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Final Drainage Report

Eagle Rising

Filing No. 1

Project No. 61145

November 17, 2023

PCD File No. SF2225

See SP205 MDDP/PDR comments; carry through any revisions and requirements to this report.

Final Drainage Report

For

Eagle Rising Filing No. 1

Project No. 61145

November 17, 2023

Prepared for

MyPad, Inc., and Casas Limited Partnership #4
5390 N. Academy Boulevard, Suite 300
Colorado Springs, CO 80918

Prepared by

M.V.E., Inc.
1903 Lelaray Street, Suite 200
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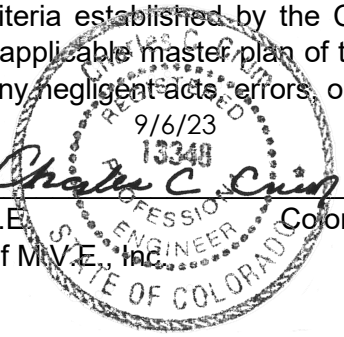
Statements and Acknowledgments

Engineer's Statement

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



Charles C. Crum, P.E. Colorado No. 13348 — 9/6/2023

Charles C. Crum, P.E. Colorado No. 13348 — Date

For and on Behalf of M.V.E., Inc.

Owner's Statement

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

Stephen J. Jacobs, Jr. — 8/21/23

Stephen J. Jacobs, Jr., President — Date

MyPad, Inc.,General Partner of Casas Limited Partnership #4
5390 N. Academy Boulevard, Suite 300
Colorado Springs, CO 80918

Developer's Statement

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

Stephen J. Jacobs, Jr. — 8/21/23

Stephen J. Jacobs, Jr., President — Date

MyPad, Inc.
5390 N. Academy Boulevard, Suite 300
Colorado Springs, CO 80918

El Paso County

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

Joshua Palmer, P.E. — Date

County Engineer / ECM Administrator

Conditions:

Contents

Final Drainage Report

The purpose of this Final Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Eagle Rising Filing No. 1 subdivision. The development project is a residential subdivision with ten (10) 2.5± to 7.1± acre lots, and two (2) tracts. The report will identify specific solutions to problems on-site and off-site resulting from the proposed project. The report and included maps present results of hydrologic and drainage facilities analyses. The report will discuss the recommended drainage improvements to the site and identify drainage requirements relative to the proposed project. This report has been prepared and submitted in accordance with the requirements of the El Paso County development approval process. An Appendix is included with this report with pertinent calculations and graphs used in the drainage analyses and design.

1. General Location and Description

1.1. Location

The proposed Eagle Rising Filing No. 1 is located within the east one-half of Section 29, Township 12 South, Range 65 west of the 6th principal meridian in El Paso County, Colorado. The Eagle Rising Filing No.1 site is situated northeast of Black Forest Road and Briargate Parkway. The site contains two existing single-family residences, a large barn, and several ancillary buildings. The El Paso County Assessor's Schedule Number for the site is 5229000034. The proposed site has never been platted. A Vicinity Map is included in the Appendix.

The surrounding properties are as follows: The south edge of the site is adjacent to Highland Park Subdivision Filing No. 2 zoned RR-2.5 (Rural Residential (2.5 acres). Lots 9, 10 & 11 Eagle Wing Estates zoned RR-2.5 each containing a single-family residence are located adjacent to the west side of the site. Also, adjacent to the west side of the site is an unplatted parcel containing a single-family residence zoned RR-5. Land with El Paso County Assessor Schedule Number 5229000035 is adjacent to the east and south sides of the site and zoned RR-2.5 with Cottonwood Creek traversing the site from north to south. The site is in El Paso County's Cottonwood Creek Drainage Basin.

1.2. Description of Property

Eagle Rising Filing No. 1 contains 35.282 acres and is zoned RR-2.5 (Residential Rural -2.5 Acres). The property is the location of two (2) single-family residences, a large barn, several ancillary buildings with two existing gravel driveways. There are two in-line ponds along the main stem of Cottonwood Creek to the east of said Filing No. 1 which were believed to be constructed around the 1950's. The purpose for their construction is unknown due to lack of history but is speculated to be for livestock use. The ponds are

not to be utilized to satisfy water quality requirements, which will be accomplished through other means. The existing ponds provide innate detention function and value but are not considered detention ponds. The proposed large lot single-family residential subdivision is shown to not require detention in this report.

The site is covered with native grass and weeds (i.e., diverse, mature wetland fauna, upland shrubs, and riparian overstory – see ERO Natural Resources Assessment) in good condition, and coniferous trees. The existing site topography slopes toward Cottonwood Creek with grades that range from 1% to 12%. Cottonwood Creek flows north to southeast of Eagle Rising Filing No. 1 subdivision with all storm runoff from said Eagle Rising Filing No. 1 subdivision flowing into Cottonwood Creek. The site is in the Cottonwood Creek Drainage Basin. The flows from Cottonwood Creek are tributary to Monument Creek.

According to the National Resource Conservation Service, there are two (2) soil types in the Eagle Rising site. Kettle gravelly loamy sand (map unit 40) makes up a portion of the soil in the northern end of the site. The soil is deep and somewhat excessively drained. Permeability is moderately rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Kettle gravelly loamy sand is classified as being part of Hydrologic Soil Group B.

The other soil type is Pring Coarse Sandy Loam (map unit 71) which makes up the rest of the site. The soil is deep and well drained. Permeability is moderately rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Pring Coarse Sandy Loam is classified as being part of Hydrologic Soil Group B.

A portion of the Soil Map and data tables from the National Cooperative Soil Survey and relevant Official Soil Series Descriptions (OSD) are included in the **Appendix**.[1] [2]

Cottonwood Creek, a major drainage way and flows north to south to the east of the Eagle Rising Filing No. 1 subdivision. The 100-year water surface elevation for the drainage-way was determined by hydraulic analysis utilizing HEC-RAS as prepared by M.V.E., Inc. which is included and accepted in this report. No build areas are shown on the Final Plat for Eagle Rising Filing No. 1. No build areas include the 100-year inundated area determined in the hydraulic analyses as well as Construction/Disturbance Limits from the Wetland Determination Mapping for the project. The two existing ponds, which are to remain, are present in the drainageway.

The current Flood Insurance Study of the region includes Flood Insurance Rate Maps (FIRM), effective on December 7, 2018.[3] The proposed subdivision is included in the Community Panels Numbered 08041C0527 G and 08041C0535 G of the Flood Insurance

[1] WSS
[2] OSD
[3] FIRM

Rate Maps for the El Paso County. No area in Eagle Rising Filing No. 1 is shown to be included in a 100-year flood hazard area as determined by FEMA. A portion of the current FEMA Flood Insurance Rate Maps with the site delineated is included in the **Appendix**.

2. Drainage Basins and Sub-Basins

2.1. Major Basin Description

Eagle Rising Filing No. 1 subdivision is in the Cottonwood Creek Drainage Basin (FOMO2200) of the Fountain Creek Major Drainage Basin. The Cottonwood Creek Drainage Basin Covers an area of approximately 19 square miles and drains to Monument Creek. The Cottonwood Creek Drainage Basin Planning Study Final Report[4] (DBPS), July 2019, prepared by Matrix Design Group provides development recommendations and requirements for drainage development in the Cottonwood Creek Drainage Basin. The Cottonwood Creek Drainage Basin encompasses a part of the northeast portion of the City of Colorado Springs and extends to the north and east. The drainage basin and Cottonwood Creek drain southwest into Monument Creek. The Eagle Rising site is located north of Cottonwood Creek as it flows offsite towards Monument Creek. The site is in portions of sub-basins UC100, UC120, and UC130 upstream of Design Point UUC126 and downstream of Design Point JUC 82 of the DBPS. No improvements are recommended on or near the Eagle Rising Filing No. 1 subdivision.

2.2. Other Drainage Reports

The “Eagle Rising Preliminary Drainage Report” by M&S Civil Consultants, Inc. dated June 2013 and Revised July 2013 was reviewed along with the “Master Development Drainage Plan/Preliminary Drainage Report” prepared by M.V.E., Inc. dated January 10, 2023[5] for Eagle Rising were reviewed in preparation of this Final Drainage Plan for Eagle Rising Filing No. 1. Said reports have not been approved as of this date and therefore they only used for informational purposes. Calculations in said M&S Eagle Rising Preliminary Drainage Report were reviewed and found to not be in compliance with the current Drainage Design used for the preparation of this report. Calculations in said “Master Development Drainage Plan/Preliminary Drainage Report” were found to be in compliance with the current Drainage Design and used for the preparation of this report.

2.3. Sub-Basin Description

The existing drainage patterns of the Eagle Rising development project are described by various sub-basins making up Existing Design Points and Developed Design Points. All existing sub-basin delineations and data are depicted on the attached **Eagle Rising Filing No. 1 Existing (On-Site) Drainage Map.**.

[4] DBPS
[5] 2015 PDR

3. Drainage Design Criteria

3.1. Development Criteria Reference

This Final Drainage Report for Eagle Rising has been prepared according to the report guidelines presented in the latest edition of El Paso County Drainage Criteria Manual (DCM)[6] . The County has also adopted portions of the City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, especially concerning the calculation of rainfall runoff flow rates.[7] [8] The hydrologic analysis is based on a collection of data from the DCM, the NRCS Web Soil Survey[9], and existing topographic data by Land Resource Associates.

3.2. Hydrologic Criteria

This Final Drainage Report, the Rational Method as described in the Drainage Criteria Manual has been used for all Storm Runoff calculations, as the development and all sub-basins are less than 130 acres in area. "Colorado Springs Rainfall Intensity Duration Frequency" curves, Figure 6-5 in the DCM, were used to obtain the design rainfall values; a copy is included in the **Appendix**. The "Overland (Initial) Flow Equation" (Eq. 6-8) in the DCM, and Manning's equation with estimated depths were used in time of concentration calculations. "Runoff Coefficients for Rational Method", Table 6-6 in the DCM, was utilized as a guide in estimating runoff coefficient and Percent Impervious values; a copy is included in the **Appendix**. Peak runoff discharges were calculated for each drainage sub-basin for both the 5-year storm event and the 100-year storm event with the Rational Method formula, (Eq. 6-5) in the DCM.[10]

4. Drainage Facility Design

Please revise. This contradicts later discussions of the runoff reduction PBMP/PCM. Update to discuss need for a PBMP for roadways, since they are not excluded from WQ treatment. Or just reference Step 3 of the 4-Step Process below.

4.1. General Concept

The intent of the drainage concept presented in Final Drainage Report is to allow for the development Eagle Rising Filing No. 1 which consists of ten (10) 2.5± to 7.1± acre lots, and two (2) tracts while maintaining the existing drainage patterns on the site. The site will follow the County's Stormwater Management regulations. Major and minor storm flows will continue to be safely conveyed through the site and downstream.

No additional drainage facilities are required for the development of Eagle Rising Filing No. 1. The proposed use of the land being 2.5 acre lots does not lead to the necessity of onsite drainage facilities, other than culverts to convey the existing flows under the existing private roadway and driveways.

and proposed

[6] DCM Section 4.3 and Section 4.4
[7] CS DCM Vol 1
[8] CS DCM Vol 2
[9] WSS
[10] DCM

The existing and proposed drainage hydrologic conditions are described in more detail below. Input data and results for all calculations are included in the **Appendix**. Drainage maps for the hydrology are also included in the **Appendix**.

4.2. Hydrologic Conditions

4.2.1. Existing Hydrologic Conditions

The Eagle Rising Filing No. 1 subdivision development is approximately 35.3+/- acres in size. The site primarily consists of grass land with slopes ranging from 4% to 12% and greater adjacent to Cottonwood Creek. The Cottonwood Creek main stem and several tributary branches are located to the east of the Eagle Rising Filing No. 1 subdivision eastern boundary. There are two existing single – family residences, a large barn, and several ancillary buildings present. Existing gravel roadway provides access. There is no evidence of severe erosion or degradation of existing channel.

Wetland areas are defined in the Natural Resources Assessment Eagle Rising Subdivision'[11], prepared by ERO Resources Corporation, Denver, CO and dated June 23, 2022 denotes most of the on-site Cottonwood Creek natural drainageway as wetlands. Any future proposed construction of grade control structures within the wetlands would require approval by the Corps of Engineers a Section 404 permit. Note that damage to the natural wetlands compared to the benefit of any grade control structures would be more detrimental than beneficial to Cottonwood Creek.

A brief description of each existing drainage basin adjacent to and affecting the proposed Eagle Rising Filing No. 1 subdivision including runoff rates, and drainage patterns is provided for in this section of the report. A summary of existing runoff for the basins and designated design points are depicted on the EXISTING (ON–SITE) DRAINAGE MAP in the **Appendix**. The off-site drainage area impacting Eagle Rising Filing No. 1 subdivision and more particularly on-site drainage areas have been divided into existing drainage basins described as follows:

The included Eagle Rising Hydrology Maps (Existing On-Site) depict the existing topographic mapping, drainage basin delineations, drainage patterns, existing drives, drainage facilities, and runoff quantities with a data table including drainage areas and flow rates. The existing hydraulic calculations for this 'Eagle Rising Filing No. 1 - Final Drainage Report' are included in the **Appendix**.

[11] NRA

COTTONWOOD CREEK 2019 CHANNEL DESIGN POINTS

and channel stability analysis?

The Master Development Drainage Plan/Preliminary Report for Eagle Rising established the 100-year water surface elevations in the Cottonwood Creek Channel. These 100-year water surface elevations were used to establish the 'No Build Areas' at a minimum of 2' above said 100 year water surface elevations on the Eagle Rising Filing No. 1 subdivision Plat.

OFF-SITE DESIGN POINTS

Design Point 4 (DP 4) storm water flows (Q5=9.2 cfs, Q100=52.2 cfs) are generated from off-site basin OS-B1A consisting of 24.9 acres. This sub-basin has been created to determine the storm water flow at the northern and western site boundary line. This basin consists of 2.5 Acre Rural Residential, Woods (Fair Condition), Natural Open Space (Fair Condition), and Civic uses.

Design Point 5 (DP 5) storm water flows (Q5=11.9 cfs, Q100=76.7 cfs) are generated from off-site basin OS-B1B consisting of 41.0 acres. This sub-basin has been created to determine the storm water flow at the western site boundary line. to the basin line. This basin consists of 2.5 Acre Rural Residential, Woods (Fair Condition), and Natural Open Space (Fair Condition).

Design Point E7 (DP E7) storm water flows (Q5=0.6 cfs, Q100=4.0 cfs) are generated from off-site basin OS-B1C consisting of 1.8 acres. Off-site basin OS-B1C consists of Natural Open Space (Fair Condition).

Design Point E8 (DP E8) storm water flows (Q5=1.6 cfs, Q100=11.8 cfs) are generated from off-site basin OS-B1D consisting of 6.0 acres. Off-site basin OS-B1C consists of Natural Open Space (Fair Condition).

Design Point E10 (DP E10) storm water flows (Q5=3.1 cfs, Q100=20.5 cfs) are generated from off-site basin OS-B1E consisting of 10.1 acres. Off-site basin OS-B1C consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition).

Design Point E11 (DP E11) storm water flows (Q5=3.8 cfs, Q100=21.3 cfs) are generated from off-site basin OS-B3A consisting of 9.1 acres. Off-site basin OS-B3A consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition).

Design Point E13 (DP E13) storm water flows (Q5=1.1 cfs, Q100=6.2 cfs) are generated from off-site basin OS-B3B consisting of 2.5 acres. Off-site basin OS-B3B consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition). Storm water flows exit said basin via a 15" CS pipe.

Design Point E15 (DP E15) storm water flows (Q5=2.5cfs, Q100=13.9cfs) are generated from off-site basin OS-B3C consisting of 5.95 acres. Off-site basin OS-B3C has been created to determine the flow at the western site boundary and does not mix with on-site flow. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to the western boundary of the Eagle Wing proposed preliminary plan.

ON-SITE DESIGN POINTS

Design Point 6 (DP 6) storm water flows (Q5=22.0 cfs, Q100=134.1 cfs) are generated from off-site **DP 4** and **DP 5,** and on-site basins EX-B and EX-C consisting totally of 71.87 acres. The summation of these flows at **DP 6** are combined in an existing small local depression area. The depression appears to be man-made, possibly for livestock watering. The current condition of the depression appears to hold some water at certain times of year but not continually. The downstream end of the depression area is a small bank to trap the water in the existing natural swale. The depression area is proposed to be left intact and not disturbed.

Design Point 6A (DP 6A) storm water flows (Q5=3.6 cfs, Q100=12.6 cfs) are generated from off-site **DP E7** and on-site basin EX-E1 consisting totally of 5.25 acres. The summation of these flows at **DP 6A** will combine with **DP 6B** and enter Cottonwood Creek.

Design Point 6B (DP 6B) storm water flows (Q5=23.5 cfs, Q100=141.5 cfs) are generated from on-site **DP 6** and on-site basin EX-D consisting totally of 78.97 acres. The summation of these flows at **DP 6B** will combine with **DP 6A** and enter Cottonwood Creek.

Design Point 6C (DP 6C) storm water flows (Q5=26.6 cfs, Q100=152.3 cfs) are generated from on-site **DP 6A** and **DP 6B** consisting totally of 84.22 acres. The summation of these flows at **DP 6C** enter Cottonwood Creek. Also, on-site Basins EX-A1 storm water flows (Q5=1.5 cfs, Q100=10.7 cfs) consisting of 4.95 acres and EX-A2 storm water flows of (Q5=0.5 cfs, Q100=3.9 cfs) consisting of 1.74 acres enter Cottonwood Creek. These storm water flows are included in the Cottonwood Creek channel storm water flows.

Design Point 7 (DP 7) storm water flows (Q5=9.7 cfs, Q100=30.2 cfs) are generated from off-site **DP E8** and on-site basin EX-F1 consisting totally of 12.48 acres. On-site basin EX-F1 consists of a single-family residence, a portion of a barn, a portion of a gravel road, and Natural Open Space (Fair Condition).

Design Point 8 (DP 8) storm water flows (Q5=4.7 cfs, Q100=18.6 cfs) are generated from on-site basin EX-E2 consisting of 7.77 acres. On-site basin EX-E2 consists of a portion of a storage barn, a garage, and a small hot house, and Natural Open Space (Fair Condition). These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 8A (DP 8A) storm water flows (Q5=9.2 cfs, Q100=50.8 cfs) are generated from off-site **DP E10** and **DP E11** and on-site basins EX-H and EX-I consist totally of 24.92 acres. On-site basin EX-F1 consists of a portion of a gravel road, and Natural Open Space (Fair Condition). Storm water flows exit basin at the existing 2 - 24" R.C. Pipes under said gravel road.

Design Point 9 (DP 9) storm water flows (Q5=9.7 cfs, Q100=32.0 cfs) are generated from off-site **DP E8** and **DP E11** and on-site basins EX-F2 consisting totally of 14.50 acres. On-site basin EX-F2 consists of a portion of a gravel road, and Natural Open Space (Fair Condition). Storm water flows exit basin and enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 10 (DP 10) storm water flows (Q5=1.0 cfs, Q100=6.5 cfs) are generated from on-site basin EX-G consisting of 2.98 acres. On-site basin EX-G consists of Natural Open Space (Fair Condition).

Design Point 11 (DP 11) storm water flows (Q5=2.3cfs, Q100=13.5 cfs) are generated from off-site **DP E13** and on-site basin EX-M consisting totally of 6.60 acres. On-site basin EX-M consists of Natural Open Space (Fair Condition). These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows**.**

Design Point 12 (DP 12) storm water flows (Q5=9.8 cfs, Q100=53.6 cfs) are generated from off-site **DP E10, DP E11, DP 8A,** and on-site basins EX-J consisting totally of 27.34 acres. On-site basin EX-J consists of Natural Open Space (Fair Condition). These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows**.**

Design Point 13 (DP 13) storm water flows (Q5=2.9 cfs, Q100=17.4 cfs) are generated from off-site E 15 on-site basin EX-L consisting totally of 8.09 acres. On-site basin EX-L consists of Natural Open Space (Fair Condition) and storm water flows exit the site along the southern boundary line.

4.2.2. Developed Hydrologic Conditions

No additional drainage facilities are required for the development of Eagle Rising Filing No. 1. A new hydraulic analysis of Cottonwood Creek was performed for the reach within the new "Reinstated Preliminary Plan" for Eagle Rising. These hydraulic calculations were performed with the new & current El Paso Drainage Criteria and provided in the Master Development Drainage Plan/Preliminary Drainage Report. The proposed use of the land being 2.5± to 7.1± acre lots does not lead to the necessity of onsite drainage facilities, other than existing culverts to convey the existing flows under the existing roadway and driveways. The existing channel is currently witnessing close to the ultimate flows from the existing upstream developed property. The channel will be left in a natural condition for its aesthetic value, better water quality conditions, for both engineering and economic

Clarify for proposed road improvements, even if "existing," which still need to be reviewed and approved in this report.

considerations. The 100-year storm water flow level has been established by said Master Development Drainage Plan/Preliminary Drainage Report and has been used to provide the no build easements above said 100-year levels for the Lots that are impacted in this Eagle Rising Filing No. 1 subdivision.

The impact to the proposed Lots was found to be only the increase in water surface elevation up to the said 100-year storm water flow level. The No-Build easements are placed at a minimum of 2' above said 100-year studied elevation. No geologic hazards or soil hazards were found to impact these areas.

A brief description of each developed drainage basin including developed runoff rates, drainage patterns and any drainage facilities for each basin is provided in this section of the report. A summary of peak developed runoff for the basins and designated design points are depicted on the Proposed Hydrologic Map (on-site) in the **Appendix**. The site has been divided into twenty-two developed drainage basins described as follows:

Design Point 6 (DP 6) storm water flows (Q5=22.5 cfs, Q100=134.7 cfs) are generated from off-site **DP 4** and **DP 5,** and on-site developed basins B and C consisting totally of 71.87 acres. The summation of these flows at **DP 6** are combined in an existing small local depression area. The depression appears to be man-made, possibly for livestock watering. The current condition of the depression appears to hold some water at certain times of year but not continually. The downstream end of the depression area is a small bank to trap the water in the existing natural swale. The depression area is proposed to be left intact, non-disturbed, and is within a drainage easement. Developed storm water flow increases from existing hydraulic conditions at this **DP 6** by 0.5 cfs for Q5 and by 0.6 cfs for Q100. These are negligible increases for the developed condition and are very close to the existing conditions.

Address water rights required if pond is to remain.

A drainage easement is proposed for the existing swale between **DP 4** and through basin B with storm water flows of Q5=11.6 cfs, Q100=63.3 cfs. The slope of the existing swale is approximately 2.7% for the Reach. The velocities are 1.8 fps and 3.4 fps, depths of 0.2' and 0.5' during the 5yr and 100yr storms respectively for the Reach. The velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022) for this project the velocity values are between 4 to 7 fps with 7 fps being used for established vegetation. The Reach is therefore considered non-erosive in nature. Therefore, no improvements are proposed for this Reach.

A drainage easement is proposed for the existing swale between **DP 5** and through basin C with storm water flows of Q5=12.6 cfs, Q100=80.7 cfs. The slope of the existing swale is approximately 1.6% for the Reach. The velocities are 2.1 fps and 3.5 fps, depths of 0.4' and 1.0' during the 5yr and 100yr storms respectively for the Reach. This velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022) for this project the velocity values are between 4 to

7 fps with 7 fps being used for established vegetation. The Reach is therefore considered non-erosive in nature. Therefore, no improvements are proposed for this Reach.

Design Point 6A (DP 6A) storm water flows (Q5=3.6 cfs, Q100=12.6 cfs) are generated from off-site **DP E7** and on-site basin E1 consisting totally of 5.25 acres. Developed storm water flow at this **DP 6A** remains the same as the existing. The summation of these flows at **DP 6A** will combine with **DP 6B** and enter Cottonwood Creek. The combined minimal increase of flows and minimal velocities do not create a need for improvements to the existing drainage swale.

See plan redlines. Is grading of a new swale proposed?

6

Design Point 6B (DP 6B) storm water flows (Q5=24.4 cfs, Q100=142.6 cfs) are generated from on-site **DP E6** and on-site basin D consisting totally of 78.97 acres. Developed storm water flow therefore increases at this **DP 6B** by 0.9 cfs for Q5 and by 1.1 cfs for Q100. These are negligible increases for the developed condition and are very close to the existing conditions. The summation of these flows at **DP 6B** will combine with **DP 6A** and enter Cottonwood Creek.

Design Point 6C (DP 6C) storm water flows (Q5=27.5 cfs, Q100=153.4 cfs) are generated from on-site **DP 6A** and **DP 6B** consisting totally of 84.22 acres. Developed storm water flow therefore increases at this **DP 6C** by 0.9 cfs for Q5 and by 1.1 cfs for Q100. These are negligible increases for the developed condition and are very close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 6A and DP 6B** will combine and enter Cottonwood Creek.

Address stability of outfall to the creek.

Also, on-site Basins EX-A1 storm water flows (Q5=1.5 cfs, Q100=10.7 cfs) consisting of 4.95 acres and EX-A2 storm water flows of (Q5=0.5 cfs, Q100=3.9 cfs) consisting of 1.74 acres enter Cottonwood Creek. There are no increase or decrease to these storm water flows as there is no change in the existing condition. These storm water flows were included in the Cottonwood Creek channel **Design Points.**

Design Point 7 (DP 7) storm water flows (Q5=10.1 cfs, Q100=30.6 cfs) are generated from off-site **DP E8** and on-site basin F1 consisting totally of 12.48 acres. The purpose of **DP 7** is to understand the proposed flows at the two flag lot drive crossings and to size the driveway culvert to provide access Lots 3,4,5,& 6 and Lots 6, 7, 8 & 9. At this time the exact location of the driveway culverts are unknown. However, a 30" RCP or equivalent should be installed under each driveway to adequately convey the flows. When the lots are developed, a portion (128,000+/- SF) of the existing gravel area will be re-vegetated increasing the pervious area. Developed storm water flow decreases at this **DP 7** by 0.4 cfs for Q5 and by 0.4 cfs for Q100. These are decreases for the developed condition and are less than the existing conditions.

Design Point 8 (DP 8) storm water flows (Q5=5.3cfs, Q100=19.2 cfs) are generated from on-site basin E2 consisting totally of 7.77 acres. These storm water flows for the

developed condition increases at this **DP 8** by 0.6 cfs for Q5 and by 0.6 cfs for Q100. These are increases for the developed condition and are close to the existing conditions. The storm water flows leave basin E2 uniformly along basin line which joins Cottonwood Creek. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates which are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates.

Address the riprap rundowns

and onsite DP 7 and DP 8

off-site

Design Point 9 (DP 9) storm water flows (Q5=10.4 cfs, Q100=32.9 cfs) are generated from on-site **DP E7** and on-site basin F2 consisting totally of 14.50 acres. Developed storm water flow increases at this **DP 9** by 0.7 cfs for Q5 and by 0.9 cfs for Q100. These are increases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 9** will enter Cottonwood Creek. A drainage easement is proposed for the existing swale which will convey the flows into the Cottonwood Creek Channel. The slope of the existing swale is approximately 3.8% for Reach 1 and 5.7% for Reach 2. At the steepest and most defined point along Reach 2 the velocities are 2.8 fps and 4.0 fps, depths of 0.5' and 0.8' during the 5yr and 100yr storms respectively. These velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022). For this project the velocity values are between 4 to 7 fps with 7 fps being used for established vegetation. Reach 1 & 2 are therefore considered non-erosive in nature. Therefore, no improvements are proposed. At the downstream end of the drainage-way, flows reach Cottonwood Creek. Since the drainage-way outfall is immediately adjacent to the creek, short in nature, well vegetated, no required improvements are recommended these Reaches.

Design Point 8A (DP 8A) storm water flows (Q5=10.0 cfs, Q100=51.8 cfs) are generated from off-site **DP E10** and **DP E11** and on-site basins H and I consisting totally of 24.92 acres. Storm water flows exit basin at the existing 2 - 24" R.C. Pipes under the existing gravel road with existing rip rap outfall aprons. Developed storm water flow increases at this **DP 8A** by 0.8 cfs for Q5 and by 1.0 cfs for Q100. These are negligible increases for the developed condition and are very close to the existing conditions. No additional storm drainage improvements are required at **DP 8A**.

Address headwater ponding easement

Design Point 10 (DP 10) storm water flows (Q5=1.5 cfs, Q100=7.2 cfs) are generated from on-site basin G consisting totally of 2.98 acres. Developed storm water flow therefore decreases at **DP 10** by 1.2 cfs for Q5 and by 1.5 cfs for Q100. These are negligible decreases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 10** will enter Cottonwood Creek.

Design Point 12 (DP 12) storm water flows (Q5=11.0 cfs, Q100=55.1 cfs) are generated from on-site **DP 8A** and on-site basin J consisting totally of 27.34 acres. Developed storm

water flow increases at this **DP 12** by 1.2 cfs for Q5 and by 1.5 cfs for Q100. These are negligible decreases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 12** will enter Cottonwood Creek. A drainage easement is proposed for the existing swale between **DP 8A** and **DP 12** with storm water flows of Q5=11.0 cfs, Q100=55.1 cfs. The slope of the existing swale is approximately 4.8% for the Reach. The velocities are 3.6 fps and 5.5 fps, depths of 0.6' and 1.1' during the 5yr and 100yr storms respectively for the Reach. These velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022). For this project the values are between 4 to 7 fps with 7 fps being used for established vegetation. The Reach is therefore considered non-erosive in nature. Therefore, no improvements are required for this Reach. At the downstream end of the drainage-way, flows reach Cottonwood Creek. Since the drainage-way outfall is immediately adjacent to the creek, short in nature, well vegetated, no proposed improvements are recommended to these Reaches.

Design Point 11 (DP 11) storm water flows (Q5=2.7 cfs, Q100=14.1 cfs) are generated from off-site **DP E13** and on-site basin M consisting totally of 6.60 acres. Developed storm water flow therefore increases at this **DP 11** by 0.4 cfs for Q5 and by 0.6 cfs for Q100. These are negligible increases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 13** flow overland across the Eagle Rising southern boundary and eventually will enter Cottonwood Creek.

Design Point 13 (DP 13) storm water flows (Q5=3.4 cfs, Q100=18.0 cfs) are generated from off-site **DP E15** and on-site basin L consisting totally of 8.09 acres. Developed storm water flow therefore increases at this **DP 13** by 0.5 cfs for Q5 and by 0.6 cfs for Q100. These are negligible increases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 13** flow overland across the Eagle Rising southern boundary and eventually will enter Cottonwood Creek.

5. Erosion Control

The only public infrastructure construction to be associated with this subdivision is the Eagle Wing Drive turnaround and will require best management practices (BMP's). The BMP's for the Eagle Wing Drive turn around will be shown on the Grading & Erosion Control Plan for Eagle Rising Filing No.1. The total disturbed for the construction of the Eagle Wing Drive turnaround will be 0.82 acres. Any required best management practices (BMP's) for the individual lot home construction will be handled on the BESQCP for each lot at time of building permit.

add common development improvement - private road and cul-de-sac

verify and add private road and any swale construction, mention ESQCP

It shall be the responsibility of the home builder and subsequently the homeowner to ensure flows from stormwater are appropriately routed around said structures to prevent flooding and damage to property. This can be accomplished using broad swales as opposed to ditches which tend to concentrate flows and are therefore more susceptible to erosion. Swales shall be protected from erosion until such time that vegetation is established. A civil engineer can aid in determination of swale placement and erosion control measures to be used.

State that Engineered site plans will be required for some lots

6. Water Quality Enhancement Best Management Practices

The El Paso County Engineering Criteria Manual (Appendix I, Section I.7.2) and Drainage Criteria Manual (Section 4.1) requires the consideration of a "Four Step Process for receiving water protection that focuses on employing Runoff Reduction practices, stabilizing drainage ways, treating the water quality capture volume (WQCV), and considering the need for industrial and commercial BMP's. The Four Step Process is incorporated in this project and the elements are discussed below.

1. Runoff Reduction Practices are employed in this project. The large-lot rural residential zoning and development density allows ample application of runoff reduction because all existing and future impervious surfaces are to be surrounded or adjacent to vegetated pervious surfaces over which runoff will travel before entering the main drainageway. The low traffic volume private roadway will not be paved with asphalt but will be gravel surfaced, further reducing imperviousness of the site. Water Quality Treatment for the roadway is provided under the Runoff Reduction standard in accordance with Section I.7.1.C.3 of the El Paso County Engineering Criteria Manual.

clarify

2. All minor drainage paths on the site have been previously stabilized with riprap protection. Calculations are included in this report showing riprap design sizing is adequate as installed. The Cottonwood Creek drainageway is located offsite of the Eagle Rising Filing No. 1 subdivision on a property having different ownership than the currently proposed subdivision. Stabilization measures within Cottonwood Creek that are required as referenced in the MDDP / Preliminary Drainage Report will be undertaken with the future plat filings associated with the approved Preliminary Plan.

this

Address stabilization per PDR

3. The runoff generated from the impervious areas of the private gravel road contained in Tract A will be treated for water quality by utilizing the Runoff Reduction standard in accordance with Section I.7.1.C.3 of the El Paso County Engineering Criteria Manual. Stormwater from the existing roadway runs off onto the vegetated side slopes and roadside ditches and then infiltrates into the ground, evaporates, or evapotranspires a quantity of water equal to at least 60% of what the calculated WQCV would be if all impervious area for the applicable development site discharged without infiltration. Runoff Reduction calculations are included in the appendix. While water quality treatment of the

(needs to be in maintenance agreement)

please clarify - all minor drainage paths have not been stabilized per the plans

roadway in Tract A is provided as required, individual residential Lots 1 – 10 are exempt from the use of WQCV BMPs by ECM I.7.1.B.5 by virtue of the large-lot rural residential designation having areas 2.5 acres or larger and having percent imperviousness values of less than 10%. The percent imperviousness value cited for the Drainage Fee calculation in this report includes the roadway surface in Tract A in addition to the individual lot percent imperviousness and is also in accordance with the value cited in Drainage Criteria Manual Appendix L.3.7.3a, Table 3.1.

4. This project contains no industrial or commercial uses that would pose a potential hazard to water quality. The rural residential development is not anticipated to contain storage of potentially harmful substances or use of potentially harmful substances. No site specific industrial or commercial BNMP's for source controls are required.

7. Drainage Facilities

by developer if needed by drainage plan

mostly?

Drainage facilities for Eagle Rising Filing No. 1 include the installation of two Horizontal Elliptical RC Pipe culverts (HE-RCP) at the Lot 7 flag stem access. These culverts will be placed by the future lot owner at the time of residential building permit and driveway construction. Culvert sizing and outlet protection calculations are included in the Appendix of this report.

Cottonwood Creek is located to the east of Eagle Rising Filing No. 1 in a parcel offsite to the proposed subdivision. Access to the Cottonwood Creek streambed and banks along with the ponds and pond embankments through the subdivision is provided along the lot line drainage and utility easements which are included on the Final Plat. An exhibit indicating the routes available is included in the Appendix of this report. Ownership and maintenance responsibility of Cottonwood Creek and existing ponds are to remain vested with landowner and Eagle Rising Homeowners Association.

add: per the drainage facility maintenance agreement.

The Cottonwood Creek channel, offsite of Eagle Rising Filing No. 1, but located within the area designated as the "Reinstated Preliminary Plan" for Eagle Rising contains two constructed ponds with stabilized embankments that have created conditions within the creek that function as Constructed Wetlands Channel (CWC) which is described in the El Paso County Drainage Criteria Manual as an authorized BMP. The two ponds constitute stabilizing features and provide the added benefits of supporting wetland vegetation and controlling flow rates in the creek under most conditions. The existing pond spillway at DP 104 will require riprap installation at time of final plat as noted on the Drainage Plan to protect the spillway during storm water overflows from the pond to the downstream creek drainageway. The Spillway at DP 126 has existing riprap in place and no further installation is required. The ponds have withstood repeated significantly sized rainfall events throughout decades of existence.

now

are both stabilized now?

The creek bed, wetland areas and riparian overstory of Cottonwood Creek throughout the site are well vegetated native grasses, brush and trees as illustrated by the photos contained in the appendix of this report. The Natural Resources Assessment by ERO Resources Corporation lists the various plants found. The ERO report also contains photographic documentation of the plants and site conditions. Wetland areas feature native grasses such as Nebraska Sedge, Baltic Rush, Redtop and Broadleaf Cattail. The wetlands also contain mature, dense and well-established

see PDR comments

provide exhibit, including where fencing is prohibited

willows which serve to anchor the soil of the creek bed throughout the site. Specific willow species include Sandbar Willow, Strapleaf Willow, Park Willow and Shining Willow. The riparian overstory is described as containing Peachleaf Willow and Plains Cottonwood trees. Shrubs present in the riparian corridor through the site include Snowberry, Wood's Rose, Golden Current, and Chokecherry. All these species act together to preserve the existing creek alignment and grades that are observed at the site and documented by photographic evidence.

Supplemental information concerning permissible velocities and permissible shear stresses for channel lining materials is included in the appendix. The information includes suggested permissible values for the native grasses, willows and trees that grow in the project reach. Live willow stakes are included and listed to have permissible velocities of 3 to 10 f/sec with permissible shear stress of 2.10 to 3.10 lbs/sf. However, the supplemental information assumes that the vegetation is newly planted, as in Reed Plantings, Hardwood Tree Plantings and Live Willow Stakes. In this case, the vegetative cover throughout the site are not plantings or stakes, but well established, robust and dense cover that has served to stabilize the creek bed and banks. The upper end of the permissible value range ~~applies in this project reach.~~ clarify values

The results of the hydraulic analysis contained in this report indicate eight locations that exhibit channel flow velocities that approach or exceed 6 fps or have Froude Number values that equal or exceed 1.0. Five of those locations are the pond emergency spillways which are protected with riprap as indicated on the Drainage Map. The other three locations are within the natural creek which exhibit the established vegetative protection discussed above. The most upstream location, upstream of the pond at DP 104, has Froude Number of 0.87, Channel Velocity of 5.88 ft/sec and shear stress of 1.90 lbs/sf. The next downstream location is upstream of the pond at DP 126 and has Froude Number of 1.01, Channel Velocity of 6.57 ft/sec and shear stress of 3.08 lbs/sf. The final location, just downstream of the previous has Froude Number of 1.00, Channel Velocity of 6.92 ft/sec and shear stress of 1.10 lbs/sf. The presence of dense vegetation in the reach provides established stabilization for these locations. An existing boulder structure, located upstream of the pond at DP 104 provides stabilization. Portions of the banks inside the DP 104 pond are lined with large boulders. The boulders have been in place for many years and are well embedded and incorporated into the creek terrain. No further improvements are needed in the creek.

provide details

Adjust per revised calculations

8. Drainage and Bridge Fees

The site is located within the Cottonwood Creek Drainage Basin of Fountain Creek, El Paso Basin Number FOMO2200, which was last studied in 1994. 2022 fees associated with this basin are Drainage Fees of $21,134 per impervious acre and Bridge Fees of $1,156 per impervious acre. The percent Imperviousness of the entire 2.5-acre Rural Residential subdivision, for purposes of drainage fee calculation including the roadway and residential lots, is 11% in accordance with El Paso County Engineering Criteria Manual Appendix L Table 3-1. Also, reduction in the per acre Drainage Fee are allowed pursuant to El Paso County Resolution 99-383 in the amount of 25% for lots 2.5 acres or larger will be utilized for this project. The Eagle Rising Filing No. 1 subdivision contains 35.282 acres. Drainage and Bridge Fees for the site are calculated below. Fees will be paid at the time of Final Plat recording.

FEE CALCULATION (Cottonwood Creek 202 Drainage and Bridge Fees)

Drainage Fee = 35.282 Ac. x $21,134/Imp. Ac. x 0.11 Imp.	=	$82,021.48
Less 25% Drainage Fee Reduction per Resolution 99-383	=	(20,505.37)
Bridge Fee = 35.282 Ac. x $1,156/Imp. Ac. x 0.11 Imp.	=	4,486.46
Grand Total Drainage and Bridge Fees	=	$66,002.57

In addition to the Drainage Fees stated above, the owner has constructed improvements to the two Cottonwood Creek ponds that serve to mitigate flow rates downstream of the ponds and provide stabilization within the reach. The owner reserves the opportunity to seek reimbursement or drainage credits for these improvements from the City/County Drainage Board in accordance with the procedures outlined in DCM Section 3.3.

requires DBPS amendment

9. Conclusion

This Final Drainage Report presents existing and proposed drainage conditions for the proposed Eagle Rising Filing No. 1 project. The development contains 35.3 acres with ten (10) 2.5-acre to 7.1-acre single family residential lots, and associated roadway which will have negligible and inconsequential effects on the existing site drainage and drainage conditions downstream. The proposed project will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream properties. Applicable agency permitting requirements will be observed and adhered to in the development of the subdivision.

References

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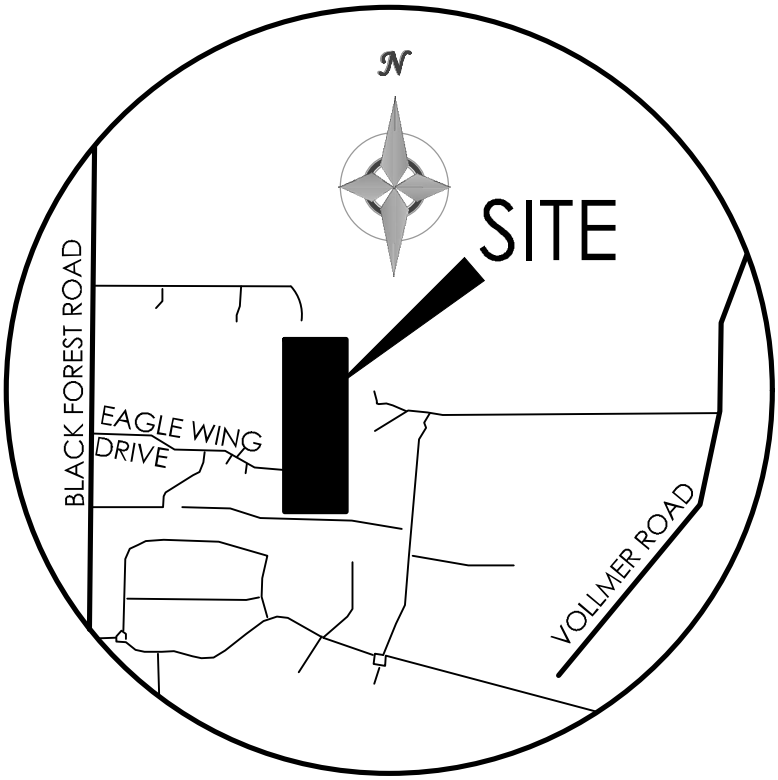
Appendices

10. General Maps and Supporting Data

Vicinity Map
Portions of Flood Insurance Rate Map
NRCS Soil Map and Tables
SCS Soil Type Descriptions
Hydrologic Soil Group Map and Tables
Site Photographs



VICINITY MAP

NOT TO SCALE

National Flood Hazard Layer FIRMette

FEMA

104°41'41"W 38°58'59"N

104°41'3"W 38°58'31"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/15/2021 at 6:32 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

104°41'41"W 38°58'36"N

104°41'3"W 38°58'8"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/15/2021 at 6:36 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

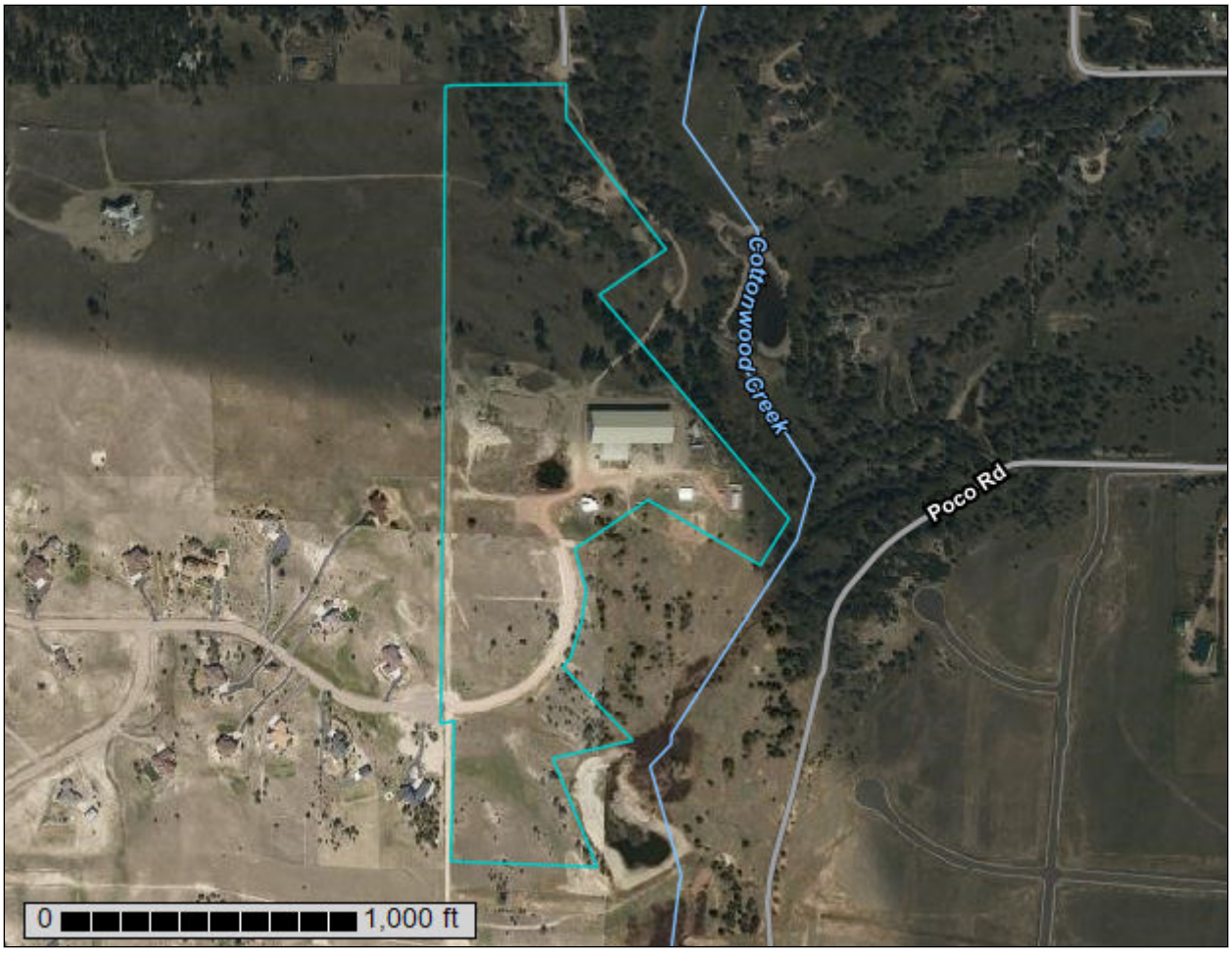
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado



April 7, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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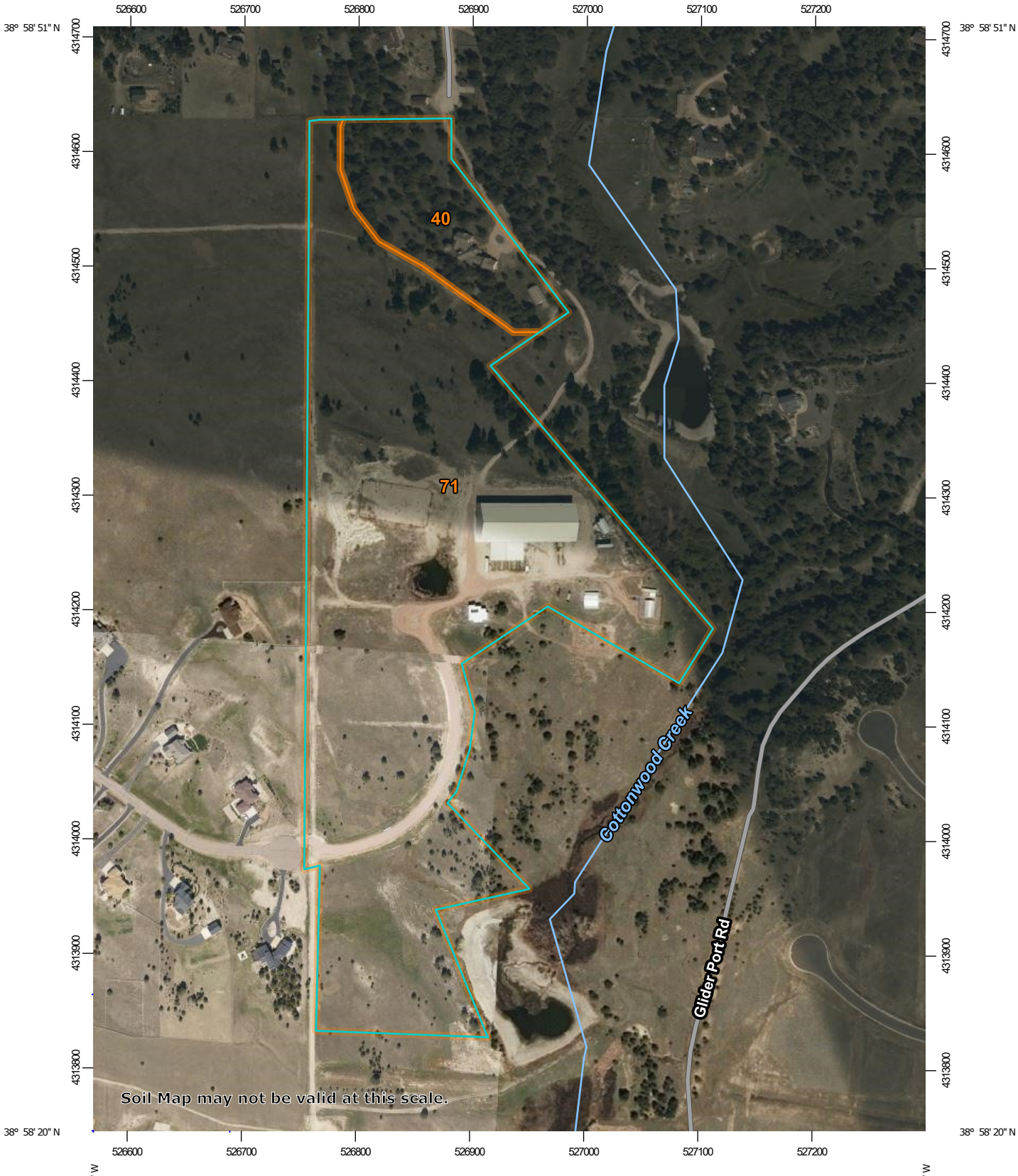
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	4.5	12.2%
71	Pring coarse sandy loam, 3 to 8 percent slopes	32.4	87.8%
Totals for Area of Interest		**36.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Kettle

Setting

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

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

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

Map Unit Setting

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

Map Unit Composition

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

Description of Pring

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

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

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

Depending on land use, this soil can produce habitat that is suitable for either rangeland wildlife, such as antelope, or for openland wildlife, such as pheasant, cottontail, and mourning dove. Availability of irrigation water largely determines the land use. Where no irrigation water is available, this soil is mainly used as rangeland, a use that favors rangeland wildlife. If this soil is used as rangeland, fences, livestock water developments, and proper livestock grazing use are practices that enhance habitat for rangeland wildlife. Production of crops such as wheat, corn, and alfalfa provides suitable habitat for openland wildlife, especially pheasant. Among the practices that increase openland wildlife populations are planting trees and shrubs and providing undisturbed nesting cover.

The main limitation of this soil for urban use is shrink-swell potential. Buildings and roads need to be designed to overcome this limitation. Roads need to be designed to minimize frost-heave damage. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

40—Kettle gravelly loamy sand, 3 to 8 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes; Elbeth sandy loam, 3 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; Tomah-Crowfoot loamy sands, 3 to 8 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate. A few gullies have formed in drainageways.

This soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for the production or harvesting of timber is the low available water capacity. The low available water capacity also influences seedling survival, especially in areas where understory plants are plentiful. Erosion must be kept to a minimum when harvesting timber.

This soil has good potential for mule deer, tree squirrels, cottontail rabbit, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

This soil has good potential for use as homesites. Plans for homesite development on this soil should provide for the preservation of as many trees as possible in order to maintain the esthetic value of the sites. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

41—Kettle gravelly loamy sand, 8 to 40 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Elbeth sandy loam, 8 to 15 percent slopes; Pring coarse sandy loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board

survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have a good potential for homesites. The main limitations, especially on the Peyton soil, are low bearing strength and frost-action potential. Buildings and roads can be designed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

69—Peyton-Pring complex, 8 to 15 percent slopes. These gently to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; and a few areas of Rock outcrop.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The soils in this complex are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem grasses, needleandthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have good potential for use as homesites. The main limitations are steepness of slope, limited ability to support a load, and frost-action potential. Buildings and roads can be designed to overcome these limitations. These soils also require special site or building designs because of the slope. Access roads should have adequate cut-slope grade, and drains should be provided to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

70—Pits, gravel. Gravel pits are in nearly level to rolling areas. They are open excavations several feet deep and commonly 5 acres or less in size.

Gravel pits are very low in natural fertility and are highly susceptible to soil blowing. A cover of weeds or straw helps to control erosion.

Windbreaks and environmental plantings generally are not suited to these areas. Onsite investigation is needed to determine if plantings are feasible. Capability subclass VIIIs.

71—Pring coarse sandy loam, 3 to 8 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes, along drainageways; Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy loam, 1 to 5 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. In some places arkose beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

Almost all areas of this soil are used as rangeland. Some areas previously cultivated have been reseeded to grass. This soil is also used for wildlife habitat and homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain vigor and production of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. The hazard of soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil is well suited for use as homesites. Erosion control practices are needed to control soil blowing and water erosion on construction sites where the ground cover has been removed. Capability subclass IVe.

72—Pring coarse sandy loam, 8 to 15 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. Arkose beds of sandstone and shale are at a depth of 0 to 40 inches in some places.

Permeability of this Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have developed along drainageways.

Almost all areas of this soil are used as rangeland. Some areas previously cultivated have been reseeded to grass. This soil is also used for wildlife habitat and as homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. The native vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and production of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. The hazard of soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife habitat. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for urban uses. The main limitation is slope. Special site or building designs are needed because of the slope. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass VIe.

73—Razor clay loam, 3 to 9 percent slopes. This moderately deep, well drained, clayey soil formed in residuum derived from calcareous shale on uplands. Elevation ranges from 5,300 to 6,100 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Included with this soil in mapping are small areas of Midway clay loam, 3 to 25 percent slopes; Heldt clay loam, 0 to 3 percent slopes; and Stoneham sandy loam, 3 to 8 percent slopes.

1

Looking downstream from 250 feet downstream of Cottonwood Creek DBPS Design Point 82.

September 27, 2022

2

Looking upstream from 250 feet downstream of Cottonwood Creek DBPS Design Point 82.

September 27, 2022

3

Looking upstream from Cottonwood Creek DBPS Design Point 84.

September 27, 2022

4

Looking downstream from 200 feet downstream of Cottonwood Creek DBPS Design Point 84.

September 27, 2022

5

Looking upstream from Cottonwood Creek DBPS Design Point 102.

September 27, 2022

6

Looking upstream from Cottonwood Creek DBPS Design Point 102.

September 27, 2022

7

Looking upstream from Cottonwood Creek DBPS Design Point 102.

September 27, 2022

8

Looking upstream of tributary , from Cottonwood Creek DBPS Design Point 102.

September 27, 2022

9

Looking downstream from Cottonwood Creek DBPS Design Point 102.

September 27, 2022

10

Looking northeast from 100 feet downstream of Cottonwood Creek DBPS Design Point 102.

September 27, 2022

11

Looking downstream from 200 feet downstream of Cottonwood Creek DBPS Design Point 102. Emergency spillway on left corner of pond.

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12

Looking upstream from 200 feet downstream of Cottonwood Creek DBPS Design Point 102.

September 27, 2022

13

Buried and partially buried riprap at emergency overflow, from Cottonwood Creek DBPS Design Point 104.

September 27, 2022

14

Looking at heavy vegetation downstream, from Design Point 6C.

September 27, 2022

15

Looking at riprap upstream tributary flow, from Design Point 6B.

September 27, 2022

16

Looking southwest across stream from 450 feet downstream of Cottonwood Creek DBPS Design Point 104.

September 27, 2022

17

Looking up stream from 450 feet downstream of Cottonwood Creek DBPS Design Point 104.

September 27, 2022

18

Looking upstream from 300 feet upstream of Cottonwood Creek DBPS Design Point 124.

September 27, 2022

19

Looking west across channel from 100 feet upstream of Cottonwood Creek DBPS Design Point 124.

September 27, 2022

20

Looking downstream at the upper banks from 100 feet upstream of Cottonwood Creek DBPS Design Point 124.

September 27, 2022

21

Looking upstream from Design Point 8.

September 27, 2022

22

Looking downstream from Design Point 8.

September 27, 2022

23

On the east side of the creek looking west from 200 feet downstream of Design Point 9.

September 27, 2022

24

Looking southwest towards pond embankment from 400 feet downstream of Design Point 10.

September 27, 2022

25

Looking downstream towards offsite pond and riprap from Cottonwood Creek DBPS Design Point 126.

September 27, 2022

26

Looking upstream from Cottonwood Creek DBPS Design Point 126.

September 27, 2022

27

Looking upstream towards riprap for Pond 2 emergency overflow from east bank 550 feet downstream of Design Point 10.

September 27, 2022

28

Looking across channel, from east bank 550 feet downstream of Design Point 10.

September 27, 2022

29

Looking upstream from the west bank 500 feet downstream of Design Point 10.

September 27, 2022

30

Looking north at culverts, on the east side of the road from 100 feet south of Design Point 8A.

September 27, 2022

31

Riprap lining downstream from DP8A, from 100 feet north of Design Point 12.

September 27, 2022

32

Looking northwest up tributary stream from 100 feet northwest of Design Point 9.

September 27, 2022

33

Looking east, on west bank of creek 100 feet northwest of Design Point 9.

September 27, 2022

34

Riprap lined swale from barn area to creek, in need of additional riprap. Just west of Design Point 104.

September 27, 2022

35

Looking west, existing riprap lined swale in need of additional riprap in area of Design Point 6A.

September 27, 2022

36

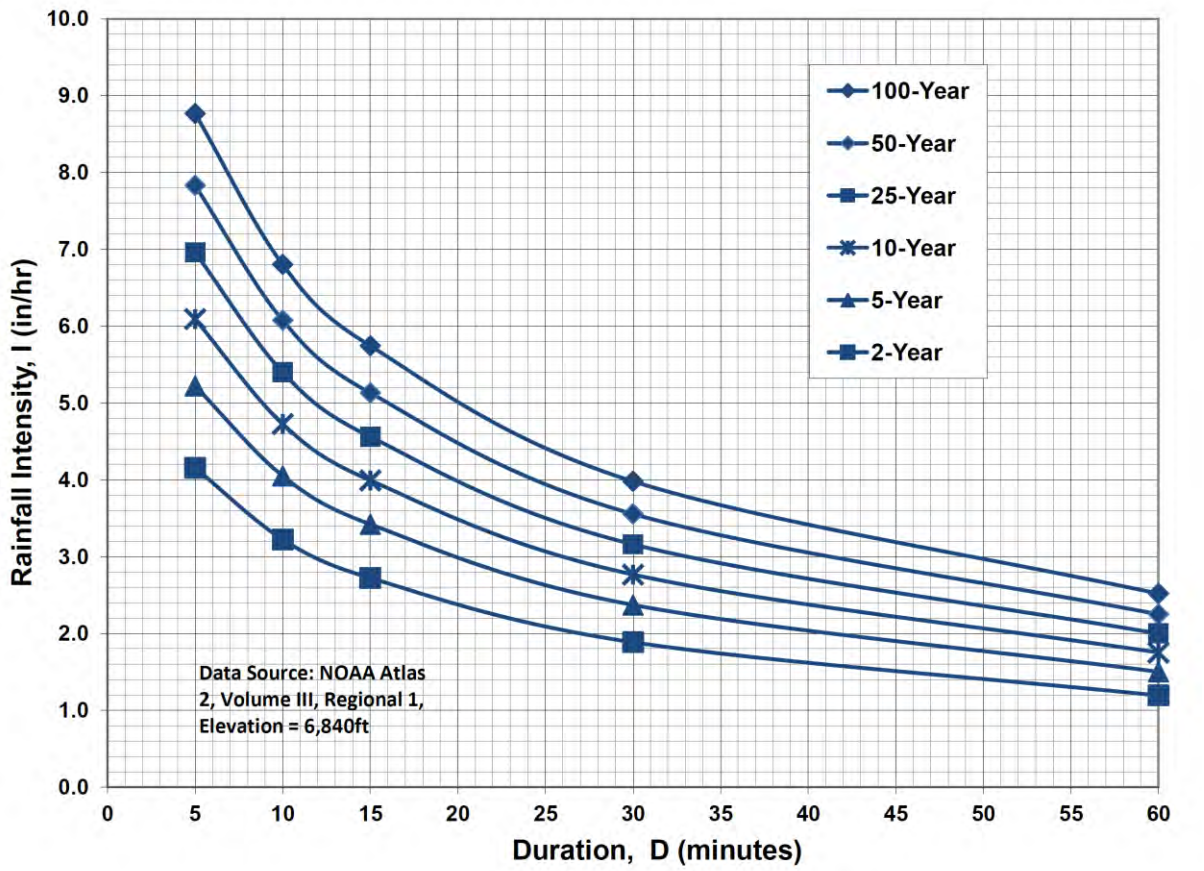
Looking at riprap on tributary flow upstream of DP6B, from Design Point 6A.

September 27, 2022

11. Hydrologic Calculations

Runoff Coefficients and Percent Imperviousness Table 6-6
Colorado Springs Rainfall Intensity Duration Frequency Table 6-5
Hydrologic Calculations Summary Form SF-1 for Existing & Developed Conditions
Hydrologic Calculations Summary 5-yr Form SF-2 for Existing & Developed Conditions
Hydrologic Calculations Summary 100-yr Form SF-2 for Existing & Developed Conditions
Runoff Reduction Calculations
Runoff Reduction Map

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

Job No.: **61145** Date: **1/4/2023 11:19**

Project: **Eagle Rising - Preliminary/Final** (Existing) Calcs By: **O. Ali**

Checked By:

Time of Concentration (Modified from Standard Form SF-1)

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		
	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	t_c (min)
EX-A1	4.95	0.08	0.35	0%	299	11%	14.6	337	0.059	1.7	3.3	0	0.000	0.0	0.0	636	13.5	13.5
EX-A2	1.74	0.08	0.35	0%	154	13%	9.8	238	0.059	1.7	2.3	0	0.000	0.0	0.0	392	12.2	12.1
EX-B	4.35	0.12	0.38	5%	100	8%	9.1	176	0.031	1.2	2.4	240	0.023	3.2	1.2	516	12.9	12.7
EX-C	1.66	0.08	0.35	0%	100	5%	10.8	238	0.050	1.6	2.5	0	0.000	0.0	0.0	338	11.9	11.9
EX-D	7.10	0.12	0.38	6%	100	7%	9.3	160	0.088	2.1	1.3	621	0.034	4.2	2.5	881	14.9	13.1
EX-E1	3.41	0.28	0.49	30%	100	7%	7.8	0	0.000	0.0	0.0	865	0.016	2.7	5.3	965	15.4	13.1
EX-E2	7.77	0.18	0.42	15%	299	3%	19.3	222	0.054	1.6	2.3	618	0.024	3.8	2.7	1139	16.3	16.3
EX-F1	6.45	0.42	0.58	51%	100	2%	9.8	343	0.012	0.8	7.6	239	0.056	4.9	0.8	682	13.8	13.8
EX-F2	2.02	0.08	0.35	1%	84	4%	11.0	306	0.046	1.5	3.4	241	0.050	3.5	1.1	631	13.5	13.5
EX-G	2.98	0.10	0.36	2%	126	10%	9.7	186	0.032	1.3	2.5	427	0.042	3.6	2.0	739	14.1	14.1
EX-H	4.10	0.14	0.40	8%	100	4%	10.9	382	0.050	1.6	4.1	208	0.058	4.2	0.8	690	13.8	13.8
EX-I	1.64	0.17	0.42	11%	100	9%	8.1	166	0.030	1.2	2.3	147	0.020	1.2	2.0	413	12.3	12.3
EX-J	2.42	0.14	0.39	7%	100	7%	9.1	144	0.076	1.9	1.2	274	0.036	3.4	1.3	518	12.9	11.7
EX-K	2.65	0.08	0.35	0%	150	9%	11.1	0	0.000	0.0	0.0	0	0.000	0.0	0.0	150	10.8	10.8
EX-L	2.14	0.08	0.35	0%	206	5%	15.2	224	0.020	1.0	3.8	0	0.000	0.0	0.0	430	12.4	12.4
EX-M	4.10	0.10	0.36	2%	108	4%	12.2	453	0.022	1.0	7.3	312	0.032	1.5	3.5	873	14.9	14.9
OS-B1A	24.88	0.12	0.40	10%	300	6%	17.0	1000	0.047	1.5	11.0	344	0.020	3.1	1.9	1644	19.1	19.1
OS-B1B	40.97	0.10	0.37	5%	300	5%	18.5	1000	0.055	1.6	10.2	711	0.020	3.0	3.9	2011	21.2	21.2
OS-B1C	1.84	0.08	0.35	0%	300	2%	24.1	228	0.039	1.4	2.7	0	0.000	0.0	0.0	528	12.9	12.9
OS-B1D	6.03	0.08	0.35	0%	300	3%	22.2	942	0.034	1.3	12.2	0	0.000	0.0	0.0	1242	16.9	16.9
OS-B1E	10.12	0.10	0.37	4%	300	7%	16.8	1000	0.035	1.3	12.7	104	0.058	4.5	0.4	1404	17.8	17.8
OS-B3A	9.06	0.12	0.40	11%	300	4%	19.4	638	0.052	1.6	6.7	0	0.000	0.0	0.0	938	15.2	15.2
OS-B3B	2.50	0.12	0.40	11%	300	4%	20.0	336	0.054	1.6	3.5	0	0.000	0.0	0.0	636	13.5	13.5
OS-B3C	5.95	0.12	0.40	11%	300	3%	20.6	694	0.040	1.4	8.2	0	0.000	0.0	0.0	994	15.5	15.5

Job No.: **61145** Date: **1/4/2023 11:19**

Project: **Eagle Rising - Preliminary/Final** (Developed) Calcs By: **O. Ali**

Checked By:

Time of Concentration (Modified from Standard Form SF-1)

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		
	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	t_c (min)
A1	4.95	0.12	0.38	6%	299	11%	13.9	337	0.059	1.7	3.3	0	0.000	0.0	0.0	636	13.5	13.5
A2	1.74	0.08	0.35	0%	154	13%	9.8	238	0.059	1.7	2.3	0	0.000	0.0	0.0	392	12.2	12.1
B	4.35	0.15	0.40	9%	100	8%	8.8	176	0.031	1.2	2.4	240	0.023	3.2	1.2	516	12.9	12.5
C	1.66	0.11	0.37	3%	100	5%	10.6	238	0.050	1.6	2.5	0	0.000	0.0	0.0	338	11.9	11.9
D	7.10	0.14	0.40	9%	100	7%	9.1	160	0.088	2.1	1.3	621	0.034	4.2	2.5	881	14.9	12.8
E1	3.41	0.23	0.45	21%	100	7%	8.3	0	0.000	0.0	0.0	865	0.016	2.7	5.3	965	15.4	13.6
E2	7.77	0.20	0.43	17%	299	3%	18.8	222	0.054	1.6	2.3	618	0.024	3.8	2.7	1139	16.3	16.3
F1	6.45	0.22	0.45	20%	100	2%	12.6	343	0.012	0.8	7.6	239	0.056	4.9	0.8	682	13.8	13.8
F2	2.02	0.15	0.40	9%	84	4%	10.3	306	0.046	1.5	3.4	241	0.050	3.5	1.1	631	13.5	13.5
G	2.98	0.14	0.39	8%	126	10%	9.3	186	0.032	1.3	2.5	427	0.042	3.6	2.0	739	14.1	13.7
H	4.10	0.20	0.44	15%	100	4%	10.3	382	0.050	1.6	4.1	208	0.058	4.2	0.8	690	13.8	13.8
I	1.64	0.21	0.45	17%	100	9%	7.8	166	0.030	1.2	2.3	147	0.020	1.2	2.0	413	12.3	12.0
J	2.42	0.19	0.43	14%	100	7%	8.7	144	0.076	1.9	1.2	274	0.036	3.4	1.3	518	12.9	11.2
K	2.65	0.08	0.35	0%	150	9%	11.1	0	0.000	0.0	0.0	0	0.000	0.0	0.0	150	10.8	10.8
L	2.14	0.14	0.39	8%	206	5%	14.3	224	0.022	1.0	3.6	0	0.000	0.0	0.0	430	12.4	12.4
M	4.10	0.13	0.39	6%	108	4%	11.8	453	0.022	1.0	7.3	312	0.032	1.5	3.5	873	14.9	14.9
OS-B1A	24.88	0.12	0.40	10%	300	6%	17.0	1000	0.047	1.5	11.0	344	0.020	3.1	1.9	1644	19.1	19.1
OS-B1B	40.97	0.10	0.37	5%	300	5%	18.5	1000	0.055	1.6	10.2	711	0.020	3.0	3.9	2011	21.2	21.2
OS-B1C	1.84	0.08	0.35	0%	300	2%	24.1	228	0.039	1.4	2.7	0	0.000	0.0	0.0	528	12.9	12.9
OS-B1D	6.03	0.08	0.35	0%	300	3%	22.2	942	0.034	1.3	12.2	0	0.000	0.0	0.0	1242	16.9	16.9
OS-B1E	10.12	0.10	0.37	4%	300	7%	16.8	1000	0.035	1.3	12.7	104	0.058	4.5	0.4	1404	17.8	17.8
OS-B3A	9.06	0.12	0.40	11%	300	4%	19.4	638	0.052	1.6	6.7	0	0.000	0.0	0.0	938	15.2	15.2
OS-B3B	2.50	0.12	0.40	11%	300	4%	20.0	336	0.054	1.6	3.5	0	0.000	0.0	0.0	636	13.5	13.5
OS-B3C	5.95	0.12	0.40	11%	300	3%	20.6	694	0.040	1.4	8.2	0	0.000	0.0	0.0	994	15.5	15.5

Job No.: **61145**
Project: **Eagle Rising - Preliminary/Final** (Existing)
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
Calcs By: **O. Ali**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	EX-A1	4.95	0.08	13.5	0.40	3.68	1.46															
	EX-A2	1.74	0.08	12.1	0.14	3.84	0.53															
	EX-B	4.35	0.12	12.7	0.51	3.77	1.92															
	EX-C	1.66	0.08	11.9	0.13	3.87	0.52															
	EX-D	7.10	0.12	13.1	0.87	3.73	3.26															
	EX-E1	3.41	0.28	13.1	0.95	3.72	3.53															
EX-DP8	EX-E2	7.77	0.18	16.3	1.40	3.39	4.74															
	EX-F1	6.45	0.42	13.8	2.68	3.65	9.78															
	EX-F2	2.02	0.08	13.5	0.17	3.68	0.63															
EX-DP10	EX-G	2.98	0.10	14.1	0.29	3.61	1.03															
	EX-H	4.10	0.14	13.8	0.59	3.64	2.16															
	EX-I	1.64	0.17	12.3	0.29	3.82	1.09															
	EX-J	2.42	0.14	11.7	0.34	3.89	1.32															
	EX-K	2.65	0.08	10.8	0.21	4.01	0.85															
	EX-L	2.14	0.08	12.4	0.17	3.81	0.65															
	EX-M	4.10	0.10	14.9	0.40	3.54	1.42															
EX-DP6		71.87	0.10					22.3	7.50	2.93	22.0											
EX-DP6A		5.25	0.21					17.9	1.10	3.25	3.6											
EX-DP6B		78.97	0.11					24.1	8.37	2.81	23.5											
EX-DP6C		84.22	0.11					24.1	9.47	2.81	26.6											
EX-DP7		12.48	0.25					20.4	3.16	3.06	9.7											
EX-DP8A		24.92	0.12					19.5	2.93	3.12	9.2											
EX-DP9		14.50	0.23					22.8	3.33	2.89	9.7											
EX-DP11		6.60	0.11					18.1	0.70	3.24	2.3											
EX-DP12		27.34	0.12					21.2	3.27	3.00	9.8											
EX-DP13		8.09	0.11					17.2	0.89	3.32	2.9											
	OS-B1A	24.88	0.12	19.1	2.90	3.16	9.16															
	OS-B1B	40.97	0.10	21.2	3.95	3.00	11.87															
	OS-B1C	1.84	0.08	12.9	0.15	3.74	0.55															
	OS-B1D	6.03	0.08	16.9	0.48	3.34	1.61															
	OS-B1E	10.12	0.10	17.8	0.96	3.26	3.15															
	OS-B3A	9.06	0.12	15.2	1.09	3.50	3.81															
	OS-B3B	2.50	0.12	13.5	0.30	3.68	1.10															
	OS-B3C	5.95	0.12	15.5	0.71	3.47	2.48															

DCM: $I = C1 * \ln(tc) + C2$
C1: 1.5
C1: 7.583

Job No.: **61145**
Project: **Eagle Rising - Preliminary/Final** (Developed)
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
Calcs By: **O. Ali**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	A1	4.95	0.12	13.5	0.61	3.68	2.25															
	A2	1.74	0.08	12.1	0.14	3.84	0.53															
	B	4.35	0.15	12.5	0.64	3.80	2.43															
	C	1.66	0.11	11.9	0.18	3.87	0.68															
	D	7.10	0.14	12.8	1.03	3.75	3.85															
	E1	3.41	0.23	13.6	0.77	3.67	2.84															
DP8	E2	7.77	0.20	16.3	1.56	3.39	5.29															
	F1	6.45	0.22	13.8	1.44	3.65	5.25															
	F2	2.02	0.15	13.5	0.30	3.68	1.10															
DP10	G	2.98	0.14	13.7	0.42	3.66	1.52															
	H	4.10	0.20	13.8	0.81	3.64	2.93															
	I	1.64	0.21	12.0	0.35	3.86	1.34															
	J	2.42	0.19	11.2	0.45	3.95	1.79															
	K	2.65	0.08	10.8	0.21	4.01	0.85															
	L	2.14	0.14	12.4	0.30	3.81	1.15															
	M	4.10	0.13	14.9	0.53	3.54	1.89															
DP6		71.87	0.11					22.3	7.67	2.93	22.5											
DP6A		5.25	0.18					17.9	0.92	3.25	3.0											
DP6B		78.97	0.11					24.1	8.70	2.81	24.4											
DP6C		84.22	0.11					24.1	9.62	2.81	27.0											
DP7		12.48	0.15					20.4	1.92	3.06	5.9											
DP8A		24.92	0.13					19.5	3.21	3.12	10.0											
DP9		14.50	0.15					22.8	2.22	2.89	6.4											
DP11		6.60	0.13					18.1	0.83	3.24	2.7											
DP12		27.34	0.13					21.2	3.66	3.00	11.0											
DP13		8.09	0.13					17.2	1.02	3.32	3.4											
	OS-B1A	24.88	0.12	19.1	2.90	3.16	9.16															
	OS-B1B	40.97	0.10	21.2	3.95	3.00	11.87															
	OS-B1C	1.84	0.08	12.9	0.15	3.74	0.55															
	OS-B1D	6.03	0.08	16.9	0.48	3.34	1.61															
	OS-B1E	10.12	0.10	17.8	0.96	3.26	3.15															
	OS-B3A	9.06	0.12	15.2	1.09	3.50	3.81															
	OS-B3B	2.50	0.12	13.5	0.30	3.68	1.10															
	OS-B3C	5.95	0.12	15.5	0.71	3.47	2.48															

DCM: $I = C1 * \ln(tc) + C2$
C1: 1.5
C1: 7.583

Job No.: **61145**
Project: **Eagle Rising - Preliminary/Final** (Existing)
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
Calcs By: **O. Ali**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
	Sub-	Area		t_c	CA	I100	Q100	t_c	CA	I100	Q100	Slope	Length	Q	Q	Slope	Mnngs	Length	D_{Pipe}	Length	v_{0sc}	t_t
DP	Basin	(Acres)	C100	(min)	(Acres)	(in/hr)	(cfs)	(min)	(Acres)	(in/hr)	(cfs)	(%)	(ft)	(cfs)	(cfs)	(%)	n	(ft)	(in)	(ft)	(ft/s)	(min)
	EX-A1	4.95	0.35	13.5	1.73	6.17	10.69															
	EX-A2	1.74	0.35	12.1	0.61	6.44	3.93															
	EX-B	4.35	0.38	12.7	1.64	6.32	10.38															
	EX-C	1.66	0.35	11.9	0.58	6.50	3.79															
	EX-D	7.10	0.38	13.1	2.70	6.26	16.94															
	EX-E1	3.41	0.49	13.1	1.66	6.25	10.38															
EX-DP8	EX-E2	7.77	0.42	16.3	3.26	5.70	18.55															
	EX-F1	6.45	0.58	13.8	3.76	6.12	23.00															
	EX-F2	2.02	0.35	13.5	0.71	6.18	4.41															
EX-DP10	EX-G	2.98	0.36	14.1	1.08	6.07	6.54															
	EX-H	4.10	0.40	13.8	1.63	6.11	9.99															
	EX-I	1.64	0.42	12.3	0.69	6.41	4.41															
	EX-J	2.42	0.39	11.7	0.96	6.54	6.25															
	EX-K	2.65	0.35	10.8	0.93	6.73	6.25															
	EX-L	2.14	0.35	12.4	0.75	6.39	4.79															
	EX-M	4.10	0.36	14.9	1.49	5.94	8.85															
EX-DP6		71.87	0.38					22.3	27.30	4.91	134.1											
EX-DP6A		5.25	0.44					17.9	2.31	5.46	12.6											
EX-DP6B		78.97	0.38					24.1	30.00	4.71	141.5											
EX-DP6C		84.22	0.38					24.1	32.31	4.71	152.3											
EX-DP7		12.48	0.47					20.4	5.87	5.14	30.2											
EX-DP8A		24.92	0.39					19.5	9.68	5.25	50.8											
EX-DP9		14.50	0.45					22.8	6.58	4.86	32.0											
EX-DP11		6.60	0.38					18.1	2.49	5.44	13.5											
EX-DP12		27.34	0.39					21.2	10.64	5.04	53.6											
EX-DP13		8.09	0.39					17.2	3.13	5.57	17.4											
	OS-B1A	24.88	0.40	19.1	9.86	5.30	52.23															
	OS-B1B	40.97	0.37	21.2	15.21	5.04	76.72															
	OS-B1C	1.84	0.35	12.9	0.64	6.28	4.04															
	OS-B1D	6.03	0.35	16.9	2.11	5.61	11.84															
	OS-B1E	10.12	0.37	17.8	3.73	5.48	20.46															
	OS-B3A	9.06	0.40	15.2	3.63	5.88	21.30															
	OS-B3B	2.50	0.40	13.5	1.00	6.17	6.18															
	OS-B3C	5.95	0.40	15.5	2.38	5.82	13.87															

DCM: I = C1 * ln (tc) + C2
C1: 2.52
C1: 12.735

Job No.: **61145**
Project: **Eagle Rising - Preliminary/Final** (Developed)
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
Calcs By: **O. Ali**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C100	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	A1	4.95	0.38	13.5	1.89	6.17	11.66															
	A2	1.74	0.35	12.1	0.61	6.44	3.93															
	B	4.35	0.40	12.5	1.74	6.38	11.07															
	C	1.66	0.37	11.9	0.61	6.50	3.99															
	D	7.10	0.40	12.8	2.81	6.30	17.74															
	E1	3.41	0.45	13.6	1.54	6.15	9.51															
DP8	E2	7.77	0.43	16.3	3.38	5.70	19.25															
	F1	6.45	0.45	13.8	2.91	6.12	17.84															
	F2	2.02	0.40	13.5	0.81	6.18	4.98															
DP10	G	2.98	0.39	13.7	1.17	6.14	7.21															
	H	4.10	0.44	13.8	1.79	6.11	10.93															
	I	1.64	0.45	12.0	0.73	6.47	4.74															
	J	2.42	0.43	11.2	1.04	6.64	6.89															
	K	2.65	0.35	10.8	0.93	6.73	6.25															
	L	2.14	0.39	12.4	0.84	6.39	5.39															
	M	4.10	0.39	14.9	1.58	5.94	9.41															
DP6		71.87	0.38					22.3	27.42	4.91	134.7											
DP6A		5.25	0.42					17.9	2.19	5.46	12.0											
DP6B		78.97	0.38					24.1	30.24	4.71	142.6											
DP6C		84.22	0.39					24.1	32.43	4.71	152.9											
DP7		12.48	0.40					20.4	5.02	5.14	25.8											
DP8A		24.92	0.40					19.5	9.88	5.25	51.8											
DP9		14.50	0.40					22.8	5.83	4.86	28.3											
DP11		6.60	0.39					18.1	2.59	5.44	14.1											
DP12		27.34	0.40					21.2	10.92	5.04	55.1											
DP13		8.09	0.40					17.2	3.22	5.57	18.0											
	OS-B1A	24.88	0.40	19.1	9.86	5.30	52.23															
	OS-B1B	40.97	0.37	21.2	15.21	5.04	76.72															
	OS-B1C	1.84	0.35	12.9	0.64	6.28	4.04															
	OS-B1D	6.03	0.35	16.9	2.11	5.61	11.84															
	OS-B1E	10.12	0.37	17.8	3.73	5.48	20.46															
	OS-B3A	9.06	0.40	15.2	3.63	5.88	21.30															
	OS-B3B	2.50	0.40	13.5	1.00	6.17	6.18															
	OS-B3C	5.95	0.40	15.5	2.38	5.82	13.87															

DCM: $I = C1 * \ln(tc) + C2$
C1: 2.52
C1: 12.735

Sub-Basin OS-B1A (DP4) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	942,816	21.64	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	99,743	2.29	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	41,339	0.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**1,083,898**	**24.88**	**0.08**	**0.12**	**0.22**	**0.31**	**0.36**	**0.40**	**10.2%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,644	72	-	-	-	-	
Initial Time	300	18	0.060	-	17.0	19.1	DCM Eq. 6-8
Shallow Channel	1,000	47	0.047	1.5	11.0	-	DCM Eq. 6-9
Channelized	344	7	0.020	3.1	1.9	-	V-Ditch
				t_c	**19.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.52	3.16	3.68	4.21	4.73	5.30
Runoff (cfs)	4.8	**9.2**	19.7	32.0	41.9	**52.2**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	4.8	**9.2**	19.7	32.0	41.9	**52.2**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1B (DP5) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	601,016	13.80	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	267,802	6.15	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	915,935	21.03	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**1,784,753**	**40.97**	**0.05**	**0.10**	**0.18**	**0.28**	**0.33**	**0.37**	**4.8%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	2,011	84	-	-	-	-	
Initial Time	300	15	0.050	-	18.5	21.2	DCM Eq. 6-8
Shallow Channel	1,000	55	0.055	1.6	10.2	-	DCM Eq. 6-9
Channelized	711	14	0.020	3.0	3.9	-	V-Ditch
				t_c	**21.2**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.40	3.00	3.50	4.01	4.51	5.04
Runoff (cfs)	4.5	**11.9**	26.0	45.3	60.2	**76.7**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	4.5	**11.9**	26.0	45.3	60.2	**76.7**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1C (DP-E7) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	80,078	1.84	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**80,078**	**1.84**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	528	16	-	-	-	-	
Initial Time	300	7	0.023	-	24.1	12.9	DCM Eq. 6-8
Shallow Channel	228	9	0.039	1.4	2.7	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**12.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.99	3.74	4.37	4.99	5.62	6.28
Runoff (cfs)	0.1	**0.6**	1.2	2.3	3.1	**4.0**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.6**	1.2	2.3	3.1	**4.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1D (DP-E8) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	262,653	6.03	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**262,653**	**6.03**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,242	41	-	-	-	-	
Initial Time	300	9	0.030	-	22.2	16.9	DCM Eq. 6-8
Shallow Channel	942	32	0.034	1.3	12.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**16.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.67	3.34	3.90	4.46	5.01	5.61
Runoff (cfs)	0.3	**1.6**	3.5	6.7	9.1	**11.8**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	**1.6**	3.5	6.7	9.1	**11.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1E (DP-E10) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	168,070	3.86	0.08	0.12	0.22	0.31	0.36	0.4	11%
Pasture/Meadow	272,638	6.26	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**440,708**	**10.12**	**0.04**	**0.10**	**0.18**	**0.27**	**0.32**	**0.37**	**4.2%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,404	61	-	-	-	-	
Initial Time	300	20	0.067	-	16.8	17.8	DCM Eq. 6-8
Shallow Channel	1,000	35	0.035	1.3	12.7	-	DCM Eq. 6-9
Channelized	104	6	0.058	4.5	0.4	-	V-Ditch
				t_c	**17.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.61	3.26	3.81	4.35	4.90	5.48
Runoff (cfs)	1.1	**3.1**	6.8	12.0	16.0	**20.5**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.1	**3.1**	6.8	12.0	16.0	**20.5**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B3A (DP-E11) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	394,804	9.06	0.08	0.12	0.22	0.31	0.36	0.4	11%
Combined	**394,804**	**9.06**	**0.08**	**0.12**	**0.22**	**0.31**	**0.36**	**0.40**	**11.0%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	938	45	-	-	-	-	
Initial Time	300	12	0.040	-	19.4	15.2	DCM Eq. 6-8
Shallow Channel	638	33	0.052	1.6	6.7	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**15.2**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.80	3.50	4.08	4.67	5.25	5.88
Runoff (cfs)	2.0	**3.8**	8.1	13.1	17.1	**21.3**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.0	**3.8**	8.1	13.1	17.1	**21.3**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B3B (DP-E13) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.4	11%
Combined	**109,046**	**2.50**	**0.08**	**0.12**	**0.22**	**0.31**	**0.36**	**0.40**	**11.0%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	636	29	-	-	-	-	
Initial Time	300	11	0.037	-	20.0	13.5	DCM Eq. 6-8
Shallow Channel	336	18	0.054	1.6	3.5	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**13.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.68	4.29	4.90	5.51	6.17
Runoff (cfs)	0.6	**1.1**	2.4	3.8	5.0	**6.2**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	**1.1**	2.4	3.8	5.0	**6.2**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B3C (DP-E15) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.4	11%
Combined	**259,332**	**5.95**	**0.08**	**0.12**	**0.22**	**0.31**	**0.36**	**0.40**	**11.0%**

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	994	38	-	-	-	-	
Initial Time	300	10	0.033	-	20.6	15.5	DCM Eq. 6-8
Shallow Channel	694	28	0.040	1.4	8.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**15.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.77	3.47	4.05	4.63	5.20	5.82
Runoff (cfs)	1.3	**2.5**	5.3	8.5	11.2	**13.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.3	**2.5**	5.3	8.5	11.2	**13.9**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-A1 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	215,572	4.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**215,572**	**4.95**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	215572								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	636	52	-	-	-	-	
Initial Time	299	32	0.107	-	14.6	13.5	DCM Eq. 6-8
Shallow Channel	337	20	0.059	1.7	3.3	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**13.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.68	4.29	4.90	5.51	6.17
Runoff (cfs)	0.3	**1.5**	3.2	6.1	8.2	**10.7**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	**1.5**	3.2	6.1	8.2	**10.7**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-A2 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	75,899	1.74	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**75,899**	**1.74**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	75899								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	392	34	-	-	-	-	
Initial Time	154	20	0.130	-	9.8	12.2	DCM Eq. 6-8
Shallow Channel	238	14	0.059	1.7	2.3	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**12.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.06	3.84	4.48	5.12	5.76	6.44
Runoff (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-B Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	1,676	0.04	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,329	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	180,315	4.14	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**189,320**	**4.35**	**0.06**	**0.12**	**0.19**	**0.28**	**0.33**	**0.38**	**4.7%**
	189320								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	516	19	-	-	-	-	
Initial Time	100	8	0.075	-	9.1	12.9	DCM Eq. 6-8
Shallow Channel	176	6	0.031	1.2	2.4	-	DCM Eq. 6-9
Channelized	240	6	0.023	3.2	1.2	-	V-Ditch
				t_c	**12.7 min.**		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.01	3.77	4.39	5.02	5.65	6.32
Runoff (cfs)	0.8	**1.9**	3.5	6.1	8.1	**10.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.8	**1.9**	3.5	6.1	8.1	**10.4**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-C Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	72,522	1.66	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**72,522**	**1.66**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	72522								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	338	17	-	-	-	-	
Initial Time	100	5	0.050	-	10.8	11.9	DCM Eq. 6-8
Shallow Channel	238	12	0.050	1.6	2.5	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**11.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.09	3.87	4.52	5.16	5.81	6.50
Runoff (cfs)	0.1	**0.5**	1.1	2.1	2.9	**3.8**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.5**	1.1	2.1	2.9	**3.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-D Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,302	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	6,215	0.14	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	288,588	6.63	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**309,475**	**7.10**	**0.07**	**0.12**	**0.19**	**0.29**	**0.33**	**0.38**	**6.0%**
	309475								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	881	42	-	-	-	-	
Initial Time	100	7	0.070	-	9.3	14.9	DCM Eq. 6-8
Shallow Channel	160	14	0.088	2.1	1.3	-	DCM Eq. 6-9
Channelized	621	21	0.034	4.2	2.5	-	V-Ditch
				t_c	**13.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.98	3.73	4.35	4.97	5.59	6.26
Runoff (cfs)	1.4	**3.3**	5.9	10.1	13.2	**16.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.4	**3.3**	5.9	10.1	13.2	**16.9**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-E1 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	15,215	0.35	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	38,377	0.88	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	94,964	2.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**148,556**	**3.41**	**0.23**	**0.28**	**0.34**	**0.41**	**0.45**	**0.49**	**29.9%**
	148556								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	965	21	-	-	-	-	
Initial Time	100	7	0.070	-	7.8	15.4	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	865	14	0.016	2.7	5.3	-	V-Ditch
				t_c	**13.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.97	3.72	4.34	4.96	5.58	6.25
Runoff (cfs)	2.4	**3.5**	5.0	6.9	8.6	**10.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.4	**3.5**	5.0	6.9	8.6	**10.4**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-E2 (EX-DP8) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	12,616	0.29	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	50,194	1.15	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	275,673	6.33	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**338,483**	**7.77**	**0.13**	**0.18**	**0.24**	**0.33**	**0.37**	**0.42**	**15.2%**
	338483								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,139	37	-	-	-	-	
Initial Time	299	10	0.033	-	19.3	16.3	DCM Eq. 6-8
Shallow Channel	222	12	0.054	1.6	2.3	-	DCM Eq. 6-9
Channelized	618	15	0.024	3.8	2.7	-	V-Ditch
				t_c	**16.3**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.71	3.39	3.96	4.53	5.09	5.70
Runoff (cfs)	2.7	**4.7**	7.5	11.6	14.8	**18.6**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.7	**4.7**	7.5	11.6	14.8	**18.6**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-F1 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	9,594	0.22	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,538	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	103,459	2.38	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	160,546	3.69	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**281,137**	**6.45**	**0.38**	**0.42**	**0.47**	**0.52**	**0.55**	**0.58**	**51.4%**

281137

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	682	20	-	-	-	-	
Initial Time	100	2	0.020	-	9.8	13.8	DCM Eq. 6-8
Shallow Channel	343	4	0.012	0.8	7.6	-	DCM Eq. 6-9
Channelized	239	14	0.056	4.9	0.8	-	V-Ditch
				t_c	**13.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.65	4.26	4.86	5.47	6.12
Runoff (cfs)	7.2	**9.8**	12.8	16.3	19.5	**23.0**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	7.2	**9.8**	12.8	16.3	19.5	**23.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-F2 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	87,492	2.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	476	0.01	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	**87,968**	**2.02**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.5%**
	87968								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	631	29	-	-	-	-	
Initial Time	84	3	0.036	-	11.0	13.5	DCM Eq. 6-8
Shallow Channel	306	14	0.046	1.5	3.4	-	DCM Eq. 6-9
Channelized	241	12	0.050	3.5	1.1	-	V-Ditch
				t_c	**13.5 min.**		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.94	3.68	4.29	4.90	5.52	6.18
Runoff (cfs)	0.1	**0.6**	1.3	2.5	3.4	**4.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.6**	1.3	2.5	3.4	**4.4**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-G (EX-DP10) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	127,367	2.92	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	2,498	0.06	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	**129,865**	**2.98**	**0.04**	**0.10**	**0.16**	**0.26**	**0.31**	**0.36**	**1.9%**
	129865								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	739	36	-	-	-	-	
Initial Time	126	12	0.095	-	9.7	14.1	DCM Eq. 6-8
Shallow Channel	186	6	0.032	1.3	2.5	-	DCM Eq. 6-9
Channelized	427	18	0.042	3.6	2.0	-	V-Ditch
				t_c	**14.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.89	3.61	4.22	4.82	5.42	6.07
Runoff (cfs)	0.3	**1.0**	2.1	3.8	5.1	**6.5**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	**1.0**	2.1	3.8	5.1	**6.5**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-H Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	164,577	3.78	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	14,101	0.32	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	**178,678**	**4.10**	**0.09**	**0.14**	**0.21**	**0.30**	**0.35**	**0.40**	**7.9%**
	178678								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	690	35	-	-	-	-	
Initial Time	100	4	0.040	-	10.9	13.8	DCM Eq. 6-8
Shallow Channel	382	19	0.050	1.6	4.1	-	DCM Eq. 6-9
Channelized	208	12	0.058	4.2	0.8	-	V-Ditch
				t_c	**13.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.64	4.25	4.86	5.46	6.11
Runoff (cfs)	1.1	**2.2**	3.7	6.1	7.9	**10.0**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.1	**2.2**	3.7	6.1	7.9	**10.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-I Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	63,090	1.45	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	8,194	0.19	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	**71,284**	**1.64**	**0.12**	**0.17**	**0.24**	**0.33**	**0.37**	**0.42**	**11.5%**
	71284								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ = 300 ft C_v = 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	413	17	-	-	-	-	
Initial Time	100	9	0.090	-	8.1	12.3	DCM Eq. 6-8
Shallow Channel	166	5	0.030	1.2	2.3	-	DCM Eq. 6-9
Channelized	147	3	0.020	1.2	2.0	-	V-Ditch
				t_c	**12.3**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.05	3.82	4.46	5.09	5.73	6.41
Runoff (cfs)	0.6	**1.1**	1.7	2.7	3.5	**4.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	**1.1**	1.7	2.7	3.5	**4.4**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-J Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	97,872	2.25	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	7,699	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	**105,571**	**2.42**	**0.08**	**0.14**	**0.21**	**0.30**	**0.35**	**0.39**	**7.3%**
	105571								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	518	28	-	-	-	-	
Initial Time	100	7	0.070	-	9.1	12.9	DCM Eq. 6-8
Shallow Channel	144	11	0.076	1.9	1.2	-	DCM Eq. 6-9
Channelized	274	10	0.036	3.4	1.3	-	V-Ditch
				t_c	**11.7**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.11	3.89	4.54	5.19	5.84	6.54
Runoff (cfs)	0.6	**1.3**	2.3	3.8	4.9	**6.3**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	**1.3**	2.3	3.8	4.9	**6.3**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-K Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	115,609	2.65	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**115,609**	**2.65**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	115609								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	150	13	-	-	-	-	
Initial Time	150	13	0.087	-	11.1	10.8	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**10.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.20	4.01	4.68	5.35	6.01	6.73
Runoff (cfs)	0.2	**0.9**	1.9	3.5	4.8	**6.3**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	**0.9**	1.9	3.5	4.8	**6.3**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-L Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	93,208	2.14	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**93,208**	**2.14**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	93208								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	430	16	-	-	-	-	
Initial Time	206	11	0.053	-	15.2	12.4	DCM Eq. 6-8
Shallow Channel	224	5	0.020	1.0	3.8	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**12.4**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.04	3.81	4.44	5.08	5.71	6.39
Runoff (cfs)	0.1	**0.7**	1.4	2.7	3.7	**4.8**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.7**	1.4	2.7	3.7	**4.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-M Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Paved	3,980	0.09	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	174,550	4.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**178,530**	**4.10**	**0.04**	**0.10**	**0.17**	**0.27**	**0.31**	**0.36**	**2.2%**
	178530								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	873	24	-	-	-	-	
Initial Time	108	4	0.037	-	12.2	14.9	DCM Eq. 6-8
Shallow Channel	453	10	0.022	1.0	7.3	-	DCM Eq. 6-9
Channelized	312	10	0.032	1.5	3.5	-	V-Ditch
				t_c	**14.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.82	3.54	4.13	4.72	5.30	5.94
Runoff (cfs)	0.5	**1.4**	2.8	5.1	6.8	**8.8**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.5	**1.4**	2.8	5.1	6.8	**8.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Combined Sub-Basin Runoff Calculations - DP6 Existing

Includes Basins OS-B1A OS-B1B EX-B EX-C

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	1,210,111	27.78	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	1,676	0.04	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,329	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**3,130,493**	**71.87**	**0.06**	**0.10**	**0.19**	**0.29**	**0.34**	**0.38**	**6.5%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	378	9	77	0	2	5.7	1.1
Channelized-2									
Channelized-3									
Total			2,389	93					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **22.3**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
Intensity (in/hr)	2.34	2.93	3.42	3.90	4.39	4.91
Site Runoff (cfs)	9.54	**21.95**	47.25	80.28	106.06	**134.13**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**22.0**	-	-	-	**134.1**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations- DP6A Existing

Includes Basins OS-B1C EX-E1

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	38,377	0.88	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	-	0.00	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	175,042	4.02	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	15,215	0.35	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**228,634**	**5.25**	**0.16**	**0.21**	**0.27**	**0.35**	**0.40**	**0.44**	**19.4%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1C	-	528	16	-	-	-	-	12.9
Channelized-1	V-Ditch	2	963	36	4	0	2	3.2	5.0
Channelized-2									
Channelized-3									
Total			1,491	52					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **17.9**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
Intensity (in/hr)	2.60	3.25	3.80	4.34	4.88	5.46
Site Runoff (cfs)	2.16	**3.57**	5.39	8.06	10.17	**12.59**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**3.6**	-	-	-	**12.6**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations- DP6B Existing

Includes Basins OS-B1A OS-B1B EX-B EX-C EX-D

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	13,544	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,498,699	34.41	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	6,978	0.16	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**3,439,968**	**78.97**	**0.06**	**0.11**	**0.19**	**0.29**	**0.34**	**0.38**	**6.5%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **24.1**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	10.21	**23.52**	49.78	84.64	111.76	**141.47**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**23.5**	-	-	-	**141.5**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations- DP6C Existing

Includes Basins OS-B1A OS-B1B EX-B EX-C EX-D OS-B1C EX-E1

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	47,747	1.10	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	13,544	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,673,741	38.42	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	22,193	0.51	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**3,668,602**	**84.22**	**0.06**	**0.11**	**0.20**	**0.29**	**0.34**	**0.38**	**7.3%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **24.1**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	0	0	**0**
WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	12.08	**26.60**	54.43	91.60	120.54	**152.34**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**26.6**	-	-	-	**152.3**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP7 Existing

Includes Basins OS-B1D EX-F1

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	366,112	8.40	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	9,594	0.22	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,538	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	160,546	3.69	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**543,790**	**12.48**	**0.21**	**0.25**	**0.31**	**0.39**	**0.43**	**0.47**	**26.6%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	869	32	12	0	2	4.2	3.5
Channelized-2									
Channelized-3									
Total			2,111	73					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **20.4**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
Intensity (in/hr)	2.45	3.06	3.57	4.08	4.59	5.14
Site Runoff (cfs)	6.32	**9.69**	13.96	19.88	24.66	**30.15**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**9.7**	-	-	-	**30.2**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP8A Existing

Includes Basins OS-B1E OS-B3A EX-H EX-I

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	500,305	11.49	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	22,295	0.51	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**1,085,474**	**24.92**	**0.07**	**0.12**	**0.20**	**0.30**	**0.34**	**0.39**	**7.8%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	524	22	20	0	2	5.0	1.7
Channelized-2									
Channelized-3									
Total			1,928	83					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **19.5**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.50	3.12	3.65	4.17	4.69	5.25
Site Runoff (cfs)	4.29	**9.16**	18.36	30.66	40.24	**50.77**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**9.2**	-	-	-	**50.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP9 Existing

Includes Basins OS-B1D EX-F1 EX-F2

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	453,604	10.41	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	9,594	0.22	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	8,014	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	160,546	3.69	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**631,758**	**14.50**	**0.18**	**0.23**	**0.29**	**0.37**	**0.41**	**0.45**	**23.0%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	1,500	58	12	0	2	4.3	5.9
Channelized-2									
Channelized-3									
Total			2,742	99					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **22.8**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.32	2.89	3.38	3.86	4.34	4.86
Site Runoff (cfs)	6.09	**9.65**	14.25	20.77	25.98	**31.97**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**9.7**	-	-	-	**32.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP11 Existing

Includes Basins OS-B3B EX-M

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	174,550	4.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	3,980	0.09	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**287,576**	**6.60**	**0.05**	**0.11**	**0.19**	**0.28**	**0.33**	**0.38**	**5.6%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B3B	-	636	29	-	-	-	-	13.5
Channelized-1	V-Ditch	2	873	24	6	0	2	3.2	4.6
Channelized-2									
Channelized-3									
Total			1,509	53					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **18.1**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
Intensity (in/hr)	2.59	3.24	3.78	4.32	4.86	5.44
Site Runoff (cfs)	0.94	**2.28**	4.67	8.05	10.64	**13.55**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**2.3**	-	-	-	**13.5**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP12 Existing

Includes Basins OS-B1E OS-B3A EX-H EX-I EX-J

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	598,177	13.73	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	29,994	0.69	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**1,191,045**	**27.34**	**0.07**	**0.12**	**0.20**	**0.30**	**0.34**	**0.39**	**7.7%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	955	34	20	0	2	4.7	3.4
Channelized-2									
Channelized-3									
Total			2,359	95					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **21.2**

Storage Volume

40 -hr release time

Detention is NOT required

Water Quality is NOT required

EURV	0.00 (in)		a =	1			
WQCV	0.00 (in)						
i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**		
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.40	3.00	3.51	4.01	4.51	5.04
Site Runoff (cfs)	4.62	**9.82**	19.41	32.40	42.49	**53.64**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**9.8**	-	-	-	**53.6**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP13 Existing

Includes Basins OS-B3C EX-L

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	93,208	2.14	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	-	0.00	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**352,540**	**8.09**	**0.06**	**0.11**	**0.20**	**0.29**	**0.34**	**0.39**	**8.1%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B3C	-	994	38	-	-	-	-	15.5
Channelized-1	V-Ditch	2	430	16	14	0	2	4.4	1.6
Channelized-2									
Channelized-3									
Total			1,424	54					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **17.2**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	0	0	**0**
WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.65	3.32	3.87	4.43	4.98	5.57
Site Runoff (cfs)	1.38	**2.94**	6.31	10.54	13.87	**17.44**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**2.9**	-	-	-	**17.4**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Sub-Basin A1 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	202,272	4.64	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	8,500	0.20	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	4,800	0.11	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	**215,572**	**4.95**	**0.07**	**0.12**	**0.19**	**0.29**	**0.33**	**0.38**	**5.8%**
	215572								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	636	52	-	-	-	-	
Initial Time	299	32	0.107	-	13.9	13.5	DCM Eq. 6-8
Shallow Channel	337	20	0.059	1.7	3.3	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**13.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.68	4.29	4.90	5.51	6.17
Runoff (cfs)	1.0	**2.3**	4.0	6.9	9.1	**11.7**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.0	**2.3**	4.0	6.9	9.1	**11.7**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin A2 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	75,899	1.74	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**75,899**	**1.74**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	75899								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	392	34	-	-	-	-	
Initial Time	154	20	0.130	-	9.8	12.2	DCM Eq. 6-8
Shallow Channel	238	14	0.059	1.7	2.3	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**12.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.06	3.84	4.48	5.12	5.76	6.44
Runoff (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin B Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	6,776	0.16	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	10,209	0.23	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	172,335	3.96	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**189,320**	**4.35**	**0.09**	**0.15**	**0.21**	**0.31**	**0.35**	**0.40**	**8.6%**
	189320								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	516	19	-	-	-	-	
Initial Time	100	8	0.075	-	8.8	12.9	DCM Eq. 6-8
Shallow Channel	176	6	0.031	1.2	2.4	-	DCM Eq. 6-9
Channelized	240	6	0.023	3.2	1.2	-	V-Ditch
				t_c	**12.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.03	3.80	4.43	5.07	5.70	6.38
Runoff (cfs)	1.2	**2.4**	4.1	6.7	8.7	**11.1**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.2	**2.4**	4.1	6.7	8.7	**11.1**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin C Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	1,698	0.04	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	959	0.02	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	69,865	1.60	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**72,522**	**1.66**	**0.05**	**0.11**	**0.17**	**0.27**	**0.32**	**0.37**	**3.4%**
	72522								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	338	17	-	-	-	-	
Initial Time	100	5	0.050	-	10.6	11.9	DCM Eq. 6-8
Shallow Channel	238	12	0.050	1.6	2.5	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**11.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.09	3.87	4.52	5.16	5.81	6.50
Runoff (cfs)	0.2	**0.7**	1.3	2.3	3.1	**4.0**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	**0.7**	1.3	2.3	3.1	**4.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin D Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	11,254	0.26	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	9,576	0.22	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	279,275	6.41	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**309,475**	**7.10**	**0.09**	**0.14**	**0.21**	**0.30**	**0.35**	**0.40**	**8.8%**
	309475								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	881	42	-	-	-	-	
Initial Time	100	7	0.070	-	9.1	14.9	DCM Eq. 6-8
Shallow Channel	160	14	0.088	2.1	1.3	-	DCM Eq. 6-9
Channelized	621	21	0.034	4.2	2.5	-	V-Ditch
				t_c	**12.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.00	3.75	4.38	5.00	5.63	6.30
Runoff (cfs)	1.9	**3.9**	6.5	10.8	14.0	**17.7**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.9	**3.9**	6.5	10.8	14.0	**17.7**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin E1 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	17,165	0.39	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	1,152	0.03	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	111,118	2.55	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	19,121	0.44	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**148,556**	**3.41**	**0.18**	**0.23**	**0.29**	**0.37**	**0.41**	**0.45**	**21.5%**
	148556								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	965	21	-	-	-	-	
Initial Time	100	7	0.070	-	8.3	15.4	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	865	14	0.016	2.7	5.3	-	V-Ditch
				t_c	**13.6**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.67	4.28	4.89	5.50	6.15
Runoff (cfs)	1.8	**2.8**	4.2	6.2	7.7	**9.5**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.8	**2.8**	4.2	6.2	7.7	**9.5**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin E2 (DP8) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	26,889	0.62	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	5,760	0.13	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	269,259	6.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	36,575	0.84	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**338,483**	**7.77**	**0.15**	**0.20**	**0.26**	**0.35**	**0.39**	**0.43**	**17.5%**

338483

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,139	37	-	-	-	-	
Initial Time	299	10	0.033	-	18.8	16.3	DCM Eq. 6-8
Shallow Channel	222	12	0.054	1.6	2.3	-	DCM Eq. 6-9
Channelized	618	15	0.024	3.8	2.7	-	V-Ditch
				t_c	**16.3**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.71	3.39	3.96	4.53	5.09	5.70
Runoff (cfs)	3.1	**5.3**	8.1	12.2	15.5	**19.2**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	3.1	**5.3**	8.1	12.2	15.5	**19.2**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin F1 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	19,794	0.45	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	13,312	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	215,748	4.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	32,283	0.74	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**281,137**	**6.45**	**0.17**	**0.22**	**0.28**	**0.37**	**0.41**	**0.45**	**20.3%**

281137

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	682	20	-	-	-	-	
Initial Time	100	2	0.020	-	12.6	13.8	DCM Eq. 6-8
Shallow Channel	343	4	0.012	0.8	7.6	-	DCM Eq. 6-9
Channelized	239	14	0.056	4.9	0.8	-	V-Ditch
				t_c	**13.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.65	4.26	4.86	5.47	6.12
Runoff (cfs)	3.3	**5.3**	7.8	11.5	14.5	**17.8**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	3.3	**5.3**	7.8	11.5	14.5	**17.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin F2 Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	3,253	0.07	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	79,615	1.83	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**87,968**	**2.02**	**0.09**	**0.15**	**0.21**	**0.31**	**0.35**	**0.40**	**8.9%**
	87968								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	631	29	-	-	-	-	
Initial Time	84	3	0.036	-	10.3	13.5	DCM Eq. 6-8
Shallow Channel	306	14	0.046	1.5	3.4	-	DCM Eq. 6-9
Channelized	241	12	0.050	3.5	1.1	-	V-Ditch
				t_c	**13.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.94	3.68	4.29	4.90	5.52	6.18
Runoff (cfs)	0.5	**1.1**	1.8	3.0	3.9	**5.0**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.5	**1.1**	1.8	3.0	3.9	**5.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin G (DP10) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	5,394	0.12	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	119,371	2.74	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**129,865**	**2.98**	**0.08**	**0.14**	**0.21**	**0.30**	**0.35**	**0.39**	**7.7%**
	129865								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	739	36	-	-	-	-	
Initial Time	126	12	0.095	-	9.3	14.1	DCM Eq. 6-8
Shallow Channel	186	6	0.032	1.3	2.5	-	DCM Eq. 6-9
Channelized	427	18	0.042	3.6	2.0	-	V-Ditch
				t_c	**13.7**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.92	3.66	4.27	4.88	5.49	6.14
Runoff (cfs)	0.7	**1.5**	2.6	4.4	5.7	**7.2**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.7	**1.5**	2.6	4.4	5.7	**7.2**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin H Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	7,650	0.18	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	19,307	0.44	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	151,721	3.48	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**178,678**	**4.10**	**0.14**	**0.20**	**0.26**	**0.35**	**0.39**	**0.44**	**14.7%**
	178678								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	690	35	-	-	-	-	
Initial Time	100	4	0.040	-	10.3	13.8	DCM Eq. 6-8
Shallow Channel	382	19	0.050	1.6	4.1	-	DCM Eq. 6-9
Channelized	208	12	0.058	4.2	0.8	-	V-Ditch
				t_c	**13.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.64	4.25	4.86	5.46	6.11
Runoff (cfs)	1.7	**2.9**	4.5	6.9	8.8	**10.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.7	**2.9**	4.5	6.9	8.8	**10.9**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin I Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	2,550	0.06	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	9,527	0.22	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	59,207	1.36	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**71,284**	**1.64**	**0.16**	**0.21**	**0.27**	**0.36**	**0.40**	**0.45**	**16.6%**
	71284								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	413	17	-	-	-	-	
Initial Time	100	9	0.090	-	7.8	12.3	DCM Eq. 6-8
Shallow Channel	166	5	0.030	1.2	2.3	-	DCM Eq. 6-9
Channelized	147	3	0.020	1.2	2.0	-	V-Ditch
				t_c	**12.0**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.08	3.86	4.50	5.14	5.78	6.47
Runoff (cfs)	0.8	**1.3**	2.0	3.0	3.8	**4.7**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.8	**1.3**	2.0	3.0	3.8	**4.7**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin J Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	9,725	0.22	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	90,746	2.08	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**105,571**	**2.42**	**0.13**	**0.19**	**0.25**	**0.34**	**0.38**	**0.43**	**13.6%**
	105571								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	518	28	-	-	-	-	
Initial Time	100	7	0.070	-	8.7	12.9	DCM Eq. 6-8
Shallow Channel	144	11	0.076	1.9	1.2	-	DCM Eq. 6-9
Channelized	274	10	0.036	3.4	1.3	-	V-Ditch
				t_c	**11.2**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.15	3.95	4.61	5.27	5.93	6.64
Runoff (cfs)	1.0	**1.8**	2.8	4.3	5.5	**6.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.0	**1.8**	2.8	4.3	5.5	**6.9**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin K Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	115,609	2.65	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**115,609**	**2.65**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**
	115609								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	150	13	-	-	-	-	
Initial Time	150	13	0.087	-	11.1	10.8	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**10.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.20	4.01	4.68	5.35	6.01	6.73
Runoff (cfs)	0.2	**0.9**	1.9	3.5	4.8	**6.3**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	**0.9**	1.9	3.5	4.8	**6.3**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin L Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	2,880	0.07	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	85,228	1.96	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**93,208**	**2.14**	**0.08**	**0.14**	**0.21**	**0.30**	**0.35**	**0.39**	**8.0%**
	93208								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	430	16	-	-	-	-	
Initial Time	206	11	0.053	-	14.3	12.4	DCM Eq. 6-8
Shallow Channel	224	5	0.022	1.0	3.6	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**12.4**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.04	3.81	4.44	5.08	5.71	6.39
Runoff (cfs)	0.6	**1.1**	2.0	3.3	4.2	**5.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	**1.1**	2.0	3.3	4.2	**5.4**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin M Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	6,860	0.16	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	166,570	3.82	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**178,530**	**4.10**	**0.07**	**0.13**	**0.20**	**0.29**	**0.34**	**0.39**	**6.4%**
	178530								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	873	24	-	-	-	-	
Initial Time	108	4	0.037	-	11.8	14.9	DCM Eq. 6-8
Shallow Channel	453	10	0.022	1.0	7.3	-	DCM Eq. 6-9
Channelized	312	10	0.032	1.5	3.5	-	V-Ditch
				t_c	**14.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.82	3.54	4.13	4.72	5.30	5.94
Runoff (cfs)	0.8	**1.9**	3.3	5.6	7.4	**9.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.8	**1.9**	3.3	5.6	7.4	**9.4**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Combined Sub-Basin Runoff Calculations - DP6 Developed

Includes Basins OS-B1A OS-B1B B C

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	1,199,474	27.54	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	8,474	0.19	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	11,168	0.26	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**3,130,493**	**71.87**	**0.06**	**0.11**	**0.19**	**0.29**	**0.34**	**0.38**	**6.8%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	378	9	77	0	2	5.7	1.1
Channelized-2									
Channelized-3									
Total			2,389	93					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **22.3**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	0	0	**0**
WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.34	2.93	3.42	3.90	4.39	4.91
Site Runoff (cfs)	9.97	**22.46**	47.80	80.84	106.66	**134.74**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**22.5**	-	-	-	**134.7**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations- DP6A Developed

Includes Basins OS-B1C E1

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	19,121	0.44	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	1,152	0.03	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	191,196	4.39	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	17,165	0.39	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**228,634**	**5.25**	**0.12**	**0.18**	**0.24**	**0.33**	**0.37**	**0.42**	**14.0%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1C	-	528	16	-	-	-	-	12.9
Channelized-1	V-Ditch	2	963	36	4	0	2	3.2	5.0
Channelized-2									
Channelized-3									
Total			1,491	52					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **17.9**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.60	3.25	3.80	4.34	4.88	5.46
Site Runoff (cfs)	1.67	**3.00**	4.76	7.46	9.55	**11.95**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**3.0**	-	-	-	**12.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations- DP6B Developed

Includes Basins OS-B1A OS-B1B B C D

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	20,744	0.48	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,478,749	33.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	19,728	0.45	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**3,439,968**	**78.97**	**0.06**	**0.11**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **24.1**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
i (return period)			
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	0	0	**0**
WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	10.99	**24.44**	50.77	85.64	112.83	**142.58**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**24.4**	-	-	-	**142.6**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations- DP6C Developed

Includes Basins OS-B1A OS-B1B B C D OS-B1C E1

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	28,491	0.65	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	21,896	0.50	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,669,945	38.34	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	36,893	0.85	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**3,668,602**	**84.22**	**0.07**	**0.11**	**0.20**	**0.29**	**0.34**	**0.39**	**7.5%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **24.1**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
i (return period)			
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	0	0	**0**
WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	12.43	**27.02**	54.88	92.08	121.07	**152.89**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**27.0**	-	-	-	**152.9**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP7 Developed

Includes Basins OS-B1D F1

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	478,401	10.98	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	19,794	0.45	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	13,312	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	32,283	0.74	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**543,790**	**12.48**	**0.10**	**0.15**	**0.22**	**0.31**	**0.36**	**0.40**	**10.5%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	869	32	12	0	2	4.2	3.5
Channelized-2									
Channelized-3									
Total			2,111	73					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **20.4**

Storage Volume

40 -hr release time

Detention is NOT required

Water Quality is NOT required

EURV	0.00 (in)		a =	1			
WQCV	0.00 (in)						
i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**		
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.45	3.06	3.57	4.08	4.59	5.14
Site Runoff (cfs)	3.03	**5.89**	9.78	15.83	20.46	**25.83**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**5.9**	-	-	-	**25.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP8A Developed

Includes Basins OS-B1E OS-B3A H I

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	483,566	11.10	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	10,200	0.23	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	28,834	0.66	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**1,085,474**	**24.92**	**0.08**	**0.13**	**0.21**	**0.30**	**0.35**	**0.40**	**9.2%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	524	22	20	0	2	5.0	1.7
Channelized-2									
Channelized-3									
Total			1,928	83					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **19.5**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.50	3.12	3.65	4.17	4.69	5.25
Site Runoff (cfs)	5.02	**10.02**	19.30	31.61	41.24	**51.82**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**10.0**	-	-	-	**51.8**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP9 Developed

Includes Basins OS-B1D F1 F2

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	558,016	12.81	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	24,894	0.57	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	16,565	0.38	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	32,283	0.74	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**631,758**	**14.50**	**0.10**	**0.15**	**0.22**	**0.31**	**0.36**	**0.40**	**10.3%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	1,500	58	12	0	2	4.3	5.9
Channelized-2									
Channelized-3									
Total			2,742	99					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **22.8**

Storage Volume

40 -hr release time

Detention is NOT required

EURV 0.00 (in) a = 1

Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.32	2.89	3.38	3.86	4.34	4.86
Site Runoff (cfs)	3.30	**6.43**	10.70	17.35	22.43	**28.33**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**6.4**	-	-	-	**28.3**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP11 Developed

Includes Basins OS-B3B M

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	166,570	3.82	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	6,860	0.16	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**287,576**	**6.60**	**0.08**	**0.13**	**0.21**	**0.30**	**0.35**	**0.39**	**8.2%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B3B	-	636	29	-	-	-	-	13.5
Channelized-1	V-Ditch	2	873	24	6	0	2	3.2	4.6
Channelized-2									
Channelized-3									
Total			1,509	53					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **18.1**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
Intensity (in/hr)	2.59	3.24	3.78	4.32	4.86	5.44
Site Runoff (cfs)	1.29	**2.70**	5.13	8.51	11.14	**14.06**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**2.7**	-	-	-	**14.1**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP12 Developed

Includes Basins OS-B1E OS-B3A H I J

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	574,312	13.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	15,300	0.35	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	38,559	0.89	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**1,191,045**	**27.34**	**0.09**	**0.13**	**0.22**	**0.31**	**0.36**	**0.40**	**9.6%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	955	34	20	0	2	4.7	3.4
Channelized-2									
Channelized-3									
Total			2,359	95					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **21.2**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.40	3.00	3.51	4.01	4.51	5.04
Site Runoff (cfs)	5.61	**10.99**	20.68	33.69	43.86	**55.06**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**11.0**	-	-	-	**55.1**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations - DP13 Developed

Includes Basins OS-B3C L

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	85,228	1.96	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	2,880	0.07	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**352,540**	**8.09**	**0.08**	**0.13**	**0.22**	**0.31**	**0.36**	**0.40**	**10.2%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-B3C	-	994	38	-	-	-	-	15.5
Channelized-1	V-Ditch	2	430	16	14	0	2	4.4	1.6
Channelized-2									
Channelized-3									
Total			1,424	54					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **17.2**

Storage Volume

40 -hr release time — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

i (return period)	5-year	10-year	100-year		Design Volume (ft^3)			
K_i (ft)	0.0000	0.0000	0		% Storage	100-year	WQCV	Total
V_i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	**0**
V_i (ft^3)	0	0	0	WQCV	0%		0	**0**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas: OS-B4B

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.65	3.32	3.87	4.43	4.98	5.57
Site Runoff (cfs)	1.74	**3.37**	6.78	11.01	14.37	**17.96**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**3.4**	-	-	-	**18.0**

DCM: I = C1 * ln (tc) + C2

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer:	**O. Ali**
Company:	**M.V.E., Inc.**
Date:	**February 2, 2023**
Project:	**Eagle Rising**
Location:	**Eagle Wing Drive**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.42 inches (for Watersheds Outside of th

Please provide discussion in the text above on how this was selected. If helpful, provide an annotated copy of Figure 3-1 (and any other applicable MHFD figures or equations)

Area Type	UIA:RPA											
Area ID	1											
Downstream Design Point ID	1											
Downstream BMP Type	None											
DCIA (ft^2)	--											
UIA (ft^2)	33,190											
RPA (ft^2)	17,355											
SPA (ft^2)	--											
HSG A (%)	0%											
HSG B (%)	100%											
HSG C/D (%)	0%											
Average Slope of RPA (ft/ft)	0.167											
UIA:RPA Interface Width (ft)	895.00											

CALCULATED RUNOFF RESULTS

Area ID	1											
UIA:RPA Area (ft^2)	50,545											
L / W Ratio	0.06											
UIA / Area	0.6566											
Runoff (in)	0.00											
Runoff (ft^3)	0											
Runoff Reduction (ft^3)	1383											

CALCULATED WQCV RESULTS

Area ID	1											
WQCV (ft^3)	1351											
WQCV Reduction (ft^3)	1351											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	1											
DCIA (ft^2)	0											
UIA (ft^2)	33,190											
RPA (ft^2)	17,355											
SPA (ft^2)	0											
Total Area (ft^2)	50,545											
Total Impervious Area (ft^2)	33,190											
WQCV (ft^3)	1,351											
WQCV Reduction (ft^3)	1,351											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	50,545
Total Impervious Area (ft^2)	33,190
WQCV (ft^3)	1,351
WQCV Reduction (ft^3)	1,351
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

LEGEND

PROPERTY LINE

EASEMENT LINE

EXISTING

5985 INDEX CONTOUR

84 INTERMEDIATE CONTOUR

PROPOSED

5985 INDEX CONTOUR

84 INTERMEDIATE CONTOUR

AREA BOUNDARY

1 AREA I.D.

SURFACE TYPES

UNCONNECTED IMPERVIOUS AREA (UIA)	
RECEIVING PERVIOUS AREA (RPA)	
EXCLUDED PER ECM I.7.1.B.5	

30'X30 900 SF EXIST'G WATER WELL SITE - SEE DEV NOTE NO. 14

WELL

LOT 9
2.50 AC

LOT 10
2.50 AC

LOT 11
2.50 AC

WETLAND 2

Notes:
1) The UIAs and RPAs should be split into different tributary sections (on this map and as separate columns on the calcs spreadsheet on the previous page). The road grade is shown as typically superelevated to one side or the other. Meaning half of the entire road (longitudinally) isn't treated by each RPA on either side of the road. So if in one section of the road, the entire width of the road is tributary to the southern RPA, the southern RPA will need to have more width (unless limited by Note 2 below).
2) For RPAs within a ditch, only count the area from the edge of road to flowline. The far slope of the ditch cannot be counted. Revise the RPA areas accordingly.
3) RPAs must be fully vegetated. From aerial imagery, alot of the RPAs adjacent to the existing road is not vegetated. Reflect this need for seeding on the GEC Plan.
4) The runoff reduction RPA is considered a WQ Facility and requires a signed Maintenance Agreement
5) All RPA/SPA areas will need to be within a no build/drainage easement (or tract) and discussed in the maintenance agreement and O&M manual.

Other guidance for Runoff Reduction from MHFD:
- Turf grass vegetation should have a uniform density of at least 80%.
- Irrigation (temp or permanent) is necessary to establish sufficient vegetation and not just weeds.
- Show suitability of topsoil of RPA and steps for proper preparation of topsoil per recommendations in MHFD detail T-0 Table RR-3
- RPA/SPA limits must be shown on GEC Plans (not just FDR) so our SW inspectors and the QSM know that these areas are to remain pervious and vegetated (80%). Our SW inspectors do not look at drainage reports.

SEPTIC SYSTEM

1

TRACT 'B'
PRIVATE ROAD ROW
1.31 AC

LOT 2
2.50 AC

LOT 3
2.50 AC

LOT 1
2.50 AC

LOT 12
2.50 AC

EAGLE WING DRIVE

WETLAND 4

EXISTING CULVERT
15" CSP

VICINITY MAP
NOT TO SCALE

SITE

EAGLE WING DRIVE

BLACK FOREST ROAD

VOLLMER ROAD

BENCHMARK

1" = 40' 1:480

MVE, INC.
ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING

BMP AREA ID MAP

MVE PROJECT 61145
MVE DRAWING BMP-Area

AUGUST 31, 2023
SHEET 1 OF 1

12. Hydraulic Calculations

Culvert Calculations
Ditch Flow Calculations

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Nov 17 2023

61145 - Eagle Rising DP-E13 Exist 15in RCP Culvert

Invert Elev Dn (ft)	=	7136.00
Pipe Length (ft)	=	30.00
Slope (%)	=	2.00
Invert Elev Up (ft)	=	7136.60
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.013
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

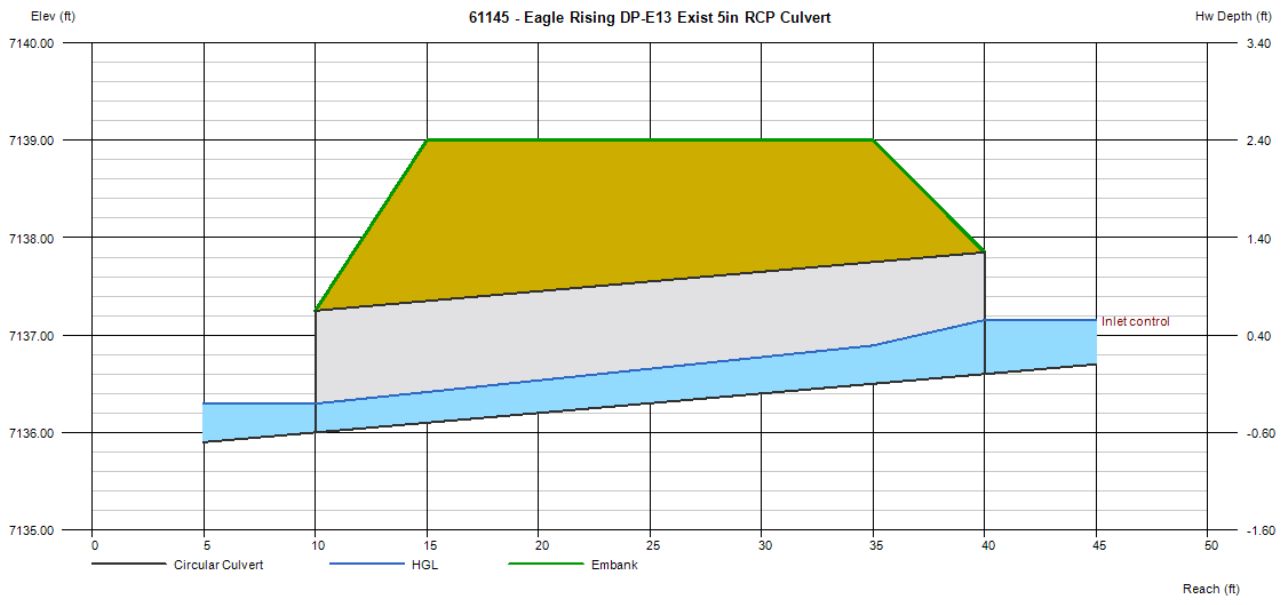
Top Elevation (ft)	=	7139.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	1.10
Qmax (cfs)	=	6.20
Tailwater Elev (ft)	=	Normal

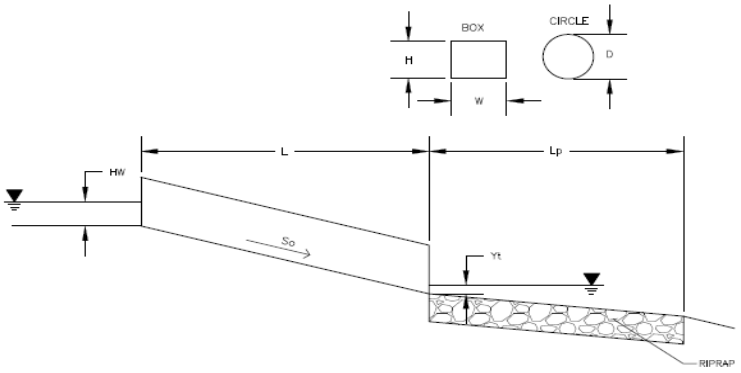
Highlighted

Qtotal (cfs)	=	1.10
Qpipe (cfs)	=	1.10
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.97
Veloc Up (ft/s)	=	3.11
HGL Dn (ft)	=	7136.30
HGL Up (ft)	=	7137.01
Hw Elev (ft)	=	7137.15
Hw/D (ft)	=	0.44
Flow Regime	=	Inlet Control



Determination of Culvert Headwater and Outlet Protection

Project: 61145 - Eagle Rising
Basin ID: DP E13 24in RCP Driveway Culvert



Soil Type:
Choose One:
- ○ Sandy
- ◉ Non-Sandy

Design Information (Input):

Design Discharge	Q =	6.1	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)		Grooved End Projection	
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	Height (Rise) =		ft
Barrel Width (Span) in Feet	Width (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	No =	1	
Inlet Elevation	Elev IN =	7136.6	ft
Outlet Elevation **OR** Slope	Elev OUT =	7136	ft
Culvert Length	L =	30	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	Elev Y_t =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.80	ft
Flow Area at Max Channel Velocity	A_t =	3.69	ft^2
Culvert Cross Sectional Area Available	A =	3.14	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.62	
Sum of All Losses Coefficients	k_s =	1.82	ft
Culvert Normal Depth	Y_n =	1.46	ft
Culvert Critical Depth	Y_c =	1.78	ft
Tailwater Depth for Design	d =	1.89	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	-	ft
Expansion Factor	1/(2*tan(Θ)) =	2.88	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	4.56	$ft^{0.5}/s$
Froude Number	Fr =	-	**Pressure flow!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.40	
Inlet Control Headwater	HW_I =	3.50	ft
Outlet Control Headwater	HW_O =	3.29	
Design Headwater Elevation	**HW =**	**7,150.00**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.75**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	8	in
Nominal Riprap Size	d_{50} =	9	in
UDFCD Riprap Type	**Type =**	**L**	
Length of Protection	**L_p =**	**8**	**ft**
Width of Protection	**T =**	**5**	**ft**

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Nov 17 2023

61145 - Eagle Rising DP7 23x14 HE-RCP Driveway Culvert Lot 7 flag

Invert Elev Dn (ft)	=	7146.00
Pipe Length (ft)	=	50.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	7146.50
Rise (in)	=	14.0
Shape	=	Elliptical
Span (in)	=	23.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

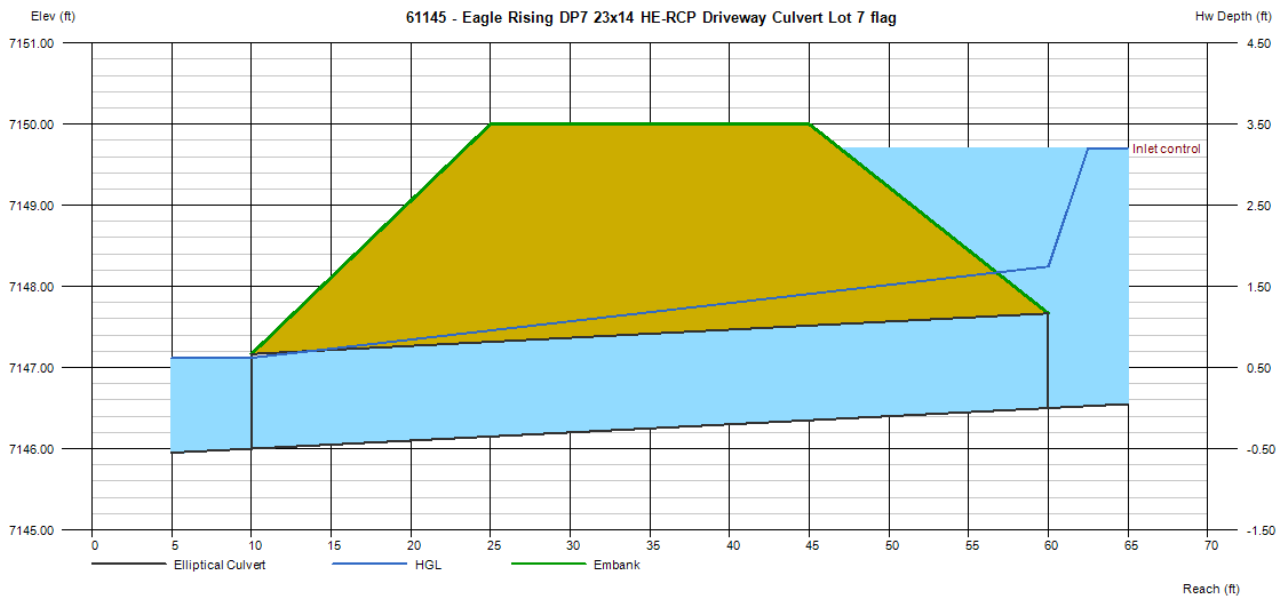
Top Elevation (ft)	=	7150.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	115.00

Calculations

Qmin (cfs)	=	30.60
Qmax (cfs)	=	30.60
Tailwater Elev (ft)	=	(dc+D)/2

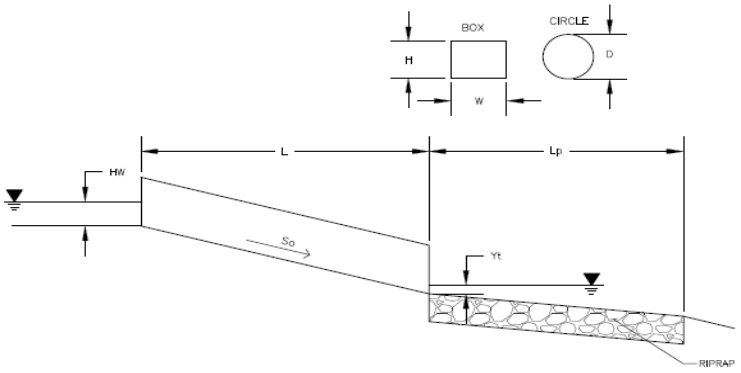
Highlighted

Qtotal (cfs)	=	30.60
Qpipe (cfs)	=	30.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.71
Veloc Up (ft/s)	=	8.71
HGL Dn (ft)	=	7147.12
HGL Up (ft)	=	7148.24
Hw Elev (ft)	=	7149.71
Hw/D (ft)	=	2.75
Flow Regime	=	Inlet Control



Determination of Culvert Headwater and Outlet Protection

Project: 61145 - Eagle Rising
Basin ID: DP7 30in RCP Driveway Culvert



Soil Type:
Choose One:
- ○ Sandy
- ◉ Non-Sandy

Design Information (Input):

Design Discharge	Q =	25.8	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)		Grooved End Projection	
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	Height (Rise) =		ft
Barrel Width (Span) in Feet	Width (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	No =	1	
Inlet Elevation	Elev IN =	7146.5	ft
Outlet Elevation **OR** Slope	Elev OUT =	7146	ft
Culvert Length	L =	50	ft
Manning's Roughness	n =	0.013	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	Elev Y_t =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.80	ft
Flow Area at Max Channel Velocity	A_t =	3.69	ft^2
Culvert Cross Sectional Area Available	A =	3.14	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.62	
Sum of All Losses Coefficients	k_s =	1.82	ft
Culvert Normal Depth	Y_n =	1.46	ft
Culvert Critical Depth	Y_c =	1.78	ft
Tailwater Depth for Design	d =	1.89	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	-	ft
Expansion Factor	1/(2*tan(Θ)) =	2.88	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	4.56	$ft^{0.5}/s$
Froude Number	Fr =	-	**Pressure flow!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.40	
Inlet Control Headwater	HW_I =	3.50	ft
Outlet Control Headwater	HW_O =	3.29	
Design Headwater Elevation	**HW =**	**7,150.00**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.75**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	8	in
Nominal Riprap Size	d_{50} =	9	in
UDFCD Riprap Type	**Type =**	**L**	
Length of Protection	**L_p =**	**8**	**ft**
Width of Protection	**T =**	**5**	**ft**

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

61145 - Eagle Rising DP8A 24in RCP Culvert

Invert Elev Dn (ft)	=	7129.68
Pipe Length (ft)	=	89.80
Slope (%)	=	3.73
Invert Elev Up (ft)	=	7133.03
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	2
n-Value	=	0.013
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

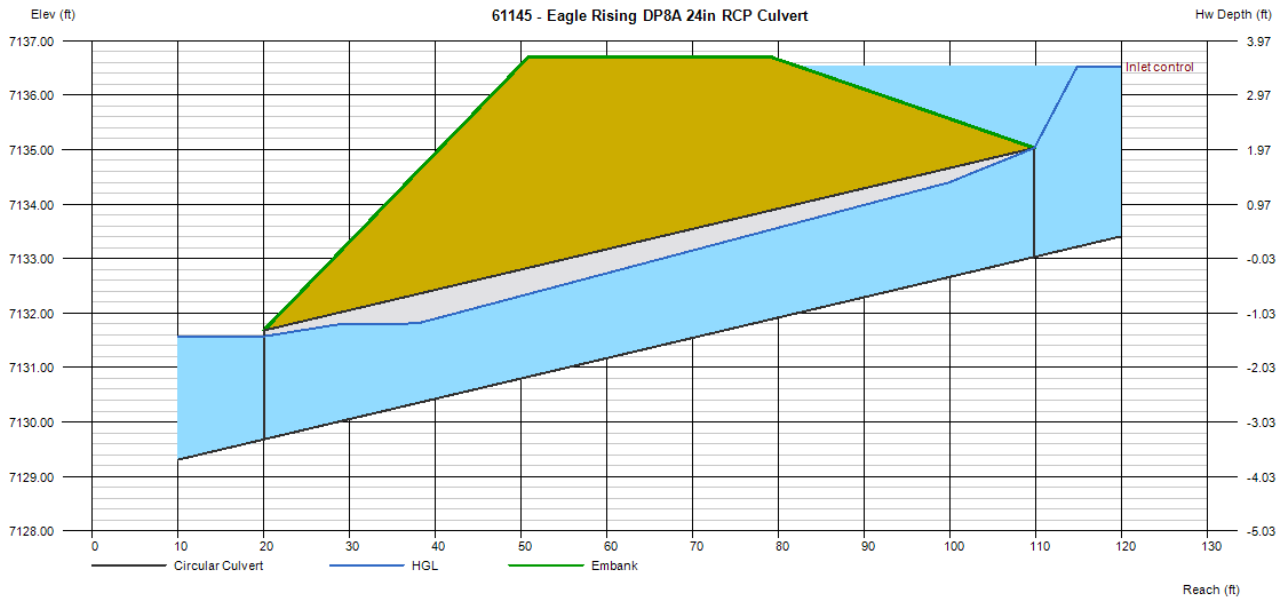
Top Elevation (ft)	=	7136.71
Top Width (ft)	=	28.00
Crest Width (ft)	=	205.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	51.80
Tailwater Elev (ft)	=	(dc+D)/2

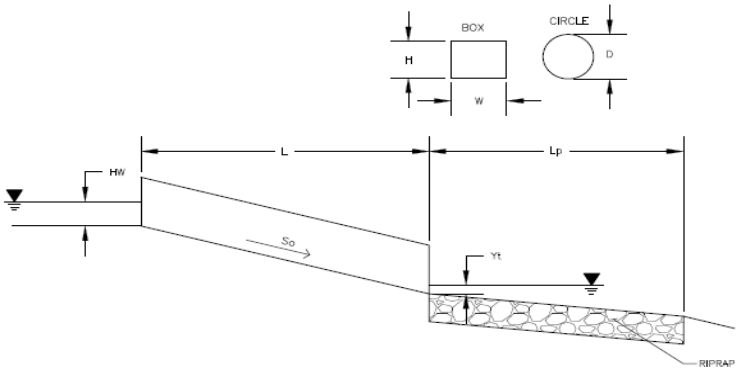
Highlighted

Qtotal (cfs)	=	51.80
Qpipe (cfs)	=	51.80
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.42
Veloc Up (ft/s)	=	8.76
HGL Dn (ft)	=	7131.57
HGL Up (ft)	=	7134.81
Hw Elev (ft)	=	7136.53
Hw/D (ft)	=	1.75
Flow Regime	=	Inlet Control



Determination of Culvert Headwater and Outlet Protection

Project: 61145 - Eagle Rising
Basin ID: DP8A Double 24in RCP



Soil Type:
Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

	Design Discharge	Q =	51.8	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	24	inches
	Inlet Edge Type (Choose from pull-down list)		1.5 : 1 Beveled Edge	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	2	
	Inlet Elevation	Elev IN =	7133.03	ft
	Outlet Elevation **OR** Slope	Elev OUT =	7129.68	ft
	Culvert Length	L =	89.8	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	7	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.80	ft
Flow Area at Max Channel Velocity	A_t =	3.70	ft^2
Culvert Cross Sectional Area Available	A =	3.14	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	1.11	
Sum of All Losses Coefficients	k_s =	2.31	ft
Culvert Normal Depth	Y_n =	1.11	ft
Culvert Critical Depth	Y_c =	1.78	ft
Tailwater Depth for Design	d =	1.89	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	1.55	ft
Expansion Factor	1/(2*tan(Θ)) =	4.22	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	4.58	$ft^{0.5}/s$
Froude Number	Fr =	2.70	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.52	
Inlet Control Headwater	HW_I =	3.32	ft
Outlet Control Headwater	HW_O =	0.98	
Design Headwater Elevation	**HW =**	**7,136.35**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.66**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	8	in
Nominal Riprap Size	d_{50} =	9	in
UDFCD Riprap Type	**Type =**	**L**	
Length of Protection	**L_p =**	**12**	**ft**
Width of Protection	**T =**	**5**	**ft**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 31 2023

Design Point E11 (Lot 1) - Redirect Culvert (21.3 cfs 100 Year)

Circular

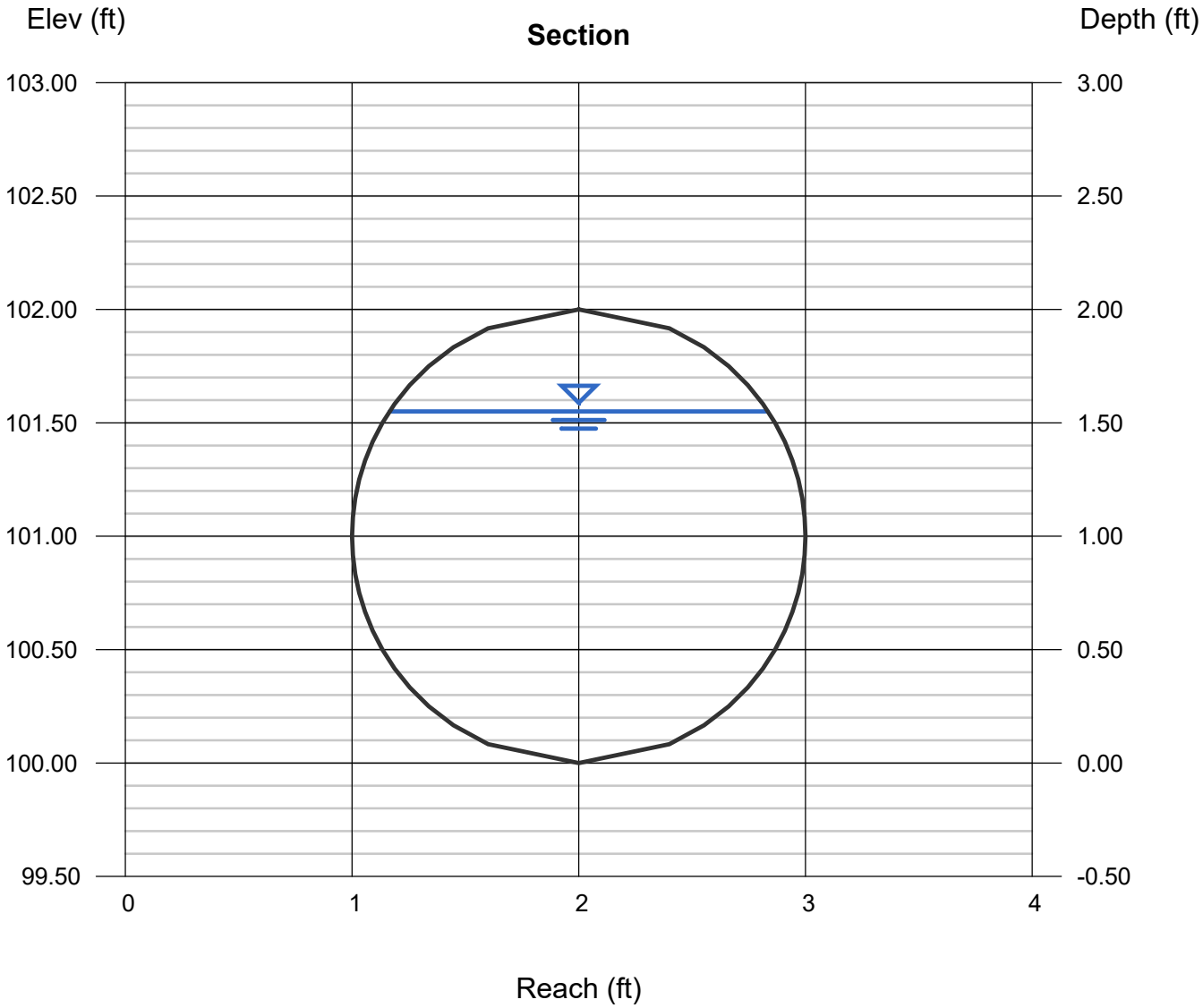
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 21.30

Highlighted

Depth (ft)	= 1.55
Q (cfs)	= 21.30
Area (sqft)	= 2.62
Velocity (ft/s)	= 8.15
Wetted Perim (ft)	= 4.31
Crit Depth, Yc (ft)	= 1.66
Top Width (ft)	= 1.67
EGL (ft)	= 2.58



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin B - Swale Calculation - Reach (Q5)

Trapezoidal

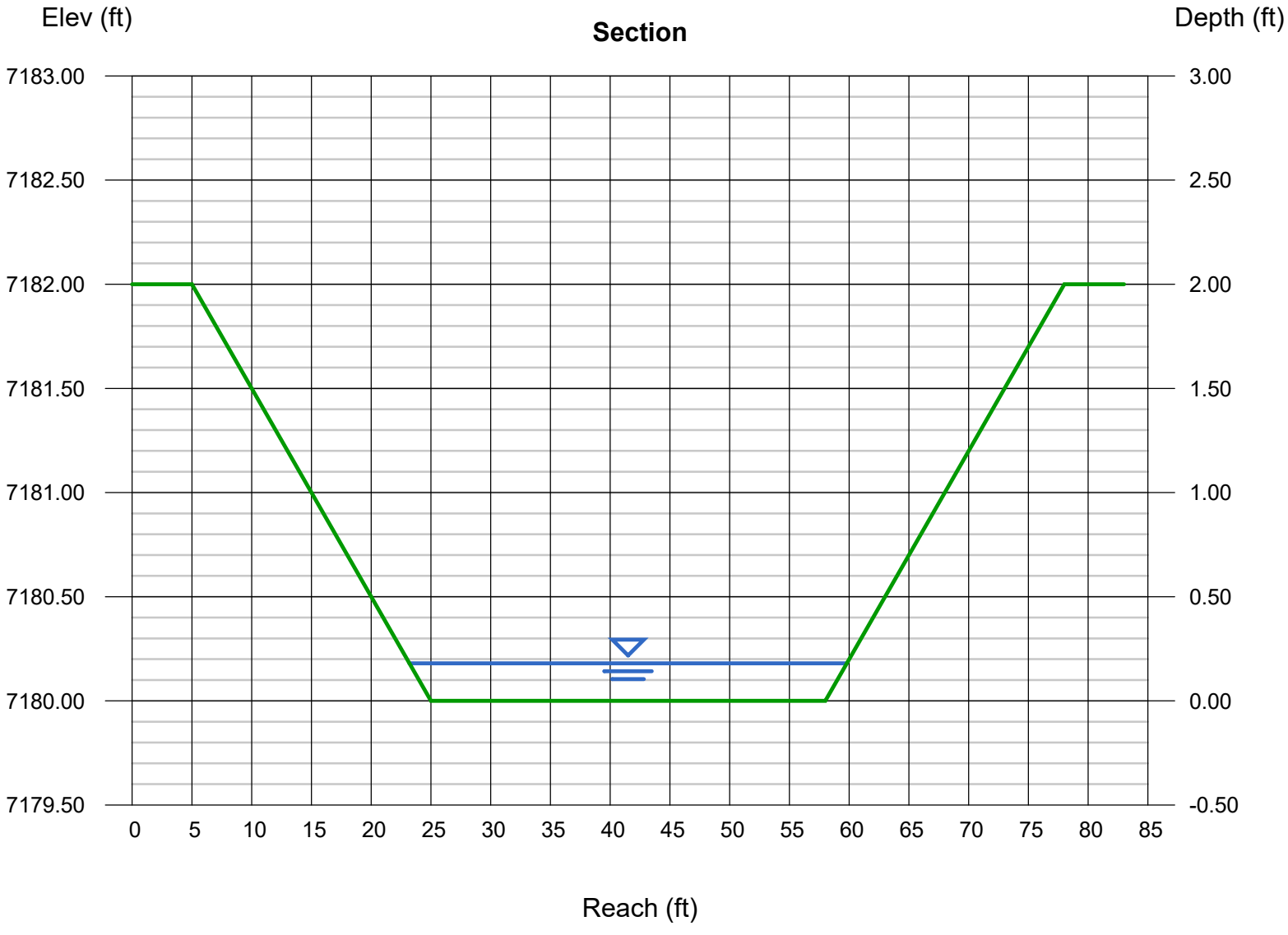
Bottom Width (ft)	= 33.00
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7180.00
Slope (%)	= 2.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.60

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 11.60
Area (sqft)	= 6.26
Velocity (ft/s)	= 1.85
Wetted Perim (ft)	= 36.62
Crit Depth, Yc (ft)	= 0.16
Top Width (ft)	= 36.60
EGL (ft)	= 0.23



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin B - Swale Calculation - Reach (Q100)

Trapezoidal

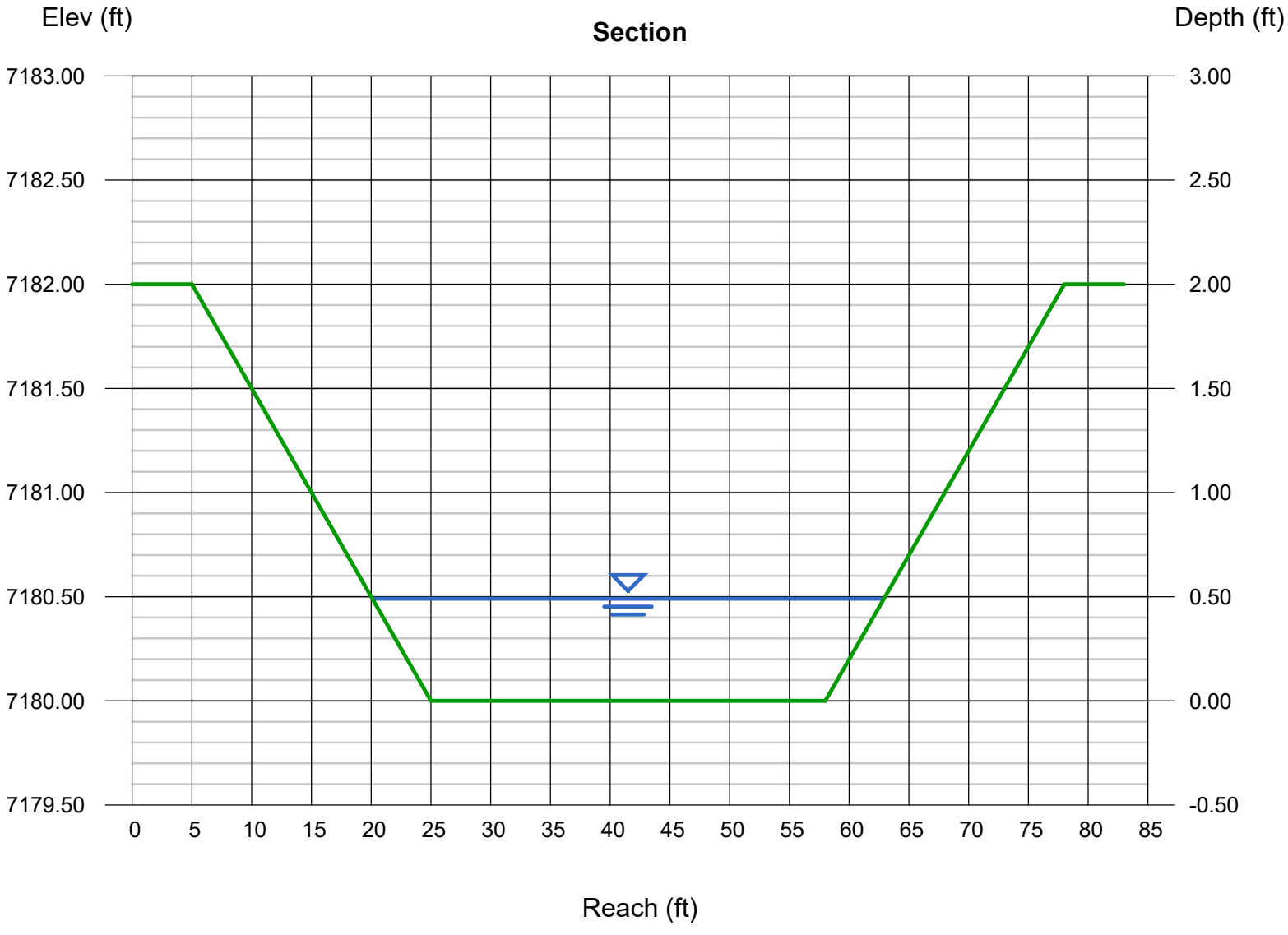
Bottom Width (ft)	= 33.00
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7180.00
Slope (%)	= 2.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 63.30

Highlighted

Depth (ft)	= 0.49
Q (cfs)	= 63.30
Area (sqft)	= 18.57
Velocity (ft/s)	= 3.41
Wetted Perim (ft)	= 42.85
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 42.80
EGL (ft)	= 0.67



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin C - Swale Calculation - Reach (Q5)

Trapezoidal

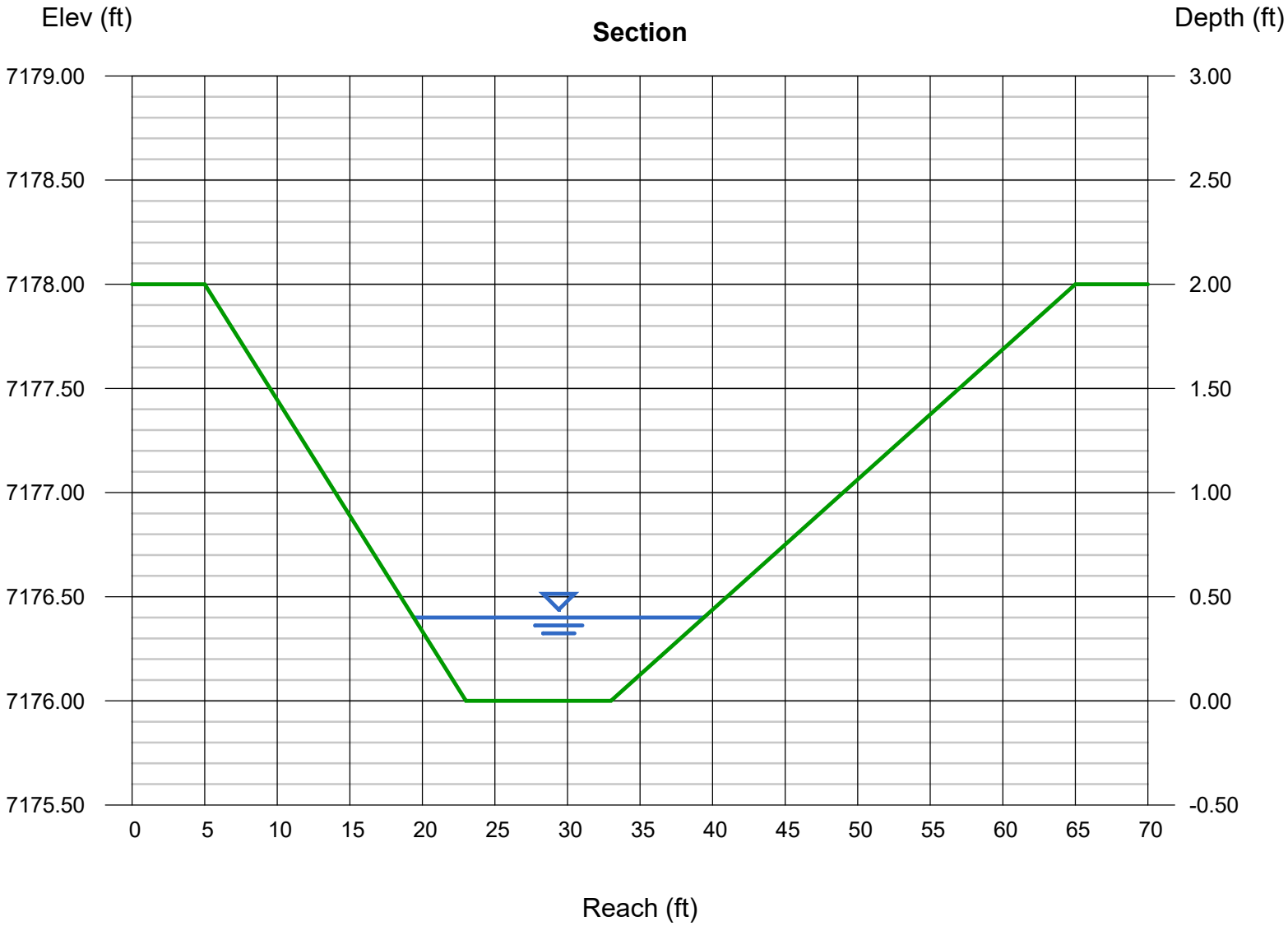
Bottom Width (ft)	= 10.00
Side Slopes (z:1)	= 9.00, 16.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7176.00
Slope (%)	= 1.60
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.60

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 12.60
Area (sqft)	= 6.00
Velocity (ft/s)	= 2.10
Wetted Perim (ft)	= 20.03
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 20.00
EGL (ft)	= 0.47



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin C - Swale Calculation - Reach (Q100)

Trapezoidal

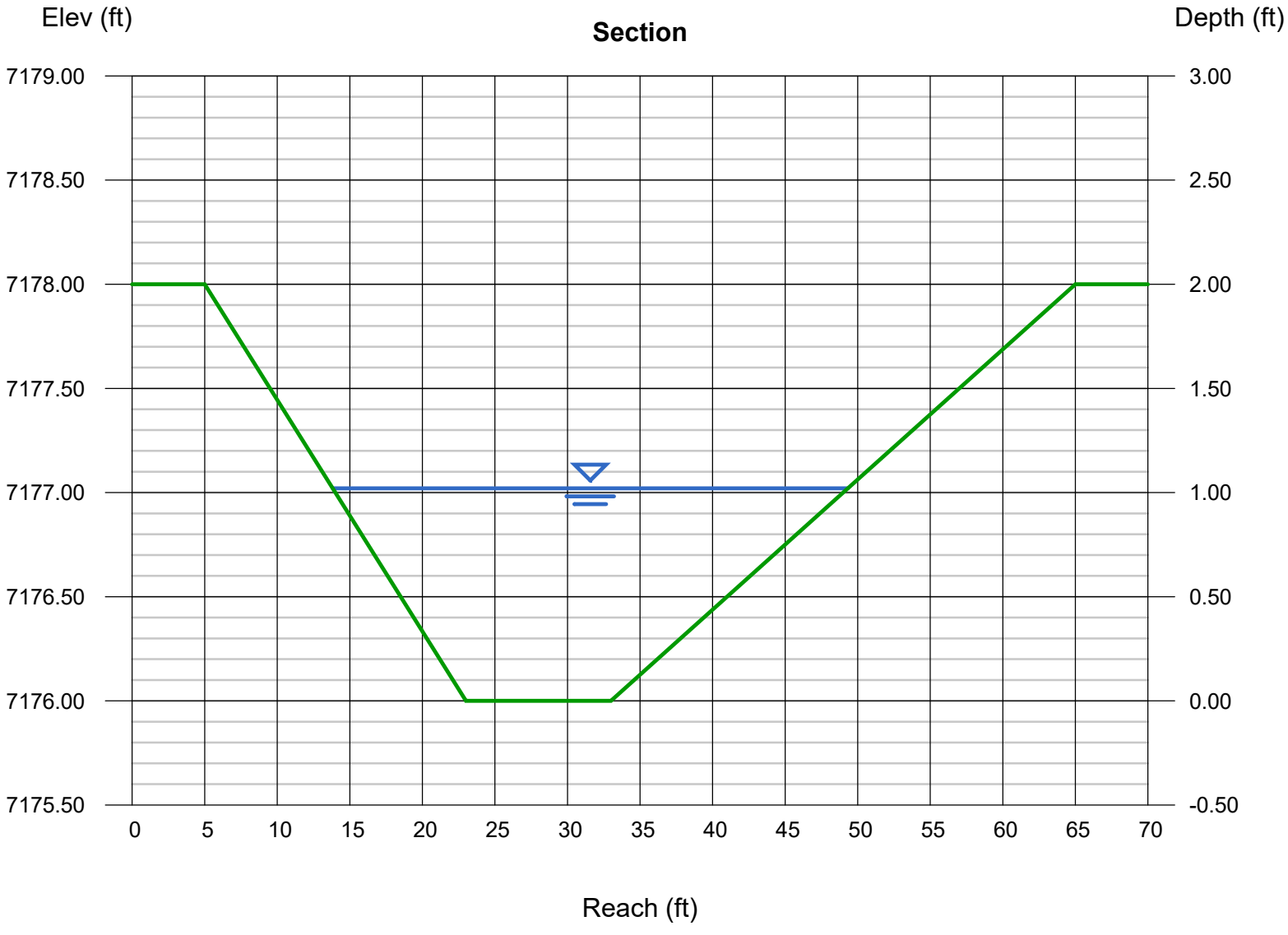
Bottom Width (ft)	= 10.00
Side Slopes (z:1)	= 9.00, 16.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7176.00
Slope (%)	= 1.60
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 80.70

Highlighted

Depth (ft)	= 1.02
Q (cfs)	= 80.70
Area (sqft)	= 23.20
Velocity (ft/s)	= 3.48
Wetted Perim (ft)	= 35.59
Crit Depth, Yc (ft)	= 0.89
Top Width (ft)	= 35.50
EGL (ft)	= 1.21



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 4 2023

Basin D - Swale Calculation - Reach (Q5)

Trapezoidal

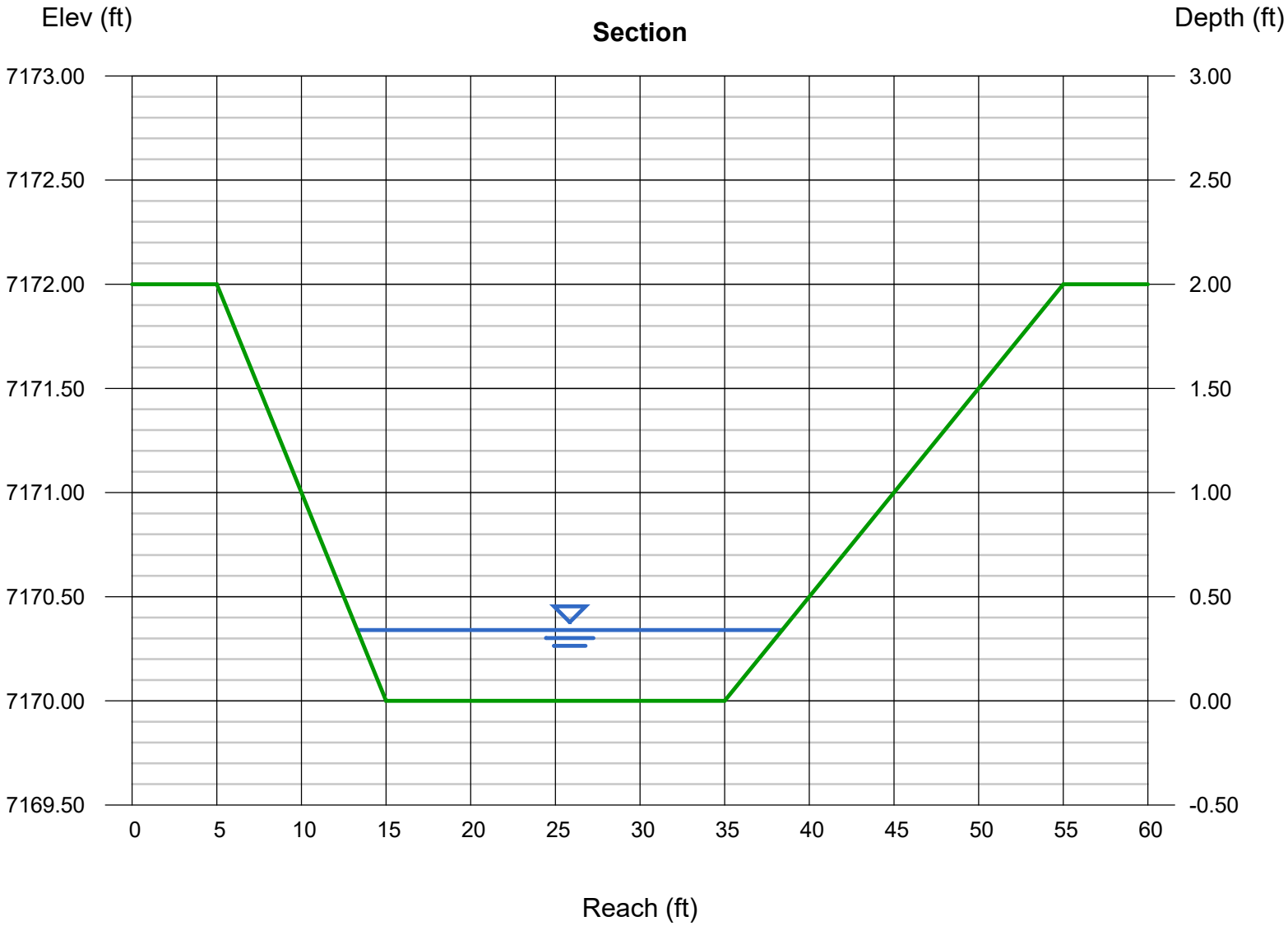
Bottom Width (ft)	= 20.00
Side Slopes (z:1)	= 5.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7170.00
Slope (%)	= 3.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 24.40

Highlighted

Depth (ft)	= 0.34
Q (cfs)	= 24.40
Area (sqft)	= 7.67
Velocity (ft/s)	= 3.18
Wetted Perim (ft)	= 25.15
Crit Depth, Yc (ft)	= 0.35
Top Width (ft)	= 25.10
EGL (ft)	= 0.50



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 4 2023

Basin D - Swale Calculation - Reach (Q100)

Trapezoidal

Bottom Width (ft)	= 20.00
Side Slopes (z:1)	= 5.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7170.00
Slope (%)	= 3.70
N-Value	= 0.040

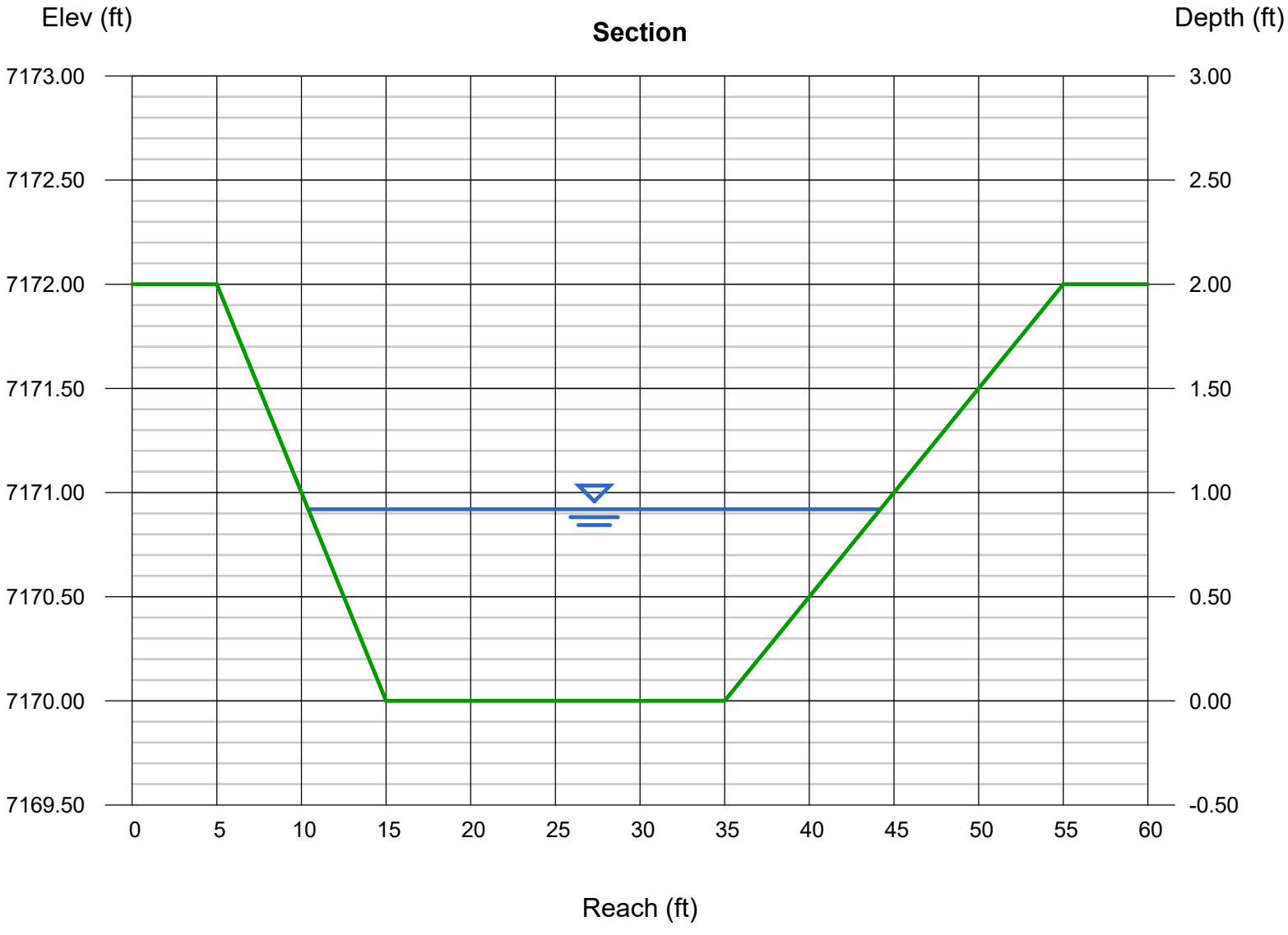
Calculations

Compute by:	Known Q
Known Q (cfs)	= 142.60

Highlighted

Depth (ft)	= 0.92
Q (cfs)	= 142.60
Area (sqft)	= 24.75
Velocity (ft/s)	= 5.76
Wetted Perim (ft)	= 33.94
Crit Depth, Yc (ft)	= 1.02
Top Width (ft)	= 33.80
EGL (ft)	= 1.44

If supercritical, state what the proposed lining is on this sheet.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 1 (Q5)

Triangular

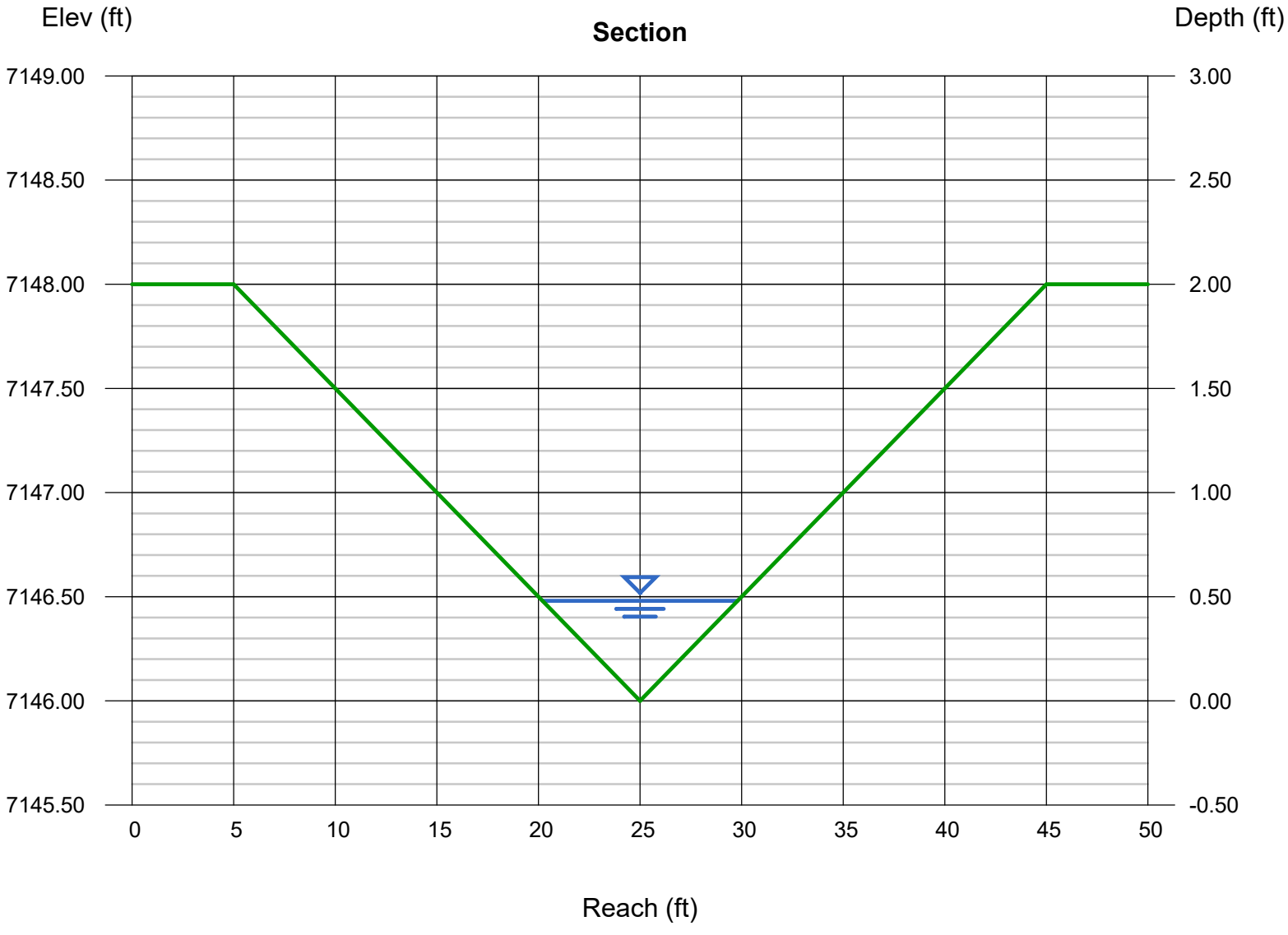
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7146.00
Slope (%)	= 3.80
N-Value	= 0.040

Calculations

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

Highlighted

Depth (ft)	= 0.48
Q (cfs)	= 6.400
Area (sqft)	= 2.30
Velocity (ft/s)	= 2.78
Wetted Perim (ft)	= 9.65
Crit Depth, Yc (ft)	= 0.48
Top Width (ft)	= 9.60
EGL (ft)	= 0.60



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 1 (Q100)

Triangular

Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7146.00
Slope (%)	= 3.80
N-Value	= 0.040

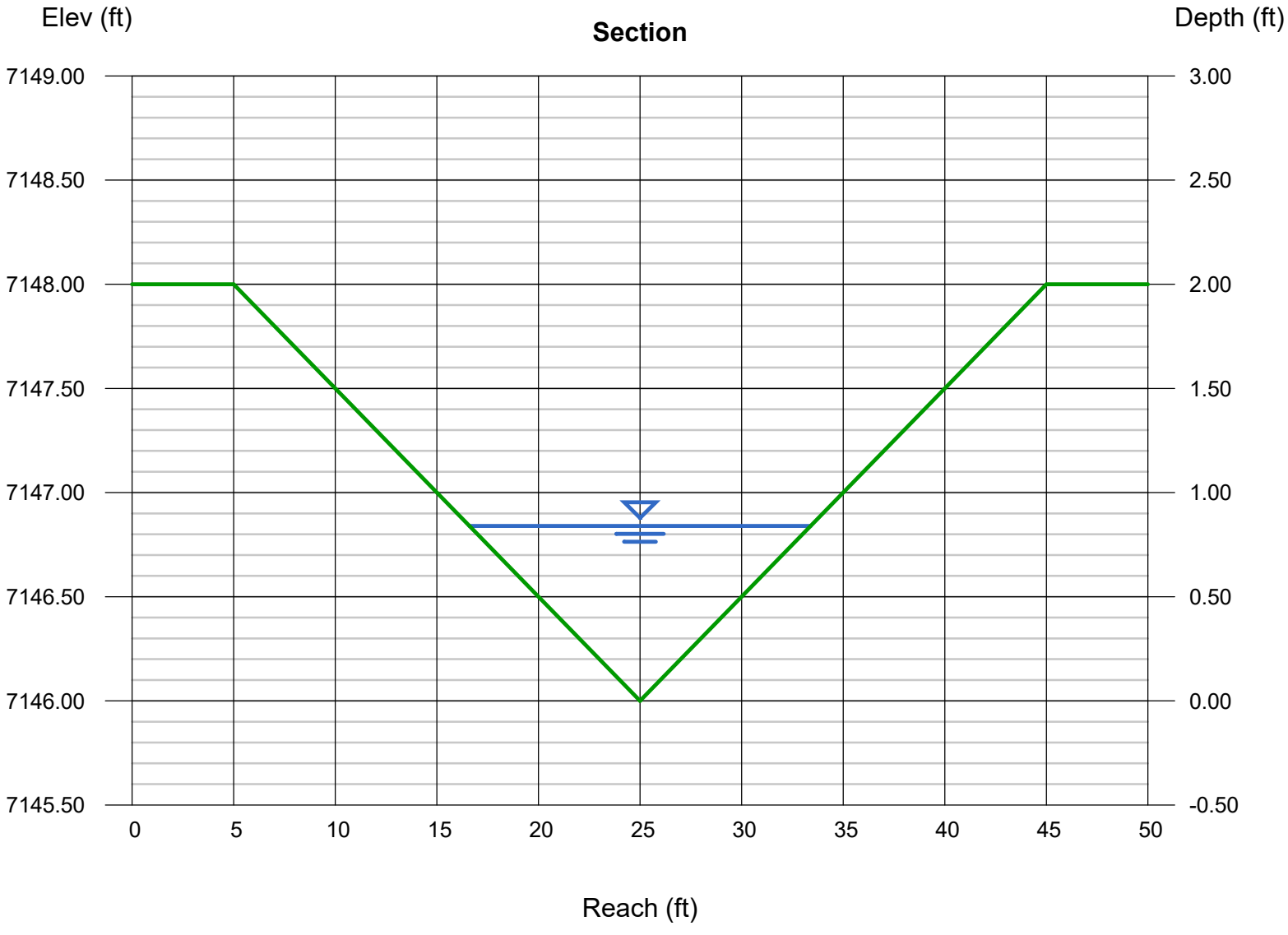
Calculations

Compute by:	Known Q
Known Q (cfs)	= 28.30

Highlighted

Depth (ft)	= 0.84
Q (cfs)	= 28.30
Area (sqft)	= 7.06
Velocity (ft/s)	= 4.01
Wetted Perim (ft)	= 16.88
Crit Depth, Yc (ft)	= 0.87
Top Width (ft)	= 16.80
EGL (ft)	= 1.09

If supercritical, state what the proposed lining is on this sheet.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 2 (Q5)

Triangular

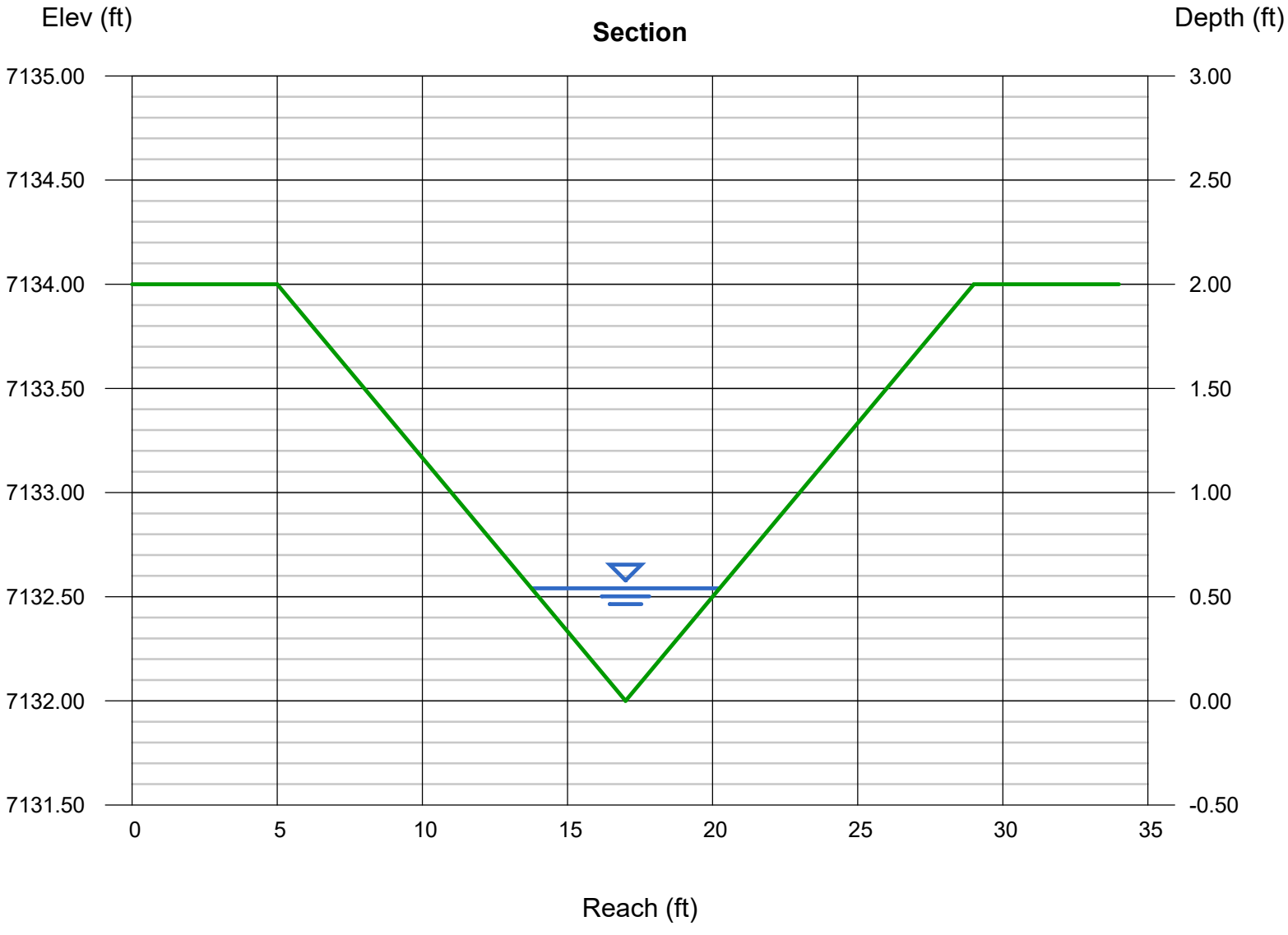
Side Slopes (z:1)	= 6.00, 6.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 5.70
N-Value	= 0.040

Calculations

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

Highlighted

Depth (ft)	= 0.54
Q (cfs)	= 6.400
Area (sqft)	= 1.75
Velocity (ft/s)	= 3.66
Wetted Perim (ft)	= 6.57
Crit Depth, Yc (ft)	= 0.59
Top Width (ft)	= 6.48
EGL (ft)	= 0.75



Channel Report

Basin F2 Swale Calculation - Reach 2 (Q100)

Triangular

Side Slopes (z:1)	= 6.00, 6.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 5.70
N-Value	= 0.040

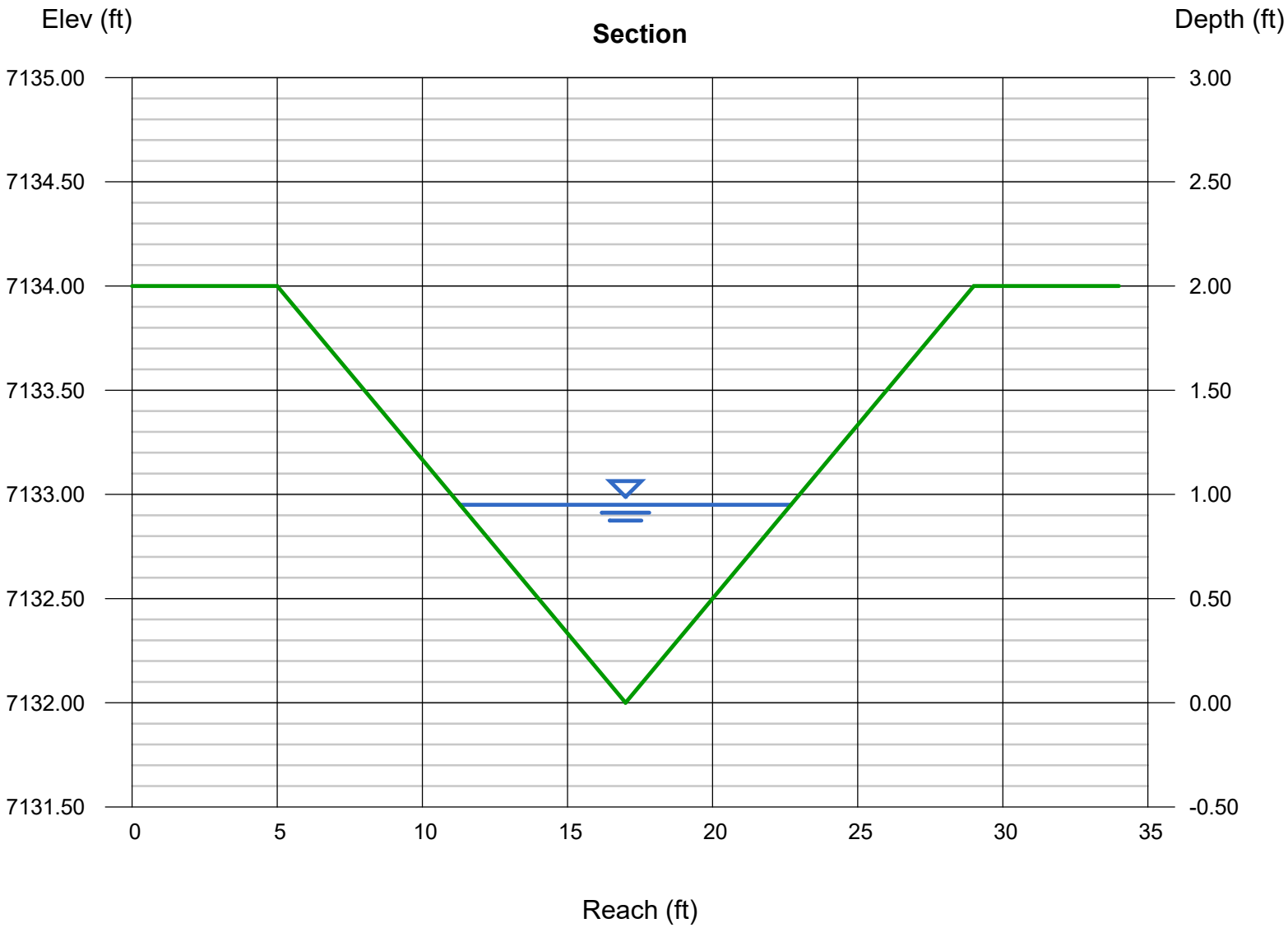
Calculations

Compute by:	Known Q
Known Q (cfs)	= 28.30

Highlighted

Depth (ft)	= 0.95
Q (cfs)	= 28.30
Area (sqft)	= 5.41
Velocity (ft/s)	= 5.23
Wetted Perim (ft)	= 11.56
Crit Depth, Yc (ft)	= 1.07
Top Width (ft)	= 11.40
EGL (ft)	= 1.37

If supercritical, state what the proposed lining is on this sheet.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin J - Swale Calculation - Reach (Q5)

Triangular

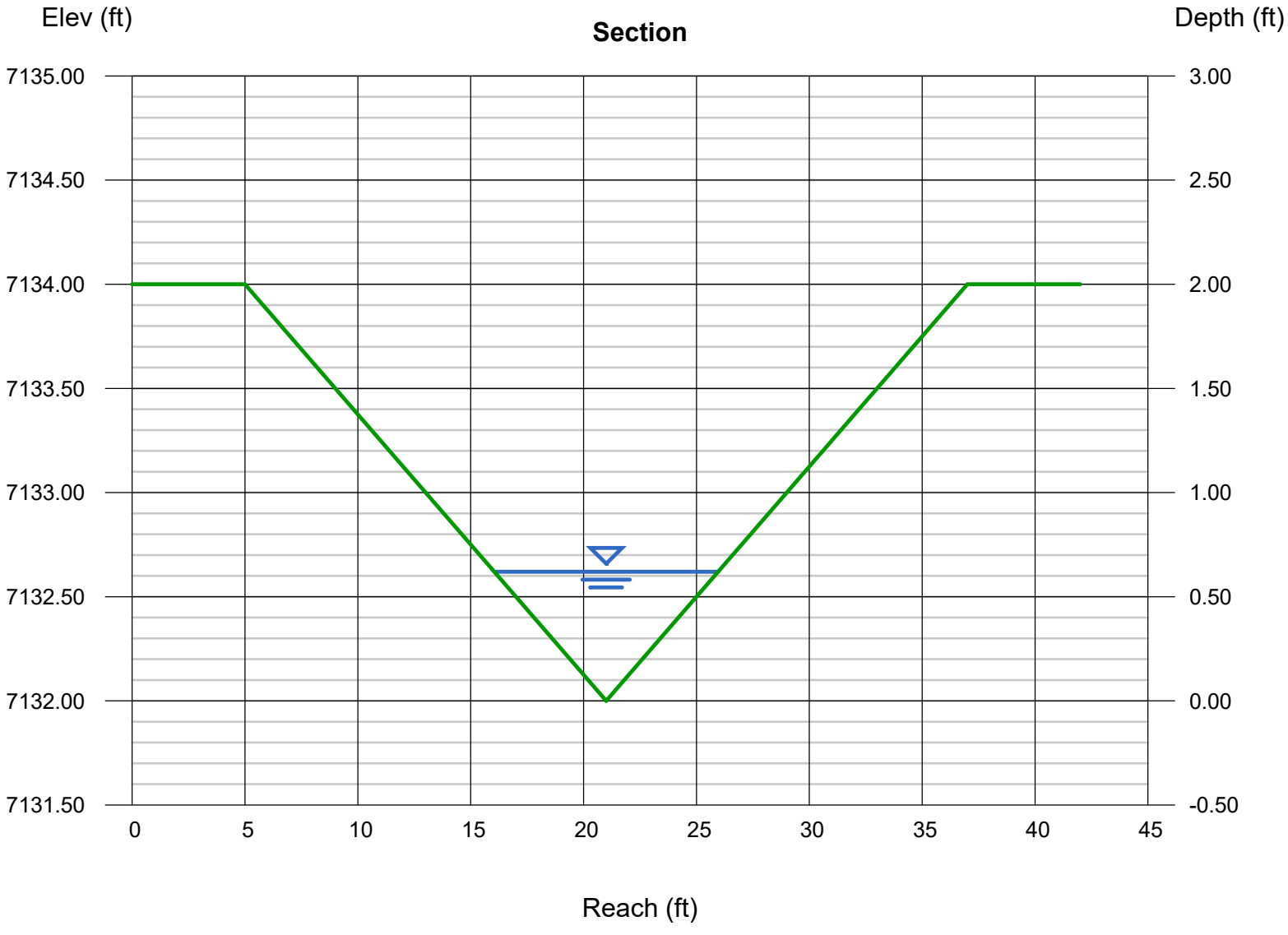
Side Slopes (z:1)	= 8.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 4.80
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.00

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 11.00
Area (sqft)	= 3.08
Velocity (ft/s)	= 3.58
Wetted Perim (ft)	= 10.00
Crit Depth, Yc (ft)	= 0.66
Top Width (ft)	= 9.92
EGL (ft)	= 0.82



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin J - Swale Calculation - Reach (Q100)

Triangular

Side Slopes (z:1)	= 8.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 4.80
N-Value	= 0.040

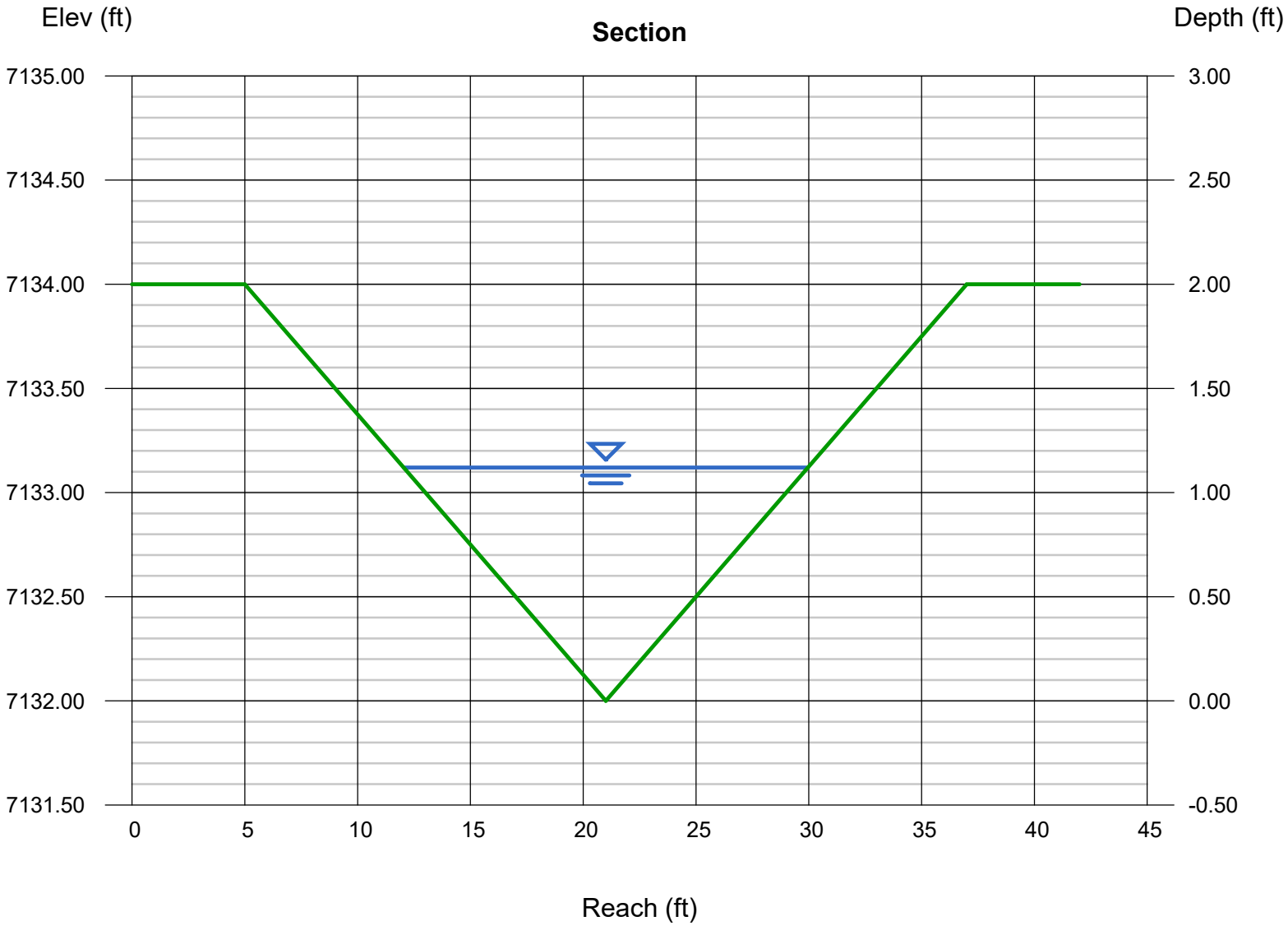
Calculations

Compute by:	Known Q
Known Q (cfs)	= 55.10

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 55.10
Area (sqft)	= 10.04
Velocity (ft/s)	= 5.49
Wetted Perim (ft)	= 18.06
Crit Depth, Yc (ft)	= 1.25
Top Width (ft)	= 17.92
EGL (ft)	= 1.59

If supercritical, state what the proposed lining is on this sheet.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Sep 5 2023

Design Point DP6A Channel

Triangular

Side Slopes (z:1)	= 8.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7154.00
Slope (%)	= 12.00
N-Value	= 0.034

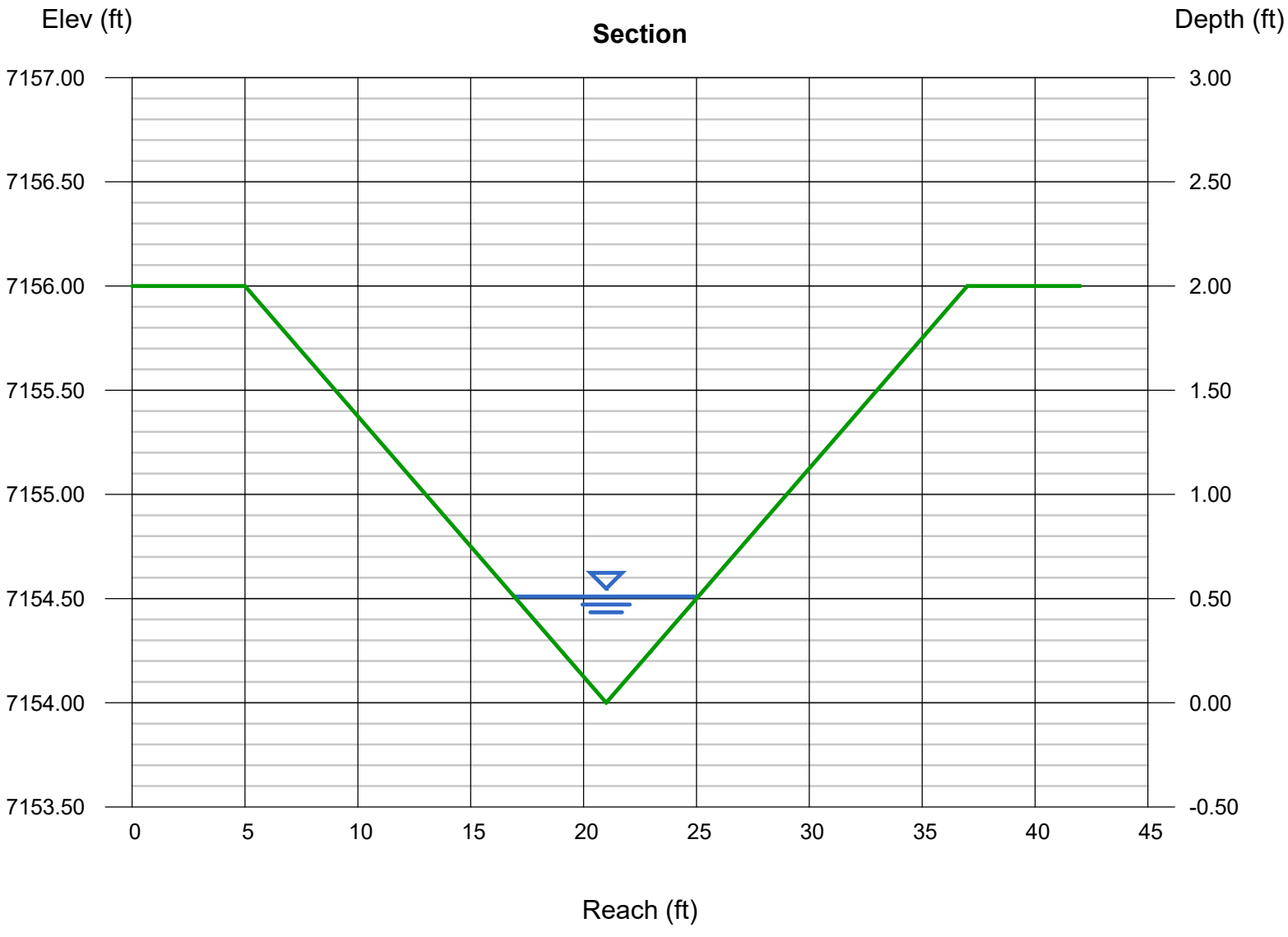
Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.00

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 12.00
Area (sqft)	= 2.08
Velocity (ft/s)	= 5.77
Wetted Perim (ft)	= 8.22
Crit Depth, Yc (ft)	= 0.68
Top Width (ft)	= 8.16
EGL (ft)	= 1.03

If supercritical, state what the proposed lining is on this sheet.



Channel Report

Roadside Ditch Calc Sub-Basin H (0.7 ac - 2.2 cfs = 20% of Sub-Basin 100 yr)

Triangular

Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 4.00
N-Value	= 0.035

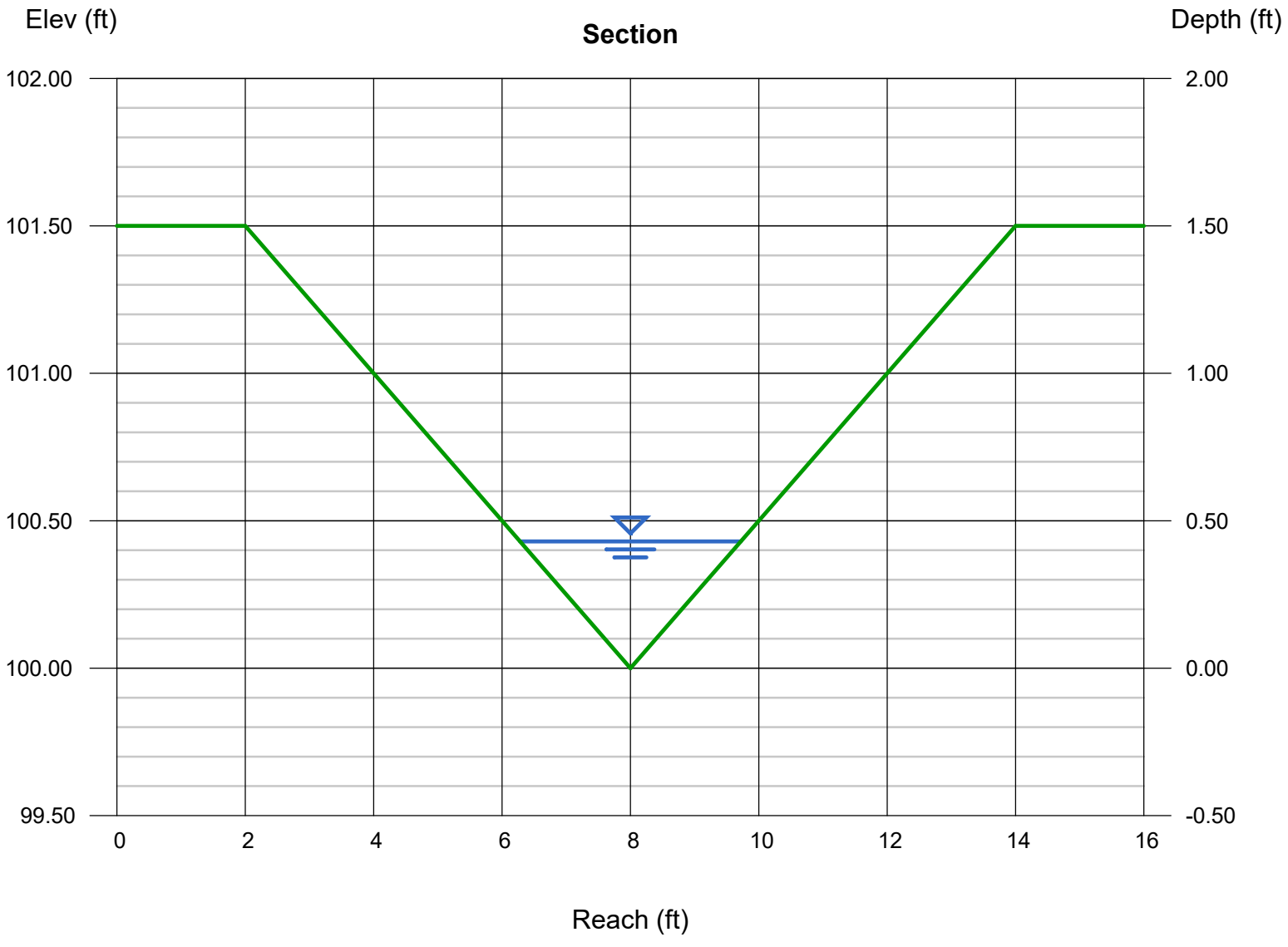
Calculations

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

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 2.200
Area (sqft)	= 0.74
Velocity (ft/s)	= 2.97
Wetted Perim (ft)	= 3.55
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 3.44
EGL (ft)	= 0.57

If supercritical, state what the proposed lining is on this sheet.



Rip Rap Sizing Calculations (Mild Slope)

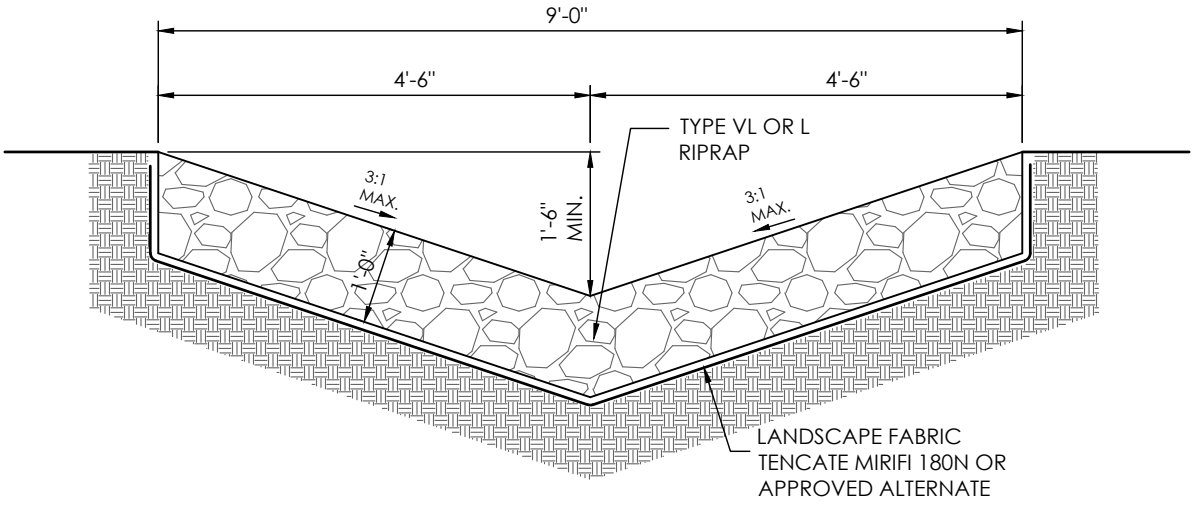
MHFC Eq 8-11 d50 = (V*S ^0.17/(4.5*(Gs-1)^0.66)^2

Channel Designation	Q100 (cfs)	V (ft/sec)	S (ft/ft)	Gs	d50 (ft)	d50 (in)	Note
Swale DP6A	12	5.77	0.12	2.6	0.43	5.2	Existing Type VL
Lot 9/10	28.3	5.23	0.25	2.6	0.45	5.4	Existing Type VL
Lot 11	55.1	5.49	0.06	2.6	0.31	3.7	Existing Type VL

Manning's n calculation for riprap

MHFC Eq 8-9 n = 0.0395*D50^(1/6)

Channel Designation	D (ft)		n
Typical	0.43	Existing Type VL	0.034



TYPICAL SWALE (TYPE "VL" OR "L")

SCALE 1" = 1.0'

LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
- ←Subbasin Area

*** Land Use**

- Civic
- Commercial
- Industrial
- Natural Open Space (Fair Condition)
- Natural Open Space (Poor Condition)
- Woods (Fair Condition)
- Park/Open Space (Fair Condition)
- Park/Open Space (Good Condition)
- ROW
- CONDO/TOWNHOME
- 25+ du/ac
- 12.0-24.99 du/ac
- 8.0-11.99 du/ac
- 3.5-7.99 du/ac
- 2.0-3.49 du/ac
- 0-1.99 du/ac
- 2.5 Acre Rural Residential
- 5 Acre Rural Residential
- 35 Acre Tract

Sources:
*COS Planning Department, 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

FEE BASIN OUTSIDE OF DRAINAGE BASIN

Existing Land Use - Cottonwood Creek	
Land Use	**% of Basin Area**
0-1.99 du/ac	4.2%
12.0-24.99 du/ac	1.3%
2.0-3.49 du/ac	2.0%
2.5 ACRE RURAL RESIDENTIAL	7.4%
25+ du/ac	0.2%
3.5-7.99 du/ac	19.6%
35 ACRE TRACT	1.3%
5 ACRE RURAL RESIDENTIAL	8.2%
8.0-11.99 du/ac	2.8%
CIVIC	3.7%
COMMERCIAL	5.3%
CONDO/TOWNHOME	1.3%
INDUSTRIAL	1.7%
NATURAL OPEN SPACE (FAIR CONDITION)	22.8%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	1.1%
PARK/OPEN SPACE (GOOD CONDITION)	0.9%
ROW	12.9%
WOODS (FAIR CONDITION)	2.9%

Existing Land Use - South Pine Creek	
Land Use	**% of Basin Area**
0-1.99 du/ac	0.7%
12.0-24.99 du/ac	1.9%
2.0-3.49 du/ac	3.6%
25+ du/ac	0.0%
3.5-7.99 du/ac	29.4%
8.0-11.99 du/ac	2.6%
CIVIC	6.2%
COMMERCIAL	16.6%
CONDO/TOWNHOME	4.2%
INDUSTRIAL	4.2%
NATURAL OPEN SPACE (FAIR CONDITION)	3.1%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	5.4%
PARK/OPEN SPACE (GOOD CONDITION)	1.1%
ROW	20.8%

FIGURE 3-5
EXISTING CITY & COUNTY LAND USE
COTTONWOOD CREEK
& SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\activelayout\DBPS_Report\Figure_3_5_CottonwoodCreek_Land_Use_Existing_20190530.mxd, 5/30/2019, Drew_Phillips

LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
  ←Subbasin Area

*** Land Use**

- Civic
- Commercial
- Industrial
- Natural Open Space (Fair Condition)
- Natural Open Space (Poor Condition)
- Woods (Fair Condition)
- Park/Open Space (Fair Condition)
- Park/Open Space (Good Condition)
- ROW
- Condo/Townhome
- 25+ du/ac
- 12.0-24.99 du/ac
- 8.0-11.99 du/ac
- 3.5-7.99 du/ac
- 2.0-3.49 du/ac
- 0-1.99 du/ac
- 2.5 Acre Rural Residential
- 5 Acre Rural Residential
- 35 Acre Tract

Sources:
*COS Planning Department, 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

FEE BASIN OUTSIDE OF DRAINAGE BASIN

Future Development Planned

Future Land Use - Cottonwood Creek

Land Use	% of Basin Area
0-1.99 du/ac	5.3%
12.0-24.99 du/ac	1.7%
2.0-3.49 du/ac	6.3%
2.5 ACRE RURAL RESIDENTIAL	7.6%
25+ du/ac	0.5%
3.5-7.99 du/ac	21.4%
35 ACRE TRACT	1.4%
5 ACRE RURAL RESIDENTIAL	8.7%
8.0-11.99 du/ac	2.8%
CIVIC	4.7%
COMMERCIAL	8.7%
CONDO/TOWNHOME	1.3%
INDUSTRIAL	1.8%
NATURAL OPEN SPACE (FAIR CONDITION)	8.6%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	1.6%
PARK/OPEN SPACE (GOOD CONDITION)	0.9%
ROW	13.5%
WOODS (FAIR CONDITION)	2.9%

Future Land Use - South Pine Creek

Land Use	% of Basin Area
0-1.99 du/ac	0.7%
12.0-24.99 du/ac	1.9%
2.0-3.49 du/ac	4.2%
25+ du/ac	0.0%
3.5-7.99 du/ac	29.4%
8.0-11.99 du/ac	2.3%
CIVIC	6.2%
COMMERCIAL	18.1%
CONDO/TOWNHOME	4.2%
INDUSTRIAL	4.2%
NATURAL OPEN SPACE (FAIR CONDITION)	1.6%
PARK/OPEN SPACE (FAIR CONDITION)	5.4%
PARK/OPEN SPACE (GOOD CONDITION)	1.1%
ROW	20.8%

FIGURE 3-6
FUTURE CITY & COUNTY LAND USE
COTTONWOOD CREEK
& SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\activelayout\DBPS_Report\Figure_3_6_CottonwoodCreek_Land_Use_Future_20190530.mxd, 5/30/2019, Drew_Phillips

LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Local Erosion Issue
- Existing Crossing Deficiency
- Future Crossing Deficiency
- Storm Main (Size)
- Major Reach
- Reach Erosion Issue
- Existing Reach Capacity Deficiency

SCAP Identified Poor Condition Infrastructure

- Grade Control Structures
- Channel Banks
- Channel

* Information that became available after data procurement was complete was not incorporated.

FEE BASIN OUTSIDE OF DRAINAGE BASIN

FIGURE 4-7
DEFICIENCIES MAP
COTTONWOOD CREEK & SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\pls_projects\Cottonwood_Creek_DBPS_2017\active\apps\DBPS_Report\Figure_4-7_CottonwoodCreek_Deficiencies.mxd, 4/11/2019, jeff_dents

LEGEND

- City Boundary
- Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
  ←2-yr & 100-yr Flows
- Detention
- Junction

Source:

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

INTERSTATE 25

FEE BASIN OUTSIDE OF DRAINAGE BASIN

CC OUTLET

FIGURE 3-12
HYDROLOGIC MODEL ELEMENTS
COTTONWOOD CREEK &
SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE:G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\arcpy\DBPS_Report\Figure_3_12_CottonwoodCreek_Hydrology_Existing_20180626.mxd, 6/29/2018, jeff_dionis

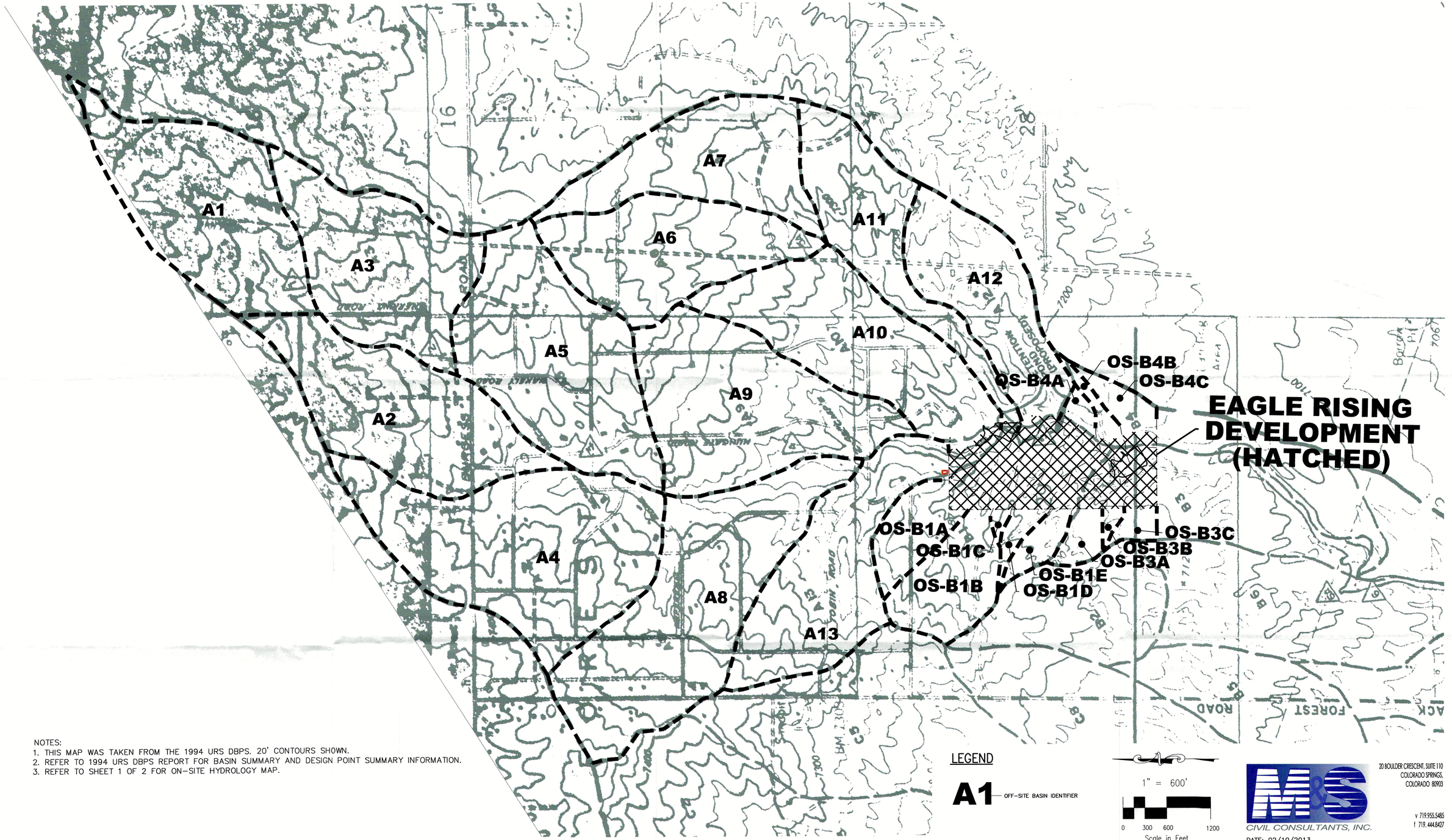
Cottonwood Creek Drainage Basin Planning Study

Future Model Results

Hydrologic Element	Drainage Area (sq mi)	Results 2-Year Peak Discharge (cfs)	5-Year Peak Discharge (cfs)	10-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	50-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
JRT010	0.09	5.7	7.5	8.7	9.8	11	13
JRT020	0.24	47	61	72	80	92	100
JRT030	0.42	61	81	95	110	120	130
JRT040	0.22	53	70	82	92	110	120
JRT052	0.64	110	150	180	200	230	250
JRT054	0.93	200	260	310	350	390	440
JRT060	0.29	190	260	300	340	380	420
JRT070	0.45	140	180	210	240	270	300
JRT082	0.74	310	400	470	530	600	660
JRT084	0.8	330	440	510	570	650	720
JRT090	0.14	69	90	110	120	140	150
JRT102	1.73	430	570	670	770	870	970
JRT104	1.87	490	650	760	870	990	1100
JRT106	2.12	580	770	900	1000	1200	1300
JRT108	0.49	220	290	330	370	430	470
JRT110	0.24	160	220	250	280	330	360
JRT120	0.49	220	290	330	370	430	470
JRT130	0.16	98	130	150	170	190	210
JRT140	0.28	98	130	150	170	190	210
JRT152	0.44	170	230	270	300	340	380
JRT154	0.66	250	330	390	440	510	570
JRT162	2.61	740	980	1100	1300	1500	1600
JRT164	3.27	950	1300	1500	1700	1900	2100
JRT166	3.41	990	1300	1500	1700	2000	2200
JSPC010	0.2	110	140	160	180	210	230
JSPC020	0.21	80	110	120	140	160	170
JSPC032	0.41	180	230	270	300	340	380
JSPC034	0.63	270	360	420	470	540	590
JSPC040	0.18	82	110	130	140	160	180
JSPC050	0.3	160	210	240	270	310	340
JSPC060	1.26	470	630	730	820	940	1000
JSPC070	0.1	38	50	59	66	76	83
JSPC080	0.24	230	310	360	400	460	510
JSPC090	0.1	69	91	110	120	140	150
JSPC102	1.36	520	690	810	900	1000	1100
JSPC106	1.61	80	90	96	110	110	120
JSPC114	0.42	77	90	100	110	120	130
JSPC120	0.29	190	260	300	330	380	420
JSPC130	0.51	370	490	570	640	730	810
JSPC140	0.1	45	59	69	77	88	97
JSPC152	0.61	410	530	630	700	800	890
JSPC154	2.93	560	730	850	960	1100	1200
JSPC156	3.19	760	1000	1200	1300	1500	1600
JSPC162	2.03	150	170	180	210	220	230
JSPC164	2.03	150	170	180	210	220	230
JSPC166	2.32	250	310	350	400	440	480
JSPC180	0.35	95	120	140	160	190	220
JSPC190	0.5	220	290	340	380	430	480
JSPC200	3.69	950	1300	1500	1700	1900	2100

Hydrologic Element	Drainage Area (sq mi)	Results 2-Year Peak Discharge (cfs)	5-Year Peak Discharge (cfs)	10-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	50-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
JUC010	0.23	2.4	3.5	8.2	25	37	51
JUC020	0.55	11	16	28	70	98	130
JUC030	0.76	12	21	38	95	140	180
JUC040	0.12	3.2	6.8	12	29	39	50
JUC052	0.88	13	26	46	110	160	220
JUC054	1.15	19	39	69	160	220	290
JUC060	1.38	27	54	95	210	290	380
JUC070	0.1	1.9	4.5	7.9	18	24	30
JUC082	1.48	28	58	100	230	310	410
JUC084	1.66	31	69	120	270	370	470
JUC090	0.24	1.8	8.1	18	47	66	87
JUC102	1.9	32	76	140	320	430	560
JUC104	2.24	37	95	170	400	540	700
JUC110	0.1	3.5	13	21	43	56	69
JUC122	2.24	37	95	170	400	540	700
JUC124	2.34	39	100	190	420	580	750
JUC126	2.63	48	120	210	470	630	820
JUC130	2.82	59	140	240	540	730	930
JUC140	3.05	76	180	290	620	830	1100
JUC150	3.14	77	180	300	630	830	1100
JUC160	3.24	78	180	300	640	850	1100
JUC165	0.22	15	27	36	59	71	84
JUC170	0.22	53	73	83	97	110	120
JUC180	0.33	100	140	160	200	220	240
JUC190	3.46	93	210	340	690	910	1100
JUC192	3.79	130	260	410	810	1000	1300
JUC194	3.93	150	280	420	830	1100	1300
JWR010	0.07	1.9	4	8.3	21	30	39
JWR020	0.05	0.7	3.8	7.4	17	23	30
JWR032	0.12	2.4	7.7	16	38	52	68
JWR034	0.34	91	120	140	200	230	270
JWR040	0.03	1	5.3	9.3	19	25	31
JWR050	0.09	2.9	8	15	34	45	57
JWR060	0.26	2.6	10	22	58	81	110
JWR070	0.1	10	16	24	43	54	65
JWR080	0.18	21	36	50	90	110	130
JWR092	0.12	3.4	12	21	48	66	83
JWR094	0.38	5.4	20	39	99	130	170
JWR096	0.56	26	54	89	190	240	310
JWR098	1.12	150	210	260	390	460	530
JWR100	0.19	100	130	150	180	200	230
JWR112	1.31	240	320	400	570	660	760
JWR114	1.52	310	410	510	730	860	990
JWR120	0.05	4.9	11	17	30	38	46
JWR130	0.21	68	90	110	160	190	220
JWR140	0.3	100	140	160	230	270	320
JWR150	0.15	69	90	110	120	140	160
JWR162	0.45	170	220	260	350	410	470
JWR164	1.97	460	610	750	1100	1300	1500
JWR166	2.05	360	510	610	860	1000	1400
JWR170	2.13	360	520	630	880	1000	1400

EAGLE RISING
HYDROLOGY MAP
(OFF-SITE)



NOTES:
1. THIS MAP WAS TAKEN FROM THE 1994 URS DBPS. 20' CONTOURS SHOWN.
2. REFER TO 1994 URS DBPS REPORT FOR BASIN SUMMARY AND DESIGN POINT SUMMARY INFORMATION.
3. REFER TO SHEET 1 OF 2 FOR ON-SITE HYDROLOGY MAP.

LEGEND

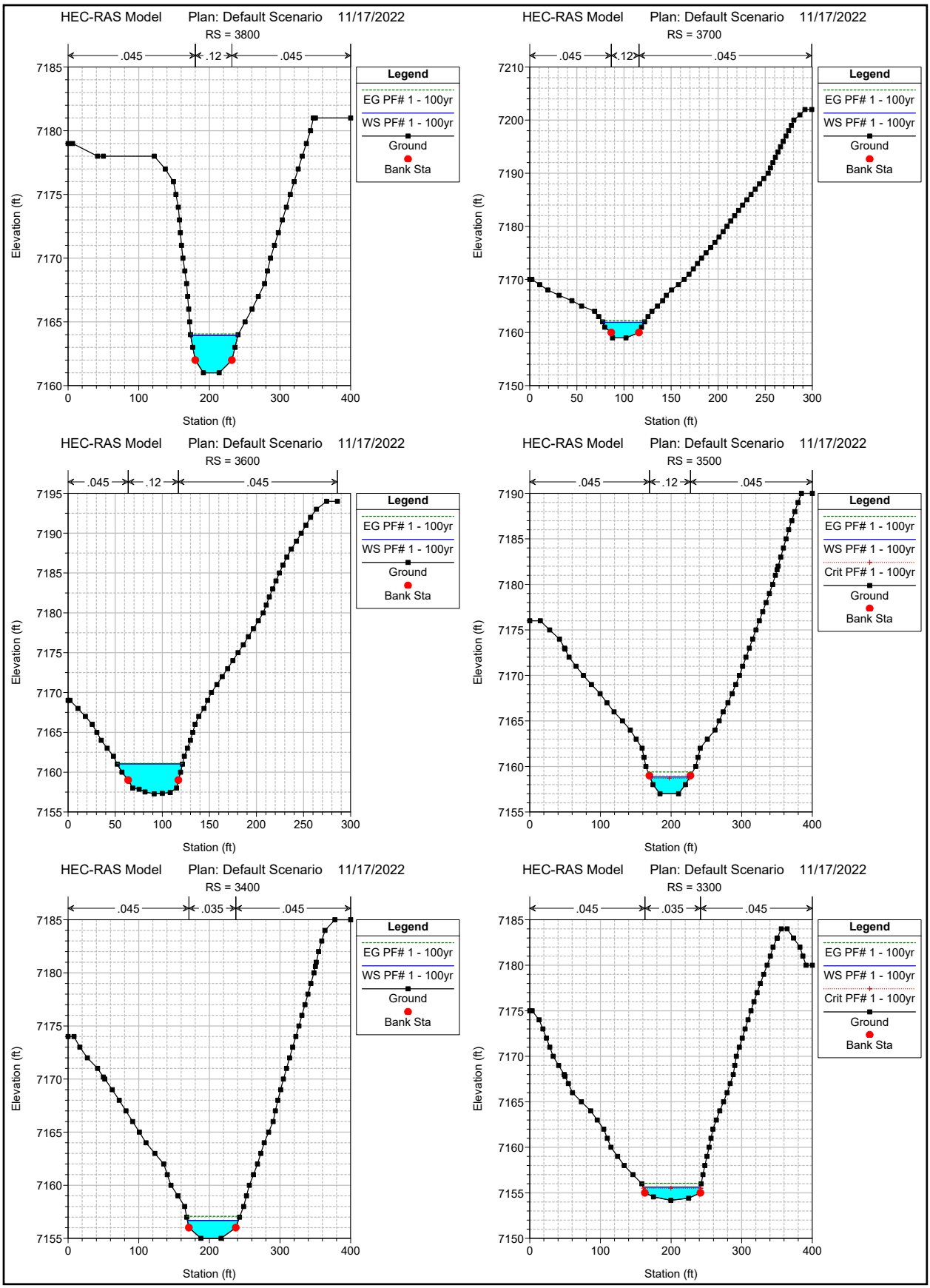
A1 — OFF-SITE BASIN IDENTIFIER

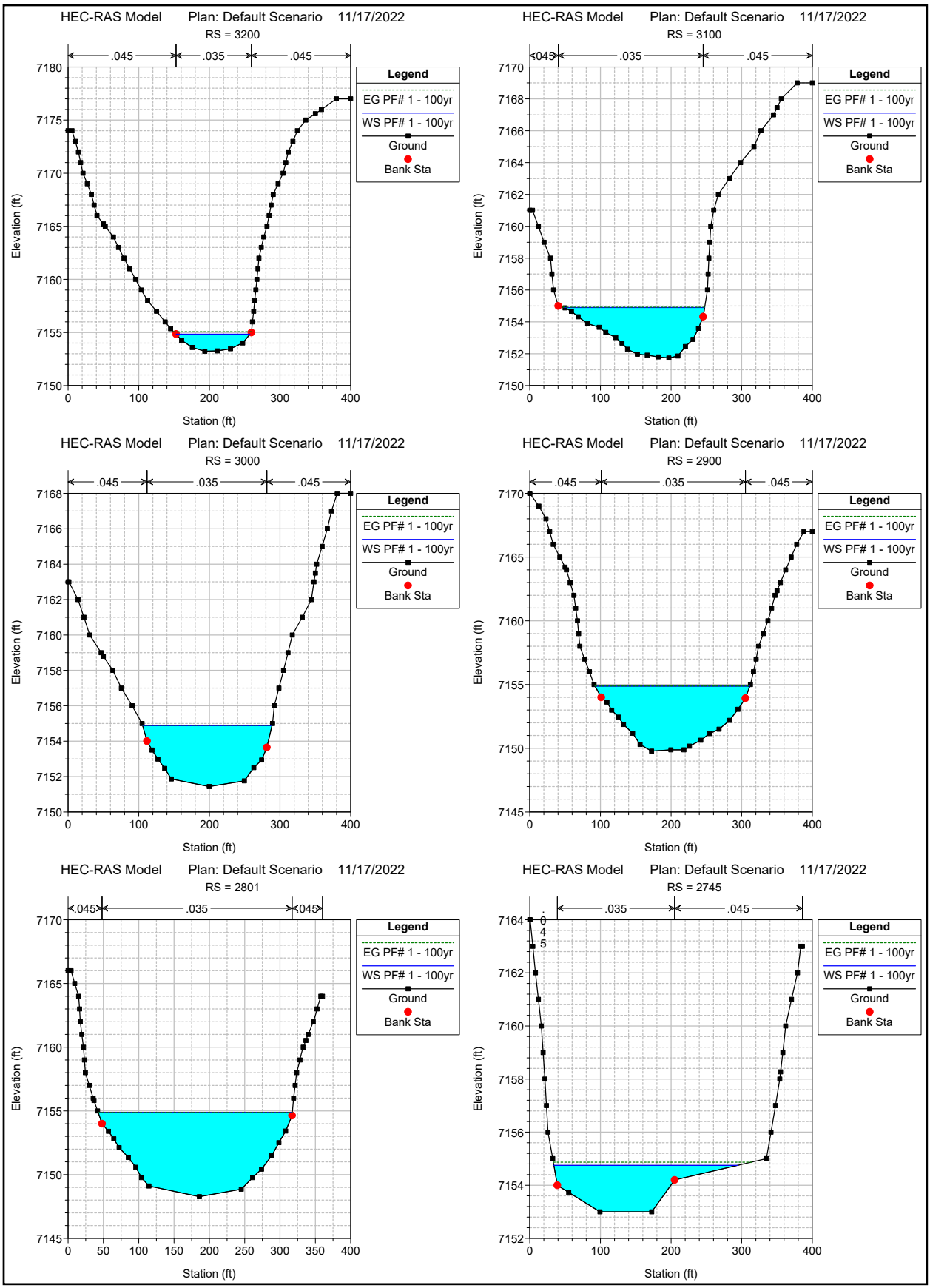
1" = 600'

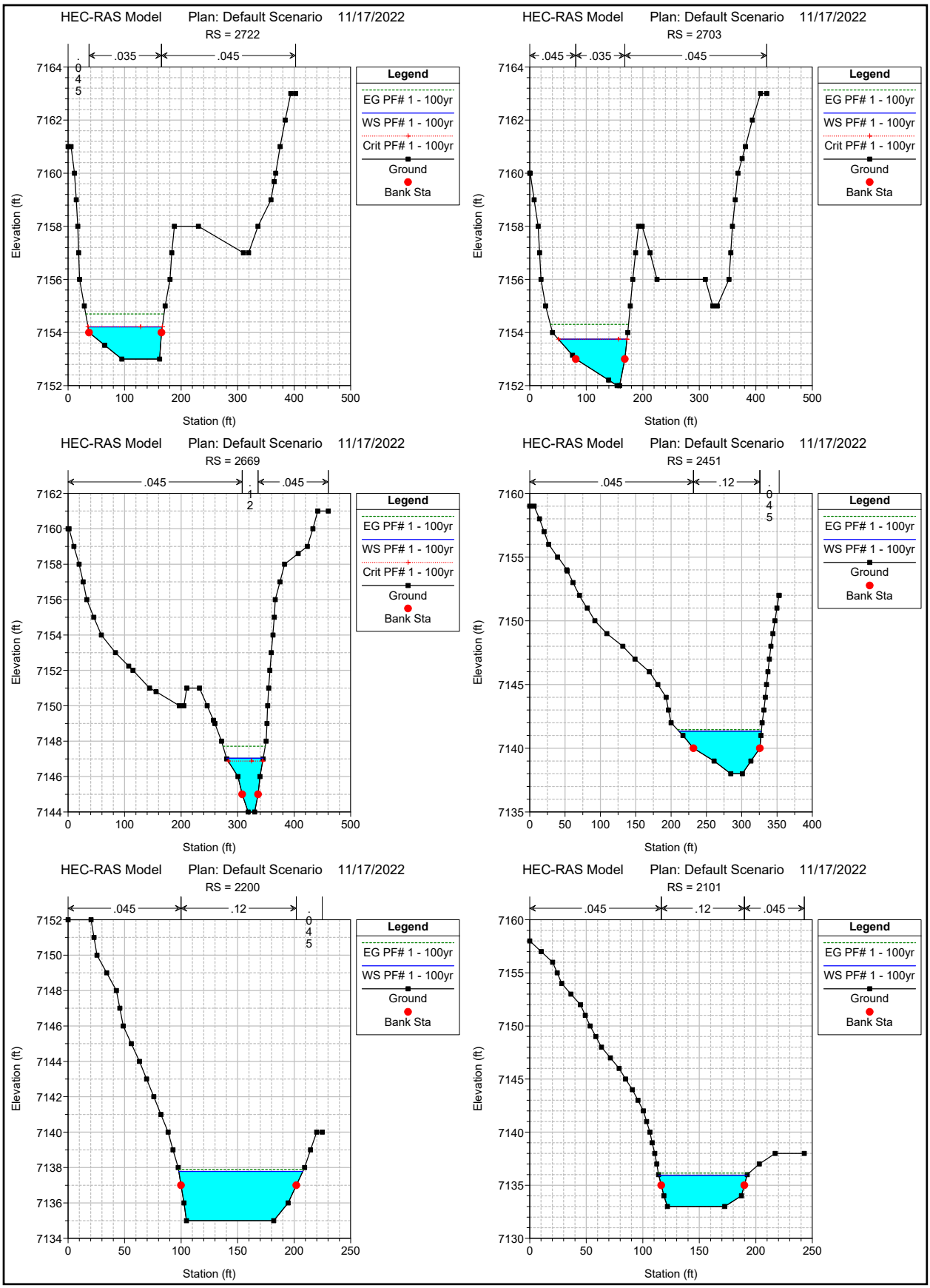
0 300 600 1200
Scale in Feet

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, COLORADO 80903
v 719.955.5485
f 719.444.8427

DATE: 02/10/2013
REV. DATE: 08/04/2015


HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3800
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3700
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3600
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3500
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3400
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3300
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3200
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3100
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 3000
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2900
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2801
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2745
.035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2722
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2703
.045 .035 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2669
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2451
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2200
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2101
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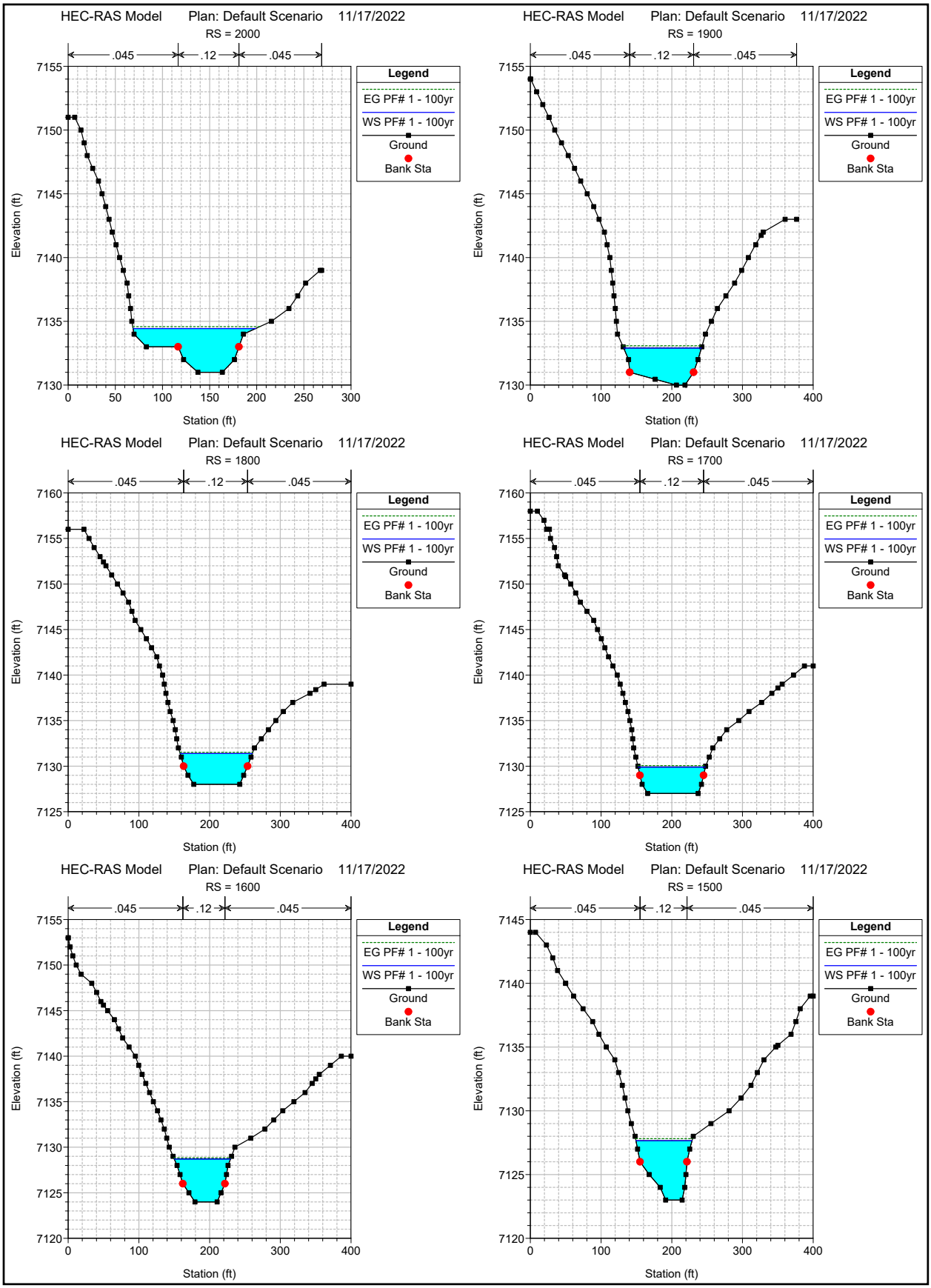
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 2000
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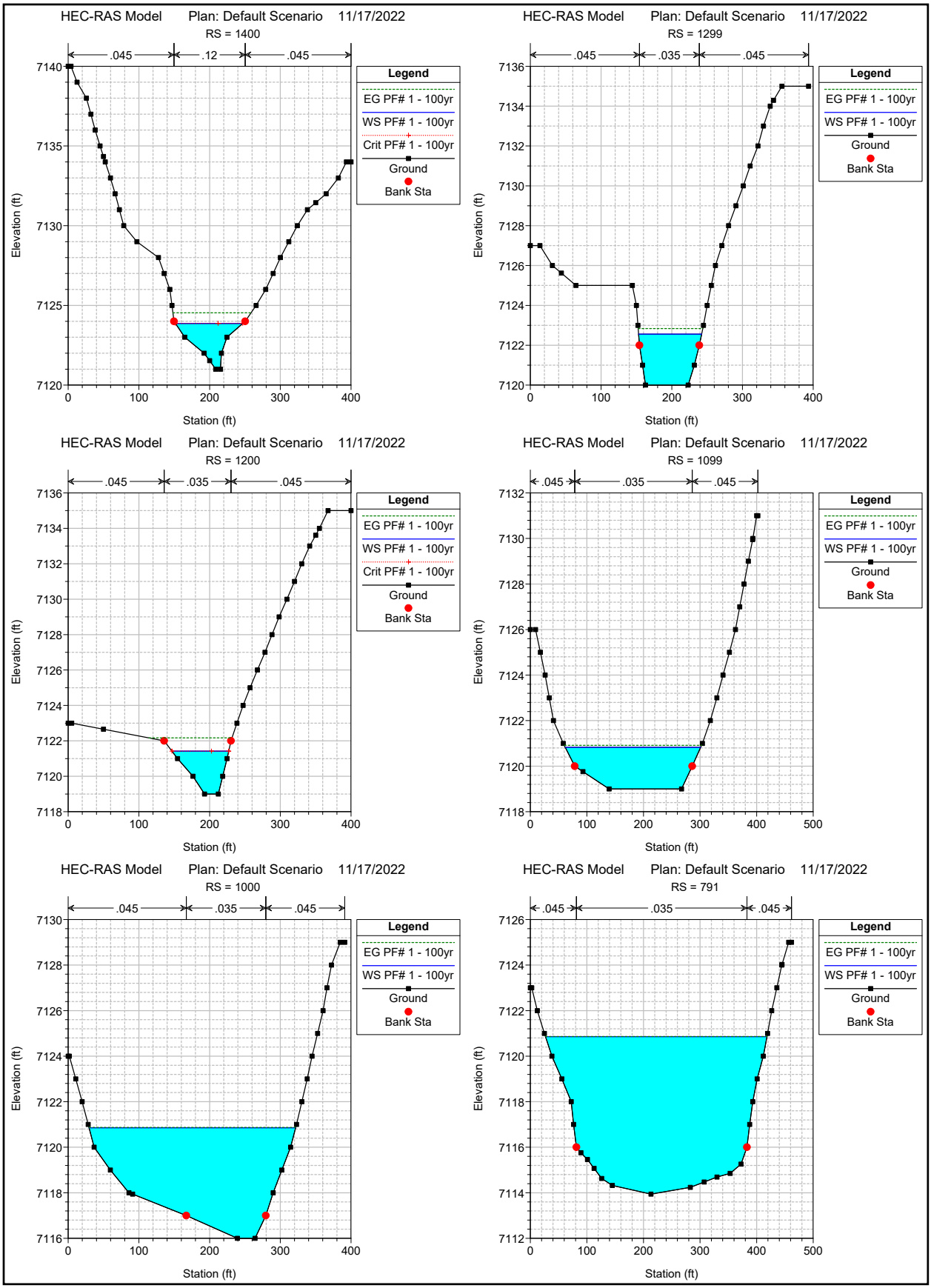
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1900
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1800
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1700
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1600
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1500
.045 .12 .045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1400
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Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1299
.045 .035 .045
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1200
.045 .035 .045
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1099
.045 .035 .045
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 1000
.045 .035 .045
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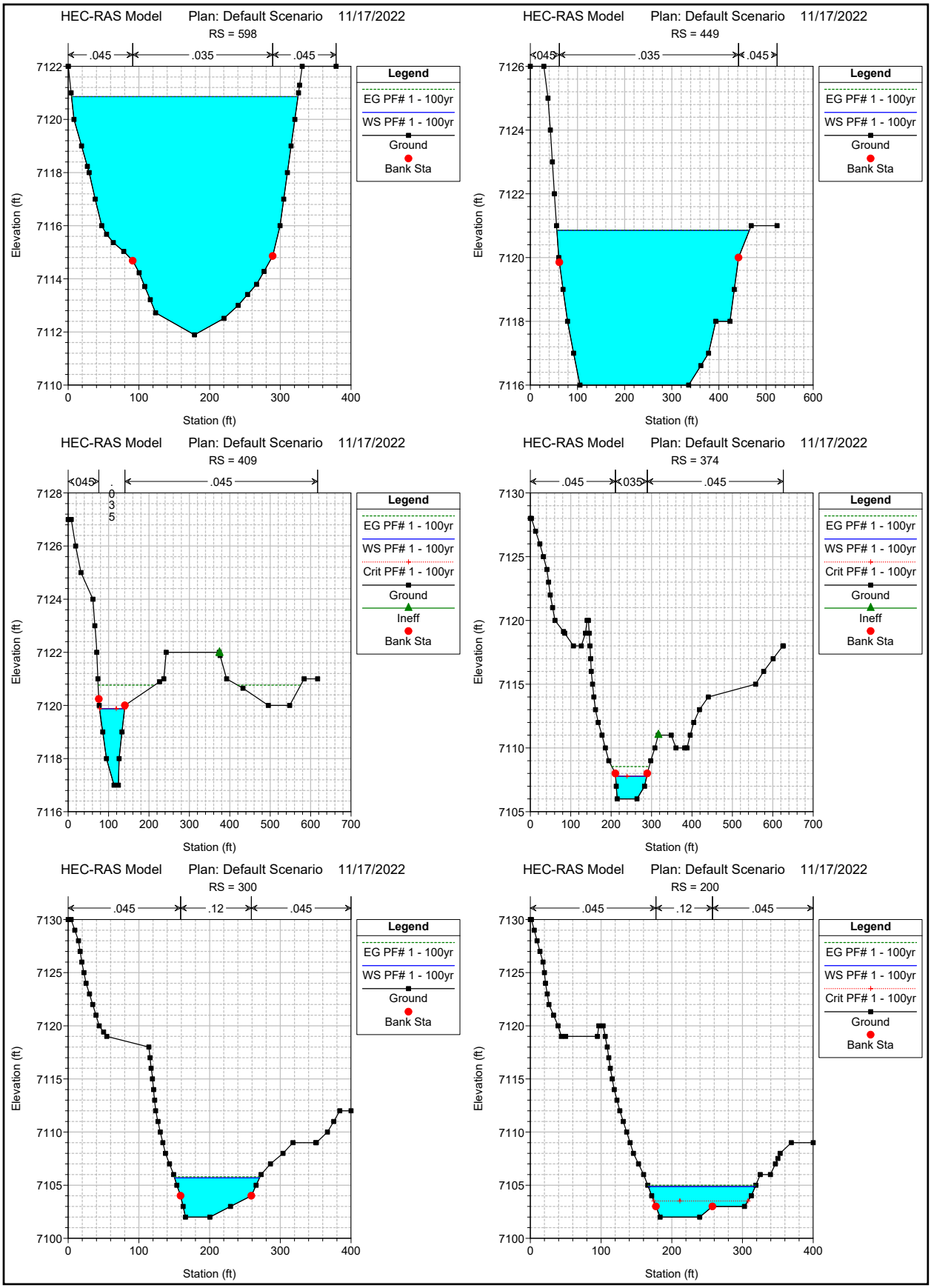
RS = 791
.045 .035 .045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RS = 598
.045
.035
.045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 449
.045
.035
.045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 409
.045
.035
.045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 374
.045
.035
.045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 300
.045
.12
.045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 200
.045
.12
.045
Legend
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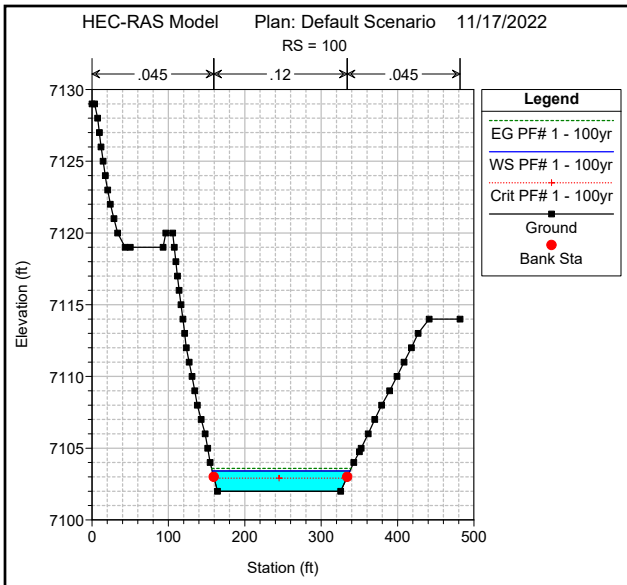
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

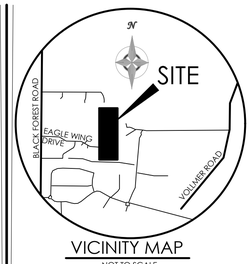

HEC-RAS Model
Plan: Default Scenario
11/17/2022
RS = 100
.045
.12
.045
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
7130
7125
7120
7115
7110
7105
7100
0
100
200
300
400
500

LEGEND

PROPERTY LINE
EASEMENT LINE
LOT LINE

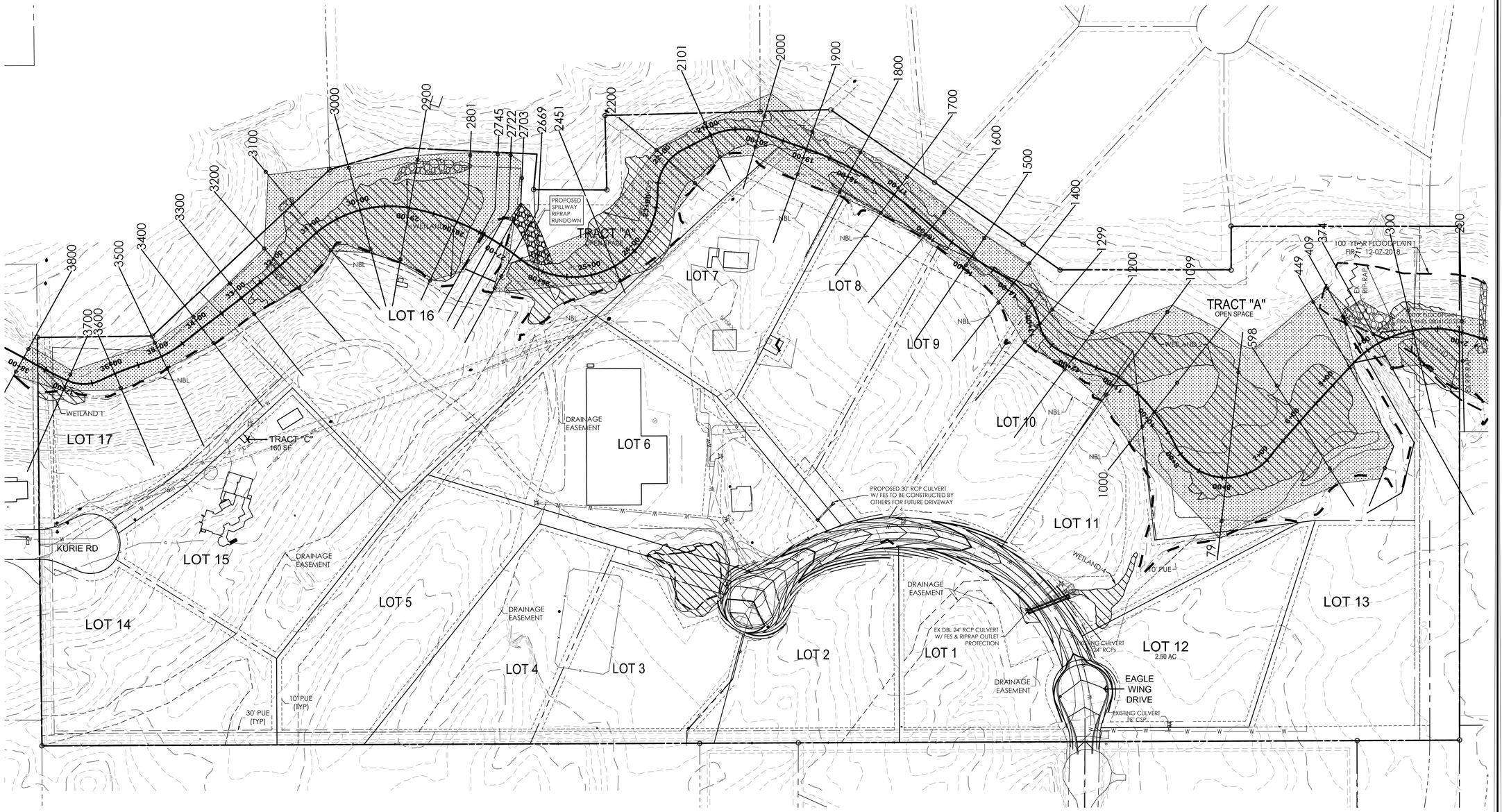
EXISTING
5985 INDEX CONTOUR
84 INTERMEDIATE CONTOUR

PROPOSED
5985 INDEX CONTOUR
84 INTERMEDIATE CONTOUR



VICINITY MAP
NOT TO SCALE

BENCHMARK



N

10 0 50 100 200
1" = 100' 1:1,200

MVE, INC
ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
FILING NO.1

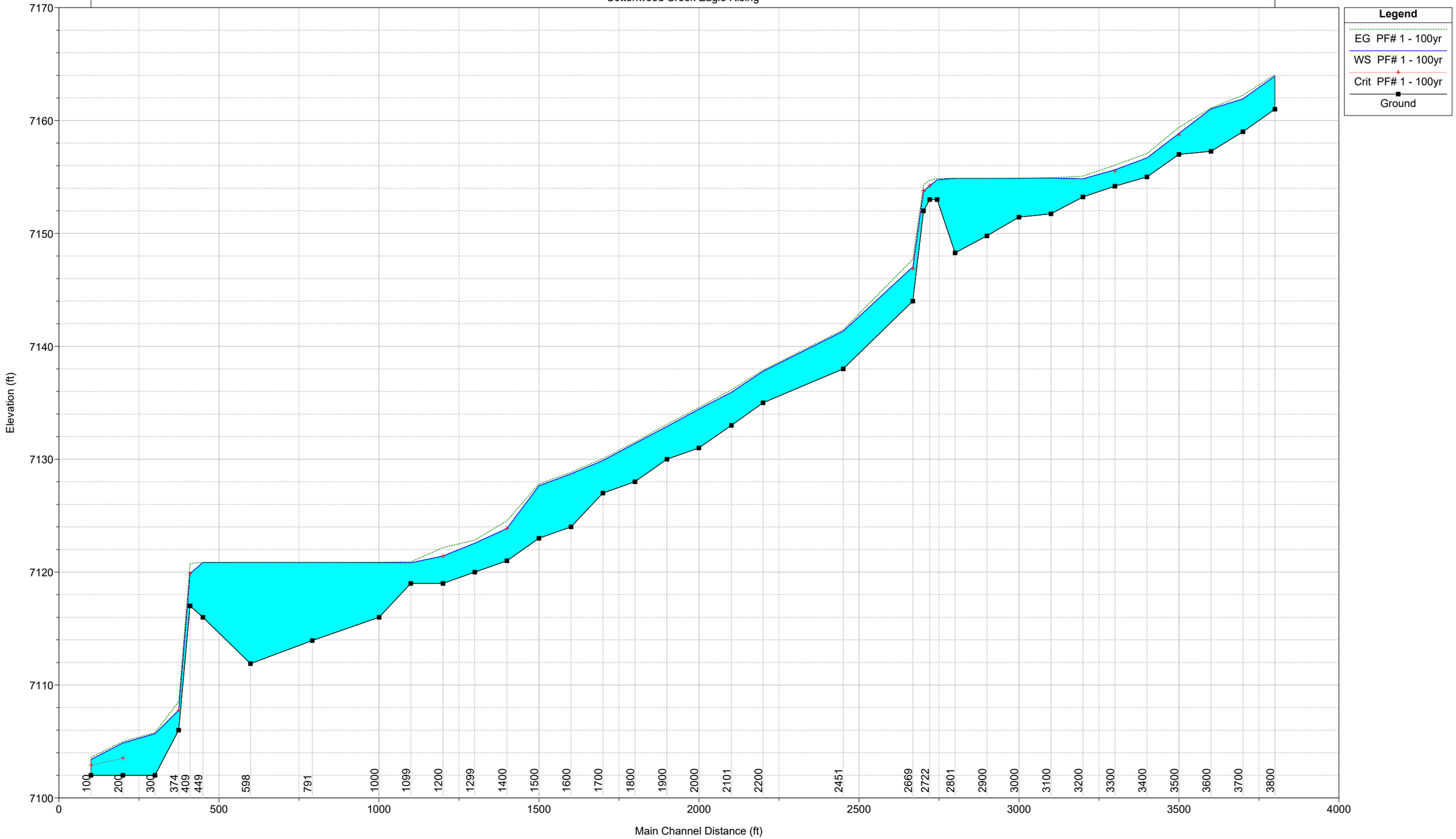
PROPOSED
DRAINAGE MAP
HECRAS SECTIONS

MVE PROJECT 61145
MVE DRAWING DRN-MAP-HECRAS

OCTOBER 31, 2023
SHEET 1 **OF** 1

HEC-RAS Model Plan: Default Scenario 12/14/2022

Cottonwood Creek Eagle Rising



HEC-RAS Plan: Default Scenario River: Cottonwood Creek Reach: Eagle Rising Profile: PF# 1 - 100yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Max Chl Dpth	Hydr Depth C	Flow Area	Top Width	Vel Chnl	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(sq ft)	(ft)	(ft/s)	
Eagle Rising	3800	PF# 1 - 100yr	410.00	7161.00	7163.94		7164.05	0.012109	2.93	2.65	152.06	66.86	2.61	0.28
Eagle Rising	3700	PF# 1 - 100yr	410.00	7159.00	7161.92		7162.24	0.029305	2.92	2.66	94.28	44.14	4.03	0.44
Eagle Rising	3600	PF# 1 - 100yr	410.00	7157.27	7161.03		7161.10	0.005420	3.76	3.37	197.13	69.42	2.04	0.20
Eagle Rising	3500	PF# 1 - 100yr	470.00	7157.00	7158.86	7158.71	7159.40	0.142197	1.86	1.42	79.91	56.29	5.88	0.87
Eagle Rising	3400	PF# 1 - 100yr	470.00	7155.00	7156.69		7157.08	0.008872	1.69	1.40	95.16	72.07	5.01	0.75
Eagle Rising	3300	PF# 1 - 100yr	470.00	7154.18	7155.63	7155.51	7156.05	0.012276	1.45	1.15	91.65	81.96	5.17	0.85
Eagle Rising	3200	PF# 1 - 100yr	470.00	7153.23	7154.84		7155.08	0.007121	1.61	1.15	119.77	104.39	3.92	0.65
Eagle Rising	3100	PF# 1 - 100yr	470.00	7151.73	7154.90		7154.93	0.000309	3.17	2.01	396.65	199.43	1.19	0.15
Eagle Rising	3000	PF# 1 - 100yr	560.00	7151.44	7154.88		7154.90	0.000192	3.44	2.81	483.23	182.97	1.17	0.12
Eagle Rising	2900	PF# 1 - 100yr	560.00	7149.78	7154.88		7154.89	0.000055	5.10	3.67	755.95	219.29	0.75	0.07
Eagle Rising	2801	PF# 1 - 100yr	560.00	7148.27	7154.88		7154.88	0.000013	6.61	4.83	1300.80	274.98	0.43	0.03
Eagle Rising	2745	PF# 1 - 100yr	700.00	7153.00	7154.75		7154.87	0.002708	1.75	1.45	266.79	259.88	2.83	0.41
Eagle Rising	2722	PF# 1 - 100yr	700.00	7153.00	7154.21	7154.21	7154.70	0.017942	1.21	0.98	125.47	131.38	5.59	1.00
Eagle Rising	2703	PF# 1 - 100yr	700.00	7152.00	7153.75	7153.75	7154.31	0.015041	1.75	1.27	123.15	121.42	6.11	0.95
Eagle Rising	2669	PF# 1 - 100yr	700.00	7144.00	7147.04	7146.88	7147.72	0.065271	3.04	2.74	107.17	64.73	6.18	0.66
Eagle Rising	2451	PF# 1 - 100yr	700.00	7138.00	7141.34		7141.46	0.015438	3.34	2.48	247.56	116.63	2.81	0.32
Eagle Rising	2200	PF# 1 - 100yr	700.00	7135.00	7137.78		7137.89	0.013151	2.78	2.57	264.70	109.72	2.65	0.29
Eagle Rising	2101	PF# 1 - 100yr	750.00	7133.00	7135.93		7136.15	0.024330	2.93	2.71	201.29	78.09	3.73	0.40
Eagle Rising	2000	PF# 1 - 100yr	750.00	7131.00	7134.43		7134.58	0.010411	3.43	2.97	259.23	129.85	2.60	0.27
Eagle Rising	1900	PF# 1 - 100yr	820.00	7130.00	7132.90		7133.09	0.022089	2.90	2.47	239.09	109.97	3.36	0.38
Eagle Rising	1800	PF# 1 - 100yr	820.00	7128.00	7131.39		7131.52	0.011479	3.39	3.12	290.28	102.12	2.83	0.28
Eagle Rising	1700	PF# 1 - 100yr	820.00	7127.00	7129.89		7130.06	0.019219	2.89	2.72	246.73	95.07	3.33	0.36
Eagle Rising	1600	PF# 1 - 100yr	820.00	7124.00	7128.70		7128.84	0.008320	4.70	4.23	275.45	79.56	2.94	0.25
Eagle Rising	1500	PF# 1 - 100yr	820.00	7123.00	7127.65		7127.82	0.012667	4.65	3.63	251.47	79.41	3.27	0.30
Eagle Rising	1400	PF# 1 - 100yr	820.00	7121.00	7123.87	7123.87	7124.54	0.198074	2.87	1.31	124.73	95.26	6.57	1.01
Eagle Rising	1299	PF# 1 - 100yr	820.00	7120.00	7122.56		7122.84	0.003337	2.56	2.28	194.44	89.18	4.24	0.49
Eagle Rising	1200	PF# 1 - 100yr	820.00	7119.00	7121.42	7121.42	7122.17	0.015883	2.42	1.48	118.52	80.34	6.92	1.00
Eagle Rising	1099	PF# 1 - 100yr	820.00	7119.00	7120.83		7120.92	0.001638	1.83	1.64	352.73	239.24	2.39	0.33
Eagle Rising	1000	PF# 1 - 100yr	820.00	7116.00	7120.85		7120.87	0.000092	4.85	4.47	953.80	292.08	1.10	0.09
Eagle Rising	791	PF# 1 - 100yr	820.00	7113.94	7120.86		7120.86	0.000008	6.92	6.33	2085.37	391.40	0.42	0.03
Eagle Rising	598	PF# 1 - 100yr	820.00	7111.89	7120.86		7120.86	0.000007	8.97	7.92	2040.13	320.26	0.46	0.03
Eagle Rising	449	PF# 1 - 100yr	820.00	7116.00	7120.85		7120.86	0.000021	4.85	4.24	1621.77	408.30	0.51	0.04
Eagle Rising	409	PF# 1 - 100yr	820.00	7117.00	7119.88	7119.88	7120.77	0.015149	2.88	1.76	108.41	61.72	7.56	1.01
Eagle Rising	374	PF# 1 - 100yr	820.00	7106.00	7107.78	7107.78	7108.54	0.015803	1.78	1.52	116.74	76.83	7.02	1.00
Eagle Rising	300	PF# 1 - 100yr	820.00	7102.00	7105.69		7105.79	0.009663	3.69	3.03	320.21	120.06	2.54	0.26
Eagle Rising	200	PF# 1 - 100yr	820.00	7102.00	7104.87	7103.51	7105.00	0.006474	2.87	2.72	327.90	151.21	1.94	0.21
Eagle Rising	100	PF# 1 - 100yr	820.00	7102.00	7103.41	7102.91	7103.59	0.049853	1.41	1.37	240.78	180.32	3.41	0.51

NATURAL STREAMS			
Minor streams (top width at flood stage 100 ft)			
a. Streams on plain			
1. Clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4, but more stones	0.045	0.050	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

CHANNEL BOTTOM w/ DENSE BRUSH → USE 0.12

CHANNEL BOTTOM w/ GRASS & WEEDS → USE 0.035

OVERBANKS w/ WEEDS, STONES & TREES → USE 0.045

Table 2. Permissible Shear and Velocity for Selected Lining Materials[1]

Boundary Category	Boundary Type	Permissible Shear Stress (lb/sq ft)	Permissible Velocity (ft/sec)	Citation(s)
Soils	Fine colloidal sand	0.02 - 0.03	1.5	A
	Sandy loam (noncolloidal)	0.03 - 0.04	1.75	A
	Alluvial silt (noncolloidal)	0.045 - 0.05	2	A
	Silty loam (noncolloidal)	0.045 - 0.05	1.75 – 2.25	A
	Firm loam	0.075	2.5	A
	Fine gravels	0.075	2.5	A
	Stiff clay	0.26	3 – 4.5	A, F
	Alluvial silt (colloidal)	0.26	3.75	A
	Graded loam to cobbles	0.38	3.75	A
	Graded silts to cobbles	0.43	4	A
	Shales and hardpan	0.67	6	A
Gravel/Cobble	1-in.	0.33	2.5 – 5	A
	2-in.	0.67	3 – 6	A
	6-in.	2.0	4 – 7.5	A
	12-in.	4.0	5.5 – 12	A
Vegetation	Class A turf	3.7	6 – 8	E, N
	Class B turf	2.1	4 - 7	E, N
	Class C turf	1.0	3.5	E, N
	Long native grasses	1.2 – 1.7	4 – 6	G, H, L, N
	Short native and bunch grass	0.7 - 0.95	3 – 4	G, H, L, N
	Reed plantings	0.1-0.6	N/A	E, N
	Hardwood tree plantings	0.41-2.5	N/A	E, N
Temporary Degradable RECPs	Jute net	0.45	1 – 2.5	E, H, M
	Straw with net	1.5 – 1.65	1 – 3	E, H, M
	Coconut fiber with net	2.25	3 – 4	E, M
	Fiberglass roving	2.00	2.5 – 7	E, H, M
Non-Degradable RECPs	Unvegetated	3.00	5 – 7	E, G, M
	Partially established	4.0-6.0	7.5 – 15	E, G, M
	Fully vegetated	8.00	8 – 21	F, L, M
Riprap	6 – in. d_{50}	2.5	5 – 10	H
	9 – in. d_{50}	3.8	7 – 11	H
	12 – in. d_{50}	5.1	10 – 13	H
	18 – in. d_{50}	7.6	12 – 16	H
	24 – in. d_{50}	10.1	14 – 18	E
Soil Bioengineering	Wattles	0.2 – 1.0	3	C, I, J, N
	Reed fascine	0.6-1.25	5	E
	Coir roll	3 - 5	8	E, M, N
	Vegetated coir mat	4 - 8	9.5	E, M, N
	Live brush mattress (initial)	0.4 – 4.1	4	B, E, I
	Live brush mattress (grown)	3.90-8.2	12	B, C, E, I, N
	Brush layering (initial/grown)	0.4 – 6.25	12	E, I, N
	Live fascine	1.25-3.10	6 – 8	C, E, I, J
	Live willow stakes	2.10-3.10	3 – 10	E, N, O
Hard Surfacing	Gabions	10	14 – 19	D
	Concrete	12.5	>18	H

[1] Ranges of values generally reflect multiple sources of data or different testing conditions.

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USACE TR EL 97-8

Velocity, Froude Number & Shear Stress at Selected Channel Sections

Hydraulic Data from HEC-RAS Analysis, M.V.E., Inc.

Shear Stress $\tau = \gamma RS$

τ = Shear Stress (Lbs/sf)

γ = Weight Density of Water (lb/cf) = 62.4

R = Hydraulic Radius = Area/Wetted Perimeter (ft)

S = Energy Grade Slope (ft/ft)

Froude No. $Fr = \frac{V}{\sqrt{gD}}$

V = Channel Velocity (ft/sec)

D = Hydr Depth = Flow Area / Top Width

g = Accereration of gravity = 32.2 ft/sec^2

Channel Section	Q100 (cfs)	Energy Slope (ft/ft)	Max Channel Depth (ft)	Hydraulic (Ave) Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius R (ft)	Flow Area (sf)	Top Width (ft)	Channel Velocity (ft/sec)	Froude No.	Shear Stress (lbs/sf)	Notes:
3500	410	0.022	1.9	1.4	57	1.4	80	56	5.88	0.87	1.90	dense vegetation present
2722	700	0.023	1.2	1.0	132	1.0	125	131	5.59	1.00	1.39	spillway riprap
2703	700	0.024	1.8	1.3	122	1.0	123	121	6.11	0.95	1.51	spillway riprap
2669	700	0.197	3.0	2.7	65	0.3	17	65	6.18	0.66	3.25	spillway riprap
1400	820	0.038	2.9	1.3	96	1.3	125	95	6.57	1.01	3.08	dense vegetation present
1200	820	0.012	2.4	1.5	81	1.5	119	80	6.92	1.00	1.10	dense vegetation present
409	820	0.024	2.9	1.8	62	1.7	108	62	7.56	1.01	2.62	spillway riprap
374	820	0.346	1.8	1.5	77	1.5	117	77	7.02	1.00	32.73	spillway riprap

update

LEGEND

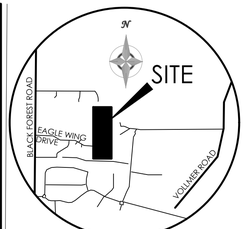
- PROPERTY LINE
- EASEMENT LINE
- NBL — NO BUILD LIMIT LINE
- LOT LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR

PROPOSED

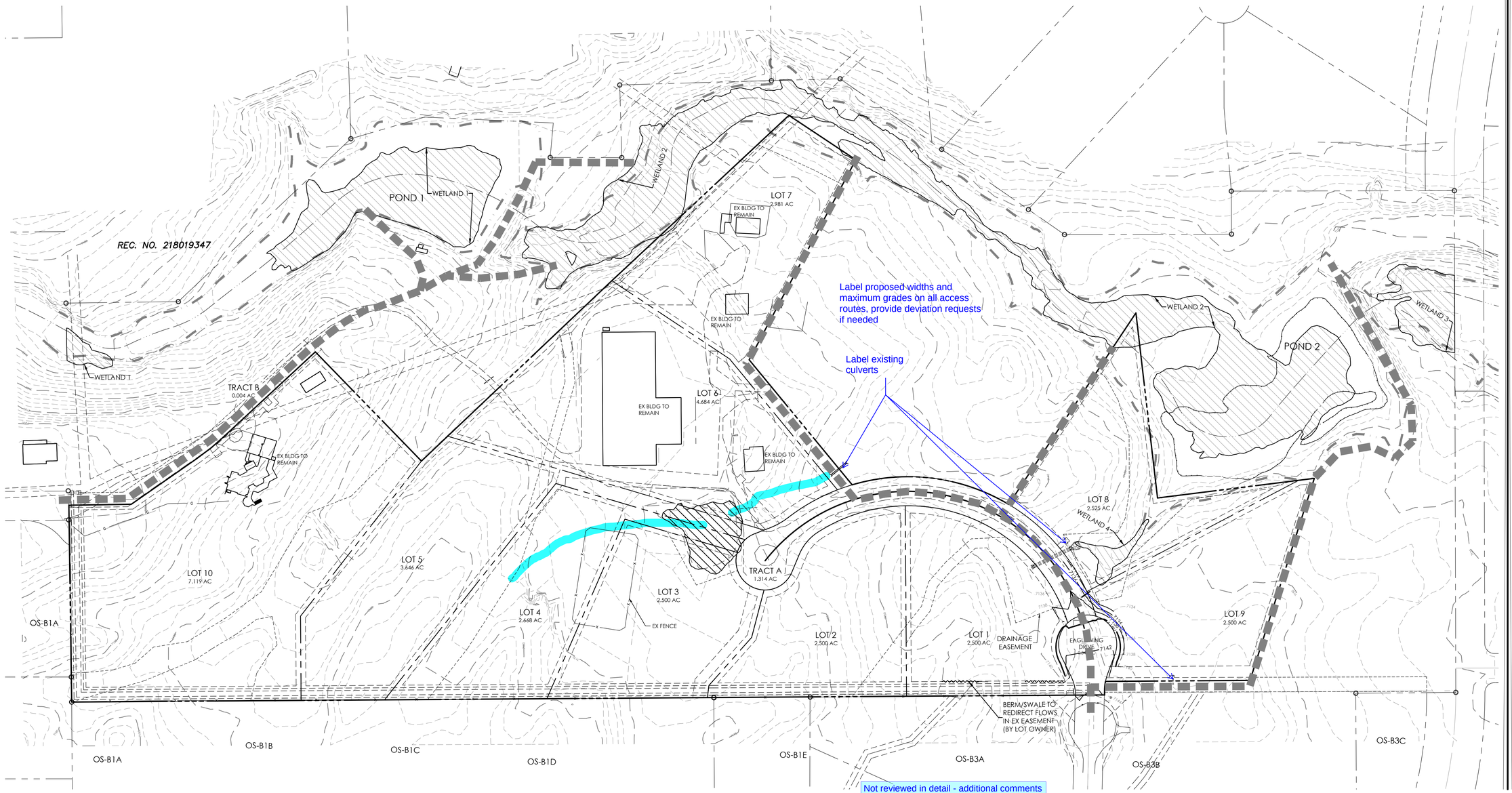
- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- 100 YEAR STORM WATER FLOOD LEVEL
- POSSIBLE ACCESS PATH



VICINITY MAP

NOT TO SCALE

BENCHMARK



Not reviewed in detail - additional comments may be provided pending approval of PDR and clarifications within report

10 0 50 100 200

1" = 100' 1:1,200

MVE, INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
FILING NO. 1

CREEK ACCESS

EXHIBIT

MVE PROJECT 61145

MVE DRAWING DRN-MAP-DEV

NOVEMBER 13, 2023

SHEET 1 OF 1

13. Report Maps

Existing (ON-SITE) Drainage Map
Developed (ON-SITE) Drainage Map

OFF-SITE DRAINAGE BASIN SUMMARY TABLE

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
4	OS-B1A	24.9	19.1	9.2	52.2
5	OS-B1B	41.0	21.2	11.9	76.7
E7	OS-B1C	1.8	12.9	0.6	4.0
E8	OS-B1D	6.0	16.9	1.6	11.8
E10	OS-B1E	10.1	17.8	3.1	20.5
E11	OS-B3A	9.1	15.2	3.8	21.3
E13	OS-B3B	2.5	13.5	1.1	6.2
E15	OS-B3C	5.95	15.5	2.5	13.9

ON-SITE DRAINAGE BASIN SUMMARY TABLE

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
	EX-A1	4.95	13.5	1.5	10.7
	EX-A2	1.74	12.1	0.5	3.9
	EX-B	4.35	12.7	1.9	10.4
	EX-C	1.66	11.9	0.5	3.8
	EX-D	7.10	13.1	3.3	16.9
	EX-E1	3.41	13.1	3.5	10.4
	EX-E2	7.77	16.3	4.7	18.6
	EX-F1	6.45	13.8	9.8	23.0
	EX-F2	2.02	13.5	0.6	4.4
	EX-G	2.98	14.1	1.0	6.5
	EX-H	4.10	13.8	2.2	10.0
	EX-I	1.64	12.3	1.1	4.4
	EX-J	2.42	11.7	1.3	6.3
	EX-K	2.65	10.8	0.9	6.3
	EX-L	2.14	12.4	0.7	4.8
	EX-M	4.10	14.9	1.4	8.8

ON-SITE DESIGN POINTS

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
DP6	OS-B1A, OS-B1B, EX-B, EX-C	71.87	22.3	22.0	134.1
DP6A	OS-B1C, EX-E1	5.25	17.9	3.6	12.6
DP6B	DP6, EX-D	78.97	19.1	23.5	141.5
DP6C	DP6A, DP6B	84.22	19.1	26.6	152.3
DP7	OS-B1D, EX-F1	12.48	20.4	9.7	30.2
DP8	EX-E2	7.77	16.3	4.7	18.6
DP8A	OS-B1E, OS-B3A, EX-H, EX-I	24.92	19.5	9.2	50.8
DP9	OS-B1D, EX-F1, EX-F2	14.50	22.8	9.7	32.0
DP10	EX-G	2.98	14.1	1.0	6.5
DP11	OS-B3B, EX-M	6.60	18.1	2.3	13.5
DP12	OS-B1E, OS-B3A, EX-H, EX-I, EX-J	27.34	21.2	9.8	53.6
DP13	OS-B3C, EX-L	8.09	17.2	2.9	17.4

LEGEND

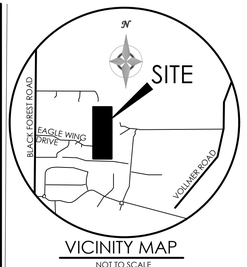
- PROPERTY LINE
- EASEMENT LINE
- LOT LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- 100 YEAR STORM WATER FLOOD LEVEL
- Q = 19.0 cfs, C_{100} = 60.0 cfs, 1.50% — GENERAL FLOW/DIRECTION
- SLOPE DIRECTION AND GRADE
- A1 / 1.0 AC / 50% IMP — BASIN LABEL: AREA IN ACRES, PERCENT IMPERVIOUS
- 1 — DESIGN POINT
- 1 — COTTONWOOD CREEK DBPS DESIGN POINT
- 1 / M&S — M&S DESIGN POINT

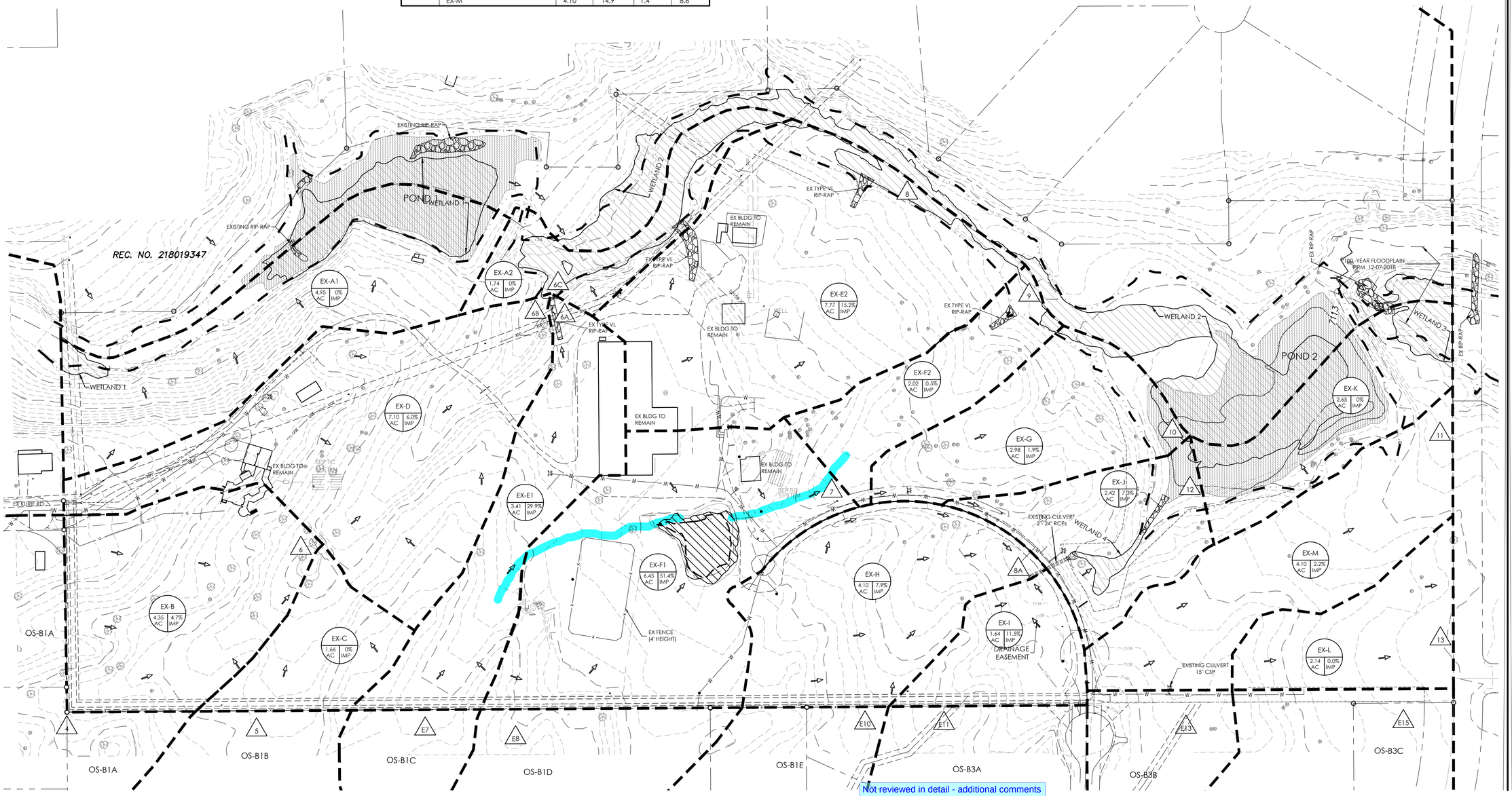
PROPOSED

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR



VICINITY MAP
NOT TO SCALE

BENCHMARK



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N

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REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
FILING NO. 1

EXISTING (ON - SITE) DRAINAGE MAP

MVE PROJECT 61145
MVE DRAWING DRN-MAP-EX

NOVEMBER 13, 2023
SHEET 1 OF 1

OFF-SITE DRAINAGE BASIN SUMMARY TABLE

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
4	OS-B1A	24.9	19.1	9.2	52.2
5	OS-B1B	41.0	21.2	11.9	76.7
E7	OS-B1C	1.8	12.9	0.6	4.0
E8	OS-B1D	6.0	16.9	1.6	11.8
E10	OS-B1E	10.1	17.8	3.1	20.5
E11	OS-B3A	9.1	15.2	3.8	21.3
E13	OS-B3B	2.5	13.5	1.1	6.2
E15	OS-B3C	5.95	15.5	2.5	13.9

ON-SITE BASINS

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
	A1	4.95	13.5	2.3	11.7
	A2	1.74	12.1	0.5	3.9
	B	4.35	12.5	2.4	11.1
	C	1.66	11.9	0.7	4.0
	D	7.10	12.8	3.9	17.7
	E1	3.41	13.6	3.5	10.4
	E2	7.77	16.3	5.3	19.2
	F1	6.45	13.8	10.3	23.6
	F2	2.02	13.5	1.1	5.0
	G	2.98	13.7	1.5	7.2
	H	4.10	13.8	2.9	10.9
	I	1.64	12.0	1.3	4.7
	J	2.42	11.2	1.8	6.9
	K	2.65	10.8	0.9	6.3
	L	2.14	12.4	1.1	5.4
	M	4.10	14.9	1.9	9.4

ON-SITE DESIGN POINTS

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
DP6	OS-B1A, OS-B1B, B, C	71.87	22.3	22.5	134.7
DP6A	OS-B1C, E1	5.25	17.9	3.6	12.6
DP6B	DP6, D	78.97	19.1	24.4	142.6
DP6C	DP6A, DP6B	84.22	19.1	27.5	153.4
DP7	OS-B1D, F1	12.48	20.4	10.1	30.6
DP8	E2	7.77	16.3	5.3	19.2
DP8A	OS-B1E, OS-B3A, H, I	24.92	19.5	10.0	51.8
DP9	OS-B1D, F1, F2	14.50	22.8	6.4	28.3
DP10	G	2.98	13.7	1.5	7.2
DP11	OS-B3B, M	6.60	18.1	2.7	14.1
DP12	OS-B1E, OS-B3A, H, I, J	27.34	21.2	11.0	55.1
DP13	OS-B3C, L	8.09	17.2	3.4	18.0

LEGEND

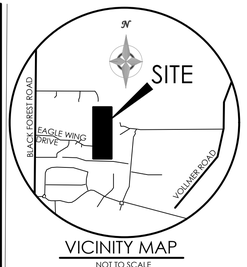
- PROPERTY LINE
- EASEMENT LINE
- NBL — NO BUILD LIMIT LINE
- LOT LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR

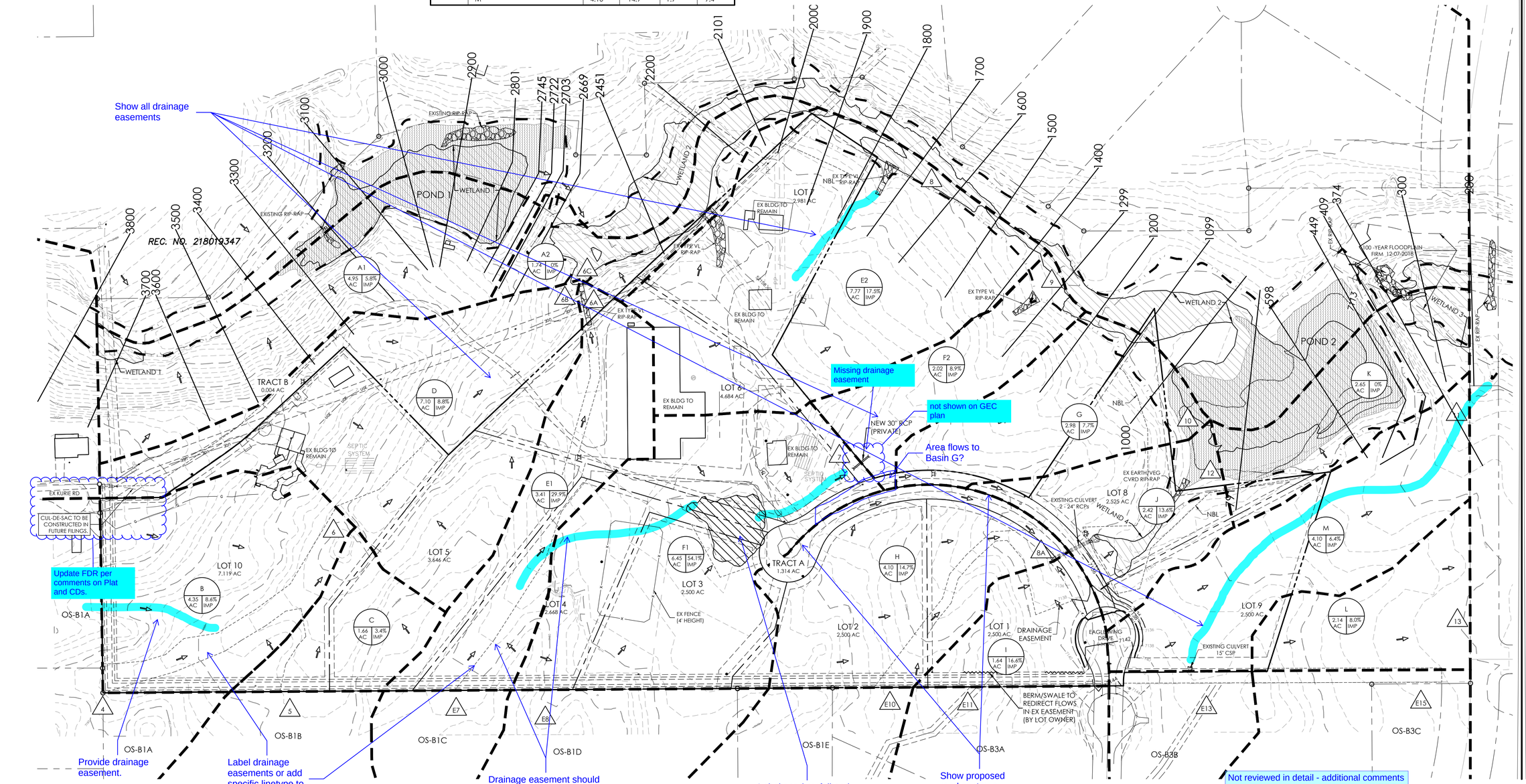
PROPOSED

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- 100 YEAR STORM WATER FLOOD LEVEL
- Q = 19.0 cfs, Q_{100} = 60.0 cfs, 1.50% — GENERAL FLOW/DIRECTION
- SLOPE DIRECTION AND GRADE
- A1: 1.0 AC, 50% IMP — BASIN LABEL: AREA IN ACRES, PERCENT IMPERVIOUS
- 1 — DESIGN POINT
- 1 (DBPS) — COTTONWOOD CREEK DBPS DESIGN POINT
- 1 (M&S) — M&S DESIGN POINT



VICINITY MAP
NOT TO SCALE

BENCHMARK



10 0 50 100 200

1" = 100' 1:200

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REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
FILING NO. 1

DEVELOPED (ON - SITE) DRAINAGE MAP

MVE PROJECT 61145
MVE DRAWING DRN-MAP-DEV

NOVEMBER 13, 2023

SHEET 1 OF 1