure to reduce velocities to <2 fps. The lower velocity is requested to reduce the risk of someone getting pinned to the grate, MHFD guidance.

I acknowledge this was not commented on during the initial review, and I apologize for the additional revisions.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
	0:15:00	0.00	0.00	0.04	0.08	0.11	0.09	0.12	0.13	0.21
	0:20:00	0.00	0.00	0.20	0.28	0.51	0.24	0.30	0.44	1.08
	0:25:00	0.00	0.00	0.93	1.62	2.89	1.28	1.78	2.28	6.72
	0:30:00	0.00	0.00	1.38	2.76	4.93	7.55	10.66	13.45	21.99
	0:35:00	0.00	0.00	1.34	2.74	4.80	10.14	13.66	17.99	27.83
	0:40:00	0.00	0.00	1.24	2.42	4.24	10.46	13.85	18.05	27.67
	0:45:00	0.00	0.00	1.06	2.11	3.69	9.61	12.72	17.11	26.17
	0:50:00	0.00	0.00	0.92	1.86	3.18	8.85	11.72	15.73	24.12
	0:55:00	0.00	0.00	0.80	1.63	2.77	7.67	10.26	14.18	21.84
	1:00:00	0.00	0.00	0.69	1.41	2.37	6.60	8.92	12.80	19.75
	1:05:00	0.00	0.00	0.59	1.21	2.03	5.64	7.70	11.49	17.83
	1:10:00	0.00	0.00	0.51	1.07	1.80	4.64	6.35	9.42	14.95
	1:15:00	0.00	0.00	0.44	0.96	1.65	3.93	5.40	7.85	12.75
	1:20:00	0.00	0.00	0.39	0.83	1.46	3.32	4.56	6.53	10.61
	1:25:00	0.00	0.00	0.34	0.71	1.23	2.80	3.84	5.40	8.76
	1:30:00	0.00	0.00	0.29	0.61	1.02	2.29	3.15	4.41	7.15
	1:35:00	0.00	0.00	0.24	0.50	0.82	1.83	2.52	3.49	5.66
	1:40:00	0.00	0.00	0.19	0.39	0.63	1.39	1.92	2.64	4.29
	1:45:00	0.00	0.00	0.16	0.29	0.47	0.98	1.37	1.87	3.09
	1:50:00	0.00	0.00	0.14	0.23	0.38	0.66	0.95	1.30	2.23
	1:55:00	0.00	0.00	0.12	0.20	0.33	0.47	0.71	0.95	1.70
	2:00:00	0.00	0.00	0.10	0.17	0.28	0.36	0.57	0.73	1.35
	2:05:00	0.00	0.00	0.08	0.14	0.22	0.26	0.42	0.51	0.98
	2:10:00	0.00	0.00	0.06	0.10	0.17	0.19	0.30	0.35	0.69
	2:15:00	0.00	0.00	0.05	0.08	0.13	0.14	0.22	0.24	0.48
	2:20:00	0.00	0.00	0.04	0.06	0.10	0.10	0.16	0.15	0.32
	2:25:00	0.00	0.00	0.03	0.05	0.07	0.07	0.12	0.11	0.22
	2:30:00	0.00	0.00	0.02	0.03	0.05	0.05	0.09	0.08	0.16
	2:35:00	0.00	0.00	0.02	0.03	0.04	0.04	0.06	0.06	0.12
	2:40:00	0.00	0.00	0.01	0.02	0.03	0.03	0.05	0.05	0.09
	2:45:00	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.04	0.07
	2:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.05
	2:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.04
	3:00:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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

POND 1 - FOREBAY SIZING

$$w = 9.23 (A_{FB} / t) (1 / \sqrt{h_{max}})$$

Equation 4-1

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

TABLE 4-12. FOREBAY SIZING CRITERIA

FOREBAY SIZING CRITERIA	IA UP TO 2 ACRES	WATERSHED IMPERVIOUS AREA (IA)			
		IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, concrete pad with slotted metal edge, or similar design	Size to drain in 4 to 5 minutes using Equation 4-1			
Minimum Forebay Volume ¹		1% of WQCV			
Forebay Depth ¹		12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

¹ Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

IA = 15.8% * 14.89 acres = 2.35 IA's
Design Depth = 15"

Minimum Volume = 1% of WQCV = 1% *
0.121 ac-ft * 43,560 = 52.7 CF

Provided Volume ~ 125 CF

$A_{fb} = 214$ sf
 $t = 300$ s
 $h_{max} = 1.25$
 $w = 9.23 * (214/300) * (1/\sqrt{1.25}) =$
5.89" FOR A 5 MINUTE DRAIN TIME,
USE 6"

$A_{fb} = 214$ sf
 $t = 240$ s
 $h_{max} = 1.25$
 $w = 9.23 * (214/240) * (1/\sqrt{1.25}) =$
7.36" FOR A 4 MINUTE DRAIN TIME
USE 6"

POND 2 - FOREBAY SIZING

$$w = 9.23 (A_{FB} / t) (1 / \sqrt{h_{max}})$$

Equation 4-1

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

TABLE 4-12. FOREBAY SIZING CRITERIA

FOREBAY SIZING CRITERIA	IA UP TO 2 ACRES	WATERSHED IMPERVIOUS AREA (IA)			
		IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, concrete pad with slotted metal edge, or similar design	Size to drain in 4 to 5 minutes using Equation 4-1			
Minimum Forebay Volume ¹		1% of WQCV			
Forebay Depth ¹		12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

¹ Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

IA = 17.3% * 9.48 acres = 1.64 IA's
Design Depth = 12"

Minimum Volume = 1% of WQCV = 1% *
0.082 ac-ft * 43,560 = 52.7 CF

Provided Volume ~ 60 CF

$A_{fb} = 101 \text{ sf}$
 $t = 300 \text{ s}$
 $h_{max} = 1.0$
 $w = 9.23 * (101/300) * (1/\sqrt{1.0}) = 3.1"$
FOR A 5 MINUTE DRAIN TIME, USE
3.5"

$A_{fb} = 101 \text{ sf}$
 $t = 240 \text{ s}$
 $h_{max} = 1.0$
 $w = 9.23 * (101/240) * (1/\sqrt{1.0}) = 3.9"$
FOR A 4 MINUTE DRAIN TIME USE
3.5"

Weir Report

POND 1 - FOREBAY NOTCH MAX FLOW

Rectangular Weir

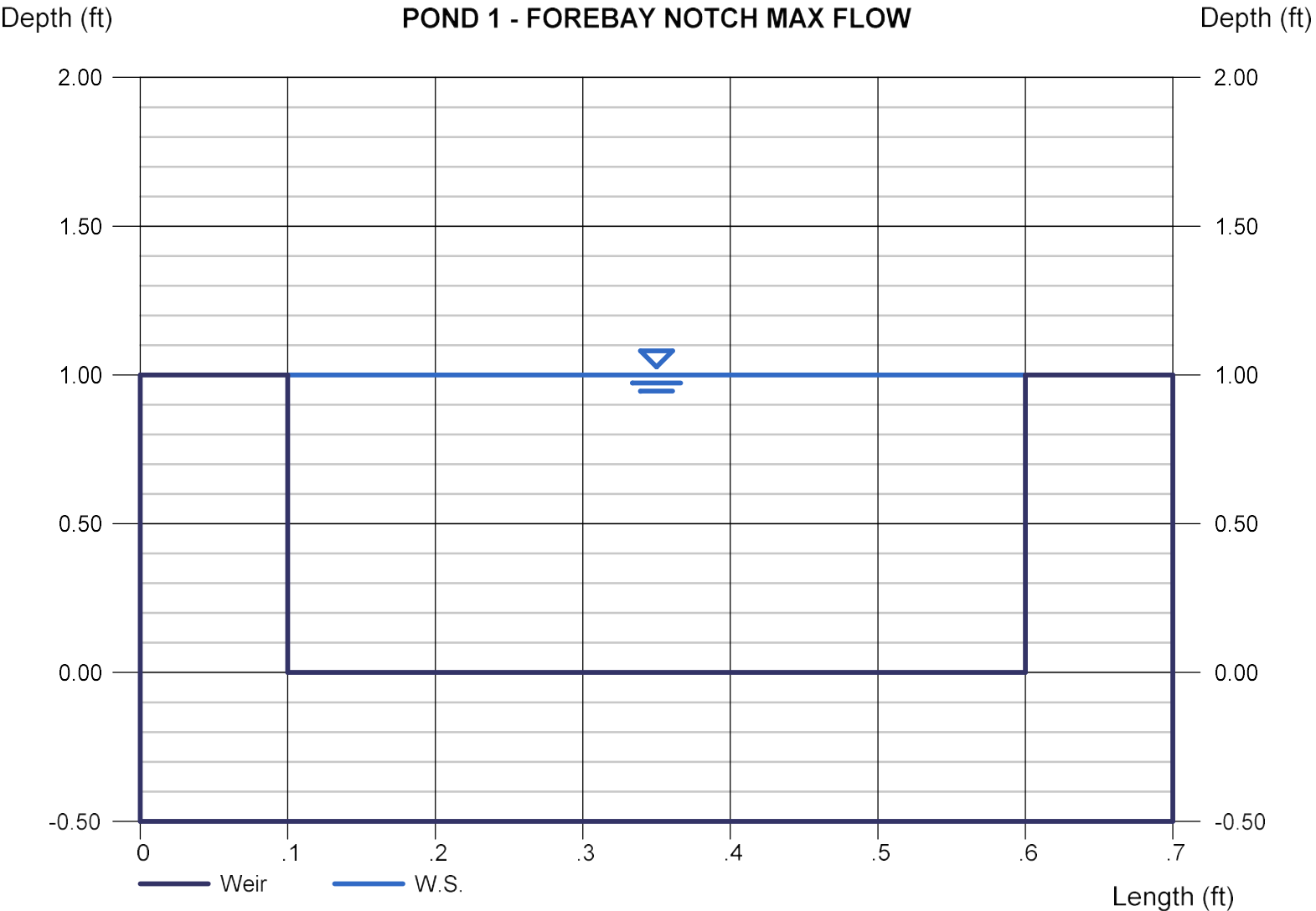
Crest = Sharp
Bottom Length (ft) = 0.50
Total Depth (ft) = 1.00

Calculations

Weir Coeff. Cw = 3.33
Compute by: Q vs Depth
No. Increments = 10

Highlighted

Depth (ft) = 1.00
Q (cfs) = 1.665
Area (sqft) = 0.50
Velocity (ft/s) = 3.33
Top Width (ft) = 0.50



Channel Report

POND 1 TRICKLE CHANNEL

Rectangular

Bottom Width (ft) = 2.00
Total Depth (ft) = 0.50

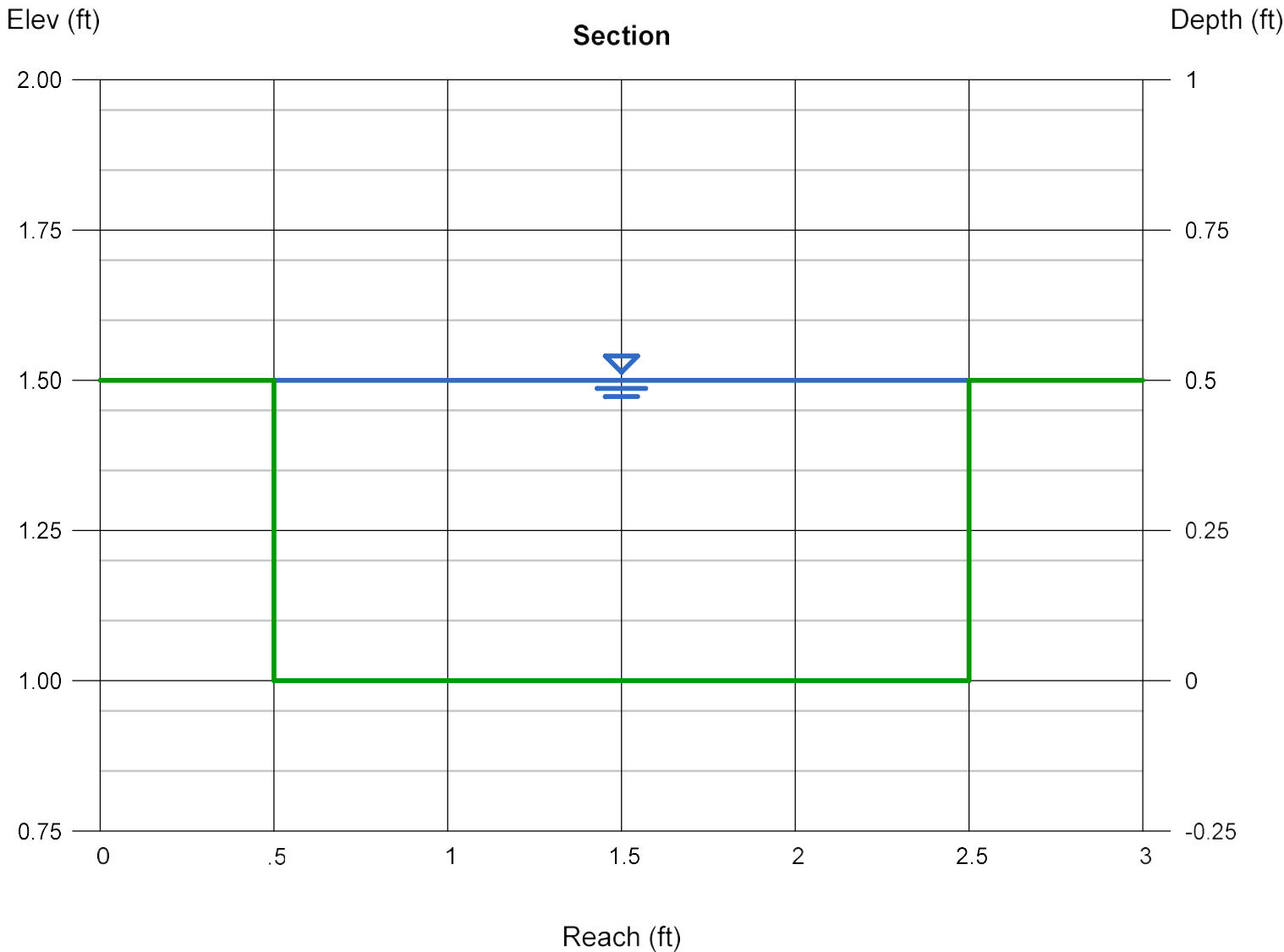
Invert Elev (ft) = 1.00
Slope (%) = 0.50
N-Value = 0.012

Calculations

Compute by: Q vs Depth
No. Increments = 4

Highlighted

Depth (ft) = 0.50
Q (cfs) = 4.208
Area (sqft) = 1.00
Velocity (ft/s) = 4.21
Wetted Perim (ft) = 3.00
Crit Depth, Yc (ft) = 0.50
Top Width (ft) = 2.00
EGL (ft) = 0.78



Weir Report

POND 2 - FOREBAY NOTCH MAX FLOW

Rectangular Weir

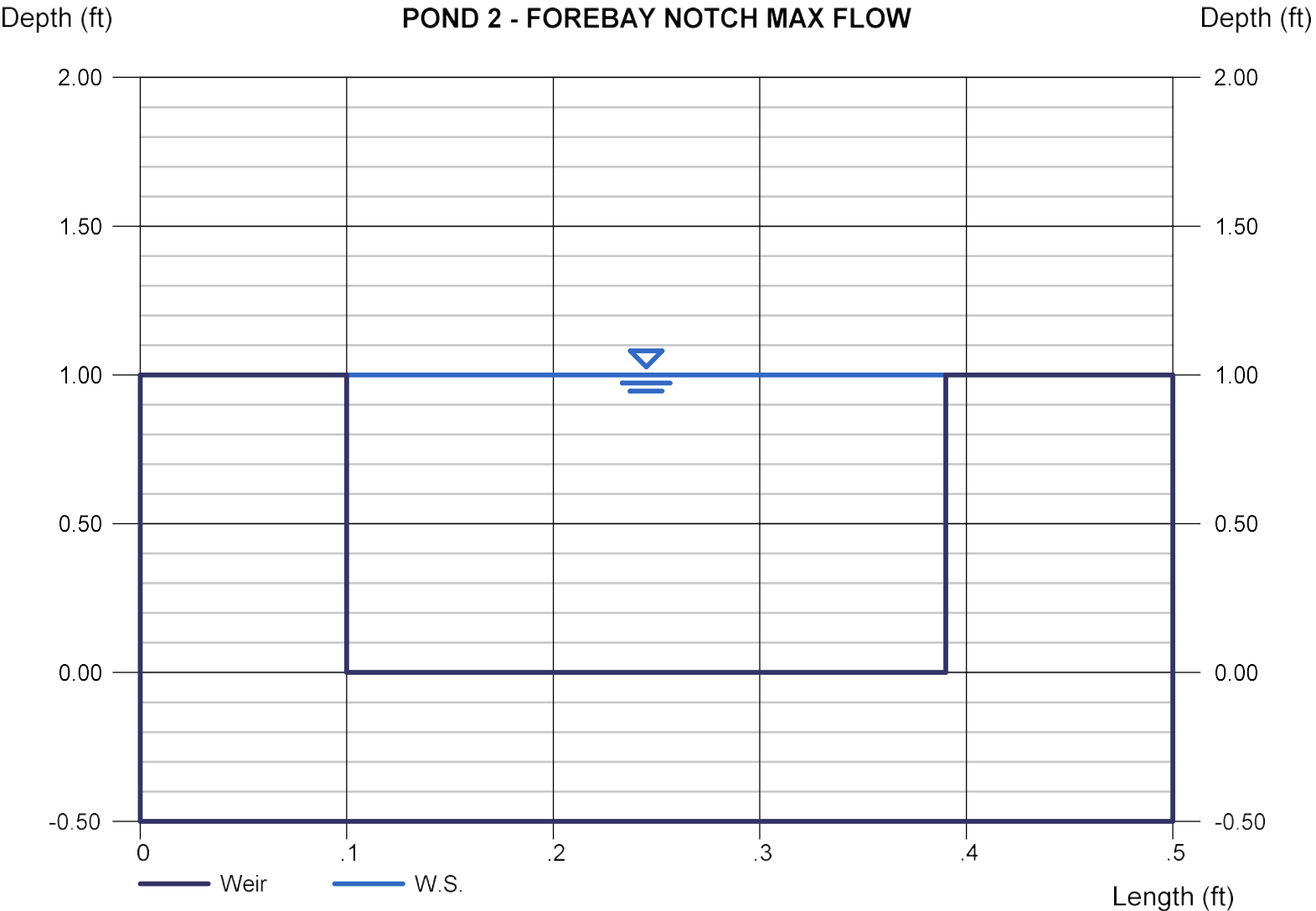
Crest = Sharp
Bottom Length (ft) = 0.29
Total Depth (ft) = 1.00

Calculations

Weir Coeff. Cw = 3.33
Compute by: Q vs Depth
No. Increments = 10

Highlighted

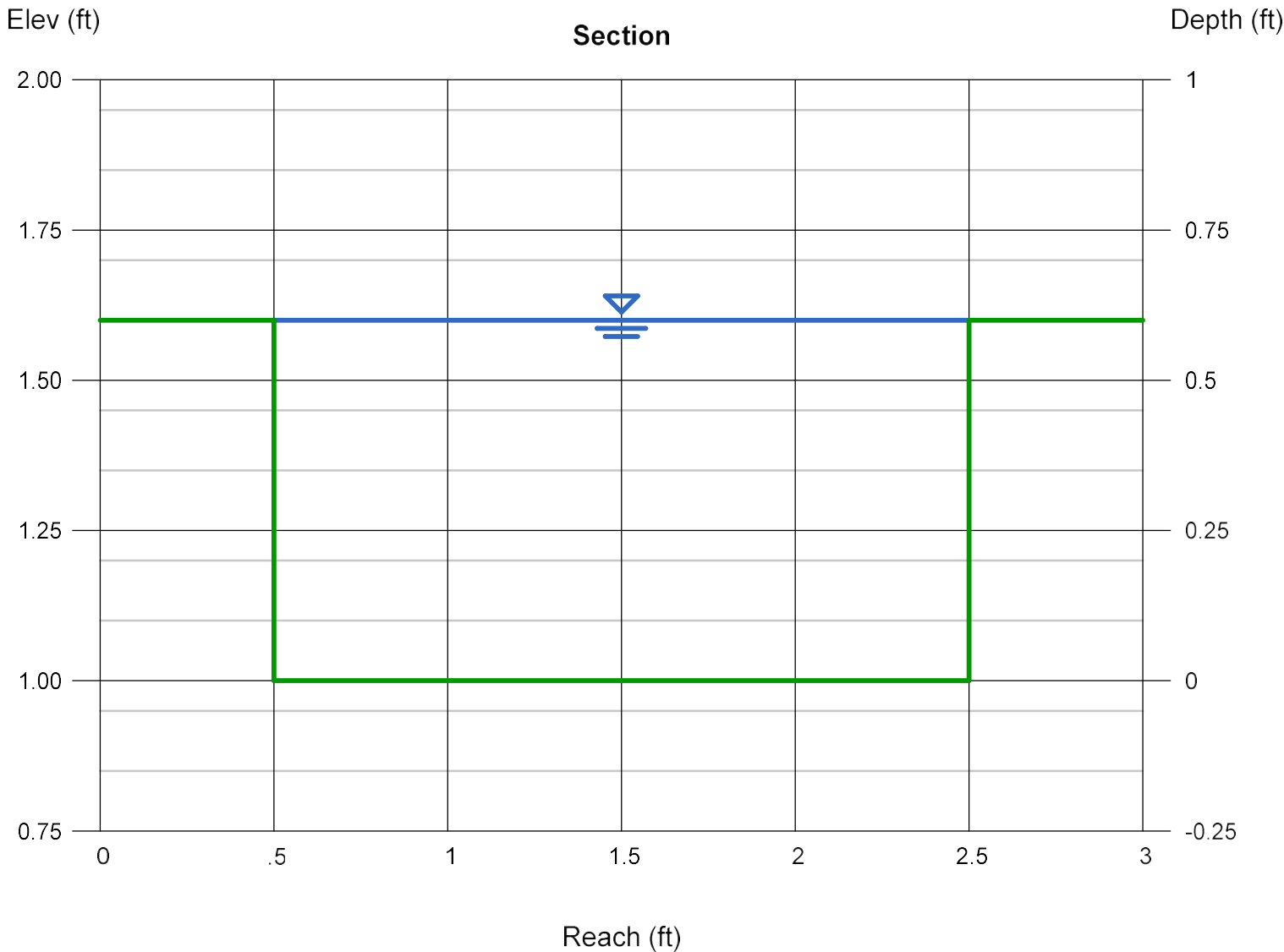
Depth (ft) = 1.00
Q (cfs) = 0.966
Area (sqft) = 0.29
Velocity (ft/s) = 3.33
Top Width (ft) = 0.29



Channel Report

POND 2 TRICKLE CHANNEL

Rectangular		Highlighted	
Bottom Width (ft)	= 2.00	Depth (ft)	= 0.60
Total Depth (ft)	= 0.60	Q (cfs)	= 5.462
		Area (sqft)	= 1.20
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.55
Slope (%)	= 0.50	Wetted Perim (ft)	= 3.20
N-Value	= 0.012	Crit Depth, Yc (ft)	= 0.60
		Top Width (ft)	= 2.00
		EGL (ft)	= 0.92
Calculations			
Compute by:	Q vs Depth		
No. Increments	= 4		



Channel Report

DP4.1 - POND 1 OUTLET (Q5)

Circular

Diameter (ft) = 2.00

Invert Elev (ft) = 1.00

Slope (%) = 2.69

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.10

Highlighted

Depth (ft) = 0.08

Q (cfs) = 0.100

Area (sqft) = 0.04

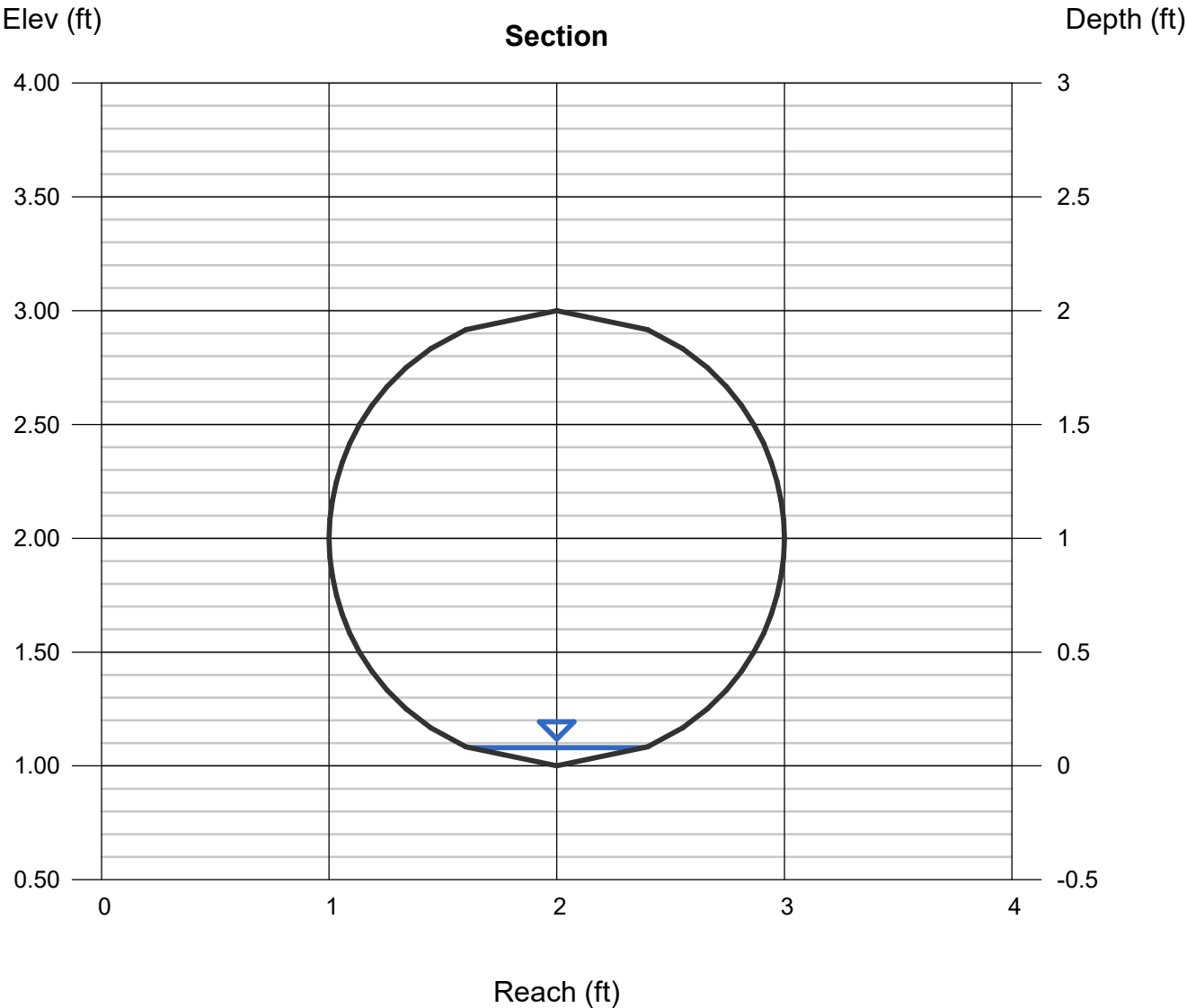
Velocity (ft/s) = 2.33

Wetted Perim (ft) = 0.81

Crit Depth, Yc (ft) = 0.11

Top Width (ft) = 0.79

EGL (ft) = 0.16



Channel Report

DP4.1 - POND 1 OUTLET (Q100)

Circular

Diameter (ft) = 2.00

Invert Elev (ft) = 1.00

Slope (%) = 2.69

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 23.90

Highlighted

Depth (ft) = 1.17

Q (cfs) = 23.90

Area (sqft) = 1.92

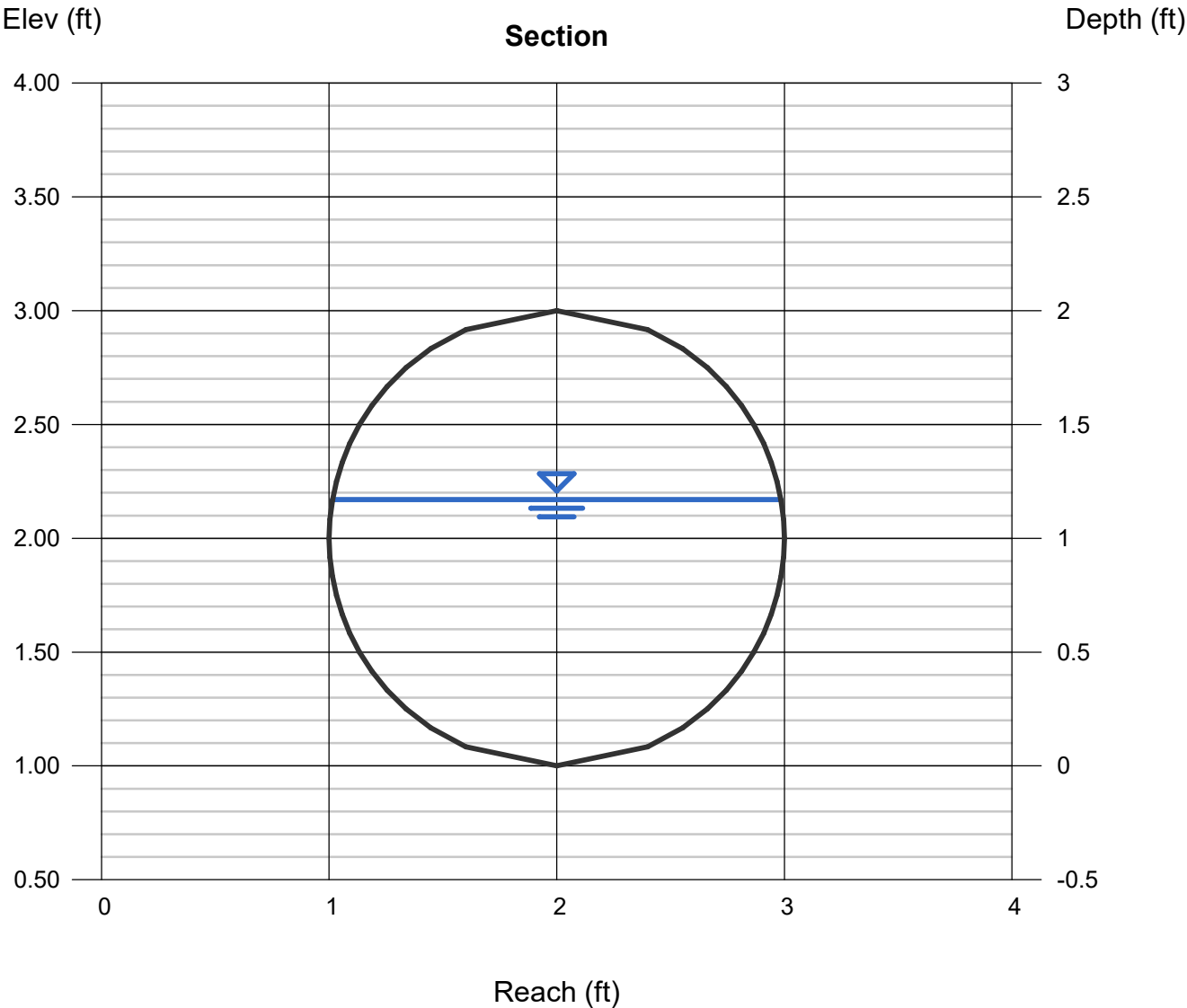
Velocity (ft/s) = 12.48

Wetted Perim (ft) = 3.49

Crit Depth, Yc (ft) = 1.74

Top Width (ft) = 1.97

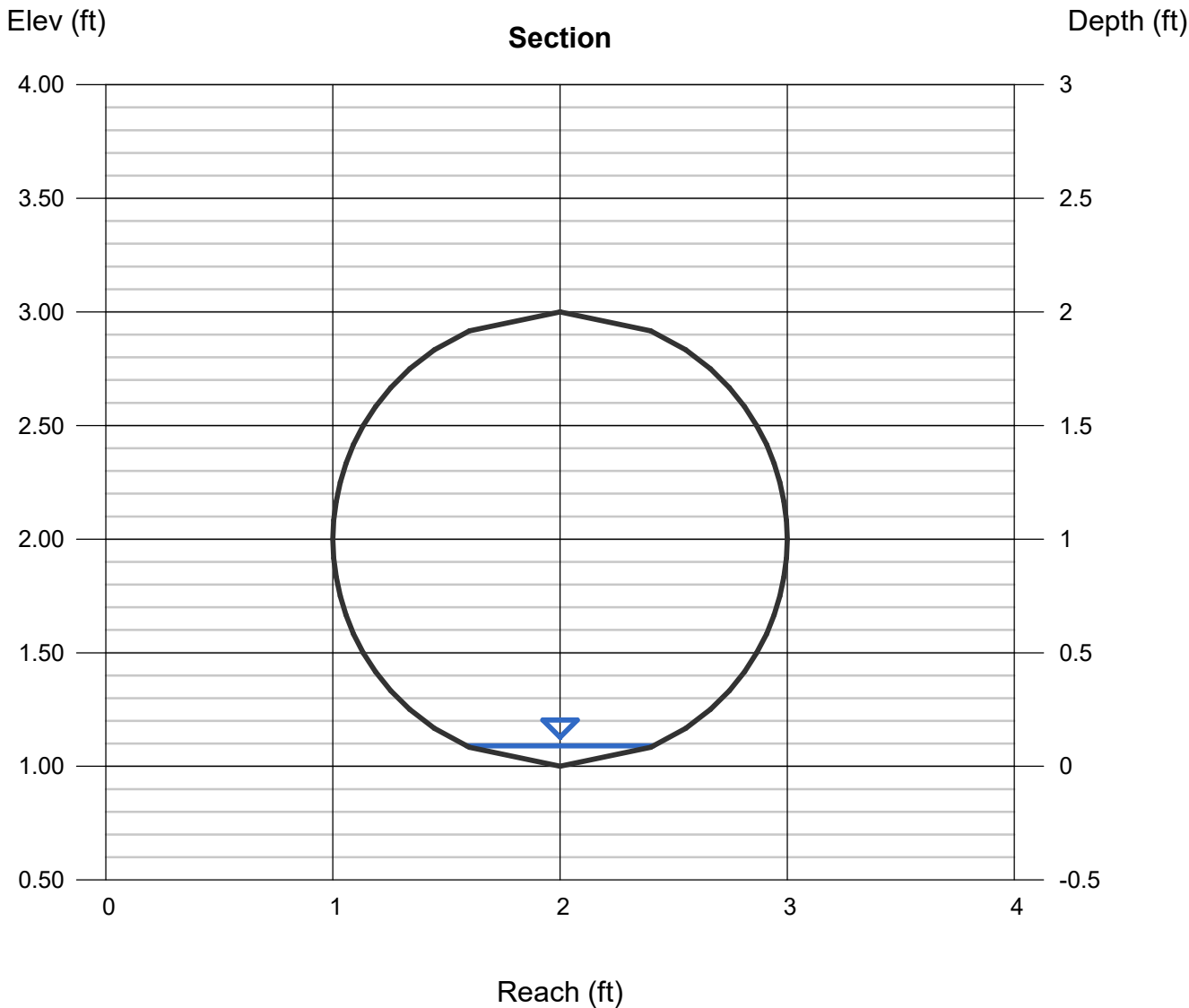
EGL (ft) = 3.59



Channel Report

DP14.1 - POND 2 OUTLET (Q5)

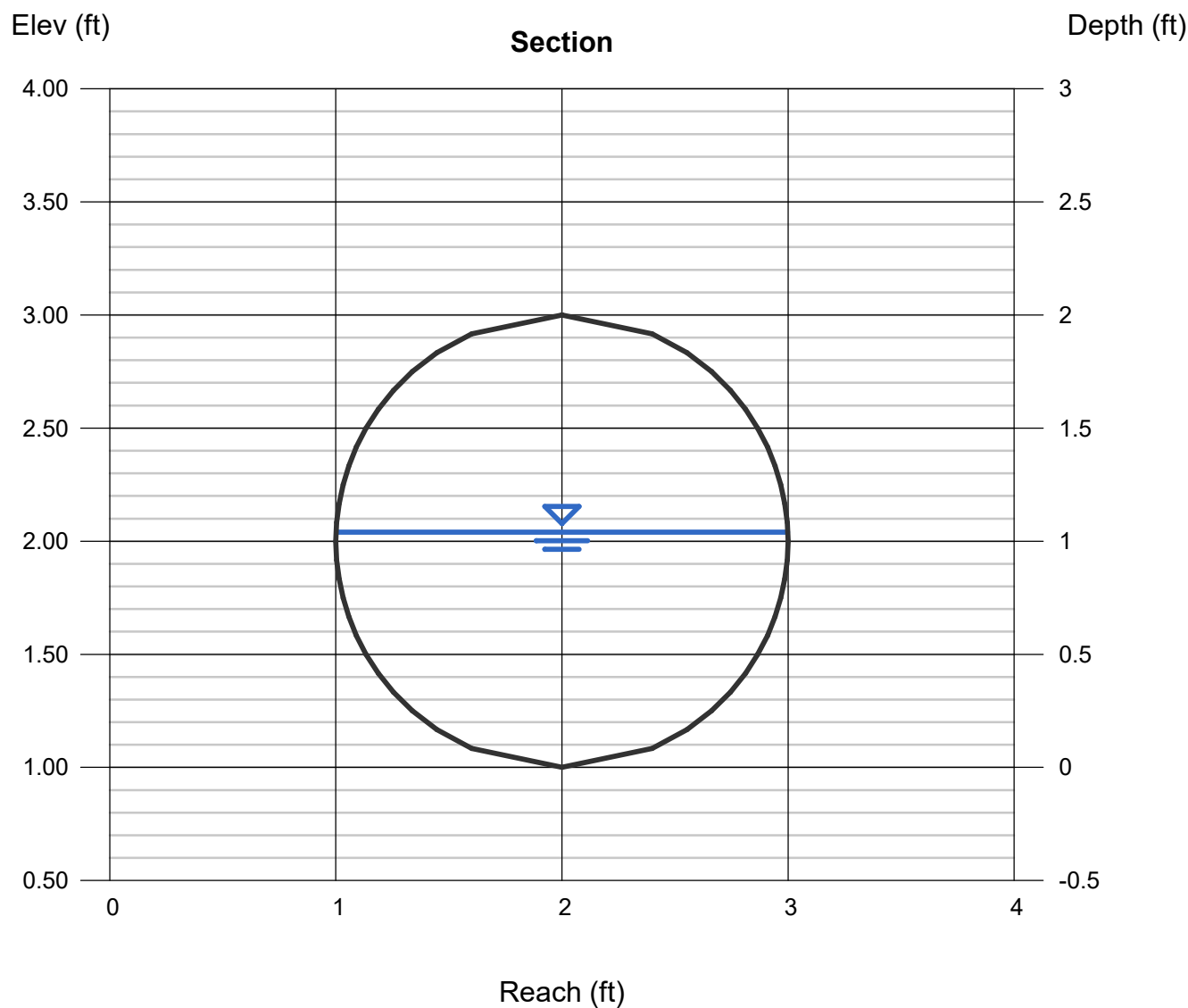
Circular		Highlighted	
Diameter (ft)	= 2.00	Depth (ft)	= 0.09
		Q (cfs)	= 0.100
		Area (sqft)	= 0.05
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 1.96
Slope (%)	= 1.40	Wetted Perim (ft)	= 0.86
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.11
		Top Width (ft)	= 0.83
		EGL (ft)	= 0.15
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 0.10		



Channel Report

DP14.1 - POND 2 OUTFALL PIPE (Q100)

Circular		Highlighted	
Diameter (ft)	= 2.00	Depth (ft)	= 1.04
		Q (cfs)	= 14.30
		Area (sqft)	= 1.66
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 8.62
Slope (%)	= 1.40	Wetted Perim (ft)	= 3.23
N-Value	= 0.013	Crit Depth, Yc (ft)	= 1.37
		Top Width (ft)	= 2.00
		EGL (ft)	= 2.19
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 14.30		



POND 2

Figure 13-12c. Emergency Spillway Protection

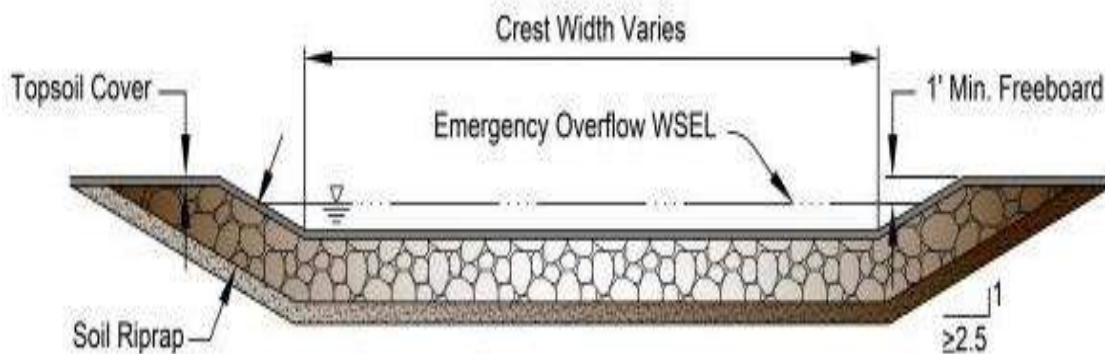
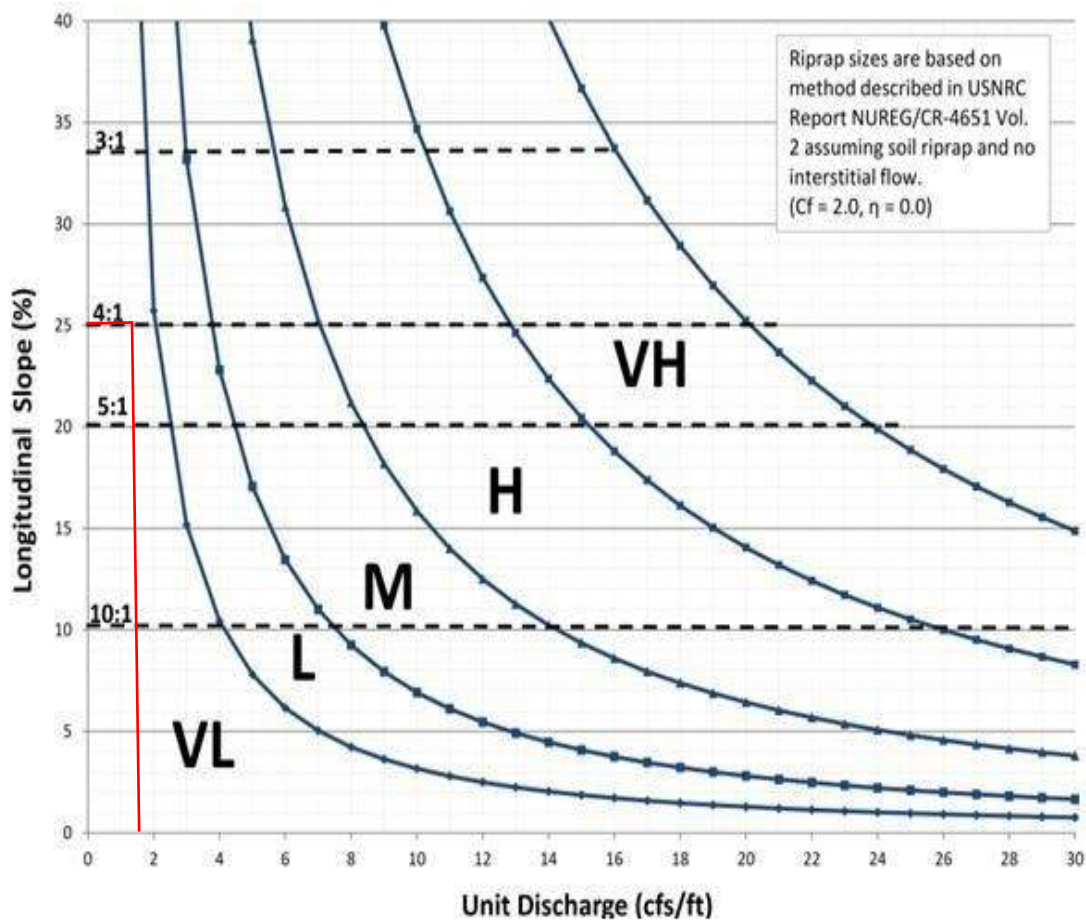


Figure 13-12d. Riprap Types for Emergency Spillway Protection



POND 1

Figure 13-12c. Emergency Spillway Protection

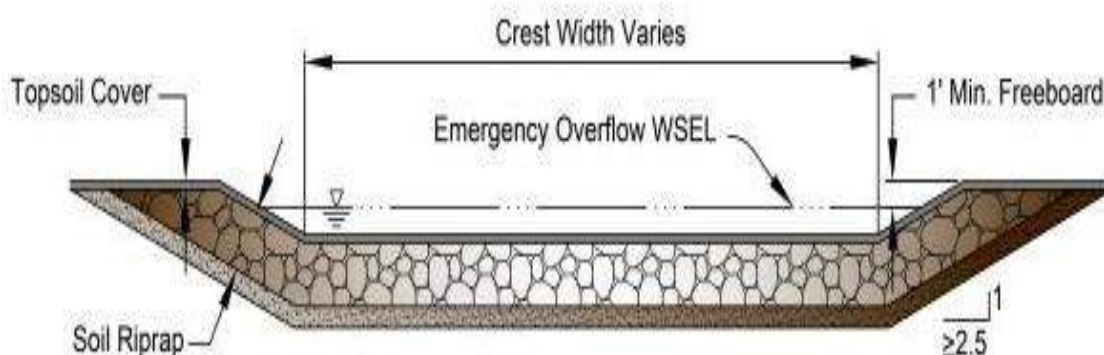
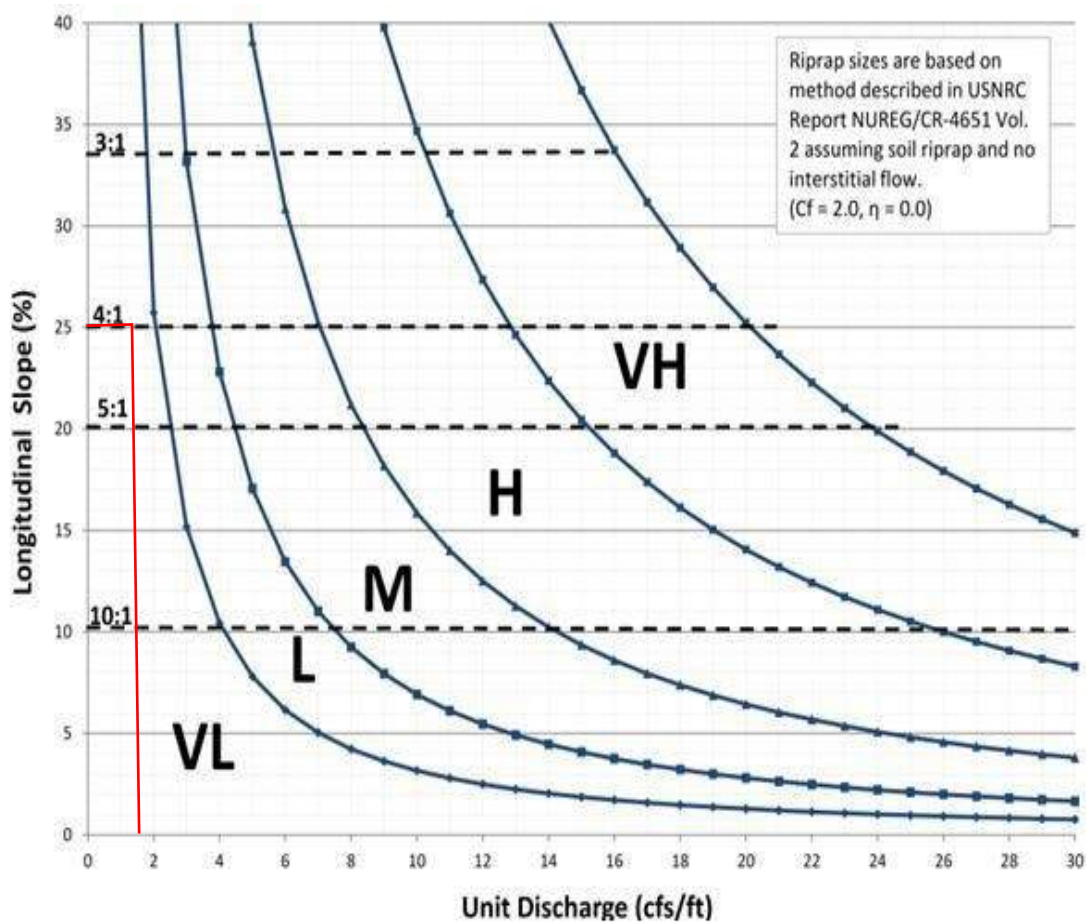


Figure 13-12d. Riprap Types for Emergency Spillway Protection



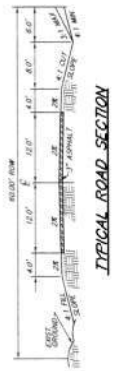


APPENDIX E – REFERENCE MATERIAL

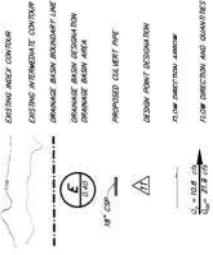
POND COST ESTIMATES

IRON RIDGE FILING NO. 1				
POND 1 - ENGINEER'S OPINION OF PROBABLE COSTS				
Item*	Quantity	Units	Unit Cost	Total
Earthwork	2500.00	CY	\$ 6.50	\$ 16,250.00
Rip Rap, d50 size from 6" to 24" (Forebay, Spillway, Inlet/Outlet Protection)	152.00	TONS	\$ 102.00	\$ 15,504.00
Aggregate Base Course (135 lbs/cf) - Maint. Road	87.00	CY	\$ 81.00	\$ 7,047.00
Turf Reinforcement Mat	71	SY	\$ 2.00	\$ 142.00
Concrete Paving (4" thick w/ Fibermesh) - Forebay	6.00	SY	\$ 69.00	\$ 414.00
Concrete Weir Wall Forebay	1	EA	\$ 1,750.00	\$ 1,750.00
Coincrete Trickle Channel (3' wide, 6" deep)	141	LF	\$ 50.00	\$ 7,050.00
Outlet Structure & Appurtenances	1	EA	\$ 12,500.00	\$ 12,500.00
24" RCP (OR CMP)	64	LF	\$ 161.00	\$ 10,304.00
24" RCP FES (OR CMP)	1	EA	\$ 600.00	\$ 600.00
TOTAL				\$ 71,561.00
*All items include labor costs				

IRON RIDGE FILING NO. 1				
POND 2 - ENGINEER'S OPINION OF PROBABLE COSTS				
Item*	Quantity	Units	Unit Cost	Total
Earthwork	1800.00	CY	\$ 6.50	\$ 11,700.00
Rip Rap, d50 size from 6" to 24" (Forebay, Spillway, Inlet/Outlet Protection)	176.00	TONS	\$ 102.00	\$ 17,952.00
Aggregate Base Course (135 lbs/cf) - Maint. Road	57.00	CY	\$ 81.00	\$ 4,617.00
Turf Reinforcement Mat	51	SY	\$ 2.00	\$ 102.00
Concrete Paving (4" thick w/ Fibermesh) - Forebay	3.00	SY	\$ 69.00	\$ 207.00
Concrete Weir Wall Forebay	1	EA	\$ 1,750.00	\$ 1,750.00
Coincrete Trickle Channel (3' wide, 6" deep)	88	LF	\$ 50.00	\$ 4,400.00
Outlet Structure & Appurtenances	1	EA	\$ 12,500.00	\$ 12,500.00
24" RCP (OR CMP)	81	LF	\$ 161.00	\$ 13,041.00
24" RCP FES (OR CMP)	1	EA	\$ 600.00	\$ 600.00
TOTAL				\$ 66,869.00
*All items include labor costs				



LEGEND



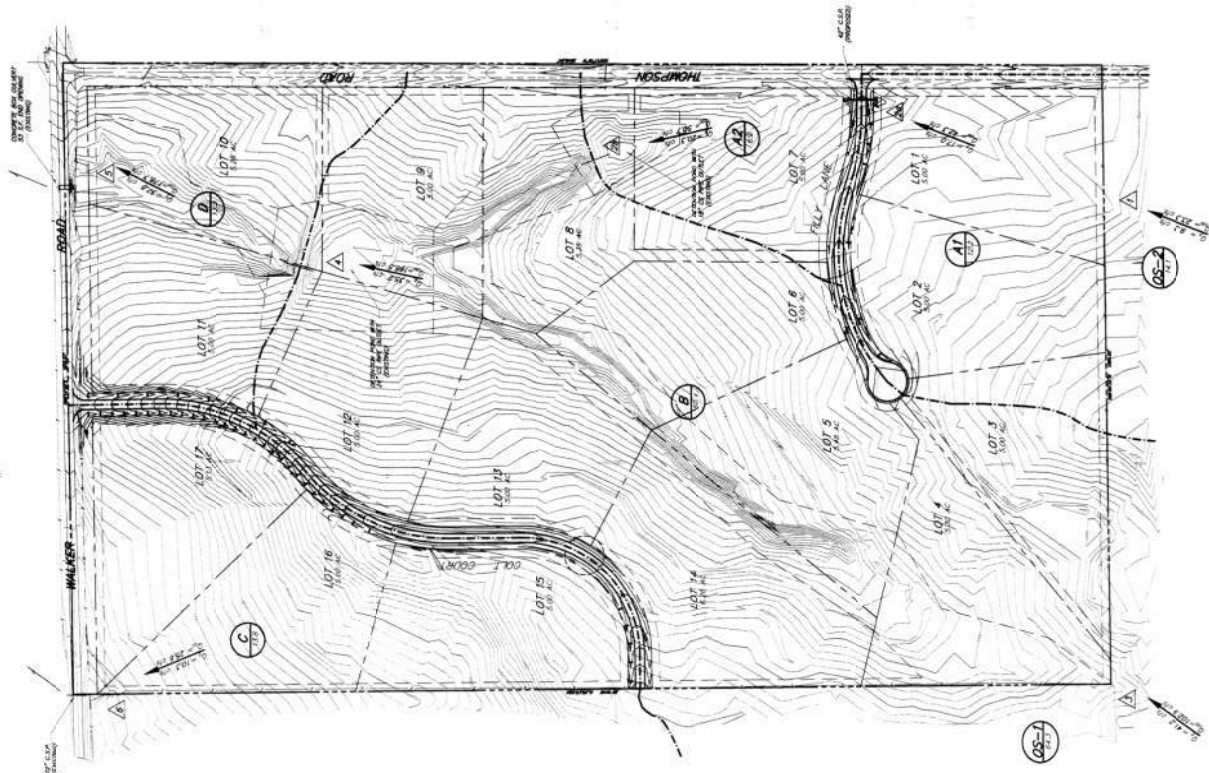
NOTES

INDIVIDUAL LOT OWNERS WILL BE RESPONSIBLE FOR CONSTRUCTING AND MAINTAINING DRAINAGE AWAY FROM ALL STRUCTURES.

INDIVIDUAL LOT OWNERS WILL BE RESPONSIBLE FOR PLACING DRAINWAY CURBENTS. EL PASO COUNTY D.O.T. SHOULD BE CONTACTED AT 713-361-2200 FOR CURB BENT SPECIFICATIONS. DRAINWAY CURBENTS SIZE SHALL BE 18" DIAMETER.

PUBLIC UTILITY AND DRAINAGE EASEMENTS AS SHOWN ON THE SUBMISSION PLAT FOR EASEMENTS SHALL BE 20' WIDE. ALL LOT LINES SHALL BE 10' WIDE. ALL LOT LINES UNLESS OTHERWISE SHOWN.

SEE OFFSITE DRAINAGE BASIN MAP FOR OFFSITE BASINS (D-1).

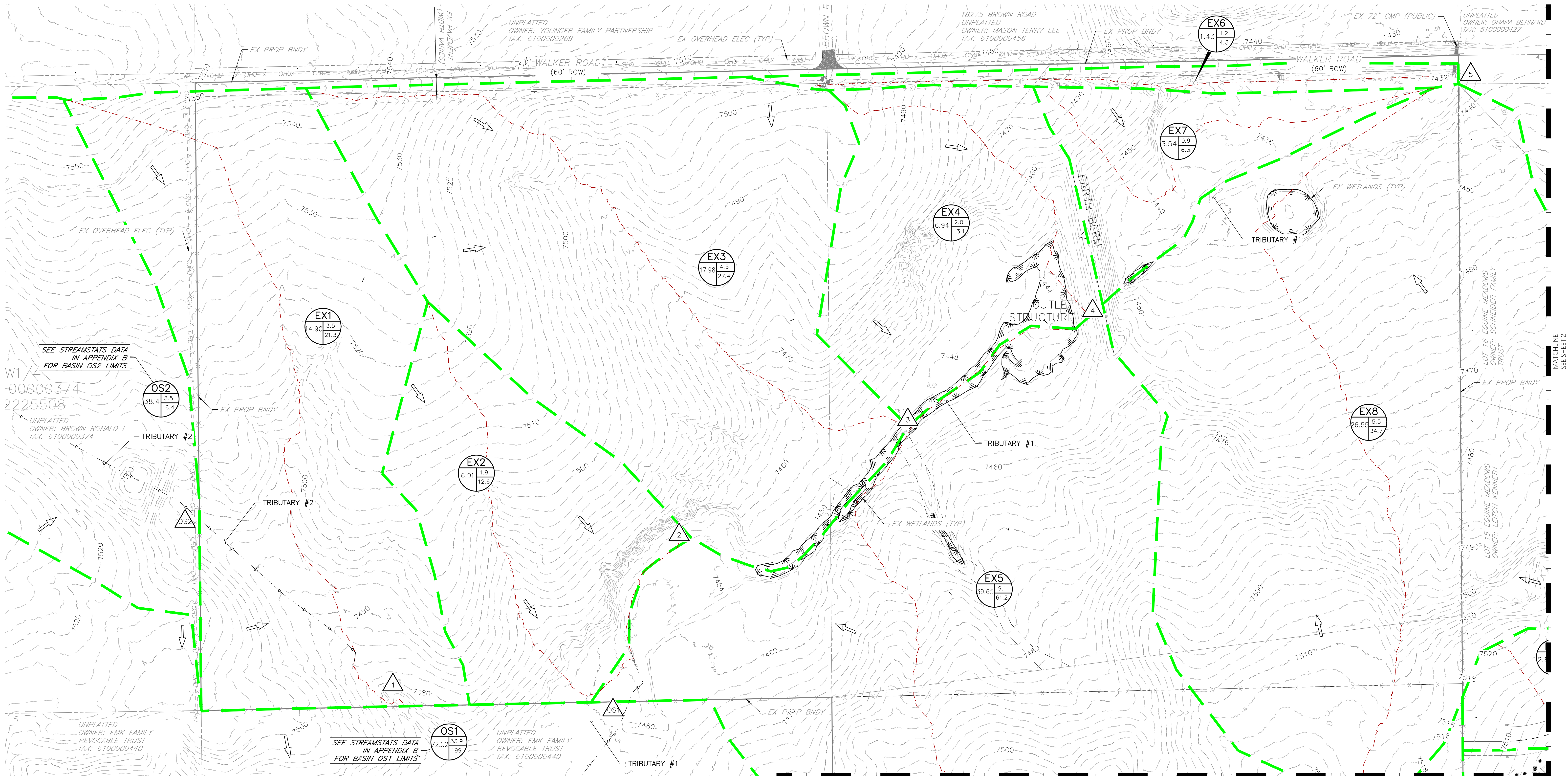
[illegible]



APPENDIX F – DRAINAGE MAPS

IRON RIDGE SUBDIVISION

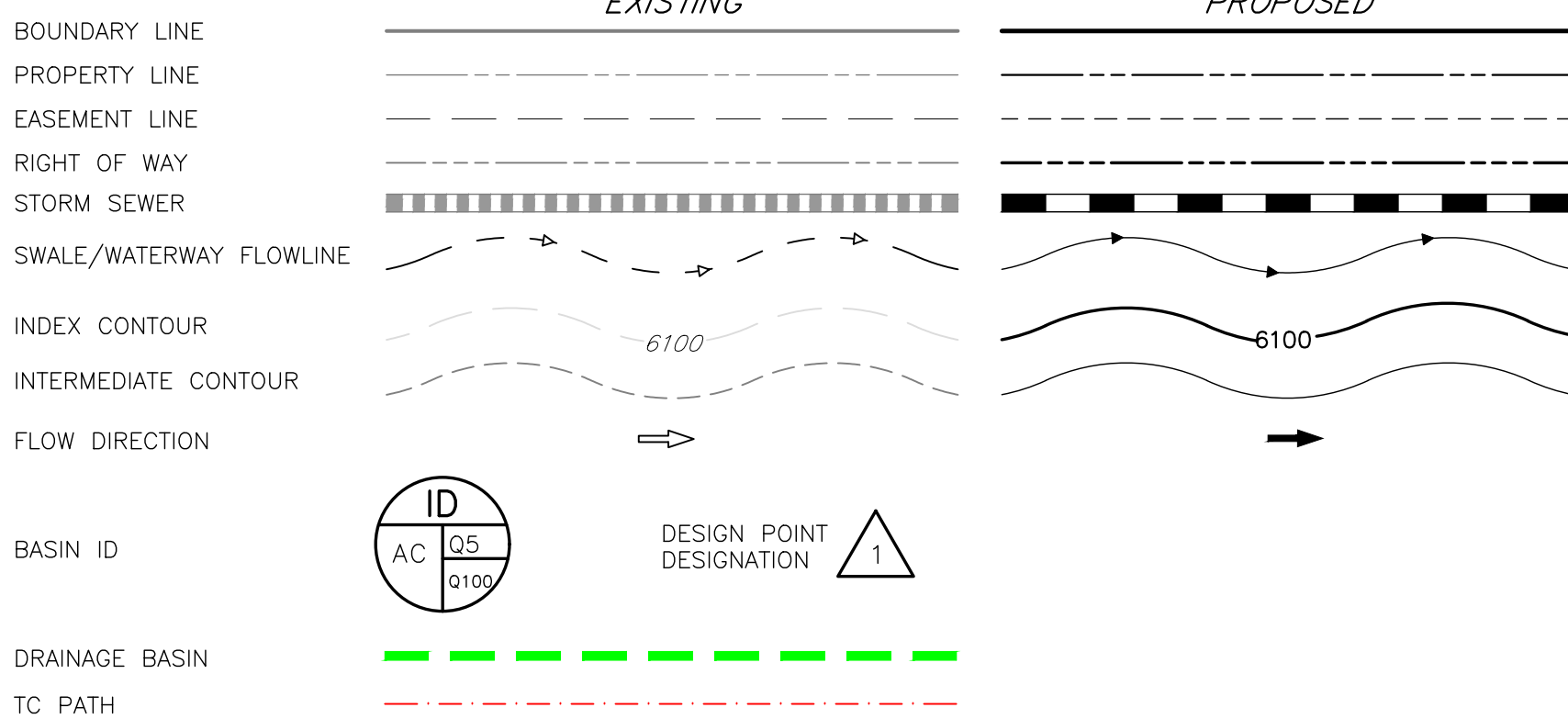
EXISTING DRAINAGE MAP



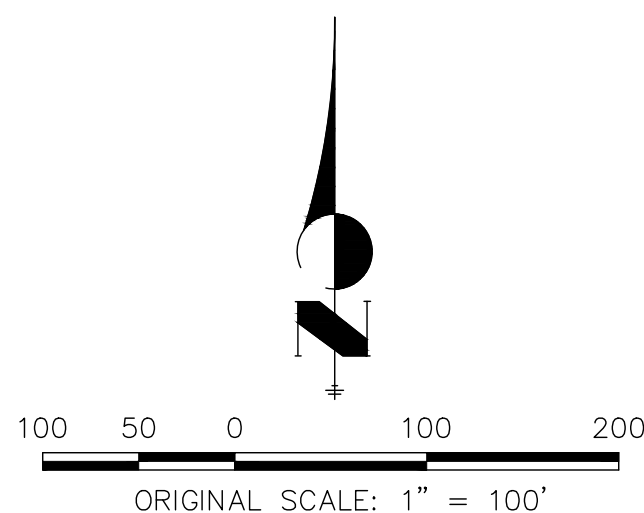
EXISTING CONDITIONS - BASIN SUMMARY TABLE							
Sub-basin	Area (ac)	Impervious	C _s	C ₁₀₀	t _c (min)	Q _S -YR (cfs)	Q ₁₀₀ -YR (cfs)
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4
EX1	14.90	3.4%	0.10	0.37	33.7	3.5	21.3
EX2	6.91	2.0%	0.09	0.36	21.1	1.9	12.6
EX3	17.98	3.4%	0.10	0.37	30.3	4.5	27.4
EX4	6.94	2.0%	0.09	0.36	19.5	2.0	13.1
EX5	39.65	2.0%	0.09	0.36	28.5	9.1	61.2
EX6	1.43	22.2%	0.22	0.45	11.1	1.2	4.3
EX7	3.54	2.0%	0.09	0.36	21.7	0.9	6.3
EX8	26.55	3.4%	0.10	0.37	38.3	5.5	34.7
EX9	12.23	2.0%	0.09	0.36	30.0	2.7	18.4
EX10	2.15	2.0%	0.09	0.36	15.9	0.7	4.5
EX11	2.85	11.3%	0.15	0.41	15.8	1.5	6.8
EX12	0.89	16.7%	0.20	0.44	15.2	0.6	2.3

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE			
DP#	Q _S -YR	Q ₁₀₀ -YR	
OS1	34.6	202.5	
OS2	3.5	16.4	
OS3	4.3	20.4	
1	3.5	21.3	
2	3.9	24.4	
3	11.6	74.4	
4	12.5	80.8	
5 (ONSITE)	14.0	89.0	
5 (TOTAL)	48.7	291.5	
6	2.7	18.4	
7 (ONSITE)	3.5	20.3	
7 (TOTAL)	7.8	40.7	

LEGEND



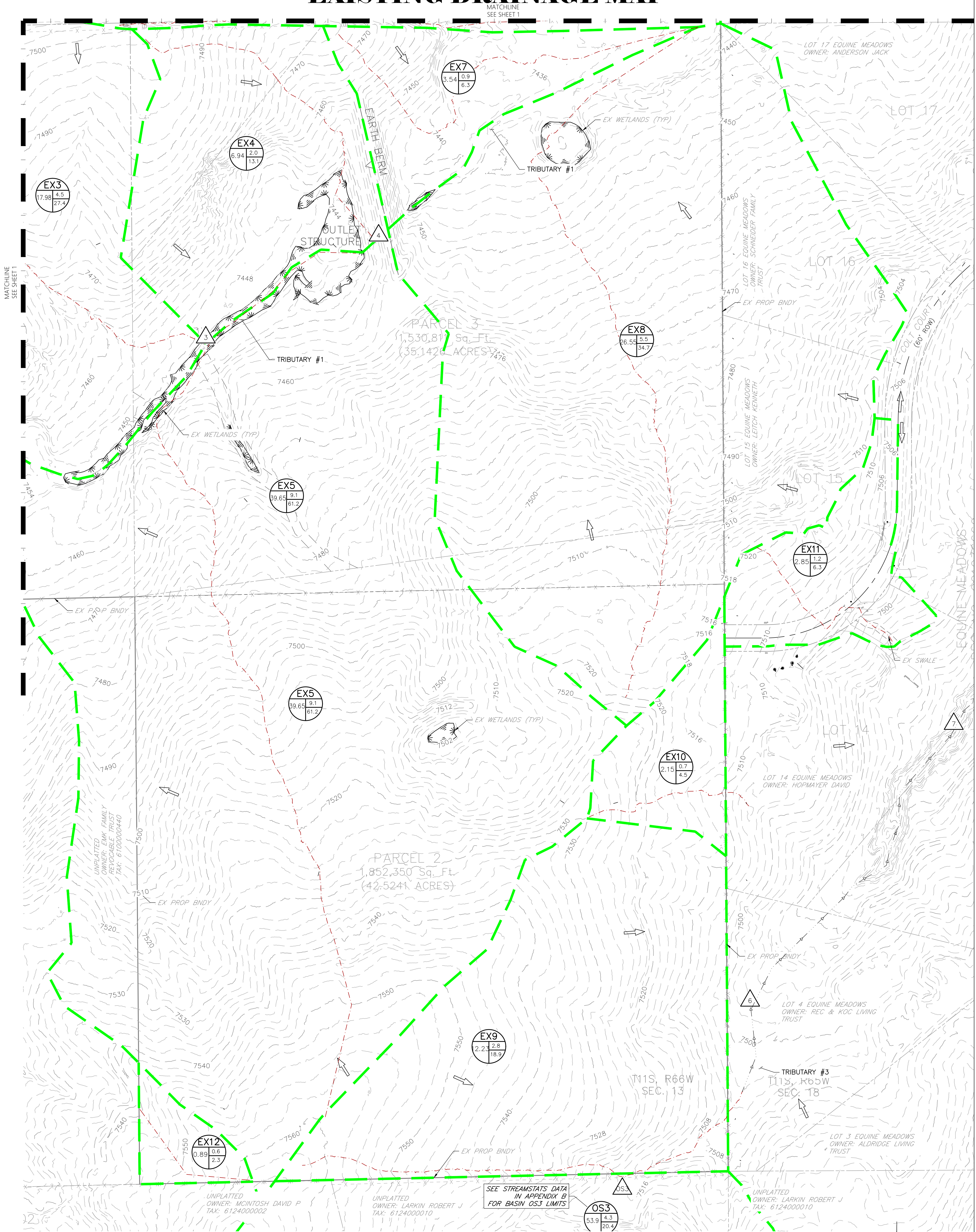
MATCHLINE
SEE SHEET 2



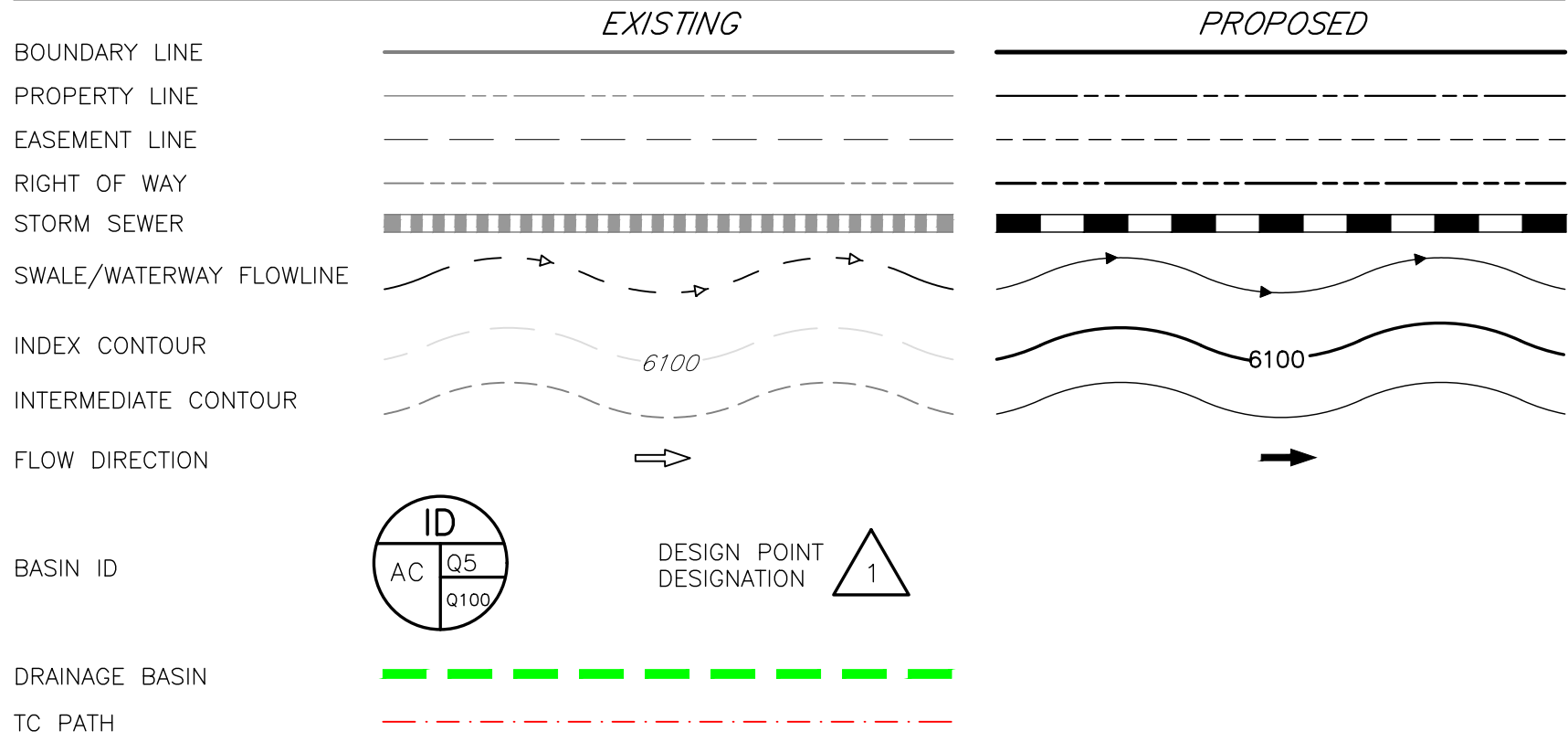
EXISTING DRAINAGE MAP		
IRON RIDGE SUBDIVISION		
JOB NO. 25009	SHEET 1	
LOCATION: EPC		
09/01/2026		
		

IRON RIDGE SUBDIVISION

EXISTING DRAINAGE MAP

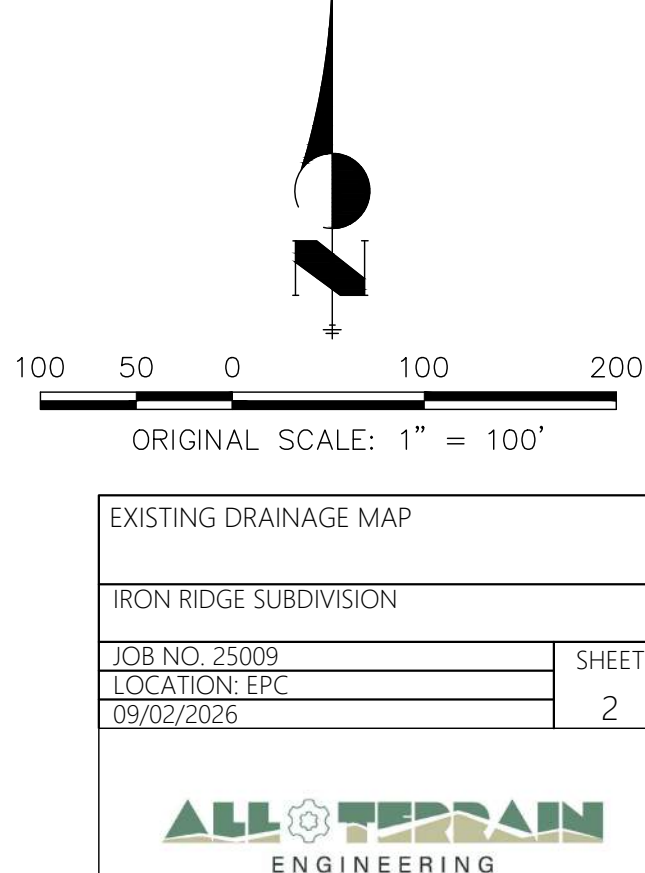


LEGEND



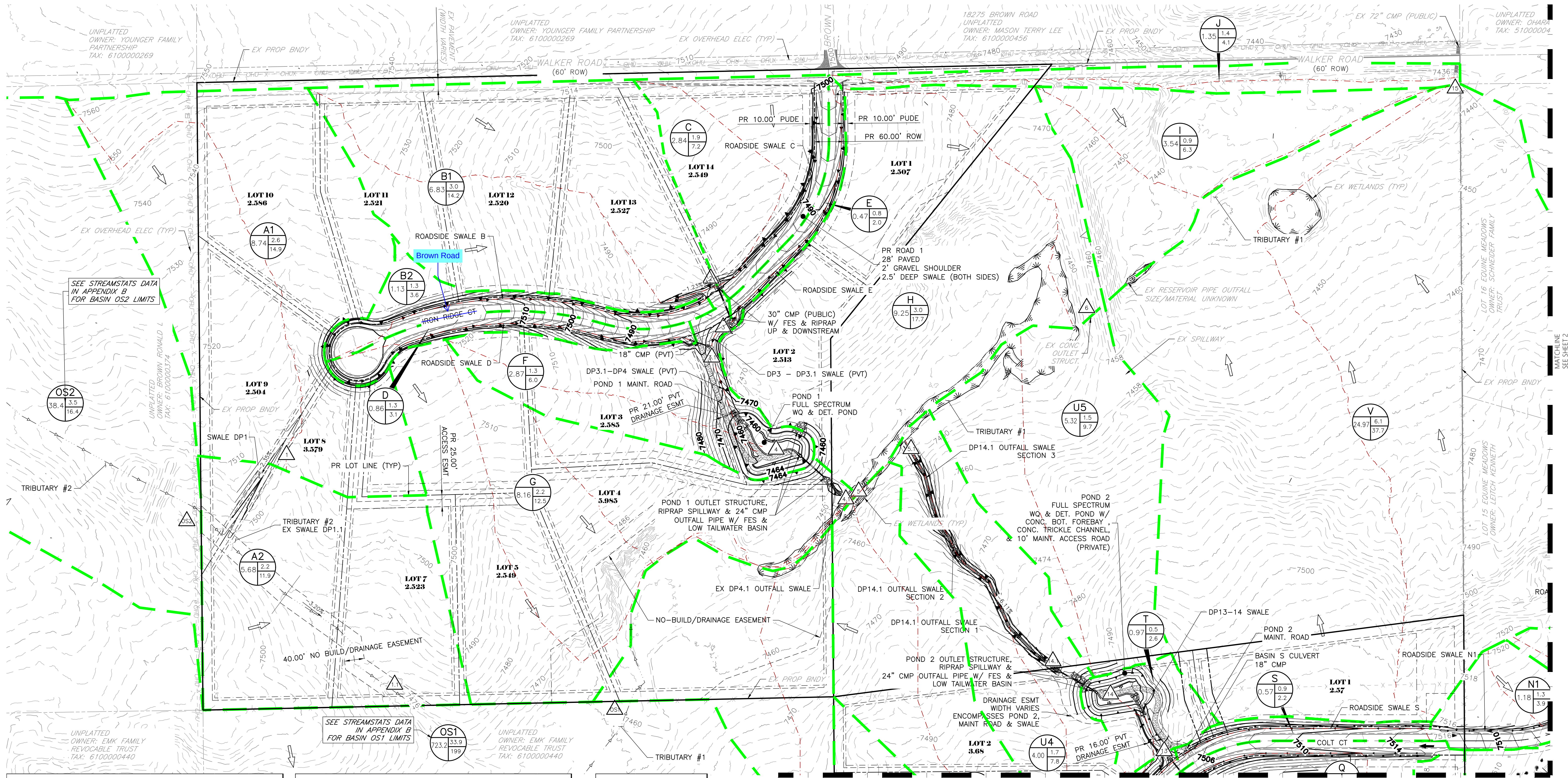
EXISTING CONDITIONS - BASIN SUMMARY TABLE							
Sub-basin	Area (ac)	Impervious	C _s	C ₁₀₀	t _c (min)	Q _{5-YR} (cfs)	Q _{100-YR} (cfs)
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4
EX1	14.90	3.4%	0.10	0.37	33.7	3.5	21.3
EX2	6.91	2.0%	0.09	0.36	21.1	1.9	12.6
EX3	17.98	3.4%	0.10	0.37	30.3	4.5	27.4
EX4	6.94	2.0%	0.09	0.36	19.5	2.0	13.1
EX5	39.65	2.0%	0.09	0.36	28.5	9.1	61.2
EX6	1.43	22.2%	0.22	0.45	11.1	1.2	4.3
EX7	3.54	2.0%	0.09	0.36	21.7	0.9	6.3
EX8	26.55	3.4%	0.10	0.37	38.3	5.5	34.7
EX9	12.23	2.0%	0.09	0.36	30.0	2.7	18.4
EX10	2.15	2.0%	0.09	0.36	15.9	0.7	4.5
EX11	2.85	11.3%	0.15	0.41	15.8	1.5	6.8
EX12	0.89	16.7%	0.20	0.44	15.2	0.6	2.3

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE		
DP#	Q _{5-YR}	Q _{100-YR}
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	3.5	21.3
2	3.9	24.4
3	11.6	74.4
4	12.5	80.8
5 (ONSITE)	14.0	89.0
5 (TOTAL)	48.7	291.5
6	2.7	18.4
7 (ONSITE)	3.5	20.3
7 (TOTAL)	7.8	40.7



IRON RIDGE SUBDIVISION

PROPOSED DRAINAGE MAP



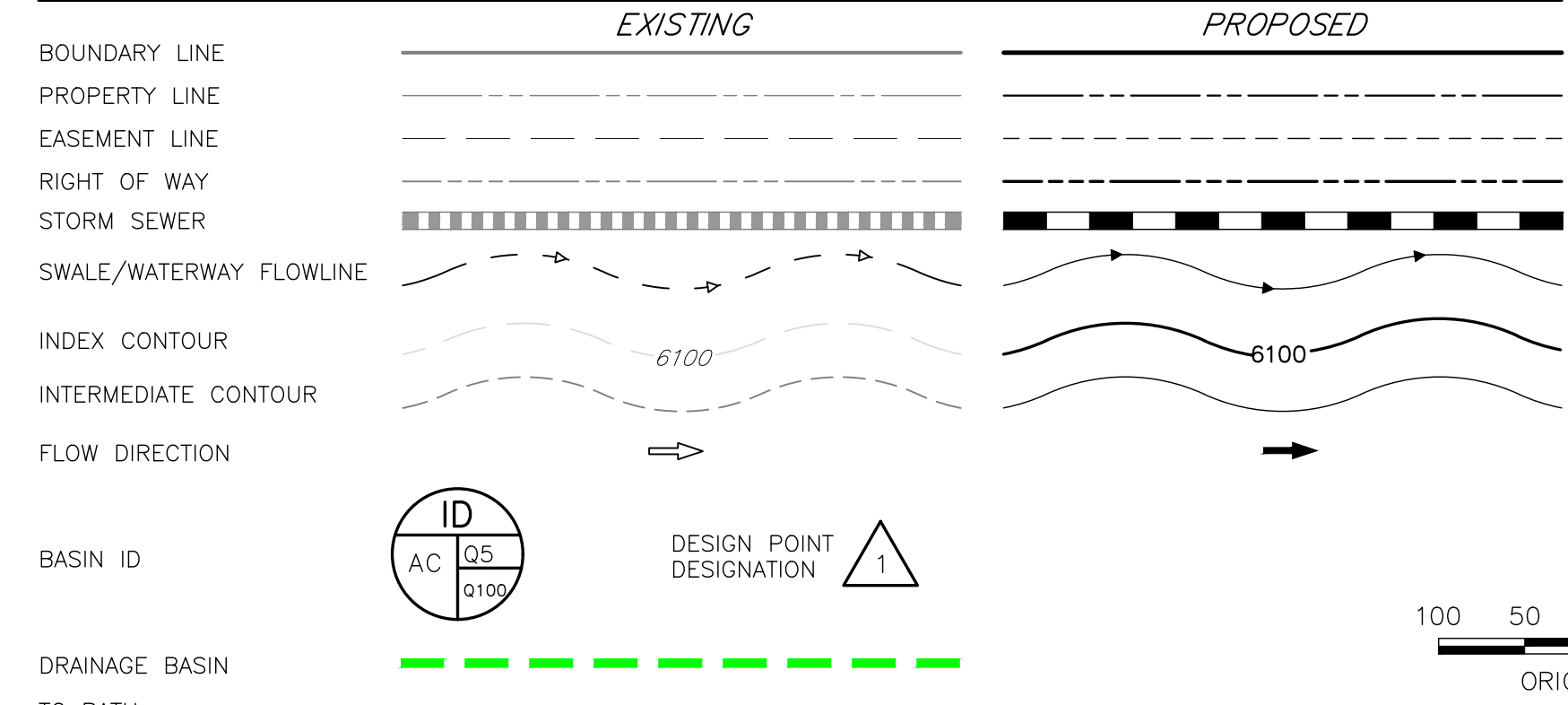
PROPOSED CALCS - BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C _s	C ₁₀₀	t _c (min)	Q _s (cfs)	Q ₁₀₀ (cfs)
A1	8.74	3.8%	0.11	0.37	25.4	2.6	14.9
A2	5.68	7.0%	0.12	0.39	18.5	2.2	11.9
B1	6.83	9.9%	0.14	0.41	20.7	3.0	14.2
B2	1.13	32.3%	0.34	0.55	15.9	1.3	3.6
C	2.84	16.2%	0.20	0.45	16.4	1.9	7.2
D	0.86	41.9%	0.42	0.60	14.6	1.3	3.1
E	0.47	42.7%	0.43	0.60	9.5	0.8	2.0
F	2.87	4.3%	0.14	0.41	20.4	1.3	6.0
G	8.15	5.5%	0.11	0.38	31.7	2.2	12.5
H	9.25	3.1%	0.10	0.37	19.9	3.0	17.7
I	3.54	2.0%	0.09	0.36	21.8	0.9	6.3
J	1.35	27.1%	0.30	0.51	14.9	1.4	4.1
K	0.89	7.0%	0.12	0.39	9.6	0.4	2.4
L1	4.82	6.4%	0.12	0.39	29.5	1.4	7.8
L2	7.18	4.1%	0.11	0.37	24.3	2.2	12.6
M	2.06	6.9%	0.12	0.39	13.3	0.9	5.0
N1	1.18	25.7%	0.27	0.50	11.3	1.3	3.9

PROPOSED CALCS - BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C _s	C ₁₀₀	t _c (min)	Q _s (cfs)	Q ₁₀₀ (cfs)
N2	1.25	18.2%	0.21	0.46	11.2	1.1	3.8
O	0.60	22.4%	0.24	0.47	10.1	0.6	2.0
P	5.00	13.2%	0.17	0.43	17.8	2.8	11.7
Q	1.21	21.1%	0.24	0.47	11.7	1.1	3.8
R	1.82	24.8%	0.27	0.50	14.3	1.8	5.5
S	0.57	36.8%	0.37	0.57	9.8	0.9	2.2
T	0.97	5.2%	0.12	0.37	9.5	0.5	2.6
U1	6.63	0.0%	0.09	0.35	28.7	1.5	9.9
U2	7.43	7.0%	0.12	0.39	22.7	2.6	14.1
U3	8.41	5.2%	0.11	0.38	32.7	2.2	12.6
U4	4.00	0.8%	0.09	0.35	17.7	1.2	7.8
U5	5.31	0.0%	0.09	0.35	19.8	1.5	9.7
V	24.97	3.9%	0.10	0.37	31.2	6.1	37.7
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4

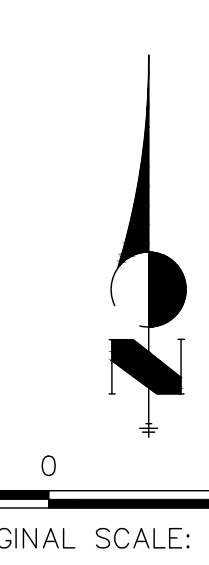
DESIGN POINT SUMMARY TABLE			
DP#	Q _s -YR	Q ₁₀₀ -YR	
OS1	34.6	202.5	
OS2	3.5	16.4	
OS3	4.3	20.4	
1	2.6	14.9	
1.1	5.8	29.1	
2	5.9	23.7	
3	6.4	25.1	
3.1	7.4	27.2	
4	8.4	32.2	
4.1	0.1	23.9	
5	8.4	64.5	
6	9.5	76.3	
7	5.4	26.6	
7.1	2.2	12.6	
8	0.9	5.0	

DESIGN POINT SUMMARY TABLE			
DP#	Q _s -YR	Q ₁₀₀ -YR	
9	2.3	7.7	
10	2.9	9.6	
11(ONSITE)	4.1	20.4	
11(TOTAL)	8.4	40.8	
12	2.9	14.8	
13	4.7	21.5	
14	4.8	22.7	
14.1	0.1	14.4	
15(ONSITE)	11.6	85.3	
15(TOTAL)	46.3	287.7	

LEGEND



MATCHLINE
SEE SHEET 2



PROPOSED DRAINAGE MAP	
IRON RIDGE SUBDIVISION	
JOB NO. 25009	SHEET 1
LOCATION: EPC	
09/02/2026	

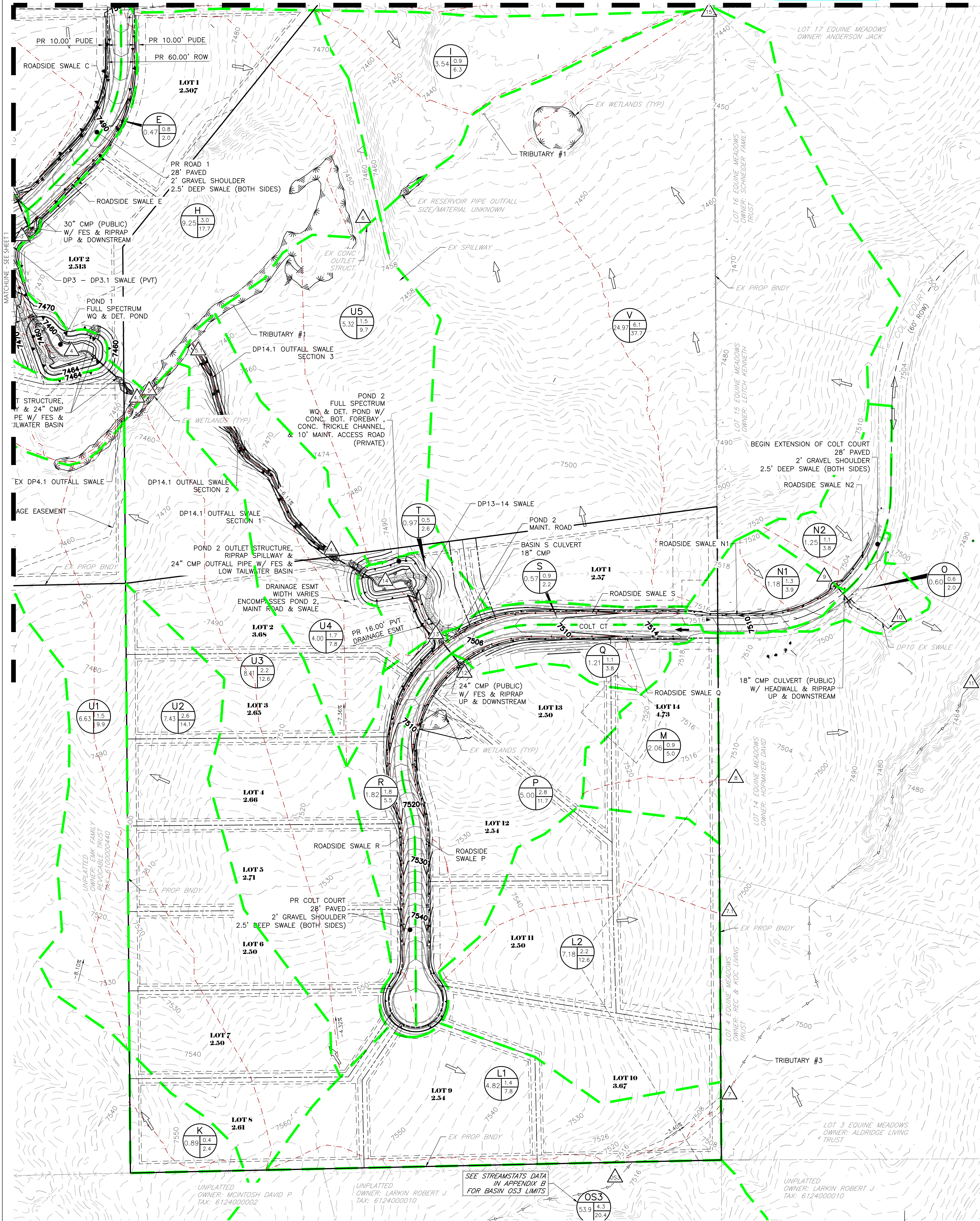
ALL TERRAIN ENGINEERING

IRON RIDGE SUBDIVISION

PROPOSED DRAINAGE MAP

MATCHLINE SEE SHEET 1

Matchlines do not line up (typ)



PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary	Area	Percent	C _s	C ₁₀₀	t _c	Q _s	Q ₁₀₀
Sub-basin	(acres)	Impervious			(min)	(cfs)	(cfs)
A1	8.74	3.8%	0.11	0.37	25.4	2.6	14.9
A2	5.68	7.0%	0.12	0.39	18.5	2.2	11.9
B1	6.83	9.9%	0.14	0.41	20.7	3.0	14.2
B2	1.13	32.3%	0.34	0.55	15.9	1.3	3.6
C	2.84	16.2%	0.20	0.45	16.4	1.9	7.2
D	0.86	41.9%	0.42	0.60	14.6	1.3	3.1
E	0.47	42.7%	0.43	0.60	9.5	0.8	2.0
F	2.87	4.3%	0.14	0.41	20.4	1.3	6.0
G	8.15	5.5%	0.11	0.38	31.7	2.2	12.5
H	9.25	3.1%	0.10	0.37	19.9	3.0	17.7
I	3.54	2.0%	0.09	0.36	21.8	0.9	6.3
J	1.35	27.1%	0.30	0.51	14.9	1.4	4.1
K	0.89	7.0%	0.12	0.39	9.6	0.4	2.4
L1	4.82	6.4%	0.12	0.39	29.5	1.4	7.8
L2	7.18	4.1%	0.11	0.37	24.3	2.2	12.6
M	2.06	6.9%	0.12	0.39	13.3	0.9	5.0
N1	1.18	25.7%	0.27	0.50	11.3	1.3	3.9

PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary	Area	Percent	C _s	C ₁₀₀	t _c	Q _s	Q ₁₀₀
Sub-basin	(acres)	Impervious			(min)	(cfs)	(cfs)
N2	1.25	18.2%	0.21	0.46	11.2	1.1	3.8
O	0.60	22.4%	0.24	0.47	10.1	0.6	2.0
P	5.00	13.2%	0.17	0.43	17.8	2.8	11.7
Q	1.21	21.1%	0.24	0.47	11.7	1.1	3.8
R	1.82	24.8%	0.27	0.50	14.3	1.8	5.5
S	0.57	36.8%	0.37	0.57	9.8	0.9	2.2
T	0.97	5.2%	0.12	0.37	9.5	0.5	2.6
U1	6.63	0.0%	0.09	0.35	28.7	1.5	9.9
U2	7.43	7.0%	0.12	0.39	22.7	2.6	14.1
U3	8.41	5.2%	0.11	0.38	32.7	2.2	12.6
U4	4.00	0.8%	0.09	0.35	17.7	1.2	7.8
U5	5.31	0.0%	0.09	0.35	19.8	1.5	9.7
V	24.97	3.9%	0.10	0.37	31.2	6.1	37.7
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4

DESIGN POINT SUMMARY TABLE

DP#	Q _s -YR	Q ₁₀₀ -YR
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	2.6	14.9
1.1	5.8	29.1
2	5.9	23.7
3	6.4	25.1
3.1	7.4	27.2
4	8.4	32.2
4.1	0.1	23.9
5	8.4	64.5
5.1	8.5	72.3
6	9.5	76.3
7	5.4	26.6
7.1	2.2	12.6

DESIGN POINT SUMMARY TABLE

DP#	Q _s -YR	Q ₁₀₀ -YR
8	0.9	5.0
9	2.3	7.7
10	2.9	9.6
11 (ONSITE)	4.1	20.4
11 (TOTAL)	8.4	40.8
12	2.9	14.8
13	4.7	21.5
14	4.8	22.7
14.1	0.1	14.4
15 (ONSITE)	11.6	85.3
15 (TOTAL)	46.3	287.7

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

PROPOSED DRAINAGE MAP

IRON RIDGE SUBDIVISION

JOB NO. 25009

LOCATION: EPC

09/02/2026

ALL TERRAIN
ENGINEERING

SHEET

2