Marksheffel Road – Segment M3 CDRs

Final Drainage Report

PCD File No: CDR2413

All Terrain Engineering Project No: 24013

April 2026

PREPARED FOR:

Turkey Canon Quarry Inc

Contact: James Morley

20 Boulder Crescent Street, Suite 200

Colorado Springs, CO 80903

PREPARED BY:

All Terrain Engineering LLC

Contact: Ryan Burns

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ENGINEER'S STATEMENT

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

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Ryan Burns, PE Date

State of Colorado No. 54412

For and on behalf of All Terrain Engineering LLC

DEVELOPER'S STATEMENT

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

Business Name: Turkey Canon Quarry Inc

By: James Morley

Title: Manager

Address: 20 Boulder Crescent Street, Suite 200, Colorado Springs, CO 80903

EL PASO COUNTY STATEMENT

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

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

Conditions:

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Appendices

I. General Purpose, Location & Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for Marksheffel Road – Segment M3 CDRs is to describe the site's onsite and offsite drainage patterns, existing and proposed storm infrastructure, and to safely route developed stormwater to adequate outfalls. This report also supports the construction of future public roadways, Marksheffel & Brushtop Roads, associated utilities and stormwater infrastructure to support future development. No development is proposed with this report, except for the infrastructure described above.

b. Location

The Schmidt Parcel (hereby referred to as the "site") is a collection of undeveloped parcels with a total area of approximately 98 acres, consisting of (4) Parcels per the EPC Assessor, including parcel # 5200000577, owned by Turkey Canon Quarry Inc., parcel #'s 5200000575 & 5200000576, owned by SRW Residential Partners LP LTD., and parcel # 5200000570 owned by Steve Martin.

The site is in the south half of Section 32, Township 12 South, Range 65 West of the Sixth Principal Meridian in the County of El Paso, State of Colorado. The site is located to the west of Vollmer Road and Marksheffel Road intersection. The site is bound by Holiday Hills Filing No.1 to the north, by Vollmer Road to the east, by the Trails at Forest Meadows Filing No. 3 & 4 to the south, and by Black Forest Road, Cottonwood Creek, and Parcel # 520000056 (8585 Black Forest Road to the west. The parcel is planned to be platted after approval of the "Schmidt PUD Preliminary Plan. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 98 acres of undeveloped land with existing vegetation consisting of native grasses. The total disturbance area associated with this FDR is 51.55 acres. A drainage swale exists along the eastern and southern border of the site which intercepts runoff and carries it off-site to the west towards Cottonwood Creek. An existing sediment basin installed with ECP project # CDR22-007 currently intercepts flows and releases them to Cottonwood Creek. The site generally slopes from North to South at 2-4%.

The proposed improvements include overlot grading, construction of Marksheffel Road from Vollmer Road to proposed Brushtop Road, an extension of Brushtop Road from its current terminus at the site's southern border to proposed Marksheffel Road, and storm drainage improvements to support the road construction and future development of on-site parcels. Water and wastewater infrastructure will also be constructed with this project to support future development. It is assumed that approximately 29 acres of the site (parcels 5200000575 & 5200000576) will be developed as multi-family residential in the future. Areas west of Brushtop Road are also assumed to be developed into single family and single family attached residential in the future, and will be detailed in the forth-coming "Schmidt PUD Preliminary Plan". The remainder of the site will be Public R.O.W. for Brushtop Road and Marksheffel Road, and a tract for a storm infrastructure and water quality pond (Pond A). Pond A, is sized to support the proposed construction within the CDR submittal this FDR supports, and considered a temporary condition until any of the vacant land develops. Any future development will require a site-specific FDR/drainage report, pond expansion, and additional storm/drainage infrastructure.

Per a NRCS soil survey, the site is made up of Blakeland loamy sands and Columbine gravelly sandy loam, which are classified as a Group A soils. Group A soils have a high infiltration rate when thoroughly wet and have a high rate of water transmission. The NRCS soil survey is presented in Appendix A.

There are no known irrigation facilities located on the project site.

d. Floodplain Statement

Based on the FEMA Firm Map Number 08041C0529G, revised December 7, 2018, the proposed site is located within Zone X. Zone X is defined as areas outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. A FEMA panel for the site is presented in Appendix A.

II. Drainage Basins

a. Major Basin Description

The site lies within the Sand Creek and Cottonwood Creek Drainage Basins. According to FEMA FIRM 08041C0529G a potion of site lies within the existing Zone AE 100-yr flood plain. It should also be noted that as part of the Colorado Spring Black Forest Road Widening Project, a LOMR application was submitted to FEMA under case # 23-08-0623X, but is currently under review.

Based upon the Sand Creek and Cottonwood Creek Drainage Basin Planning Studies, the site partially falls within each basin while most of the site was not included in either. The site was an active quarry in the past and a berm was constructed along the southern border, which intercepted the majority of overland flows, and directed them to Cottonwood Creek, or a low point roughly located where the existing sediment basin is located per # CDR22-007, which also discharges to Cottonwood Creek. Recent site visits have confirmed that the majority of the flows that did not infiltrate into the ground, were tributary to Cottonwood Creek and according to the Master Development Drainage Plan Update for Woodmen Heights Developed Drainage and the various Trails at Forest Meadows FDR's, this condition has been present since the early 2000's.
For this reason, a drainage basin line is shown on the drainage maps, based upon current topography, for the split between Cottonwood Creek and Sand Creek drainage basins. It should also be noted, that per the "Trails at Forest Meadows Filing No. 3 & 4 Drainage Report, this berm was constructed to ensure flows did not negatively impact the residential homes to the South. It appears that there is no viable outfall to the south, as the bordering properties did not provide surface drainage paths, or the overflow path as identified in the "Master Development Drainage Plan Update for Woodmen Heights Developed Drainage" and the existing storm infrastructure cannot support the total flows generated from the project site.

Based upon the above, approximately 17 acres of the site is within the Sand Creek Drainage Basin. The remainder of the site lies within the Cottonwood Creek Drainage Basin. The proposed Cottonwood Creek-Sand Creek Drainage Basin line is presented on the drainage maps in Appendix F.

Cottonwood Creek is located to the west of the site and runs from north to south. The reach that runs to the west of the site was studied in the Colorado Springs, "Cottonwood Creek Drainage Basin Planning Study" (Cottonwood DBPS) completed by Matrix Design Group in July 2019. According to the Cottonwood Creek

please discuss cross basin flows in this basin from Sand Creek to Cottonwood Creek. The paragraphs above don't mention that flows are being diverted out of the Sand Creek basin. A deviation would be required for the basin exchange

DBPS, reach RUC160 runs west of the site and has been identified as being in stable condition. Cottonwood Creek was also studied in the June 1994, "Cottonwood Creek Drainage Basin Planning Study" by URS Consultants, and identified the on-site reach as the segment between Design Points 6 & 7. The study characterized the reach as a naturalized channel with ecological value including wetlands and riparian vegetation.

The channel will be analyzed for stability and required improvements with the forthcoming Schmidt PUD and Preliminary Plan and any required creek improvements will be identified with that project.

The Sand Creek Basin was studied many times over the years by various companies and in various reports. One of the most recent reports adopted by the County is the "Master Development Drainage Plan Amendment for Sterling Ranch" prepared by JR Engineering in March 2023. This report did not include the subject site in the in the Sand Creek Basin, and neither did the original 2018 "Sterling Ranch Master Development Drainage Plan" prepared by M&S in 2018. Although not adopted by the County, the site was partially included in the "Sand Creek Drainage Basin Planning Study" (Sand DBPS) completed by Stantec in January 2021, however it only showed approximately 17 acres of the eastern most portion of the site as tributary to Sand Creek. The Stantec Sand Creek DBPS assumed the Schmidt Parcel property to have an "Open Space" use which is consistent with the property at this time and the Basin line they showed, is generally consistent with the existing site topography.

b. Existing Subbasin Description

The existing condition describes the current state of the site after the early grading for the Schmidt Parcel. The existing condition consists of six on-site basins and one off-site basin. The existing sub-basin delineation is shown on the drainage map within Appendix F and is described as follows:

Basin OSI4 is 27.16 acres of Silver Ponds Subdivision Filing 1 & the existing Colorado Springs R.O.W. reserved for the future Marksheffel Road extension. Values for this basin were taken from "Silver Ponds Subdivision Filing No.1 Final Drainage Report". Runoff from this basin (Q_5=19.0 cfs, Q_{100}=44.2 cfs) flows south and is intercepted by the existing swale/berm that directs runoff around the site. Flows are diverted to the west towards DPI4 and enter Cottonwood Creek.

Basin EXA is 0.25 acres of an existing berm with stabilized vegetation. Runoff from this basin (Q_5=0.0 cfs, Q_{100}=0.3 cfs) flows along the berm west and enters an existing swale at DP1 and flows offsite and into basin OSI4. Flows in the existing swale combine with a portion of Basin OSI4 at DP14 (Q_5 = 19.0 cfs, Q_{100} = 44.2 cfs) and direct flows to the west towards Cottonwood Creek.

Basin EXB is 1.51 acres of an existing berm with stabilized vegetation, and includes a portion of the "Tahiti Road" R.O.W. Although the R.O.W. exists, the road is shut down and no longer active and generally consists of only a dirt 2-track or varying width drive. Runoff from this basin (Q_5=0.6 cfs, Q_{100}=2.4 cfs) flows east along the berm and enters existing dual 48" RCP culverts at DP2. Culvert flows are directed south along Vollmer Road. There is no drainage infrastructure downstream, therefore; runoff that enters Vollmer Road right-of-way (R.O.W.) flows per existing drainage patterns southeast towards Sand Creek.

Basin EXC is 11.5 acres of native and stabilized vegetation except for a temporary vehicle tracking pad and access that was installed with the CDR22-007 project. Runoff from this basin (Q_5=2.0 cfs, Q_{100}=13.2 cfs) flows overland southeast and enters an existing swale also installed with the CDR22-007 project. The existing swale enters Basin EXD at DP3 and follows the drainage patterns of that Basin EXD.

Basin EXD is 21.8 acres of native and stabilized vegetation. Runoff from this basin (Q_5=3.7 cfs, Q_{100}=23.3 cfs) flows overland southwest and enters an existing swale at DP4. Flows from DP3 and DP4 combine at DP4.1 (Q_5=5.5 cfs, Q_{100}=35.6 cfs) and are conveyed via an existing swale through Basin EX-G and towards the existing Temporary Sediment Basin. The sediment basin outfalls to Cottonwood Creek at DP7.1. See Basin EXG description below.

Basin EXE is 3.96 acres of undeveloped land with native vegetation. Runoff from this basin (Q_5=0.9 cfs, Q_{100}=5.7 cfs) flows overland southeast to DP5, where flow enters Vollmer Road R.O.W. There is no drainage infrastructure downstream, therefore; runoff that enters Vollmer Road R.O.W flows per existing drainage patterns southeast towards Sand Creek.

Basin EXF is 2.58 acres of native and stabilized vegetation. Runoff from this basin (Q_5=0.6 cfs, Q_{100}=4.1 cfs) flows overland south to DP6. Basin EXF overland flows south to Trails at Forest Meadows Filing No. 3. Basin EXF flow was accounted for in "Trails at Forest Meadows Filing No. 3 Final Drainage Report" (Trails No. 3 FDR) as Basins OS2 and OS3. Basin OS2 and OS3 total 1.56 acres and have a total flow of Q_5=1.0 cfs and Q_{100}=3.6 cfs.

Basin EXG is 39.7 acres of native and stabilized vegetation, although, disturbance from the CDR22-007 project may be present at the time of writing this report. Runoff from this basin (Q_5=4.9 cfs, Q_{100}=32.9 cfs) flows overland southwest and enters an existing sediment basin installed with the CDR22-007 project, at DP7. Flows are then either released through the sediment basin outlet, to DP7.1 or over-top the spillway, and flow to DP7.1 (Q5 = 9.2 cfs, Q100 = 60.8 cfs), where they combine with flows from DP4.1 and enter Cottonwood Creek and continue off-site. Total flow in Cottonwood Creek, including the site flows, is 854 CFS per the "Cottonwood Creek DBPS" by URS, dated 1994.

Historically, this basin flowed to a low point in roughly the same location as the existing sediment basin and flows either infiltrated or over-topped the low-point and entered Cottonwood Creek. The site was previously an active quarry, and therefore the drainage patterns were altered with mining activities over the years. Construction of the Trails at Forest Meadows development to the south stated that the construction company running the mine constructed a large berm to ensure flows did not enter the Trails Subdivision and instead were diverted west.

Basin EXI is 10.3 acres of native and stabilized vegetation, including wetland and riparian vegetation within the Cottonwood Creek Flood Plain. Runoff from this basin (Q_5=2.4 cfs, Q_{100}=16.3 cfs) flows overland south and towards Cottonwood Creek. Flows enter the Creek and combine with flows from upstream and DP7.1 flows and continue south off-site. Total flow in Cottonwood Creek, including the site flows, is 854 CFS per the "Cottonwood Creek DBPS" by URS, dated 1994.

Basin EXJ is 0.33 acres of native and stabilized vegetation and includes just a small sliver of land from the southern property line to the top of a small berm that keeps the majority of the site flows from entering the "Trails at Forest Meadows Filing No. 4 Subdivision. Runoff from this basin (Q_5=0.1 cfs, Q_{100}=0.5cfs) flows overland south to DP10. Flows are distributed over the length of the basin, and are not concentrated. This area was analyzed as part of Trails at Forest Meadows Filing No. 4 drainage report and was delineated as basins OS4 and Basin OS2 which had a combined flow of Q5 = 1.0 cfs & Q100 = 4.7 cfs.

c. Proposed Subbasin Description

Proposed Sub-basin Drainage

The proposed condition consists of 13 on-site basins and 1 off-site basin. The proposed sub-basin delineation is shown on the drainage map within Appendix F and is described as follows:

Basin OSI4 is 27.16 acres of Silver Ponds Subdivision Filing 1. Values for this basin were taken from "Silver Ponds Subdivision Filing No.1 Final Drainage Report". Runoff from this basin (Q_5=19.0 cfs, Q_{100}=44.2 cfs) flows south and is intercepted by the existing swale/berm that directs runoff around the site. Flows are diverted to the west towards DP14 and enter Cottonwood Creek. Basin OSI4 will not be captured nor detained in Pond A. No exclusion is necessary for Basin OSI4 as it is an offsite, undisturbed basin shown for reference only.

Basin A is 0.25 acres of an existing berm with stabilized vegetation. Runoff from this basin (Q_5=0.0 cfs, Q_{100}=0.2 cfs) flows along the berm west and enters an existing swale at DP1 and enters an existing swale at DP1 and flows offsite and into basin OSI4.Flows in the existing swale combine with a portion of Basin OSI4 at DP14 (Q_5 = 19.0 cfs, Q_{100} = 44.2 cfs) and direct flows west to Cottonwood Creek. Basin A will not be captured or detained in Pond A. Water quality is not required for Basin A as it will remain in its existing condition and will not be disturbed.

Basin B is 0.09 acres of an existing berm with stabilized vegetation. Runoff from this basin (Q_5=0.0 cfs, Q_{100}=0.1 cfs) flows along the berm east and enters an existing pond adjacent to Vollmer Road. Basin B will follow historic drainage patterns. Water quality is not required for Basin B as it will remain in its existing condition and will not be disturbed.

does not match basin summary table

Basin C is 1.12 acres of undeveloped land and a portion of the north side of Marksheffel Roadway. Runoff from this basin (Q_5=1.6 cfs, Q_{100}=4.4 cfs) flows overland to the south to the CS Type 1 C&G which transports flows west to a 5' Type R sump inlet (CS Type 2 Inlet) at DP3. All flows are captured by the inlet and are piped to DP4.1 where they combine with flows Captured at DP4. This inlet was sized to capture all flow in the 5 and 100-year storm and in the event of inlet failure at DP3, the flow will overtop the roadway crown and flow either to the inlet at DP4 or south in Brushtop Road curb and gutter. See Basin D description below. WQ and detention will be provided for this basin in Interim Pond A.

Basin D is 1.18 acres of proposed Marksheffel Road and proposed sidewalk. Runoff from this basin (Q_5=1.8 cfs, Q_{100}=4.0 cfs) flows toward the CS Type 1 C&G and are transported west to a 5' Type R sump inlet (CS Type 2 Inlet at DP4. All flows at DP4 are captured and piped to DP4.1(Q5 = 3.2 cfs, Q100 = 7.9 cfs), where they combine with DP3 flows. This inlet was sized to capture all flow in the 5 and 100-year storm. In the event of inlet failure at DP4, the flow will overtop the roadway crown and flow south in Brushtop Road curb and gutter.

Captured flows at DP4 are piped to proposed swale E1 which carries them to DP5. See basin E description below. Water quality and detention for Basin D is provided in Interim Pond A.

Basin E is 6.66 acres of undeveloped land and proposed swale E1. Runoff generated (Q5 = 1.2 cfs & Q100 = 8.5 cfs) flows overland south and towards proposed swale E1. Flows enter the swale and are transported to design point 5 (Q5 = 3.9 cfs, Q100 = 15.1 cfs) where they combine with Basin D flows. Swale E1 is sized to remain stable while carrying the 100-yr storm flows. with 1'+ of freeboard. Flows at DP5 are transported in the swale E1 to swale L1 at design point 5.1 (Q5 = 13.4 cfs & Q100 = 44.8 cfs), where they combine in the swale with flows from design point 11.2 (Q5 = 10.4 cfs & Q100 = 44.3 cfs). Swale L1 is sized to remain stable while conveying the 100-yr flows with 1'+ of freeboard. Flows at design point 5.1 continue west in swale L1 to design point 13.1, see Basin L description below. Water quality and detention for Basin E is provided in Interim Pond A.

Basin F is 2.56 acres of the east half of Brush Top Road and sidewalk and undeveloped open space. Runoff (Q5 = 1.5 cfs & Q100 = 5.4 cfs) flows towards the EPC Type A curb and gutter and is transported south to a 15' CDOT type R on-grade inlet at design point 6. This inlet was sized to capture all flow in the 5 and 100-year storms. Captured flows are piped to DP7.1. See basin G description below. Water quality and detention for Basin E is provided in Interim Pond A.

Basin G is 0.78 acres of the west half of Brush Top Road and sidewalk. Runoff (Q5 = 2.0 cfs & Q100 = 3.8 cfs) flows towards the EPC Type A curb and gutter and is transported south to a 15' CDOT type R on-grade inlet at design point 7. This inlet was sized to capture all flow in the 5 and 100-year storms. Captured flows are piped to DP7.1 (Q5 = 3.4 cfs & Q100 = 8.3 cfs) where they combine in the pipe with flows from DP6. Flows at DP7.1 are piped to DP 11.2 (Q5 = 10.4 cfs, Q100 = 44.3 cfs) where they combine with flows from DP11.1 and continue to DP5.1 in swale L1. See Basin K description below & Basin E description above. Water quality and detention for Basin E is provided in Interim Pond A.

Basin H is 3.59 acres of undeveloped land and open space consisting of stabilized and native vegetation. No disturbance is proposed in this basin with this project. Runoff (Q5 = 0.7 cfs & Q100 = 5.2 cfs) sheet flows south and east towards the Marksheffel R.O.W. and basin I boundary. Flows enter Basin I and combine with Basin I flows at DP9 (Q5 = 2.9 cfs, Q100 = 9.3 cfs). See basin I description below. Water quality and detention for Basin E is provided in Interim Pond A.
Although no development is proposed in this basin with this project, a 24" storm stub out is provided at the basins low-point and boundary with Basin I to support potential, future development. The stub will remain plugged with this project. A site specific drainage report will be required if this basin develops to confirm storm sizing and routing as well as water quality and detention requirements.

Basin I is 1.22 acres of a portion of the north side of Marksheffel Roadway. Runoff from this basin (Q_5=2.9 cfs, Q_{100}=5.6 cfs) flows to the CS Type 1 C&G which transports flows southeast to a 10' Type R sump inlet (CS Type 2 Inlet) at DP9 (Q5 = 2.9 cfs, Q100 = 9.3 cfs) where flows combine with Basin H flows. All flows are captured by the inlet and are piped to DP10.1 where they combine with flows Captured at DP10, see Basin J description below. This inlet was sized to capture all flow in the 5 and 100-year storm and in the event of inlet failure at DP9, the flow will overtop the roadway crown and flow either to the inlet at DP10 or into the Vollmer Road

R.O.W and to an existing CDOT 10' Type R sump inlet. Water quality and detention for Basin I is provided in Interim Pond A.

Basin J is 1.28 acres of a portion of the south half of proposed Marksheffel Road and associated sidewalk. Runoff from this basin (Q_5=3.5 cfs, Q_{100} = 6.5 cfs) flows to the CS Type 1 C&G which transports flows southeast to a 10' Type R sump inlet (CS Type 2 Inlet) at DP10 (Q_5=3.5 cfs, Q_{100} = 6.5 cfs). Captured flows are piped to DP10.1 (Q5 = 5.3 & Q100 = 13.9 cfs) where they combine in the pipe with flows from DP9. Flows from DP10.1 continue in the pipes to DP11.1 (Q5 = 7.9 cfs & Q100 = 38.0 cfs). The storm system is over-size to accommodate the potential for future developed flows. See Basin K description below. This inlet was sized to capture all flows in the 5 and 100-yr design storms. In the event of inlet failure at DP10, flows will overtop to the east and enter Vollmer Road. Water quality and detention for Basin J is provided in Interim Pond A.

Basin K is 24.33 acres of undeveloped land with native vegetation. Overlot grading is proposed for this basin at this time but it will remain undeveloped with this project, with exception of stormwater and utility infrastructure to support potential future development. Runoff (Q5 = 3.7 cfs, Q100 = 27.3 cfs) sheet flows overland south and enters swale K1, which carries flows west to DP11 (Q5 = 3.7 cfs, Q100 = 27.3 cfs). Swale K1 was sized to remain stable while conveying the 100-yr design storm flows with 1'+ of freeboard. A berm is proposed along the eastern site/basin boundary to ensure any nuisance flows are directed to proposed swale K1 and DP11. Flows at DP 11 will enter a 36" FES and are piped to DP11.1 (Q5 = 7.9 cfs & Q100 = 38.0 cfs). Flows at DP11.1 continue to DP11.2 in the pipe where they combine with flows from 7.1. See Basin G description above. Water quality and detention for Basin K is provided in Interim Pond A.
Although no development is proposed in this basin with this project, a 36" storm stub out is provided at the lower limits of the basin along its eastern boundary to support potential, future development. The stub will remain plugged with this project. The storm system was up-sized to accommodate future developed flows and consists of a 42" RCP main trunk line. It is also anticipated that the existing 36" FES and associated 36" RCP will accept future developed flows. A site specific drainage report will be required if this basin develops to confirm storm sizing and routing as well as water quality and detention requirements.

Basin L is 36.07 acres of undeveloped open space. Runoff (Q5 = 4.6 cfs & Q100 = 34.1 cfs) flows towards the proposed swale L1 at design point 13 (Q5 = 4.6 & Q100 = 34.1). Flows enter Swale L1 and continue to design point 13.1 (Q5 = 16.3 cfs, Q100 = 82.8 cfs) where they combine in the swale with flows from DP5.1. Swale L1 is sized to remain stable while carrying the 100-yr storm flows with 1'+ of freeboard. Flows at DP13.1 enter the proposed Interim Pond A and associated low-tailwater basin & forebay and combine with Basin M flows at DP14, see Basin description below. Water quality and detention for Basin L is provided in Interim Pond A.

Basin M is 4.86 acres of undeveloped open space and proposed Interim Pond A. Runoff (Q5 = 0.7 cfs & Q100 = 5.4 cfs) sheet flows towards the proposed Interim Pond A and combines with DP13.1 flows in the pond a DP14 (Q5 = 17 cfs, Q100 = 87.4 cfs). Water quality and detention for Basin M is provided in Interim Pond A.

Basin N is 0.34 acres of undeveloped land, with the exception of proposed storm sewer. Runoff (Q5 = 0.1 cfs, Q100 = 0.5 cfs) sheet flows east, offsite towards Vollmer Road R.O.W. Flows are distributed along the length of the basin and are not concentrated. The basin is undeveloped land that will remain undeveloped and the proposed disturbance will not alter existing drainage patterns and therefore no water quality or detention is required.

Basin O is 0.56 acres of undeveloped land and a portion of the southern limits of the proposed Bursh Top Road extension. Basin O runoff (Q5 = 0.1 cfs and Q100 = .9 cfs) overland flows south to Trails at Forest Meadows Filing No. 3 at DP16 (same flows). Basin O flow was accounted for in "Trails at Forest Meadows Filing No. 3 Final Drainage Report" (Trails No. 3 FDR) as Basins OS2 and OS3. Basin OS2 and OS3 total 1.56 acres and have a total flow of Q_5=1.0 cfs and Q_{100}=3.6 cfs and these flows are tributary to the "Sand Creek Detention Pond No. 6" which provide both detention and water quality per the "Trails at Forest Meadows Filing No. 3 Final Drainage Report" (Trails No. 3 FDR).

Reference EDARP Project number for this FDR

Basin P is 2.68 acres of undeveloped land that will remain undeveloped. Runoff (Q5 = 0.6 cfs and Q100 = 4.2 cfs) sheets flows south and west per existing drainage patterns. The majority of this basin will remain undisturbed, except for a portion of the southern limits of this basin along the sites boundary with the "Trails at Forest Meadows Filing No. 4" development. The proposed disturbance is intended to restore the existing property line berm, to ensure no flows negatively impact the homes to the south. Please note, this grading will not changes existing drainage patterns, and flows will be distributed along the length of the basin and not concentrated and the basin will; remain undeveloped with this project,. And therefore, no water quality or detonation is required.

Basin Q 10.29 acres of undeveloped land and native and stabilized vegetation, including wetland and riparian vegetation within the Cottonwood Creek Flood Plain. Runoff from this basin (Q_5=1.5 cfs, Q_{100}=10.8 cfs) flows overland south and towards Cottonwood Creek. Flows enter the Creek and combine with flows from upstream and DP7.1 flows and continue south off-site. Total flow in Cottonwood Creek, including the site flows, is 854 CFS per the "Cottonwood Creek DBPS" by URS, dated 1994.

Is this 2.68 supposed to be another Basin?

2.68 acres of undeveloped land that will remain undeveloped. Runoff (Q5 = 0.6 cfs and Q100 = 4.2 cfs) sheets flows south and west per existing drainage patterns. The majority of this basin will remain undisturbed, except for a portion of the southern limits of this basin along the sites boundary with the "Trails at Forest Meadows Filing No. 4" development. The proposed disturbance is intended to restore the existing property line berm, to ensure no flows negatively impact the homes to the south. Please note, this grading will not changes existing drainage patterns, and flows will be distributed along the length of the basin and not concentrated and the basin will; remain undeveloped with this project,. And therefore, no water quality or detonation is required.

III. Drainage Design Criteria

a. Development Criteria Reference

Storm drainage analysis and design criteria for this project were taken from the "City of Colorado Springs/El Paso County Drainage Criteria Manual" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "Urban Storm Drainage Criteria Manual" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual" (CSDCM), dated May 2014, as adopted by El Paso County.

b. Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. On-

site drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Table 6-2 of the CSDCM. One-hour point rainfall data for the storm events is identified in the chart below. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 1 - 1-hr Point Rainfall Data

Storm	Rainfall (in.)
5-year	1.50
100-year	2.52

c. Hydraulic Criteria

The Rational Method and USDCM's SF-2 and SF-3 forms are used to determine the runoff from the minor and major storms. MHFD-Detention v4.06 spreadsheet is utilized for full-spectrum extended detention basin design. Hydraflow Express is used for hydraulic modeling of swale, spillway, and emergency overflow calculations. Proposed swales have been designed to meet El Paso County criteria for velocity, freeboard, and stability. Hydraflow Storm Sewers is used for storm sewer hydraulic analysis.

IV. Drainage Facility Design

a. General Concept

Onsite stormwater will be conveyed via proposed curb and gutter to proposed Type R inlets. Captured storm water will be piped to Pond A, a full spectrum water quality and detention pond. Drainage infrastructure is sized to account for the assumed future condition of tributary areas. Pond A will discharge to Cottonwood Creek per historic drainage patterns.

b. Water Quality & Detention

Interim Pond A provides full spectrum water quality and detention for Basins C-M. It is the intent of the developer that this pond will be expanded and retrofitted in the future to accommodate developed flows from the entire area this drainage report encompasses. However, the nature and timing of the future development is in the works still, and therefore, the interim pond provides water quality and detention only for the construction proposed with this report and CDR submittal. Individual and site specific drainage reports will be required to support any future development and to address water quality and detention.

See Proposed subbasin descriptions for excluded basins (A, B, N, O, P, Q). A total of 84.37 acres at 5.5% imperviousness are treated in Interim Pond A. The WQCV and EURV are released in 40 and 42 hours, respectively. A concrete bottom forebay is located at the outfall into the pond. A 3.0' riprap lined trickle channel conveys flow towards the full spectrum outlet structure. The outlet structure will release 100-year stormwater at less than historic rates to minimize adverse impacts to downstream stormwater facilities. For some minor storm events, the release rate is higher than the existing predevelopment flows. The table below

this statement does not seem to be accurate based on the pond design sheet

provides the volumes required for the proposed pond, along with the release rates for the 5-year and 100-year storm.

	Required Volume (ac-ft)	Provided Volume (ac-ft)	WQCV (ac-ft)	EURV (ac-ft)	5-year Release (cfs)	100-year Release (cfs)
Pond A	1.39	1.51	0.27	0.009	0.1	40.9

A broad crested weir, lined with Type L buried soil riprap, is provided as an emergency spillway for Pond A. The emergency spillway conveys flow (57.2 cfs) to Cottonwood Creek at the location of the existing sediment basin outfall.

The Pond A outfall pipe controlled release Q_5=0.1 cfs, Q_{100}= 40.9 cfs through a 30" RCP pipe releases flows west to Cottonwood Creek. There are no expected impacts to water surface elevations in Cottonwood Creek from the development of this site. Pond A will be privately owned and maintained by Stonebridge Metropolitan District #4.

c. Major Drainageways

The Cottonwood Creek major drainage basin and Creek traverses the western portions of the site. According to FEMA FIRM 08041C0529G a potion of site lies within the existing Zone AE 100-yr flood plain. It should also be noted that as part of the Colorado Spring Black Forest Road Widening Project, a LOMR application was submitted to FEMA under case # 23-08-0623X, but is currently under review.

d. Operations & Maintenance

An Operations and Maintenance Manual has been submitted separately. The manual specifies maintenance intervals and required actions to maintain the function of the extended detention basin and appurtenances.

e. Grading & Erosion Control Plan

Due to the project disturbance area, a separate Grading and Erosion Control plan is required. The Grading and Erosion Control Plan has been submitted in conjunction with this FDR.

f. Four Step Process

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

Step 1 – Reducing Runoff Volumes: The proposed site development consists of multi-family homes with open spaces and lawn areas interspersed within the development that helps disconnect impervious areas and reduce runoff volumes.

Step 2 – Stabilize Drainageways: The majority of the site lies within the Cottonwood Creek Drainage Basin, while the eastern most portion on the property is within the Sand Creek Drainage Basin. Cottonwood Creek is located to the west of the site. Basin and bridge fees will be due at time of platting. There are no proposed improvements with the 100-year flood plain. According to the "Cottonwood Creek Drainage Basin Planning Study" by URS, 1994 (Cottonwood DBPS), the reach adjacent to the site is DP 6 -7, with design point 7 being the Black Forest Road crossing. The report identifies the reach as having an acceptable slope and velocity range for all alternatives.Proposed outfalls will be analyzed in the final design stage for stability. Applicable excerpts from the Cottonwood DBPS are presented in Appendix D.

Step 3 – Treat the WQCV: Water quality treatment for this site is provided in a proposed full-spectrum EDB (Interim Pond A). The runoff from this site will be captured by inlets and conveyed to Interim Pond A via storm sewer and open channel. Upon entrance to the ponds, flows will be captured in a concrete bottom forebay designed to promote settlement of suspended solids. A riprap lined trickle channel will help convey pond flows and minimize standing water. The outlet structure has been designed to detail the WQCV 40 hours and the EURV 42 hours. 100-year flows released from Pond A will be reduced to historic rates.

Step 4 – Consider Need for Industrial and Commercial BMPs: There are no commercial or industrial components to this development, therefore; no Industrial or Commercial BMPs are required. BMPs will be utilized to minimize off-site contaminants and to protect the downstream receiving waters. The site is not a high-risk site per Figure I-1 in ECM Appendix I. Site specific temporary source control BMPs that will be implemented include, but are not limited to, silt fencing placed around downstream areas of disturbance, construction vehicle tracking pads at the entrances, designated vehicle fueling areas, covered storage areas, and spill containment and control. The permanent erosion control BMPs include asphalt drives, storm inlets, storm sewer, Pond A, and permanent vegetation.

g. Drainage Basin & Bridge Fees

Applicable drainage and bridge fees for the site will be paid at time of platting.

V. Summary

Marksheffel Road – Segment M3 CDRs remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements. The proposed development will not adversely affect downstream stormwater infrastructure or surrounding developments. This report meets the latest El Paso County Drainage Criteria.

VI. References

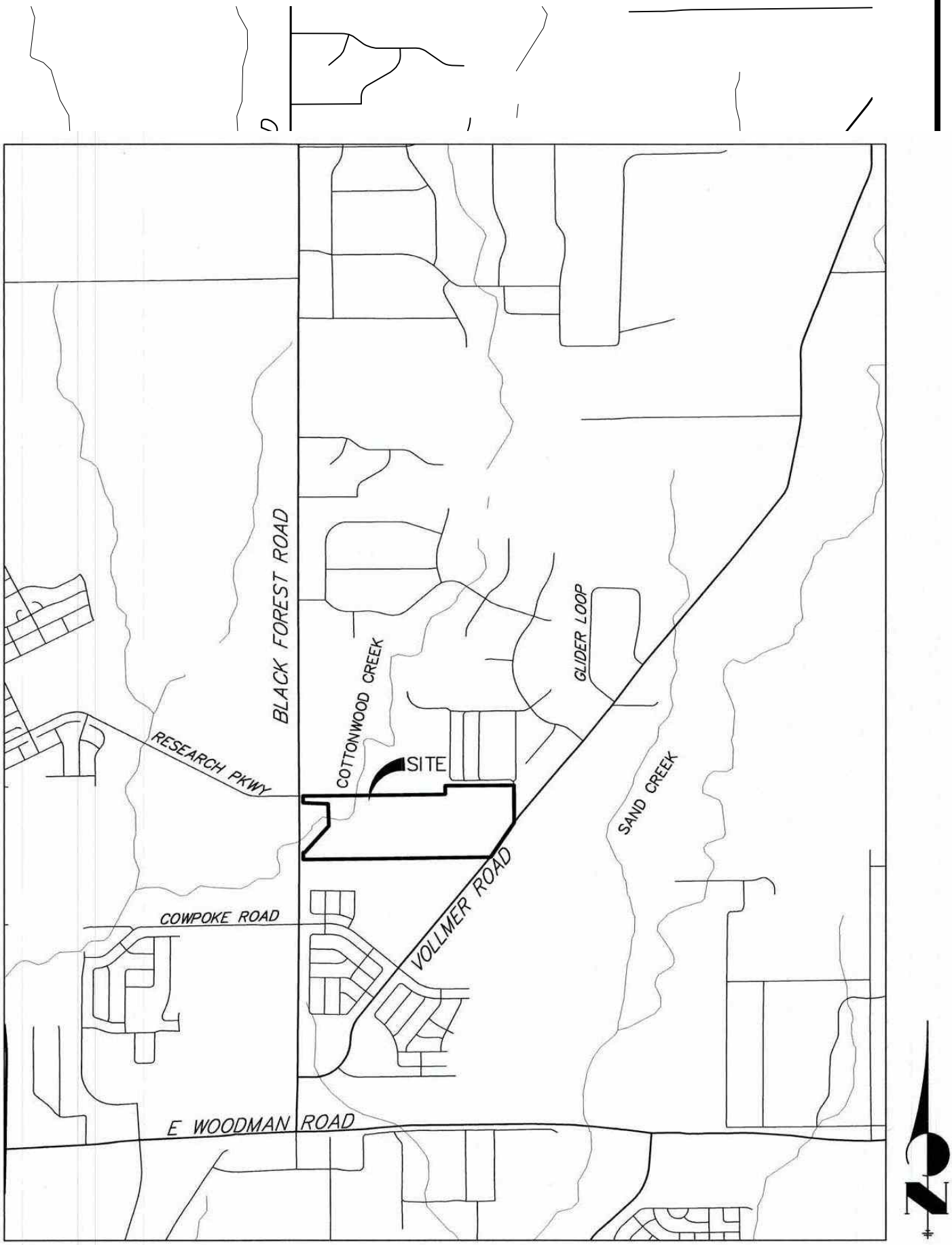
1. El Paso County Drainage Criteria Manual, Vol I & II, as amended.
2. El Paso County Engineering Criteria Manual, 2019.
3. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3), Urban Drainage and Flood Control District, June 2001.
4. Final Drainage Report for Silver Ponds Subdivision Filing No. 1, M.V.E. Inc., February 2, 1995, Revised May 5, 1996.

5. Sand Creek Drainage Basin Planning Study, Stantec, January 2021.
6. Cottonwood Creek Drainage Basin Planning Study, Matrix Design Group, July 2019.
7. Trails at Forest Meadows Filing No. 3 Final Drainage Report, M&S Civil Consultants Inc., August 2015.
8. Trails at Forest Meadows Filing No. 4 Final Drainage Report, M&S Civil Consultants Inc., April 2016.
9. "Cottonwood Creek Drainage Basin Planning Study" June 1994, by URS Consultants
10. LOMR associated w/ Black Forest Road Widening – Case # 23-08-0623X, FEMA
11. "Master Development Drainage Plan Amendment for Sterling Ranch" prepared by JR Engineering, March 2023

Unresolved: Include a cost estimate for each PBMP with line items for all components (ex: riprap, road base, forebay, trickle channel, outlet structure, outlet pipe, spillway, etc). Input the total value into the FAE form under "Permanent Pond/BMP (provide engineer's estimate)" in Section 1. The total should not include grading, which is a separate line item in Section 1: "Earthwork." The cost estimate should include labor costs (as a separate line item or added into the cost of each component).

This should not only be in the FAE but be in the drainage report with each item broken out.

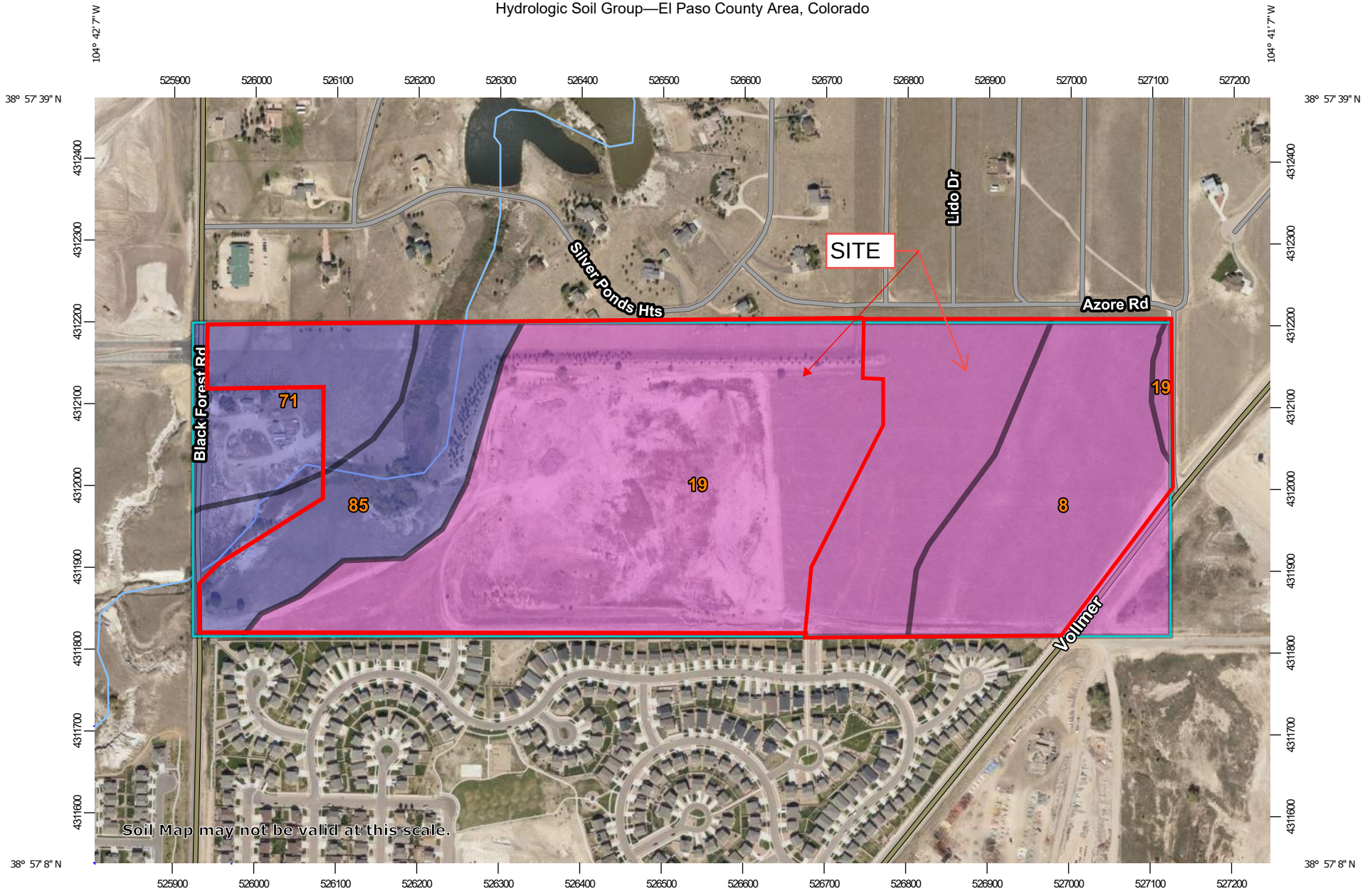
APPENDIX A – VICINITY MAP, FEMA MAP, NRCS WEB SOIL SURVEY & NOAA ATLAS 14



VICINITY MAP

SCALE: 1"=2000'

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:6,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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 19, Aug 31, 2021

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—Sep 23, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	22.3	19.5%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	64.2	56.2%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	12.1	10.6%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	B	15.6	13.6%
Totals for Area of Interest			**114.1**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

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

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

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

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

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

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

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

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

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

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

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

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

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

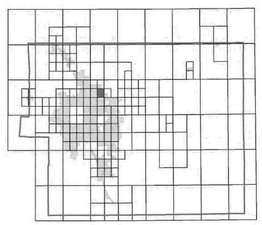
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

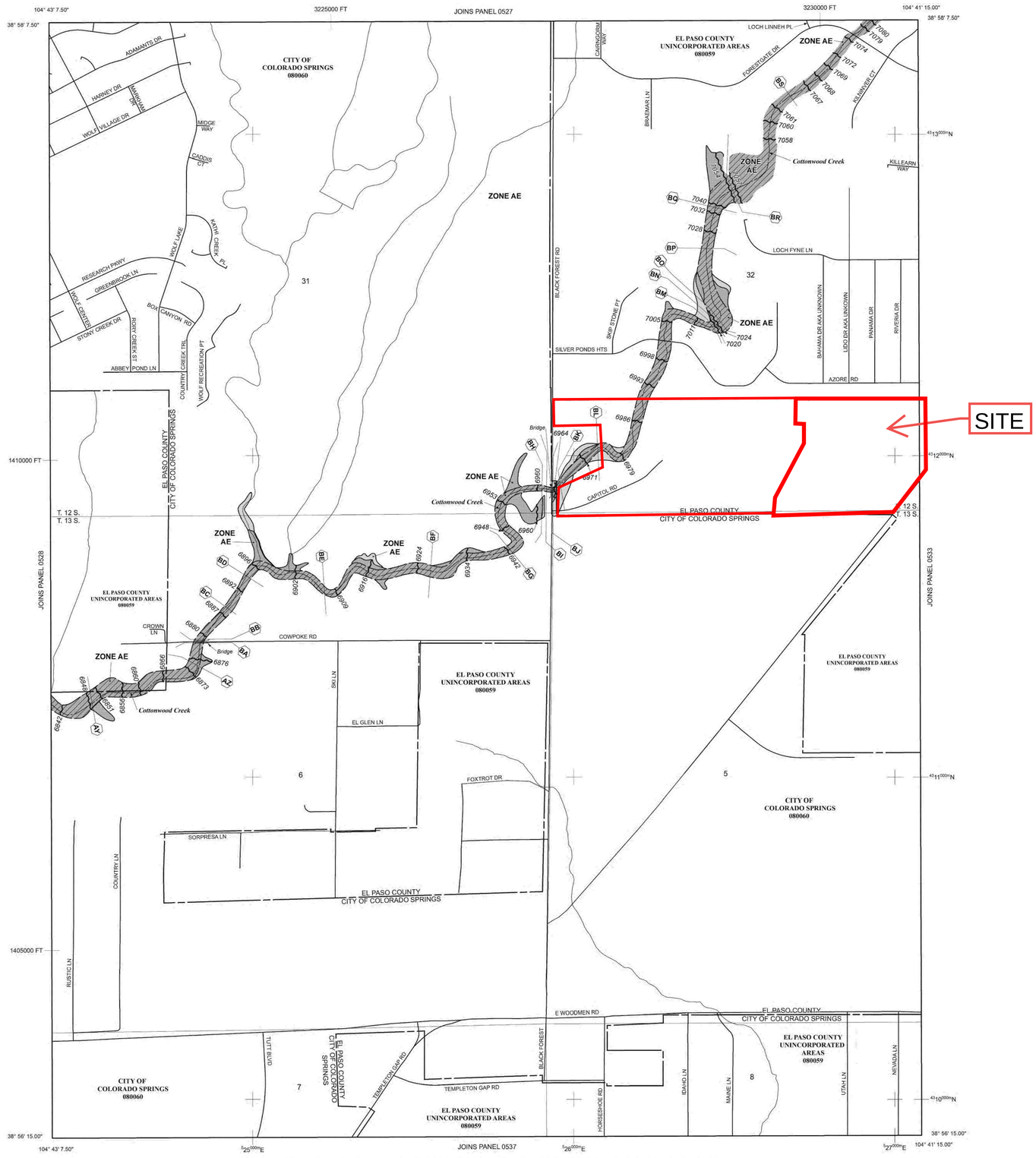
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

A — A Cross section line
23 — 23 Transect line
97° 07' 30.00" / 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4 275 000 mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0529G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 529 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0529	G
EL PASO COUNTY	080059	0529	G

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

MAP NUMBER 08041C0529G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B – HYDROLOGIC CALCULATIONS

ALL TERRAIN
ENGINEERING

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA	0.25	2%	0.09	0.36	51.8	0.0	0.3
EXB	1.51	16%	0.18	0.42	34.8	0.6	2.4
EXC	11.55	2%	0.09	0.36	44.5	2.0	13.2
EXD	21.78	3%	0.10	0.36	48.7	3.7	23.3
EXE	3.96	2%	0.09	0.36	31.9	0.9	5.7
EXF	2.58	2%	0.09	0.36	27.1	0.6	4.1
EXG	39.67	2%	0.09	0.36	62.7	4.9	32.9
EXH	6.67	2%	0.09	0.36	26.6	1.6	10.7
EXI	10.29	2%	0.09	0.36	27.3	2.4	16.3
EXJ	0.33	2%	0.09	0.36	25.7	0.1	0.5
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.0	0.3
2	0.6	2.4
3	2.0	13.2
4	3.7	23.3
4.1	5.5	35.6
5	0.9	5.7
6	0.6	4.1
7	4.9	32.9
7.1	9.2	60.8
8	1.6	10.7
9	2.4	16.3
10	0.1	0.5
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

COMPOSITE % IMPERVIOUS CALCULATIONS -EXISTING CONDITIONS

Subdivision:
Location: El Paso County

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/23/26

Basin ID	Total Area (ac)	Gravel Street (80% Imp.)				Undeveloped (2% Imp.)				Basins Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
EXA	0.25	0.59	0.70	0.00	0.0%	0.09	0.36	0.25	2.0%	0.09	0.36	2.0%
EXB	1.51	0.59	0.70	0.27	14.3%	0.09	0.36	1.24	1.6%	0.18	0.42	16.0%
EXC	11.55	0.59	0.70	0.00	0.0%	0.09	0.36	11.55	2.0%	0.09	0.36	2.0%
EXD	21.78	0.59	0.70	0.27	1.0%	0.09	0.36	21.51	2.0%	0.10	0.36	3.0%
EXE	3.96	0.59	0.70	0.00	0.0%	0.09	0.36	3.96	2.0%	0.09	0.36	2.0%
EXF	2.58	0.59	0.70	0.00	0.0%	0.09	0.36	2.58	2.0%	0.09	0.36	2.0%
EXG	39.67	0.59	0.70	0.00	0.0%	0.09	0.36	39.67	2.0%	0.09	0.36	2.0%
EXH	6.67	0.59	0.70	0.00	0.0%	0.09	0.36	6.67	2.0%	0.09	0.36	2.0%
EXI	10.29	0.59	0.70	0.00	0.0%	0.09	0.36	10.29	2.0%	0.09	0.36	2.0%
EXJ	0.33	0.59	0.70	0.00	0.0%	0.09	0.36	0.33	2.0%	0.09	0.36	2.0%
TOTAL	**98.58**											**2.4%**

STANDARD FORM SF-2 - EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision:
Location: El Paso County

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EXA	0.25	A	2.0%	0.09	0.36	10.0	25.0%	2.0	1030	0.5%	7.0	0.5	34.7	36.7	1040.0	51.8	51.8
EXB	1.51	A	16.0%	0.18	0.42	10.0	25.0%	1.8	950	1.5%	15.0	1.8	8.6	10.4	960.0	34.8	34.8
EXC	11.55	A	2.0%	0.09	0.36	300.0	3.0%	22.0	1260	1.8%	7.0	0.9	22.5	44.5	1560.0	42.6	44.5
EXD	21.78	A	3.0%	0.10	0.36	300.0	2.3%	23.8	1400	1.8%	7.0	0.9	24.8	48.7	1700.0	44.0	48.7
EXE	3.96	A	2.0%	0.09	0.36	300.0	2.1%	24.8	425	2.1%	7.0	1.0	7.0	31.9	725.0	31.0	31.9
EXF	2.58	A	2.0%	0.09	0.36	200.0	2.6%	18.9	123	2.3%	7.0	1.1	1.9	20.8	323.0	27.1	27.1
EXG	39.67	A	2.0%	0.09	0.36	200.0	1.0%	25.8	2300	2.2%	7.0	1.0	36.9	62.7	2500.0	53.5	62.7
EXH	6.67	A	2.0%	0.09	0.36	180.0	2.6%	17.9	100	4.0%	7.0	1.4	1.2	19.1	280.0	26.6	26.6
EXI	10.29	A	2.0%	0.09	0.36	300.0	2.0%	25.1	261	8.0%	7.0	2.0	2.2	27.3	561.0	27.3	27.3
EXJ	0.33	A	2.0%	0.09	0.36	22.0	2.6%	6.3	0	0.0%	7.0	0.0	0.0	6.3	22.0	25.7	25.7

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)
t_i = overland (initial) flow time (minutes)
t_t = channelized flow time (minutes).

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

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

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

Equation 6-2 $$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

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

Equation 6-5

STANDARD FORM SF-2 - EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision:
Location: El Paso County

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EXA	0.25	A	2.0%	0.09	0.36	10.0	25.0%	2.0	1030	0.5%	7.0	0.5	34.7	36.7	1040.0	51.8	51.8
EXB	1.51	A	16.0%	0.18	0.42	10.0	25.0%	1.8	950	1.5%	15.0	1.8	8.6	10.4	960.0	34.8	34.8
EXC	11.55	A	2.0%	0.09	0.36	300.0	3.0%	22.0	1260	1.8%	7.0	0.9	22.5	44.5	1560.0	42.6	44.5
EXD	21.78	A	3.0%	0.10	0.36	300.0	2.3%	23.8	1400	1.8%	7.0	0.9	24.8	48.7	1700.0	44.0	48.7
EXE	3.96	A	2.0%	0.09	0.36	300.0	2.1%	24.8	425	2.1%	7.0	1.0	7.0	31.9	725.0	31.0	31.9
EXF	2.58	A	2.0%	0.09	0.36	200.0	2.6%	18.9	123	2.3%	7.0	1.1	1.9	20.8	323.0	27.1	27.1
EXG	39.67	A	2.0%	0.09	0.36	200.0	1.0%	25.8	2300	2.2%	7.0	1.0	36.9	62.7	2500.0	53.5	62.7
EXH	6.67	A	2.0%	0.09	0.36	180.0	2.6%	17.9	100	4.0%	7.0	1.4	1.2	19.1	280.0	26.6	26.6
EXI	10.29	A	2.0%	0.09	0.36	300.0	2.0%	25.1	261	8.0%	7.0	2.0	2.2	27.3	561.0	27.3	27.3
EXJ	0.33	A	2.0%	0.09	0.36	22.0	2.6%	6.3	0	0.0%	7.0	0.0	0.0	6.3	22.0	25.7	25.7

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)
t_i = overland (initial) flow time (minutes)
t_t = channelized flow time (minutes).

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

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

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

Equation 6-2 $$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

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

Equation 6-5

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

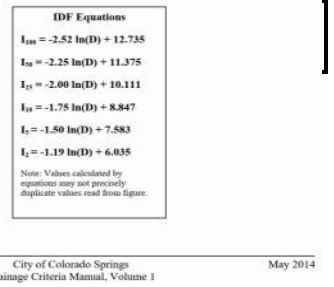
(RATIONAL METHOD PROCEDURE)

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

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	I4	OSI4	27.16	0.30	29.2	8.15	2.33	19.0															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	EXA	0.25	0.09	51.8	0.02	1.66	0.0															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	EXB	1.51	0.18	34.8	0.27	2.26	0.6															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	EXC	11.55	0.09	44.5	1.04	1.89	2.0															Runoff overland flows to existing swale and continues into Basin EXD at DP3.
	4	EXD	21.78	0.10	48.7	2.10	1.75	3.7															Runoff from Basin EXD, overland flows to existing swale at DP4.
	4.1								48.7	3.13	1.75	5.5	48.7	27.75	1.2					1231	1.6	12.5	Flows from DP3 and DP4 combine at DP4.1 and flows to the west to the existing TSB, continue to DP7.1
	5	EXE	3.96	0.09	31.9	0.36	2.39	0.9															Runoff overland flows across exisitng field to DP5 where flow enters Vollmer Road R.O.W.
	6	EXF	2.58	0.09	27.1	0.23	2.63	0.6															Runoff from Basin EXF overland flows south off-site and enters the adjacent property.
	7	EXG	39.67	0.09	62.7	3.57	1.38	4.9															Runoff overland flows SW, enters ex TSB, continues to DP7.1
	7.1								62.7	6.71	1.38	9.2											Combined flow @ DP7.1 from Basin G and DP 4.1, enters Cottonwood Creek and flows off-site
	8	EXH	6.67	0.09	26.6	0.60	2.66	1.6															Runoff from Basin EXH overland flows west, off-site and enters Cottonwood Creek @ DP8
	9	EXI	10.29	0.09	27.3	0.93	2.62	2.4															Runoff from Basin EXI overland flows south and enters Cottonwood Creek & flow off-site.
	10	EXJ	0.33	0.09	25.7	0.03	2.72	0.1															Runoff from Basin EXJ overland flows south off-site and enters the adjacent property.

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.



STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

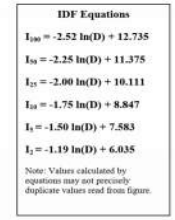
(RATIONAL METHOD PROCEDURE)

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

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	I4	OSI4	27.16	0.40	29.2	10.86	4.07	44.2															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	EXA	0.25	0.36	51.8	0.09	2.79	0.3															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	EXB	1.51	0.42	34.8	0.63	3.79	2.4															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	EXC	11.55	0.36	44.5	4.16	3.17	13.2															Runoff overland flows to existing swale and continues into Basin EXD at DP3.
	4	EXD	21.78	0.36	48.7	7.93	2.94	23.3															Runoff from Basin EXD, overland flows to existing swale at DP4.
	4.1								48.7	12.09	2.94	35.6	48.7	16.5	1.2					1231	1.6	12.5	Flows from DP3 and DP4 combine at DP2.1 and flows to the west to the existing sediment basin.
	5	EXE	3.96	0.36	31.9	1.42	4.01	5.7															Runoff overland flows across exisitng field to DP5 where flow enters Vollmer Road R.O.W.
	6	EXF	2.58	0.36	27.1	0.93	4.42	4.1															Runoff from Basin EXF overland flows south off-site and enters the adjacent property.
	7	EXG	39.67	0.36	62.7	14.28	2.31	32.9															Runoff overland flows SW, enters ex TSB, continues to DP7.1
	7.1								62.7	26.37	2.31	60.8											Combined flow @ DP7.1 from Basin G and DP 4.1, enters Cottonwood Creek and flows off-site
	8	EXH	6.67	0.36	26.6	2.40	4.47	10.7															Runoff from Basin EXH overland flows west, off-site and enters Cottonwood Creek @ DP8
	9	EXI	10.29	0.36	27.3	3.70	4.40	16.3															Runoff from Basin EXI overland flows south and enters Cottonwood Creek & flow off-site.
	10	EXJ	0.33	0.36	25.7	0.12	4.56	0.5															Runoff from Basin EXJ overland flows south off-site and enters the adjacent property.

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.



ALL TERRAIN ENGINEERING

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	0.25	0%	0.08	0.35	53.0	0.0	0.2
B	0.09	0%	0.08	0.35	36.1	0.0	0.1
C	1.85	31%	0.34	0.54	26.9	1.6	4.4
D	1.18	54%	0.52	0.68	21.5	1.8	4.0
E	6.66	0%	0.08	0.35	36.8	1.2	8.5
F	2.56	25%	0.29	0.50	29.5	1.8	5.4
G	0.78	85%	0.78	0.87	16.9	2.0	3.8
H	3.59	0%	0.08	0.35	30.7	0.7	5.2
I	1.22	80%	0.73	0.84	17.5	2.9	5.6
J	1.28	87%	0.79	0.88	16.0	3.5	6.5
K	24.33	0%	0.08	0.35	43.9	3.7	27.3
L	36.07	0%	0.08	0.35	53.6	4.6	34.1
M	4.86	0%	0.08	0.35	44.3	0.7	5.4
N	0.34	0%	0.08	0.35	26.1	0.1	0.5
O	0.56	0%	0.08	0.35	26.7	0.1	0.9
P	2.68	0%	0.08	0.35	26.1	0.6	4.2
Q	10.29	0%	0.08	0.35	47.7	1.5	10.8
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.0	0.2
2	0.0	0.1
3	1.6	4.4
4	1.8	4.0
4.1	3.2	7.9
5	3.9	15.1
5.1	13.4	55.8
6	1.8	5.4
7	2.0	3.8
7.1	3.4	8.3
9	2.9	9.3
10	3.5	6.5
10.1	5.3	13.9
11	3.7	27.3
11.1	7.9	38.0
11.2	10.4	44.3
13	4.6	34.1
13.1	16.3	82.8
14	17.0	87.4
15	0.1	0.5
16	0.1	0.9
17	0.6	4.2
18	1.5	10.8
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

ALL TERRAIN ENGINEERING

COMPOSITE % IMPERVIOUS CALCULATIONS -PROPOSED CONDITIONS

Subdivision: Schmidt Parcel - District P1
Location: El Paso County

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 4/29/26

Basin ID	Total Area (ac)	Paved Streets and Walks (100% Imp.)				Apartments/Mixed Use (75% Imp.)				FUTURE DEVELOPMENT (62.5%)				Lawns/Pasture (0% Imp.)				Basins Total Weighted C		Basins Total Weighted
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A	0.25	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.25	0.0%	0.08	0.35	0.0%
B	0.09	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.09	0.0%	0.08	0.35	0.0%
C	1.85	0.90	0.96	0.58	31.2%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	1.27	0.0%	0.34	0.54	31.2%
D	1.18	0.90	0.96	0.64	54.2%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.54	0.0%	0.52	0.68	54.2%
E	6.66	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	6.66	0.0%	0.08	0.35	0.0%
F	2.56	0.90	0.96	0.65	25.3%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	1.91	0.0%	0.29	0.50	25.3%
G	0.78	0.90	0.96	0.67	85.1%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.12	0.0%	0.78	0.87	85.1%
H	3.59	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	3.59	0.0%	0.08	0.35	0.0%
I	1.22	0.90	0.96	0.97	79.6%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.25	0.0%	0.73	0.84	79.6%
J	1.28	0.90	0.96	1.12	87.2%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.16	0.0%	0.79	0.88	87.2%
K	24.33	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	24.33	0.0%	0.08	0.35	0.0%
L	36.07	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	36.07	0.0%	0.08	0.35	0.0%
M	4.86	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	4.86	0.0%	0.08	0.35	0.0%
N	0.34	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.34	0.0%	0.08	0.35	0.0%
O	0.56	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.56	0.0%	0.08	0.35	0.0%
P	2.68	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	2.68	0.0%	0.08	0.35	0.0%
Q	10.29	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	10.29	0.0%	0.08	0.35	0.0%
TOTAL POND	**84.37**																			**5.5%**
TOTAL (ON-SITE)	**98.58**																			**4.7%**

ALL TERRAIN ENGINEERING

STANDARD FORM SF-2 - PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Schmidt Parcel - District P1
Location: El Paso County

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 4/24/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A	0.25	A	0.0%	0.08	0.35	10.0	25.0%	2.0	1030	0.5%	15.0	1.1	16.2	18.2	1040.0	53.0	53.0
B	0.09	A	0.0%	0.08	0.35	10.0	25.0%	2.0	385	0.5%	15.0	1.1	6.0	8.1	395.0	36.1	36.1
C	1.85	A	31.2%	0.34	0.54	100.0	1.8%	11.4	525	1.1%	20.0	2.1	4.2	15.5	625.0	26.9	26.9
D	1.18	A	54.2%	0.52	0.68	85.0	2.0%	7.6	490	1.1%	20.0	2.1	3.9	11.5	575.0	21.5	21.5
E	6.66	A	0.0%	0.08	0.35	100.0	6.0%	10.2	900	2.4%	15.0	2.3	6.5	16.7	1000.0	36.8	36.8
F	2.56	A	25.3%	0.29	0.50	45.0	2.0%	7.8	1050	3.2%	20.0	3.6	4.9	12.7	1095.0	29.5	29.5
G	0.78	A	85.1%	0.78	0.87	50.0	2.0%	3.3	1050	2.4%	20.0	3.1	5.6	8.9	1100.0	16.9	16.9
H	3.59	A	0.0%	0.08	0.35	100.0	4.5%	11.2	435	3.0%	15.0	2.6	2.8	14.0	535.0	30.7	30.7
I	1.22	A	79.6%	0.73	0.84	85.0	2.0%	4.9	820	1.8%	20.0	2.7	5.1	10.0	905.0	17.5	17.5
J	1.28	A	87.2%	0.79	0.88	85.0	2.0%	4.0	820	1.8%	20.0	2.7	5.1	9.1	905.0	16.0	16.0
K	24.33	A	0.0%	0.08	0.35	100.0	2.9%	13.0	1530	2.5%	7.0	1.1	23.0	36.0	1630.0	43.9	43.9
L	36.07	A	0.0%	0.08	0.35	100.0	2.0%	14.7	2000	1.8%	7.0	0.9	35.5	50.1	2100.0	53.6	53.6
M	4.86	A	0.0%	0.08	0.35	100.0	2.0%	14.7	700	0.5%	15.0	1.1	11.0	25.7	800.0	44.3	44.3
N	0.34	A	0.0%	0.08	0.35	10	25.0%	2.0	5	2.0%	10.0	1.4	0.1	2.1	15.0	26.1	26.1
O	0.56	A	0.0%	0.08	0.35	25	2.0%	7.3	60	2.5%	10.0	1.6	0.6	8.0	85.0	26.7	26.7
P	2.68	A	0.0%	0.08	0.35	10	25.0%	2.0	5	0.5%	10.0	0.7	0.1	2.1	15.0	26.1	26.1
Q	10.29	A	0.0%	0.08	0.35	100	30.0%	6.0	1170	1.0%	10.0	1.0	19.5	25.5	1270.0	47.7	47.7

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)
t_i = overland (initial) flow time (minutes)
t_t = channelized flow time (minutes).

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

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Equation 6-2

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

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

Equation 6-5

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

ALL TERRAIN ENGINEERING

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Schmidt Parcel - District P1
Location: El Paso County
Design Storm: 5-Year

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 4/24/26

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	I4	OSI4	27.16	0.30	29.2	8.15	2.33	19.0															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	A	0.25	0.08	53.0	0.02	1.63	0.03															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	B	0.09	0.08	36.1	0.01	2.20	0.02															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	C	1.85	0.34	26.9	0.62	2.64	1.6								1.6	0.62	1.0	18	85	4.2	0.3	RUNOFF SHEET FLOWS TO C&G, CARRIED TO 5' TYPE R SUMP INLET @ DP3, CAPTURED FLOWS CONTINUE IN PIPE TO DP4.1
	3																						TOTAL FLOW @ DP3 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP4.1
	4	D	1.18	0.52	21.5	0.62	2.98	1.8															RUNOFF SHEET FLOWS TO C&G, CARRIED TO DP4 (5' TYPE R SUMP INLET). CAPTURED FLOWS PIPED TO DP4.1 WHERE THEY COMBINE WITH DP3 FLOWS
	4.1								27.3	1.24	2.62	3.2	3.2	1.24	2.8	3.2	1.24	2.0	24	1000	2.5	6.6	COMBINED FLOW IN PIPE FROM DP3 & 4, FLOWS DISCHARGE TO SWALE E1 AND ARE CARRIED TO DP5 WHERE THEY COMBINE WITH BASIN E FLOWS
	5	E	6.66	0.08	36.8	0.53	2.18	1.2															RUNOFF SHEET FLOWS TOWARDS SWALE E1, FLOWS CONTINUE IN SWALE TO DP5, WHERE THEYC COMBINE WITH FLOWS FROM DP4.1
	5								36.8	1.77	2.18	3.9											COMBINED FLOW IN SWALE E1 @ DP5, FLOWS CONTINUE TO DP5.1 IN SWALE L1
	6	F	2.56	0.29	29.5	0.74	2.51	1.8								1.8	0.74	1.0	18	40	4.4	0.2	RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 6, CAPTURED FLOWS ARE PIPED TO DP7.1
	7	G	0.78	0.78	16.9	0.61	3.34	2.0															RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 7, CAPTURED FLOWS ARE PIPED TO DP7.1
	7.1								29.6	1.35	2.50	3.4				3.4	1.35	1.0	24	45	5.1	0.1	COMBINED FLOW FROM DP6 & 7 IN 24" RCP, FLOWS ARE PIPED TO DP11.2
	9	H	3.59	0.08	30.7	0.29	2.45	0.7															BASIN H RUNOFF SHEET FLOWS TO C&G IN BASIN I, FLOWS CONTINUE TO DP9 (10' TYPE R SUMP) WHERE THEY COMBINE WITH BASIN I FLOWS
	9	I	1.22	0.73	17.5	0.89	3.29	2.9	30.7	1.18	2.45	2.9				2.9	1.18	1.0	24	90	4.8	0.3	BASIN I RUNOFF CARREID BY C&G TO 10' TYPE R SUMP INLET @ DP9, WHERE FLOWS COMBINE WITH BASIN H FLOWS, CAPTURED FLOWS PIPED TO DP10.1
	10	J	1.28	0.79	16.0	1.02	3.43	3.5															BASIN J RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO DP10 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP10.1
	10.1								31.0	2.19	2.43	5.3				5.3	2.19	1.0	36	1880	5.6	5.6	COMBINED FLOW IN PIPE @ DP10.1, FLOWS CONTINUE IN PIPE TO DP11.1
	11	K	24.33	0.08	43.9	1.95	1.91	3.7								3.7	1.95	2.3	36	136	6.6	0.3	RUNOFF SHEET FLOWS TOWARDS SWALE K1, FLOWS CONTINUE IN SWALE TO DP11, A TYPE C SUMP INLET/ CAPTURED FLOWS ARE PIPED TO DP11.1
	11.1								44.3	4.14	1.90	7.9				7.9	4.14	2.8	42	46	8.8	0.1	COMBINED FLOW IN PIPE @ DP 11.1 FROM DP11 RUNOFF & DP10.1 PIPED FLOW, FLOW CONTINUES IN 42" RCP TO DP11.2
	11.2								44.3	5.49	1.89	10.4	10.4	5.49	0.65					120	1.2	1.7	COMBINED FLOW IN PIPE @ DP 11.2, OUTFALLS TO SWALE L1, CONTINUE TO DP5.1, WHERE FLOWS COMBINE WITH DP5 FLOWS IN SWALE L1
	5.1								46.0	7.26	1.84	13.4	13.4	7.26	1					1600	1.5	17.8	COMBINED FLOW IN SWALE L1 @ DP5.1. FLOWS CONTINUE IN SWALE TO DP13.1, WHERE THEY COMBINE WITH BASIN L RUNOFF
	13	L	36.07	0.08	53.6	2.89	1.61	4.6															RUNOFF FROM BASIN L, SHEET FLOWS TO SWALE @ DP13, FLOWS CONTINUE IN SWALE TO DP13.1 WHERE THEY COMBINE WITH DP5.1 FLOWS
	13.1								53.6	10.14	1.61	16.3											TOTAL FLOWS IN SWALE L1 @ DP13.1, FLOWS CONTINUE TO POND A @ DP14
	14	M	4.86	0.08	44.3	0.39	1.90	0.7	53.6	10.53	1.61	17.0											RUNOFF SHEET FLOWS INTO POND @ DP14 AND COMBINES WITH FLOWS FROM DP13.1
	15	N	0.34	0.08	26.1	0.03	2.69	0.1															RUNOFF SHEET FLOWS OFF-SITE @ DP 15
	16	O	0.56	0.08	26.7	0.04	2.66	0.1															RUNOFF SHEET FLOWS OFF-SITE @ DP 16
	17	P	2.68	0.08	26.1	0.21	2.69	0.6															RUNOFF SHEET FLOWS OFF-SITE @ DP 17
	18	Q	10.29	0.08	47.7	0.82	1.79	1.5															RUNOFF SHEET FLOWS OFF-SITE @ DP 18

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

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.

ALL TERRAIN ENGINEERING

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

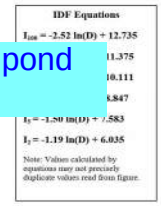
Subdivision: Schmidt Parcel - District P1
Location: El Paso County
Design Storm: 100-Year

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 4/27/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	I4	OSI4	27.16	0.40	29.2	10.86	4.07	44.2															
	1	A	0.25	0.35	53.0	0.09	2.73	0.2															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	B	0.09	0.35	36.1	0.03	3.70	0.1															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	C	1.85	0.54	26.9	1.00	4.44	4.4								4.4	1.00	1.0	18	85	5.7	0.2	RUNOFF SHEET FLOWS TO C&G, CARRIED TO 5' TYPE R SUMP INLET @ DP3, CAPTURED FLOWS CONTINUE IN PIPE TO DP4.1
	4	D	1.18	0.68	21.5	0.80	5.01	4.0															RUNOFF SHEET FLOWS TO C&G, CARRIED TO DP4 (5' TYPE R SUMP INLET). CAPTURED FLOWS PIPED TO DP4.1 WHERE THEY COMBINE WITH DP3 FLOWS
	4.1								27.2	1.80	4.41	7.9	7.9	1.8	2.8	7.9	1.80	2.0	24	1000	2.5	6.6	COMBINED FLOW IN PIPE FROM DP3 & 4, FLOWS DISCHARGE TO SWALE E1 AND ARE CARRIED TO DP5 WHERE THEY COMBINE WITH BASIN E FLOWS
	5	E	6.66	0.35	36.8	2.33	3.65	8.5															RUNOFF SHEET FLOWS TOWARDS SWALE E1, FLOWS CONTINUE IN SWALE TO DP5, WHERE THEYC COMBINE WITH FLOWS FROM DP4.1
	5								36.8	4.13	3.65	15.1											COMBINED FLOW IN SWALE E1 @ DP5, FLOWS CONTINUE TO DP5.1 IN SWALE L1
	6	F	2.56	0.50	29.5	1.29	4.21	5.4								5.4	1.29	1.0	18	40	6.0	0.1	RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 6, CAPTURED FLOWS ARE PIPED TO DP7.1
	7	G	0.78	0.87	16.9	0.68	5.60	3.8															RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 7, CAPTURED FLOWS ARE PIPED TO DP7.1
	7.1								29.6	1.97	4.20	8.3				8.3	1.97	1.0	24	45	6.6	0.1	COMBINED FLOW FROM DP6 & 7 IN 24" RCP, FLOWS ARE PIPED TO DP11.2
	9	H	3.59	0.35	30.7	1.26	4.11	5.2															BASIN H RUNOFF SHEET FLOWS TO C&G IN BASIN I, FLOWS CONTINUE TO DP9 (10' TYPE R SUMP) WHERE THEY COMBINE WITH BASIN I FLOWS
	9	I	1.22	0.84	17.5	1.02	5.52	5.6	30.7	2.27	4.11	9.3				9.3	2.27	1.0	24	90	6.8	0.2	BASIN I RUNOFF CARREID BY C&G TO 10' TYPE R SUMP INLET @ DP9, WHERE FLOWS COMBINE WITH BASIN H FLOWS, CAPTURED FLOWS PIPED TO DP10.1
	10	J	1.28	0.88	16.0	1.13	5.75	6.5															BASIN J RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO DP10 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP10.1
	10.1								30.9	3.40	4.09	13.9				13.9	3.40	1.0	36	1880	7.5	4.2	COMBINED FLOW IN PIPE @ DP10.1, FLOWS CONTINUE IN PIPE TO DP11.1
	11	K	24.33	0.35	43.9	8.52	3.20	27.3								27.3	8.52	2.3	36	136	12.1	0.2	RUNOFF SHEET FLOWS TOWARDS SWALE K1, FLOWS CONTINUE IN SWALE TO DP11, A TYPE C SUMP INLET/ CAPTURED FLOWS ARE PIPED TO DP11.1
	11.1								44.1	11.92	3.19	38.0				38.0	11.92	2.8	42	46	14.2	0.1	COMBINED FLOW IN PIPE @ DP 11.1 FROM DP11 RUNOFF & DP10.1 PIPED FLOW, FLOW CONTINUES IN 42" RCP TO DP11.2
	11.2								44.2	13.89	3.19	44.3	44.3	13.9	0.65					120	1.2	1.7	COMBINED FLOW IN PIPE @ DP 11.2, OUTFALLS TO SWALE L1, CONTINUE TO DP5.1, WHERE FLOWS COMBINE WITH DP5 FLOWS IN SWALE L1
	5.1								45.8	18.02	3.10	55.8	55.8	18	1					1600	1.5	17.8	COMBINED FLOW IN SWALE L1 @ DP5.1. FLOWS CONTINUE IN SWALE TO DP13.1, WHERE THEY COMBINE WITH BASIN L RUNOFF
	13	L	36.07	0.35	53.6	12.63	2.70	34.1															RUNOFF FROM BASIN L, SHEET FLOWS TO SWALE @ DP13, FLOWS CONTINUE IN SWALE TO DP13.1 WHERE THEY COMBINE WITH DP5.1 FLOWS
	13.1								53.6	30.64	2.70	82.8											TOTAL FLOWS IN SWALE L1 @ DP13.1, FLOWS CONTINUE TO POND A @ DP14
	14	M	4.86	0.35	44.3	1.70	3.18	5.4	53.6	32.34	2.70	87.4											RUNOFF SHEET FLOWS INTO POND @ DP14 AND COMBINES WITH FLOWS FROM DP13.1
	15	N	0.34	0.35	26.1	0.12	4.52	0.5															RUNOFF SHEET FLOWS OFF-SITE @ DP 15
	16	O	0.56	0.35	26.7	0.20	4.46	0.9															RUNOFF SHEET FLOWS OFF-SITE @ DP 16
	17	P	2.68	0.35	26.1	0.94	4.51	4.2															RUNOFF SHEET FLOWS OFF-SITE @ DP 17
	18	Q	10.29	0.35	47.7	3.60	3.00	10.8															RUNOFF SHEET FLOWS OFF-SITE @ DP 18

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

include 14.1 for pond outflow


IDF Equations

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

$I_{50} = -2.19 \ln(D) + 11.375$

$I_{25} = -1.90 \ln(D) + 10.111$

$I_{10} = -1.50 \ln(D) + 7.847$

$I_2 = -1.50 \ln(D) + 7.583$

$I_2 = -1.19 \ln(D) + 6.035$

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

APPENDIX C – HYDRAULIC CALCULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP4	DP6	DP7
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.8	1.8	2.0
Major Q_{Known} (cfs)	4.0	5.4	3.8

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.8**	**1.8**	**2.0**
Major Total Design Peak Flow, Q (cfs)	**4.0**	**5.4**	**3.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP9	DP10	DP3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.9	3.5	1.6
Major Q_{Known} (cfs)	9.3	6.5	4.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

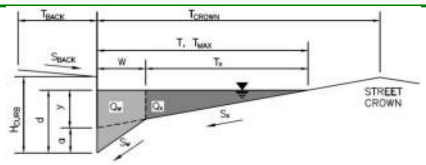
Minor Total Design Peak Flow, Q (cfs)	**2.9**	**3.5**	**1.6**
Major Total Design Peak Flow, Q (cfs)	**9.3**	**6.5**	**4.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

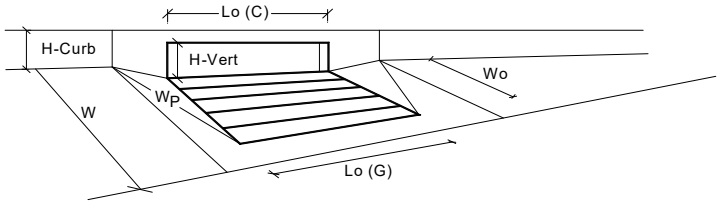
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



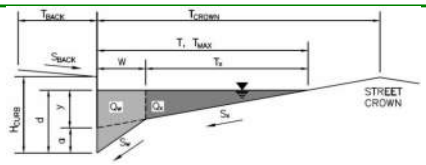
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.0	8.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.50	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.8	4.0	cfs

MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP6**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.024	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

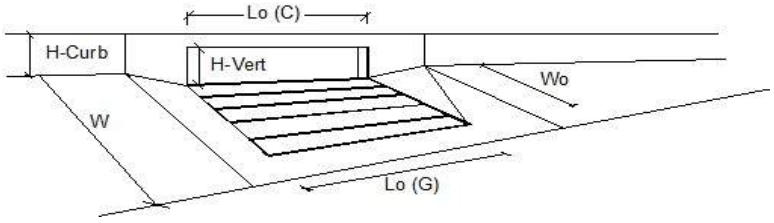
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**29.7**	**30.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.80 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 5.40 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

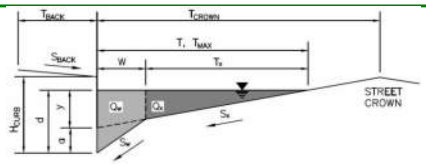
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.8**	**5.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP7**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.024	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

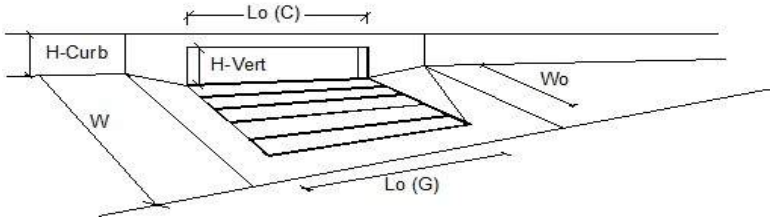
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**29.7**	**30.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.00 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.80 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



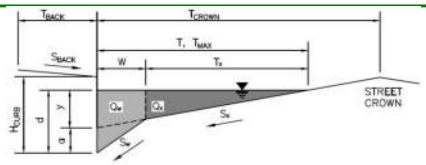
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.0**	**3.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP9**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

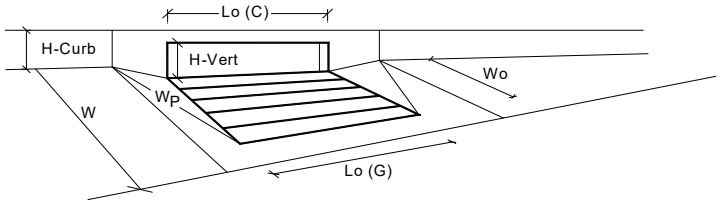
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

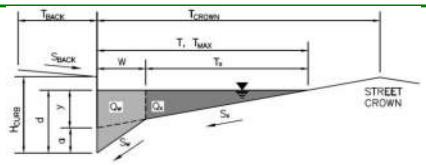


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.7	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.68	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.9**	**20.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.9	9.3	cfs

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

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

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP10**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

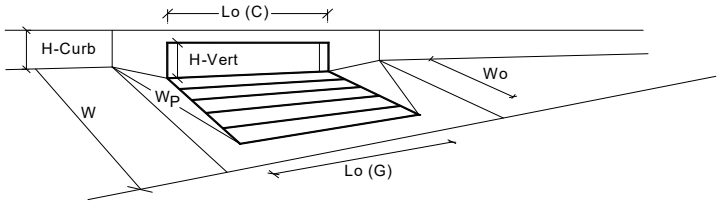
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

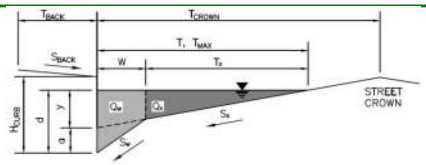


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.7	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.68	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.3**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.5	6.5	cfs

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

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

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

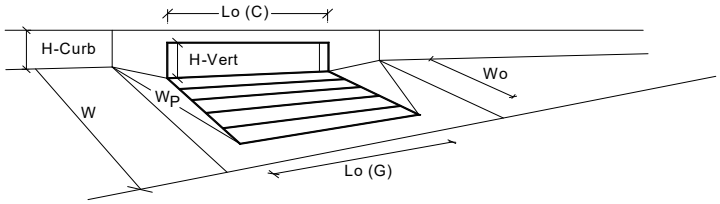
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.0	8.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.50	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.6	4.4	cfs

ATE

(5-yr)

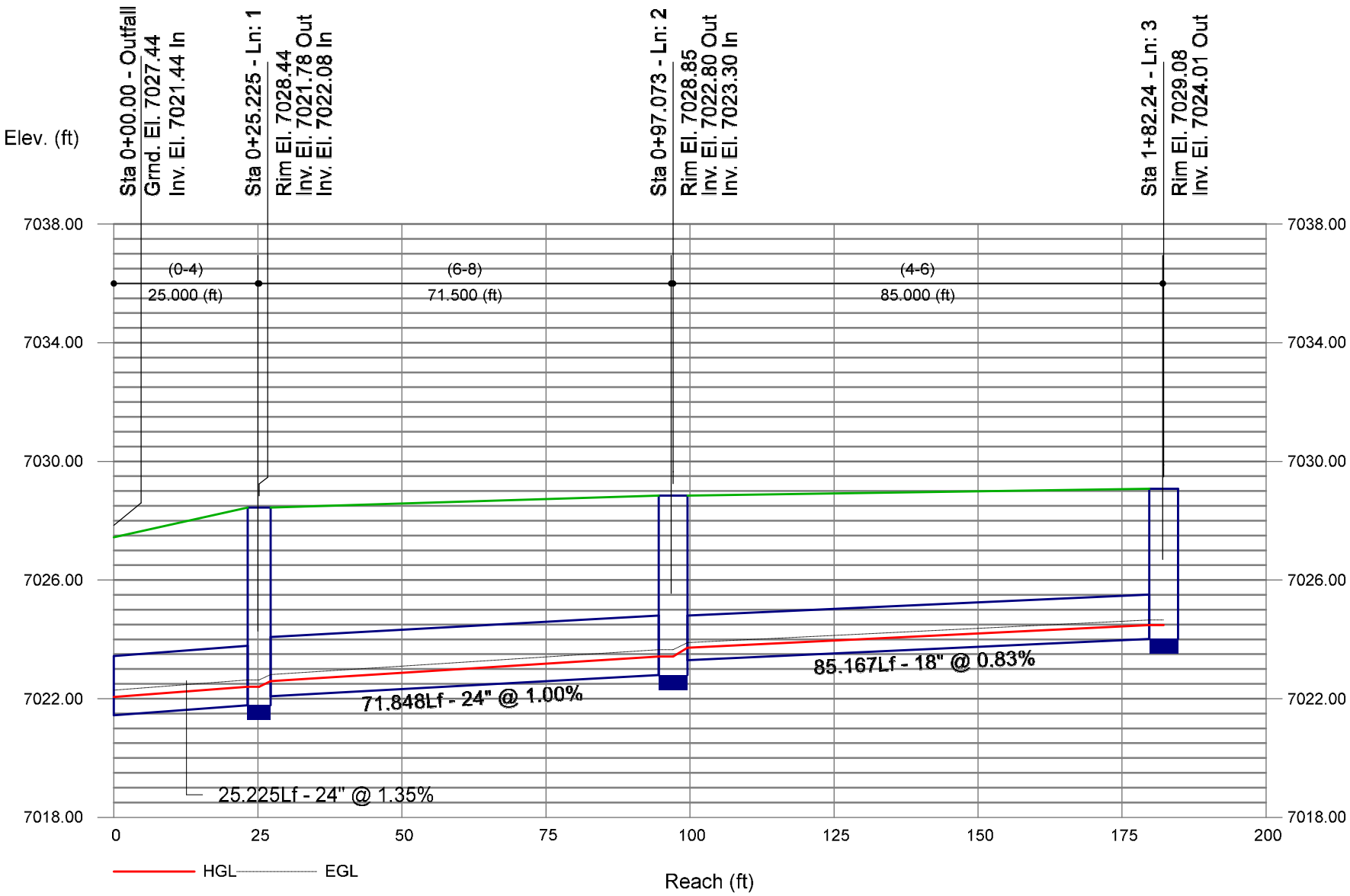
Line No.	DnStm Ln No	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Vel Ave (ft/s)	HGL Dn (ft)	HGL Up (ft)	EGL Dn (ft)	EGL Up (ft)	Line Size (in)	Line Length (ft)	
1	Outfall	3.20	26.25	0.013	7021.44	7021.78	3.84	7022.06	7022.40	7022.29	7022.634296875	24	25.225	
2	1	3.20	22.64	0.013	7022.08	7022.80	4.45	7022.59	7023.42	7022.82	7023.65431640625	24	71.848	
3	2	1.60	9.59	0.013	7023.30	7024.01	3.67	7023.72	7024.48	7023.89	7024.654375	18	85.167	
4	Outfall	10.40	100.34	0.013	6993.46	6993.92	4.73	6994.44	6994.90 j	6994.79	6995.2455078125	42	46.243	
5	4	7.90	82.03	0.013	6994.02	6994.33	4.30	6994.90	6995.18 j	6995.20	6995.4767578125	42	46.639	
6	5	5.30	82.01	0.013	6994.63	6995.46	4.37	6995.23	6996.15	6995.48	6996.390390625	42	124.922	
7	6	5.30	82.23	0.013	6995.76	6998.19	4.38	6996.36	6998.88	6996.60	6999.12037109375	42	363.779	
8	7	5.30	82.15	0.013	6998.29	7001.35	4.37	6998.89	7002.04	6999.14	7002.28052734375	42	459.002	
9	8	5.30	81.94	0.013	7001.65	7002.50	4.37	7002.25	7003.19	7002.50	7003.4304296875	42	128.163	
10	9	5.30	66.92	0.013	7003.00	7004.89	4.85	7003.57	7005.61	7003.83	7005.87083984375	36	187.764	
11	10	5.30	29.90	0.012	7005.89	7013.28	5.80	7006.46	7014.09	7006.77	7014.40130859375	24	496.348	
12	11	5.30	19.70	0.012	7013.58	7014.40	4.87	7014.29	7015.21	7014.59	7015.52142578125	24	126.786	
13	12	3.40	19.69	0.012	7014.70	7015.29	4.29	7015.26	7015.93	7015.50	7016.17408203125	24	91.347	
14	4	3.40	22.71	0.013	6995.42	6995.88	4.54	6995.94	6996.52	6996.18	6996.76392578125	24	45.605	
15	14	1.80	10.46	0.013	6996.38	6996.79	3.94	6996.80	6997.29	6996.99	6997.47443359375	18	41.333	
16	5	3.70	131.65	0.012	6994.83	6998.15	5.91	6995.18	6998.75	6995.39	6998.95951171875	36	100.000	
17	Outfall	0.10	43.18	0.013	6968.40	6970.40	1.50	6968.50	6970.50	6968.53	6970.53146484375	30	180.403	

Project File: DVDP_P1_interim.stm | Number of lines: 17 | Date: 4/29/2026

NOTES: ** Critical depth

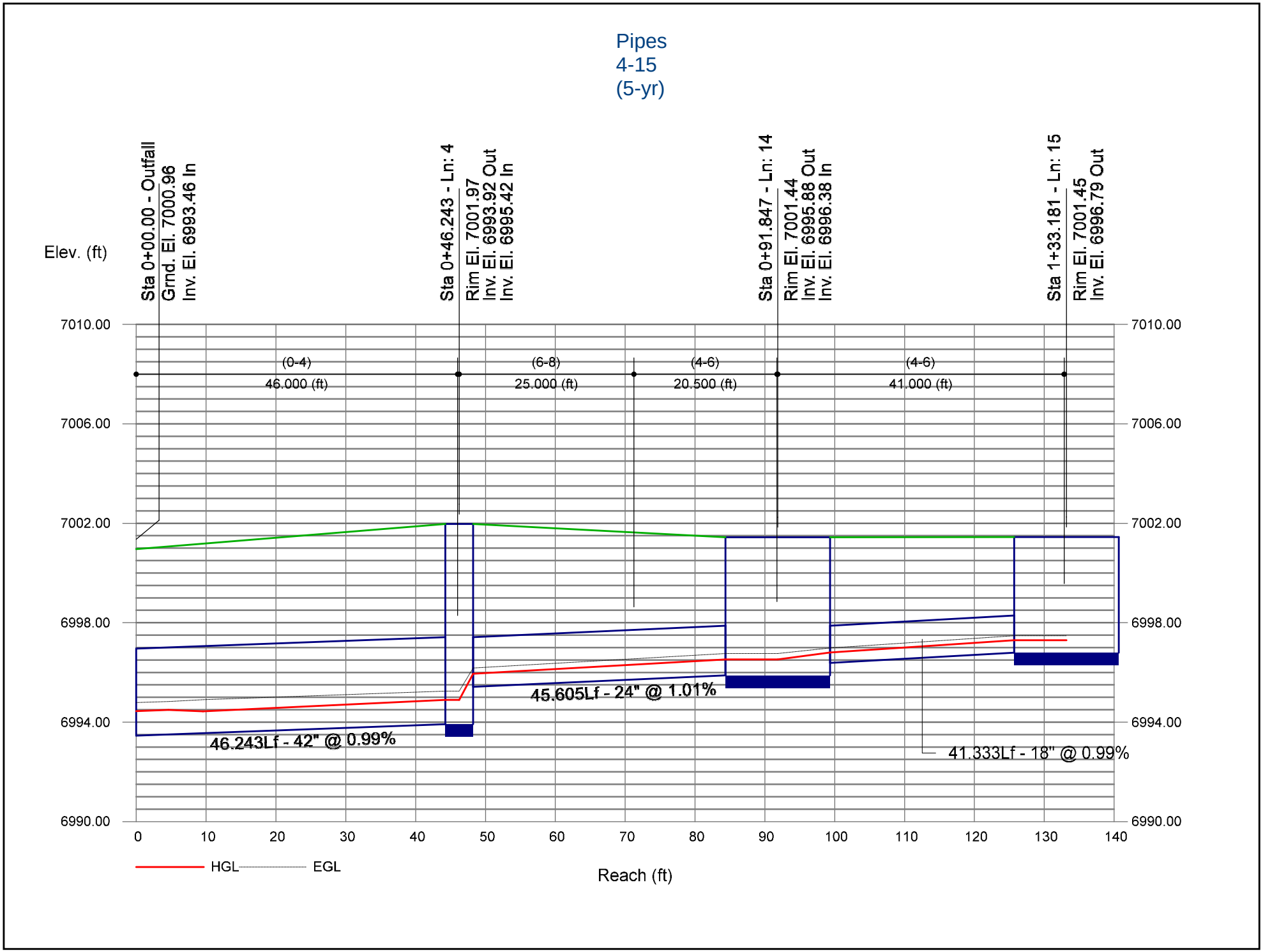
Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



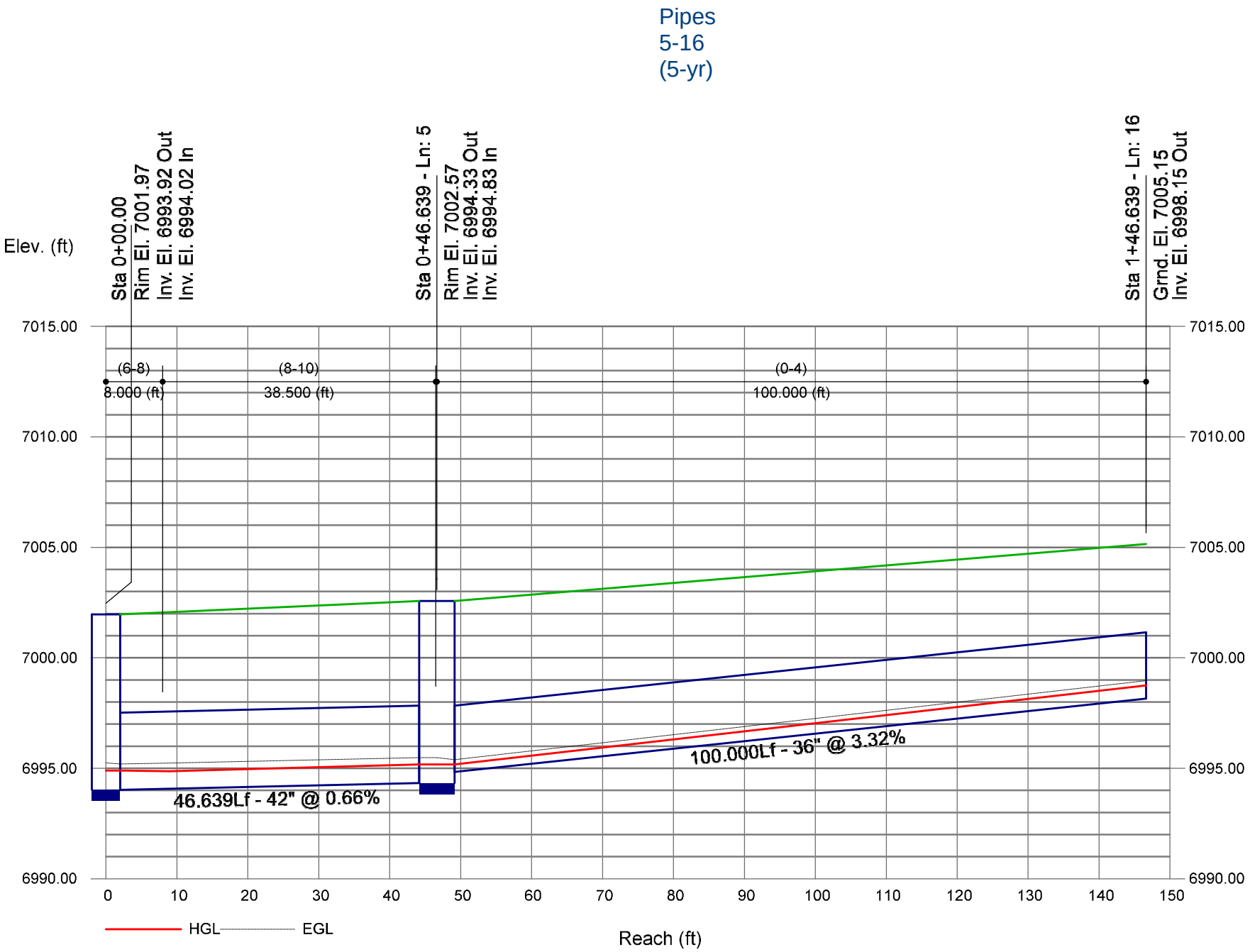
Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



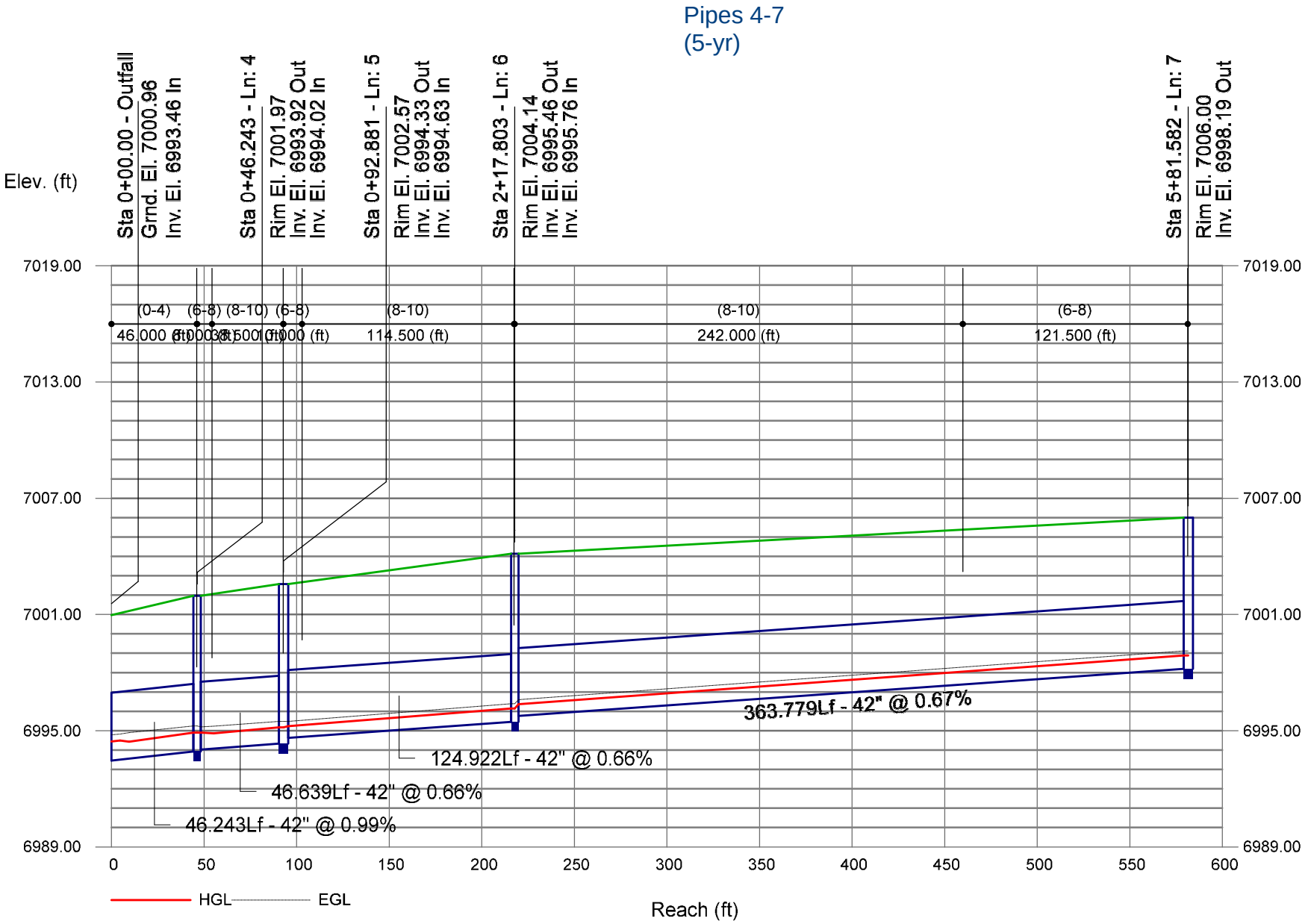
Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



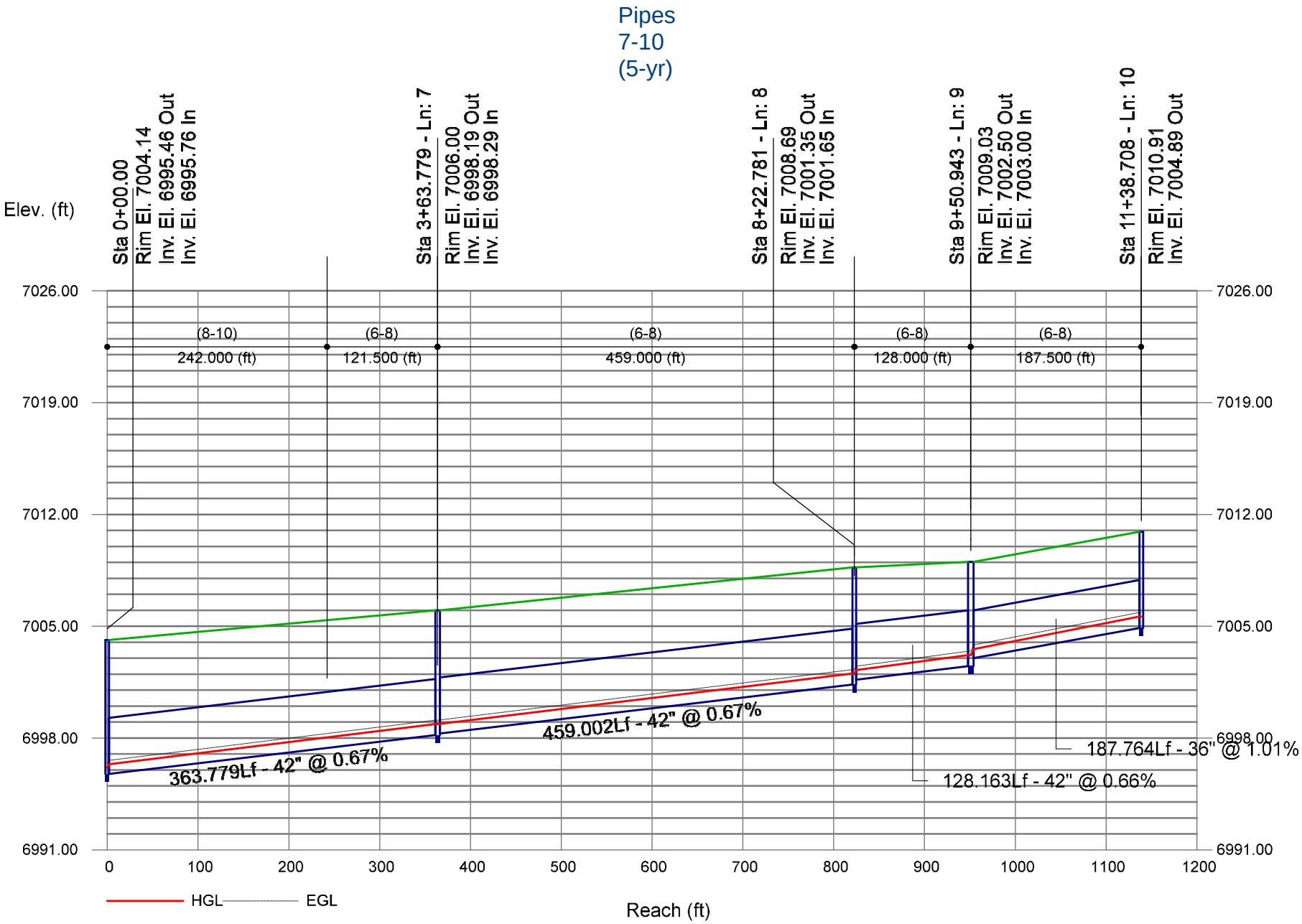
Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



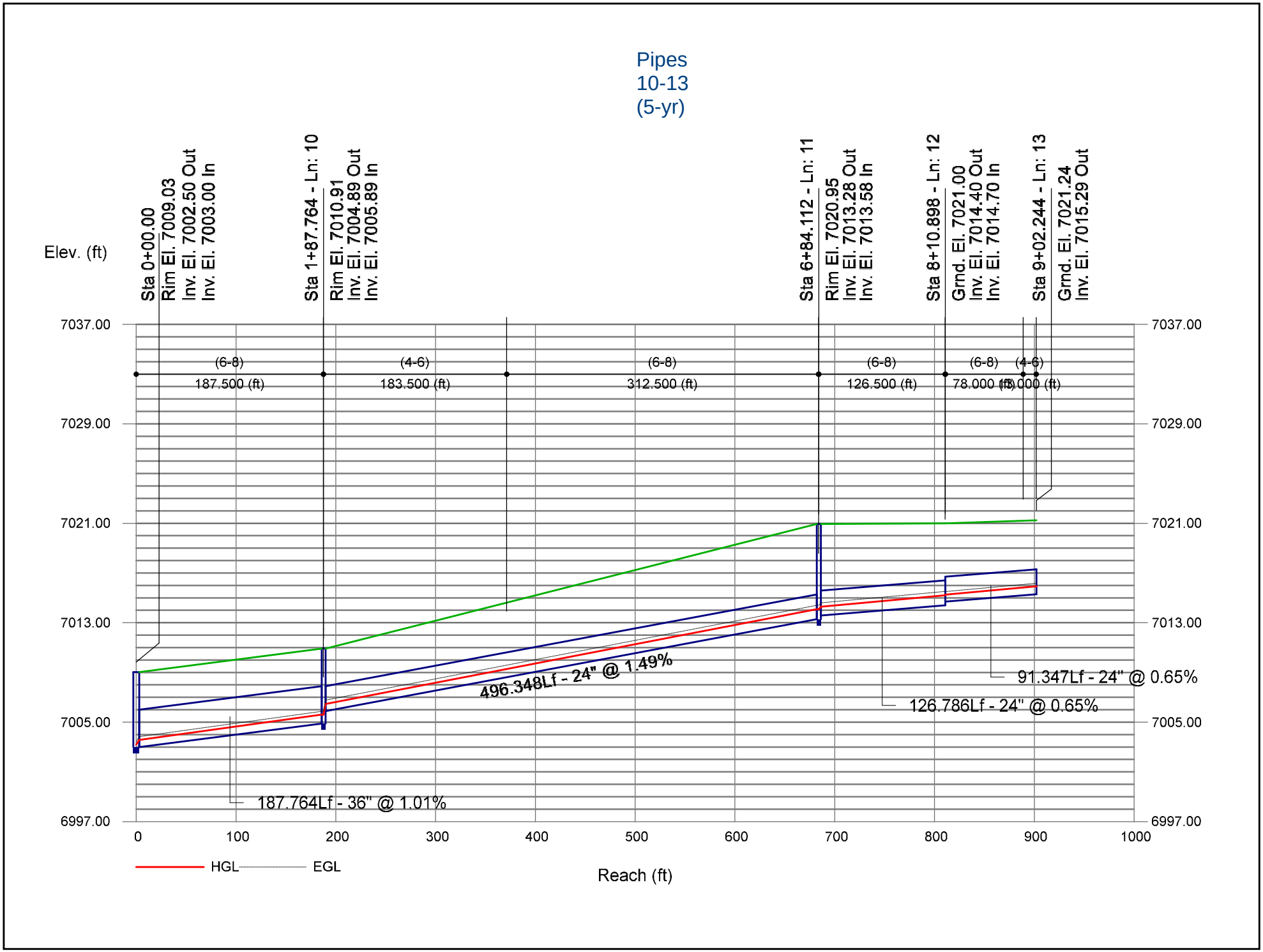
Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



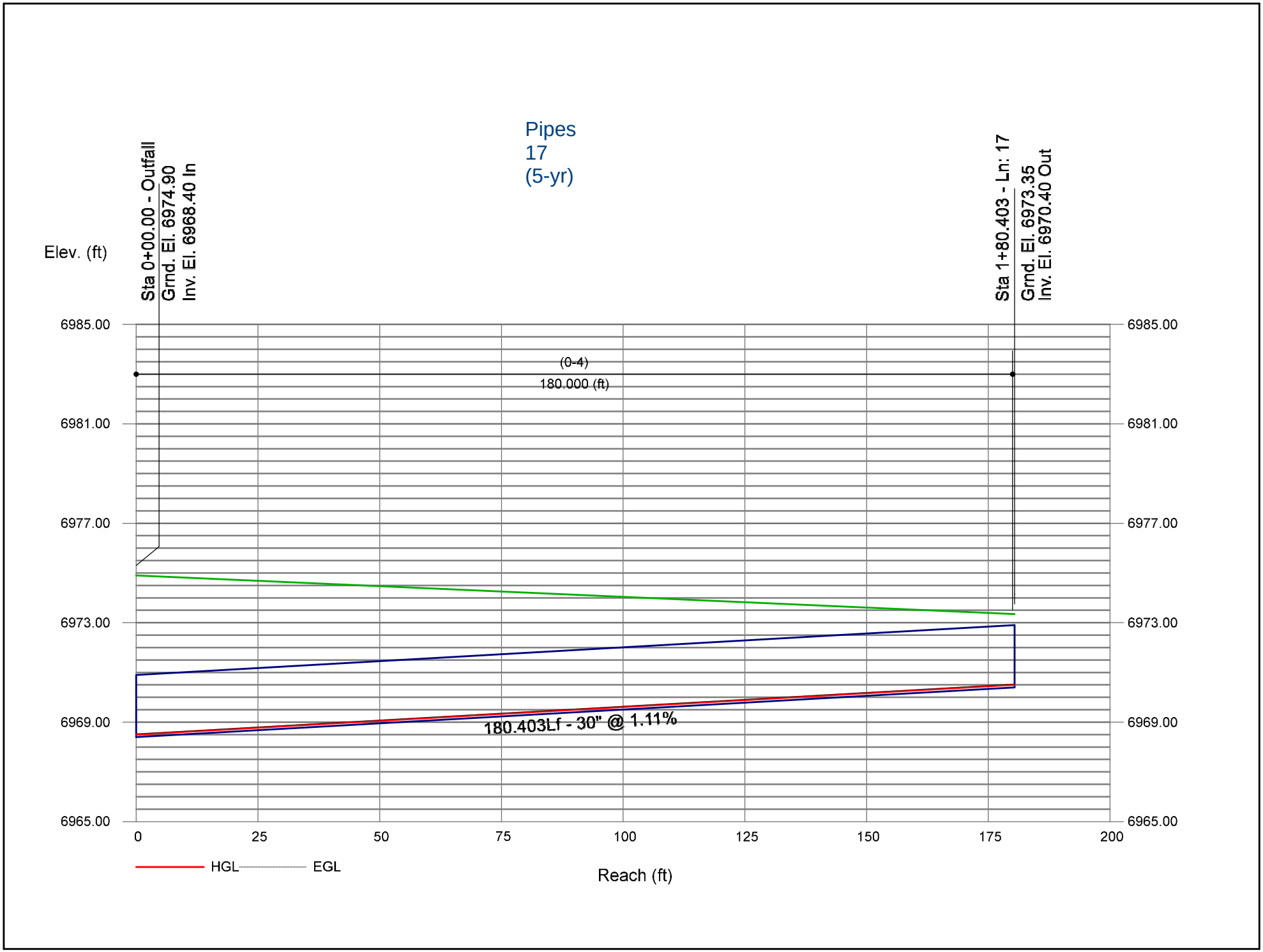
Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



Storm Sewer Profile

Proj. file: DVDP_P1_interim.stm



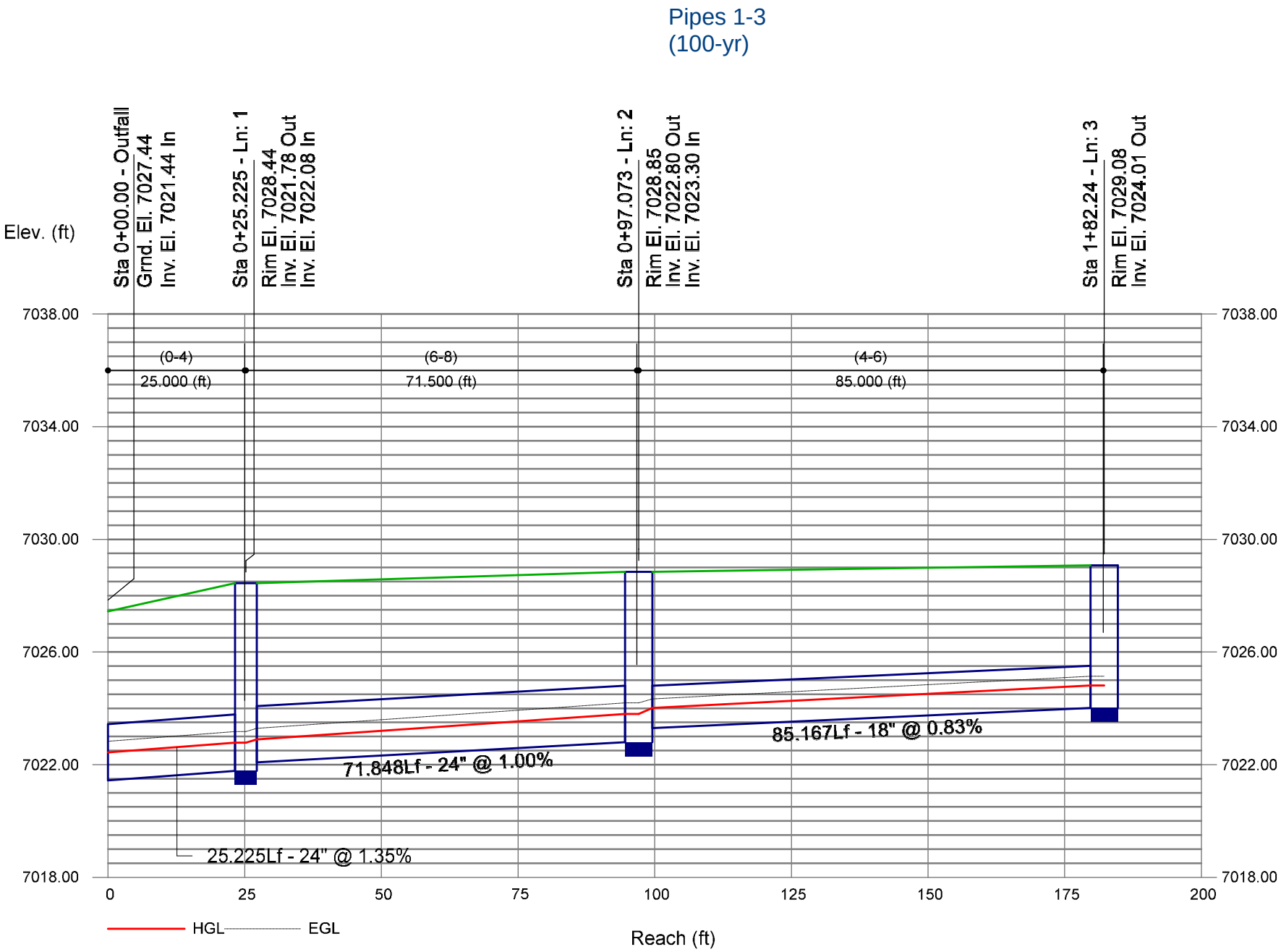
Line No.	DnStm Ln No	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Vel Ave (ft/s)	HGL Dn (ft)	HGL Up (ft)	EGL Dn (ft)	EGL Up (ft)	Line Size (in)	Line Length (ft)	
1	Outfall	7.90	26.25	0.013	7021.44	7021.78	4.08	7022.94	7022.78	7023.33	7023.16880859375	24	25.225	
2	1	7.90	22.64	0.013	7022.08	7022.80	5.80	7022.90	7023.80	7023.29	7024.188828125	24	71.848	
3	2	4.40	9.59	0.013	7023.30	7024.01	4.93	7024.01	7024.81	7024.34	7025.13396484375	18	85.167	
4	Outfall	44.30	100.34	0.013	6993.46	6993.92	6.43	6996.25	6995.99	6997.12	6996.8631640625	42	46.243	
5	4	38.00	82.03	0.013	6994.02	6994.33	6.93	6995.99	6996.24 j	6996.77	6997.01365234375	42	46.639	
6	5	13.90	82.01	0.013	6994.63	6995.46	4.18	6996.24	6996.59 j	6996.66	6997.0027734375	42	124.922	
7	6	13.90	82.23	0.013	6995.76	6998.19	5.76	6996.73	6999.32	6997.15	6999.73275390625	42	363.779	
8	7	13.90	82.15	0.013	6998.29	7001.35	5.51	6999.32	7002.48	6999.74	7002.89291015625	42	459.002	
9	8	13.90	81.94	0.013	7001.65	7002.50	5.75	7002.63	7003.63	7003.04	7004.0428125	42	128.163	
10	9	13.90	66.92	0.013	7003.00	7004.89	6.40	7003.93	7006.08	7004.37	7006.516171875	36	187.764	
11	10	13.90	29.90	0.012	7005.89	7013.28	7.77	7006.85	7014.62	7007.45	7015.22158203125	24	496.348	
12	11	13.90	19.70	0.012	7013.58	7014.40	6.50	7014.82	7015.74	7015.42	7016.34169921875	24	126.786	
13	12	5.20	19.69	0.012	7014.70	7015.29	3.77	7015.74	7016.09 j	7016.04	7016.39375	24	91.347	
14	5	27.30	131.65	0.012	6994.83	6998.15	7.50	6996.24	6999.84	6996.94	7000.52740234375	36	100.000	
15	Outfall	8.30	22.71	0.013	6995.42	6995.88	4.19	6996.93	6996.91 j	6997.34	6997.31576171875	24	45.605	
16	15	5.40	10.46	0.013	6996.38	6996.79	5.44	6997.14	6997.69	6997.52	6998.0645703125	18	41.333	
17	Outfall	46.40	43.18	0.013	6968.40	6970.40	9.83	6970.65	6972.75	6972.20	6974.21146484375	30	180.403	

Project File: DVDP_P1_interim_100ur.stm | Number of lines: 17 | Date: 4/29/2026

NOTES: ** Critical depth

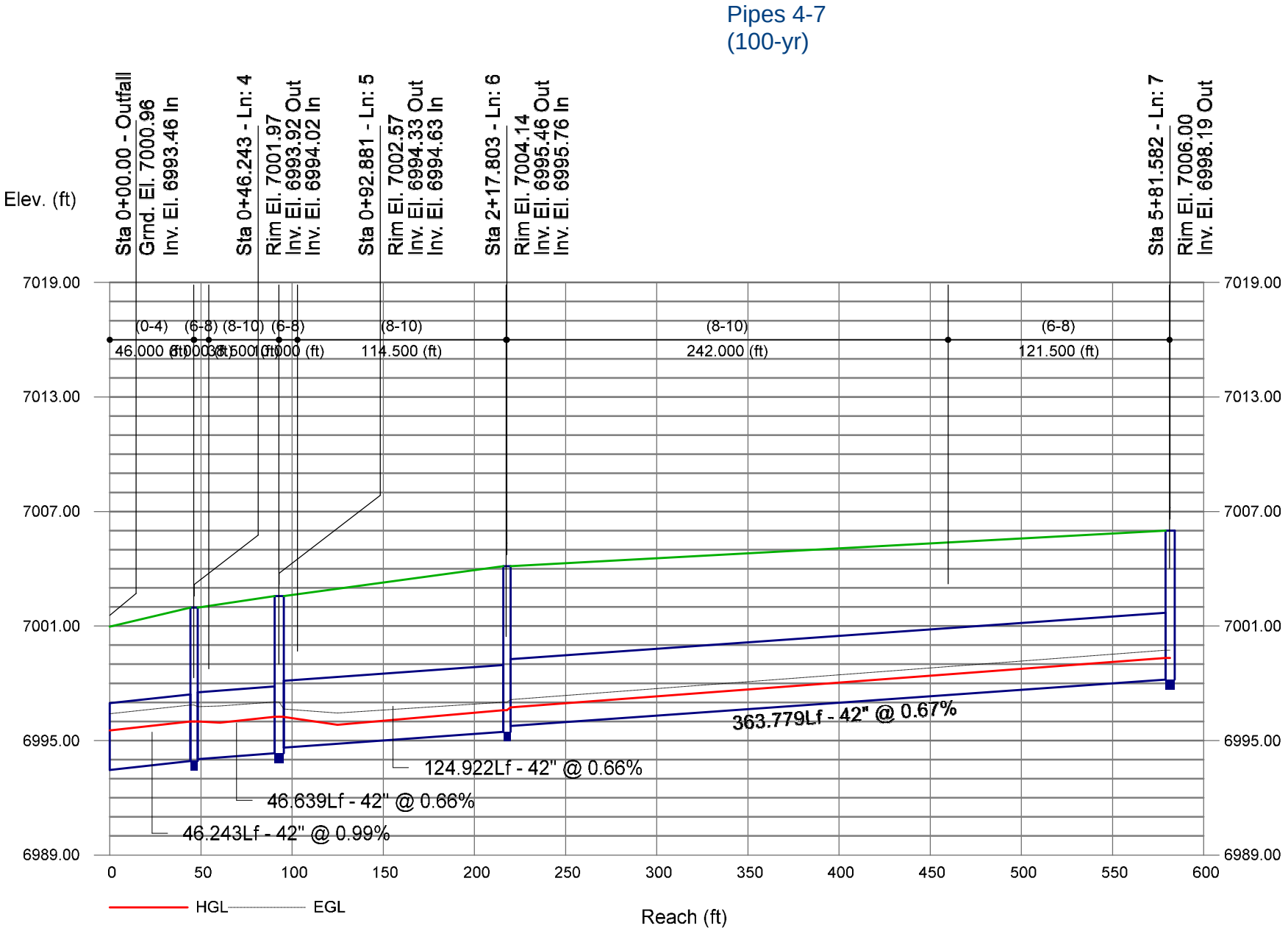
Storm Sewer Profile

Proj. file: DVDP_P1_interim_100ur.stm



Storm Sewer Profile

Proj. file: DVDP_P1_interim_100ur.stm



Storm Sewer Profile

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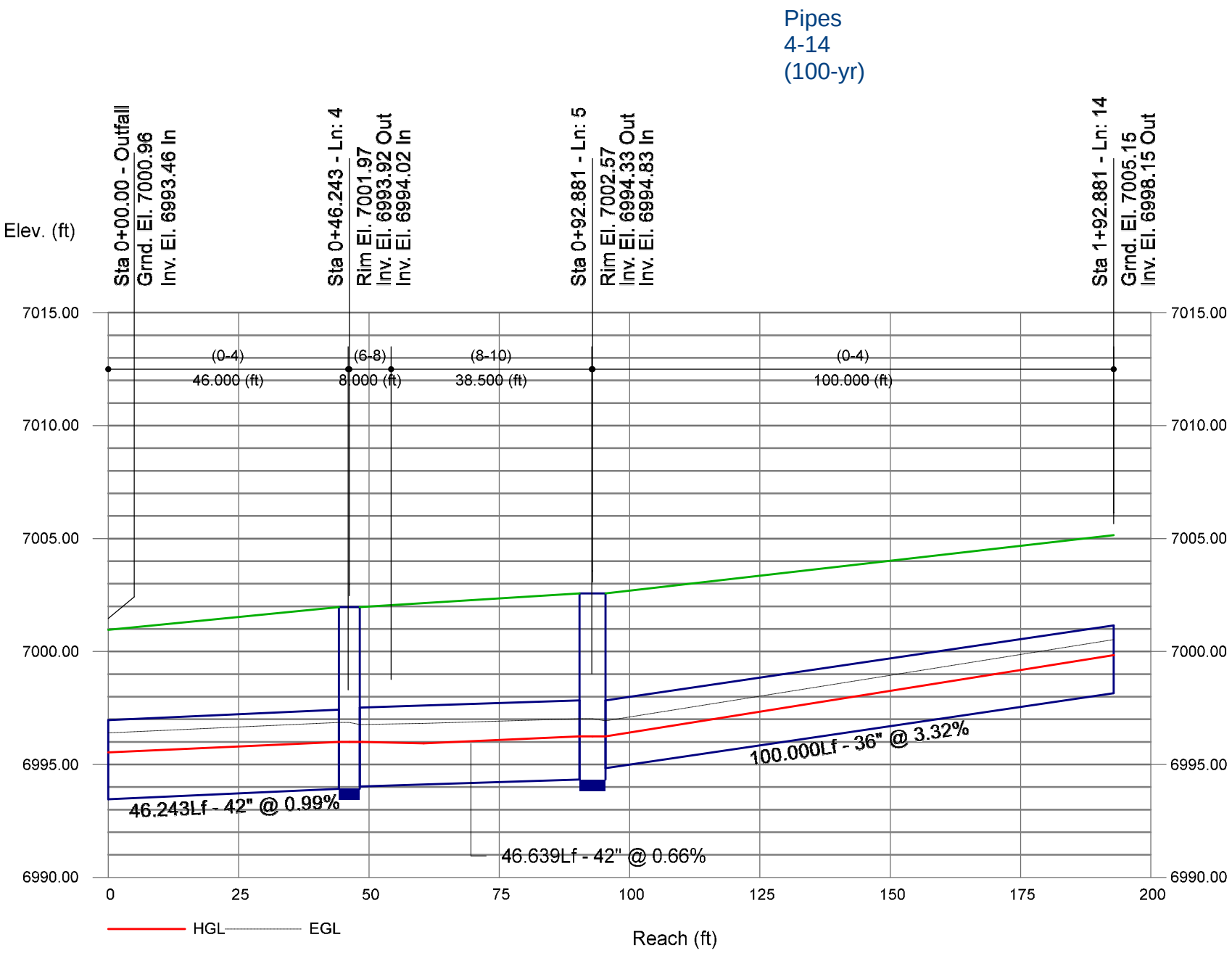
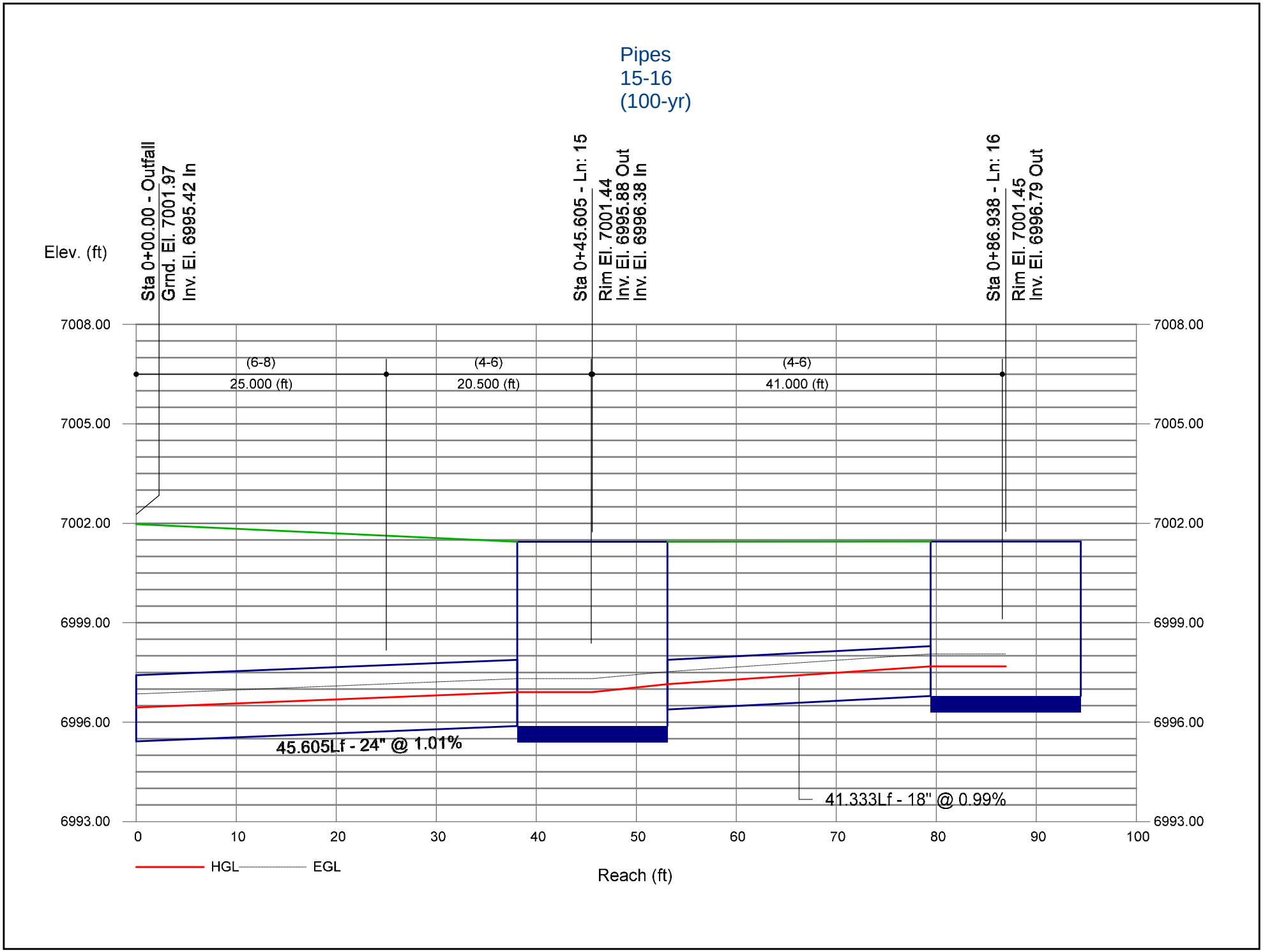


Storm Sewer Profile

Proj. file: DVDP_P1_interim_100ur.stm



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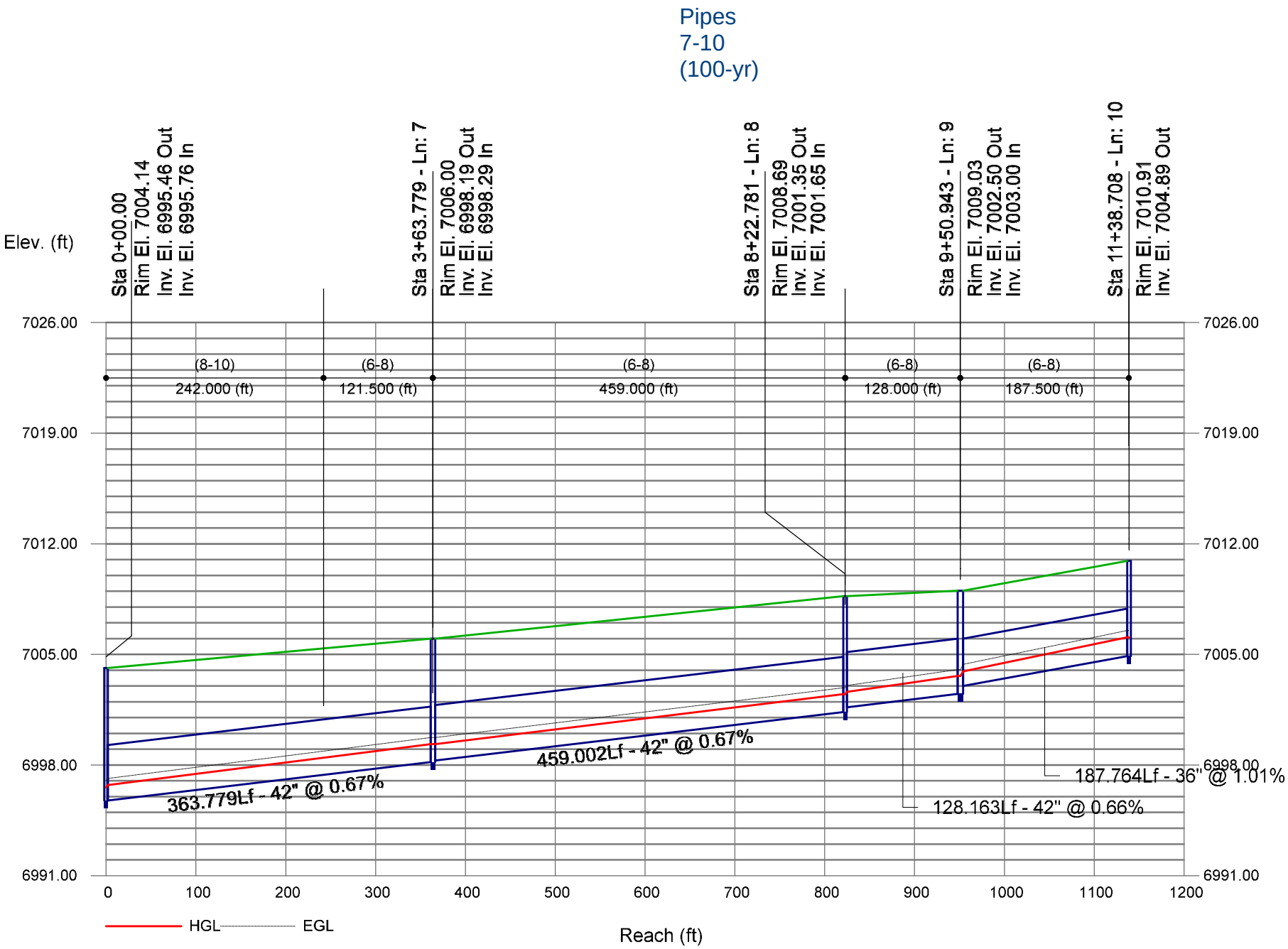

Storm Sewer Profile

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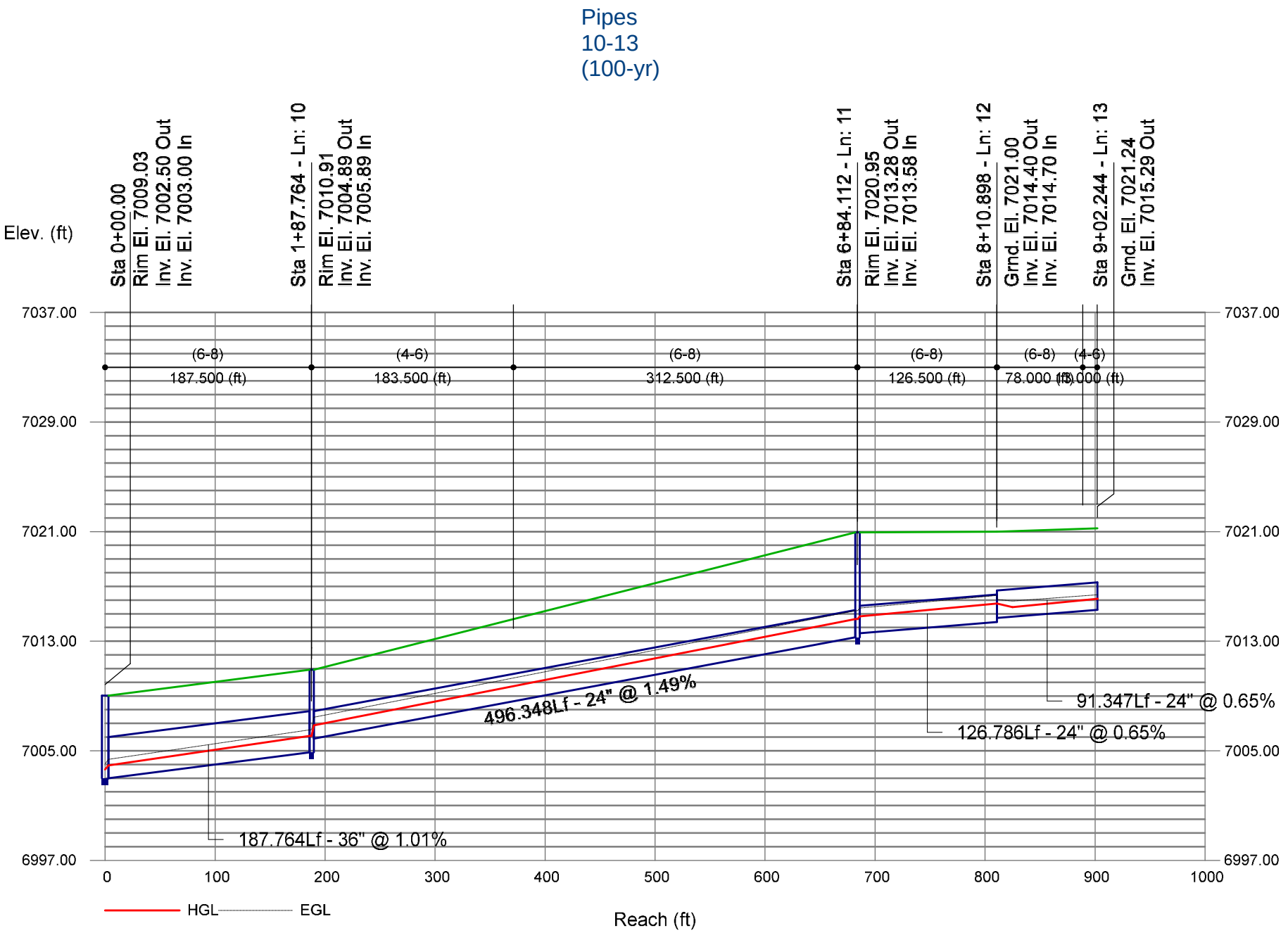
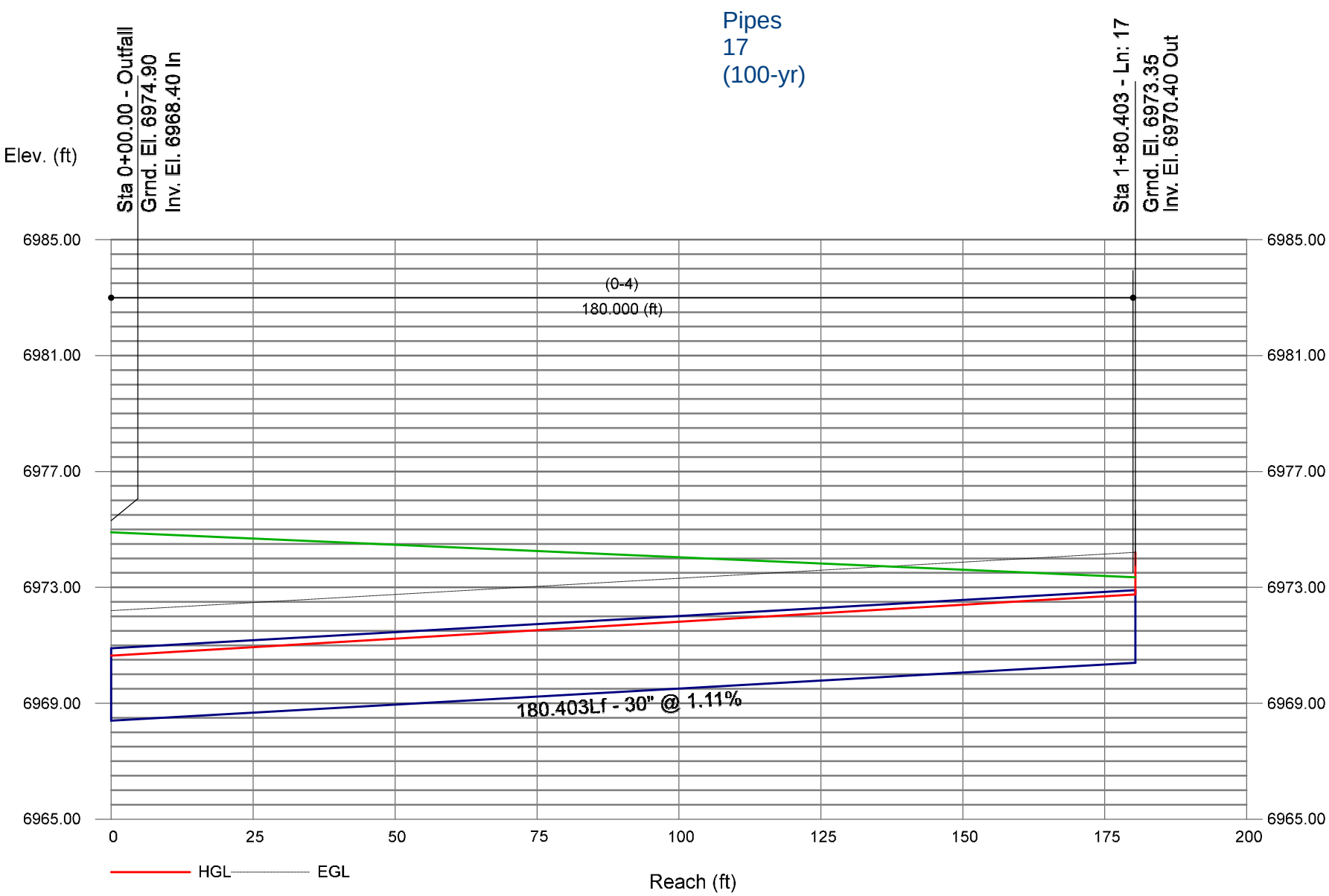


Storm Sewer Profile

Proj. file: DVDP_P1_interim_100ur.stm



ALL TERRAIN ENGINEERING

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Schmidt Parcel - District P1
Location: El Paso County

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 4/27/26

	STORM DRAIN SYSTEM			
	DESIGN POINT 4.1	**DESIGN POINT 11.2**	**DESIGN POINT 14.1**	**Notes**
Q_{100} (cfs):	7.9	44.3	46.4	
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	24	42	30	
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	0.80	1.00	1.00	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.40	0.29	0.40	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	1.40	1.93	4.70	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:				
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	2.33	8.40	9.73	
Required Riprap Size:	**L**	**L**	**M**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**12**	
Expansion Factor, $1/(2\tan\theta)$:	6.50	4.00	2.50	Read from Fig. 9-35 or 9-36
θ:	0.08	0.12	0.20	
Erosive Soils?	No	No		
Area of Flow, A_t (ft^2):	1.13	6.33	6.63	$A_t=Q/V$
Length of Protection, L_p (ft):	-3.8	11.3	10.3	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	6.0	10.5	7.5	Min L=3D or 3H
Max Length (ft)	20.0	35.0	25.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.4	6.3	6.6	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**6.0**	**12.0**	**11.0**	
Design Width (ft)	**1.4**	**6.3**	**6.6**	
Riprap Depth (in)	**18**	**18**	**24**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

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

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

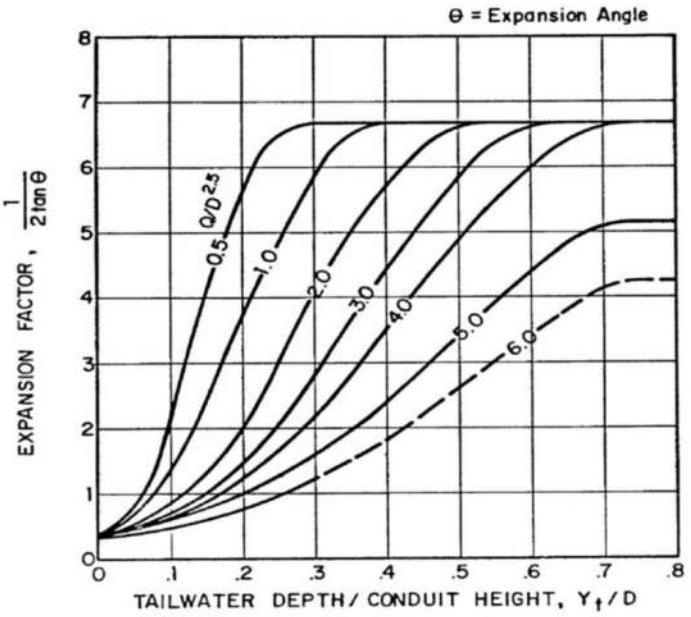


Figure 9-35. Expansion factor for circular conduits

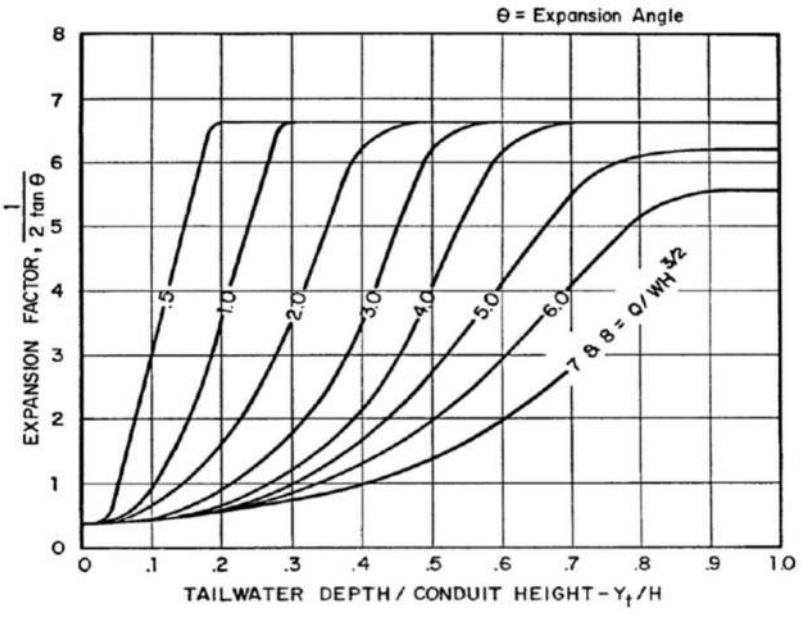


Figure 9-36. Expansion factor for rectangular conduits

ALL TERRAIN
ENGINEERING

Subdivision:	ANTLER RANGE F1
Location:	El Paso County
Project Name:	ANTLER RANGE F1
Project Number:	24013
Calculated By:	NQJ
Checked By:	REB
Date:	4/13/2026

Proposed Conditions - Drainageway/Swale Summary Table

Channel Section	Section Slope, ft/ft	100-year Depth, ft	100-year Velocity, ft/s	100-year Hydraulic Radius, ft	Froude, 100-yr	Shear Stress, 100-yr
E1	0.0456	0.8	4.72	0.39	0.93	1.1
K1	0.0110	1.42	1.42	0.69	0.21	0.5
L1	0.0172	0.95	0.95	0.78	0.17	0.8

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 26 2026

SWALE E1 - DP5 Q100 (MAX SLOPE)

Triangular

Side Slopes (z:1)	= 5.00, 5.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 4.56
N-Value	= 0.035

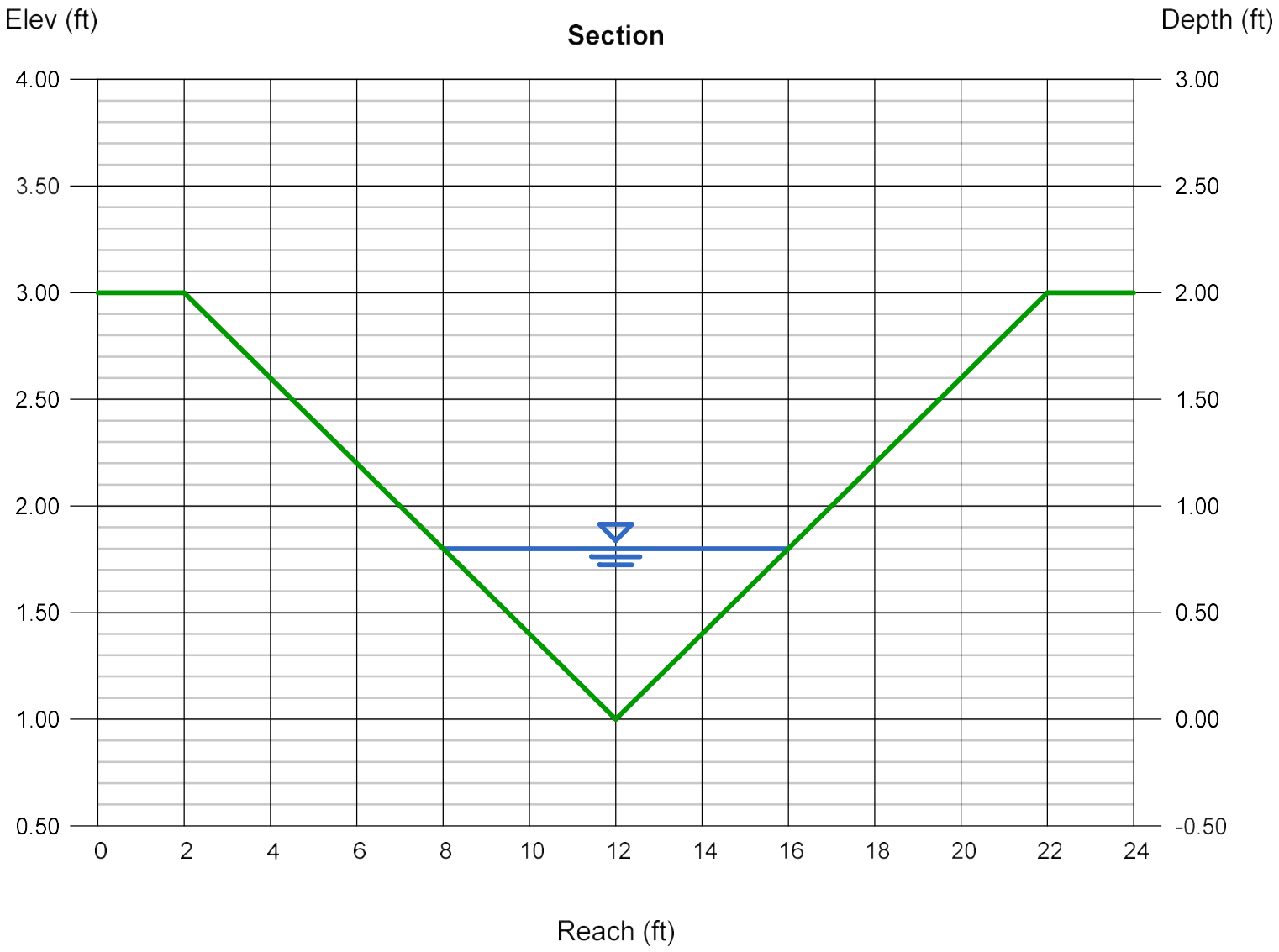
Calculations

Compute by:	Known Q
Known Q (cfs)	= 15.10

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 15.10
Area (sqft)	= 3.20
Velocity (ft/s)	= 4.72
Wetted Perim (ft)	= 8.16
Crit Depth, Yc (ft)	= 0.90
Top Width (ft)	= 8.00
EGL (ft)	= 1.15

Please include froude No.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 26 2026

SWALE K1 - DP11 Q100

Triangular

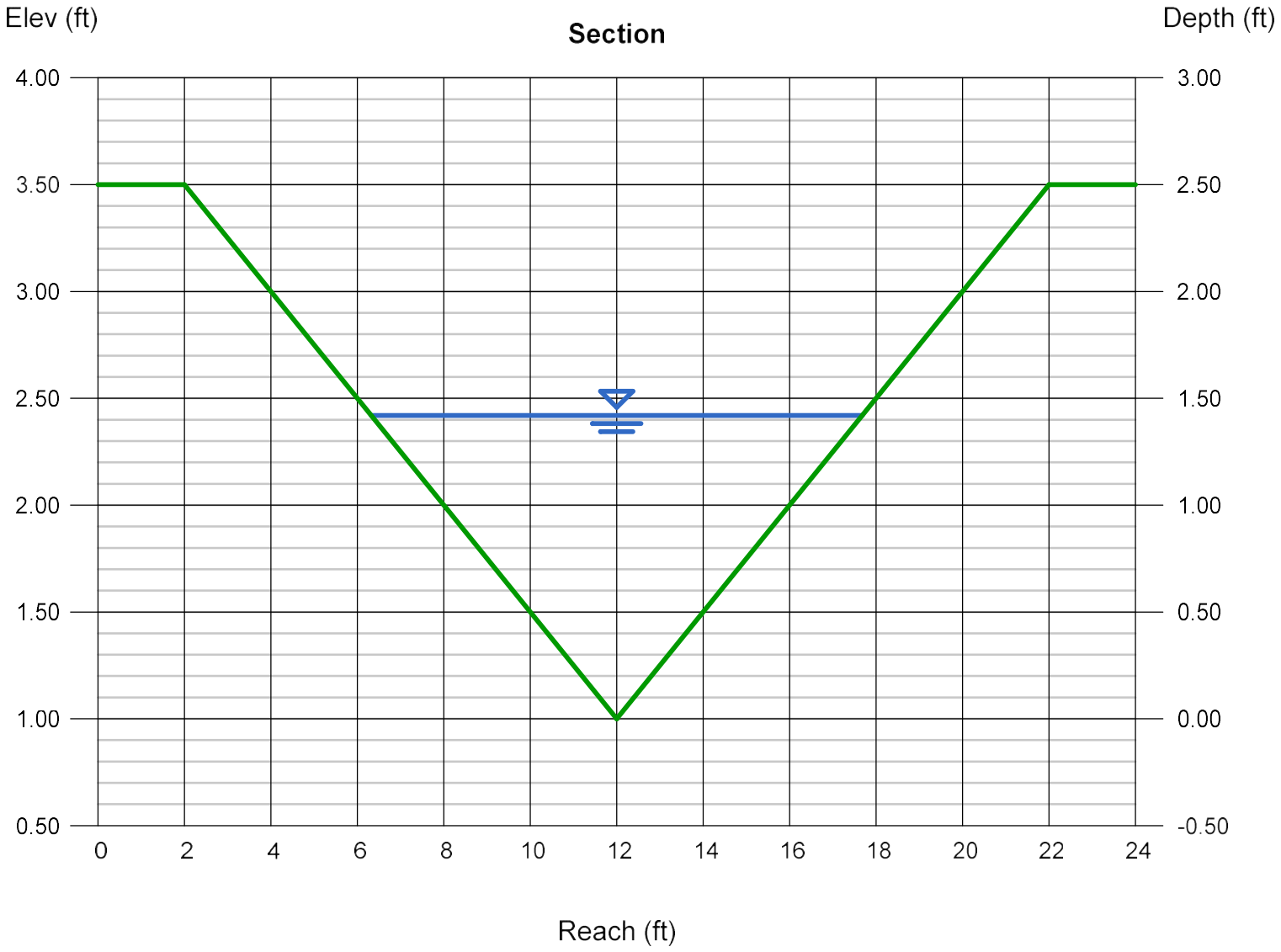
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 28.00

Highlighted

Depth (ft)	= 1.42
Q (cfs)	= 28.00
Area (sqft)	= 8.07
Velocity (ft/s)	= 3.47
Wetted Perim (ft)	= 11.71
Crit Depth, Yc (ft)	= 1.25
Top Width (ft)	= 11.36
EGL (ft)	= 1.61



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 26 2026

SWALE L1 - DP5.1 Q100 (CAPACITY)

Trapezoidal

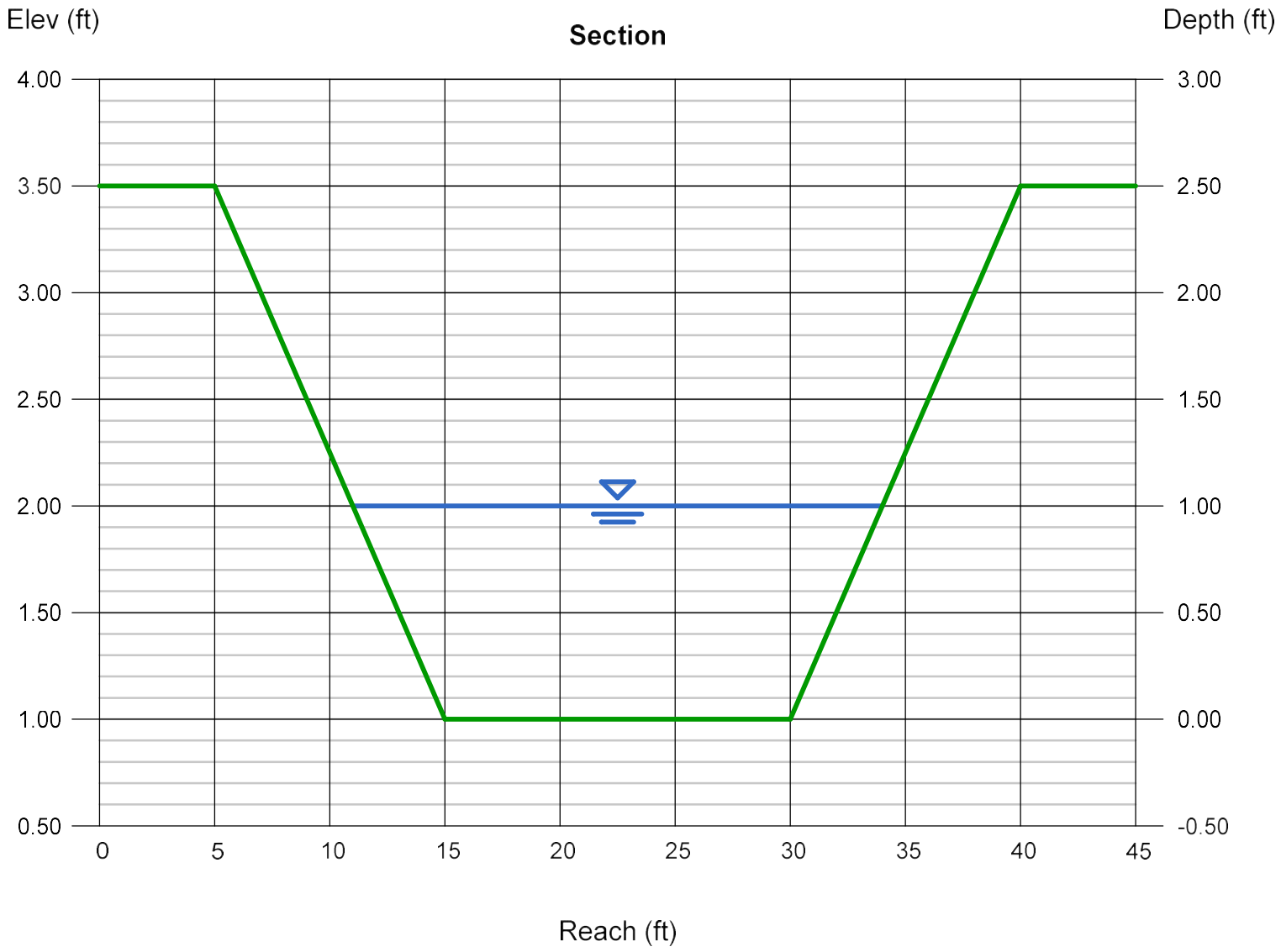
Bottom Width (ft)	= 15.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.64
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 56.00

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 56.00
Area (sqft)	= 19.00
Velocity (ft/s)	= 2.95
Wetted Perim (ft)	= 23.25
Crit Depth, Yc (ft)	= 0.71
Top Width (ft)	= 23.00
EGL (ft)	= 1.14



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 26 2026

SWALE L1 - DP13.1 Q100 (MAX SLOPE)

Trapezoidal

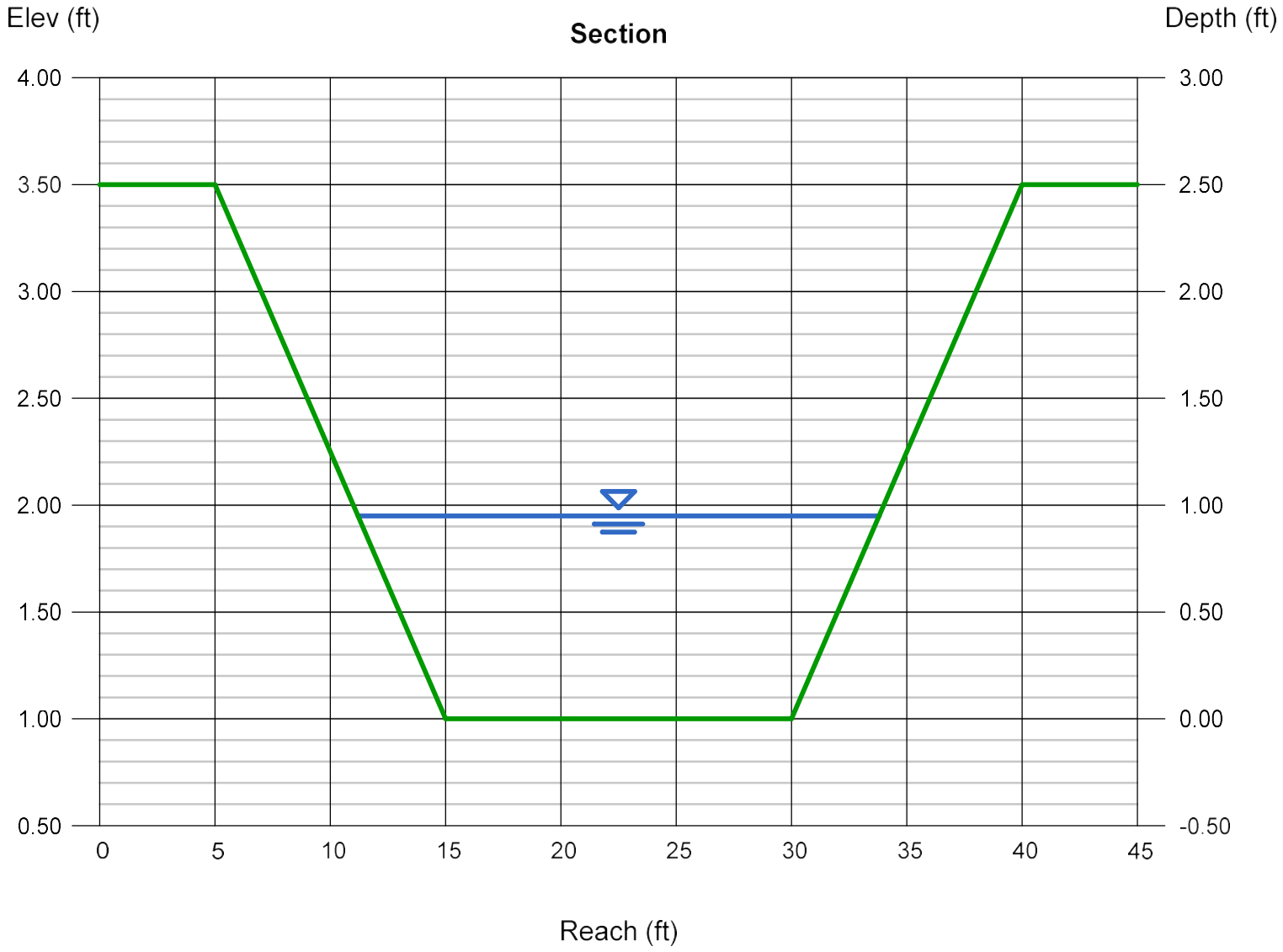
Bottom Width (ft)	= 15.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.72
N-Value	= 0.035

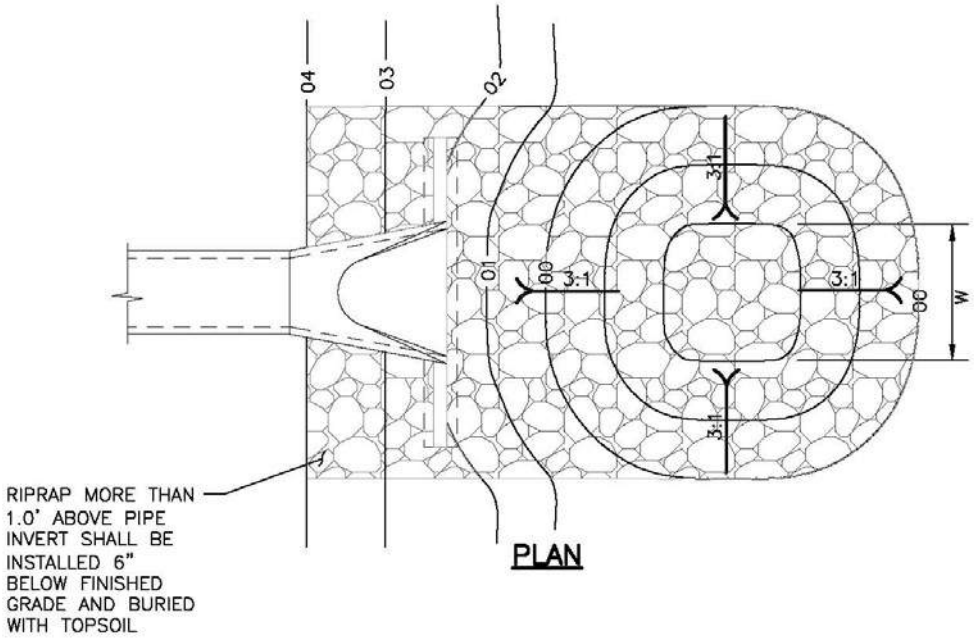
Calculations

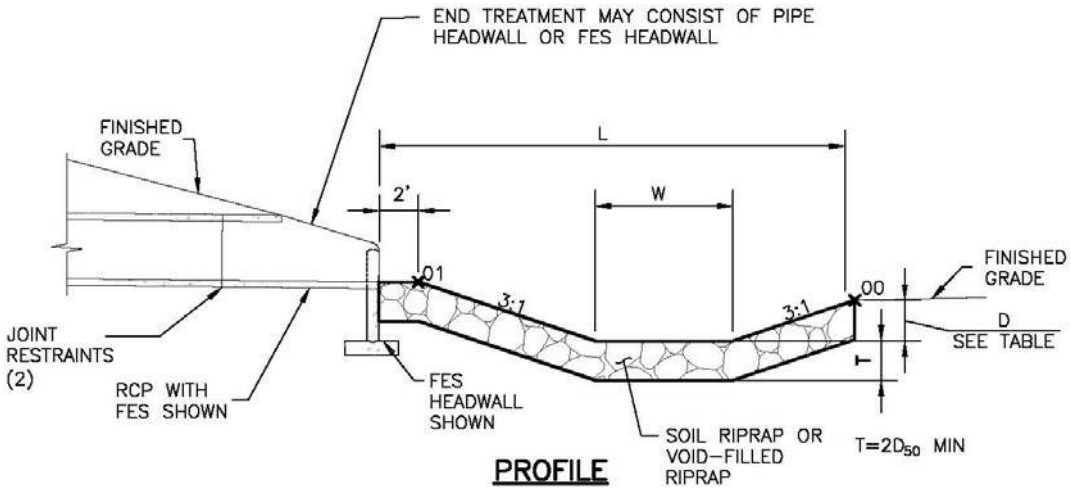
Compute by:	Known Q
Known Q (cfs)	= 83.00

Highlighted

Depth (ft)	= 0.95
Q (cfs)	= 83.00
Area (sqft)	= 17.86
Velocity (ft/s)	= 4.65
Wetted Perim (ft)	= 22.83
Crit Depth, Yc (ft)	= 0.91
Top Width (ft)	= 22.60
EGL (ft)	= 1.29







PIPE SIZE OR BOX HEIGHT	D	W*	L
18" – 24"	1'–0"	4'	15'
30" – 36"	1'–6"	6'	20'
42" – 48"	2'–0"	7'	24'
54" – 60"	2'–6"	8'	28'
66" – 72"	3'–0"	9'	32'

* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

APPROXIMATE CHANNEL EQUIVALENT.

Figure 9-37. Low tailwater riprap basin

Q (DP13.1) = 83 CFS Figure 9-39 is valid for $Q/WH^{1.5}$ of 8.0 or less.
W = 15
H = 2
Q/WH^1.5 = 1.95 = <8 (VALID)

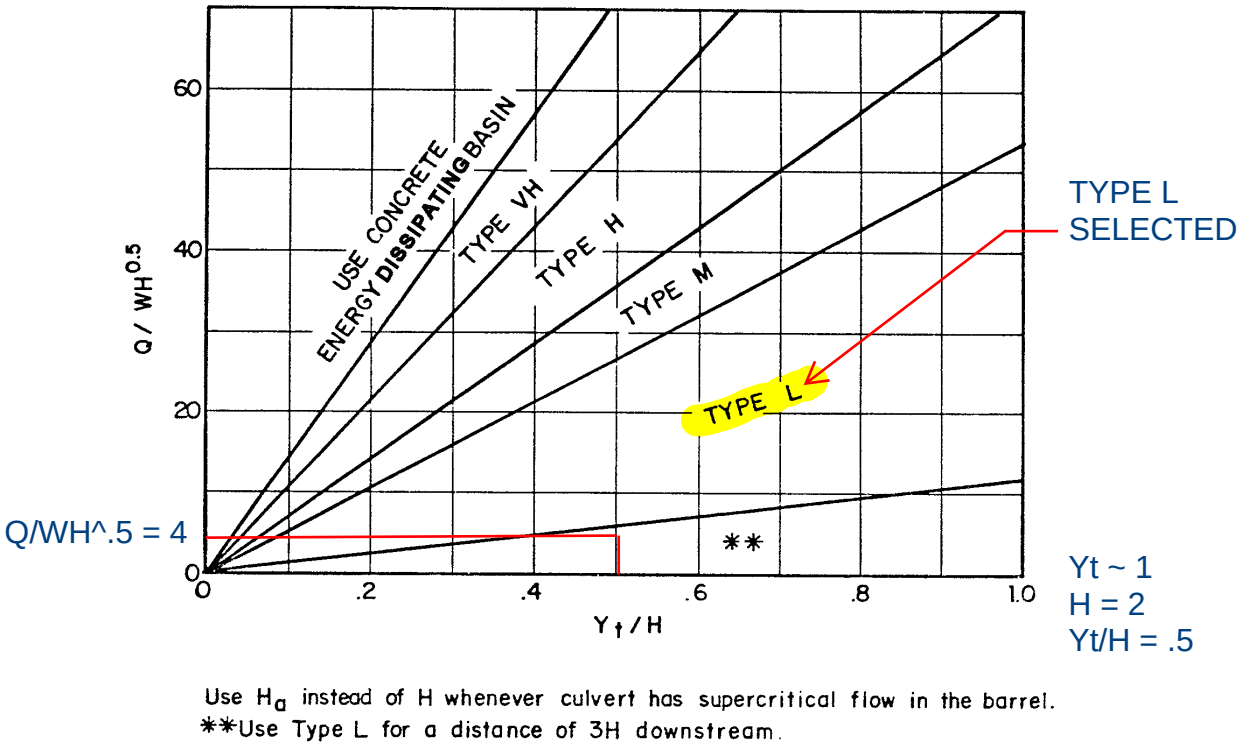


Figure 9-39. Riprap erosion protection at rectangular conduit outlet (valid for Q/WH1.5 ≤ 8.0)

3.2.4 Outfalls and Rundowns

A grouted boulder outfall or "rundown" dissipates energy and provides erosion control protection. Grouted boulder outfalls are most commonly used in large rivers like the South Platte. Figure 9-40 provides a plan view and cross section for a standard grouted boulder rundown. See the grouted boulder drop profiles (A1, A2, and A3) in Figure 9-12 for site specific profile options, (i.e., depressed or free-draining basin for use with a stable downstream channel or with no basin for use in channels subject to degradation). Figure 9-41 provides a plan view of the same structure for use when the structure is in-line with the channel. Evaluate the following when designing a grouted boulder outfall or rundown:

- Minimize disturbance to channel bank
- Determine water surface elevation in receiving channel for base flow and design storm(s)
- Determine flow rate, velocity, depth, etc. of flow exiting the outfall pipe for the design storm(s)
- Evaluate permitting procedures and requirements for construction adjacent to large river system.

APPENDIX D – WATER QUALITY & DETENTION

$$w = 9.23\ (A_{FB} / t)\ (1 / \sqrt{h_{max}})$$ **Equation 4-1**

Where:

w = width of the rectangular vertical notch (inches)

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

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

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

TABLE 4-12. FOREBAY SIZING CRITERIA

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

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

IA = 5.5% * 84.37 acres = 4.64 IA's
Design Depth = 15" - 18"

Minimum Volume = 1% of WQCV = 1% * 0.277 ac-ft * 43,560 = 120 CF MIN.

Provided Volume ~ 357 CF (see MHFD Volume Calc

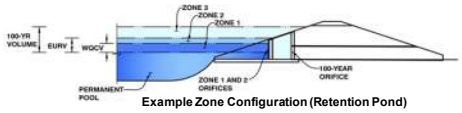
Design utilizes (1) 8" culvert pipes (see culvert calc on next page)
flow rate @ design full = 3 CFS
Drain Time = 347 CF / 1.4CFS = 248 seconds or 4.13 minutes

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Schmidt CDRs - Interim Pond Forebay Volume Calc

Basin ID: Pond A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	84.37	acres
Watershed Length =	2,710	ft
Watershed Length to Centroid =	1,260	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	5.50%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.277 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.416 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =		1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =		1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =		1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =		2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =		2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =		2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =			inches
Approximate 2-yr Detention Volume =			
Approximate 5-yr Detention Volume =			
Approximate 10-yr Detention Volume =			
Approximate 25-yr Detention Volume =			
Approximate 50-yr Detention Volume =			
Approximate 100-yr Detention Volume =			

Define Zones and Basin Geometry

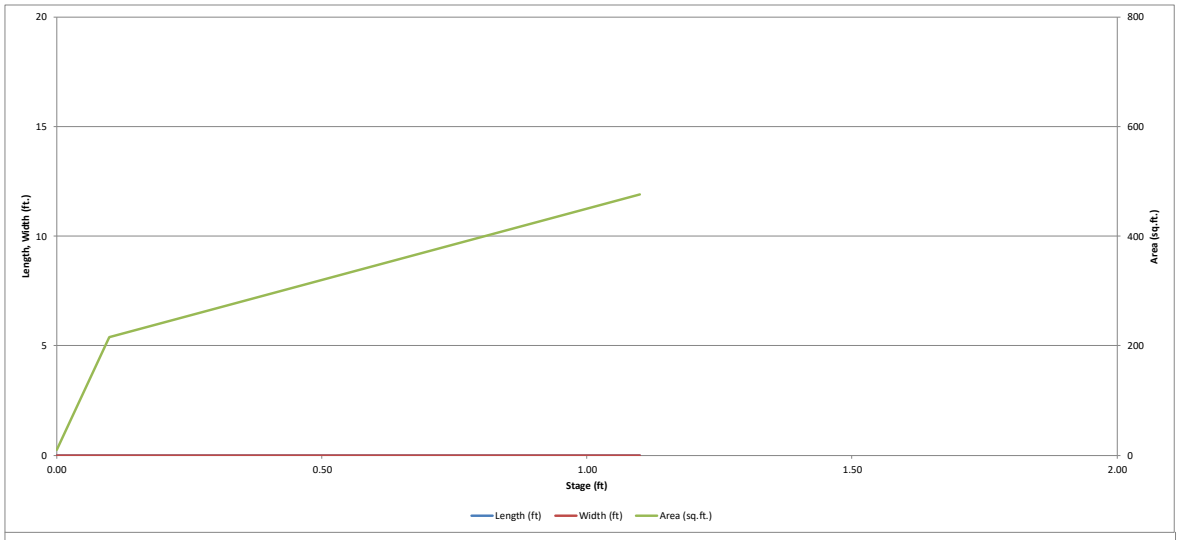
Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention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

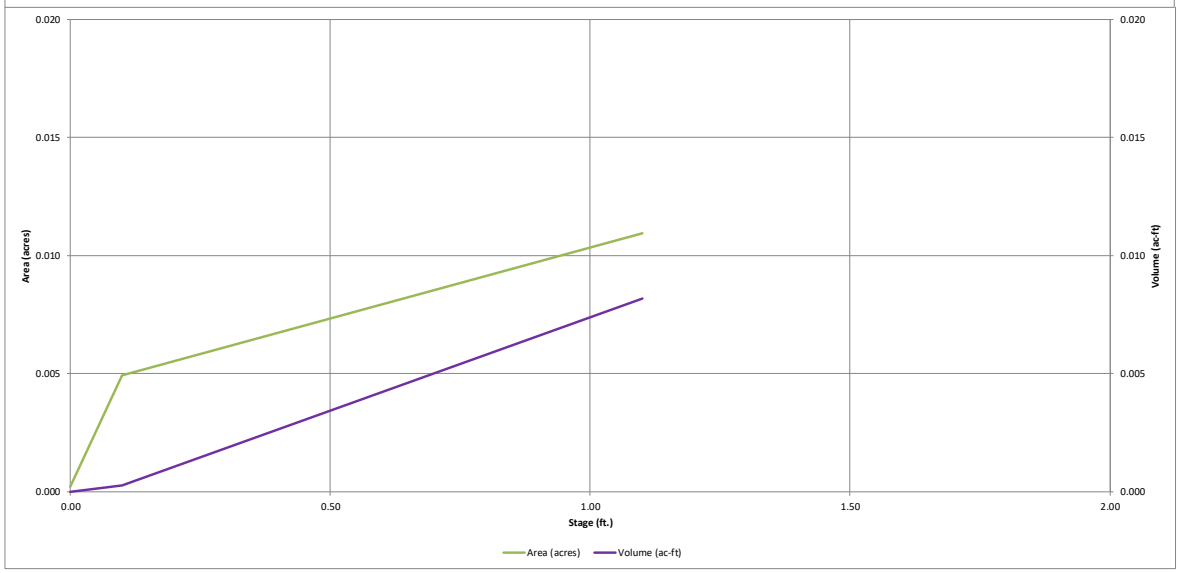
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6972.9 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
6973	--	0.10	--	--	--	215	0.005	11	0.000
6974	--	1.10	--	--	--	477	0.011	357	0.008

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)





Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 30 2026

FOREBAY INTERIM POND A - OUTLET PIPE

Invert Elev Dn (ft)	=	6972.84
Pipe Length (ft)	=	17.00
Slope (%)	=	0.649126851931214
Invert Elev Up (ft)	=	6972.95
Rise (in)	=	8.0
Shape	=	Circular
Span (in)	=	8.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

Embankment

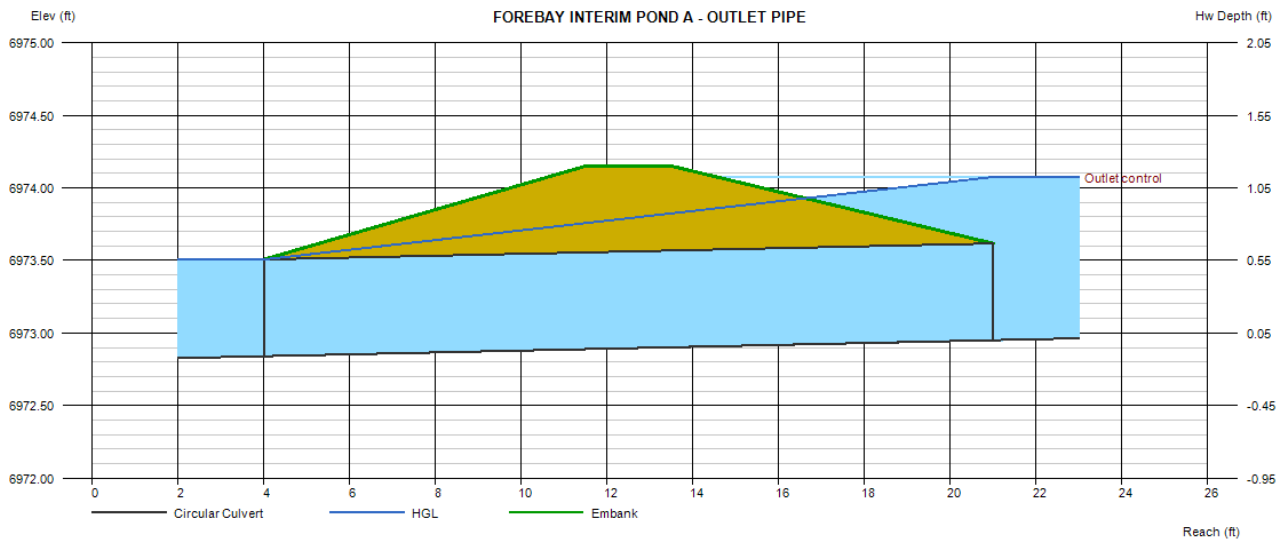
Top Elevation (ft)	=	6974.15
Top Width (ft)	=	2.00
Crest Width (ft)	=	45.00

Calculations

Qmin (cfs)	=	1.40
Qmax (cfs)	=	1.40
Tailwater Elev (ft)	=	Crown

Highlighted

Qtotal (cfs)	=	1.40
Qpipe (cfs)	=	1.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.01
Veloc Up (ft/s)	=	4.01
HGL Dn (ft)	=	6973.51
HGL Up (ft)	=	6974.08
Hw Elev (ft)	=	6974.08
Hw/D (ft)	=	1.69
Flow Regime	=	Outlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 30 2026

TRICKLE CHANNEL CAPCITY (2X FOREBAY RELEASE)

Triangular

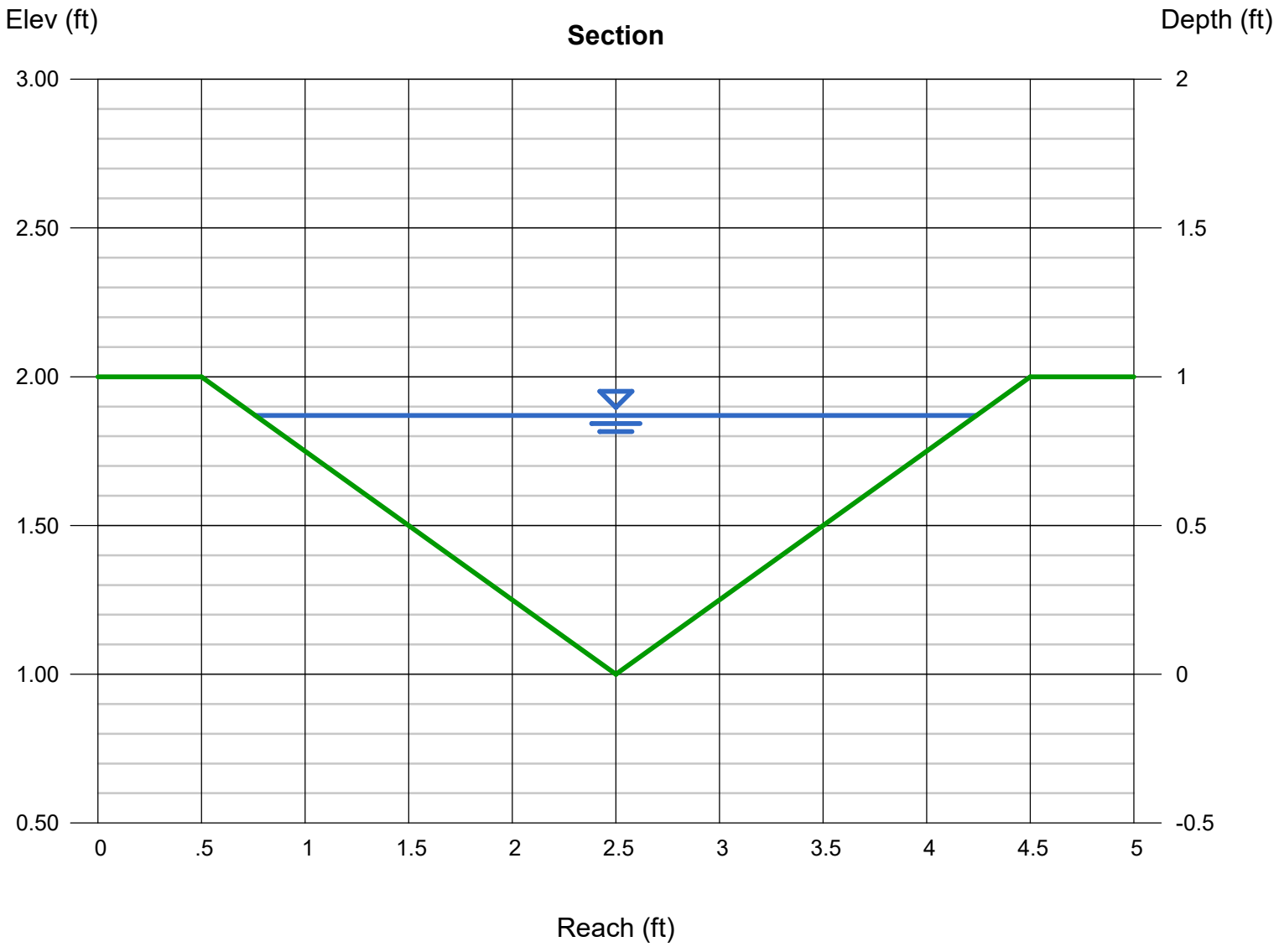
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

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

Highlighted

Depth (ft)	= 0.87
Q (cfs)	= 2.800
Area (sqft)	= 1.51
Velocity (ft/s)	= 1.85
Wetted Perim (ft)	= 3.89
Crit Depth, Yc (ft)	= 0.66
Top Width (ft)	= 3.48
EGL (ft)	= 0.92

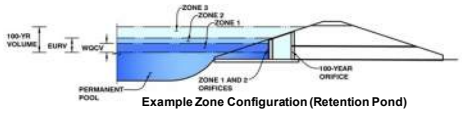


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Schmidt CDRs - Interim Pond Forebay Volume Calc

Basin ID: Pond A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB	
Watershed Area =	84.37	acres
Watershed Length =	2,710	ft
Watershed Length to Centroid =	1,260	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	5.50%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.277	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.416	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =		acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =		acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =		acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =		acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =		acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =		acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =		acre-feet	inches
Approximate 2-yr Detention Volume =		acre-feet	
Approximate 5-yr Detention Volume =		acre-feet	
Approximate 10-yr Detention Volume =		acre-feet	
Approximate 25-yr Detention Volume =		acre-feet	
Approximate 50-yr Detention Volume =		acre-feet	
Approximate 100-yr Detention Volume =		acre-feet	

Define Zones and Basin Geometry

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

Depth Increment = ft

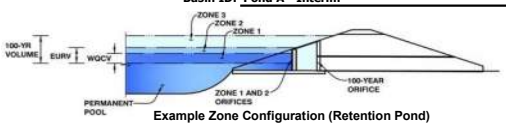
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6972.9 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
6973	--	0.10	--	--	--	623	0.014	32	0.001
6974	--	1.10	--	--	--	988	0.023	837	0.019

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Schmidt Phase 1 - District Infrastructure

Basin ID: Pond A - Interim



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	84.37	acres
Watershed Length =	2,710	ft
Watershed Length to Centroid =	1,260	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	5.40%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.273	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.282	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.137	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.250	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.346	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.378	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.483	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.017	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	7.513	acre-feet		inches
Approximate 2-yr Detention Volume =	0.164	acre-feet		
Approximate 5-yr Detention Volume =	0.229	acre-feet		
Approximate 10-yr Detention Volume =	0.310	acre-feet		
Approximate 25-yr Detention Volume =	0.437	acre-feet		
Approximate 50-yr Detention Volume =	0.693	acre-feet		
Approximate 100-yr Detention Volume =	1.391	acre-feet		

Define Zones and Basin Geometry

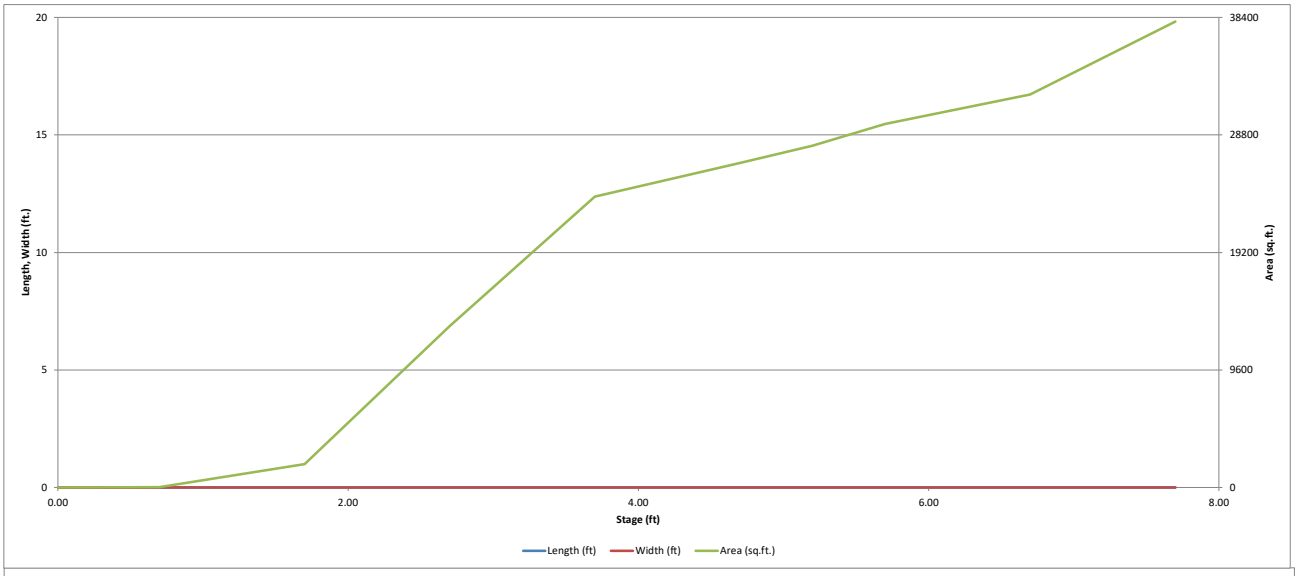
Zone 1 Volume (WQCV) =	0.273	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.009	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.109	acre-feet
Total Detention Basin Volume =	1.391	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

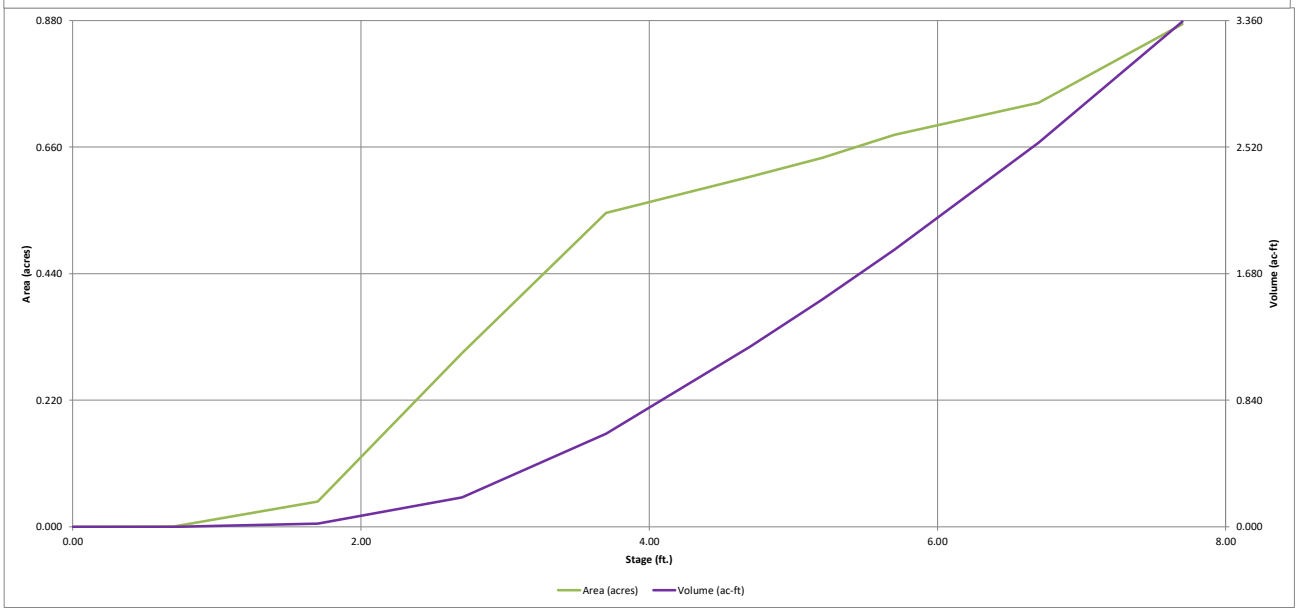
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
71.3 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
6972	--	0.70	--	--	--	30	0.001	14	0.000
6973	--	1.70	--	--	--	1,909	0.044	983	0.023
6974	--	2.70	--	--	--	13,161	0.302	8,518	0.196
6975	--	3.70	--	--	--	23,769	0.546	26,983	0.619
6976	--	4.70	--	--	--	26,510	0.609	52,123	1.197
6976.5	--	5.20	--	--	--	27,927	0.641	65,732	1.509
6977	--	5.70	--	--	--	29,688	0.682	80,136	1.840
6978	--	6.70	--	--	--	32,109	0.737	111,034	2.549
6979	--	7.70	--	--	--	38,065	0.874	146,121	3.354

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





✓ = calcs match details in plans

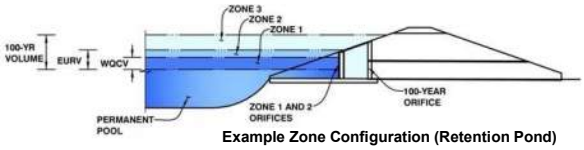
X = calcs do not match details in plans

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Schmidt Phase 1 - District Infrastructure**

Basin ID: **Pond A - Interim**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.94	0.273	Orifice Plate
Zone 2 (EURV)	2.96	0.009	Orifice Plate
Zone 3 (100-year)	5.02	1.109	Weir&Pipe (Restrict)
Total (all zones)		1.391	

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

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft²
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	✓ 0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	✓ 2.86	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	✓ 0.00	✓ 1.00	✓ 2.30					
Orifice Area (sq. inches)	✓ 0.79	✓ 0.79	✓ 0.99					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	✓ 3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.00	N/A	feet
Overflow Weir Front Edge Length =	✓ 3.76	N/A	feet	Overflow Weir Slope Length =	3.76	N/A	feet
Overflow Weir Grate Slope =	✓ 0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	2.28	N/A	
Horiz. Length of Weir Sides =	✓ 3.76	N/A	feet	Overflow Grate Open Area w/o Debris =	11.18	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	5.59	N/A	ft²
Debris Clogging % =	✓ 50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	✓ 0.90	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A	ft²
Outlet Pipe Diameter =	✓ 30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A	feet
Restrictor Plate Height Above Pipe Invert =	✓ 30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	✓ 5.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.99	feet
Spillway Crest Length =	✓ 16.00	feet	Stage at Top of Freeboard =	7.09	feet
Spillway End Slopes =	✓ 4.00	H:V	Basin Area at Top of Freeboard =	0.79	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.85	acre-ft

5.2 per plans

Calculated Parameters for Spillway

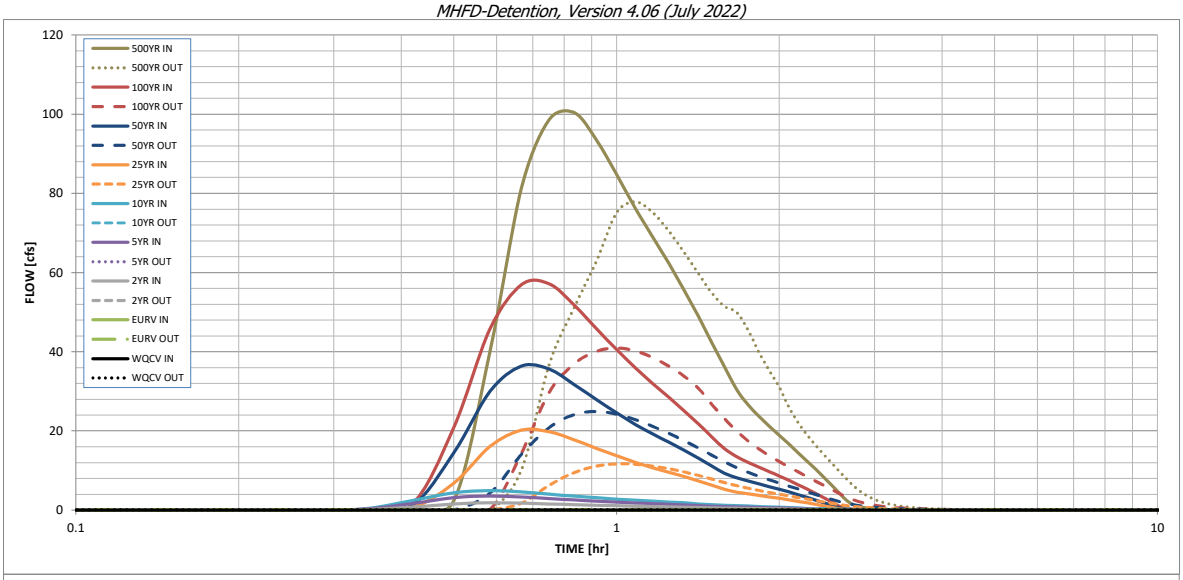
Routed Hydrograph Results

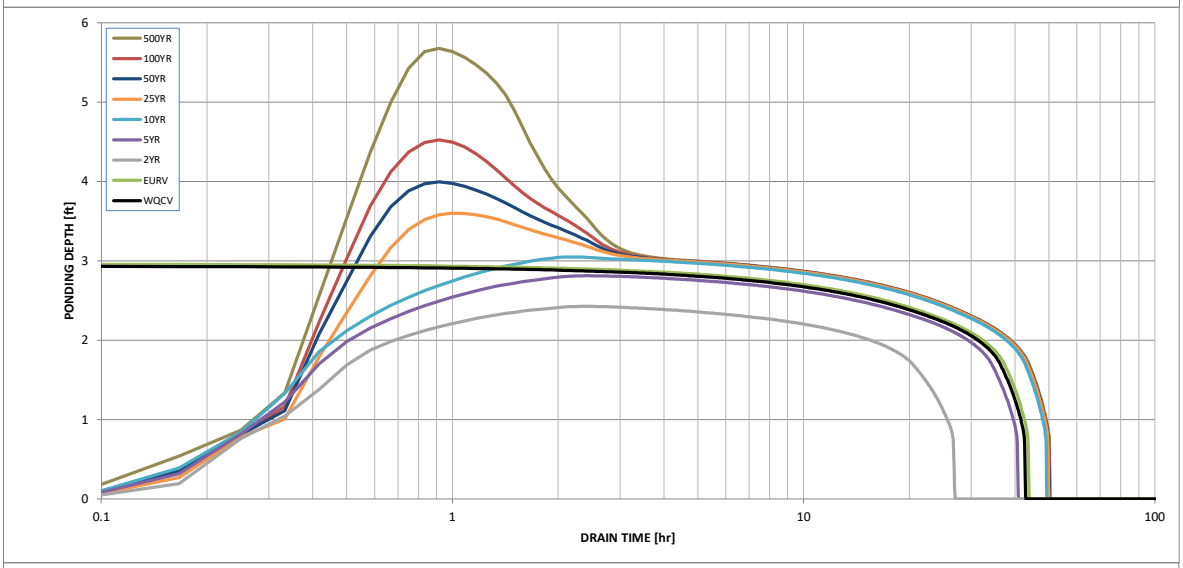
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

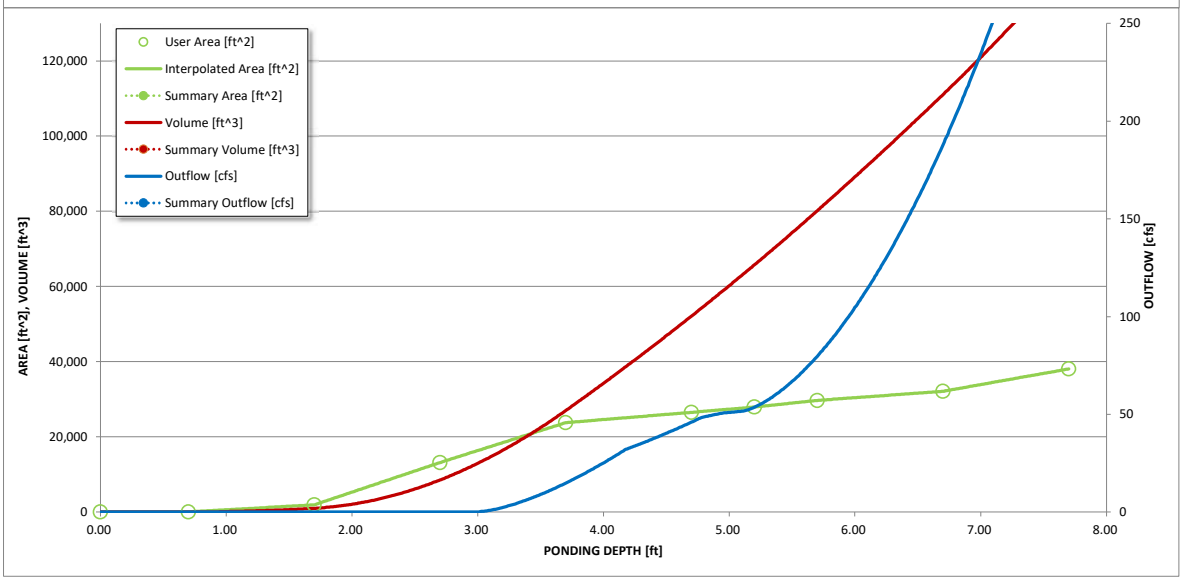
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.273	0.282	0.137	0.250	0.346	1.378	2.483	4.017	7.513
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.137	0.250	0.346	1.378	2.483	4.017	7.513
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.7	1.3	1.8	16.2	32.2	53.0	96.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.19	0.38	0.63	1.14
Peak Inflow Q (cfs) =	N/A	N/A	1.9	3.6	4.9	20.2	36.4	57.2	100.5
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.4	11.7	24.9	40.9	77.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.2	0.7	0.8	0.8	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	1.0	2.2	3.6	4.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	41	25	38	46	40	34	26	13
Time to Drain 99% of Inflow Volume (hours) =	**42**	42	26	40	48	45	43	40	34
Maximum Ponding Depth (ft) =	2.94	2.96	2.43	2.81	3.05	3.60	3.99	4.52	5.67
Area at Maximum Ponding Depth (acres) =	0.36	0.37	0.23	0.33	0.38	0.52	0.56	0.60	0.68
Maximum Volume Stored (acre-ft) =	0.275	0.282	0.121	0.230	0.312	0.561	0.780	1.088	1.819

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.03	0.05	0.06	0.04	0.05	0.05	0.07
	0:20:00	0.00	0.00	0.12	0.16	0.20	0.13	0.15	0.16	0.21
	0:25:00	0.00	0.00	0.71	1.60	2.34	0.52	0.97	1.25	2.32
	0:30:00	0.00	0.00	1.56	3.16	4.42	6.80	14.48	20.85	40.05
	0:35:00	0.00	0.00	1.87	3.56	4.91	16.09	29.97	45.75	81.21
	0:40:00	0.00	0.00	1.78	3.33	4.60	20.22	36.42	56.91	98.58
	0:45:00	0.00	0.00	1.59	2.92	4.01	19.79	35.64	57.18	100.45
	0:50:00	0.00	0.00	1.40	2.57	3.54	17.81	31.77	51.87	93.63
	0:55:00	0.00	0.00	1.25	2.28	3.13	15.63	27.99	45.87	84.77
	1:00:00	0.00	0.00	1.11	2.02	2.76	13.76	24.58	40.59	76.14
	1:05:00	0.00	0.00	1.01	1.82	2.49	12.09	21.63	35.90	68.97
	1:10:00	0.00	0.00	0.92	1.65	2.26	10.71	19.22	31.97	62.26
	1:15:00	0.00	0.00	0.82	1.48	2.06	9.57	17.13	28.44	55.51
	1:20:00	0.00	0.00	0.73	1.30	1.84	8.46	15.12	25.06	48.87
	1:25:00	0.00	0.00	0.64	1.13	1.59	7.36	13.12	21.76	42.40
	1:30:00	0.00	0.00	0.56	0.97	1.35	6.28	11.14	18.52	36.20
	1:35:00	0.00	0.00	0.50	0.87	1.22	5.27	9.33	15.52	30.50
	1:40:00	0.00	0.00	0.47	0.81	1.12	4.57	8.15	13.48	26.61
	1:45:00	0.00	0.00	0.44	0.74	1.03	4.13	7.33	12.08	23.71
	1:50:00	0.00	0.00	0.40	0.68	0.94	3.74	6.62	10.87	21.18
	1:55:00	0.00	0.00	0.37	0.61	0.85	3.36	5.94	9.73	18.87
	2:00:00	0.00	0.00	0.33	0.54	0.75	2.99	5.26	8.62	16.67
	2:05:00	0.00	0.00	0.29	0.47	0.65	2.61	4.58	7.51	14.50
	2:10:00	0.00	0.00	0.24	0.39	0.54	2.23	3.90	6.41	12.40
	2:15:00	0.00	0.00	0.20	0.32	0.43	1.85	3.22	5.32	10.36
	2:20:00	0.00	0.00	0.15	0.24	0.33	1.47	2.54	4.23	8.33
	2:25:00	0.00	0.00	0.11	0.17	0.23	1.09	1.87	3.15	6.31
	2:30:00	0.00	0.00	0.08	0.10	0.14	0.72	1.20	2.07	4.30
	2:35:00	0.00	0.00	0.05	0.07	0.09	0.36	0.56	1.02	2.33
	2:40:00	0.00	0.00	0.04	0.06	0.08	0.15	0.23	0.44	1.28
	2:45:00	0.00	0.00	0.04	0.05	0.06	0.09	0.12	0.23	0.77
	2:50:00	0.00	0.00	0.03	0.04	0.05	0.06	0.08	0.13	0.47
	2:55:00	0.00	0.00	0.02	0.03	0.04	0.04	0.06	0.09	0.29
	3:00:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.06	0.18
	3:05:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.04	0.09
	3:10:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:15:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	3:20:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	3:25:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:30:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:35:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

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

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

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

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

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

APPENDIX E – REFERENCE MATERIAL

SILVER PONDS SUBDIVISION FILING NO. 1

FINAL DRAINAGE REPORT

February 2, 1995
Revised May 5, 1996
Project No. 60572

PREPARED FOR:

The Campbell Corporation
4975 Austin Bluffs Parkway
Colorado Springs, CO 80918

PREPARED BY:

M.V.E., Inc.
1911 Lelaray St.
Colorado Springs, CO 80909

Table 3.1 - Developed Condition Hydrologic Data

5-year and 100-Year

Design Point	Included Basins	Cumulative Drainage Area (Ac)	5-yr Discharge (cfs)	100-yr Discharge (cfs)
1	OSA1	18.14	13.1	30.4
2	OSA2	8.72	7.0	16.3
3	OSA1 thru A3	29.05	20.5	47.7
4	OSA1 thru A4	31.04	24.3	53.6
5	OSB1	39.26	29.8	69.3
6	OSB1 thru B2	44.66	25.9	60.3
7	OSB1 thru B3	50.03	35.7	83.1
8	OSB1 thru B4	52.02	39.2	89.8
9	OSD1	8.26	7.9	18.4
10	OSD1 thru D2	19.95	24.1	52.9
11	D3	3.41	4.5	9.9
12	E1	4.24	5.5	12.1
13	F1	4.26	6.6	14.4
14	OSG1	6.66	7.0	16.4
15	OSG1 thru G2	9.22	10.5	24.0
16	OSH1	17.22	17.5	38.4
17	OSH1 thru H2	28.28	27.9	61.3
18	OSI1	3.67	3.3	7.8
19	OSI1 thru I2	11.05	7.9	18.4
20	I3	8.01	6.3	14.6
21	OSI1 thru I4	27.16	19.0	44.2
22	J1	4.19	3.0	6.9

M.V.E., Inc.
Colorado Springs, Colorado

Proj. No.: 60572 Project: SILVER PONDS Date: 1-31-96

DEVELOPED DISCHARGES
RAINFALL/RUNOFF ANALYSIS - RATIONAL METHOD

Design Point	Area (Ac)	C5	C100	Tc (min)	i5 (in/hr)	i100 (in/hr)	Q5 (cfs)	Q100 (cfs)
1	18.14	0.30	0.40	27.7	2.40	4.20	13.1	30.4
2	8.72	0.30	0.40	22.9	2.68	4.68	7.0	16.3
5	39.26	0.30	0.40	25.4	2.53	4.41	29.8	69.3
9	8.26	0.30	0.40	16.5	3.19	5.57	7.9	18.4
14	6.66	0.30	0.40	13.5	3.52	6.15	7.0	16.4
16	17.22	0.39	0.49	24.1	2.60	4.55	17.5	38.4
18	3.67	0.30	0.40	18.2	3.03	5.30	3.3	7.8
3	29.05	0.30	0.40	28.7	2.35	4.11	20.5	47.7
4	31.04	0.34	0.43	29.8	2.30	4.02	24.3	53.6
6	44.66	0.30	0.40	39.5	1.93	3.38	25.9	60.3
B3	5.37	0.30	0.40	26.7	2.45	4.29	4.0	9.2
7	50.03	0.30	0.40	28.2	2.38	4.15	35.7	83.1
8	52.02	0.32	0.42	28.7	2.35	4.11	39.2	89.8
D2	11.69	0.39	0.49	17.6	3.09	5.39	14.1	30.9
10	19.95	0.39	0.49	17.5	3.10	5.41	24.1	52.9
11	3.41	0.39	0.49	14.5	3.40	5.94	4.5	9.9
12	4.24	0.39	0.49	15.0	3.35	5.85	5.5	12.1
13	4.26	0.39	0.49	10.5	3.94	6.89	6.6	14.4
G2	2.56	0.39	0.49	13.1	3.57	6.24	3.6	7.8
15	9.22	0.33	0.43	14.0	3.46	6.04	10.5	24.0
H2	11.06	0.39	0.49	17.5	3.10	5.41	13.4	29.3
17	28.28	0.39	0.49	25.3	2.53	4.42	27.9	61.3
19	11.05	0.30	0.40	28.0	2.39	4.17	7.9	18.4
20	8.01	0.30	0.40	23.9	2.62	4.57	6.3	14.6
I4	8.10	0.30	0.40	23.1	2.67	4.66	6.5	15.1
21	27.16	0.30	0.40	29.2	2.33	4.07	19.0	44.2
22	4.19	0.30	0.40	28.8	2.35	4.10	3.0	6.9

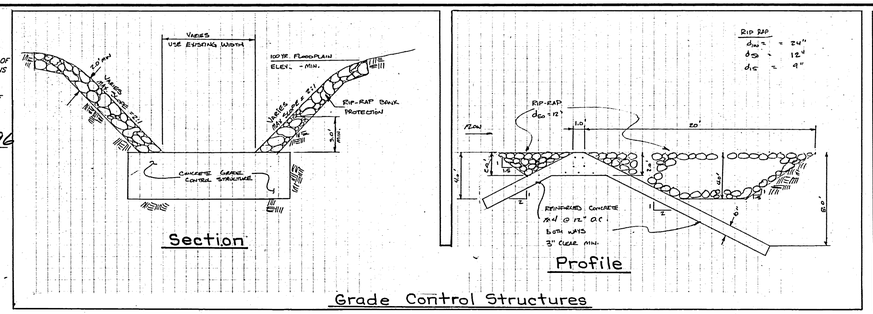
LEGEND

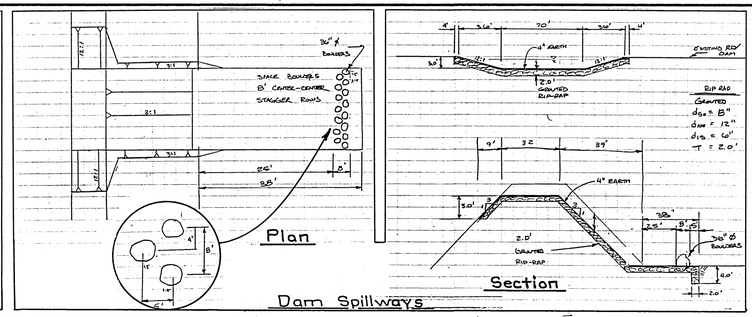
- EXISTING INDEX CONTOUR (7430)
- EXISTING INTERMEDIATE CONTOUR
- DRAINAGE BASIN BOUNDARY LINE
- SUBDIVISION BOUNDARY LINE
- SILT FENCE
- DRAINAGE DIRECTION ARROW
- 5 — DESIGN POINT DESIGNATION
- PROPOSED STORM DRAIN CULVERT
- E / 0.40 — DRAINAGE BASIN DESIGNATION / DRAINAGE BASIN AREA

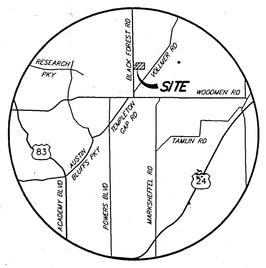
THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

REGISTERED 13348 PROFESSIONAL ENGINEER STATE OF COLORADO

CHARLES C. CROW, P.E. COLORADO NO. 13348 — DATE 5-6-96







VICINITY MAP

SCALE

100' 50' 0 50' 100' 200'

75' 25'

1"=100' 1:1200

SITE HYDROLOGY DATA

DESIGN POINT	INCL. BASINS	AREA (Ac)	Q_5 (cfs)	Q_{100} (cfs)
1	OSA1	18.14	13.1	30.4
2	OSA2	8.72	7.0	16.3
3	OSA1–A3	29.05	20.5	47.7
4	OSA1–A4	31.04	24.3	53.6
5	OSB1	39.26	29.8	69.3
6	OSB1–B2	44.66	25.9	60.3
7	OSB1–B3	50.03	35.7	83.1
8	OSB1–B4	52.02	39.2	89.8
9	OSD1	8.26	7.9	18.4
10	OSD1–D2	19.95	24.1	52.9
11	D3	3.41	4.5	9.9
12	E1	4.24	5.5	12.1
13	F1	4.26	6.6	14.4
14	OSG1	6.66	7.0	16.4
15	OSG1–G2	9.22	10.5	24.0
16	OSH1	17.22	17.5	38.4
17	OSH1–H2	28.28	27.9	61.3
18	OSI1	3.67	3.3	7.8
19	OSI1–I2	11.05	7.9	18.4
20	I3	8.01	6.3	14.6
21	OSI1–I4	27.16	19.0	44.2
22	J1	4.19	3.0	6.9

NOTE: SEE OFFSITE DRAINAGE BASIN MAP FOR OFFSITE BASINS (OS__)

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

Murray D. Stewart Jr. 5/9/96

MURRAY D. STEWART, JR., P.E. COUNTY ENGINEER

PROJECT: SILVER PONDS SUBDIVISION FILING NO. 1

TITLE: DRAINAGE IMPROVEMENT DETAILS

MONUMENT VALLEY ENGINEERS INC.
ENGINEERS • SURVEYORS
1911 LELARAY STREET
COLORADO SPRINGS, COLORADO 80909
PHONE (719) 635-5736

PROJ. NO. 60572
DRAWN: DRG
ENGINEER: DRG
CHECKED: CCC
SCALE: 1" = 100'
DATE: 3/18/96
REVISIONS:

NO.	DATE:	ITEM
1	5/7/96	ADD ESMTS, SILT FENCE & DETAIL

SHEET 1 OF 1

DRAWING NO. 60572008

DISK NO. 1516

PLANNING
KEVIN J. WALKER & ASSOCIATES
105 EAST VERMIJO AVE., SUITE 600 COLORADO SPRINGS, CO 80903 (719) 475-8345

SILVER PONDS FIL. 1

COTTONWOOD CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT
JULY 2019

Prepared for:

Department of Public Works
Water Resources Engineering

City of Colorado Springs
30 S. Nevada Ave
Colorado Springs, CO 80903

Prepared by:

Matrix DESIGN GROUP
AN EMPLOYEE-OWNED COMPANY

LEGEND

City Boundary

Major Reach

Fee Basin Outside DBPS

Hydrologic Basin Boundary

Major Subbasin Boundary

Subbasin Boundary

*** Recent Wetlands**

Palustrine Emergent Wetland (PEM)

Palustrine Scrub/Shrub Wetland

**** Historic Wetlands**

Palustrine Emergent Wetland (PEM)

Palustrine Scrub/Shrub Wetland (PSS)

Palustrine Forested Wetland (PFO)

Sources:
* CRHMP CDOW, 1990-1995
** National Wetlands Inventory, USFWS, 1970s

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

PINE CREEK

INTERSTATE 25

SOUTH PINE CREEK

FAIRFAX TRIBUTARY

WOLF RANCH TRIBUTARY

COTTONWOOD CREEK

AUSTIN BLUFFS TRIBUTARY

FEE BASIN OUTSIDE OF DRAINAGE BASIN

COTTONWOOD CREEK

RANGEWOOD TRIBUTARY

DUBLIN TRIBUTARY

MONUMENT CREEK

FIGURE 2-5
WETLANDS MAP
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\mxd\DBPS_Report\Figure_2_4_CottonwoodCreek_Wetlands_20171221.mxd, 12/21/2017, jeff_dants

LEGEND

City Boundary
Major Reach
Fee Basin Outside DBPS
Hydrologic Basin Boundary
Major Subbasin Boundary
Subbasin Boundary

*** Wildlife Habitat**

Migratory Bird Corridor 300ft
Elk Winter Concentration
Mule Deer
White Tailed Deer
Mountain Lion

* Source: Colorado Division of Wildlife. URS Corporation Fountain Creek Watershed Study, USACE, 2007

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

FEE BASIN OUTSIDE OF DRAINAGE BASIN

INTERSTATE 25
EXPLORER DR
BRIARGATE PKWY
DYNAMIC DR
CHARITY DR
RESEARCH PKWY
N UNION BLVD
AUSTIN BLUFFS PKWY
FAIRFAX TRIBUTARY
WOLF RANCH TRIBUTARY
OLD RANCH RD
COTTONWOOD CREEK
VOLLMER RD
JAMBOREE DR
SUMMERSET DR
MIRAGE DR
SOUTH PINE CREEK
AUSTIN BLUFFS TRIBUTARY
POWER BLVD
COWPOKE RD
TUTT BLVD
ACADEMY BLVD
E WOODMEN RD
EXINGTON DR
BRIDLE PASS DR
BURYEA DR
GLEN HAVEN DR
TEMPLETON GAP RD
DUBLIN BLVD
RANGEWOOD TRIBUTARY
MONTARBOR DR
RANGEWOOD DR
FLINTRIDGE DR
VICKERS DR
DUBLIN TRIBUTARY
MONUMENT CREEK
N NEVADA AVE
STETSON HILLS BLVD

FIGURE 2-6
WILDLIFE HABITAT
COTTONWOOD CREEK & SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\pls_projects\Cottonwood_Creek_DBPS_2017\activeapps\DBPS_Report\Figure_2_5_CottonwoodCreek_Wildlife_and_Mig_Corridors_2019_07_01_DAP.mxd, 7/1/2019, Drew_Phillips

LEGEND

- City Boundary
- Major Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary

*** Threatened and Endangered Species**

- Preble's Meadow Jumping Mouse Block Clearance
- Preble's Meadow Jumping Mouse Block Clearance Zone

Sources:
* CFWS, October 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

FEE BASIN OUTSIDE OF DRAINAGE BASIN

FIGURE 2-7
PREBLE'S MEADOW JUMPING MOUSE BLOCK CLEARANCE ZONE 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\activeapps\DBPS_ReportFigure_2-6_CottonwoodCreek_TE_Species_20171221.mxd, 5/30/2019, Drew_Phillips

LEGEND

- City Boundary
- Major Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary

*** Erosion Issues**

- Aggraded
- Degraded

Sources:
* Field observations 2007, updated 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

FEE BASIN OUTSIDE OF DRAINAGE BASIN

INTERSTATE 25
PINE CREEK
EXPLORER DR
BRIARGATE PKWY
DYNAMIC DR
N UNION BLVD
WERS BLVD
CHARITY DR
RESEARCH PKWY
AUSTIN BLUFFS PKWY
FAIRFAX TRIBUTARY
WOLF RANCH TRIBUTARY
OLD RANCH RD
COTTONWOOD CREEK
VOLLMER RD
COWPOKE RD
POWERS BLVD
TUTT BLVD
E WOODMEN RD
SUMMERSET DR
MIRAGE DR
SOUTH PINE CREEK
N ACADEMY BLVD
AUSTIN BLUFFS TRIBUTARY
LEXINGTON DR
BRIDLE PASS DR
SURREY DR
TEMPLETON GAP RD
DUBLIN BLVD
RANGEWOOD TRIBUTARY
MONTARBOR DR
RANGEWOOD DR
FLINTRIDGE DR
VICKERS DR
DUBLIN TRIBUTARY
MONUMENT CREEK
N NEVADA AVE
ROCKHURST BLVD
MONTEBELLO DR W
STETSON HILLS BLVD

FIGURE 2-9
OBSERVED EROSION ISSUES
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\arcmaps\DBPS_Report\Figure 2_8_CottonwoodCreek_Erosion_Issues_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
- 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

SPC 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_2017active\apps\DBPS_Report\Figure_3_12_CottonwoodCreek_Hydrology_Existing_20180628.mxd, 6/29/2018, jeff_clonts

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.

0 1,000 2,000 3,000 Feet

MATCH LINE

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:\gis_projects\Cottonwood_Creek_DBPS_2017\active\apps\DBPS_Report\Figure_4-7_CottonwoodCreek_Deficiencies.mxd, 4/11/2019, jetf, donts

SAND CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT

JANUARY 2021

Prepared for:

COLORADO SPRINGS
OLYMPIC CITY USA

STORMWATER ENTERPRISE

Prepared by:

Stantec

HDR Dewberry

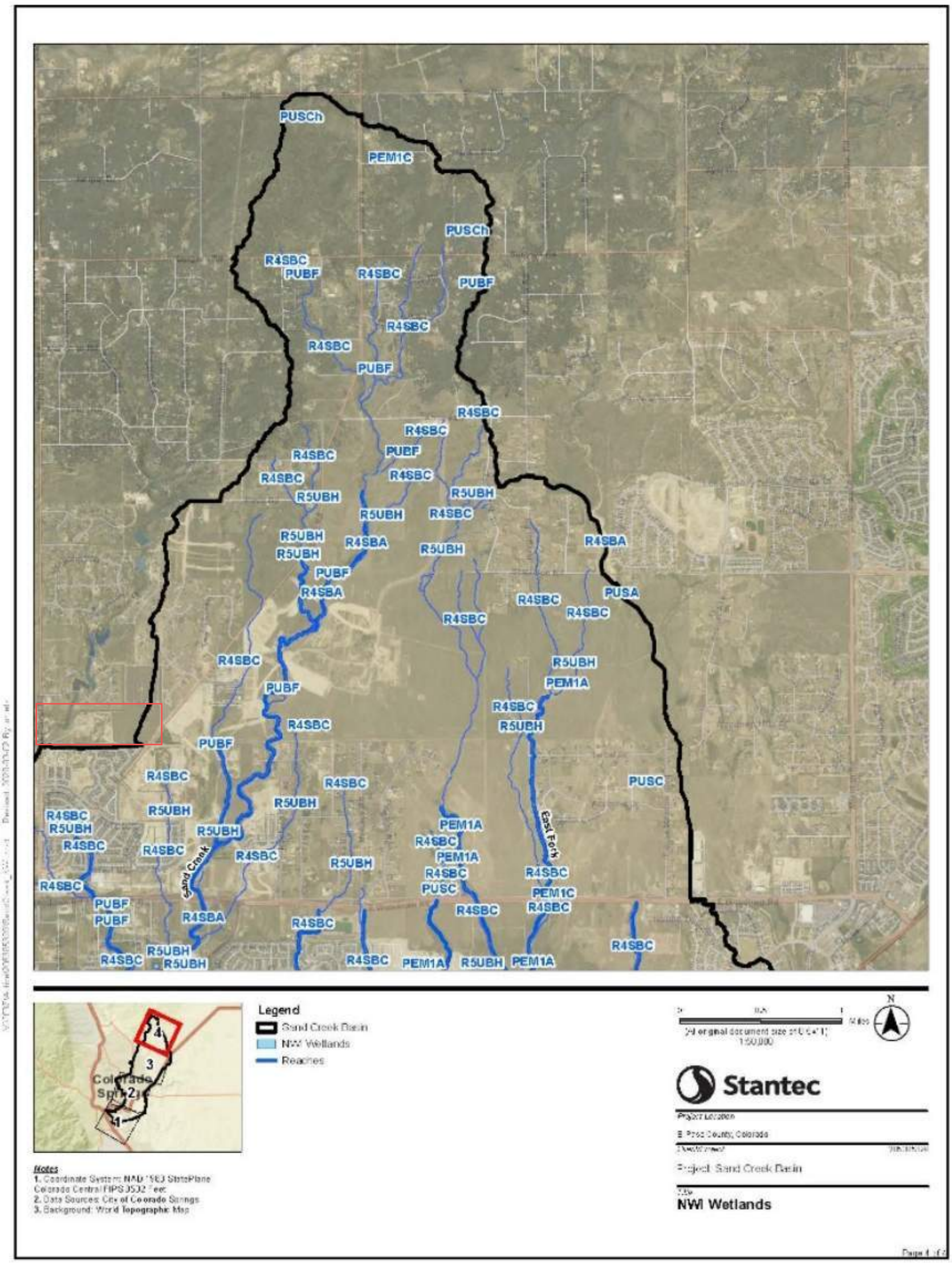


Figure 2-7: NWI Wetlands Located in Sand Creek Drainage Basin (Page 4)

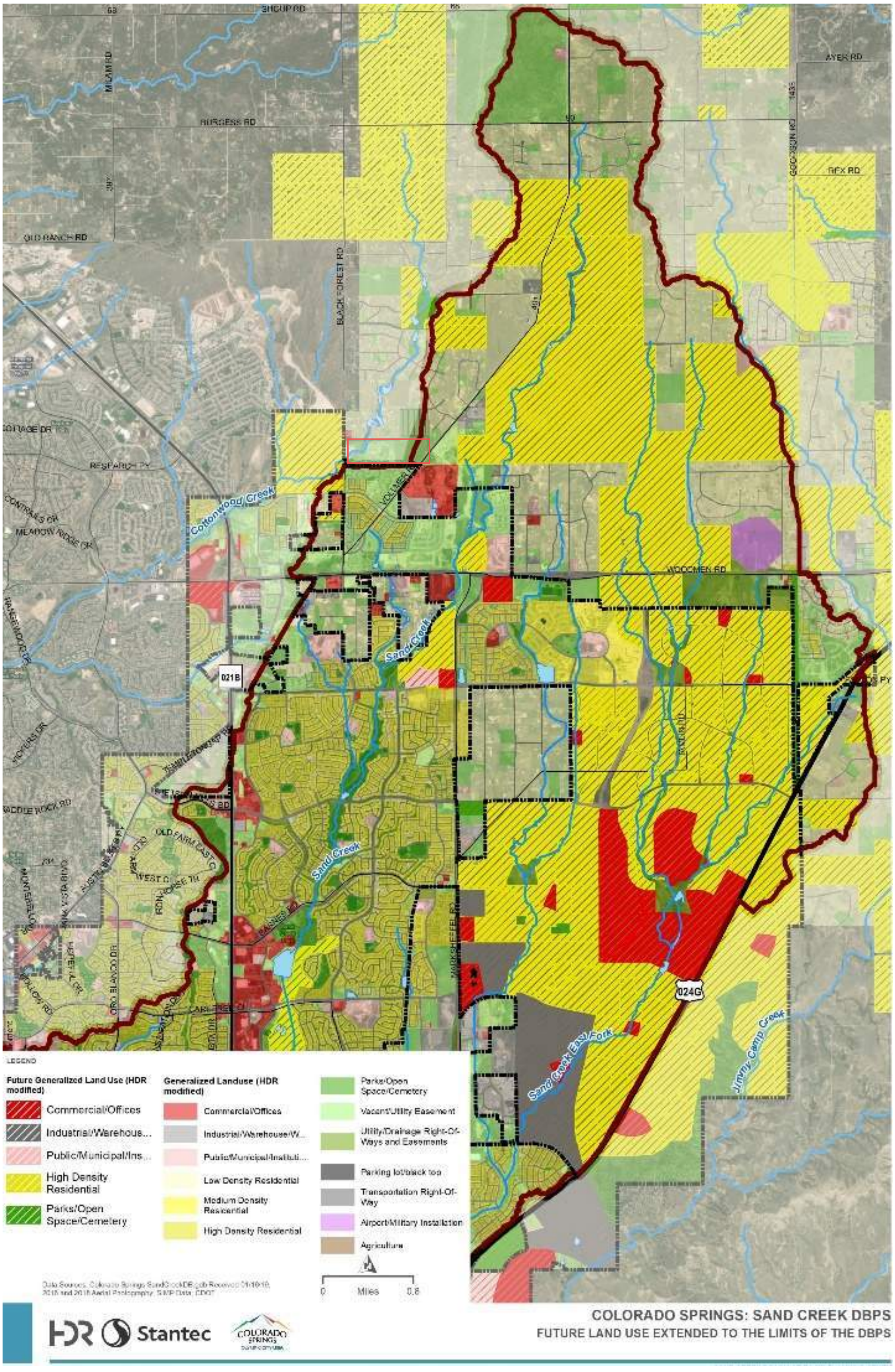


Figure 3-15. Future Land Use MapFuture Condition Model Results

Zone Map 523.32

- El Paso County -

Development Services Department

Zoning Designations

- RS-20000: Residential Suburban (20,000 sq. ft.)
- RS-6000: Residential Suburban (6,000 sq. ft.)
- RS-5000: Residential Suburban (5,000 sq. ft.)
- RM-12: Residential Multi-Dwelling (12 DU/acre)
- RM-30: Residential Multi-Dwelling (30 DU/acre)
- RR-0.5: Residential Rural (0.5 acres)
- RR-2.5: Residential Rural (2.5 acres)
- RR-5: Residential Rural (5 acres)
- R-T: Residential - Topographic
- MHP: Mobile Home Park
- MHP-R: Mobile Home Park, Rural
- MHS: Mobile Home Subdivision
- RVP: Recreational Vehicle Park
- F-5: Forest & Recreation (5 acres)
- PUD: Planned Unit Development
- CC: Commercial Community
- CR: Commercial Regional
- CS: Commercial Service
- I-2: Limited Industrial
- I-3: Heavy Industrial
- A-5: Agricultural (5 acres)
- A-35: Agricultural (35 acres)
- C-1: ** Commercial
- C-2: ** Commercial
- M: ** Industrial
- R-4: ** Planned Development

** Indicates an obsolete designation

Supporting Data

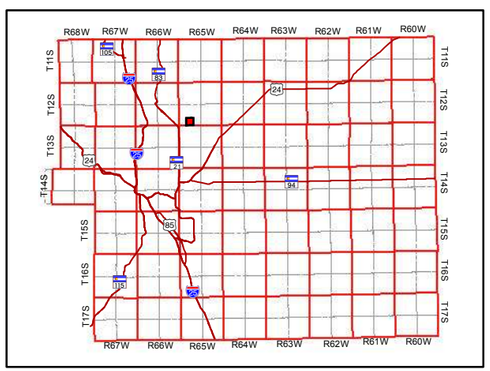
- Highways
- Major Roadways
- Creeks - Perennial
- Creeks - Intermittent
- Section Corner Nodes
- Sections
- Parcels
- Military
- Pike National Forest
- Incorporated Cities
- Zone Map Boundary
- Zoning Overlay
- Special Uses

600 300 0 600 Feet

1 inch = 600 feet

May 25, 2016

Vicinity Map



523 523 523

30 29 28

R65W T12S

LAKENHEATH LN

CAIRNGORM WAY

LOCH LINNHE

LOCHWINNOCH LN

HIGHLAND PARK

FOREST GATE DR

BRAEMAR LN

KILMARNOCK CT

KILLEARN WAY

BLACK FOREST RD

RR-2.5

RR-5

WILDR SUB.

GLIDER LOOP

I-2

523

31 32 33

THE LAKES

RR-5

LOCH FYNE LN

PANAMA DR

BAHAMA DR

LIDO DR

RS-6000

HOLIDAY HILLS

TAHITI DR

RIVIERA DR

AZORE RD

BEN TIRRAN CT

SARAH DAWN VW

LOCH LAWERS HTS

I-3

I-2

VOLLMER

SKIP STONE PT

SILVER PONDS

PUD

SILVER PONDS HTS

CC

Commercial Airport Overlay

Cottonwood Creek

GLIDER PORT RD

VOLLMER RD

RS-5000

RR-5

COLORADO SPRINGS

CREEK BRUSH DR

VANDERWOOD RD

I-3

6 5 4

532.06 532 532

TRAILS AT FOREST MEADOWS
FILING NO. 3
FINAL DRAINAGE REPORT

AMENDMENT TO:
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO.1AND NO.4

August 2015

Prepared for:

Rivers Development, Inc.
13530 Northgate Estates Drive, Suite 200
Colorado Springs, CO 80921

Prepared by:

CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #08-029

OFFICE COPY

ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are co=on during the summer months.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood lnsurance Rate Map (FIRM) Panel No. 08041C0529, effective date March 17, 1997, no portion of the site lies within a designated floodplain.

DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/E) Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

EXISTING DRAINAGE CONDITIONS

The overall site consists of 18.172 acres and is currently undeveloped, with the initial grading project proposed to disturb 18.172 acres for Filing No. 3 residential subdivision. Filing No.3 proposes 87 single family residential lots. The number of lots to be platted in the future filings to the west is unknown at this time. All of the streets, curb, gutter, sidewalk and utilities for the development of Vanderwood Road, Cedar Brush Court, Brush Top Road, and Creek Brush Drive, will be constructed in Filing No. 3 Vanderwood Road will be extended in the future filings of Trails at Forest Meadows.

As shown by the historic drainage map for "Trails at Forest Meadows Filing 2", included in the appendix, offsite historic flows, tributary to Vollmer (EX1 ~ Q5=66 cfs and Q100=300.7 cfs, EX2 ~ Q5=23 cfs and Q100=106 cfs, and EX3 ~ Q5=1.8 cfs and Q100=8.0 cfs, see Historic drainage map DP-1), have been estimated to reach proposed Vollmer Road infrastructure at the Dry Needle Place/Vollmer Road intersection and northerly boundary of Filing No. 2. It has been determined that due to limited roadside capacity along the West side of Vollmer Roadway much of this historic runoff may cross Vollmer prior to reaching DP3 (see proposed Drainage Conditions for addition discussion). No new developed flow will be introduced onto Vollmer Road, north of the intersection. Any new developed flows, south of the intersection, will be intercepted by 2-20' D-10-R inlets within the proposed Vollmer Road Section. It should be noted that upon the construction of the Sterling Ranch subdivision a large percentage of the historic flows, once reaching the subject site (north and west of Vollmer Road/ future Marksheffel Road) will be collected and conveyed in a proposed 54" RCP to Sand Creek.

Per review of the existing topographic drainage patterns, the off-site historic flows, north of the property (OSl, see Historic drainage map DP-1), are conveyed west by an existing berm and swale to an existing gravel borrow pit, as evident by the eroded embankment at the southeast comer of the gravel borrow pit and evaluation of grade during onsite visits. Per the "Master Development Drainage Plan for Woodmen Heights Master ·Plan" prepared by Classic Consulting Engineers and Surveyors, dated June 2004, it was inferred that the entire watershed (historic flows of Q5=65 cfs and Q100=162 cfs) would be transported to the future detention facility through our site. This report was amended by the "Master Development Drainage Plan, Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4" (MDDP) by Engineering and Surveying, Inc., dated February 2006, in which it states that 50% of the flow from OS1 (Q5=34 cfs, Q100==84 cfs) will be collected by a proposed concrete pipe and will be conveyed through and combined with the flows of Trails at Forest Meadows Filings to Sand Creek Regional Detention Facility No. 6. Per historic drainage patterns and per the "Preliminary/Final Drainage Report for Highland Park Filing No.2", prepared by Law and Mariotti Consultants, dated June 2002, the remainder of the flows will be transported via road side swale on the west side of Vollmer Road to the proposed drainage infrastructure in Vollmer Road. Any increase in flows due to future development of

Basin OS1 will require the construction of a proposed detention facility, as per the Sand Creek DBPS. Historic flows (EX4- Q5=5.1 cfs and Q100=22.9 cfs, see Historic drainage map DP-1) south of OS1, sheet flow to an existing abandoned road swale and outlet to a roadside swale on Black Forest Road. There are road side swales on either side of the abandoned road. Since topographic drainage patterns have been altered since the approval of the MDDP, existing historic flows have been diverted to the gravel borrow pit, Vollmer Road and Black Forest Road.

The site is tributary to Sand Creek Detention Basin No. 6. The stormwater infrastructure downstream of the subject site has already been constructed to the aforementioned detention pond. Specifically, flows initially intercepted at Design Point E3 are conveyed within the Vollmer Road Storm Sewer System which parallels the west side of Vollmer prior to out-falling (at the East Side of Vollmer Road) into a partially riprap lined channel. The existing channel, which parallels both the southwest and western edge of Forest Meadows Filing No. 1, directs runoff under Forest Meadows Avenue and into the existing Sand Creek Detention Pond No. 6. A rip rap plunge pool and energy dissipater aid to slow the incoming flows while the receiving facility provides both WQCV and detention for this development.

The site was originally studied in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report" (DBPS) prepared by Kiowa Engineering. This study was then updated in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report Technical Addendum" by Kiowa, revised October 1995.

It should be noted that the subject site was most currently studied in the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4, where the proposed land use had been revised to single-family residential development from previously planned commercial usage.

PROPOSED DRAINAGE CONDITIONS

The following is a description of the onsite basins, offsite bypass flows and the overall proposed drainage characteristics for the development of Trails at Forest Meadows Filing No.3. The following Design Points and Basins were determined using the Rational Method since each individual basin is less than 100 acres and the combined acreage at any Design Point is also less than 100 acres. This method offers a more conservative approach to calculating swale cross sections and storm drain. The proposed drainage design for this subdivision is typical for single family residential, consisting of; homes, landscaping, rear and side lot drainage swales, curb & gutter, streets, curb inlets, and pipes to convey developed flows downstream. Rear and side lot swales will be constructed to get developed flows to street curb and gutter.

Filing No.2 - Basins F2-F, F2-I and F2-J are located to the south of the subject site, in the central and east portions of the Filing 2 site. The flows from these basins were previously analyzed as part of "The Trails at Forest Meadows Filing No. 2 Preliminary/Final Drainage Report" (FDR2). Runoff produced within Basins F2-F, F2-I and F2-J flow to existing inlets in the Trails at Forest Meadows Filing No. 2 subdivision and have been accounted for.

Basin K is located in the northerly portion of the site and contains 0.92 acres of portions of single family residential lots and streets. Basin K has proposed design flows of 1.8 cfs for the minor storm event (5-Year) and 3.9 cfs for the major storm event (100-Year). Runoff from Basin K will flow, overland via side lot swales, to the curb and gutter of existing streets within Basin F2-F (Filing No. 2) to Design Point 1 (6.1 cfs/12.8 cfs), an existing 12' D-10-R inlet in a sump condition. See FDR2 Basin F for pipe conveyance information and over flow conditions. Pipe 2 and 3 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin L is located in the northerly portion of the site and contains 0.55 acres of rear yards of single family residential lots. Basin L has proposed design flows of 1.2 cfs for the minor storm event (5-Year) and 2.5 cfs for the major storm event (100-Year). Runoff from Basin L will flow, overland, to lots and tracts within Basin F2-J (Filing No. 2) and be conveyed, via side lot swales, to the curb and gutter of the adjacent streets to Design Point 5 (4.9 cfs/7.4 cfs). Runoff will be intercept at DP-5 via an existing at-grade 12' D-10-R inlet. See FDR2 Basin J for pipe conveyance information and over flow conditions. Pipes 5, 7, 8, 9 and 11- have been sized to accept these developed flows and do not exceed the pipe design flows determined within the FDR for Filing 2.

Basin M is located in the northeast portion of the site and contains 2.62 acres of single family residential lots, landscaping, and an asphalt roadway. Basin M has proposed design flows of 5.4 cfs for the minor storm event (5-Year) and 11.3 cfs for the major storm event (100-Year). Runoff from Basin M will flow, via side lot swales, to the curb and gutter and will be conveyed south to Design Point 10, a 10' D-10-R inlet in an at-grade condition. The inlet at Design Point 10 has been sized to accept flows from Basin M in the developed condition. Collected flows from Design Point 10 will be conveyed in an 18" RCP (Pipe 20) to Design Point II, a 12' D-10-R at-grade inlet.

Basin M-1 is located in the northeast portion of the site and contains 0.65 acres of single family residential lots and asphalt roadway. Basin M-1 has proposed design flows of 1.3 cfs for the minor storm event (5- Year) and 2.7 cfs for the major storm event (100-Year). Basin M-1 was part of a Basin Min FDR2 and is identified only to account for design flows to Design Point 6, an existing 8' D-10-R inlet in a sump condition. See FDR2 Basin M for pipe conveyance information and over flow conditions. Pipes 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin O is located in the northeast portion of the site and contains 0.70 acres of rear yards of single family residential lots and Tract G. Basin 0 has proposed design flows of 1.6 cfs for the minor storm event (5-Year) and 3.3 cfs for the major storm event (100-Year). The runoff from Basin 0 will flow overland thru Tract G via the side lot swales, to the curb and gutter of Aspen Brush Court, w/o crossing any lots within Filing 2. Runoff collected by the roadway continues southerly (down-gradient) to Design Point 5, an existing 12' D-10-R inlet in an at-grade condition. See FDR2 Basin J for pipe conveyance information and over flow conditions. Pipe 5, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin P is located in the northerly portion of the site and contains 2.14 acres of single family residential lots, landscaping, and an asphalt roadway. Basin P has proposed design flows of 4.2 cfs for the minor storm event (5-Year) and 8.8 cfs for the major storm event (100-Year). Runoff from Basin P will flow, via side lot swales, to the curb and gutter and then westward to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year). A temporary riprap pad will be constructed at the end of the proposed roadway to dissipate energy and prevent local scour. The existing diversion swale established with FDR2 (which previously directed runoff reaching this location to the south) will be abandoned by the construction of a new swale which will be to redirect runoff westward to the existing 48" RCP (Pipe 14). It should be noted that the majority of the existing swale along the western boundary of Filing No.2 remain in place to protect existing lots and serve as a secondary level of protection should the swale leading to pipe 14 fail. Pipes 14 and 3 have been sized to accept the contributing developed flows and do not exceed the pipe design flows in FDR2.

Basin Q is located in the northerly portion of the site and contains 3.66 acres of single family residential lots, landscaping, and proposed roadways. Basin Q has proposed design flows of 6.1 cfs for the minor storm event (5-Year) and 12.8 cfs for the major storm event (100-Year). Runoff from Basin Q will flow, via side lot swales, to the curb and gutter to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year), before continuing within the aforementioned swale to Pipe 14. A temporary sediment basin is recommended to be constructed upstream of Pipe 14, to aid in deterring sediment transport, while riprap protection will be placed immediately adjacent to the pipe entrance to protect the transition slope to the mouth of the pipe . A perimeter berm will be constructed (within a permanent drainage easement) along the north of the filing within Basin Q to ensure that on site property owners are protected from offsite flows (OS1) should lack of maintenance or

removal of the existing offsite berm occur. The combination of the existing grade north of the proposed berm and the berm itself aids to direct any potential runoff to the west. A proposed 3' wide sidewalk chase will be constructed to convey the minor runoff from Basin OS-3 and east third of Basin OS-2 into Brush Top Road. Limited flow from the north is anticipated reach Brush Top, with future development as a high point will be planned to be placed near the north boundary line.

It should be noted that the contours on the provided drainage map illustrate the potential for a low point or break in the existing offsite berm immediately to the north of Brush Top Road which would allow for flows from Basin OS-1 to reach Basin OS-2. M&S Civil Consultants traveled to the sight and evaluated the onsite conditions at this location and determined that the existing contours shown on the provided map are not entirely representative of the current conditions. M&S Civil further ascertained the existing swale/berm at this location maintains a positive grade to the west and is somewhere between 1.7 to 2.0 feet tall which should provide adequate temporary capacity to redirect the offsite flows to the west.

Refer to the existing condition section of this report, the "Master Development Drainage Plan, Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4", and Preliminary/Final Drainage Report for Highland Park Filing No.2" for additional information regarding offsite development in this area.

Basin R is located in the northerly portion of the site and contains 2.37 acres of single family residential lots, landscaping, and an asphalt roadway. Basin R has proposed design flows of 4.7 cfs for the minor storm event (5-Year) and 9.9 cfs for the major storm event (100-Year). Runoff from Basin R will flow, via side lot swales, to the curb and gutter to Design Point 11, a 12' D-10-R inlet in an at-grade condition. The inlet at Design Point 11 has been sized to accept flows from Basin R, S and OS3 in the developed condition. Collected flows from Design Point 11 will be conveyed in a 24" RCP (pipe 19) to pipe 6, an existing 24" RCP stub. Pipe 6, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. A perimeter berm will be constructed (within a permanent drainage easement) along the north of the filing within Basin R to ensure that on site property owners are protected from offsite flows (OS1) should lack of maintenance or removal of the existing offsite berm occur. The combination of the existing grade north of the proposed berm and the berm itself aids in directing any potential runoff to west.

Basin S is located in the easterly portion of the site and contains 3.09 acres of single family residential lots, landscaping, and an asphalt roadway. Basin S has proposed design flows of 4.7 cfs for the minor storm event (5-Year) and 9.9 cfs for the major storm event (100-Year). Runoff from Basins will flow, via side lot swales, to the curb and gutter to Design Point 11, a 12' D-10-R inlet in an at-grade condition. The inlet at Design Point 11 has been sized to accept flows from Basin R, S and OS3 in the developed condition. Collected flows from Design Point 11 will be conveyed in a 24" RCP (pipe 19) to pipe 6, an existing 24" RCP stub. Pipe 6, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. A perimeter berm will be constructed (within a permanent drainage easement) along the north and northeast edges of the proposed filing within Basin S to ensure that on site property owners are protected from offsite flows (OS3). The existing offsite berm located on the adjacent property to the currently aids in directing flows around the majority of the northeast edge of the filing , but terminates prior to eastern boundary line and cannot be relied on in perpetuity for flood control. Flows reaching the onsite berm will be directed to a pair of proposed 4' sidewalk chases which will aid to discharge runoff to the curb and gutter of Vollmer Road.

Basin T is located in the easterly portion of the site and contains 1.73 acres of rear yards of single family residential lots. Basin T has proposed design flows of 4.0 cfs for the minor storm event (5-Year) and 8.4 cfs for the major storm event (100-Year). Runoff from Basin Twill flow, via side lot swales, to the curb and gutter in Vollmer Road to Design Point E3, an existing 12' D-10-R inlet, in an at-grade condition. The inlet at Design Point E3 has been sized to accept flows from Basin T, U and historic flows EX1 and EX2. Collected flows from Design Point E3 will be conveyed in an existing 30" RCP (pipe 10) to pipe 11, an existing 48" RCP. Combined flows in 9, 10 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

EX GRAVEL PIT

TST CONSTRUCTION CO.

DEVELOPED OS1 MDDP

Q=34 cfs
Q=84 cfs
MAX DISCHARGE ALLOWED

EXIST. BERM

EL PASO COUNTY
CITY OF COLORADO SPRINGS.

FLOWS OUTFALL WEST ONTO BLACK FOREST ROAD VIA ABANDONED ROAD SWALE

EX. ABANDONED ROAD

EX5 17 .13 .33

SEE DP1 HISTORIC DRAINAGE PLAN

FUTURE PIPE PER MDDP

EX 48" FES TO COLLECT DIVERTED FLOWS

PIPE RUN 14 STUB PROVIDE FOR FLOWS FROM FUTURE FILINGS AND FUTURE OFFSITE DEVELOPMENT OS1 SEE MDDP

30' DRAINAGE EASEMENT

OS2 1.22 .13 .33

OS1 HISTORIC
Q=34.4 cfs
Q100=84.1 cfs

FUTURE DEVELOPMENT OF THIS SITE WILL REQUIRE ONSITE DETENTION AND A DIVERSION SWALE

OS3 0.34 .13 .33

DIVERT SWALE ONTO C&G AND ASPHALT PAVEMENT

TST CONSTRUCTION CO.

EXIST. BERM

Q 3.68 .13 .33

R 2.37 .57 .67

P 2.14 .57 .67

K 0.92 .57 .67

L 0.55 .57 .67

F2-P 2.95 .57 .67

NO CHANGE FROM FILING 2 DRAINAGE REPORT

F2-O 3.12 .57 .67

O 0.70 .57 .67

M 2.63 .13 .33

S 3.09 .57 .67

T 1.73 .57 .67

U 1.23 .90 .95

TRACT G

TRACT L

ASPEN BRUSH COURT

DEX TWELVE PLACE

FUTURE FILING NO. 3

FILING NO. 3

FILING NO. 2

OFFWOOD ROAD

CANARY CIRCLE

FUTURE SCHOOL

F2-I 1.72 .57 .67

EX. 12' D-10-R INLET

PROP. 10' D-10-R INLET

PROP. 12' D-10-R INLET

EX. 8' D-10-R INLET

EX. 20' D-10-R INLET

EX. 4' D-10-R INLET

M-1 0.65 .57 .67

E3

NAGEL TOE COURT

EX. 10' D-10-R INLET

EX. 12' D-10-R INLET

F1-A 3.03 .57 .67

NO CHANGE FROM FILING 1 DRAINAGE REPORT

EX. FILING NO. 1

EX. FILING NO. 2

EXIST. 24" RCP

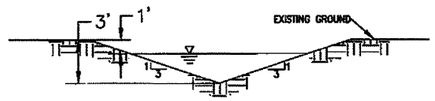
SB

1" = 100'

0 25 50 100 200
Scale in Feet

NOTE:

THIS PLAN REFLECTS THE PRELIMINARY GRADING AND PRELIMINARY LOT TEMPLATES ONLY. THE FINAL GRADING PLAN WILL BE SUBMITTED FOLLOWING THE APPROVAL OF THE DEVELOPMENT PLAN.



A-A GRASS-LINED PERIMETER SWALE CROSS-SECTION
NTS

BASIN/DESIGN POINT SUMMARY

BASIN	AREA (ACRES)	Q5	Q100	DESIGN POINT
FILING NO.2 BASIN F2-I	2.85	6.1	12.8	1
FILING NO.2 BASIN F2-J	1.72	2.9	6.0	2
FILING NO.2 BASIN F2-O	3.12	8.6	18.0	5
K	0.92	1.8	3.9	
L	0.55	1.0	2.5	
P	2.89	6.4	11.3	10
M-1	0.65	1.3	2.7	8
Q	3.70	1.8	9.3	
T	2.14	4.3	8.8	9
U	3.90	8.1	17.0	11
R	2.37	4.7	9.8	11
S	3.09	6.1	12.8	11
T	1.73	4.0	8.4	11
U	1.95	4.4	8.1	11
OFF-SITE UNDEVELOPED BASIN OS2	1.22	0.8	3.8	9
OFF-SITE UNDEVELOPED BASIN OS3	0.34	0.2	1.0	11
HISTORIC EX1	31.8	38.8	80.0	E1
HISTORIC EX2	1.27	2.4	5.1	E2
HISTORIC EX3	8.6	1.8	8.0	E3
HISTORIC OS1	28.0	34.4	84.1	E4

PROPOSED STORM SEWER SUMMARY

PIPE RUN	Q5	Q100	STRUCTURE
1	9.3	18.4	EX 24" RCP
2	15.7	34.3	EX 30" RCP
3	37.2	134.9	EX 42" RCP
5	4.8	7.4	EX 24" RCP
6	7.4	11.3	EX 24" RCP
7	11.7	17.8	EX 30" RCP
8	26.2	42.8	EX 42" RCP
9	22.9	68.1	EX 48" RCP
10	48.1	98.6	EX 42" RCP
11	82.4	113.9	EX 48" RCP
14	48.8	118.7	EX 48" RCP
19	7.6	11.3	24" RCP
20	8.1	7.8	18" RCP

LEGEND

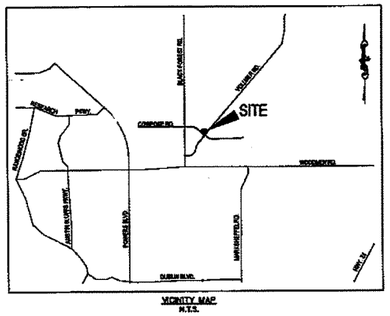
- SB — SEDIMENT BASIN
- BASIN DESIGNATION — A — 6.04 — .25/.35 — ACRES — C5/C100
- 1 — PIPE REFERENCE LABEL
- 1 — SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- FILING 1 BASIN BOUNDARY
- 5920 — EXISTING CONTOUR
- 5920 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- PERIMETER SWALE
- FILING LINE
- H.P. — HIGH POINT
- L.P. — LOW POINT
- INLET

CIVIL CONSULTANTS, INC.

THE TRAILS AT FOREST MEADOWS FIL. 3

FILING 3 DRAINAGE PLAN

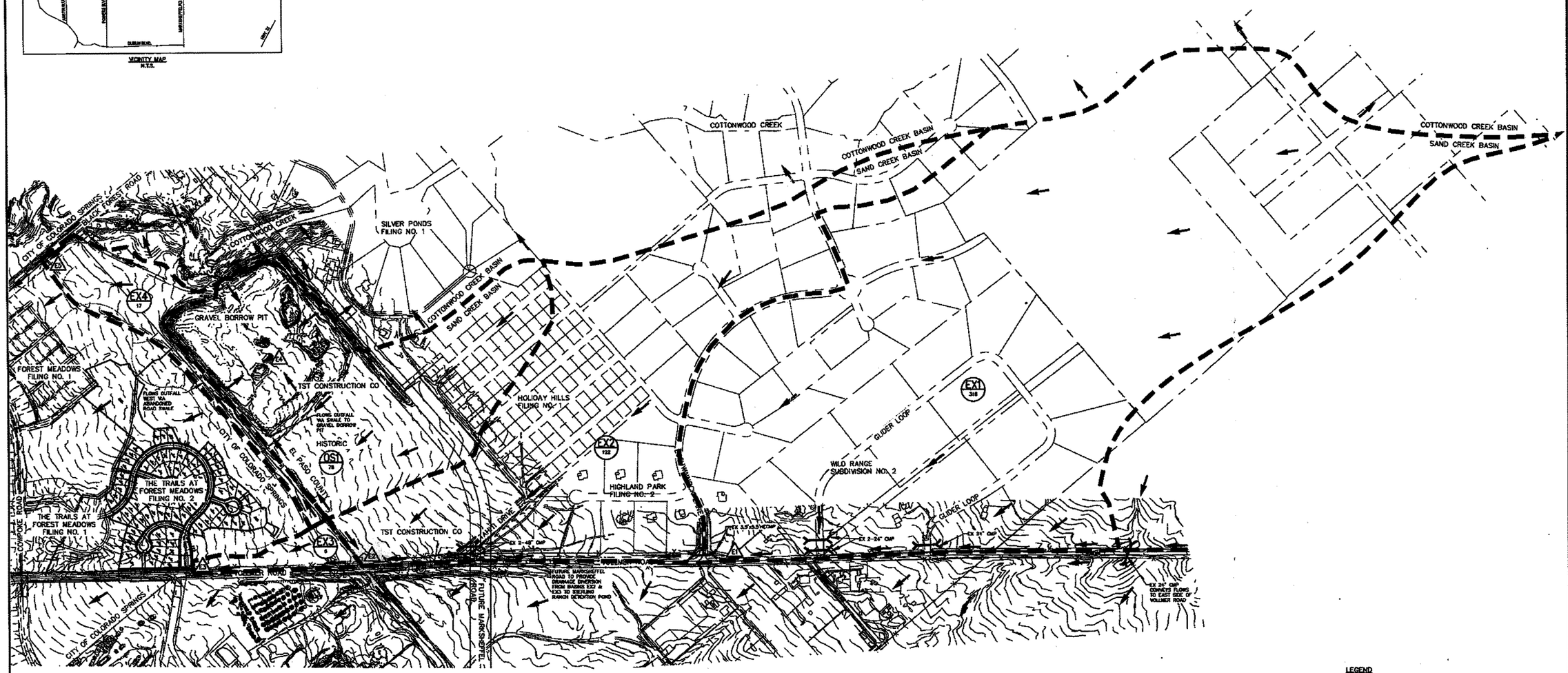
PROJECT NO. 08-025	FILE: *\dwg\Dev. Plan\ 08025 - DRAINAGE		
DESIGNED BY: VAS	SCALE	DATE: 04/09/2014	
DRAWN BY: BLB	HORIZ: 1"=100'	SHEET 2 OF 2	DP2
CHECKED BY: VAS	VERT: N/A		



VICINITY MAP
N.T.S.

HISTORIC BASIN SUMMARY			
BASIN	AREA (acres)	Q_5 (cfs)	Q_{100} (cfs)
EX1	318	66.6	300.7
EX2	122	23.5	106.1
EX3	6	1.8	8.0
OS1	78	34.4	84.1
EX5	17	5.1	22.9

HISTORIC SURFACE ROUTING SUMMARY			
DESIGN POINT	CONTRIBUTING BASINS/DESIGN POINTS	Q_5 (cfs)	Q_{100} (cfs)
E1	EX1	66.6	300.7
E2	EX2 & DP E1	84.7	382.6
E3	EX3 & DP E2	85.8	387.8
E4	OS1	34.4	84.1
E5	EX4	5.1	22.9



1" = 300

0 75 150 300 600

Scale in Feet

LEGEND

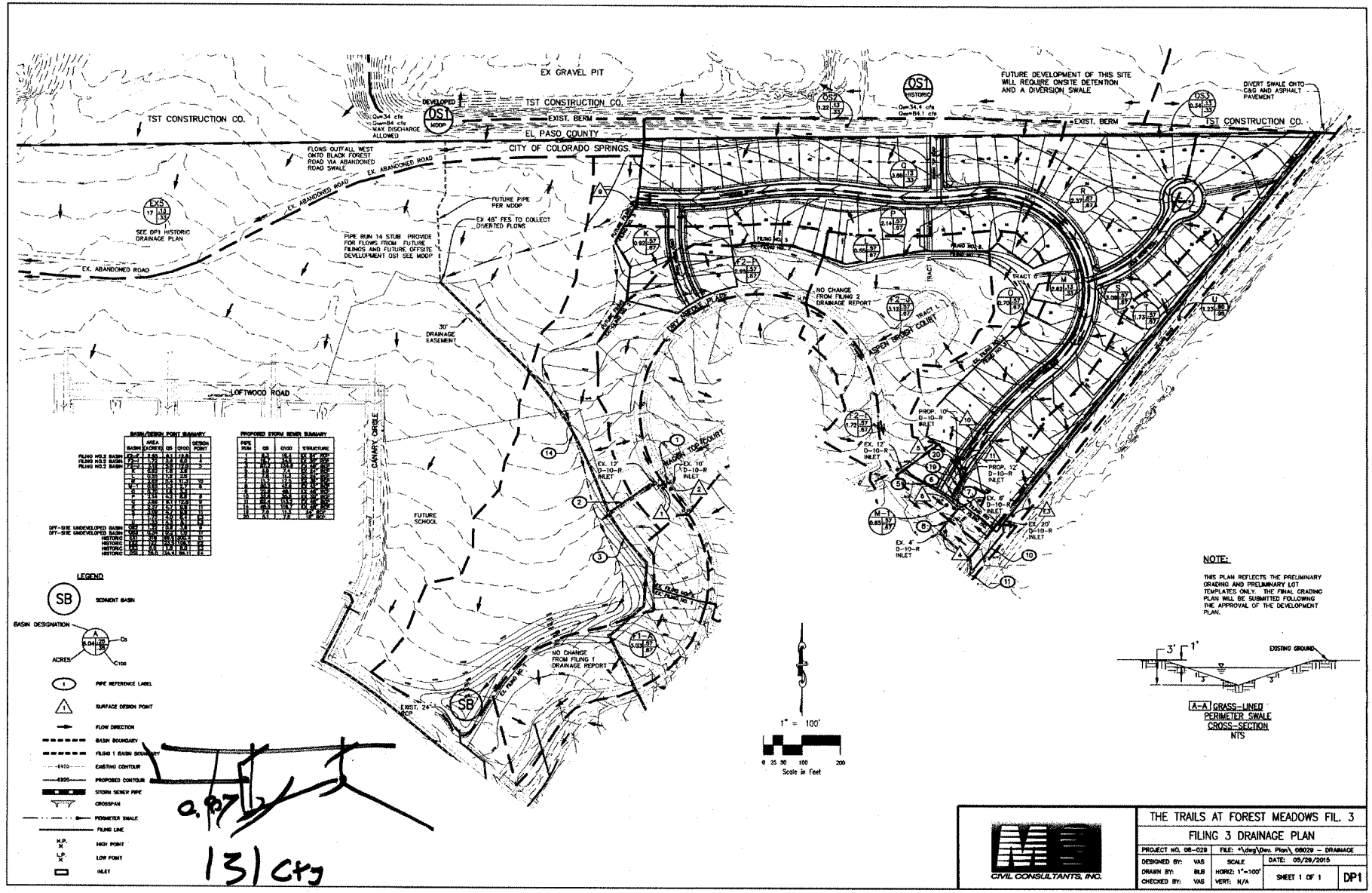
- EX1 / 33.2 — EXISTING MDDP BASIN / ACREAGE
- E1 — EXISTING FLOW RELEASE POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- 6060 — EXISTING CONTOUR
- CULVERT PIPE

CIVIL CONSULTANTS, INC.
E. PIKES PEAK AVE., STE 300
COLORADO SPRINGS, CO 80901
(719) 235-5249, FAX (719) 444-8427

THE TRAILS AT FOREST MEADOWS FIL. NO. 2

HISTORIC – DRAINAGE MAP

PROJECT NO. 08-025	FILE: *\dwg\Dev Plan\08-025-HISTORIC		
DESIGNED BY: ET	SCALE	DATE: 05/01/14	
DRAWN BY: ET	HORIZ: 1"=300'	SHEET 1 OF 2	DP1
CHECKED BY:	VERT: N/A		



BASIN/DESIGN POINT SUMMARY

	BASIN	AREA (ACRES)	Q5	Q100	DESIGN POINT
FILING NO.2 BASIN	OS-1	7.85	0.1	13.9	1
FILING NO.2 BASIN	FC-1	1.39	0.0	0.0	2
FILING NO.2 BASIN	FC-2	1.13	0.0	0.0	3
	A	0.04	0.0	0.1	1
	B	0.03	0.0	0.1	2
	C	0.86	0.2	2.5	3
	D	2.14	0.5	6.3	4
	E	0.57	0.1	1.7	5
	F	2.14	0.5	6.3	6
	G	0.86	0.2	2.5	7
	H	0.92	0.2	2.7	8
	I	0.06	0.0	0.2	9
	J	2.94	0.7	8.6	10
	K	0.92	0.2	2.7	11
	L	0.06	0.0	0.2	12
	M	2.82	0.7	8.3	13
	N	0.79	0.2	2.3	14
	O	3.08	0.7	9.1	15
	P	1.73	0.4	5.1	16
	Q	2.37	0.6	7.0	17
	R	2.37	0.6	7.0	18
	S	3.08	0.7	9.1	19
	T	1.73	0.4	5.1	20
	U	1.23	0.3	3.6	21
	V	0.34	0.1	1.0	22
OFF-SITE UNDEVELOPED BASIN	OS2	1.22	0.1	3.6	1
OFF-SITE UNDEVELOPED BASIN	OS3	0.34	0.1	1.0	2
HISTORIC	OS1	7.85	0.1	13.9	23
HISTORIC	OS2	1.22	0.1	3.6	24
HISTORIC	OS3	0.34	0.1	1.0	25
HISTORIC	OS4	4.15	1.8	8.20	26
HISTORIC	OS5	38.5	14.5	64.2	27

PROPOSED STORM SEWER SUMMARY

PIPE RUN	Q5	Q100	STRUCTURE
1	0.1	0.1	10' TYPE R INLET
2	0.2	0.3	10' TYPE R INLET
3	0.3	0.4	10' TYPE R INLET
4	0.5	0.7	10' TYPE R INLET
5	0.1	0.1	10' TYPE R INLET
6	0.1	0.1	10' TYPE R INLET
7	0.1	0.1	10' TYPE R INLET
8	0.1	0.1	10' TYPE R INLET
9	0.1	0.1	10' TYPE R INLET
10	0.1	0.1	10' TYPE R INLET
11	0.1	0.1	10' TYPE R INLET
12	0.1	0.1	10' TYPE R INLET
13	0.1	0.1	10' TYPE R INLET
14	0.1	0.1	10' TYPE R INLET
15	0.1	0.1	10' TYPE R INLET
16	0.1	0.1	10' TYPE R INLET
17	0.1	0.1	10' TYPE R INLET
18	0.1	0.1	10' TYPE R INLET
19	0.1	0.1	10' TYPE R INLET
20	0.1	0.1	10' TYPE R INLET
21	0.1	0.1	10' TYPE R INLET
22	0.1	0.1	10' TYPE R INLET
23	0.1	0.1	10' TYPE R INLET
24	0.1	0.1	10' TYPE R INLET
25	0.1	0.1	10' TYPE R INLET
26	0.1	0.1	10' TYPE R INLET
27	0.1	0.1	10' TYPE R INLET

LEGEND

- SB — SEDIMENT BASIN
- BASIN DESIGNATION — A, 0.04 ac, Cs, C100
- PIPE REFERENCE LABEL
- SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- FILING 1 BASIN BOUNDARY
- 6410 — EXISTING CONTOUR
- 6395 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- PERIMETER SWALE
- FILING LINE
- H.P. — HIGH POINT
- L.P. — LOW POINT
- INLET

0.87

131 Cfs

NOTE:

THIS PLAN REFLECTS THE PRELIMINARY GRADING AND PRELIMINARY LOT TEMPLATES ONLY. THE FINAL GRADING PLAN WILL BE SUBMITTED FOLLOWING THE APPROVAL OF THE DEVELOPMENT PLAN.

A-A GRASS-LINED PERIMETER SWALE CROSS-SECTION
NTS

CIVIL CONSULTANTS, INC.

THE TRAILS AT FOREST MEADOWS FIL. 3

FILING 3 DRAINAGE PLAN

PROJECT NO. 08-029	FILE: *\dcs\Dev. Plan\ 08029 - DRAINAGE		
DESIGNED BY: VAS	SCALE	DATE: 05/29/2015	
DRAWN BY: BLB	HORIZ: 1"=100'	SHEET 1 OF 1	DP1
CHECKED BY: VAS	VERT: N/A		

TRAILS AT FOREST MEADOWS FILING NO. 3

CITY OF COLORADO SPRINGS, EL PASO COUNTY, STATE OF COLORADO

STREET IMPROVEMENT PLANS

(INCLUDING STORM SEWER)

AUGUST 2015

GENERAL NOTES

1. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN COMPLIANCE WITH THE CITY OF COLORADO SPRINGS, DEPARTMENT OF PUBLIC WORKS, SUBDIVISION POLICY MANUAL AND DIVISION "RULES FOR THE INSTALLATION OF SEWER MAINS AND SERVICES".
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES ALONG THE ROUTE OF THE WORK. THE OMISSION FROM OR THE INCLUSION OF UTILITY LOCATIONS ON THE PLANS IS NOT TO BE CONSIDERED AS THE NONEXISTENCE OF OR A DEFINITE LOCATION OF EXISTING UNDERGROUND UTILITIES.
3. THE CONTRACTOR WILL TAKE THE NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES FROM DAMAGE DUE TO THIS OPERATION. ANY DAMAGE TO THE UTILITIES WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, AND ANY SERVICE DISRUPTION WILL BE SETTLED BY THE CONTRACTOR.
4. CONCRETE USED IN CURB AND GUTTER, SIDEWALK, AND CROSSPAN CONSTRUCTION WILL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
5. ALL BACKFILL, SUB-BASE, AND/OR BASE COURSE (CLASS 6) MATERIAL SHALL BE COMPACTED PER THE SOILS ENGINEER'S RECOMMENDATIONS.
6. ALL STATIONING IS CENTERLINE OF IMPROVEMENTS UNLESS OTHERWISE INDICATED. ALL ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE INDICATED AS TOP BACK OF CURB (TBC), ASPHALT (ASP), OR TOP OF INLET OR BOX (TOB).
7. ALL CURB RETURNS AND 10' EITHER SIDE OF CURB RETURNS SHALL BE 8" VERTICAL CURB, CITY OF COLORADO SPRINGS TYPE 1 CURB WITH AND ADDITIONAL 10' OF TRANSITION TO 6" RAMP CURB. CITY OF COLORADO SPRINGS MODIFIED TYPE 5 CURB, UNLESS OTHERWISE INDICATED.
8. PEDESTRIAN RAMPS SHALL BE INSTALLED AT INTERSECTIONS AS SHOWN AND CONFORM TO THE CITY OF COLORADO SPRINGS, DEPARTMENT OF PUBLIC WORKS STANDARDS AND SPECIFICATIONS.
   NOTE: WIDTH OF PEDESTRIAN RAMPS MUST MATCH WIDTH OF SIDEWALK.
9. IF A DISCREPANCY OCCURS BETWEEN THE CONSTRUCTION DOCUMENTS AND THE CITY OF COLORADO SPRINGS STANDARD SPECIFICATIONS, THE ENGINEER WILL BE NOTIFIED IMMEDIATELY FOR RESOLUTION.
10. THE CONTRACTOR SHALL SECURE ALL APPLICABLE LICENSES AND PERMITS TO COMPLETE THE CONSTRUCTION IN COMPLIANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
11. CONTRACTOR TO OBTAIN COPIES OF THE SOILS REPORT FROM THE GEOTECHNICAL ENGINEER AND TO BE KEPT ON-SITE DURING ALL EARTHWORK OPERATIONS.

CONCRETE: CONCRETE REINFORCEMENT:

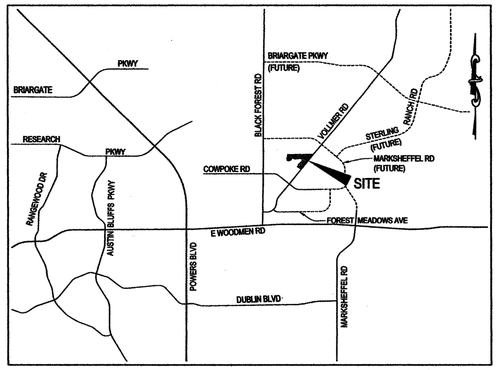
1. ALL CAST IN PLACE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE YIELD STRENGTH OF 4,000 PSI UNLESS OTHERWISE NOTED. HIGHER COMPRESSIVE STRENGTH CONCRETE IS ACCEPTABLE TO ACHIEVE EARLY CONCRETE STRENGTH THAT MAY BE DEEMED NECESSARY TO MEET CONSTRUCTION SCHEDULING PRIORITIES.
2. ALL CAST IN PLACE CONCRETE REINFORCEMENT SHALL HAVE A MINIMUM TENSILE YIELD STRENGTH OF 6,000 PSI UNLESS OTHERWISE NOTED, AND CONFORMANCE WITH CITY OF COLORADO SPRINGS SPECIFICATIONS, SECTION 603.
3. CONCRETE TESTING SHALL BE IN CONFORMANCE WITH CITY OF COLORADO SPRINGS SPECIFICATIONS, SECTION 506.

STORM SEWER NOTES:

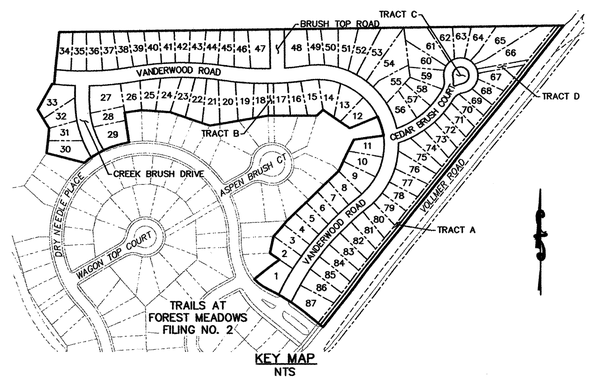
1. CONSTRUCT AND INSTALL D-10-R INLETS PER CITY OF COLORADO SPRINGS SHEET D-10-R 1, 2, AND 3.
2. CONSTRUCT AND INSTALL TYPE I MANHOLES PER CITY OF COLORADO SPRINGS SHEETS D-20A (1) AND D-20D (4).
3. THE MINIMUM CLASS OF REINFORCED CONCRETE PIPE SHALL BE CLASS III.

TRAFFIC ENGINEERING GENERAL NOTES:

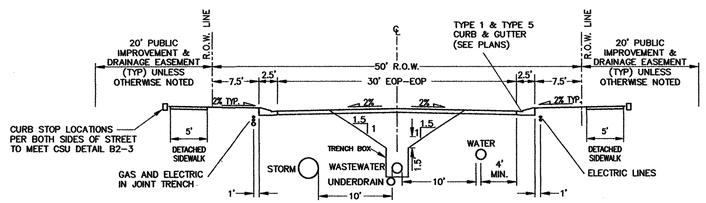
1. CALL BEFORE EXCAVATING, CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND UTILITIES.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY MONUMENTATION AND/OR BENCHMARKS WHICH WILL BE DISTURBED OR DESTROYED BY CONSTRUCTION. SUCH POINTS SHALL BE REFERENCED AND REPLACED WITH APPROPRIATE MONUMENTATION BY A REGISTERED CIVIL ENGINEER AUTHORIZED TO PRACTICE LAND SURVEYING.
3. APPROVAL OF THESE PLANS BY THE CITY ENGINEER DOES NOT AUTHORIZE ANY WORK TO BE PERFORMED UNTIL A PERMIT HAS BEEN ISSUED.
4. THE APPROVAL OF THESE PLANS OR ISSUANCE OF A PERMIT BY THE CITY OF COLORADO SPRINGS DOES NOT AUTHORIZE THE SUBDIVIDER AND OWNER TO VIOLATE ANY FEDERAL, STATE, OR CITY LAWS, ORDINANCES, REGULATIONS, OR POLICIES.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NEW, TEMPORARY AND EXISTING TRAFFIC SIGNS FROM THE START OF THE CONSTRUCTION PROJECT UNTIL ACCEPTANCE BY CITY TRAFFIC ENGINEERING.
6. ALL TRAFFIC SIGNS, PAVEMENT MARKINGS, AND TRAFFIC SIGNALS SHALL MEET OR EXCEED M.T.U.C.D. STANDARDS.
7. THE CONTRACTOR SHALL NOT REMOVE ANY EXISTING SIGNS, PAVEMENT MARKINGS OR TRAFFIC SIGNALS DURING THE PROJECT WITHOUT SIGNED AUTHORIZATION OF THE CITY TRAFFIC ENGINEERING INSPECTOR ASSIGNED TO THE PROJECT.
8. CONTRACTOR SHALL PREPARE A DETAILED TRAFFIC CONTROL PLAN, SUBMIT TO CITY TRAFFIC ENGINEERING FOR APPROVAL, AND OBTAIN APPROPRIATE PERMITS IN ACCORDANCE WITH THE "TRAFFIC CONTROLS FOR STREET CONSTRUCTION, UTILITY WORK AND MAINTENANCE OPERATIONS", M.U.T.C.D. SUPPLEMENT FOR THE CITY OF COLORADO SPRINGS. AUGUST 1992.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK ZONE TRAFFIC CONTROL. CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING, INSTALLING AND MAINTAINING THE TEMPORARY TRAFFIC CONTROL DEVICES THROUGHOUT THE DURATION OF THE PROJECT.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NEW, TEMPORARY, AND EXISTING TRAFFIC SIGNAL MODIFICATIONS.



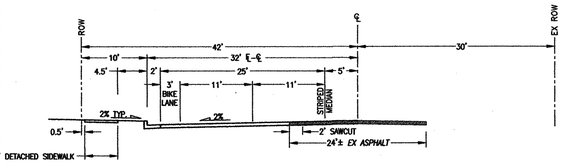
VICINITY MAP
N.T.S.



KEY MAP
NTS



TYPICAL RESIDENTIAL STREET
SCALE: NTS



TYPICAL MINOR ARTERIAL
STREET/UTILITY SECTION (VOLLMER ROAD)
SCALE: NTS

AGENCIES

OWNER:	CHALLENGER HOMES, INC. 13570 NORTHGATE ESTATES DRIVE COLORADO SPRINGS, CO 80921 ROGER MILLER (719) 598-5192 ROGER@MYCHALLENGERHOMES.COM
CIVIL ENGINEER:	M & S CIVIL CONSULTANTS, INC. 20 BOULDER CRESCENT, SUITE 110 COLORADO SPRINGS, CO 80903 VIRGIL A. SANCHEZ P.E. (719) 955-5485
ENGINEERING DIVISION:	CITY OF COLORADO SPRINGS 30 S. NEVADA AVE., SUITE 401 COLORADO SPRINGS, CO 80903 ELIZABETH NIJKAMP, P.E. (719) 385-5410
TRAFFIC ENGINEERING:	CITY OF COLORADO SPRINGS 30 S. NEVADA AVE., SUITE 401 COLORADO SPRINGS, CO 80903 KATHLEEN KRAGER (719) 385-7628
DEVELOPMENT SERVICES:	COLORADO SPRINGS UTILITIES 1521 HANCOCK EXPRESSWAY COLORADO SPRINGS, CO 80903 AL JUVERA (719) 668-8769
GAS DEPARTMENT:	COLORADO SPRINGS UTILITIES 7710 DURANT DR. COLORADO SPRINGS, CO 80920 TIM WENDT (719) 668-3556
ELECTRIC DEPARTMENT:	COLORADO SPRINGS UTILITIES 7710 DURANT DR. COLORADO SPRINGS, CO 80920 SARAH LABARRE (719) 668-4933
COMMUNICATIONS:	QWEST COMMUNICATIONS (U.N.C.C. LOCATORS) (800) 922-1987 AT&T (LOCATORS) (719) 635-3674

DETAILED DRAINAGE CONSTRUCTION PLANS AND SPECIFICATIONS ENGINEER'S STATEMENT:

THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS."

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

9/16/15
DATE

PLAN REVIEW BY CITY OF COLORADO SPRINGS IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH DESIGN CRITERIA. THE CITY OF COLORADO SPRINGS IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE CITY OF COLORADO SPRINGS, THROUGH THE APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

SHEET INDEX

PROJECT DATUM
VERTICAL - NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD29)
HORIZONTAL - NORTH AMERICAN DATUM 1983 (NAD83)
CONTROL - COLORADO STATE PLANE CENTRAL ZONE

STATEMENT:

THE CITY OF COLORADO SPRINGS RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN; THE CITY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY. RESUBMITTAL REQUIRED IF CONSTRUCTION HAS NOT COMMENCED WITHIN 180 DAYS AFTER REVIEW DATE.

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

STREET DESIGN:
REVIEW:
TRAFFIC ENGINEERING: _____ DATE: _____
CURB & GUTTER: _____ DATE: 9/18/15
FINAL REVIEW: _____ DATE: _____
DRAINAGE DESIGN:
DRAINAGE REVIEW: _____ DATE: _____
FILED IN ACCORDANCE WITH SECTION 7-7-906 OF COLORADO SPRINGS CODE 2001, AS AMENDED.

DESIGN DATA:

* FULL DEPTH ASPHALT

SIDEWALKS: WIDTH 5'
LOCATION: Attached ☐
Detached ☐ CENTERED IN 5' EASEMENT
CURB TYPE 1 ☒
CURB TYPE 5 ☒
ROW WIDTH 50' EOP-EOP 30'
STREET TYPE RES HVEEM

ASPHALT THICKNESS:
AC Surface _____
AC Base _____
AGG. BASE THICKNESS:
Class 6 _____
Class 5 _____
Class 2 _____

REVISIONS: NO. | DATE: | BY: | DESCRIPTION:

APPR'D. BY: | DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

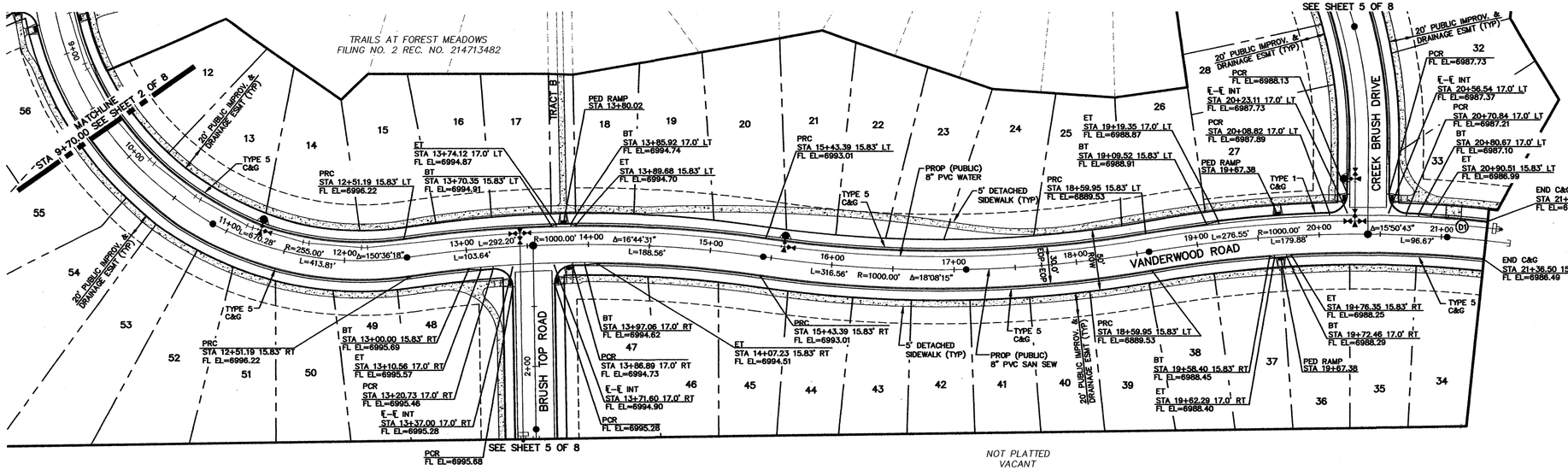
CAUTION

TRAILS AT FOREST MEADOWS FILING NO. 3
STREET IMPROVEMENT PLANS COVER SHEET
PROJECT NO. 08-029 | FILE: \dwg\Cons...Drgs...\Street Improv...\SI01.dwg
DESIGNED BY: GW | SCALE
DRAWN BY: BB | HORIZ: N/A
CHECKED BY: VAS | VERT: N/A
DATE: 8-05-15
SHEET 1 OF 8
SI01

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
M & S CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

21326.20



VANDERWOOD ROAD (VR)

1" = 50'

0 25 50 100

Scale in Feet

STREET ABBREVIATIONS

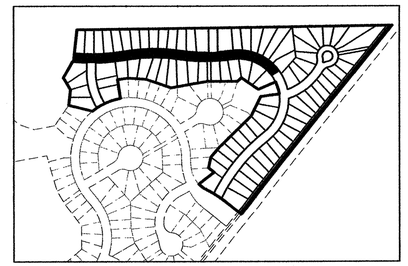
VR	VANDERWOOD ROAD
VR-2	VOLLMER ROAD
CBC	CEDAR BRUSH COURT
BTR	BRUSH TOP ROAD
CBD	CREEK BRUSH DRIVE
DNP	DRY NEEDLE PLACE

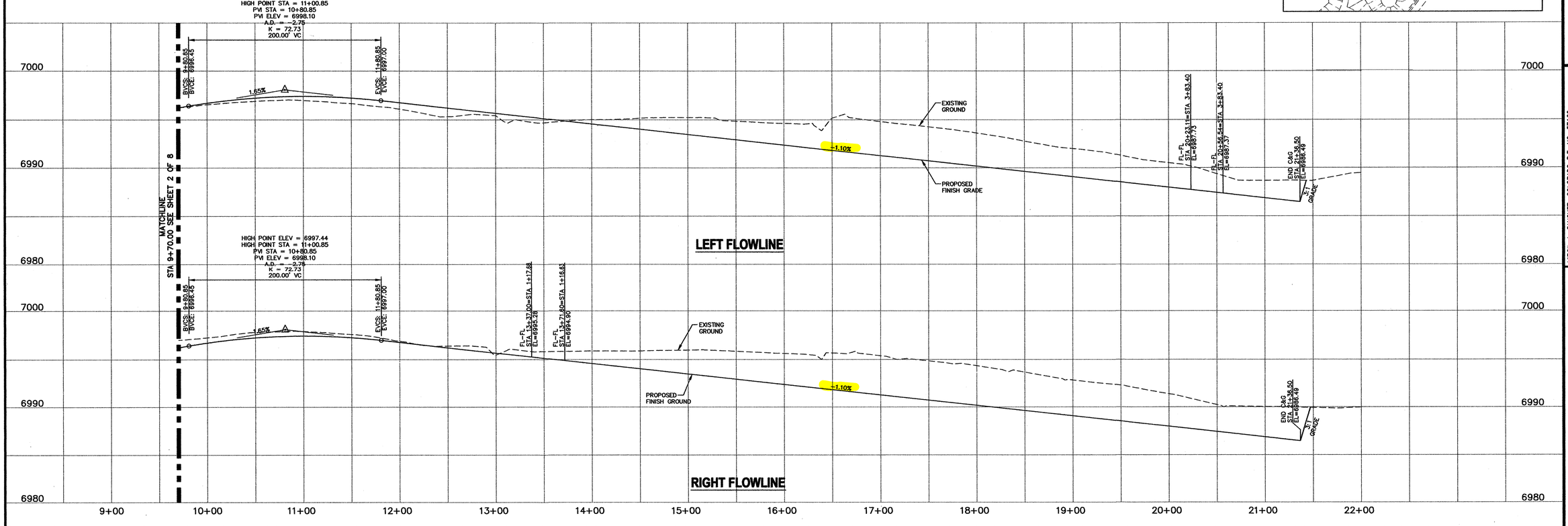
NOTES:

1. ALL CURB RETURN RADIUS SHALL BE 15.00'. CURB RETURNS WILL ALWAYS USE TYPE 1 VERTICAL CURB. WHEN TRANSITIONING FROM RAMP CURB TO VERTICAL CURB A 20 FOOT TRANSITION SHALL BE USED AS FOLLOWS: BEGINNING AT THE P.T.C.R., TEN FEET OF VERTICAL CURB AND 10 FEET OF TRANSITION SECTION.
2. ALL SIDEWALKS SHALL BE 5' WIDE AND DETACHED UNLESS OTHERWISE STATED.
3. ALL CROSS PANS SHALL BE CITY STANDARD D-7 (6' PAN) AS SHOWN.
4. ALL PED RAMPS LOCATED AT INTERSECTIONS SHALL BE CITY STD D-8A AND ALL MID STREET PED RAMPS SHALL BE CITY STD D-8D.
5. DRIVEWAYS FOR LOTS 1, 33, 75, & 87 SHALL BE PER CITY STANDARD D-16

SPECIAL DRIVEWAY LOCATIONS

LOT 33 (D1) 16' DRIVEWAY CUT
STA 20+98.87, 15.83' LT
STA 21+14.62, 15.83' LT





20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CIVIL CONSULTANTS, INC.

TRAILS AT FOREST MEADOWS FILING NO. 3

STREET IMPROVEMENT PLANS ~ VANDERWOOD ROAD

PROJECT NO. 06-029	FILE: \dwg\Cons...Drwn...\STREET IMPR...\SI03.dwg		SI03
DESIGNED BY: GW	SCALE	DATE: 8-05-15	SHEET 3 OF 8
DRAWN BY: BB	HORIZ: 1"=50'		
CHECKED BY: VAS	VERT: 1"=5'		

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APPRO. BY:	DATE:

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CAUTION

STATEMENT:

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CALL 1-800-922-1987

STREET DESIGN:

REVIEW:

TRAFFIC ENGINEERING: _____ DATE: _____

CURB & GUTTER: [signature] DATE: 9/18/15

FINAL REVIEW: [signature] DATE: 10/29/15

DRAINAGE DESIGN:

DRAINAGE REVIEW: _____ DATE: _____

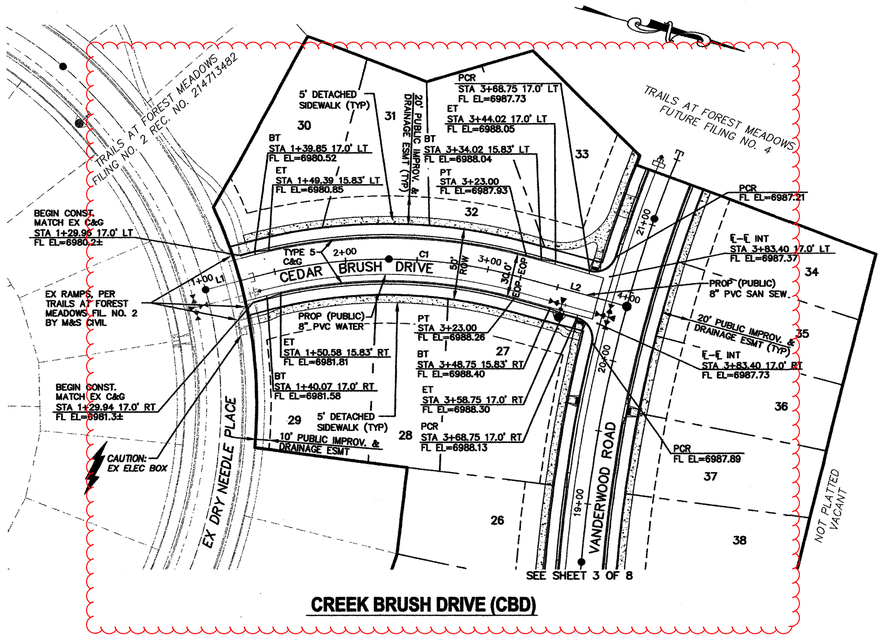
FILED IN ACCORDANCE WITH SECTION 7-7-906 OF COLORADO SPRINGS CODE 2001, AS AMENDED.

DESIGN DATA:

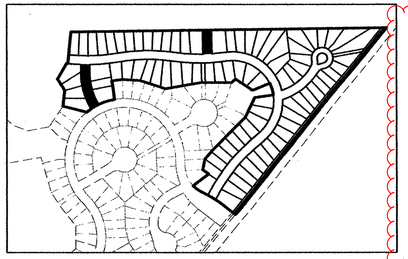
SIDEWALKS: WIDTH 5'
LOCATION: Attached ☐
Detached ☐ CENTERED IN 5' EASEMENT
CURB TYPE 1 ☒
CURB TYPE 5 ☒
ROW WIDTH 50' EOP-EOP 30'
STREET TYPE RES HVEEM

" FULL DEPTH ASPHALT

ASPHALT THICKNESS: 4"
AC Surface
AC Base
AGG. BASE THICKNESS: 6"
Class 6
Class 5
Class 2



CREEK BRUSH DRIVE (CBD)



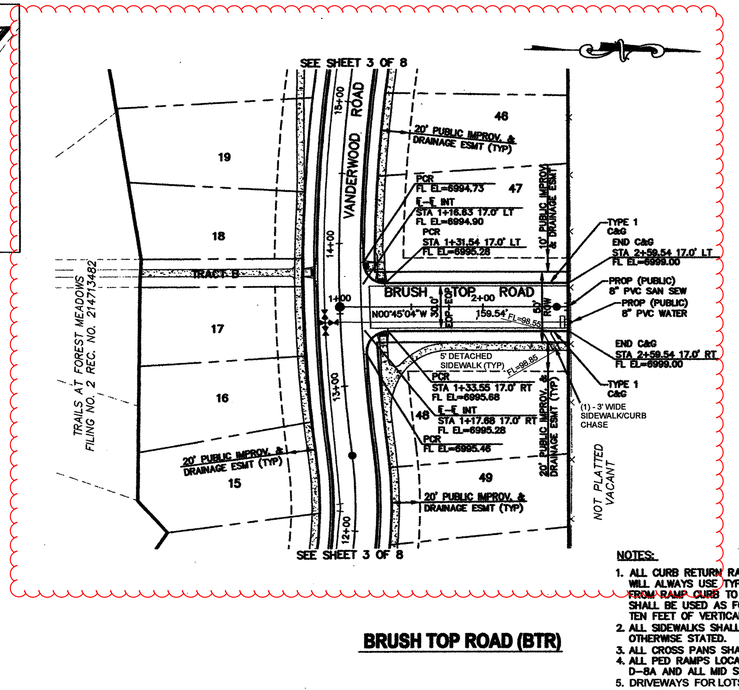
LINE TABLE		
LINE	LENGTH	BEARING
L1	37.44'	N29°53'25"W
L2	77.26'	N00°29'11"E

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	30°22'38"	350.00	185.56'

1" = 50'

0 25 50 100

Scale in Feet



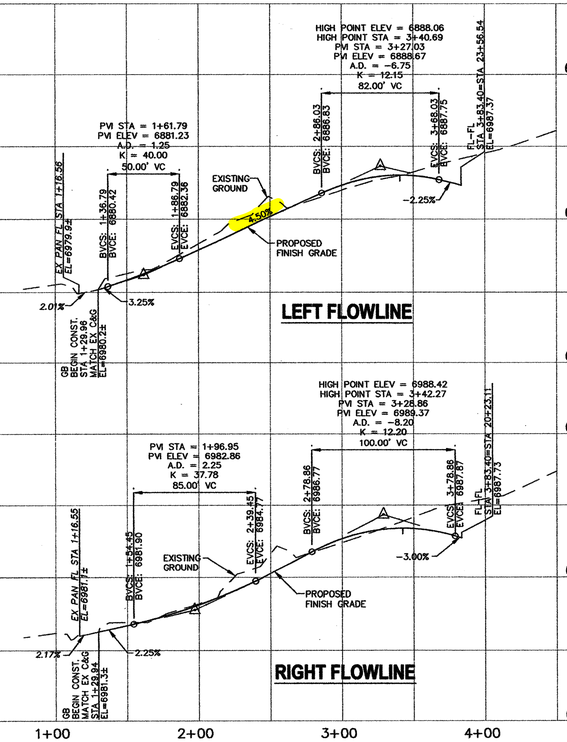
BRUSH TOP ROAD (BTR)

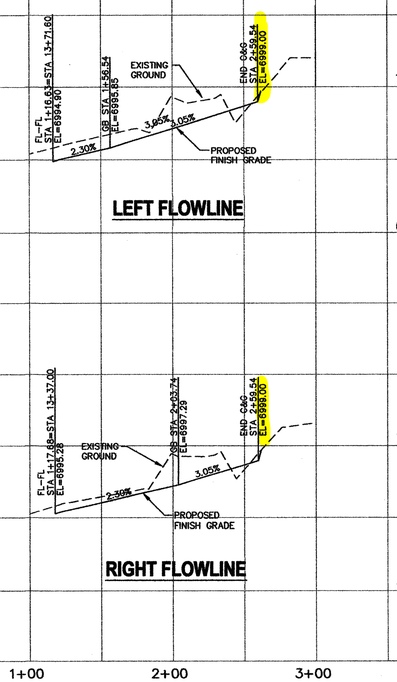
STREET ABBREVIATIONS

VR	VANDERWOOD ROAD
VR-2	VOLLMER ROAD
CBC	CEDAR BRUSH COURT
BTR	BRUSH TOP ROAD
CBD	CREEK BRUSH DRIVE
DNP	DRY NEEDLE PLACE

NOTES:

1. ALL CURB RETURN RADIUS SHALL BE 15.00'. CURB RETURNS WILL ALWAYS USE TYPE I VERTICAL CURB. WHEN TRANSITIONING FROM RAMP CURB TO VERTICAL CURB A 20 FOOT TRANSITION SHALL BE USED AS FOLLOWS: BEGINNING AT THE P.T.C.R., TEN FEET OF VERTICAL CURB AND 10 FEET OF TRANSITION SECTION.
2. ALL SIDEWALKS SHALL BE 5' WIDE AND DETACHED UNLESS OTHERWISE STATED.
3. ALL CROSS PANS SHALL BE CITY STANDARD D-7 (6' PAN) AS SHOWN.
4. ALL PED RAMPS LOCATED AT INTERSECTIONS SHALL BE CITY STD D-8A AND ALL MID STREET PED RAMPS SHALL BE CITY STD D-8D.
5. DRIVEWAYS FOR LOTS 1, 33, 75, & 87 SHALL BE PER CITY STANDARD D-16





STATEMENT:

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FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987

STREET DESIGN:

REVIEW:

TRAFFIC ENGINEERING: _____ DATE: -

CURB & GUTTER: _____ DATE: 9/18/15

FINAL REVIEW: _____ DATE: 10/29/15

DRAINAGE DESIGN:

DRAINAGE REVIEW: _____ DATE: _____

FILED IN ACCORDANCE WITH SECTION 7-7-906 OF COLORADO SPRINGS CODE 2001, AS AMENDED.

DESIGN DATA:

SIDEWALKS: WIDTH 5'
LOCATION: Attached ☐ Detached ☐ CENTERED IN 5' EASEMENT
CURB TYPE 1 ☒
CURB TYPE 5 ☒
ROW WIDTH 50' EOP-EOP 30'
STREET TYPE RES HVEEM

" FULL DEPTH ASPHALT

ASPHALT THICKNESS: 6"
AC Surface ____
AC Base ____
AGG. BASE THICKNESS: 11"
Class 6 6
Class 5 ____
Class 2 ____

REVISIONS:			
NO.	DATE:	BY:	DESCRIPTION:

	DATE:
APPRVD. BY:	

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

TRAILS AT FOREST MEADOWS FILING NO. 3

STREET IMPROVEMENT ~ CREEK BRUSH CT/BRUSH TOP RD

PROJECT NO. 08-029 | FILE: \eng\Cons...Drwg.\Street Improv...\SI05.dwg | DESIGNED BY: GW | DRAWN BY: BB | CHECKED BY: VAS | DATE: 8-05-15 | SCALE HORIZ: 1"=50' VERT: 1"=5' | SHEET 5 OF 8 | SI05

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

TRAILS AT FOREST MEADOWS
FILING NO. 4
FINAL DRAINAGE REPORT

AMENDMENT TO:
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO.1AND NO.4

April 2016

Prepared for:

Challenger Homes, Inc.
13530 Northgate Estates Drive, Suite 200
Colorado Springs, CO 80921
(719) 598-5192

Prepared by:

CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #08-032

ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0529, effective date March 17, 1997, no portion of the site lies within a designated floodplain.

DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

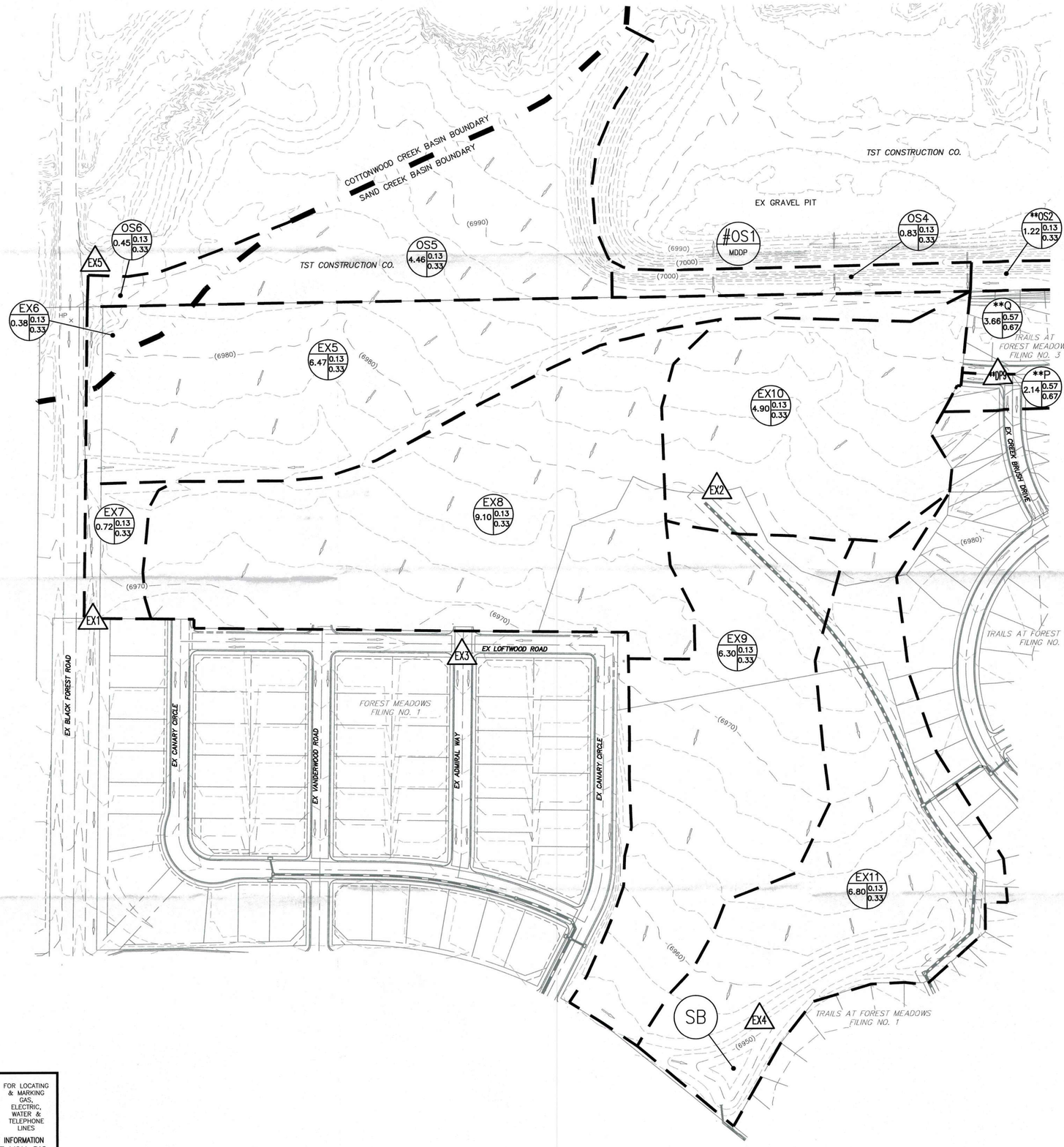
EXISTING DRAINAGE CONDITIONS

The overall site consists of 20.514 acres and is currently undeveloped, with the initial grading project proposed to disturb 20.514 acres for Filing No. 4 residential subdivision. Filing No.4 proposes 90 single family residential lots. All of the streets, curb, gutter, sidewalk and utilities for the development of Vanderwood Road, Oak Vine Court, Salt Brush Road, Leaf Wood Court and Admiral Way, will be constructed in Filing No. 4.

In order to compare past studies, a portion of the drainage basins within this study are denoted by asterisks. The drainage basins labels preceded (or followed) by an single hashtag (#) are referencing watersheds previously illustrated and/or described within the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 & No.4" (MDDP), by Classic Consulting Engineers, & Surveyors, dated February 2006. Those drainage basins labels preceded (or followed) by two asterisks (**) are referencing watersheds previously illustrated and/or described within the "Trails at Forest Meadows Filing No. 3 Final Drainage Report"(TFM 3 FDR), by M&S Civil Consultants, Inc., dated September 2015.

Per review of the existing topographic drainage patterns, the off-site historic flows, north of the property (OSl), are conveyed west by an existing berm and swale to an existing gravel borrow pit, as evident by the eroded embankment at the southeast comer of the gravel borrow pit and evaluation of grade during onsite visits. Per the "Master Development Drainage Plan for Woodmen Heights Master ·Plan" prepared by Classic Consulting Engineers and Surveyors, dated June 2004, it was inferred that the entire watershed (historic flows of Q5=65 cfs and Q100=162 cfs) would be transported to the future detention facility through our site. This report was amended by the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4" (MDDP) by Engineering and Surveying, Inc., dated February 2006, in which it states that 50% of the flow from OS1 (Q5=34 cfs, Q100==84 cfs) will be collected by a proposed concrete pipe and will be conveyed through and combined with the flows of Trails at Forest Meadows Filings to Sand Creek Regional Detention Facility No. 6. Per historic drainage patterns and per the "Preliminary/Final Drainage Report for Highland Park Filing No.2", prepared by Law and Mariotti Consultants, dated June 2002, which is referenced in the MDDP, the remainder of the flows will be transported via road side swale on the west side of Vollmer Road to the proposed drainage infrastructure in Vollmer Road. The flows on Vollmer Road were addressed in the "Trails at Forest Meadows Filing No. 3 Final Drainage Report"(TFM 3 FDR). Any increase in flows due to future development of Basin OS1 will require the construction of a proposed detention facility, as per the Sand Creek DBPS.

In the interim, Historic flows **OS2-Q_5=0.8 cfs and Q_{100}=3.6 cfs, OS4-Q_5=0.4 cfs and Q_{100}=1.8 cfs, OS5-Q_5=2.1 cfs and Q_{100}=9.0 cfs, EX5- Q_5=1.8 cfs and Q_{100}=7.5 cfs, EX7- Q_5=0.3 cfs and Q_{100}=1.1 cfs, see



1" = 100'

0 50 100 200

Scale in Feet

LEGEND

- SB — SEDIMENT BASIN
- 200 — PIPE RUN REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- BASIN BOUNDARY
- 6920 — EXISTING CONTOUR
- 6920 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- BASIN DESIGNATION: Z / 25 / .25 / .35 / C5 / C100 / ACRES
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE
- 11 — LOT NUMBER
- 2.5% — STREET GRADE W/DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q5	Q100
#OS1	78	34.4	84.1
**OS2	1.22	0.8	3.6
OS4	0.83	0.4	1.8
OS5	4.46	2.1	9.0
OS6	0.45	0.1	0.6
EX5	6.47	1.8	7.5
EX6	0.38	0.2	0.6
EX7	0.72	0.3	1.1
EX8	9.10	3.1	13.3
EX9	6.30	1.7	7.4
EX10	4.90	1.5	6.4
EX11	6.80	1.5	6.3
**P	2.14	4.2	8.8
**Q	3.66	6.1	12.8

DESIGN POINT SUMMARY			
DESIGN POINT	Q5	Q100	BASIN
**DP9	10.2	22.4	**DP9Q,**DP9P
EX1	3.7	16.7	**OS2,OS4,OS5,EX5,EX7
EX2	11.5	28.5	**DP9,EX10
EX3	3.1	13.3	EX8
EX4	3.0	13.4	EX9,EX11
EX5	0.3	1.2	OS6,EX6

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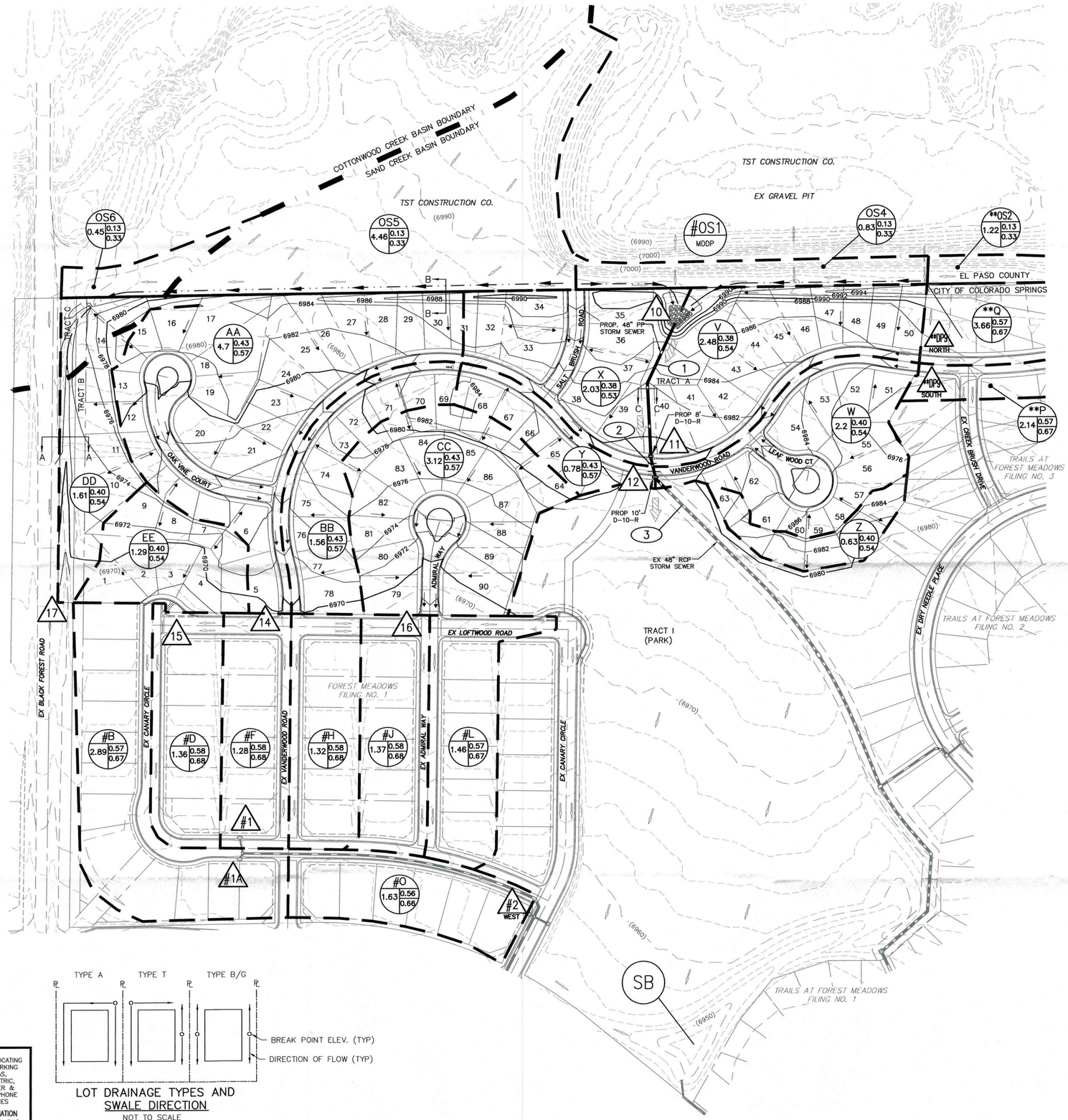
TRAILS AT FOREST MEADOWS FILING NO. 4

EXISTING DRAINAGE PLAN

PROJECT NO. 08-032
FILE: \dwg\Eng Exhibits\DP1.dwg
DESIGNED BY: ET
DRAWN BY: BB
CHECKED BY: ET
SCALE
HORIZ: 1"=100'
VERT: N/A
DATE: 3/28/16
SHEET 1 OF 2
DP1

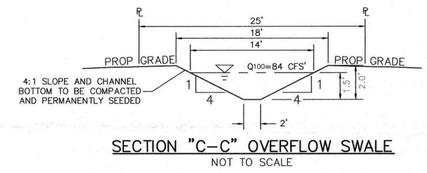


1" = 100'

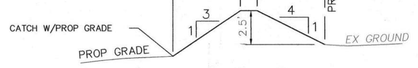
0 50 100 200
Scale in Feet

LEGEND

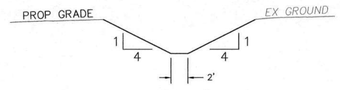
- SB — SEDIMENT BASIN
- 200 — PIPE RUN REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- BASIN BOUNDARY
- -(6920)- EXISTING CONTOUR
- 6920 PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- BASIN DESIGNATION: Z, 25 ACRES, .25, .35, C5, C100
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE
- 11 LOT NUMBER
- 2.5% STREET GRADE W/DIRECTION
- H.P. HIGH POINT
- L.P. LOW POINT



SECTION "C–C" OVERFLOW SWALE
NOT TO SCALE



SECTION "B–B" BERM
NOT TO SCALE



SECTION "A–A" SWALE
NOT TO SCALE

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q5	Q100
V	2.48	3.2	7.6
W	2.20	3.1	7.1
X	2.03	2.7	6.4
Y	0.78	1.2	2.8
Z	0.63	1.2	2.7
AA	4.70	7.2	15.9
BB	1.56	2.4	5.3
CC	3.12	5.1	11.3
DD	1.61	2.6	5.8
EE	1.29	2.3	5.3
OS4	0.83	0.4	1.8
OS5	4.46	2.1	9.0
OS6	0.45	0.1	0.6
#OS1	78.0	34.4	84.1
**OS2	1.22	0.8	3.6
**P	2.14	4.2	8.8
**Q	3.66	6.1	12.8
#B	2.89	6.4	13.4
#D	1.36	3.3	7.0
#F	1.28	3.0	6.3
#H	1.32	3.1	6.5
#J	1.37	3.2	6.8
#L	1.48	3.4	7.0
#O	1.63	3.6	7.6

DESIGN POINT SUMMARY			
DESIGN POINT	Q5	Q100	BASIN
**DP9 NORTH	6.1	12.8	**DP9Q
**DP9 SOUTH	3.6	7.5	**DP9P
10	1.0	4.7	OS4,**OS2
11	11.0	25.2	**DP9Q,V,X
12	7.5	16.8	**DP9P,W,Y
11–12	18.1	41.1	**DP9Q,**DP9P,V,X,W,Y
14	9.4	22.1	AA,BB
15	2.3	5.3	EE
#1&#1A	22.9	50.7	AA,BB,EE,#B,#D,#F,,#H
16	5.0	11.9	CC
#2 WEST	12.9	28.2	CC,#J,#L,#O
17	4.2	14.5	OS5,OS6,DD

STORM SEWER SUMMARY			
PIPE RUN	Q5	Q100	PIPE SIZE
1	34.4	84.1	48" PP
2	41.3	100.0	48" PP
3	45.8	110.0	EX 48" RCP

LOT DRAINAGE TYPES AND SWALE DIRECTION
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CIVIL CONSULTANTS, INC.

TRAILS AT FOREST MEADOWS FILING NO. 4

PROPOSED DRAINAGE PLAN

PROJECT NO. 08-032	FILE: \dwg\Eng Exhibits\DP2.dwg		
DESIGNED BY: ET	SCALE	DATE: 3/28/16	
DRAWN BY: BB	HORIZ: 1"=100'	SHEET 2 OF 2	DP2
CHECKED BY: ET	VERT: N/A		

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Cottonwood Creek Drainage Basin Planning Study

City of Colorado Springs and El Paso County

APPENDIX B

SUPPORTING DOCUMENTATION

JUNE 9, 1994

COTTONWOOD CREEK DBPS - TABLE 3

CHANNEL & CULVERT RECOMMENDATIONS

REACH	HEC-1 FLOW w/det. (CFS)	CHANNEL OR CULVERT LENGTH(FT)	EXISTING IMPROVEMENT	RECOMMENDED IMPROVEMENT	TOTAL BOTTOM WIDTH (FT)	TOTAL DEPTH (FT)
21 TO DESIGN POINT 20	11,173	1,800	NATURAL	NATURAL EXCEPT PROVIDE BURIED RIPRAP & GRADE CONTROL AT I-25 BRIDGES ONLY (500'& 2 DROPS)	50	14.0
20 TO DESIGN POINT 19	11,112	2,400	NATURAL	NATURAL EXCEPT PROVIDE GABION WALLS & GRADE CONTROL AT BRIDGES (600') & PORTIONS OF SOUTH BANK (1,550')	40	15.0
19 TO DESIGN POINT 19.2	11,127	1,500	NATURAL	NATURAL EXCEPT PROVIDE GABION WALLS & GRADE CONTROL FOR PORTIONS OF SOUTH BANK (300') & NORTH BANK (500')	40	15.0
19.2 TO DESIGN POINT 19.1	11,127	700	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 3 DROPS)	40	16.0
19.1 TO DESIGN POINT 18	11,127	1,200	F.LINED	NO IMPROVEMENT REQUIRED	80	12.0
18 TO DESIGN POINT 18.1	10,000	400	P.LINED	NO IMPROVEMENT REQUIRED	115	12.0
18.1 TO DESIGN POINT 17	10,000	2,000	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 12 DROPS)	115	12.0
17 TO DESIGN POINT 17.2	9,837	1,000	P.LINED	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 5 DROPS)	115	12.0
17.2 TO DESIGN POINT 17.1	9,837	1,100	P.LINED	NO IMPROVEMENT REQUIRED	115	9.0
17.1 TO DESIGN POINT 16	9,837	1,000	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 2 DROPS)	100	11.0
16 TO DESIGN POINT 15	9,416	2,500	P.LINED	LOWER CHANNEL BOTTOM BY NATURAL EROSION WITH PHASED BURIED RIPRAP BANKS & GRADE CONTROL (WITH 3 DROPS)	150	6.0
15 TO DESIGN POINT 14	8,790	1,400	P.LINED	INCREASE DEPTH OF BURIED RIPRAP LINING ON NORTH SIDE & GRADE CONTROL (WITH 4 DROPS)	150	7.5
14 TO DESIGN POINT 14.1	8,598	1,300	P.LINED	NO IMPROVEMENT REQUIRED	200	8.0
14.1 TO DESIGN POINT 13	8,598	1,000	P.LINED	INCREASE DEPTH OF BURIED RIPRAP LINING ON NORTH SIDE	200	6.5
13 TO DESIGN POINT 13.2	4,702	2,000	P.LINED	NEED BURIED RIPRAP LINING ON SOUTH SIDE & GRADE CONTROL (WITH 3 DROPS)	200	5.0
13.2 TO DESIGN POINT 13.1	4,702	1,100	P.LINED	NEED BURIED RIPRAP LINING ON SOUTH SIDE & GRADE CONTROL (WITH 3 DROPS)	105	7.0
13.1 TO DESIGN POINT 12	4,702	2,300	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 5 DROPS)	105	7.0
12 TO DESIGN POINT 11	4,026	5,500	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 16 DROPS)	80	8.0
11 TO DESIGN POINT 10	3,008	1,100	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 3 DROPS)	80	6.5
10 TO DESIGN POINT 9	2,531	1,800	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 4 DROPS)	80	6.5
9 TO DESIGN POINT 8	2,332	3,000	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 10 DROPS)	80	6.5
8 TO DESIGN POINT 7	1,715	3,500	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 12 DROPS)	80	5.0
7 TO DESIGN POINT 6	854	3,500	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 9 DROPS)	50	4.5
6 TO DESIGN POINT 5	673	7,000	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 12 DROPS)	50	4.0
5 TO DESIGN POINT 4	870	3,000	VEG. LINING	GRADE CONTROL (7 DROPS)	50	4.0
4 TO DESIGN POINT 3	467	3,500	VEG. LINING	GRADE CONTROL (12 DROPS)	20	4.5
3 TO DESIGN POINT 2	335	3,500	VEG. LINING	GRADE CONTROL (11 DROPS)	20	4.0
2 TO DESIGN POINT 1	114	2,300	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 5 DROPS)	20	3.0
T4B TO DESIGN POINT 19G	528	1,700	STORM/NAT.	STORM SEWER FROM EXISTING 48" CMP OUTLET DOWNSTREAM TO MAIN CHANNEL	72" RCP	N/A
19E TO DESIGN POINT 19F	1,560	2,400	CONCRETE	NO IMPROVEMENT REQUIRED	12	6.0
19D TO DESIGN POINT 19E	1,285	3,400	CONCRETE	NO IMPROVEMENT REQUIRED	13	6.0
19B TO DESIGN POINT 19C	810	2,800	CONCRETE	NO IMPROVEMENT REQUIRED	5	5.0
Q1 TO DESIGN POINT 19A	390	2,200	72" PIPE	PARALLEL PIPE (1,650')	36" RCP	N/A
T4A TO DESIGN POINT 18A	260	1,200	48" PIPE	NO IMPROVEMENT REQUIRED	N/A	N/A
17A TO DESIGN POINT 17	312	1,000	66" PIPE	NO IMPROVEMENT REQUIRED	N/A	N/A
T2 TO DESIGN POINT 17A	205	1,200	NATURAL	STORM SEWER	48" RCP	N/A
P2 TO DESIGN POINT 16C	368	2,300	48" PIPE	NO IMPROVEMENT REQUIRED	N/A	N/A
M4 TO DESIGN POINT 16B	492	2,400	P.LINED	NO IMPROVEMENT REQUIRED	N/A	N/A
M3 TO DESIGN POINT 16	291	1,400	36" PIPE	PARALLEL PIPE (1,250')	30" RCP	N/A
M1 TO DESIGN POINT 14C	513	3,000	48" PIPE	PARALLEL PIPE (2,000')	48" RCP	N/A
O1 TO DESIGN POINT 14B	426	3,700	48" PIPE	PARALLEL PIPE (2,600')	48" RCP	N/A
L1 TO DESIGN POINT 14A	371	1,700	42" PIPE	PARALLEL PIPE (1,700')	36"/42" RCP	N/A
J1 TO DESIGN POINT 13S	425	3,100	42" PIPE	PARALLEL PIPE	48" RCP	N/A
13Q TO DESIGN POINT 13R	1,058	750	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 1 DROP)	75	4.0

COTTONWOOD CREEK DBPS - TABLE 4
BRIDGE RECOMMENDATIONS

LOCATION	HEC-1 FLOW w/det. (CFS)	EXISTING IMPROVEMENT	PROPOSED IMPROVEMENT
CDOT BRIDGES			
I-25 (DP 21)	11,173	BRIDGE, T=137,B=113,D=18	REPL. BRIDGES (8 LANES), 2 @ 70' WIDE X 140' LONG
I-25 (DP 31)	5,613	BRIDGE, T=189,B=39,D=43	REPL. BRIDGES (8 LANES), 2 @ 70' WIDE X 190' LONG
CITY BRIDGES			
CORPORATE DRIVE (DP 21)	11,173	BRIDGE, T=123,B=61,D=15.8	NO IMPROVEMENT REQUIRED
VINCENT DRIVE (DP 20)	11,112	BRIDGE, T=209,B=53,D=33.5	REPL. BRIDGE (6 LANE ART.), 107' WIDE BY 210' LONG
CURRENT ACCESS RD (DP 20)	11,112	HORSESHOE - 2 @ 22' x 22'	NO IMPROVEMENT REQUIRED
ACADEMY BLVD (DP 18)	10,000	CBC - 5 @ 20' x 9'	NO IMPROVEMENT REQUIRED
UNION BLVD (DP 16)	9,416	CBC - 7 @ 12' x 6'	REPL. BRIDGE (6 LANE ART.), 107' WIDE BY 150' LONG
RANGEWOOD DRIVE (DP 13)	7,844	CM ARCH - 4 @ 25.5' x 13'	NO IMPROVEMENT REQUIRED
WOODMEN ROAD (DP 12)	4,026	BRIDGE - 118' x 22'	REPL. BRIDGE (8 LANE ART.), 143' WIDE BY 200' LONG
AUSTIN BLUFFS (DP 12)	4,026	N/A	REPL. BRIDGE (8 LANE ART.), 143' WIDE BY 200' LONG
POWERS BLVD (DP 9)	2,332	N/A	TRIPLE 10' X 9' CBC (360')
DUBLIN BLVD (DP 13O)	2,414	CMP - 2 @ 132"	ADD PARALLEL 108" CMP
AUSTIN BLUFFS (DP 13J)	3,686	CMP - 2@120"	QUADRUPLE 12' X 9' CBC
RESEARCH PKWY (DP 8G)	1,632	N/A	TRIPLE 14' X 6' CBC
PINE CREEK RD (DP 31)	5,613	BRIDGE, T=185,B=45,D=41	NO IMPROVEMENT REQUIRED
OLD RAILOAD GRADE (DP 31)	5,613	HORSESHOE - 2 @ 25' x 21'	NO IMPROVEMENT REQUIRED
ACADEMY BLVD N (DP SUM13)	2,586	CBC - 10' x 6'	REPLACE WITH TRIPLE 12' X 9' CBC
COUNTY BRIDGES			
BLACK FOREST ROAD (DP 7)	854	BRIDGE, T=40,B=26,D=17	REPL. BRIDGE (5 LANE ART.), 70' WIDE BY 110' LONG

COTTONWOOD CREEK DBPS
RESULTS OF BASIN INVENTORY

TABLE 8

REACH	EXISTING PROTECTION	AVAILABLE/ ADDITIONAL CAPACITY	EROSION CONSIDERATIONS	WETLAND CONSIDERATIONS	WILDLIFE CONSIDERATIONS	COMPATIBILITY W/ UTILITIES	LAND USE COMPATIBILITY	LAND AVAILABILITY	MULTI-USE OPPORTUNITIES	CAPITAL COST PER ALTERNATIVE	MAINTENANCE CONSIDERATIONS PER ALTERNATIVE	SAFETY OR FLOOD PROTECTION CONSIDERATIONS	COMMENTS	CONCLUSIONS
DES. PT. 9 TO DES. PT. 10	NATURAL OR VEGETATED CHANNEL 80 B + 10 D, 1:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 10 TO 20 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	PROPOSED MAJOR UTILITY MAIN ON NORTH SIDE OF CHANNEL NEEDS TO BE CONSIDERED IN FINAL DESIGN AND ROW REQUIREMENTS	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED TRAIL CORRIDOR PLANNED LINEAR PARK PLANNED UTILITY CORRIDOR	FULL LINING = $ 447,000 PARTIAL LINING = $ 313,000 NATURAL = $ [illegible]	MAINTENANCE OF ALTERNATIVE A IS NOT PRACTICAL DUE TO HIGH VELOCITIES AND EROSION - OTHER ALTERNATIVES ARE ACCEPTABLE	HIGH VELOCITIES ANTICIPATED - NATURAL ALTERNATIVE MAY NOT BE PRACTICAL SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 8 TO DES. PT. 9	NATURAL OR VEGETATED CHANNEL 80 B + 10 D, 3:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 10 TO 20 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	PROPOSED MAJOR UTILITY MAIN ON NORTH SIDE OF CHANNEL NEEDS TO BE CONSIDERED IN FINAL DESIGN AND ROW REQUIREMENTS	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED TRAIL CORRIDOR PLANNED LINEAR PARK PLANNED UTILITY CORRIDOR	FULL LINING = $ 734,000 PARTIAL LINING = $ 469,000 NATURAL = $ 1,882,000	MAINTENANCE OF ALTERNATIVE A IS NOT PRACTICAL DUE TO HIGH VELOCITIES AND EROSION - OTHER ALTERNATIVES ARE ACCEPTABLE	HIGH VELOCITIES ANTICIPATED - NATURAL ALTERNATIVE MAY NOT BE PRACTICAL SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 7 TO DES. PT. 8	NATURAL OR VEGETATED CHANNEL 80 B + 10 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE BOTTOM SIDE-SLOPES EXCEED IN ROCK	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED TRAIL CORRIDOR PLANNED LINEAR PARK	FULL LINING = $ 740,000 PARTIAL LINING = $ 500,000 NATURAL = $ 886,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	HIGH VELOCITIES ANTICIPATED - NATURAL ALTERNATIVE MAY NOT BE PRACTICAL SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 6 TO DES. PT. 7	NATURAL OR VEGETATED CHANNEL 80 B + 10 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE BOTTOM SIDE-SLOPES EXCEED IN ROCK	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 1,101,000 PARTIAL LINING = $ 1,837,000 NATURAL = $ 1,746,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 5 TO DES. PT. 6	NATURAL OR VEGETATED CHANNEL 80 B + 10 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE BOTTOM SIDE-SLOPES EXCEED IN ROCK	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 1,148,000 PARTIAL LINING = $ 840,000 NATURAL = $ 1,750,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS	RURAL TYPE SETTING	USE ALTERNATIVE B USE ALTERNATIVE A
DES. PT. 4 TO DES. PT. 5	NATURAL OR VEGETATED CHANNEL 30 B + 8 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 347,000 PARTIAL LINING = $ 484,000 NATURAL = $ 797,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 3 TO DES. PT. 4	NATURAL OR VEGETATED CHANNEL 20 B + 8 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 728,000 PARTIAL LINING = $ 826,000 NATURAL = $ 1,316,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 2 TO DES. PT. 3	NATURAL OR VEGETATED CHANNEL 20 B + 5 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 510,000 PARTIAL LINING = $ 456,000 NATURAL = $ 451,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 1 TO DES. PT. 2	NATURAL OR VEGETATED CHANNEL 20 B + 4 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY NOT JURISDICTIONAL WETLANDS PRESENT CONTACT WITH CORPS OF ENGR. REPRESENTATIVE MAY SURVEY	MOST LIKELY NOT JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 180,000 PARTIAL LINING = $ 242,000 NATURAL = $ 290,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 5A TO DES. PT. 5	NATURAL OR VEGETATED CHANNEL 20 B + 8 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 333,000 PARTIAL LINING = $ 416,000 NATURAL = $ 366,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. B2 TO DES. PT. 6A	NATURAL OR VEGETATED CHANNEL 20 B + 8 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 438,000 PARTIAL LINING = $ 414,000 NATURAL = $ 876,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES		USE ALTERNATIVE B
DES. PT. C2 TO DES. PT. 8A	NATURAL OR VEGETATED CHANNEL 20 B + 4 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 233,000 PARTIAL LINING = $ 476,000 NATURAL = $ 799,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES		USE A COMBINATION OF STREETS/STORM SEWER OR STREETS/ROADSIDE DITCH
DES. PT. 8A TO DES. PT. 8B	NATURAL OR VEGETATED CHANNEL 40 B + 4 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED OPEN SPACE	FULL LINING = $ 817,000 PARTIAL LINING = $ 809,000 NATURAL = $ 1,326,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	STEEP EXISTING SLOPES - DROPS LESS THAN 300 FT APART VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 8C TO DES. PT. 8D	NATURAL OR VEGETATED CHANNEL 40 B + 8 D, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 614,000 PARTIAL LINING = $ 776,000 NATURAL = $ 1,196,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS - PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES		USE A COMBINATION OF STREETS/STORM SEWER OR STREETS/ROADSIDE DITCH

NOTE: FINAL RECOMMENDATIONS ARE INCLUDED IN THE DBPS AND REFLECT MINOR CHANGES DUE TO COMMENTS AND/OR MORE DETAILED EVALUATION.

URS CONSULTANTS
MAKING TECHNOLOGY WORK

COTTONWOOD CREEK DBPS - TABLE 12

SUBBASIN TIME OF CONCENTRATION DATA

DATE 18-May-92

		OVERLAND			STREET			PIPE			CHANNEL			ADDED TIMES	USING OVERALL Tc		ACTUAL Tc PICKED	
BASIN	"C"	S(%)	L(FT)	t(MIN)	L(FT)	V(FPS)	t(MIN)	L(FT)	V(FPS)	t(MIN)	L(FT)	V(FPS)	t(MIN)	TOTAL T(MIN)	TOTAL L(MI)	TOTAL T(MIN)	USE T(MIN)	LAG (HR)
A1	0.25	5.0	750	25.0	600	3.0	3.3		7.0	0.0	3800	5.0	12.7	41.0	0.98	17.8	41.0	0.41
A2	0.25	5.0	500	22.0	600	3.0	3.3		7.0	0.0	3100	5.0	10.3	35.7	0.80	15.3	35.7	0.36
A3	0.25	5.0	500	22.0	600	3.0	3.3		7.0	0.0	3500	5.0	11.7	37.0	0.87	16.4	37.0	0.37
A4	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	3100	5.0	10.3	31.7	0.80	12.7	31.7	0.32
A5	0.25	6.0	500	20.0	600	3.0	3.3		7.0	0.0	3600	5.0	12.0	35.3	0.89	15.5	35.3	0.35
A6	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	3500	5.0	11.7	34.0	0.87	14.4	34.0	0.34
A7	0.25	5.0	500	22.0	600	3.0	3.3		7.0	0.0	3100	5.0	10.3	35.7	0.80	15.3	35.7	0.36
A8	0.25	4.0	500	24.0	600	3.0	3.3		7.0	0.0	3500	5.0	11.7	39.0	0.87	17.8	39.0	0.39
A9	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	3200	5.0	10.7	33.0	0.81	13.6	33.0	0.33
A10	0.25	6.0	500	20.0	600	3.0	3.3		7.0	0.0	4000	5.0	13.3	36.7	0.97	16.5	36.7	0.37
A11	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2300	5.0	7.7	29.0	0.64	10.8	29.0	0.29
A12	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2300	5.0	7.7	29.0	0.64	10.8	29.0	0.29
A13	0.25	4.0	500	24.0	600	3.0	3.3		7.0	0.0	2600	5.0	8.7	36.0	0.70	15.1	36.0	0.36
B1	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2800	5.0	9.3	30.7	0.74	12.0	30.7	0.31
B2	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2700	7.5	6.0	27.3	0.72	11.8	27.3	0.27
B3	0.25	5.0	300	16.0	600	3.0	3.3		7.0	0.0	2800	7.5	6.2	25.6	0.70	13.8	25.6	0.26
B4	0.25	5.0	300	16.0	600	3.0	3.3		7.0	0.0	5000	10.0	8.3	27.7	1.12	19.8	27.7	0.28
B5	0.90	5.0	100	10.0	600	3.0	3.3	750	7.0	1.8	2300	10.0	3.8	19.0	0.71	14.0	19.0	0.19
B6	0.55	4.0	100	10.0	600	3.0	3.3	1650	7.0	3.9	2000	10.0	3.3	20.6	0.82	17.1	20.6	0.21
B7	0.55	3.0	100	10.0	600	3.0	3.3	8550	7.0	20.4		10.0	0.0	33.7	1.75	34.1	34.1	0.34
B8	0.55	3.0	100	10.0	600	3.0	3.3	6000	7.0	14.3		10.0	0.0	27.6	1.27	26.6	27.6	0.28
B9	0.60	3.0	100	10.0	600	3.0	3.3	3000	7.0	7.1	7000	10.0	11.7	32.1	2.03	38.2	38.2	0.38
C1	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	3500	10.0	5.8	28.2	0.87	14.4	28.2	0.28
C2	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	2400	10.0	4.0	26.3	0.66	11.6	26.3	0.26
C3	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	4300	10.0	7.2	29.5	1.02	16.3	29.5	0.30
C4	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	5000	10.0	8.3	30.7	1.16	17.9	30.7	0.31
C5	0.25	4.0	500	24.0	600	3.0	3.3	6000	7.0	14.3	700	10.0	1.2	42.8	1.48	26.8	42.8	0.43
C6	0.50	3.0	100	10.0	600	3.0	3.3	3600	7.0	8.6	2000	10.0	3.3	25.2	1.19	25.4	25.4	0.25
C7	0.50	5.0	100	10.0	600	3.0	3.3	4500	7.0	10.7	3000	10.0	5.0	29.0	1.55	25.5	29.0	0.29

COTTONWOOD CREEK DBPS - TABLE 13
URS PROJECT NUMBER 49209
SUMMARY OF ALTERNATIVE CONSTRAINTS

AREA 5

COTTONWOOD CREEK MAIN CHANNEL
BLACK FOREST ROAD TO EAST SIDE OF THE BASIN

100-YEAR FLOW RANGES FROM LOW TO 1,500 CFS

100-YEAR VELOCITY RANGES FROM 5 TO 8 FPS

DESCRIPTION

The existing channel in this area transitions from the deeply incised channel characteristic of area 4 to numerous small tributaries in the Black Forest area. The channel varies in width from 20 to 80 feet. The capacity is available to handle the 100-year storm. This area predominantly has herbaceous wetlands where they are present with some shrub wetlands. The potential for wetlands is high with a significant amount of open water but it has been grazed and disturbed. The wildlife habitat has realtively high beta diversity along the channel but is not very significant away from the channel. The land uses planned for this area transition from urban residential densities by Black Forest Road to rural five acre lot densities in the Colorado Black Forest. The soils in this area include some sandstone and claystone outcrops with the majority being glacial deposits. The area in the forest will be difficult to maintain with heavy construction equipment since there is limited access available.

ALTERNATIVE	ADVANTAGES OF ALTERNATIVE	DISADVANTAGES OF ALTERNATIVE
ALTERNATIVE A	The right-of-way is available for this type of channel since the planned densities are low Limited permitting involved - only for bridges, grade control where needed, isolated bank protection and maintenance considerations Limited mitigation required only for any new bridges planned	Downcutting of the streambed and bank erosion may be a problem High maintenance costs may be involved due to the erodable nature of the soils and the access difficulties
ALTERNATIVE B	Minimal right-of-way requirements beyond the existing channel width Use of drop structures could actually enhance the diversity of the wetland types and wildlife habitat Able to control erosion problems that are occurring May be able to improve aesthetics with this treatment	May require some removal and replacement of existing vegetation Some onsite mitigation may be required Some disturbance of wetlands will occur during construction May have some problems with actually constructing this type of facility in the forest area
ALTERNATIVE C/D		This alternative was eliminated due the the difficulties with construction and mitigation

RECOMMENDATIONS

For this area the recommended solution is a combination of alternatives A and B. Alternative B would be used mostly in the westerly portion of the basin in order to transition from the reach downstream and alternative A would be used for the remainder of the area.

COTTONWOOD CREEK DBPS - TABLE 16 SHEET 3 OF 19

RATIONAL METHOD - SUBBASIN HYDROLOGIC DATA - PLATTED AREAS

DATE: 18-May-92

BASIN	HYDROLOGIC SOIL TYPE	PARKS	AVERAGE LAND USE TYPE AND AREA IN ACRES										OVERALL VALUES	
			COMMER OR BUSIN	INDUST	RESID 1/8 AC	RESID 1/6 AC	RESID 1/4 AC	RESID 1/3 AC	RESID 1/2 AC	RESID 1 AC	RESID 5 AC	SCHOOL /CHUR	AREA AC/SM	C
B6	B		0.0		0.0	0.0	9.9						9.9	0.58
	C												0.015	
	D													
B7	B				0.0	0.0	0.0				0.0	0.0	0.0	N/A
	C				0.0	0.0	0.0						0.000	
	D													
B8	B		0.0			0.0							0.0	N/A
	C												0.000	
	D													
B9	B												21.6	0.65
	C					0.0	21.6						0.034	
	D													
C1	B						0.0			38.1	0		38.1	0.40
	C												0.060	
	D													
C2	B									0.0	0.0		0.0	N/A
	C												0.000	
	D													
C3	B						0.0			0.0	2.0		2.0	0.20
	C												0.003	
	D													
C4	B						0.0			0.0	2.0	0.0	2.0	0.20
	C												0.003	
	D													
C5	B						0.0			0.0	37.2		37.2	0.20
	C												0.058	
	D													

COTTONWOOD CREEK DBPS - TABLE 17 SHEET 3 OF 19

RATIONAL METHOD - SUBBASIN HYDROLOGIC DATA - UNPLATTED AREAS

DATE: 18-May-92

BASIN	HYDROLOGIC SOIL TYPE	PARKS	AVERAGE LAND USE TYPE AND AREA IN ACRES										OVERALL VALUES	
			COMMER OR BUSIN	INDUST	RESID 1/8 AC	RESID 1/6 AC	RESID 1/4 AC	RESID 1/3 AC	RESID 1/2 AC	RESID 1 AC	RESID 5 AC	SCHOOL /CHUR	AREA AC/SM	C
B6	B		11.5		24.5	46.3	25.0						107.3	0.65
	C												0.168	
	D													
B7	B				13.5	104.3	21.6				6.4	6.4	190.1	0.63
	C				5.6	28.6	3.7						0.297	
	D													
B8	B		39.4			62.4							101.8	0.73
	C												0.159	
	D													
B9	B												86.4	0.71
	C					64.8	21.6						0.135	
	D													
C1	B						15.6			33.7	17.9		67.2	0.39
	C												0.105	
	D													
C2	B									12.1	86.2		98.3	0.22
	C												0.154	
	D													
C3	B						27.1			49.0	25.5		101.6	0.40
	C												0.159	
	D													
C4	B						53.2			68.8	13.2	5.9	141.1	0.46
	C												0.220	
	D													
C5	B						54.9			45.7	7.8		108.4	0.47
	C												0.169	
	D													

RECOMMENDED IMPROVEMENTS

FOR DRAINAGE REACHES IN EL PASO COUNTY OUTSIDE (UPSTREAM) OF THE DETAILED AERIAL TOPOGRAPHICAL STUDY MAPPING.

REACH	HEC-1 FLOW w/det. (CFS)	CHANNEL LENGTH (FT)	EXISTING IMPROVEMENT	TOTAL BOTTOM WIDTH (FT)	TOTAL DEPTH (FT)
9 TO DESIGN POINT 8	2,332	3,000	NATURAL	80	5.5
8 TO DESIGN POINT 7	1,718	3,500	NATURAL	80	5.0
7 TO DESIGN POINT 6	884	3,500	NATURAL	50	4.5
6 TO DESIGN POINT 5	673	3,000	NATURAL	50	4.0
5 TO DESIGN POINT 4	870	3,000	VEG. LINING	50	4.0
4 TO DESIGN POINT 3	467	3,500	VEG. LINING	30	4.5
3 TO DESIGN POINT 2	335	3,500	VEG. LINING	30	4.0
2 TO DESIGN POINT 1	114	2,300	NATURAL	20	3.0
[illegible]	577	6,800	NATURAL	30	3.5
[illegible]	255	2,400	NATURAL	48" RCP	N/A
[illegible]	592	4,800	NATURAL	[illegible]	N/A
[illegible]	[illegible]	4,000	NATURAL	50	3.5
[illegible]	594	6,300	NATURAL	30	4.0
[illegible]	973	3,000	NATURAL	80	4.0
[illegible]	390	4,500	NATURAL	60" RCP	N/A
[illegible]	882	4,000	NATURAL	50	3.5
[illegible]	179	3,000	NATURAL	[illegible]	N/A
[illegible]	417	3,000	NATURAL	30	4.0
[illegible]	138	3,900	NATURAL	30	3.0

LOCATION	HEC-1 FLOW w/det. (CFS)	BRIDGE LENGTH (FT)	EXISTING IMPROVEMENT	TOTAL BOTTOM WIDTH (FT)	TOTAL DEPTH (FT)
BRIARGATE PKWY (DP 8B)	861	180	N/A	13	9
RESEARCH PKWY (DP 6)	673	180	N/A	10	8
BRIARGATE PKWY (DP 5)	870	180	N/A	13	9
[illegible] ROAD (ABOVE DP 5)	870	40	[illegible]	13	9
[illegible] ROAD (DP 3)	335	40	CMP - 30"	[illegible] RCP	N/A
[illegible] ROAD (ABOVE DP 3)	335	40	CMP - 48"	[illegible] RCP	N/A
[illegible] ROAD (DP 2)	114	70	N/A	48" RCP	N/A
[illegible] ROAD (DP 1)	81	40	N/A	42" RCP	N/A

BASED ON THE REACHES/CULVERTS LISTED ON THIS SHEET, APPROXIMATELY 13.3 ACRES OF ENVIRONMENTALLY CLASSIFIED AREAS WILL BE DISTURBED OR DESTROYED AND REQUIRE MITIGATION.

LOCATION	HEC-1 FLOW w/det. (CFS)	EXISTING IMPROVEMENT	PROPOSED IMPROVEMENT
CITY BRIDGES			
RESEARCH PKWY (DP [illegible])	1,[illegible]	N/A	TRIPLE [illegible] CBC
COUNTY BRIDGES			
BLACK FOREST ROAD (DP 7)	834	BRIDGE, [illegible]	REPLACE FOR 5 LANE ARTERIAL, [illegible]

LEGEND:
- A1 SUB-BASIN DESIGNATION
- △ DESIGN POINT
- — — MAJOR BASIN BOUNDARY
- - - - SUB-BASIN BOUNDARY

SHEET INDEX: 2 4 6 8 10 / 3 5 7 9 11

MAPPING: LANDMARK MAPPING

ENGINEER: URS CONSULTANTS
MAKING TECHNOLOGY WORK
1040 SOUTH EIGHTH STREET
COLORADO SPRINGS, CO. 80906
(719)634-6699

PROJECT: COTTONWOOD CREEK
OVERALL BASIN MAP
SCALE 1"=1000'

LEGEND:

- RESIDENTIAL < 1/8 AC
- RESIDENTIAL = 1/8 AC
- RESIDENTIAL = 1/4 AC
- RESIDENTIAL = 1/3 AC
- RESIDENTIAL = 1/2 AC
- RESIDENTIAL = 1 AC
- RESIDENTIAL = 2 1/2 AC
- RESIDENTIAL = 5 AC
- OFFICE, COMMERCIAL
- INDUSTRIAL, GOVERNMENT
- SCHOOL & CHURCH
- PARK
- AIR FORCE ACADEMY
- PUBLIC OPEN SPACE

SHEET INDEX:

MAPPING:

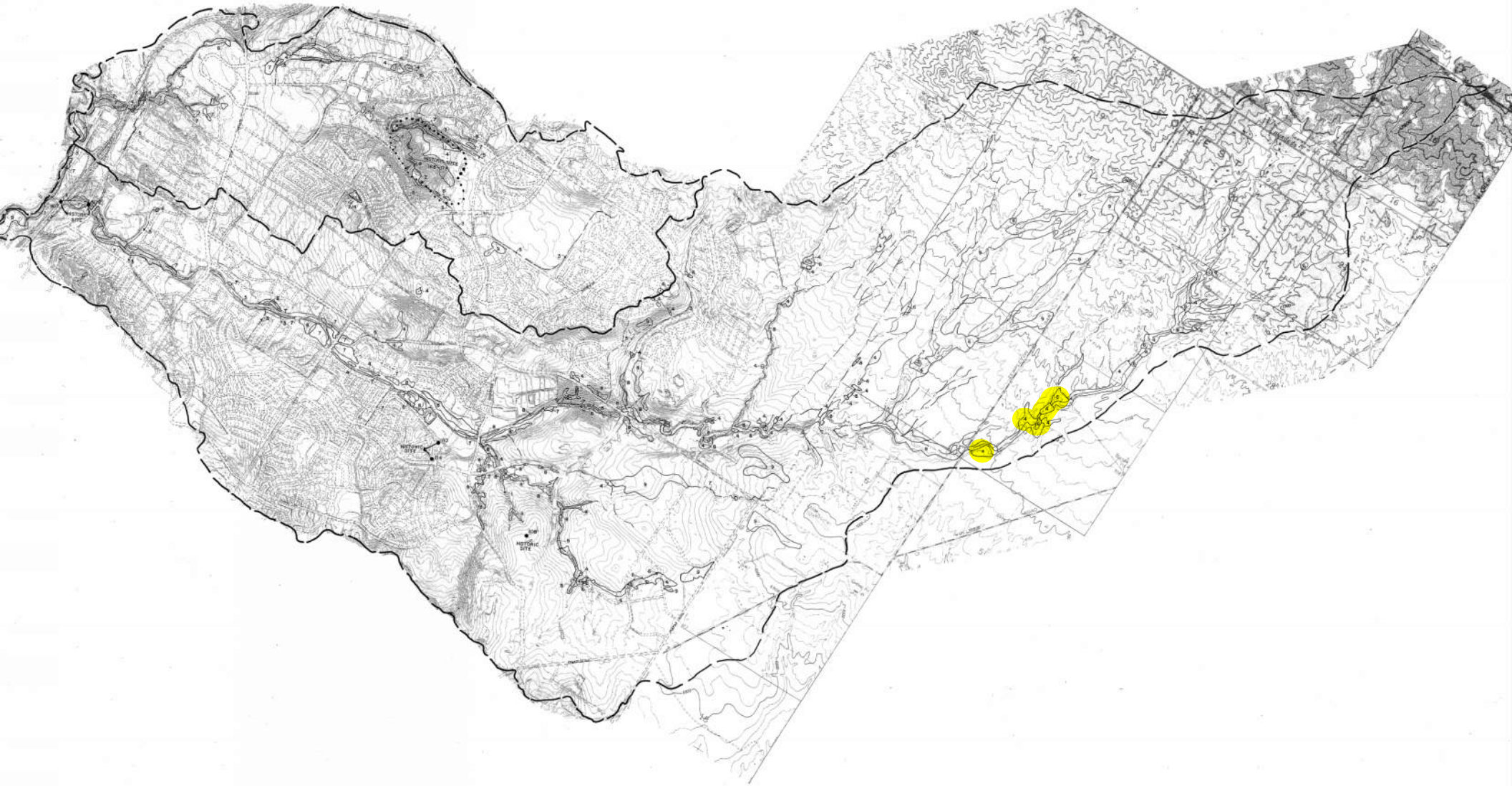
LANDMARK MAPPING

ENGINEER:

URS CONSULTANTS
MAKING TECHNOLOGY WORK
1040 SOUTH EIGHTH STREET
COLORADO SPRINGS, CO. 80905
(719)634-6699

PROJECT:

COTTONWOOD CREEK
LAND USE PLAN
SCALE 1" = 1000'



NOTE: CULTURAL/HISTORICAL INVENTORIES ARE ALSO SHOWN ON THIS FIGURE.

LEGEND:
1 AGRICULTURAL CHANNEL – drainage transecting pastures and fields
2 BACKWATER WETLAND – expanded areas of drainage above obstructions
3 ENGINEERED FLOODWAY – concrete lined channels
4 HERBACEOUS WETLAND – marshes, pondmargins and protected places along channels
5 MODIFIED CHANNEL – channelized, eroded (earth bottom)
6 OPEN WATER – ponds, reservoirs (excludes flowing channel)
7 RIPARIAN FOREST – cottonwood and conifers along channel
8 SHRUB WETLAND – willow in and along channel (no tree overstory)
9 PRAIRIE SWALE – low lying grassy and weedy depressions along drainages

NOTE: Drainageways that are not classified have been inventoried but were not considered to be significant in terms of vegetation or wildlife habitat. Examples of this are bare bank & bottom channels, channels incised in rock, or soil, or fully non-vegetated (storm sewer, etc.)

SHEET INDEX:

MAPPING: LANDMARK MAPPING

ENGINEER: URS CONSULTANTS
MAKING TECHNOLOGY WORK
1040 SOUTH EIGHTH STREET
COLORADO SPRINGS, CO. 80906
(719)634-6699

PROJECT:
COTTONWOOD CREEK DRAINAGE BASIN PLANNI
ENVIRONMENTAL INVENTORY
SCALE: 1 =1000' CONTOUR INTERVAL=2'
FIGURE 5 SHEET

COTTONWOOD CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT
JULY 2019

Prepared for:

Department of Public Works
Water Resources Engineering

City of Colorado Springs
30 S. Nevada Ave
Colorado Springs, CO 80903

Prepared by:

Matrix DESIGN GROUP
AN EMPLOYEE-OWNED COMPANY

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

SPC 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_2017active\apps\DBPS_Report\Figure_3_12_CottonwoodCreek_Hydrology_Existing_20180628.mxd, 6/29/2018, jeff_clonts

SAND CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT

JANUARY 2021

Prepared for:

COLORADO SPRINGS
OLYMPIC CITY USA

STORMWATER ENTERPRISE

Prepared by:

Stantec

HDR Dewberry

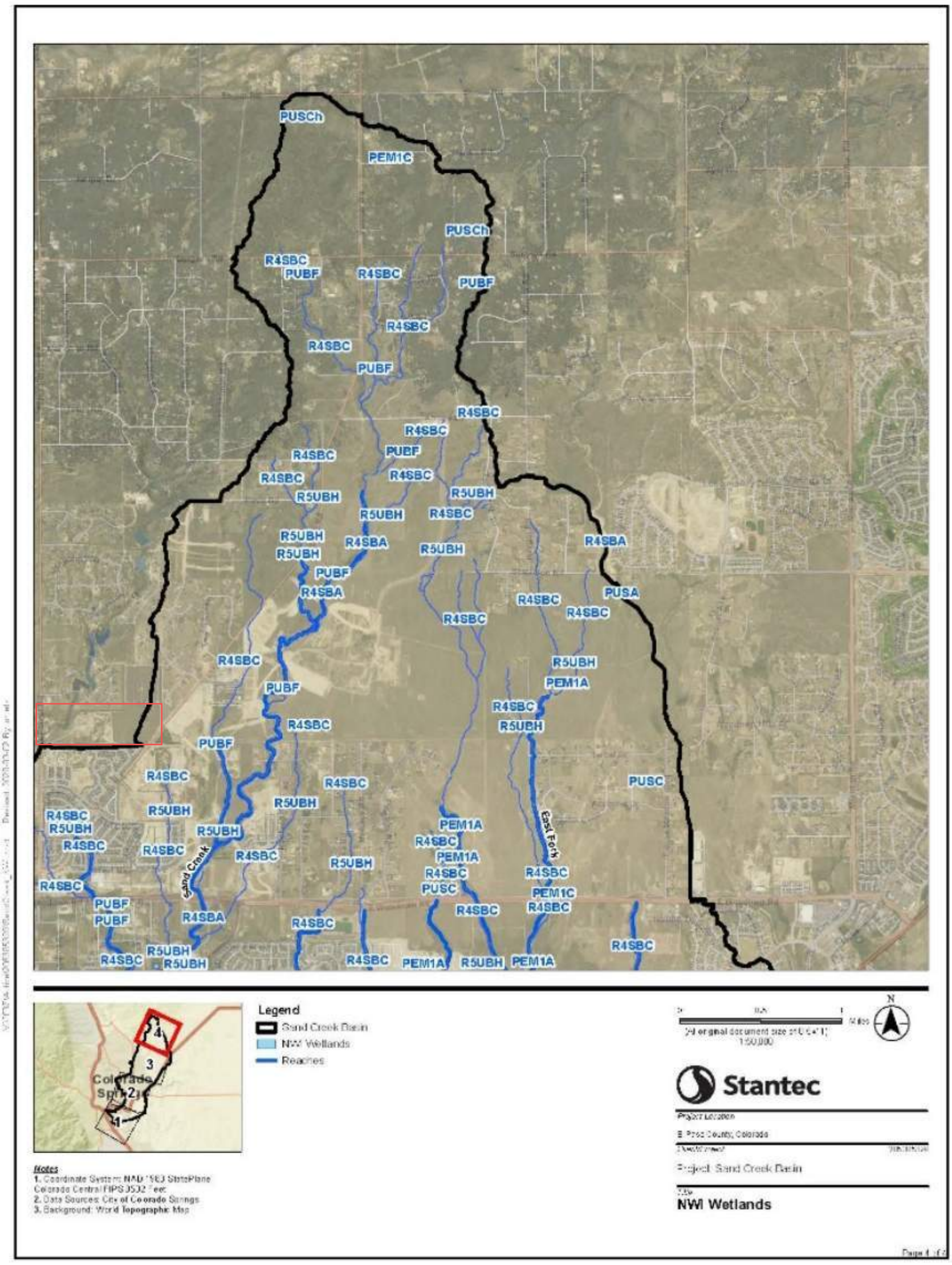


Figure 2-7: NWI Wetlands Located in Sand Creek Drainage Basin (Page 4)

MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT FOR STERLING RANCH

Prepared For:
SR Land, LLC
20 Boulder Crescent, 2nd Floor
Colorado Springs, CO 80903
(719) 491-3024

March 29th, 2023
Project No. 25188.04

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
(303)-267-6240
Contact: Mike Bramlett, PE

PURPOSE

This document is an amendment to the approved Master Development Drainage Plan (MDDP) for Sterling Ranch. The purpose of this MDDP Amendment report is to:

1. Amend the approved MDDP to account for completed and planned on-site development within Sterling Ranch, including detention from completed filings.
2. Document all differences between the analysis and conclusions reached in the MDDP and this Amendment.
3. Provide analysis and conceptual design information for the on-line Detention Pond at Sterling Ranch Road (PNDW3).
4. This amendment is not intended to address drainage and bridge fees or credits for DBPS improvements. Subsequent submittals will address this.

GENERAL LOCATION AND DESCRIPTION

Location

Sterling Ranch, known as "the site" from herein, is a parcel of land located in Section 27, 28, 33 and 34, Township 12 South, and Section 4, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. To the west the site is bound by Vollmer Road. To the north and east, the site is bounded by undeveloped land. To the south, the site is bound by the Pawnee Rancheros and Woodmen Heights developments. A vicinity map is presented in Appendix A.

Description of Property

Sterling Ranch is 1444 acres and is a Planned Unit Development to be built in multiple phases. The site is currently in various stages of development, with portions already in construction, with others unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, the site slopes from north to south and the existing drainageways follow this topography.

Per a NRCS web soil survey of the area, the site is made up of Type A and B soils. Type A soils cover roughly 65% of the site while Type B soils cover the remaining 35% of the site. Group A soils have a high infiltration rate when thoroughly wet. Type B soils have a moderate infiltration when thoroughly wet. Type D soils have a very slow infiltration rate when thoroughly wet and have a high shrink-swell potential. A NRCS soil survey map has been presented in Appendix A.

Floodplain Statement

Based on the FEMA FIRM Map numbers 08041C0533G and 08041C0535G, dated December 7, 2018, the site lies within Zone AE and Zone X of the Sand Creek floodplain. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed development within the site occurs in Zone X. The current FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUBBASINS

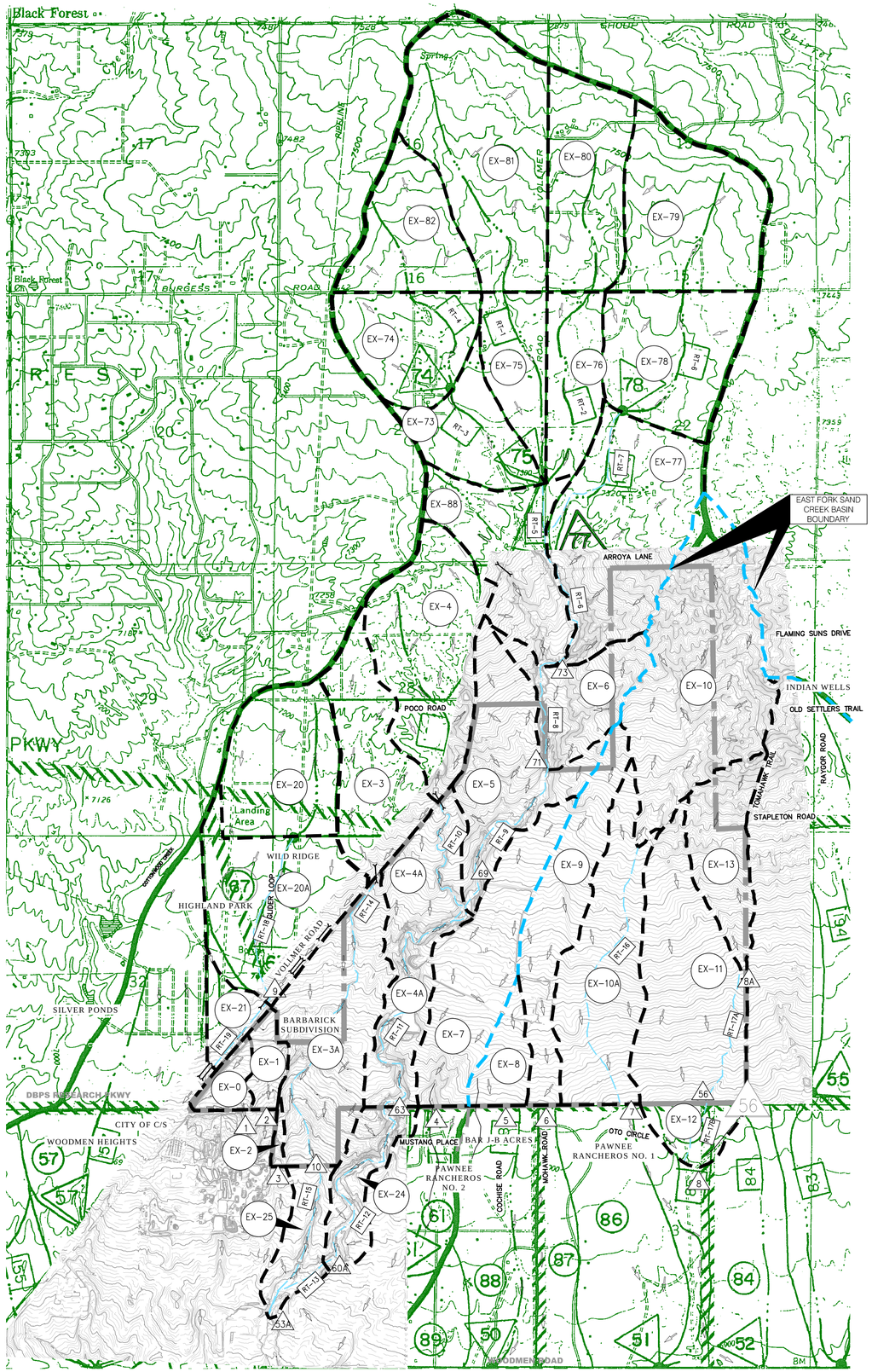
Major Basin Descriptions

The site lies within two major drainage basins: the Sand Creek Drainage Basin and the East Fork of Sand Creek Drainage Basin. Both Basins have been previously studied firstly in the 1996 Drainage Basin Planning Study (DBPS) and again in the 2018 Sterling Ranch MDDP by M&S, and finally in the 2021 DBPS by Stantec which has not been adopted by the El Paso County.

The Sand Creek Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates. Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

As part of its drainage research, JR Engineering reviewed the following drainage studies and reports:

- Sand Creek Drainage Basin Study prepared by Kiowa in 1996
- Upper Sand Creek Basin Drainage Study prepared by Wilson in 2011
- Sand Creek Drainage Basin Study prepared by Stantec in 2021
- Sterling Ranch Master Development Drainage Plan prepared by M&S in 2018
- Sterling Ranch Filing 1 Final Drainage report prepared by M&S in 2016
- Upper Sand Creek Basin Detention Evaluation Report by Wilson in 2009
- Branding Iron at Sterling Ranch Filing 1 Drainage Report prepared by M&S in 2018
- Branding Iron at Sterling Ranch Filing 2 Drainage Report prepared by M&S in 2020
- Sterling Ranch East Preliminary Drainage Report prepared by Classic Consultants in 2022



LEGEND

BASIN ID – SC3–77

DESIGN POINT – 87

REACH IDENTIFIER – RT–17A

BASIN BOUNDARY –

EAST FORK SAND CREEK BASIN BOUNDARY –

FLOW DIRECTION –

BASIN SUMMARY

BASIN	CN	AREA (ACRES)	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)
EX–0	62	23.8	0.037	5.0	8.2	13.0	19.6	25.7	32.2
EX–1	62	25.7	0.040	4.8	7.9	12.4	18.7	24.5	30.9
EX–2	62	5.5	0.009	1.1	1.8	2.8	4.3	5.6	7.1
EX–3	62	136.8	0.214	22.0	36.4	57.6	86.9	114.0	143.1
EX–3A	61	188.1	0.294	28.3	47.4	75.7	115.1	152.2	192.6
EX–4	62	192.0	0.300	30.1	49.9	79.1	119.5	157.0	197.3
EX–4A	62	151.5	0.237	24.7	40.8	64.4	97.0	127.2	160.1
EX–5	62	153.9	0.240	24.2	40.0	63.4	95.9	125.9	158.2
EX–6	62	90.2	0.141	15.3	25.5	40.1	60.7	79.9	100.5
EX–7	56	165.0	0.258	11.6	21.5	37.5	60.9	83.1	107.4
EX–8	45	42.0	0.066	0.5	1.7	4.5	9.4	14.5	20.5
EX–9	54	131.9	0.206	12.2	23.9	43.1	70.9	97.0	125.2
EX–10	60	270.7	0.423	32.7	56.0	91.1	140.1	185.9	236.1
EX–10A	41	179.3	0.280	0.6	2.2	7.3	17.4	29.1	43.1
EX–11	43	209.3	0.327	18.0	29.8	47.7	73.4	98.3	126.1
EX–12	51	39.5	0.062	2.2	5.1	10.1	17.7	25.1	33.3
EX–13	55	89.3	0.139	7.7	15.2	27.1	44.2	60.5	78.4
EX–20	62	143.4	0.224	25.4	42.1	66.7	100.7	132.3	166.2
EX–20A	64	179.7	0.281	32.2	51.9	80.5	119.8	155.9	194.6
EX–21	65	33.3	0.052	8.6	13.5	20.7	30.5	39.4	49.0
EX–24	59	63.1	0.099	9.5	16.6	27.5	42.9	57.4	73.0
EX–25	43	54.4	0.085	0.3	1.5	4.8	10.7	17.2	25.1
EX–73	63	90.0	0.141	16.4	26.4	41.3	62.1	81.3	102.0
EX–74	63	119.7	0.187	22.3	36.5	57.3	85.9	112.3	140.7
EX–75	63	79.3	0.124	13.1	21.5	33.7	50.5	66.1	82.8
EX–76	63	86.4	0.135	14.2	23.1	36.4	54.6	71.4	89.6
EX–77	62	230.6	0.360	34.7	56.9	90.6	137.5	180.9	227.7
EX–78	63	155.6	0.243	28.1	45.3	70.6	106.2	139.1	174.5
EX–79	63	189.0	0.295	34.9	57.0	89.5	134.3	175.6	220.1
EX–80	63	147.7	0.231	27.3	44.3	69.6	104.5	136.8	171.4
EX–81	62	262.9	0.411	42.6	70.2	111.0	167.4	219.6	275.7
EX–82	62	117.8	0.184	20.0	33.2	52.8	80.0	105.1	132.3
EX–88	62	139.2	0.217	22.2	36.7	58.0	87.6	115.0	144.4

DESIGN POINT SUMMARY (PEAK FLOW)

DESIGN POINT	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)	LOCATION
DP–74	0.371	39.3	65.3	104.8	158.9	209.1	262.8	
DP–75	1.413	141.2	235.1	376.6	566.6	750.9	950.5	
DP–78	0.538	59.7	98.4	154.0	232.6	306.2	385.3	
DP–73	2.528	225.9	380.7	618.0	957.0	1260.4	1582.3	
DP–71	2.669	229.3	388.9	629.7	978.8	1277.3	1637.9	STERLING RANCH NORTHERN BNDRY
DP–69	3.209	253.0	434.8	707.7	1100.0	1453.3	1870.4	
DP–63	3.446	251.4	430.7	713.1	1113.2	1496.2	1911.5	STERLING RANCH SOUTHERN BNDRY
DP–10	0.508	36.5	56.0	106.4	162.9	220.6	287.2	COLORADO SPRINGS/EL PASO BNDRY
DP–9A	0.557	55.3	94.3	150.3	227.7	299.5	380.5	VOLLMER/TAHITI DRIVE
DP–9	0.505	52.8	88.8	142.1	214.2	281.0	351.4	VOLLMER/LOCHWINNOCH LN
DP–8A	0.139	7.7	15.2	27.1	44.2	60.5	78.4	D/S STERLING RANCH EASTERN BNDRY
DP–8	0.528	24.2	45.1	77.8	124.4	169.5	220.9	D/S STERLING RANCH SOUTHERN BNDRY
DP–7	0.703	32.4	57.1	97.3	156.1	213.8	277.9	STERLING RANCH SOUTHERN BNDRY
DP–6	0.206	12.2	23.9	43.1	70.9	97.0	125.2	STERLING RANCH SOUTHERN BNDRY
DP–5	0.066	0.5	1.7	4.5	9.4	14.5	20.5	STERLING RANCH SOUTHERN BNDRY
DP–4	0.258	11.6	21.5	37.5	60.9	83.1	107.4	STERLING RANCH SOUTHERN BNDRY
DP–3	0.009	1.1	1.8	2.8	4.3	5.6	7.1	STERLING RANCH SOUTHERN BNDRY
DP–2	0.040	4.8	7.9	12.4	18.7	24.5	30.9	STERLING RANCH SOUTHERN BNDRY
DP–1	0.037	5.0	8.2	13.0	19.6	25.7	32.2	STERLING RANCH SOUTHERN BNDRY
DP–60A	3.545	247.7	430.2	707.1	1113.0	1496.6	1913.5	FUTURE MARKSHEFFEL X–ING
DP–56	0.466	23.2	42.5	71.9	115.6	157.4	202.9	STERLING RANCH SOUTHERN BNDRY
DP–53A	4.138	262.1	454.0	763.2	1196.5	1609.8	2061.5	SAND CREEK AND POND 3

DESIGN POINT SUMMARY (VOLUME)

DESIGN POINT	AREA (SQ MI)	V_2 (AC–FT)	V_5 (AC–FT)	V_{10} (AC–FT)	V_{25} (AC–FT)	V_{50} (AC–FT)	V_{100} (AC–FT)	LOCATION
DP–74	0.371	5.9	9.0	13.6	19.8	25.5	31.6	
DP–75	1.413	22.7	34.5	51.7	75.4	97.1	120.5	
DP–78	0.538	8.9	13.5	20.1	29.3	37.7	46.7	
DP–73	2.528	40.4	61.5	92.1	134.3	173.1	214.9	
DP–71	2.669	42.5	64.9	97.1	141.6	182.5	226.6	STERLING RANCH NORTHERN BNDRY
DP–69	3.209	50.7	77.4	116.1	169.4	218.6	271.4	
DP–63	3.446	54.1	82.5	123.8	180.8	233.3	289.9	STERLING RANCH SOUTHERN BNDRY
DP–10	0.508	7.6	11.7	17.6	25.8	33.4	41.6	COLORADO SPRINGS/EL PASO BNDRY
DP–9A	0.557	9.3	14.1	21.1	30.7	39.4	48.8	VOLLMER/TAHITI DRIVE
DP–9	0.505	8.4	12.7	19.0	27.6	35.5	44.0	VOLLMER/LOCHWINNOCH LN
DP–8A	0.139	1.3	2.1	3.4	5.2	7.0	8.9	D/S STERLING RANCH EASTERN BNDRY
DP–8	0.528	4.4	7.0	11.1	16.8	22.3	28.4	D/S STERLING RANCH SOUTHERN BNDRY
DP–7	0.703	6.1	10.0	15.9	24.3	32.4	41.3	STERLING RANCH SOUTHERN BNDRY
DP–6	0.206	2.4	4.0	6.3	9.6	12.7	16.0	STERLING RANCH SOUTHERN BNDRY
DP–5	0.066	0.2	0.4	0.8	1.4	1.9	2.6	STERLING RANCH SOUTHERN BNDRY
DP–4	0.258	2.6	4.2	6.7	10.2	13.5	17.2	STERLING RANCH SOUTHERN BNDRY
DP–3	0.009	0.1	0.2	0.3	0.5	0.6	0.8	STERLING RANCH SOUTHERN BNDRY
DP–2	0.040	0.6	0.9	1.4	2.1	2.7	3.4	STERLING RANCH SOUTHERN BNDRY
DP–1	0.037	0.6	0.9	1.3	1.9	2.5	3.1	STERLING RANCH SOUTHERN BNDRY
DP–60A	3.545	55.3	84.4	126.4	184.8	238.5	296.6	FUTURE MARKSHEFFEL X–ING
DP–56	0.466	4.0	6.3	9.9	14.9	19.8	25.1	SAND CREEK AND POND 3
DP–53A	4.138	63.0	96.4	144.7	211.8	273.9	340.9	SAND CREEK AND POND 3

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

DBPS DESIGN POINT	AREA (SQ MI)	Q_{10} (CFS)	Q_{100} (CFS)
DP–50	0.32	47.0	195.7
DP–51 (BASIN 86)	0.33	17.7	74.1
DP–52	1.67	80.5	456.5
DP–56	0.79	63.6	265.0

Values reported from SCDBPS
(DP 50, 51, 52 Not analyzed as a part of this study)
DBPS Reach 85(Basin91)=Q10=28.8cfs Q100=115.2cfs

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

2018 STERLING RANCH MDDP

EXISTING HYDROLOGIC CONDITIONS MAP

PROJECT NO. 09–002
FILE: \dwg\Eng Exhibits\2018–MDDP–ExistCondWSWrkMap.dwg
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VAS
SCALE
HORIZ: NTS
VERT: NTS
DATE: 08–22–18

DM1

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1–800–922–1987

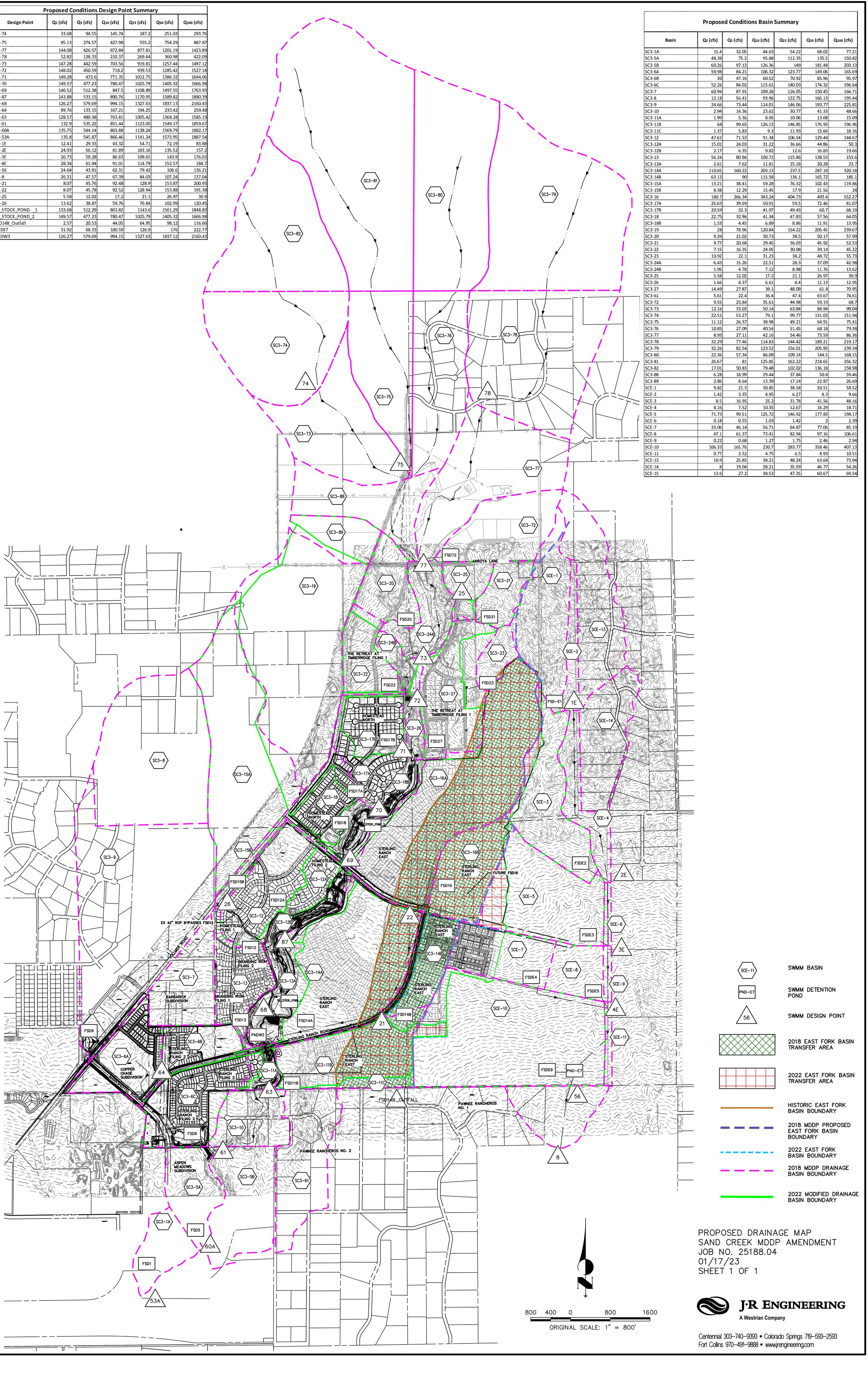
File: Q:\09002A\Sterling Ranch District\dwg\Eng Exhibits\2018 MDDP\2018–MDDP–ExistCondWSWrkMap.dwg Photostamp: 11/13/2018 1:52 PM

Proposed Conditions Design Point Summary

Design Point	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DP-74	33.68	94.55	145.74	187.2	251.03	293.76
DP-75	95.13	274.57	427.98	555.2	754.29	887.87
DP-77	144.08	426.57	672.84	877.81	1201.19	1423.89
DP-78	52.82	138.33	210.37	269.64	360.98	422.09
DP-73	147.28	442.59	703.56	919.81	1257.44	1497.12
DP-72	148.02	450.59	718.2	939.53	1285.42	1527.18
DP-71	149.28	472.6	771.35	1012.75	1386.32	1644.06
DP-70	149.57	477.23	780.47	1025.79	1405.32	1666.98
DP-69	146.52	512.38	847.5	1108.89	1497.55	1763.93
DP-87	143.88	533.15	890.76	1170.95	1589.82	1880.39
DP-68	126.27	579.69	994.15	1327.63	1837.13	2160.43
DP-64	89.76	133.15	167.21	194.25	233.42	259.48
DP-63	128.57	480.38	763.81	1005.42	1368.28	1585.19
DP-61	132.9	535.22	851.44	1123.05	1549.17	1859.67
DP-60A	135.75	544.14	863.88	1138.24	1569.79	1882.17
DP-53A	135.8	545.87	866.46	1141.24	1573.95	1887.54
DP-1E	12.41	29.33	43.32	54.71	72.19	83.88
DP-2E	24.93	56.12	81.89	103.16	135.52	157.2
DP-3E	26.73	59.28	86.63	109.01	143.9	176.03
DP-4E	28.34	61.94	91.01	114.79	152.57	184.7
DP-56	24.04	43.91	62.31	79.42	106.6	136.21
DP-8	26.31	47.57	67.39	84.03	107.24	137.04
DP-21	8.07	45.76	92.48	128.9	153.87	200.93
DP-22	8.07	45.78	92.52	128.94	153.88	191.38
DP-25	5.58	12.02	17.2	21.1	26.97	30.9
DP-26	13.62	38.87	59.76	76.84	102.99	120.45
EX_STOCK_POND__1	133.68	512.29	863.82	1143.6	1561.29	1848.83
EX_STOCK_POND_2	149.57	477.23	780.47	1025.79	1405.32	1666.98
FSD14B_Outfall	2.57	20.53	44.05	64.95	98.12	116.66
PNDE7	31.92	68.33	100.59	126.9	176	222.77
PNDW3	126.27	579.69	994.15	1327.63	1837.12	2160.43

Proposed Conditions Basin Summary

Basin	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
SC3-1A	15.4	32.05	44.63	54.22	68.02	77.21
SC3-5A	48.38	75.2	95.88	112.35	135.5	150.82
SC3-5B	60.26	97.13	126.36	149	181.48	203.13
SC3-6A	59.98	84.21	106.32	123.77	149.06	165.69
SC3-6B	30	47.16	60.52	70.92	85.96	95.97
SC3-6C	52.26	84.02	115.61	140.03	174.32	196.64
SC3-7	60.94	87.91	109.28	126.05	150.45	166.71
SC3-8	12.18	56.41	93.96	122.75	166.13	195.44
SC3-9	24.66	73.44	114.01	146.06	193.77	225.81
SC3-10	2.94	14.36	23.62	30.77	41.33	48.66
SC3-11A	1.99	5.36	8.05	10.06	13.08	15.09
SC3-11B	68	99.65	126.13	146.85	176.93	196.96
SC3-11C	1.37	5.83	9.3	11.93	15.66	18.16
SC3-12	47.61	71.53	91.34	106.54	129.44	144.67
SC3-12A	15.01	24.03	31.22	36.66	44.86	50.3
SC3-12B	2.17	6.35	9.82	12.6	16.83	19.66
SC3-13	56.24	80.96	100.72	115.86	138.53	153.6
SC3-13A	2.61	7.62	11.81	15.18	20.28	23.7
SC3-14A	110.65	160.22	203.13	237.5	287.18	320.18
SC3-14B	63.13	90	115.58	136.1	165.72	185.1
SC3-15A	13.21	38.41	59.28	76.32	102.43	119.86
SC3-15B	8.38	12.29	15.45	17.9	21.56	24
SC3-16	180.7	266.34	343.24	404.73	493.4	552.27
SC3-17A	25.63	39.59	50.91	59.5	72.46	81.07
SC3-17B	20.59	32.3	41.97	49.43	60.7	68.19
SC3-18	22.75	32.96	41.34	47.83	57.56	64.05
SC3-18B	1.53	4.45	6.89	8.86	11.91	13.95
SC3-19	28	78.96	120.84	154.22	205.45	239.67
SC3-20	9.29	21.02	30.73	38.5	50.17	57.99
SC3-21	9.77	20.68	29.45	36.03	45.92	52.53
SC3-22	7.15	16.35	24.05	30.08	39.14	45.22
SC3-23	10.92	22.1	31.23	38.2	48.72	55.73
SC3-24A	6.43	15.26	22.51	28.3	37.09	42.98
SC3-24B	1.95	4.78	7.12	8.98	11.76	13.62
SC3-25	5.58	12.02	17.2	21.1	26.97	30.9
SC3-26	1.66	4.37	6.61	8.4	11.13	12.95
SC3-27	14.49	27.87	39.1	48.09	61.8	70.95
SC3-61	5.61	22.4	36.4	47.4	63.67	74.61
SC3-72	9.55	23.84	35.61	44.98	59.19	68.7
SC3-73	12.16	33.03	50.14	63.84	84.94	99.04
SC3-74	22.51	53.27	79.1	99.77	131.03	151.94
SC3-75	11.12	26.37	38.98	49.21	64.91	75.41
SC3-76	10.85	27.09	40.54	51.45	68.18	79.38
SC3-77	8.93	27.11	42.16	54.46	73.59	86.36
SC3-78	32.29	77.46	114.83	144.42	189.21	219.17
SC3-79	32.26	82.54	123.52	156.01	205.95	239.34
SC3-80	22.36	57.34	86.09	109.14	144.5	168.15
SC3-81	26.67	81	125.85	162.22	218.65	256.32
SC3-82	17.01	50.83	79.48	102.02	136.18	158.98
SC3-88	6.28	18.99	29.44	37.84	50.8	59.46
SC3-89	2.86	8.64	13.39	17.14	22.87	26.69
SCE-1	9.82	21.3	30.85	38.58	50.51	58.52
SCE-2	1.42	3.35	4.95	6.27	8.3	9.66
SCE-3	8.5	16.95	25.2	31.78	41.56	48.16
SCE-4	4.16	7.52	10.35	12.67	16.29	18.71
SCE-5	71.73	99.51	125.72	146.92	177.83	198.17
SCE-6	0.18	0.55	1.03	1.42	2	2.39
SCE-7	33.06	46.14	56.71	64.87	77.06	85.19
SCE-8	47.1	61.37	73.41	82.94	97.16	106.61
SCE-9	0.22	0.68	1.27	1.75	2.46	2.94
SCE-10	106.33	165.76	230.7	283.77	358.46	407.13
SCE-11	0.77	2.52	4.75	6.5	8.93	10.51
SCE-13	10.9	25.85	38.21	48.24	63.64	73.94
SCE-14	8	19.04	28.21	35.59	46.77	54.26
SCE-15	13.6	27.2	38.53	47.35	60.67	69.54



PROPOSED DRAINAGE MAP
SAND CREEK MDDP AMENDMENT
JOB NO. 25188.04
01/17/23
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

Unresolved: We need to know how much of the proposed area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 (only if using the WQCV Design Base Standard) and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful (example provided):

APPENDIX F – DRAINAGE MAPS

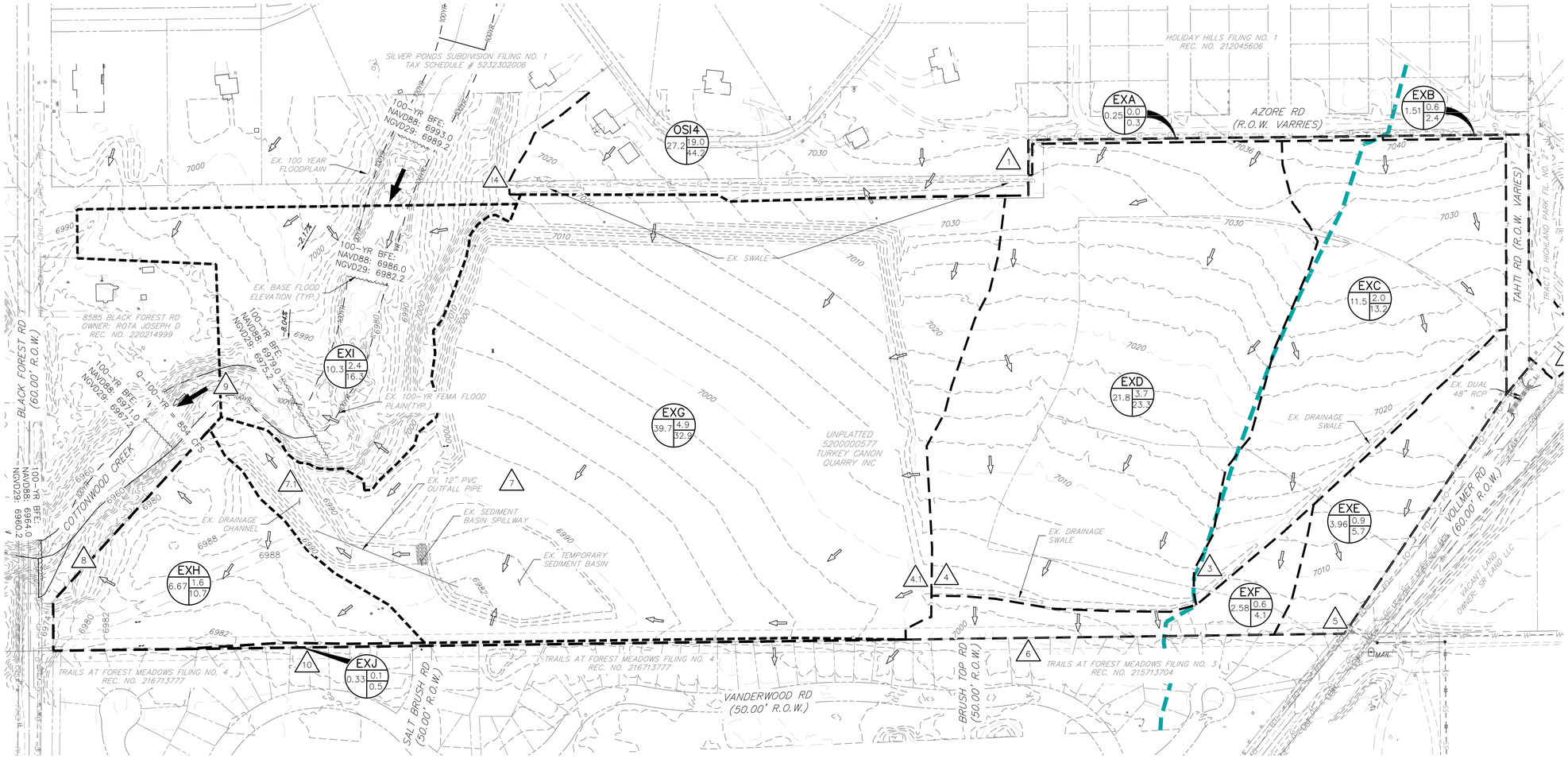
Water Quality Treatment Summary Table

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
A	4.50	4.50	4.50				
B	1.25	1.25		1.25			
C	6.00	4.00				4.00	ECM App I.7.1.B.5
D	2.50	2.50	1.00		0.50	1.00	ECM App I.7.1.B.7
E	3.00		3.00				
F	8.25						
Total	25.50	12.25	8.50	1.25	0.50	5.00	
Comments		*[For each row, the sum of the values in Columns 4-7 must be greater than or equal to the value in Column 3 above.]*	*[Values in this column can be more than Column 3 if over-treating non-disturbed areas of the same land-use.]*	*[See RR calc spreadsheet.]*	*[Total must be <20% of site and <1ac.]*		

Total Proposed Disturbed Area (ac)	Total Proposed Treated Area (ac)	Total Proposed Disturbed Area Excluded from WQ (ac)	Minimum Area to be Treated (ac)
12.25	9.75	5.50	6.75

SCHMIDT PARCEL

EXISTING CONDITIONS DRAINAGE MAP



BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA	0.25	2%	0.09	0.36	51.8	0.0	0.3
EXB	1.51	16%	0.18	0.42	34.8	0.6	2.4
EXC	11.55	2%	0.09	0.36	44.5	2.0	13.2
EXD	21.78	3%	0.10	0.36	48.7	3.7	23.3
EXE	3.96	2%	0.09	0.36	31.9	0.9	5.7
EXF	2.58	2%	0.09	0.36	27.1	0.6	4.1
EXG	39.67	2%	0.09	0.36	62.7	4.9	32.9
EXH	6.67	2%	0.09	0.36	26.6	1.6	10.7
EXI	10.29	2%	0.09	0.36	27.3	2.4	16.3
EXJ	0.33	2%	0.09	0.36	25.7	0.1	0.5
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

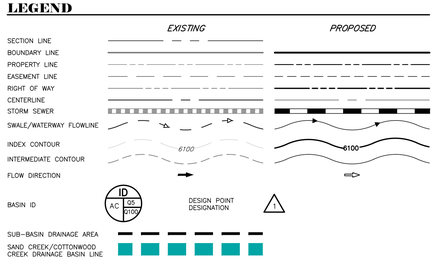
Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

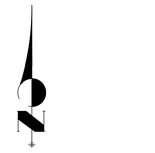
DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.0	0.3
2	0.6	2.4
3	2.0	13.2
4	3.7	23.3
4.1	5.5	35.6
5	0.9	5.7
6	0.6	4.1
7	4.9	32.9
7.1	9.2	60.8
8	1.6	10.7
9	2.4	16.3
10	0.1	0.5
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

LEGEND





150 75 0 150 300

ORIGINAL SCALE: 1" = 150'

SCHGMIDT PARCEL

EXISTING CONDITIONS DRAINAGE MAP

JOB NO. 24013 | SHEET 1

LOCATION: EPC

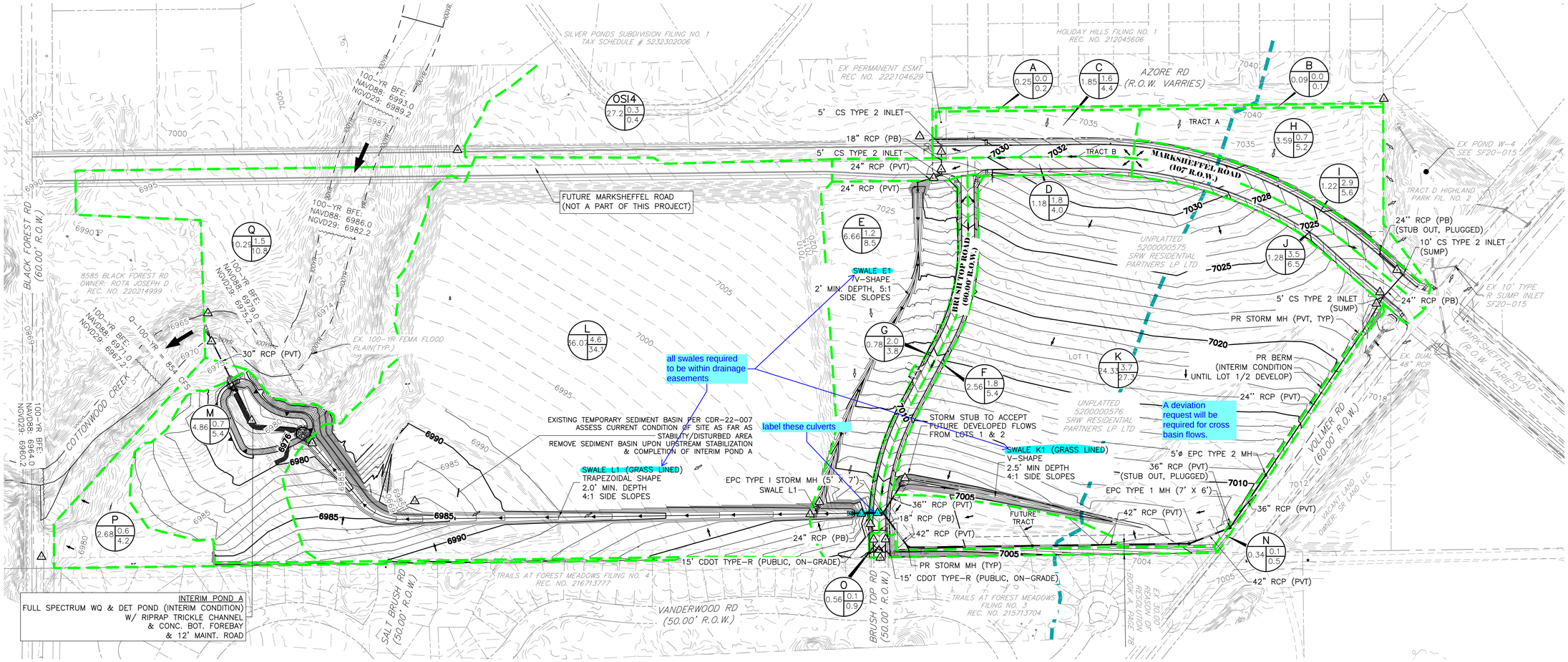
2026-04-23

ALL TERRAIN ENGINEERING

PCD FILE NO: CDR-2413

SCHMIDT PARCEL

PROPOSED CONDITIONS DRAINAGE MAP



INTERIM POND A
FULL SPECTRUM WQ & DET POND (INTERIM CONDITION)
W/ RIPRAP TRICKLE CHANNEL
& CONC. BOT. FOREBAY
& 12' MAINT. ROAD

LEGEND

	EXISTING	PROPOSED
SECTION LINE		
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
CENTERLINE		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
FLOW DIRECTION		

BASIN ID — ID | AC | 95 prop

DESIGN POINT DESIGNATION — 1

SUB-BASIN DRAINAGE AREA

SAND CREEK/COTTONWOOD CREEK DRAINAGE BASIN LINE

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	0.25	0%	0.08	0.35	53.0	0.0	0.2
B	0.09	0%	0.08	0.35	36.1	0.0	0.1
C	1.85	31%	0.34	0.54	26.9	1.6	4.4
D	1.18	54%	0.52	0.68	21.5	1.8	4.0
E	6.66	0%	0.08	0.35	36.8	1.2	8.5
F	2.56	25%	0.29	0.50	29.5	1.8	5.4
G	0.78	85%	0.78	0.87	16.9	2.0	3.8
H	3.59	0%	0.08	0.35	30.7	0.7	5.2
I	1.22	80%	0.73	0.84	17.5	2.9	5.6
J	1.28	87%	0.79	0.88	16.0	3.5	6.5
K	24.33	0%	0.08	0.35	43.9	3.7	27.3
L	36.07	0%	0.08	0.35	53.6	4.6	34.1
M	4.86	0%	0.08	0.35	44.3	0.7	5.4
N	0.34	0%	0.08	0.35	26.1	0.1	0.5
O	0.56	0%	0.08	0.35	26.7	0.1	0.9
P	2.68	0%	0.08	0.35	26.1	0.6	4.2
Q	10.29	0%	0.08	0.35	47.7	1.5	10.8
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.0	0.2
2	0.0	0.1
3	1.6	4.4
4	1.8	4.0
4.1	3.2	7.9
5	3.9	15.1
5.1	13.4	55.8
6	1.8	5.4
7	2.0	3.8
7.1	3.4	8.3
9	2.9	9.3
10	3.5	6.5
10.1	5.3	13.9
11	3.7	27.3
11.1	7.9	38.0
11.2	10.4	44.3
13	4.6	34.1
13.1	16.3	82.8
14	17.0	87.4
15	0.1	0.5
16	0.1	0.9
17	0.6	4.2
18	1.5	10.8
I4	19.0	44.2

include 14.1

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

N

150 75 0 150 300

ORIGINAL SCALE: 1" = 150'

SCHMIDT PARCEL

PROPOSED CONDITIONS DRAINAGE MAP

JOB NO. 24013
LOCATION: EPC
2026-04-23

SHEET 1

ALL TERRAIN ENGINEERING