Falcon Highlands South Filing No. 1

Final Drainage Report

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Atwell Project Number
24004308

PCD File Number
SF2418

Submitted by: Atwell, LLC

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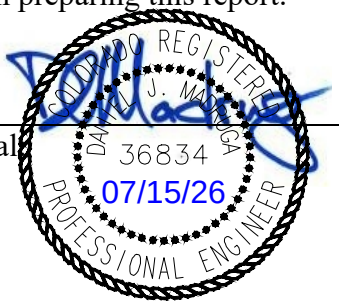
March 21, 2026

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the 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.

Daniel Madruga, PE 36834 Date Seal



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: Challenger Homes

By:

Title:

Address:

El Paso County Approval:

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

Date

Joshua Palmer, PE
County Engineer/ECM Administrator
Conditions:

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INTRODUCTION

This Final Drainage Report (FDR) has been completed for Challenger Homes in order to present an effective storm water management plan for the Falcon Highlands South Filing 1 development, hereinafter referred to as the Site. This report is intended to guide the development of the Site and recommend general drainage concepts that can be implemented as development progresses. Included within this report is a proposed drainage plan for the Site along with reference information for drainage basins and storm water conveyance facilities.

The Site was most recently studied in the Preliminary Drainage Report (PDR) level in the *Falcon Highlands South PUDSP Preliminary Drainage Report* by Atwell, LLC, approved May 17, 2024.

The Site for Falcon Highlands South Filing 1 is approximately 20.88 acres and will include a total of approximately 24 single-family residential units.

Proposed herein is a network of storm infrastructure, permanent water quality and detention facilities, and swales that will meet relevant drainage criteria.

GENERAL LOCATION AND DESCRIPTION

The Site is located within Section 12, Township 13 South, Range 65 West of the Sixth Principal Meridian, County of El Paso, State of Colorado. The Site is bounded by Antelope Meadows to the south, Bridal Vail Way to the west. Falcon Highlands Filing No. 2 is located to the north of the Site.

The overall area consists of approximately 20.87 acres that is proposed to be developed into 24 single-family residential units, roadways, and open space. In addition to the Site development, two off-site water quality and detention will be constructed to detain runoff from the Site and other areas of the overall Falcon Highlands development.

The Site is within the Sand Creek Drainage Basin.

A vicinity map showing the location of the Site is included in appendix A.

The Site is within the Falcon Highlands MDDP by Atwell, LLC, dated March 2022.

SOILS AND EXISTING CONDITIONS

Much of the Site is currently undeveloped. Of the development within the Site, there are existing dirt roadways and sanitary sewer infrastructure installed per the Construction Drawings for Falcon Highlands Filing No. 2 prepared by Terra Nova Engineering, most recent revised date of September 7, 2010. The ALTA survey conducted by Atwell, LLC., shows the existing conditions of Falcon Highlands and adjacent development of Filing No. 2. The Site is comprised of existing natural grass vegetation typical of the eastern plains with sparse vegetative cover at its outer limits to the south and southeast. There is an existing detention pond south of the Site, from Falcon Highlands Filing No.2 and the future development of Falcon Highlands Filing No. 3. The on-Site slopes range from 0 percent to 10 percent and generally sheet flows from west to east. An Existing Conditions Drainage Map is included in Appendix G showing the delineated drainage basins.

The Site is comprised of Blakeland-Fluvaquentic Haplaquolls soil, a loamy sand, and hydraulic soils group A. The Natural Resources Conservation Service of the United State Department of Agriculture Web Soil Survey has been included in Appendix B for reference.

Based on a Geotechnical Report done by Rocky Mountain Group, dated October 8, 2021, three bore holes were drilled within the Site, TB-1, TB-2, TB-3. From these bore holes it was noted that ground water was hit at 16.0', 14.6', and 11.4' respectively. In a more recent piezometer reading ground water was found as shallow as 4.5' in the nearest reading to proposed pond 2, Atwell sees no reason for concern as there is an existing pond in the same location as the proposed pond and there seem to be no adverse effects. A copy of these two reports can be found in Appendix F.

DRAINAGE DESIGN CRITERIA

The El Paso County Drainage Manual (EPC DCM) and El Paso County Engineering Criteria Manual (EPC ECM) were used in conjunction with the Colorado Springs Drainage Criteria Manual (DCM) Mile High Flood District (MHFD) Criteria Manual. The rational method was used for a drainage basin less than 100-acres. The 5-year design frequency was used for the minor storm and a 100-year design frequency was used for the major storm in calculation on-Site storm hydraulics. The City of Colorado Springs IDF Curve has used for calculating the rainfall intensity of 1.50 inches for the 5-year and 2.52 inches for the 100-year.

EXISTING ONSITE AND OFFSITE DRAINAGE BASINS

Off-Site drainage basin runoff data and calculations have been updated per current codes and standards. The developments of Falcon Highlands Filings No. 1 and 2 remain consistent with the Master Drainage Development Plan, MDDP (EDARP project number SF05033) and therefore off-site basin descriptions are delineations provided are based on previous County approved reports.

The Site has been broken down into several major existing drainage basins. An Existing Conditions Drainage Map is in Appendix G.

Off-Site Basins (Existing):

Falcon Highlands Filing No. 2:

OS-1 (6.38 ac, Q_5 = 5.58 cfs, Q_{100} = 16.11 cfs) is an off-Site sub-basin within the developed area of Filing No. 1 for quarter-acre lots and is an off-Site basin that was included in the MDDP for Filing No. 2. The basin's runoff sheet flows due south in Filing No. 2 and is captured by the roadways and storm system in Filing No. 2 that runs through Falcon Highlands South, and ultimately outfalls into the existing Pond 1.

OS-2 (3.12 ac, Q_5 = 2.29 cfs, Q_{100} = 6.06 cfs) is an off-Site sub-basin within the developed area of Filing No. 1 for quarter-acre lots and is an off-Site basin that was included in the MDDP for Filing No. 2. The basin's runoff sheet flows due south in Filing No. 2 and is captured by the roadways and storm system in Filing No. 2 that runs through Falcon Highlands South, and ultimately outfalls into the existing Pond 1.

OS-3 (1.14 ac, Q_5 = 4.06 cfs, Q_{100} = 7.04 cfs) is an off-Site basin within Filing No. 1 that includes the developed right-of-way of Rolling Thunder Way. This sub-basin was included in the previous MDDP as an off-Site basin and represents a portion of the landscaped right-of-way on the south side of Rolling Thunder Way that sheet flows due south into the developed areas of Filing No. 2 and ultimately into the public storm system shared with Falcon Highlands South, out falling to existing Detention Pond 2.

OS-4 (13.09 ac, Q_5 = 4.44 cfs, Q_{100} = 15.98 cfs) is an off-Site basin located on the southwestern part of Falcon Highlands Filing No. 2 and consists of mostly Tract A and portions of PUD residential zoned lots rear yard areas. The historic drainage pattern sheet flows south where it is runs offsite into Sand Creek and per existing drainage patterns is not tributary to on-Site detention ponds and drains directly off Site via overland sheet flow.

OS-5 (59.62 ac, Q_5 = 51.26 cfs, Q_{100} = 135.79 cfs) is an off-Site basin that stretches from the eastern border of basin OS-4 to the eastern edge of Bridal Vail Way within Filing No. 2. The basin is zoned as PUD residential lots of about quarter-acre size. Runoff is carried in the public rights-of-way where the flow travels south through a series of public curb and gutters, sump inlets and storm infrastructure within Filing No. 2. The flow outfalls into the existing Pond 1 through the public

60” RCP storm pipe that runs through Falcon Highlands South. No surface flow from this basin enters the Site.

OS-6 (35.75 ac, Q_5 = 14.22 cfs, Q_{100} = 49.60 cfs) is off-Site basin located between Bridal Vail Way and Antelope Meadows Circle within Filing 2. This basin includes PUD residential zoned lots of half-acre size and contains drainage tracts. The basin is captured by a series of public curb and gutter systems in the rights-of-way where public storm infrastructure conveys storm water to the end of the cul-de-sac of Wagon Track Drive where the public storm system of Filing No. 2 connects and daylights to Falcon Highlands South within future Antelope Meadows Circle right-of-way. Flows continue through Falcon Highlands South via an existing diversion ditch to Pond 2.

OS-7 (6.47 ac, Q_5 = 2.29 cfs, Q_{100} = 7.97 cfs) is the off-Site basin located within Filing 2. The basin includes PUD residential zoned lots of half-acre size with right of way. The basin runoff is captured in the public right-of-way curb and gutter where it travels south and is released at the road end, where it continues south through Antelope Meadows Circle and then due east through OS-13 where it outfalls to Pond WU.

OS-8 (3.74 ac, Q_5 = 0.15 cfs, Q_{100} = 2.03 cfs) is the basin located southwest of Antelope Meadow Circle, just below basin OS-4, and west of basin OS-11. The storm water runoff from this basin sheet flows south and off-Site at with the combined flow of OS-4, and per existing drainage patterns is not tributary to on-Site detention ponds.

OS-9 (3.14 ac, Q_5 = .20 cfs, Q_{100} = 2.62 cfs) is the undeveloped, natural landscaped area between Tamlin Road and the existing Pond 1. Runoff from basin OS-9 is directed by a ditch section to a low point between the future Dublin Road and Highway 24. This drainage concept and its associated storm infrastructure is presented in the previous master plan and is to remain as the intended plan. The 2005 PDR suggested that an inline grate inlet be installed but there is no evidence that this was installed. The existing drainage pattern consists of pooling within the local low point of the ditch that surcharges and is directed south through the grassland swale.

OS-10 (3.67 ac, Q_5 = 0.18 cfs, Q_{100} = 2.42 cfs) is the undeveloped area between Tamlin Road and the existing Detention Pond 2. The runoff from Basin OS-10 is directed to the low point in the downstream grasslined swale between the Site and Tamlin Road. This drainage concept and its associated storm infrastructure is presented in the previous master plan and is to remain as the intended plan. The 2005 PDR suggested that a 4’x4’ area inlet be constructed but there is no evidence that this was installed. The existing drainage pattern consists of pooling within the local low point of the ditch that surcharges and is directed south through the grassland swale.

OS-11 (35.55 ac, Q_5 = 1.32 cfs, Q_{100} = 17.58 cfs) is located south of Antelope Meadow Circle, adjacent to basin OS-12. The Site is covered in native grasses with limited grading work from a previous development. Runoff from the Site sheet flows southwesterly overland to existing Pond 1.

OS-12 (39.29 ac, Q_5 = 1.57 cfs, Q_{100} = 20.90 cfs) is located adjacent to Basin OS-11 and covered in native grasses and weeds. The Site has limited grading due to work from a previous

development that did not finish. Runoff from the basin sheet flows southwesterly overland to an existing diversion ditch that runs into Existing Pond 2.

OS-13 (10.54 ac, Q_5 =0.44 cfs, Q_{100} = 5.86 cfs) is located to the northeast of the Filing and consists of undeveloped area with native grasses. The basin's runoff drains directly to existing Pond WU.

OS-14 (8.84 ac, Q_5 = 0.39 cfs, Q_{100} = 5.14 cfs) is the area east of Basin OS-12 that is not to be disturbed and remain as open, natural landscape. The Basin consists of existing regional pond WU.

On-Site Basins (Existing):

This Site has been broken down into three major existing drainage basins. An existing drainage map can be found in Appendix G.

EX-1 (3.38 ac, Q_5= 0.12 cfs, Q_{100}= 1.60 cfs) is located in the west portion of the Site, and consists of undeveloped land. Stormwater flows south and west into the existing Bridal Vail Way then continues south via curb and gutter to a cross pan at the intersection of Bridal Vail Way and Antelope Meadows Circle and flows west to an existing inlet (Design point 1), flow from this inlet is then conveyed west and then south through existing storm infrastructure where it is then released into the existing detention pond 1 built with Falcon Highlands Filing No. 2 & No. 3 File No. SF05033 .

EX-2 (9.38 ac, Q_5= 0.36 cfs, Q_{100}= 4.85 cfs) is located in the northern part of the Site, and consists of undeveloped land. Stormwater flows southwest to a natural swale and continues off-Site and into an existing detention pond 2, built with Falcon Highlands Filing No. 2 & No. 3 File No. SF05033.

EX-3 (9.14 ac, Q_5= 0.42 cfs, Q_{100}= 5.53 cfs) is located in the south portion of the Site and consists of undeveloped land. Stormwater flows south to a low point in the basin then continues south to existing detention pond 2, built with Falcon Highlands Filing No. 2 & No. 3 File No. SF05033.

PROPOSED DRAINAGE BASINS

Preliminary grading design on the Site has been completed to include right-of-way design and assignment of lot type A, B, and Transition (T). The assigned lots drain per a typical lot template, into roadways where on-grade sump inlets are located to capture and convey stormwater through public storm system and outfall to a permanent water quality and detention facility.

The overreaching premise of the drainage design is to route overland flow from residential lots to adjacent right-of-ways where public storm infrastructure will be installed and ultimately convey the stormwater to the downstream permanent water quality and detention facility to provide water quality treatment as well as flow attenuation and detention. Previous drainage reports designed ponds 1 and 2 in order to provide detention for existing Filings 2 and 3. The analysis in this report provides a detailed and defined design of these ponds to account for drainage requirement changes as well as a design to account for full spectrum detention. This report will redesign these existing ponds to meet current standards and provide full-spectrum detention.

There is a proposed grass-lined swale to capture flows in the open space behind the northern lots, The design of this swale is included in the report in Appendix E, to accurately access the width and depth of the drainage way for the minor and major storm events.

HLG calculations for both the 5-year and 100-year storms are provided in Appendix E.

On-Site Basins (Proposed):

A-1 (4.49 ac, Q_5= 0.12 cfs, Q_{100}= 1.64 cfs) is located in the north portion of the Site along the back of the existing lots and the proposed lots, and consists of open space. Stormwater flows to a proposed swale in the open space and flows to and existing outlet (Design point A1). The existing Design point discharges to a natural swale that flows southwest to proposed pond 2.

A-2 (4.83 ac, Q_5= 2.89 cfs, Q_{100}= 8.24 cfs) is located in the north portion of the Site south of Basin A-1 and consists of large lots (greater than 19,000 sf) public right-of-way, curb and gutter, and attached sidewalk. Stormwater sheet flows from the lots toward the public right-of-way, and is conveyed south via curb and gutter to an on-grade design point in Sahalee Trail where it is partially captured by a proposed 10’ Type R inlet (Design point A2) and enters the proposed public storm infrastructure and is released into Proposed Pond 2 (Design point P2). Bypass flow from the inlet will continue to flow south and will be picked up by design point A5 and will be released into proposed pond 2.

A-3 (2.46 ac, Q_5= 1.48 cfs, Q_{100}= 4.22 cfs) is located on the west side on the Site south of Basin A-2 and consists of large lots (greater than 19,000 sf) public right-of-way, curb and gutter, and attached sidewalk. Stormwater sheet flows from the lots toward the public right-of-way, and is conveyed south via curb and gutter to an on-grade design point in Sahalee Trail where it is then captured by a proposed 10’ Type R inlet (Design point A3) and enters the proposed public storm infrastructure and is released into a Proposed Pond 2 (Design point P2). Bypass flow from the

inlet will continue to flow south and will be picked up by design point A4 and will be released into proposed pond 2.

A-4 (1.98 ac, Q_5= 1.54 cfs, Q_{100}= 4.38 cfs) is located on the southwest side on the Site south of Basin A-3 and consists of large lots (greater than 19,000 sf) public right-of-way, curb and gutter, and attached sidewalk. Stormwater sheet flows from the lots toward the public right-of-way, and is conveyed east via curb and gutter to a local low point in Sahalee Trail where it is then captured by a proposed 10' Type R sump inlet (Design point A4) and enters the proposed public storm infrastructure and is released into proposed pond 2.

A-5 (3.52 ac, Q_5= 2.35 cfs, Q_{100}= 6.7 cfs) is located on the southeast side on the Site south of Basin A-2 and consists of large lots (greater than 19,000 sf) public right-of-way, curb and gutter, and attached sidewalk. Stormwater sheet flows from the lots toward the public right-of-way, and is conveyed west via curb and gutter to a local low point in Sahalee Trail where it is then captured by a proposed 10' Type R sump inlet (Design point A-5) and enters the proposed public storm infrastructure and is released into proposed pond 2.

A-6 (1.63 ac, Q_5= 1.61 cfs, Q_{100}= 4.59 cfs) is located on the western boundary of the Site and consists of large lots (greater than 19,000 sf) public right-of-way, curb and gutter, and attached sidewalk. Stormwater sheet flows west toward the public right-of-way, and is conveyed south via existing curb and gutter in Bridal Vail Way, it then flows west via an existing crosspan to a local low point in the existing Antelope Meadows where it is captured by an existing 20' inlet at the northwest corner of the intersection of the existing Bridal Vail Way and the existing Antelope Meadows Circle (Design point 1), where it will enter existing storm infrastructure and be released into the proposed pond 1. An analysis has been done on the existing 20' inlet and it is able to accommodate the 100 year flow. Analysis is included in appendix E.

Major Basin B (40.12 ac, Q_5= 18.65 cfs, Q_{100}= 53.18 cfs) is located south-west of the proposed Site. In current undeveloped conditions, the basin will follow existing flow patterns, sheet flowing to south into proposed pond 1. In the future it is modeled as a future Falcon Highlands development and will consist of lots, public right-of-way, curb and gutter, and attached sidewalk. Future Stormwater will be conveyed via storm infrastructure into proposed pond 1.

Major Basin C (41.08 ac, Q_5= 25.69 cfs, Q_{100}= 73.24 cfs) is located south of the proposed Site, the basin will follow existing flow patterns, sheet flowing to an existing drainage swale and south into proposed pond 2. It is modeled as a future Falcon Highlands development and will consist of lots, public right-of-way, curb and gutter, and attached sidewalk. Stormwater will be conveyed via storm infrastructure into proposed pond 2. In the interim condition a berm will cause Basin C to be split into 2 interim basins. To address this, a temporary swale/diversion ditch is being added along the western/southwestern edge of the berm to collect this temporary runoff and divert a temporary storm pipe and discharge into proposed pond 2. The temporary berm will isolate an estimated drainage area of approximately 13.5 acres. The associated diversion ditch has been hydraulically designed to convey a peak flow rate of 7.55 cfs generated from this delineated catchment. The analysis is included in appendix E.

Major Basin D (8.26 ac, Q_5= 12.79 cfs, Q_{100}= 26.67 cfs) is located east of the proposed Site. It is modeled as a future Falcon Highlands development and will consist of lots, public right-of-way, curb and gutter, and attached sidewalk. Stormwater will be conveyed via storm infrastructure into proposed pond 2.

Major Basin E (1.41 ac, Q_5= 0.08 cfs, Q_{100}= 1.03 cfs) is located south of pond 1. It is undisturbed area and is planned to remain undisturbed. Stormwater sheets flows off the basin south into Sand Creek.

Major Basin F (5.91 ac, Q_5= 0.26 cfs, Q_{100}= 1.41 cfs) is located east of pond 1 and west of pond 2. It is undisturbed area and is planned to remain undisturbed. Stormwater sheets flows off the basin south into Sand Creek.

Major Basin G (8.38 ac, Q_5= 0.37 cfs, Q_{100}= 4.93 cfs) is located north east of pond 2. It is undisturbed area and is planned to remain undisturbed. Stormwater sheets flows off the basin south into Sand Creek.

Basins B-G were also modeled as undeveloped land using an imperviousness of 5% to design the outlet structure of both pond 1 and 2.

STORMWATER CONVEYANCE AND STORAGE FACILITIES

The proposed on-Site conveyance facilities will consist of a combination of storm pipe, swales/channels, curb and gutter, and inlets, and has been designed using runoff data from the calculations shown in Appendix D. Proposed drainage patterns will generally follow historic drainage patterns outlined in the previous section of this report. At sump conditions, inlets will be sized to collect 100-year flows. Runoff entering the inlets will be conveyed within the public storm sewer system to proposed pond 2.

The Site will send storm water runoff to both proposed ponds 1 and 2. These proposed ponds have been redesigned to meet current standards and provide full spectrum detention.

The outlet structures of both ponds have been designed for an interim condition, while the volume of the ponds have been designed to incorporate a full build out final condition. The interim condition includes the disturbance and adjusted imperviousness of the 20.87 acres while the remaining site is to remain undisturbed and in an existing condition. The full build out final condition uses an increased imperviousness value to account for future developments and to size the ponds fully.

In the interim condition it is worth noting that both proposed ponds providing more volume than necessary. The restrictor plate in the interim has been designed to meet release rates by utilizing a larger orifice as the top hole. This larger orifice is intended to release flow at an earlier stage than the top of the outlet structure. The top of the outlet structure in the interim being used for anything above a 100-year event. The emergency spillway, in both ponds, are not intended to be used in the interim but are designed for the final condition build out, in the interim the overflow weir will act more as an emergency spillway. The height of the outlet structures was designed based on final conditions and the restrictor plate was designed based on interim conditions to reduce the amount of pond design with future filings being built.

The existing 60” RCP storm pipe coming into Pond 1 has been analyzed in previous reports by Terra Nova Engineering, Inc. Revised Nov. 2005, SF-05-033. The plan and profile sheet has been included in Appendix F of this report. Since no additional flow is proposed into this system further analysis is not provided.

Under interim conditions, two temporary pipes have been installed at Pond 2. Both pipes were analyzed and sized using Bentley FlowMaster, with the analysis results provided in Appendix E.

- **Temporary Pipe 1** conveys runoff from the temporary Basin C berm.
- **Temporary Pipe 2** conveys runoff from the existing drainage channel.

As no additional flow has been introduced to the existing drainage channel, no further analysis is provided.

Due to the interim configuration of the outlet structures, outflows are hydraulically constrained by the restrictor plate, as reflected in the results of the MHFD detention spreadsheet. Consequently, the water surface elevations for both the 5-year and 100-year storm events are not expected to exceed the elevation of the overflow weir. As such, a detailed headwater analysis was not conducted.

Release rates of both ponds in both conditions are designed to meet current drain time requirements by the State of Colorado. The requirements for WQCV, EURV, and 100 year events are 40 hours, 72 hours, and 120 hours respectively. Below is a table describing proposed drain times.

	WQCV	EURV	100-YR
State requirement	40	72	120
Pond 1 Interim	40	70	84
Pond 1 Final	40	64	72
Pond 2 Interim	40	68	98
Pond 2 Final	40	72	78

In the interim and final conditions for both ponds, the 5-year and 10-year release rates remain below the current outflow rates of the existing pond outlet structures. Therefore, it is concluded that, since the proposed design results in lower release rates than the existing conditions, no adverse downstream impacts are anticipated. For the final conditions detention design using the MHFD spreadsheets, the existing outflow rates from the existing ponds were used to override the Predevelopment Peak Q to reflect the actual, existing rates.

Below is a summary of the interim and full build out final conditions.

Proposed Flows to Ponds for Interim Condition				
	WQCV	**EURV-WQCV**	**100-year - EURV-WQCV**	**Total Volume Required**
Interim Pond 1	1.568 ac-ft	2.679 ac-ft	3.166 ac-ft	7.413 ac-ft
Interim Pond 2	1.280 ac-ft	1.955 ac-ft	2.605 ac-ft	5.840 ac-ft

Proposed Flows to Ponds for Future (Ultimate) Build Out Condition

	WQCV	EURV-WQCV	100-year - EURV-WQCV	Total Volume Required
Ultimate Pond 1	2.342 ac-ft	6.579 ac-ft	4.372 ac-ft	13.293 ac-ft
Ultimate Pond 2	2.030 ac-ft	5.703 ac-ft	3.790 ac-ft	11.523 ac-ft

Both ponds were designed using Mile High Flood District Detention spreadsheets for volume and outlet structures. There are two sets of pond design scenarios in Appendix E, for both interim and final conditions. The ponds and outlet structures will function within MHFD design guidelines. The pond designs within this report only provide a preliminary volume capacity and outlet structure design for the final, full build out condition. Any future development shall engineer and redesign the outlet structure(s) to accommodate the additional runoff from the associated development. The design shall also confirm there is adequate volume capacity, and make any adjustments as needed. Additionally, the Construction Documents associated with this report only provide a detailed design for the interim condition. Future development shall provide Construction Documents that engineer and redesign the outlet structure(s) to accommodate the additional runoff from the associated development.

Both ponds are designed to release into Sand Creek at or below the peak existing flows.

MHFD-Inlet_v5.03 software was used to analyze and design the street and inlet capacities throughout the Site. The result of the software is included in the appendices for reference. Chapter 7 of the City of Colorado Springs Drainage Criteria Manual, Volume 1 was used for street flow design criteria.

A proposed grass lined swale with a 2.0’ wide, 0.75’ deep concrete pan is designed in basin A-1 (swale A-1) to convey stormwater to an outfall point for tributary areas within the northern open space portion of the Site. This swale is to be designed to El Paso County and Colorado Springs Drainage standards with one foot of freeboard. Design calculations and cross sections are included within the appendix.

FOUR STEP PROCESS

The Four Step Process focuses on reducing runoff volumes, treating the WQCV, stabilizing drainageways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring events, as opposed to larger storms for which drainage and flood control infrastructure are sized. The Four Step Process is summarized below, and elements of the designed development are presented as a means to address and follow this process.

1. Step 1: Employ Runoff Reduction Practices

The Site is developed to capture runoff from impervious areas at sump locations and local low points within the public storm system. Impervious area is avoided where functional hardscape is not needed and open space is provided within the subdivision and remains undisturbed where developed lots are not laid out. Pervious landscaped areas are proposed where feasible in order to reduce runoff. Typical lot layouts will include pervious landscape areas surrounding the residences including front yards, rear yards, and side yard swales for drainage. The exact future ratio of pervious to impervious area per lot may vary depending on future homebuilding activity. In order to calculate estimated runoff reduction for each lot for this project, lots were assumed to have 35% imperviousness as specified by the DCM Volume 1, Table 6-6 for residential lots sized as 0-3 dwelling per acre.

Runoff calculations were completed for three two separate areas, the basins tributary to the permanent water quality and detention facilities 1 and 2, and the basins that flow off Site. The 2 permanent water quality and detention facilities are responsible for all water quality treatment for the Site.

Runoff reduction calculations and results are included in Appendix D. Runoff reduction areas are shown and can be found in the Green Infrastructure Maps, included in Appendix G.

2. Step 2: Implement Control Measures That Provide a Water Quality Capture Volume with Slow Release.

Runoff from this development is treated through the capture and timed release of the WQCV via the 2 proposed detention ponds on Site. Proposed ponds 1 and 2 provide the required and necessary WQCV for their respective tributary basins. A drainage map can be found in appendix F.

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Tributary to Pond 1 (ac)	Area Tributary to Pond 2 (ac)	Disturbed Area Treated (ac)	Un-Disturbed Area un-Treated (ac)
A-1	4.49	4.49	0	4.49	4.49	0
A-2	4.83	4.83	0	4.83	4.83	0
A-3	2.46	2.46	0	2.46	2.46	0
A-4	2.55	2.55	0	2.55	2.55	0
A-5	3.52	3.52	0	3.52	3.52	0
A-6	2.75	2.75	2.75	0	2.75	0
B	38.75	0	38.75	0	0	0
C	41.08	0	0	41.08	0	0
D	8.26	0	0	0	0	8.26
E	1.41	0	0	0	0	1.41
F	5.91	0	0	0	0	5.91
G	8.38	0	0	0	0	8.38
OS-1	6.38	0	6.38	0	0	0
OS-2	3.12	0	3.12	0	0	0.00
OS-3	1.14	0	0	1.14	0	0
OS-4	13.1	0	0	0	0	13.1
OS-5	59.6	0	59.6	0	0	0
OS-6	35.8	0	0	35.8	0	0
OS-7	6.47	0	0	0	0	6.47
TOTAL	250	20.60	110.6	95.87	20.60	43.53

3. Step 3: Stabilized Drainageways

The Site utilizes concrete curb and gutter to channel stormwater from impervious runoff, mostly paved roadways, and residential lots. Landscaped areas are to be permanently stabilized with native seeding and mulching as well as trees and shrubbery according to the landscaping plans. Sloped landscaped areas will not exceed 3H:1V grades. The proposed grass lined swale with a 2.0’ wide, 0.75’ deep concrete pan in basin A-1(swale A-1) follows El Paso Country and City of Colorado Springs drainage criteria. The Site will outfall into the Existing Detention Pond 2.

4. Step 4: Implement Site Specific and Other Control Measures

Site construction is to follow a Stormwater Management Report and Grading and Erosion Control Plan that includes non-structural control measures during the initial, interim, and final phases of construction. As the development is multifamily residential land use, there are no anticipated Site-specific permanent source control measures required for the Site.

WATER QUALITY ENHANCEMENT CONTROL MEASURES

The proposed ponds 1 and 2 discussed in previous sections shall have infrastructure in place that meets El Paso County and MHFD Urban Storm Drainage Criteria Manuals. The proposed permanent water quality and detention facility is designed to treat the WQCV and detain the EURV and the 100-year detention volumes as well as meet release rate criteria. Runoff from the upstream tributary areas will be conveyed to the permanent water quality and detention facility via storm sewer. A developed drainage plan showing developed areas and their drainage patterns to the permanent water quality and detention facility is included in Appendix G.

Non-structural Best Management Practices that will be incorporated into the project are anticipated to include grass swales. Water quality is provided via side yard grass swales between lots in developed areas throughout the subdivision. It is provided for basins that drain directly off-site and are not tributary to the ponds by way of grass-lined swales, and by having minimal grading with no developed imperviousness in these areas as either open space or permanently seeded and landscaped rear yard areas.

Structural Best Management Practices that are incorporated in the Site design include storm infrastructure within the extended detention basins such as outlet structures and spillways.

MAINTENENANCE

The proposed permanent water quality and detention facility will be maintained by the Challenger Homes, as well as all storm systems and swales not in the public right or way or within an easement. The proposed storm sewer system in the internal streets will be owned and maintained by El Paso County.

FLOODPLAIN MODIFICATION

There are no floodplain modifications required or proposed for the Site, see Appendix C for the FEMA Flood Zone Map.

DRAINAGE/BRIDGE FEES AND COST ESTIMATES

The Site lies within the Sand Creek Drainage Basin. The El Paso County Drainage Basin Fees were last updated in 2024 and were used.

The project Site has a total area of 20.87 acres. The following calculations for the imperviousness of the development is shown below.

Average Housing Footprint: =3,400 sf

Total Housing Footprint Area: 3,400 x 24 =21,600 sf

Total ROW Area: =212,421 sf

Total Tract Area: =257,918 sf

ROW and Housing Footprint areas are 100% impervious.

Total Impervious Area: (21,600 + 212,421) / 43,560 = 5.37 ac

Drainage Fees:

$25,632 x 5.37 Imp. Acres = $137,643.84

Bridge Fees:

$10,484 x 5.37 Imp. Acres = $56,299.08

The table below summarizes these costs.

Drainage Basin	Area Impervious (acres)	2024 Drainage Fee (per impervious acre $)	2024 Bridge Fee (per impervious acre)	Drainage fees ($)	Bridge Fees ($)	Total ($)
Sand Creek	5.37	$ 25,632.00	$ 10,484.00	$ 137,643.84	$ 56,299.08	$ 193,942.92

Below is a cost estimate for the proposed storm infrastructure proposed within the filing.

Item	Quantity	Unit	Unit Cost	Cost
Storm Infrastructure				
5' CDOT Type R Inlet	1	EA	$ 8,814.00	$ 8,814.00
10' CDOT Type R Inlet	3	EA	$ 11,438.00	$ 34,314.00
CDOT Type C Inlet	1	EA	$ 8,156.00	$ 8,156.00
Riprap (Outlet Protection)	147.5	TON	$ 112.00	$ 16,520.00
18" RCP	182	LF	$ 111.00	$ 20,202.00
24" RCP	241	LF	$ 161.00	$ 38,801.00
30" RCP	327	LF	$ 167.00	$ 54,609.00
36" RCP	583	LF	$ 191.00	$ 111,353.00
48" RCP	421	LF	$ 349.00	$ 146,929.00
54" RCP	179	LF	$ 465.00	$ 83,235.00
Storm Sewer Manhole	8	EA	$ 18,950.00	$ 151,600.00
PBMPs				
Pond 1				
Forebay	3	EA	$ 15,000.00	$ 45,000.00
Trickle Channel	1008	LF	$ 15.00	$ 15,120.00
Outlet Structure	1	EA	$ 15,000.00	$ 15,000.00
Outlet Pipe (30")	123	LF	$ 167.00	$ 20,541.00
Riprap (Spillway)	54	TON	$ 112.00	$ 6,048.00
			Total	$ 101,709.00
Pond 2				
Forebay	2	EA	$ 15,000.00	$ 30,000.00
Trickle Channel	385	LF	$ 15.00	$ 5,775.00
Outlet Structure	1	EA	$ 15,000.00	$ 15,000.00
Outlet Pipe (36")	126	LF	$ 191.00	$ 24,066.00
Riprap (Spillway)	32	TON	$ 112.00	$ 3,584.00
			Total	$ 78,425.00

Subtotal	$ 854,667.00
Contingency **(15%)**	$ 128,200.05
Total	$ 982,867.05

CONCLUSION

This Final Drainage Plan report describes the proposed storm water management plan for the Falcon Highlands South Filing 1 development. This Plan will improve the existing ponds 1 and 2 on Site to current El Paso County standards and will provide water quality treatment and detention of storm water. This document will provide guidance so that the drainage infrastructure constructed throughout the Falcon Highlands South Filing 1 development will function efficiently and effectively. This report follows all standard criteria set forth by the El Paso County Drainage Criteria Manual, El Paso County Engineering Criteria Manual, the City of Colorado Springs Drainage Criteria Manuals Volumes 1, 2, and 3, and the Mile High Flood District Urban Storm Drainage Criteria Manual, with no requested variances. Downstream drainage facilities will not be negatively affected, as existing drainage patterns and allowable release rates shall be maintained. It has been concluded that the proposed Falcon Highlands South Filing 1 development will have no negative impact to infrastructure and development.

Ponds 1 and 2 both outfall into the existing Sand Creek, where the current outfalls already exist. The updated and redesigned ponds will release below the existing release rate of the existing ponds and will be at or less than the CUHP predevelopment peak flow in the interim condition, therefore no negative downstream effects are anticipated for the existing channels. Pond 1 outfall will follow existing drainage patterns where the flow is conveyed south via an existing channel until it meets with the existing Sand Creek. Pond 2 outfall will follow existing drainage patterns where flow is conveyed southwest via an existing channel until it reaches the existing Sand Creek. An analysis of both existing channels has been completed to ensure that the existing channels are hydraulically adequate, calculations for these existing channels can be found in appendix E.

REFERENCES

1) Urban Storm Drainage Criteria Manuals; Mile High Flood District; latest edition

2) El Paso County Engineering Criteria Manual (ECM), latest revision October 14, 2020

3) El Paso County Drainage Criteria Manual (DCM), October 1991; latest revision October 31, 2018

4) City of Colorado Springs Drainage Criteria Manuals, Volumes 1, 2, and 3, latest revision May 2014 (Not Adopted by El Paso County)

5) Flood Insurance Rate Map of El Paso County Colorado, Federal Emergency Management Agency, Flood Insurance Rate Map No. 08041C0561G and 08041C0545G dated December 7, 2018.

6) Hydrologic Soil Group – El Paso County, Colorado, Web Soil Survey, National Cooperative Soils Survey, May 21, 2021

7) *Falcon Highlands Filing No. 2 & 3 Final Drainage Report* by Terra Nova Engineering, Inc., latest revision August 2010.

8) *Falcon Highlands Phase 2, Filing No. 2 & 3 Master Development Drainage Plan and Preliminary Drainage Report* by Terra Nova Engineering, Inc. latest revision September 2005

9) *Bent Grass Residential Subdivision Filing No. 2* (SF-19-014) Final Drainage Report, latest revision March 2020.

10) URS Section for Regional Detention Pond WU, developed by Galloway & Company

11) Sand Creek DBPS, developed by Stantec, HDR, and Dewberry dated January 2021 (Not Adopted by El Paso County)

12) Falcon DBS, developed by Matrix Design Group dated September 2015

Appendix A

Vicinity map

Falcon Highlands South - Filing No. 1

A PART OF SECTION 12, TOWNSHIP 13 SOUTH, RANGE 65 WEST
OF THE SIXTH PRINCIPAL MERIDIAN,
COUNTY OF EL PASO,
STATE OF COLORADO

PROJECT NO.: 24004308
DATE: 05/27/2025

ATWELL
866.850.4200 www.atwell-group.com
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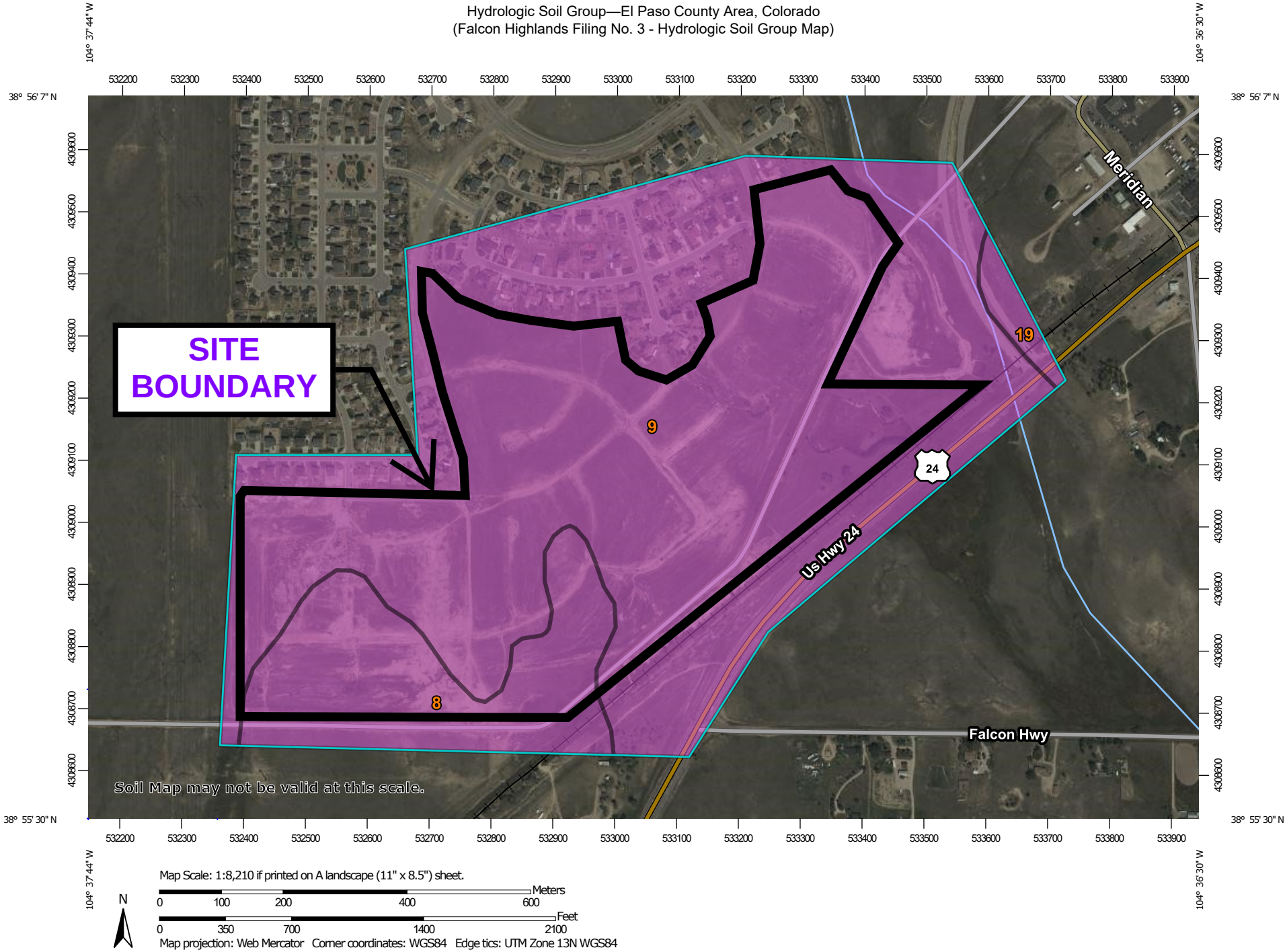
Appendix B

Soils Report

Hydrologic Soil Group—El Paso County Area, Colorado
(Falcon Highlands Filing No. 3 - Hydrologic Soil Group Map)



Map Scale: 1:8,210 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

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 18, Jun 5, 2020

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 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	31.0	14.2%
9	Blakeland-Fluvaquentic Haplaquolls	A	184.2	84.5%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	2.8	1.3%
Totals for Area of Interest			**218.0**	**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

Job No. 197925

November 1, 2024
Revised March 27, 2025

Challenger Communities
8605 Explorer Drive, Suite 250
Colorado Springs, CO 80920

Re: Addendum to Soils and Geology Study
Falcon Highlands South, Filing No. 1, Phase 1
El Paso County, Colorado

Dear Challenger Communities:

RMG – Rocky Mountain Group (RMG) prepared the original *Soils and Geology Study, Phases 1-4, Falcon Highlands* (RMG Job No. 184041, last dated September 7, 2022) for the proposed development comprising 380 single-family residential lots on approximately 109.05 acres located east of the intersection of Highway 24 and Meridian Road in El Paso County, Colorado. That report was reviewed by personnel of the El Paso County Planning and Community Development and the Colorado Geological Survey (CGS). The location of the site is presented in the Site Vicinity Map, Figure 1.

Since the approval of that report, which contained all four phases, it has been requested an updated report be completed for Filing No. 1. The filings are now defined and this letter is to update and confirm that our findings and recommendations previously presented are still valid and/or to provide additional information since the issuance of the original *Soils and Geology Study*. The Filing No. 1, Phase I, Lot Layout is presented in Figure 2.

Existing Land Use

The site currently consists of a portion of one parcel. The parcel included in this amended study is:

- **Schedule No. 5300000817** – consists of approximately 109.05 acres and encompasses the entire site. The parcel is not developed.

Filing No. 1, Phase I was originally Phase 4 of the previous report. The lot and roadway layouts have remained the same.

Project Description

Filing No. 1, Phase I is to consist of approximately 23.592 acres. Of that, single-family residences are to comprise approximately 12.8 acres (55%), open spaces and parks are to comprise approximately 6.1 acres (25%), and the remaining 4.7 acres (20%) are designated for public right-of-way usage. The main access into the filing, Sahalee Trail is to extend east and south from the existing Bridal Vail Way. One interior roadway, Fox Kestrel Court, is to extend northeast and southwest from Sahalee Trail and terminate on each end with a cul-de-sac. Both the roadways are to be constructed with a 50-foot ROW that will meet the requirements of an El Paso County Local Residential – Urban roadway. The roadways are to be paved and contain curb and gutter per El Paso County specifications.

Qualifications of Preparers

This *Addendum to Soils and Geology Study* was prepared by a professional geologist as defined by Colorado Revised Statures section 34-1-201(3) and by a qualified geotechnical engineer as defined by policy statement 15, "Engineering in Designated Natural Hazards Areas" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. (Ord. 96-74; Ord. 01-42)

The principle investigators for this study are Kelli Zigler P.G., and Tony Munger, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 24 years of experience in the geological and geotechnical engineering field. Ms. Kelli Zigler holds a B.S. in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Tony Munger is a licensed professional engineer with over 24 years of experience in the construction engineering (residential) field. Mr. Munger and holds a B.S. in Architectural Engineering from the University of Wyoming.

Previous Studies and Investigations

Previous geotechnical engineering/geologic investigation for the site and nearby sites were available for our review and are listed below:

1. *Soils and Geology Study, Phases 1-4, Falcon Highlands, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 184041, last dated September 7, 2022.
2. *Engineering Geology Study, Falcon Highlands Subdivision, El Paso County, Colorado,* prepared by John Himmelriech & Associates, Project No. 00-139, dated June 28, 2000.
3. *Soil and Geology Study, Falcon Highlands, Woodmen Road and Tamlin Road, El Paso County, Colorado,* prepared by Entech Engineering, Inc., Entech Job No. 39431, last dated January 24, 2002.
4. *Subsurface Soil Investigation, Lots 4, 30-44, 83-86, 101, 135-137, 142-146, 149-151, 1456, 157, 160, Falcon Highlands, Filing No. 2, El Paso County, Colorado,* prepared by RMG Engineers Group, Job No. 133001, dated August 24, 2012.

Since the issuance of our original report, the site conditions, topography and vegetation have not changed substantially.

RMG previously completed 11 exploratory test borings on June 8, 2021 for the original Soils and Geology Study. The borings extended to approximately 20 feet below the existing ground surface. Three of these previous test borings (TB-1, TB-2, and TB-3) were located within the area included in this current study. RMG did not perform additional borings for this study. Since the site has not undergone significant changes since the issuance of the original report, additional test borings (beyond those already performed) would not be anticipated to provide new information that would substantially change the recommendations presented herein. The Explanation of Test Boring Logs, Test Boring Logs, Summary of Laboratory Results, and Soil Classification Data for the pertinent three borings are presented in Appendix A.

As noted in the review comments from the County and CGS, in regards to our original study, *"groundwater measurements at the time of drilling, or even several weeks later, do not provide the necessary data to determine groundwater fluctuations."* At Challenger's request, RMG installed 5 piezometers on May 15, 2024, within the Falcon Highlands Subdivision. The piezometer locations were selected by Challenger, within tracts around the subdivision. Groundwater depths are being measured within these piezometers on a montly basis, for a period of at least 12 months.

Though we did not perform new test borings for this study, we are utilizing our current piezometer readings to provide additional groundwater information. The groundwater depths measured in each of the piezometers to date are presented in the **Groundwater** section of this report. The groundwater monitoring is ongoing, and future measurements can be made available (upon request) once completed.

Geologic Conditions

Based upon review of the *Falcon Quadrangle Geologic Map, El Paso County, Colorado*, the site is within an area of the Colorado Piedmont, a region that is distinguished primarily by the fact that is has been stripped of the Miocene fluvial rocks that cap the adjoining High Plains Section of the Great Plains physiographic province. Sand is abundant is the Falcon Highlands area due to the sandstone bedrock of the Squirrel Formation and/or Dawson Formation. Sandy alluvial and pluvial deposits blanket the majority of the area, and are generally 5 feet thick or more. The deposits are considered residuum, unconsolidated material derived from the weathering of the underlying bedrock, and are wide-spread. The sandstone is generally weakly-cemented, easily excavated, shows little or no lamination, and can be irregularly stratified with evidence of cross sorting.

General Geology

Our field investigation included a site reconnaissance, with consideration given to geologic features and significant surficial deposits. The general geology of the area is typically a combination of alluviual and pluvial deposits overlying the Black Squirrel Formation. The general geology units were mapped in our previous *Soils and Geology Study*, and the units that occur within the currently-proposed Filing No. 1, Phase I, are noted below:

- *Qa2: Alluvium two* (lower Holocene) – Dark gray to brown, poorly to well sorted, moderately consolidated, silt, sand, gravel, and minor clay and occasional boulders in stream terrace deposits approximately 6 to 12 feet above the modern flood plain or as non-terrace forming alluvium in valley headwaters. Clasts are subrounded to well-rounded and the dominant sediment is sandy gravel with a silty sand matrix. Clay seams are poorly to moderately stratified.

- *Tbs: Black Squirrel Formation (Paleocene)* – Gray-green to tan to brownish gray, moderately-well sorted cross-bedded sandy arkoses interbedded with micaceous sand claystone that contain abundant plant fragments and occasional, fine-to medium-grained massive arkosic beds. The exposed upped part of the Black Squirrel Formation is gradational with the overlying Dawson Arkose making the contact problematic. Thickness within the Falcon quadrangle is approximately 130 feet. The claystone within this unit may be prone to swelling when wet.

- *Af: – Artificial Fill* – man-placed fill in the form of stockpiles that were placed between prior to 2005 to 2015, as indicated by historical aerial photos. The stockpiles generally consisted of unsorted silt, sand, clay, and rock fragments. The unsorted soil was mixed with uncontrolled dumping of household debris. The average thickness of the unit is less than 15 feet, above and below the ground surface.

Engineering Geology

The Engineering Geology is presented below. Charles Robinson and Associates have mapped one environmental engineering unit on the site as:

- 2D: Eolian deposits generally on flat to gentle slopes of upland areas.

The Engineering and Geology Map specific to Filing No. 1, Phase I is included in Figure 3.

Potential Geologic Conditions

The following geologic constraints were considered in the preparation of the previous report and this addendum, and are not expected to pose a significant risk to the proposed development in Filing No. 1, Phase I:

- Avalanches
- Debris Flows, Debris Fans, Mudslides
- Floodplains
- Ground Subsidence
- Landslides
- Rockfall
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, Accelerated Erosion along creek banks and drainageways

The geologic conditions that are anticipated to impact Filing No. 1, Phase I are as follows:

Groundwater

Groundwater readings were performed at the time of the original drilling in June, 2021, with additional groundwater readings in September and October of 2021. The final water readings revealed that all eleven test borings (performed across the development as a whole) had water at depths ranging from 9 to 17.4 feet in October of 2021. However, with respect to just the three test borings located in Filing No. 1, Phase I (TB-1, TB-2, and TB-3), the final groundwater readings in October of 2021 ranged from 11.4 to 16 feet.

Test Boring (TB) Number	Depth of Groundwater (ft) June 2021	Depth of Groundwater (ft) September 2021	Depth of Groundwater (ft) October 2021
TB-1	19	3.5	16
TB-2	15	3.5	14.6
TB-3	10	3.5	11.4

We do understand groundwater information obtained at the time of the preliminary investigations performed prior to the land development phase may or may not be representative of the conditions present at the time of construction. Furthermore, the development processes (reshaping of the ground surface, installation of buried utilities, installation of an underdrain below the roadways, etc.) can significantly alter the depth and flow paths of the subsurface water. The construction of surrounding lots can also alter the amount and depth of subsurface groundwater below a given lot.

Our recommendations, as noted in our original study, were that basement construction should be restricted except where the following conditions apply:

- Underdrains are installed at the bottom of sanitary sewer trenches within drive lanes;
- A year-long groundwater monitoring study has been undertaken, and the results indicate that groundwater is sufficiently deep to allow basement construction;
- The proposed site grading will result in at least 14 feet of separation between the proposed ground surface and the groundwater elevation.

Based on the Grading Plan provided by Challenger Homes, prepared by Atwell and dated July 12, 2024, the majority of the grading is to either level the site and maintain or raise the existing grades. Minor cuts are proposed in localized areas, but they appear to be limited to approximately 3 feet or less.

Additionally, two retention basins are to be located outside the boundaries of Filing No.1, Phase I, in designated tracts. The potential impacts of shallow groundwater should be evaluated by the civil engineer of record when preparing the designs for those retention basins.

<u>Mitigation</u>
As noted above, it is our understanding that stiffened-slab foundations are to be used for the proposed lots. Neither basement nor crawlspace construction are currently proposed.

Additionally, at Challenger's request, RMG installed 5 piezometers on May 15, 2024, within the Falcon Highlands Subdivision. The piezometer locations were selected by Challenger, within tracts around the subdivision. The location of the piezometers is shown in Figure 4. Piezometer 1 (P1) is located in a tract within Filing No. 1, Phase I. However, for completeness, all 5 piezometer readings to date are presented in the table below.

Piezometer Number	Date of reading (2024)	Total Depth (ft) of Piezometer	Depth (ft) to Groundwater
P1			
	May 15	20	6.5
	June 17	20	3.8
	July 15	20	4.0
	August 21	20	5.0
	September 24	20	5.5
	October 22	20	7.3
P2			
	May 15	20	14.0
	June 17	20	13.8
	July 15	20	13.8
	August 21	20	13.5
	September 24	20	14.5
	October 22	20	11.9
P3			
	May 15	19.4	8.5
	June 17	19.4	4.5
	July 15	19.4	4.5
	August 21	19.4	5.0
	September 24	19.4	7.5
	October 22	19.4	8.0
P4			
	May 15	24	*N/A
	June 17	24	7.0
	July 15	24	7.0
	August 21	24	5.0
	September 24	24	8.5
	October 22	24	9.0
P5			
	May 15	24.2	*N/A
	June 17	24.2	15.5
	July 15	24.2	15.0
	August 21	24.2	14.5
	September 24	24.2	15.0
	October 22	24.2	15.0

**N/A is not believed that groundwater was not present but some other technical issues may have been encountered.*

Based on these monthly groundwater measurements, it is our opinion that the proposed stiffened slab foundations are suitable for the included lots. However, underslab drains may be recommended at the time of either the lot-specific subsurface soil investigations and/or open excavation observations.

Furthermore, overlot grading may encounter elevated groundwater conditions necessitating localized stabilization, especially in areas where groundwater measurements were at depths of 7 feet or less from the proposed finished ground surface.

Compressible and/or Potentially Expansive Soils

The subsurface materials at the site generally consist of silty to clayey sand and sandy clay overlying sandstone and claystone. Based on the test borings performed for the original *Soils and Geology Study* referenced above, the soils and bedrock encountered at the site generally possess low to moderate swell potential and low compressibility potential. If these materials are encountered in the excavations for the proposed residences, they can readily be mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Shallow foundations are anticipated for the lots included in this study. Foundation design and construction are typically adjusted for expansive or compressible soils. Several mitigation alternatives were presented in our previous study. Based on discussions with personnel of Challenger Communities, it is our understanding that stiffened slab foundations are preferred for these lots. Based on the boring logs and laboratory test data from our previous study, it is our opinion that stiffened slab foundations atop either undisturbed native soil or atop structural fill after limited overexcavation and replacement will be suitable for the proposed lots.

Undocumented Fill

Fill soils were encountered in five of the eleven test borings previously performed by RMG. The majority of fill was located in the southern half of the parcel and near the western boundary. Fill was not encountered in test borings TB-1, TB-2, or TB-3 which were located within the area of this study. However, some surficial fill may be encountered within this site.

Mitigation

The fill soils must be considered undocumented fill, and as such are not suitable for development. It is our opinion that they can be mitigated with typical construction practices common to the El Paso County region. If undocumented or otherwise unsuitable fill soils are encountered during the overlot grading process, they will require removal (overexcavation) and replacement with compacted structural fill. The zone of overexcavation shall extend to the bottom of the unsuitable fill zone and shall extend at least that same distance beyond the building perimeter (or to the lateral extent of the fill, if encountered first).

Additional Geologic Conditions

The following listed constraints were discussed and included in the original *Soils and Geology Study*, included in Appendix C. It is our opinion that our findings, conclusions, and recommendations regarding these conditions are still valid for the lots within the currently-proposed Filing No. 1, Phase 1:

- faults, seismicity, radon, flooding, surface drainage, erosion, corrosion, surface grading and drainage

Conclusions

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The potential for expansive/compressible soils and shallow groundwater are not considered unusual for the Front Range region of Colorado. Mitigation of geologic hazards is most effectively accomplished by avoidance. However, where avoidance is not a practical or acceptable alternative, geologic hazards should be mitigated by implementing appropriate planning, engineering, and local construction practices.

Stiffened slab foundations are currently proposed with in Filing No. 1, Phase. The foundation and floor slabs of the structure should be designed using the recommendations provided in the site-specific subsurface soil investigation performed for each lot. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site for future development. Unless indicated otherwise, the test borings, laboratory test results, conclusions and recommendations presented in this report are not intended for use for design and construction. ***A site-specific subsurface soil investigation will be required for all proposed residences.***

To develop recommendations for construction of the proposed roadways, a pavement design investigation should be performed. This investigation should consist of additional test borings, soil laboratory testing and specific recommendations for the design and construction of roadway pavement sections.

The recommendations in this and the referenced reports are intended to address normal surface drainage conditions, assuming the presence of groundcover (established vegetation, paved surfaces, and/or structures) throughout the regions upslope from this structure. However, groundcover may not be present due to a variety of factors (ongoing construction/development, wildfires, etc.). During periods when groundcover is not present in the "upslope" regions, higher than normal surface drainage conditions may occur, resulting in perched water tables, excess runoff, flash floods, etc. In these cases, the surface drainage recommendations presented herein (even if properly maintained) may not mitigate all groundwater problems or moisture intrusion into the structure.

Revisions and modifications to the conclusions and recommendations presented in this report may be issued subsequently by RMG based upon additional observations made during grading and construction which may indicate conditions that require re-evaluation of some of the criteria presented in this report.

Closing

This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, environmental assessment of the site, or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to, biological or toxicological issues, are beyond the scope of this report. If the owner is concerned about the potential for such contamination or conditions, other studies should be undertaken.

This report has been prepared for **Challenger Communities** in accordance with generally accepted geotechnical engineering and engineering geology practices. The conclusions and recommendations in this report are based in part upon data obtained from review of available topographic and geologic maps, review of available reports of previous studies conducted in the site vicinity, a site reconnaissance, and research of available published information, soil test borings, soil laboratory testing, and engineering analyses. The nature and extent of variations may not become evident until construction activities begin. If variations then become evident, RMG should be retained to re-evaluate the recommendations of this report, if necessary.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers and engineering geologists practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied, is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

I hope this provides the information you have requested. Should you have questions, please feel free to contact our office.

Cordially,

RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,

RMG – Rocky Mountain Group

Tony Munger, P.E.
Sr.Geotechnical Project Manager

Additional Referenced Documents

1. *Falcon Highlands South, Filing No. 1, Phase 1, Construction Plans,* prepared by Atwell, Job No. 24004308, dated July 12, 2024.
2. *Falcon Highlands South, Filing No. 1, Landscape Construction Documents*, prepared by Matrix, Project No. 24.1208.013, date issued, August 16, 2024.
3. *Falcon Highland, Concept Plan 03, Phasing Exhibit*, prepared by Matrix, dated May 18, 2021.
4. *Appendix C, Soils Investigation Reports and Mitigation*, *Engineering Criteria Manual,* El Paso County, revised July 9, 2019.
5. *Master Plan for Mineral Extraction, Map 2.* El Paso County, February 8, 1996,
6. *Earthquake Potential in Colorado, A Preliminary Evaluation*, Colorado Geological Survey, Bulletin 4, Kirkham, R.M. and Rogers, W.P., 1981,
7. *Results of the 1987-88 EPA Supported Radon Study in Colorado, with a discussion on Geology*, Open file Report 91-4, Colorado Geological Survey, 1991,
8. *Colorado Springs Landslide Susceptibility, Colorado Geological Survey:* https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=5e7484a637c4432e84f4f16d0af306d3
9. *Colorado Landslide Inventory, Colorado Geological Survey:* https://cologeosurvey.maps.arcgis.com/apps/webappviewer/index.html?id=9dd73db7fbc34139abe51599396e2648.
10. *Pikes Peak Regional Building Department:* https://www.pprbd.org/.
11. *City of Colorado Springs, Subdivision Document Viewer:* http://www.springsgov.com/SubDivView/default.asp?cmdGoBack=New+Search....
12. *El Paso County Assessor, El Paso County, Colorado:* https://property.spatialest.com/co/elpaso/#/property/7109000098 and https://property.spatialest.com/co/elpaso/#/property/7109000024
13. *Colorado Geological Survey, USGS Geologic Map Viewer*: http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/.
14. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1952, 1953, 1955, 1960, 1969, 1984, 1999, 2004, 2005, 2009, 2011, 2013, 2015, 2017, and 2019.
15. *USGS Historical Topographic Map Explorer:* http://historicalmaps.arcgis.com/usgs/ Images dated 1950, 1951, 1956, 1657, 1963, 1966, 1970, 1974, 1977, 1994, 2001, 2013 and 2013.
16. *Google Earth Pro*, Imagery dated 1999, 2004, 2005, 2006, 2008, 2010, 2011, 2015, 2017, 2018, 2019, 2020, 2022, and 2024.

NOT TO SCALE

ARCHITECTS RMG ENGINEERS
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Central Office:
Englewood, CO 80112
(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071

SITE VICINITY MAP

FALCON HIGHLANDS SOUTH
FILING NO. 1 PHASE I
EL PASO COUNTY, COLORADO
CHALLENGER COLORADO, LLC

JOB No. 197925

FIG No. 1

DATE 10-31-2024

BASE MAP PROVIDED BY ATWELL

JOB No. 197925

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(970) 330-1071
Woodland Park Office:
(719) 687-6077
Monument Office:
(719) 488-2145
Pueblo / Canon City:
(719) 544-7750

FALCON HIGHLANDS SOUTH
FILING NO. 1, PHASE 1

EL PASO COUNTY, COLORADO
CHALLENGER COLORADO, LLC

ENGINEER: TM
DRAWN BY: KZ
CHECKED BY: TM
ISSUED: 10/31/2024
REVISED: 3/27/2025

LOT LAYOUT

SHEET No.
FIG-2

NOT TO SCALE

DENOTES APPROXIMATE LOCATION OF TEST BORINGS AS PERFORMED FOR OUR ORIGINAL SOILS AND GEOLOGY STUDY, JOB NO. 184041, LAST DATED SEPTEMBER 7, 2022

- *Qa2: Alluvium two* (lower Holocene) - Dark gray to brown, poorly to well sorted, moderately consolidated, silt, sand, gravel, and minor clay and occasional boulders .
- *Tbs: Black Squirrel Formation (Paleocene)* - The exposed upped part of the Black Squirrel Formation is gradational with the overlying Dawson Arkose making the contact problematic. Thickness within the Falcon quadrangle is approximately 130 feet. The claystone within this unit may be prone to swelling when wet.
- *Af:* - *Artificial Fill* - man-placed fill in the form of stockpiles that were placed between prior to 2005 to 2015, as indicated by historical aerial photos. The stockpiles generally consisted of unsorted silt, sand, clay, and rock fragments. The unsorted soil was mixed with uncontrolled dumping of household debris. The average thickness of the unit is less than 15 feet, above and below the ground surface.
- 2D: - Eolian deposits generally on flat to gentle slopes of upland areas.

DENOTES AREA INCLUDED IN THIS STUDY

JOB No. 197925

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(719) 544-7750

FALCON HIGHLANDS SOUTH
FILING NO. 1, PHASE 1
EL PASO COUNTY, COLORADO
CHALLENGER COLORADO, LLC

ENGINEER: TM
DRAWN BY: KZ
CHECKED BY: TM
ISSUED: 10/31/2024

ENGINEERING AND GEOLOGY MAP

SHEET No.
FIG-3

NOT TO SCALE

JOB No. 197925

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Pueblo / Canon City:
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FALCON HIGHLANDS SOUTH
FILING NO. 1, PHASE 1
EL PASO COUNTY, COLORADO
CHALLENGER COLORADO, LLC

ENGINEER:	TPM
DRAWN BY:	KZ
CHECKED BY:	TPM
ISSUED:	10-31-2024

PIEZOMETER LOCATIONS

SHEET No.
FIG-4

APPENDIX A

Explanation of Test Boring Logs, Test Boring Logs, Summary of Laboratory Results,
And Soil Classification Data by RMG, Job No. 184041

SOILS DESCRIPTION

CLAYSTONE

SANDSTONE

SANDY CLAY

SILTY SAND

SILTY TO CLAYEY SAND

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
RMG - ROCKY MOUNTAIN GROUP
5085 LIST DRIVE, SUITE 200
COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES

XX — STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).

XX — UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).

FREE WATER TABLE

DEPTH AT WHICH BORING CAVED

BULK DISTURBED BULK SAMPLE

AUG AUGER "CUTTINGS"

4.5 WATER CONTENT (%)

ROCKY MOUNTAIN GROUP

Structural Forensics

RMG

Geotechnical Materials Testing

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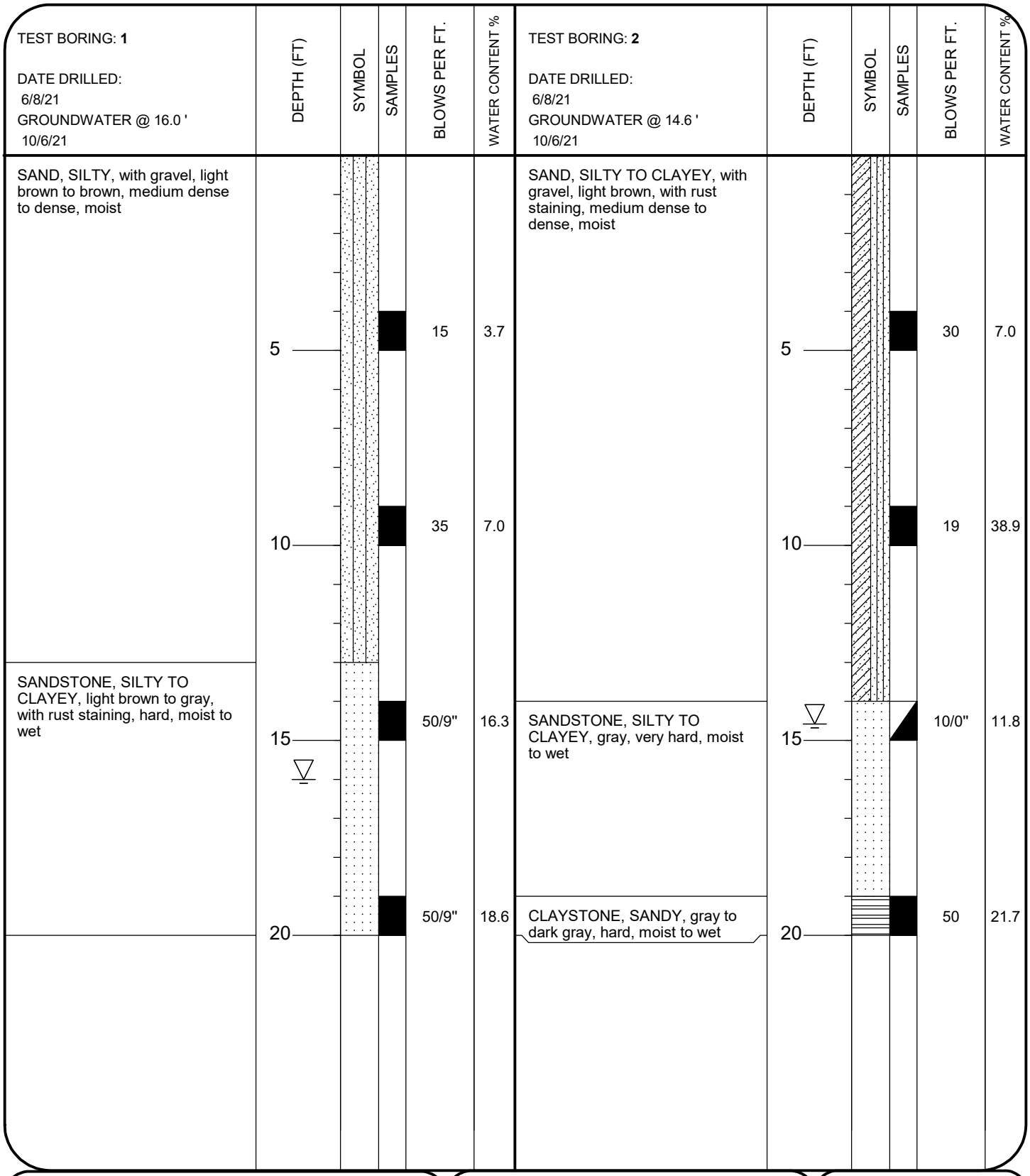
5085 List Drive, Suite 200
Colorado Spings, CO 80918
(719) 548-0600
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 184041

FIGURE No. 1

DATE Oct/25/2024



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TEST BORING LOG

JOB No. 184041

FIGURE No. 2

DATE Oct/25/2024

TEST BORING: **3**

DATE DRILLED:
6/8/21
GROUNDWATER @ 11.4 '
10/6/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, with gravel, light brown, with rust staining, medium dense, moist				
5			15	10.1
CLAY, SANDY, light gray, very stiff, moist to wet				
10			30	20.4
CLAYSTONE, SANDY, gray, medium hard, moist to wet				
15			50/11"	25.1
20			40	24.3

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TEST BORING LOG

JOB No. 184041

FIGURE No. 3

DATE Oct/25/2024

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
1	4.0	3.7								
1	9.0	7.0		NP	NP	0.2	11.1			SW-SM
1	14.0	16.3								
1	19.0	18.6								
2	4.0	7.0		NP	NP	4.8	18.4			SM
2	9.0	38.9								
2	14.0	11.8								
2	19.0	21.7								
3	4.0	10.1								
3	9.0	20.4		30	11	11.2	14.3			SC
3	14.0	25.1								
3	19.0	24.3								

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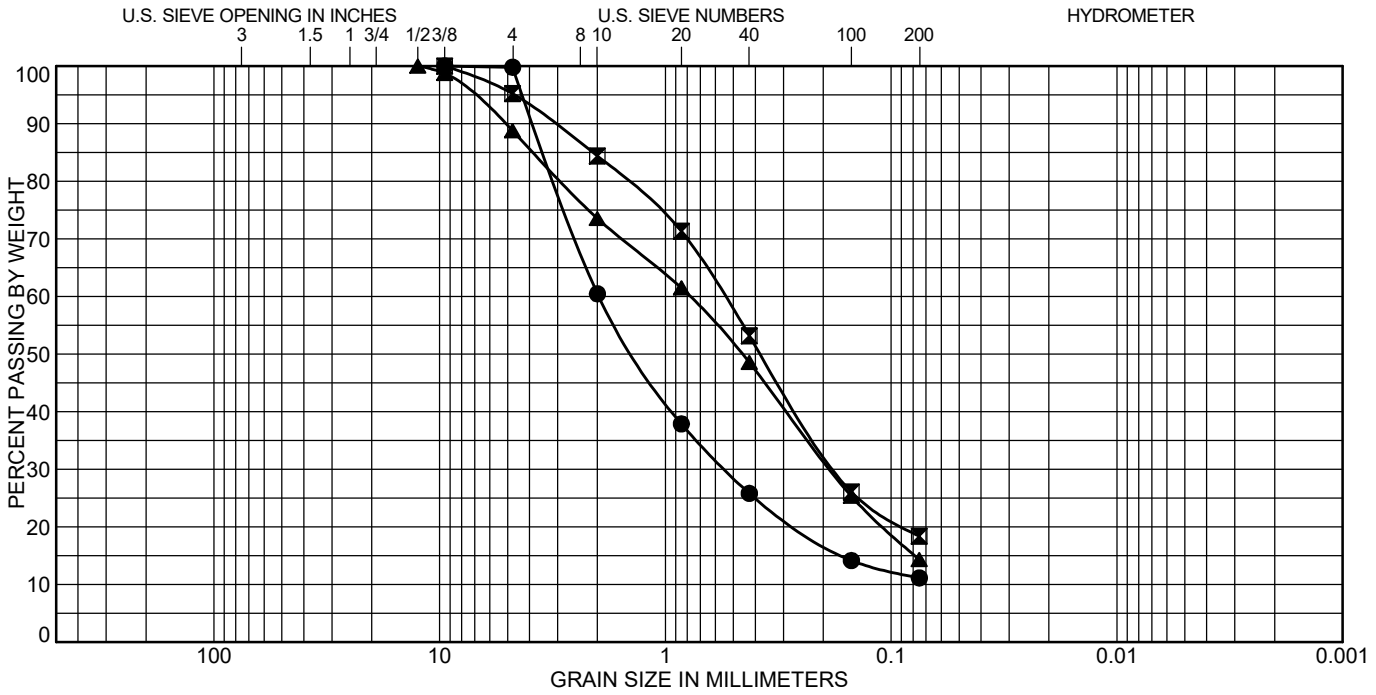
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 184041
FIGURE No. 4
PAGE 1 OF 1
DATE Oct/25/2024



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	1	9.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP
⊠	2	4.0	SILTY SAND(SM)	NP	NP	NP
▲	3	9.0	CLAYEY SAND(SC)	30	19	11

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	1	9.0	0.2	88.7	11.1	
⊠	2	4.0	4.8	76.8	18.4	
▲	3	9.0	11.2	74.5	14.3	

ROCKY MOUNTAIN GROUP

Structural Forensics

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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

SOIL CLASSIFICATION DATA

JOB No. 184041

FIGURE No. 5

DATE Oct/25/2024

Appendix C

FEMA Map

National Flood Hazard Layer FIRMette

FEMA

104°37'40"W 38°56'3"N

104°37'3"W 38°55'35"N

Feet 1:6,000

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

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

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/21/2021 at 11:21 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Appendix D

Hydrologic Calculations

Calculation of Peak Runoff using Rational Method

Designer: LMS
Company: Atwell, LLC
Date: 5/28/2025
Project: Falcon Highlands
Location: El Paso County

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$t_i = \frac{0.3}{}$ Computed $t_c = t_i + t_t$

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

$t_t =$ Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i+9)}$ Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1-hour rainfall depth, P1 (in) =	1.16	1.44	1.68	1.92	2.16	2.42

Rainfall Intensity Equation Coefficients =	a	b	c
	28.50	10.00	0.786

$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$

$Q(cfs) = CIA$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			Rainfall Intensity, I (in/hr)						Peak Flow, Q (cfs)					
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
EX-1	3.38	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.050	19.88	1250.00	0.020	5	0.71	29.46	49.34	40.34	40.34	1.52	1.89	2.20	2.51	2.83	3.17	0.09	0.12	0.16	0.26	0.65	1.60
EX-2	9.38	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.090	16.37	975.00	0.030	5	0.87	18.76	35.14	34.82	34.82	1.66	2.07	2.41	2.75	3.10	3.47	0.27	0.36	0.49	0.79	1.97	4.85
EX-3	9.14	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.090	16.37	440.00	0.020	5	0.71	10.37	26.74	30.50	26.74	1.95	2.42	2.82	3.22	3.62	4.06	0.30	0.42	0.56	0.90	2.24	5.53
OS-1	6.38	A	34.3	0.21	0.22	0.23	0.27	0.32	0.38	0.48	25.00	0.020	6.32	650.00	0.030	20	3.46	3.13	9.45	24.70	9.45	3.21	3.98	4.65	5.31	5.97	6.69	4.27	5.58	6.92	9.00	12.12	16.11
OS-2	3.12	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51	50.00	0.020	8.46	2180.00	0.020	20	2.83	12.85	21.30	36.80	21.30	2.21	2.74	3.20	3.65	4.11	4.60	1.75	2.29	2.82	3.60	4.70	6.06
OS-3	1.14	A	100.0	0.84	0.86	0.87	0.88	0.88	0.89	0.90	20.00	0.020	1.54	1190.00	0.020	20	2.83	7.01	8.55	15.10	8.55	3.33	4.13	4.82	5.51	6.20	6.95	3.19	4.06	4.80	5.55	6.21	7.04
OS-4	13.09	A	23.8	0.13	0.14	0.15	0.18	0.23	0.30	0.41	80.00	0.020	12.36	2300.00	0.020	20	2.83	13.55	25.91	43.93	25.91	1.98	2.46	2.87	3.28	3.69	4.13	3.36	4.44	5.59	7.56	11.02	15.98
OS-5	59.62	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51	100.00	0.020	11.96	608.00	0.020	20	2.83	3.58	15.54	24.11	15.54	2.59	3.21	3.75	4.29	4.82	5.40	39.33	51.26	63.13	80.65	105.39	135.79
OS-6	35.75	A	25.0	0.14	0.15	0.16	0.19	0.24	0.30	0.42	300.00	0.020	23.71	0.00	0.006	20	1.55	0.00	23.71	21.75	21.75	2.18	2.71	3.16	3.61	4.06	4.55	10.78	14.22	17.88	24.03	34.65	49.60
OS-7	6.47	A	25.0	0.14	0.15	0.16	0.19	0.24	0.30	0.42	300.00	0.020	23.71	300.00	0.006	20	1.55	3.23	26.94	26.91	26.91	1.94	2.41	2.81	3.21	3.61	4.04	1.73	2.29	2.87	3.86	5.57	7.97
OS-8	3.74	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	202.00	0.020	22.07	910.00	0.010	15	1.50	10.11	32.18	40.79	32.18	1.75	2.17	2.53	2.89	3.25	3.64	0.11	0.15	0.21	0.33	0.82	2.03
OS-9	3.14	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	75.00	0.020	13.45	150.00	0.030	15	2.60	0.96	14.41	26.64	14.41	2.68	3.33	3.89	4.44	5.00	5.60	0.14	0.20	0.27	0.43	1.06	2.62
OS-10	3.67	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	125.00	0.020	17.36	630.00	0.016	15	1.90	5.53	22.90	33.71	22.90	2.12	2.63	3.07	3.51	3.95	4.43	0.13	0.18	0.25	0.39	0.98	2.42
OS-11	35.55	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.020	26.90	950.00	0.010	15	1.50	10.56	37.45	41.47	37.45	1.59	1.98	2.30	2.63	2.96	3.32	0.96	1.32	1.78	2.85	7.13	17.58
OS-12	39.29	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.020	26.90	570.00	0.010	15	1.50	6.33	33.23	34.94	33.23	1.71	2.13	2.48	2.83	3.19	3.57	1.14	1.57	2.12	3.39	8.48	20.90
OS-13	10.54	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.020	26.90	360.00	0.010	15	1.50	4.00	30.90	31.34	30.90	1.79	2.22	2.59	2.96	3.33	3.73	0.32	0.44	0.59	0.95	2.38	5.86
OS-14	8.84	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	200.00	0.020	21.96	630.00	0.011	15	1.57	6.67	28.64	35.47	28.64	1.87	2.32	2.71	3.10	3.48	3.90	0.28	0.39	0.52	0.83	2.08	5.14

Calculation of Peak Runoff using Rational Method

Designer: LMS
Company: Atwell, LLC
Date: 5/30/2025
Project: Falcon Highlands
Location: El Paso County, CO

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$t_i = \frac{0.3}{}$ Computed $t_c = t_i + t_t$

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

$t_t =$ Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i+9)}$ Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1-hour rainfall depth, P1 (in) =	1.16	1.44	1.68	1.92	2.16	2.42

Rainfall Intensity Equation Coefficients =	a	b	c
	28.50	10.00	0.786

$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$

$Q(cfs) = CIA$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			Rainfall Intensity, I (in/hr)						Peak Flow, Q (cfs)					
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A-1	4.49	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	200.00	0.020	21.96	1600.00	0.005	10	0.71	37.71	59.67	64.03	59.67	1.18	1.46	1.70	1.95	2.19	2.45	0.09	0.12	0.17	0.27	0.67	1.64
A-2	4.83	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	200.00	0.020	17.76	650.00	0.013	20	2.24	4.84	22.61	27.02	22.61	2.14	2.65	3.10	3.54	3.98	4.46	2.21	2.89	3.58	4.64	6.23	8.24
A-3	2.46	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	200.00	0.020	17.76	625.00	0.013	20	2.24	4.66	22.42	26.75	22.42	2.15	2.66	3.11	3.55	4.00	4.48	1.13	1.48	1.83	2.37	3.19	4.22
A-6	2.75	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	200.00	0.020	17.76	975.00	0.020	20	2.83	5.75	23.51	28.32	23.51	2.09	2.60	3.03	3.46	3.90	4.36	1.23	1.61	2.00	2.59	3.47	4.59
A-4	2.55	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	200.00	0.020	17.76	550.00	0.010	20	2.00	4.58	22.35	26.64	22.35	2.15	2.67	3.11	3.56	4.00	4.49	1.17	1.54	1.90	2.47	3.31	4.38
A-5	3.52	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	100.00	0.020	12.56	700.00	0.010	20	2.00	5.83	18.39	28.44	18.39	2.38	2.96	3.45	3.94	4.44	4.97	1.80	2.35	2.91	3.77	5.06	6.70
B	38.75	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	100.00	0.020	12.56	1900.00	0.005	20	1.41	22.39	34.95	52.27	34.95	1.66	2.06	2.40	2.75	3.09	3.46	13.78	18.02	22.32	28.93	38.81	51.37
C	41.08	A	35.0	0.21	0.23	0.24	0.27	0.32	0.38	0.48	120.00	0.020	13.76	600.00	0.005	20	1.41	7.07	20.83	30.22	20.83	2.23	2.77	3.23	3.70	4.16	4.66	19.65	25.69	31.82	41.25	55.34	73.24
D	8.26	A	65.0	0.48	0.50	0.51	0.54	0.58	0.62	0.67	120.00	0.020	9.49	600.00	0.020	10	1.41	7.07	16.56	18.86	16.56	2.51	3.12	3.64	4.16	4.68	5.24	9.94	12.79	15.42	18.70	22.40	26.67
E	1.41	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	150.00	0.020	19.02	0.00	0.020	10	1.41	0.00	19.02	25.15	19.02	2.34	2.91	3.39	3.88	4.36	4.89	0.06	0.08	0.10	0.17	0.42	1.03
F	5.91	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.020	26.90	240.00	0.020	20	2.83	1.41	28.31	28.07	28.07	1.89	2.35	2.74	3.13	3.52	3.95	0.19	0.26	0.35	0.56	1.41	3.48
G	8.38	A	5.0	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	0.020	26.90	240.00	0.020	20	2.83	1.41	28.31	28.07	28.07	1.89	2.35	2.74	3.13	3.52	3.95	0.27	0.37	0.50	0.80	2.00	4.93
OS-1	6.38	A	34.3	0.21	0.22	0.23	0.27	0.32	0.38	0.48	25.00	0.020	6.32	650.00	0.020	20	2.83	3.83	10.15	25.72	10.15	3.12	3.87	4.52	5.16	5.81	6.51	4.15	5.43	6.73	8.75	11.78	15.66
OS-2	3.12	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51	50.00	0.020	8.46	2180.00	0.020	20	2.83	12.85	21.30	36.80	21.30	2.21	2.74	3.20	3.65	4.11	4.60	1.75	2.29	2.82	3.60	4.70	6.06
OS-3	1.14	A	100.0	0.84	0.86	0.87	0.88	0.88	0.89	0.90	20.00	0.020	1.54	1190.00	0.020	20	2.83	7.01	8.55	15.10	8.55	3.33	4.13	4.82	5.51	6.20	6.95	3.19	4.06	4.80	5.55	6.21	7.04
OS-4	13.09	A	23.8	0.13	0.14	0.15	0.18	0.23	0.30	0.41	80.00	0.020	12.36	2300.00	0.020	20	2.83	13.55	25.91	43.93	25.91	1.98	2.46	2.87	3.28	3.69	4.13	3.36	4.44	5.59	7.56	11.02	15.98
OS-5	59.62	A	40.0	0.25	0.27	0.28	0.32	0.37	0.42	0.51	100.00	0.020	11.96	608.00	0.006	20	1.55	6.54	18.50	28.16	18.50	2.38	2.95	3.44	3.93	4.42	4.96	36.09	47.03	57.92	74.00	96.69	124.58
0S-6	35.75	A	25.0	0.14	0.15	0.16	0.19	0.24	0.30	0.42	300.00	0.020	23.71	0.00	0.006	20	1.55	0.00	23.71	21.75	21.75	2.18	2.71	3.16	3.61	4.06	4.55	10.78	14.22	17.88	24.03	34.65	49.60
OS-7	6.47	A	25.0	0.14	0.15	0.16	0.19	0.24	0.30	0.42	300.00	0.020	23.71	300.00	0.020	20	2.83	1.77	25.48	24.58	24.58	2.04	2.53	2.96	3.38	3.80	4.26	1.82	2.41	3.03	4.07	5.86	8.39

Falcon Highlands South Fil. No. 1 Consolidated A basins for Overall

Project Name: Falcon Highlands South Fil. No. 1 **Prep. By:** Scott Z
Project Number: 24004308 **Date:** 05/29/2025

'A' Basins

Basin	(AC)	Assigned "I"	A x I%	Q_5	Q_{100}
A-1	4.49	5%	0.225	0.12	1.64
A-2	4.83	35%	1.691	2.89	8.24
A-3	2.46	35%	0.861	1.48	4.22
A-4	2.55	35%	0.893	1.54	4.38
A-5	3.52	35%	1.232	2.35	6.70
A-6	2.75	35%	0.963	1.61	4.59
A (consolidated)	**20.60**		5.863		
Total Wtd i%	**28.5%**				
C_5 @ I=28.5%	**0.17**				
C_{100} @ I=28.5%	**0.33**				
		Q_5 Total (additive & conservative)		**9.99**	
		Q_{100} Total (additive & conservative)			**29.77**

Appendix E

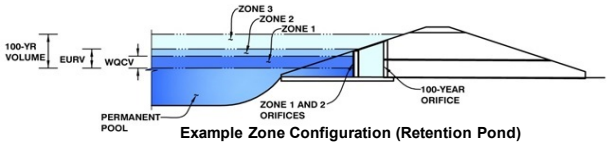
Hydraulic Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 1 Final Condition (Trib Basins = A-6, B, OS-1, OS-2, OS-5)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	110.60	acres
Watershed Length =	3,300	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	65.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.342	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	8.921	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	6.601	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	8.655	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	10.307	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	12.465	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	14.584	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	17.158	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	27.895	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	5.804	acre-feet		
Approximate 5-yr Detention Volume =	7.587	acre-feet		
Approximate 10-yr Detention Volume =	9.146	acre-feet		
Approximate 25-yr Detention Volume =	11.005	acre-feet		
Approximate 50-yr Detention Volume =	12.125	acre-feet		
Approximate 100-yr Detention Volume =	13.293	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.342	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.579	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.372	acre-feet
Total Detention Basin Volume =	13.293	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	100	0.002		
6809	--	1.00	--	--	--	481	0.011	290	0.007
6810	--	2.00	--	--	--	5,991	0.138	3,526	0.081
6811	--	3.00	--	--	--	19,811	0.455	16,427	0.377
6812	--	4.00	--	--	--	43,695	1.003	48,180	1.106
6813	--	5.00	--	--	--	75,314	1.729	107,685	2.472
6814	--	6.00	--	--	--	95,867	2.201	193,275	4.437
6815	--	7.00	--	--	--	106,862	2.453	294,640	6.764
6816	--	8.00	--	--	--	116,032	2.664	406,087	9.322
6817	--	9.00	--	--	--	125,383	2.878	526,794	12.094
6818	--	10.00	--	--	--	127,373	2.924	653,172	14.995
6819	--	11.00	--	--	--	132,451	3.041	783,084	17.977
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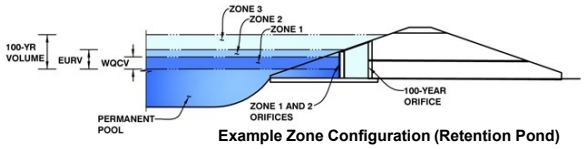
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 1 Final Condition (Trib Basins = A-6, B, OS-1, OS-2, OS-5)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.93	2.342	Orifice Plate
Zone 2 (EURV)	7.85	6.579	Orifice Plate
Zone 3 (100-year)	9.42	4.372	Weir&Pipe (Restrict)
Total (all zones)		13.293	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	8.25	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	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.00	4.00	5.00				
Orifice Area (sq. inches)	6.20	6.20	6.50	30.00				

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.98	N/A	feet
Overflow Weir Front Edge Length =	5.67	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	3.07	N/A	
Horiz. Length of Weir Sides =	2.91	N/A	feet	Overflow Grate Open Area w/o Debris =	11.84	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.92	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.86	N/A	ft^2
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.02	N/A	feet
Restrictor Plate Height Above Pipe Invert =	22.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.06	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.95	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.43	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	12.38	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	3.04	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	17.98	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

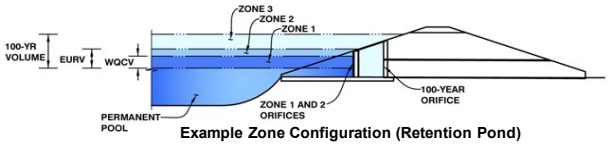
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	2.342	8.921	6.601	8.655	10.307	12.465	14.584	17.158	27.895
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.601	8.655	10.307	12.465	14.584	17.158	27.895
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.7	2.3	21.0	42.0	70.0	181.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.19	0.38	0.63	1.64
Peak Inflow Q (cfs) =	N/A	N/A	113.2	148.1	174.4	222.0	264.6	317.4	518.5
Peak Outflow Q (cfs) =	1.0	3.2	2.7	3.1	3.3	6.9	13.5	23.6	217.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.8	1.4	0.3	0.3	0.3	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.8	1.6	3.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	60	67	72	76	77	76	70
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	64	72	77	82	83	84	81
Maximum Ponding Depth (ft) =	4.93	7.85	6.77	7.56	8.17	8.87	9.42	9.98	10.95
Area at Maximum Ponding Depth (acres) =	1.68	2.63	2.39	2.57	2.70	2.85	2.90	2.92	3.03
Maximum Volume Stored (acre-ft) =	2.353	8.925	6.182	8.171	9.778	11.721	13.278	14.907	17.825

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Highlands

Basin ID: Pond 1 Interim Condition (Trib Basins = A-6, B, OS-1, OS-2, OS-5)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	110.60	acres
Watershed Length =	3,300	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	36.40%	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) =	1.568	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.247	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.144	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	4.260	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	5.156	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	7.047	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	8.851	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	11.232	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	21.174	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	2.693	acre-feet		
Approximate 5-yr Detention Volume =	3.575	acre-feet		
Approximate 10-yr Detention Volume =	4.428	acre-feet		
Approximate 25-yr Detention Volume =	5.527	acre-feet		
Approximate 50-yr Detention Volume =	6.292	acre-feet		
Approximate 100-yr Detention Volume =	7.413	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.568	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.679	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.166	acre-feet
Total Detention Basin Volume =	7.413	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	100	0.002		
6809	--	1.00	--	--	--	481	0.011	290	0.007
6810	--	2.00	--	--	--	5,991	0.138	3,526	0.081
6811	--	3.00	--	--	--	19,811	0.455	16,427	0.377
6812	--	4.00	--	--	--	43,695	1.003	48,180	1.106
6813	--	5.00	--	--	--	75,314	1.729	107,685	2.472
6814	--	6.00	--	--	--	95,867	2.201	193,275	4.437
6815	--	7.00	--	--	--	106,862	2.453	294,640	6.764
6816	--	8.00	--	--	--	116,032	2.664	406,087	9.322
6817	--	9.00	--	--	--	125,383	2.878	526,794	12.094
6818	--	10.00	--	--	--	127,373	2.924	653,172	14.995
6819	--	11.00	--	--	--	132,451	3.041	783,084	17.977
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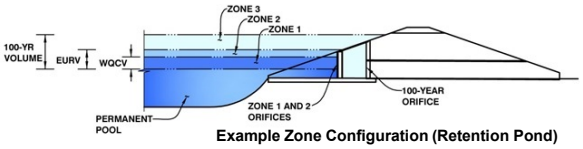
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 1 Interim Condition (Trib Basins = A-6, B, OS-1, OS-2, OS-5)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.41	1.568	Orifice Plate
Zone 2 (EURV)	5.92	2.679	Orifice Plate
Zone 3 (100-year)	7.27	3.166	Weir&Pipe (Restrict)
Total (all zones)		7.413	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	8.25	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	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.0000	2.1700	4.3300	6.50				
Orifice Area (sq. inches)	5.00	5.25	12.00	432.00				
				18x24				
	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	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.98	N/A	feet
Overflow Weir Front Edge Length =	5.67	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	3.07	N/A	
Horiz. Length of Weir Sides =	2.91	N/A	feet	Overflow Grate Open Area w/o Debris =	11.84	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.92	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.86	N/A	ft^2
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.02	N/A	feet
Restrictor Plate Height Above Pipe Invert =	22.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.06	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.95	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.99	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	11.94	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	3.04	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	17.98	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

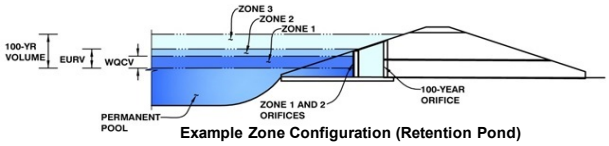
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	1.568	4.247	3.144	4.260	5.156	7.047	8.851	11.232	21.174
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.144	4.260	5.156	7.047	8.851	11.232	21.174
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.7	2.3	21.0	42.0	70.0	181.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.19	0.38	0.63	1.64
Peak Inflow Q (cfs) =	N/A	N/A	39.7	54.2	66.4	102.0	132.3	171.3	321.5
Peak Outflow Q (cfs) =	0.7	1.3	1.1	1.2	1.3	9.2	14.4	19.4	85.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.6	0.4	0.3	0.3	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	65	56	66	74	78	78	77	72
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	60	71	78	84	84	84	83
Maximum Ponding Depth (ft) =	4.41	5.92	5.27	5.81	6.21	6.79	7.29	8.01	10.28
Area at Maximum Ponding Depth (acres) =	1.30	2.16	1.85	2.11	2.25	2.40	2.51	2.66	2.96
Maximum Volume Stored (acre-ft) =	1.578	4.262	2.938	4.027	4.905	6.254	7.459	9.322	15.818

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 2 Final Condition (Trib Basins A1-A6, C, OS-3, OS-6)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	95.87	acres
Watershed Length =	2,400	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	65.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	2.030	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	7.733	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	5.692	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	7.464	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.883	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	10.730	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	12.550	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	14.761	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	19.601	acre-feet		inches
Approximate 2-yr Detention Volume =	5.031	acre-feet		
Approximate 5-yr Detention Volume =	6.577	acre-feet		
Approximate 10-yr Detention Volume =	7.928	acre-feet		
Approximate 25-yr Detention Volume =	9.540	acre-feet		
Approximate 50-yr Detention Volume =	10.511	acre-feet		
Approximate 100-yr Detention Volume =	11.523	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.030	acre-feet
Zone 2 Volume (EURV - Zone 1) =	5.703	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.790	acre-feet
Total Detention Basin Volume =	11.523	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	500	0.011		
6812	--	1.00	--	--	--	9,560	0.219	5,030	0.115
6813	--	2.00	--	--	--	23,667	0.543	21,643	0.497
6814	--	3.00	--	--	--	39,889	0.916	53,421	1.226
6815	--	4.00	--	--	--	54,887	1.260	100,809	2.314
6816	--	5.00	--	--	--	61,598	1.414	159,052	3.651
6817	--	6.00	--	--	--	67,152	1.542	223,427	5.129
6818	--	7.00	--	--	--	72,897	1.673	293,451	6.737
6819	--	8.00	--	--	--	78,830	1.810	369,315	8.478
6820	--	9.00	--	--	--	85,054	1.953	451,257	10.359
6821	--	10.00	--	--	--	93,672	2.150	540,620	12.411
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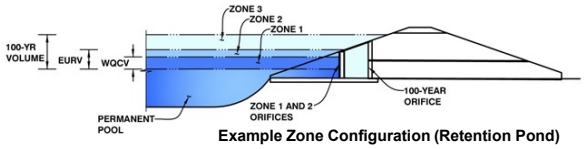
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 2 Final Condition (Trib Basins A1-A6, C, OS-3, OS-6)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.77	2.030	Orifice Plate
Zone 2 (EURV)	7.59	5.703	Orifice Plate
Zone 3 (100-year)	9.58	3.790	Weir&Pipe (Restrict)
Total (all zones)		11.523	

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 =		ft^2
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	ft^2
Depth at top of Zone using Orifice Plate =	8.00	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	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.0000	2.8333	5.6667					
Orifice Area (sq. inches)	10.50	12.50	60.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	9.46	N/A	feet
Overflow Weir Front Edge Length =	5.67	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	3.35	N/A	
Horiz. Length of Weir Sides =	5.82	N/A	feet	Overflow Grate Open Area w/o Debris =	23.67	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	11.84	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.07	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.50	N/A	feet
Restrictor Plate Height Above Pipe Invert =	36.00		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=	9.95	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.68 feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	12.63 feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	2.15 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	12.41 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

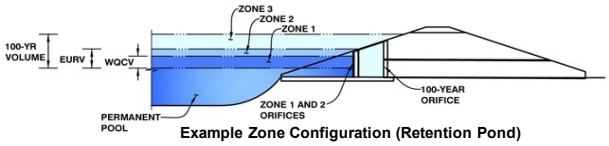
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	2.030	7.733	5.692	7.464	8.883	10.730	12.550	14.761	19.601
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.692	7.464	8.883	10.730	12.550	14.761	19.601
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.6	2.2	20.0	39.7	64.7	116.4
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	0.21	0.41	0.68	1.21
Peak Inflow Q (cfs) =	N/A	N/A	102.4	133.8	157.0	198.1	236.0	285.0	379.4
Peak Outflow Q (cfs) =	1.1	4.6	3.0	4.2	4.9	9.5	17.7	31.6	35.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.7	2.2	0.5	0.4	0.5	0.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	1.1	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	64	68	70	71	71	70	67
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	68	73	76	78	78	78	78
Maximum Ponding Depth (ft) =	3.77	7.59	6.14	7.12	7.87	8.70	9.26	9.89	10.00
Area at Maximum Ponding Depth (acres) =	1.18	1.75	1.56	1.69	1.79	1.91	2.00	2.13	2.15
Maximum Volume Stored (acre-ft) =	2.034	7.748	5.346	6.922	8.226	9.780	10.874	12.154	12.411

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 2 Interim Condition (Trib Basins A1-A6, C, OS-3, OS-6)**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	95.87	acres
Watershed Length =	2,400	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	32.90%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
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) =	1.280	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.235	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.323	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.173	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.871	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.501	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	7.031	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	9.070	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	13.440	acre-feet		inches
Approximate 2-yr Detention Volume =	2.042	acre-feet		
Approximate 5-yr Detention Volume =	2.718	acre-feet		
Approximate 10-yr Detention Volume =	3.382	acre-feet		
Approximate 25-yr Detention Volume =	4.248	acre-feet		
Approximate 50-yr Detention Volume =	4.874	acre-feet		
Approximate 100-yr Detention Volume =	5.840	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.280	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.955	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.605	acre-feet
Total Detention Basin Volume =	5.840	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	500	0.011		
6812	--	1.00	--	--	--	9,560	0.219	5,030	0.115
6813	--	2.00	--	--	--	23,667	0.543	21,643	0.497
6814	--	3.00	--	--	--	39,889	0.916	53,421	1.226
6815	--	4.00	--	--	--	54,887	1.260	100,809	2.314
6816	--	5.00	--	--	--	61,598	1.414	159,052	3.651
6817	--	6.00	--	--	--	67,152	1.542	223,427	5.129
6818	--	7.00	--	--	--	72,897	1.673	293,451	6.737
6819	--	8.00	--	--	--	78,830	1.810	369,315	8.478
6820	--	9.00	--	--	--	85,054	1.953	451,257	10.359
6821	--	10.00	--	--	--	93,672	2.150	540,620	12.411
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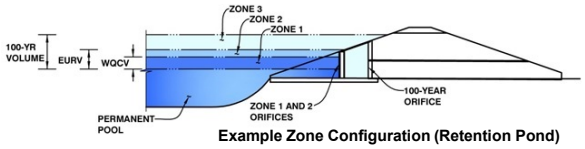
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Falcon Highlands**

Basin ID: **Pond 2 Final Condition (Trib Basins A1-A6, C, OS-3, OS-6)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.77	2.030	Orifice Plate
Zone 2 (EURV)	7.59	5.703	Orifice Plate
Zone 3 (100-year)	9.58	3.790	Weir&Pipe (Restrict)
Total (all zones)		11.523	

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 =		ft^2
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	ft^2
Depth at top of Zone using Orifice Plate =	8.00	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	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.0000	2.8333	5.6667					
Orifice Area (sq. inches)	10.50	12.50	60.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	9.46	N/A	feet
Overflow Weir Front Edge Length =	5.67	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	3.35	N/A	
Horiz. Length of Weir Sides =	5.82	N/A	feet	Overflow Grate Open Area w/o Debris =	23.67	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	11.84	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.07	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.50	N/A	feet
Restrictor Plate Height Above Pipe Invert =	36.00		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=	9.95	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.68 feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	12.63 feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	2.15 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	12.41 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	2.030	7.733	5.692	7.464	8.883	10.730	12.550	14.761	19.601
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.692	7.464	8.883	10.730	12.550	14.761	19.601
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.6	2.2	20.0	39.7	64.7	116.4
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	0.21	0.41	0.68	1.21
Peak Inflow Q (cfs) =	N/A	N/A	102.4	133.8	157.0	198.1	236.0	285.0	379.4
Peak Outflow Q (cfs) =	1.1	4.6	3.0	4.2	4.9	9.5	17.7	31.6	35.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.7	2.2	0.5	0.4	0.5	0.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	1.1	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	64	68	70	71	71	70	67
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	68	73	76	78	78	78	78
Maximum Ponding Depth (ft) =	3.77	7.59	6.14	7.12	7.87	8.70	9.26	9.89	10.00
Area at Maximum Ponding Depth (acres) =	1.18	1.75	1.56	1.69	1.79	1.91	2.00	2.13	2.15
Maximum Volume Stored (acre-ft) =	2.034	7.748	5.346	6.922	8.226	9.780	10.874	12.154	12.411

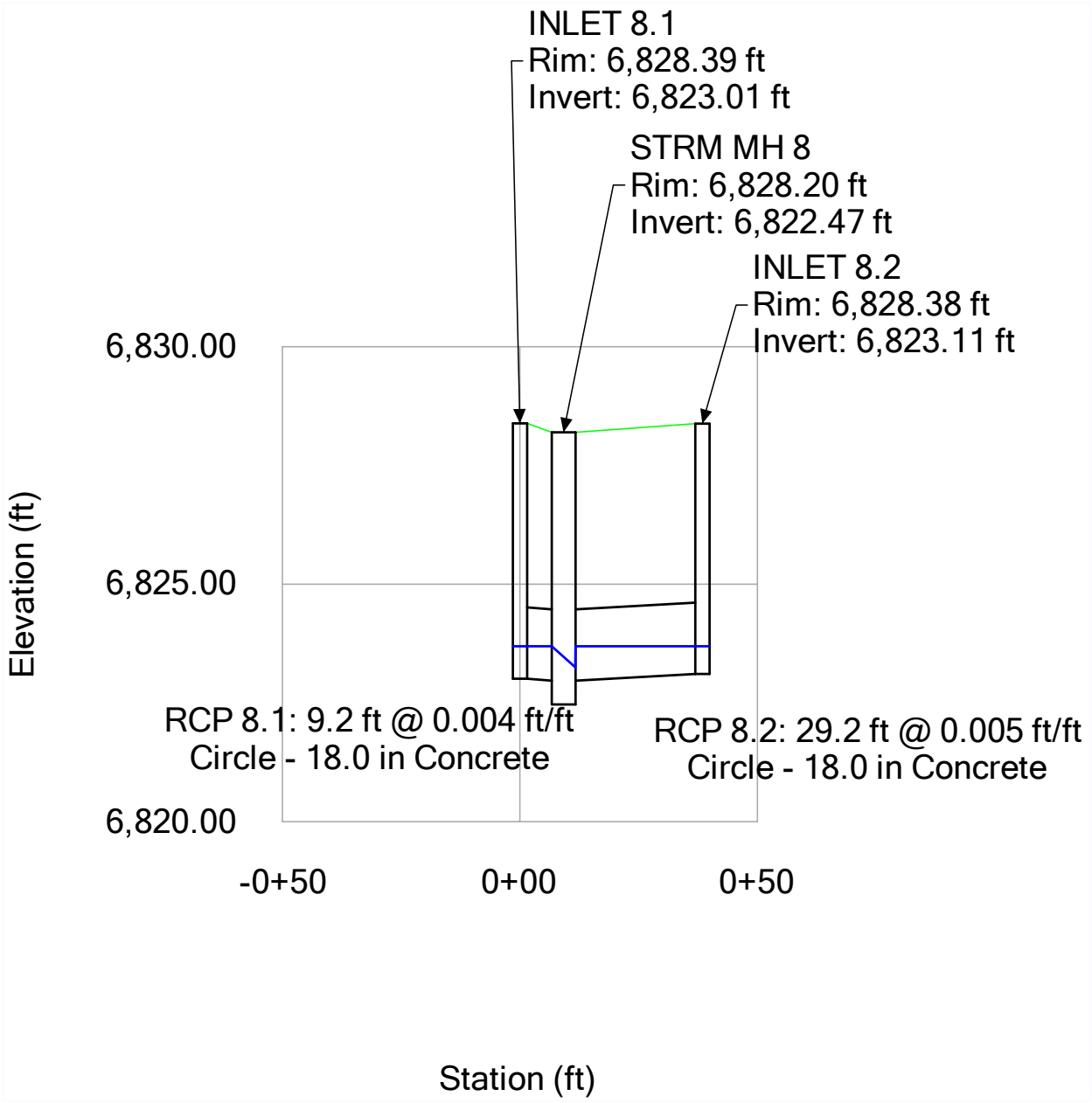
INLET 8.2
RCP 6
RCP 5
INLET 8.1
STRM MH 8
RCP 4
RCP 8
INLET 7.2
RCP 9
STRM MH 7
INLET 7.1
RCP 7
STRM MH 5
MH-19
RCP 6
STRM MH 7
RCP 10
STRM MH 8
RCP 11
STRM MH 9
RCP 12
STRM MH 10
RCP 13
P2 OUTFALL 1
MH-12
CO-13
P2 OUTFALL 2
Pond 2 Outlet
CO-20
Pond 2 outfall
MH-8
CO-9
P1 OUTFALL 1
MH-10
CO-10
P1 OUTFALL 3
POND 1 OUTLET
CO-19
MH-7

FlexTable: Conduit Table

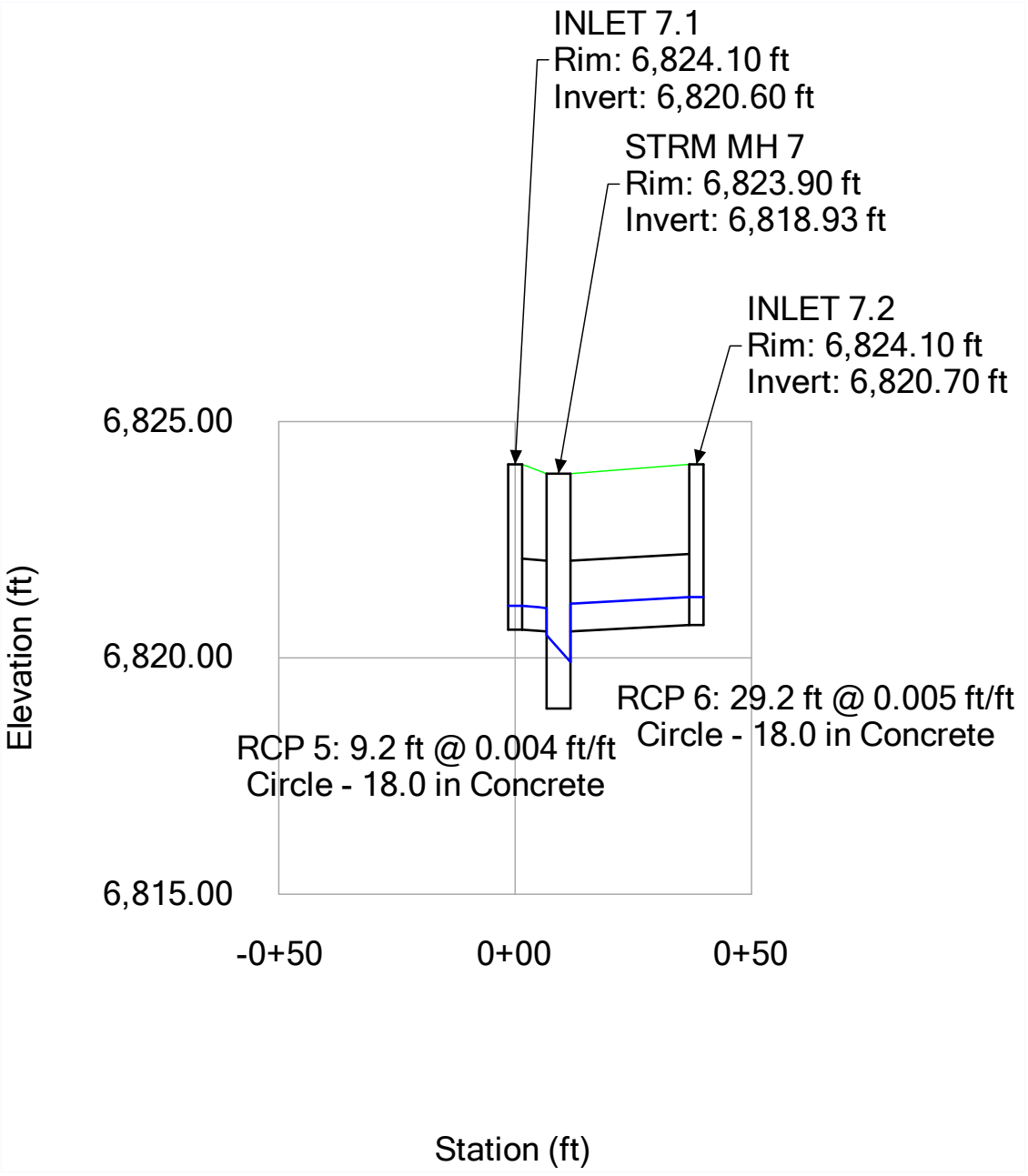
Active Scenario: 5-year

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Flow (cfs)	Length (3D) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
RCP 8.3	STRM MH 8	STRM MH 7	6,822.47	6,819.43	4.91	239.1	0.013	24.0	0.013	6.25	6,823.25	6,820.48
RCP 6	INLET 7.2	STRM MH 7	6,820.70	6,820.56	2.39	23.8	0.005	18.0	0.013	3.69	6,821.29	6,821.14
RCP 5	INLET 7.1	STRM MH 7	6,820.60	6,820.56	1.68	11.9	0.004	18.0	0.013	3.24	6,821.10	6,821.05
RCP 10	STRM MH 7	STRM MH 8	6,814.83	6,814.36	8.49	94.9	0.005	48.0	0.013	4.90	6,815.68	6,815.14
RCP 11	STRM MH 8	STRM MH 9	6,814.26	6,812.98	8.43	254.8	0.005	48.0	0.013	4.90	6,815.10	6,813.76
RCP 12	STRM MH 9	STRM MH 10	6,812.88	6,812.53	8.29	71.7	0.005	48.0	0.013	4.84	6,813.72	6,813.31
RCP 13	STRM MH 10	P2 INFALL 1	6,812.03	6,811.13	8.25	192.4	0.005	54.0	0.013	4.81	6,812.84	6,812.53
P1-INFALL 1-PIPE	FUT STUB #1	FUT INFALL 1	6,809.77	6,809.56	21.56	63.4	0.005	36.0	0.013	3.05	6,813.85	6,813.81
P1-INFALL 2-PIPE	FUT STUB #2	FUT INFALL 2	6,813.10	6,812.85	23.88	191.7	0.005	36.0	0.013	6.69	6,814.67	6,814.36
P2 INFALL 2	FUT STUB #3	FUT INFALL 3	6,811.90	6,811.54	16.56	93.7	0.005	36.0	0.013	6.09	6,813.20	6,812.78
RCP 7	STRM MH 7	STRM MH 5	6,818.93	6,817.91	8.81	206.7	0.005	30.0	0.013	5.19	6,819.92	6,818.85
RCP 8.1	INLET 8.1	STRM MH 8	6,823.01	6,822.97	3.25	13.3	0.004	18.0	0.013	3.86	6,823.70	6,823.69
RCP 8.2	INLET 8.2	STRM MH 8	6,823.11	6,822.97	1.66	30.3	0.005	18.0	0.013	3.34	6,823.70	6,823.69
P1 OUTFALL PIPE	POND 1 OUTLET	O-7	6,807.63	6,806.40	2.10	123.1	0.010	30.0	0.013	4.39	6,808.10	6,806.78
P2 OUTFALL PIPE	Pond 2 Outlet	Pond 2 outfall	6,810.80	6,810.05	2.00	129.6	0.006	36.0	0.013	3.53	6,811.24	6,810.45
8	STRM MH 5	MH-19	6,817.41	6,817.15	8.68	31.8	0.005	36.0	0.013	5.09	6,818.34	6,818.02
9	MH-19	STRM MH 7	6,817.05	6,815.83	8.64	265.2	0.005	36.0	0.013	5.07	6,817.98	6,816.70

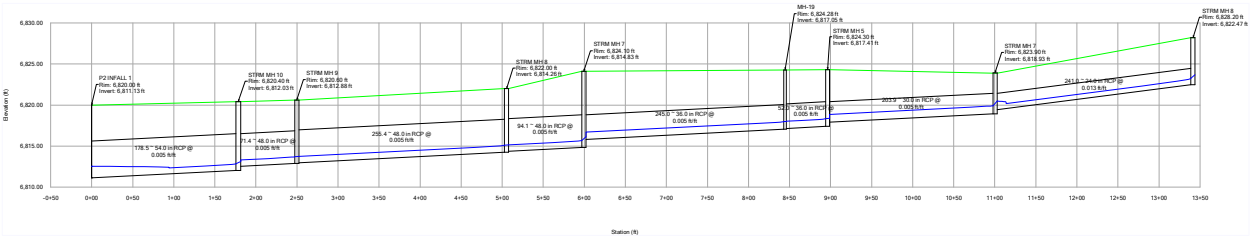
Profile Report
Engineering Profile - STORM RUN 1.1 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



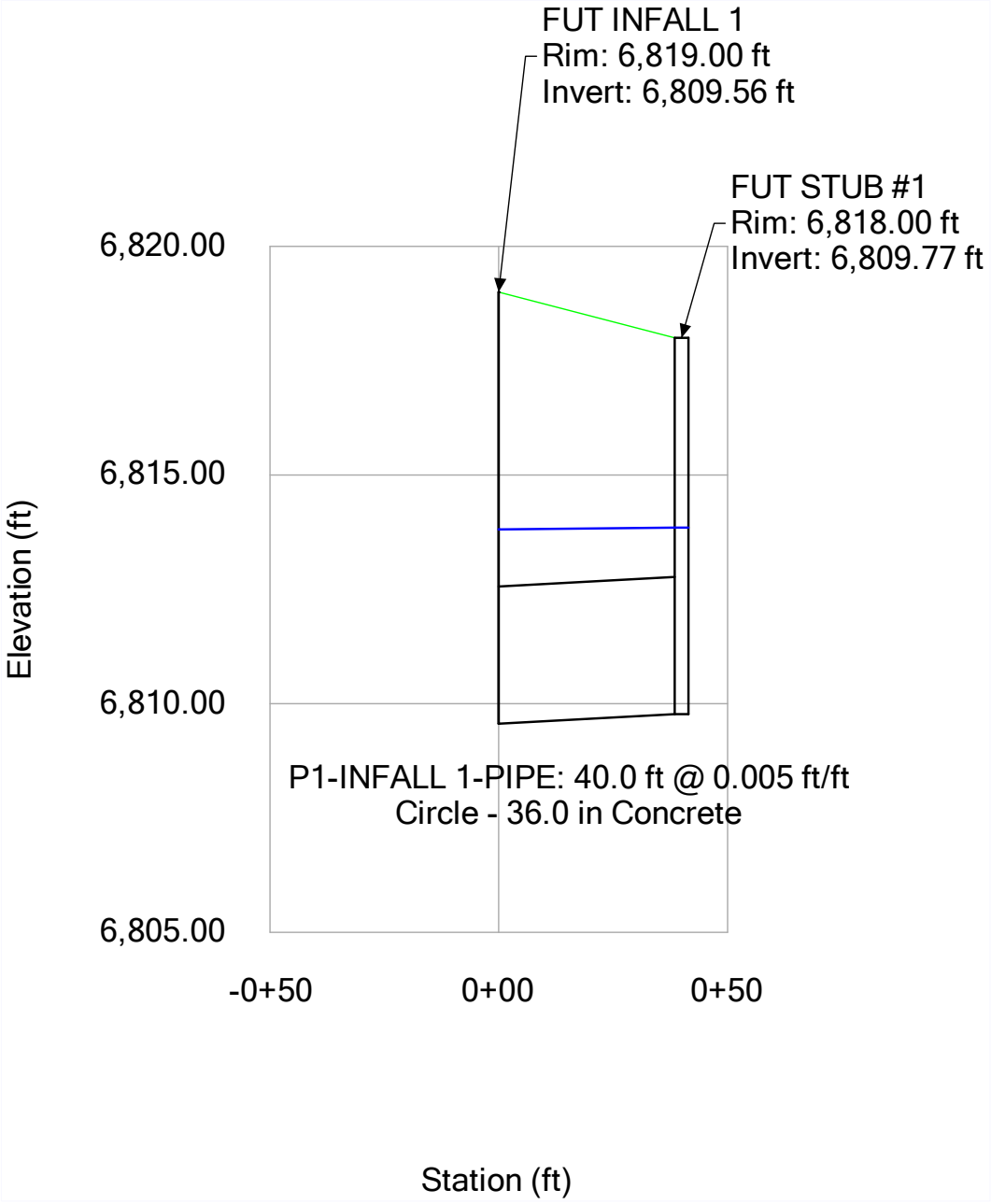
Profile Report
Engineering Profile - STORM RUN 1.2 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



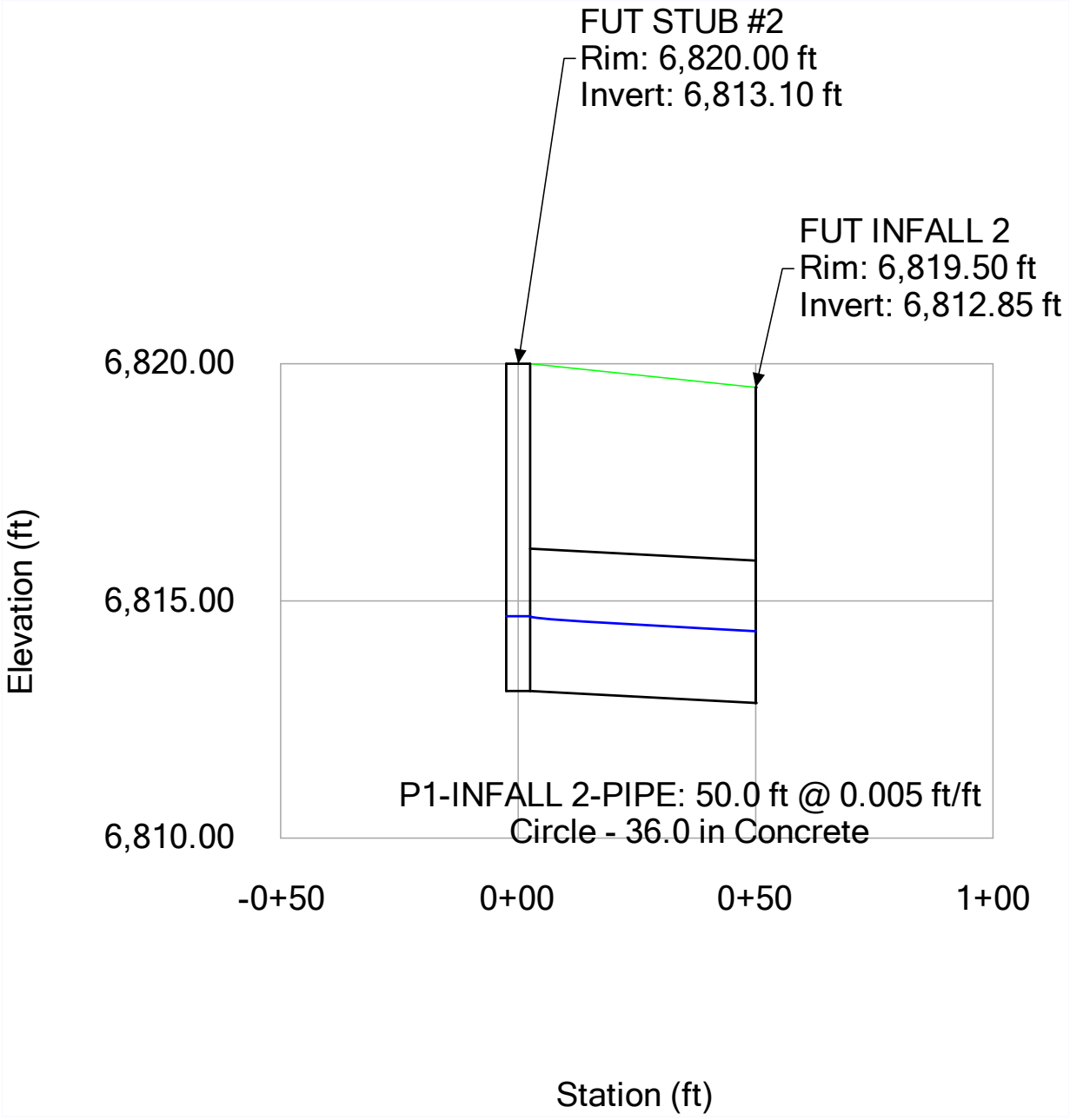
Profile Report
Engineering Profile - STORM RUN 1 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



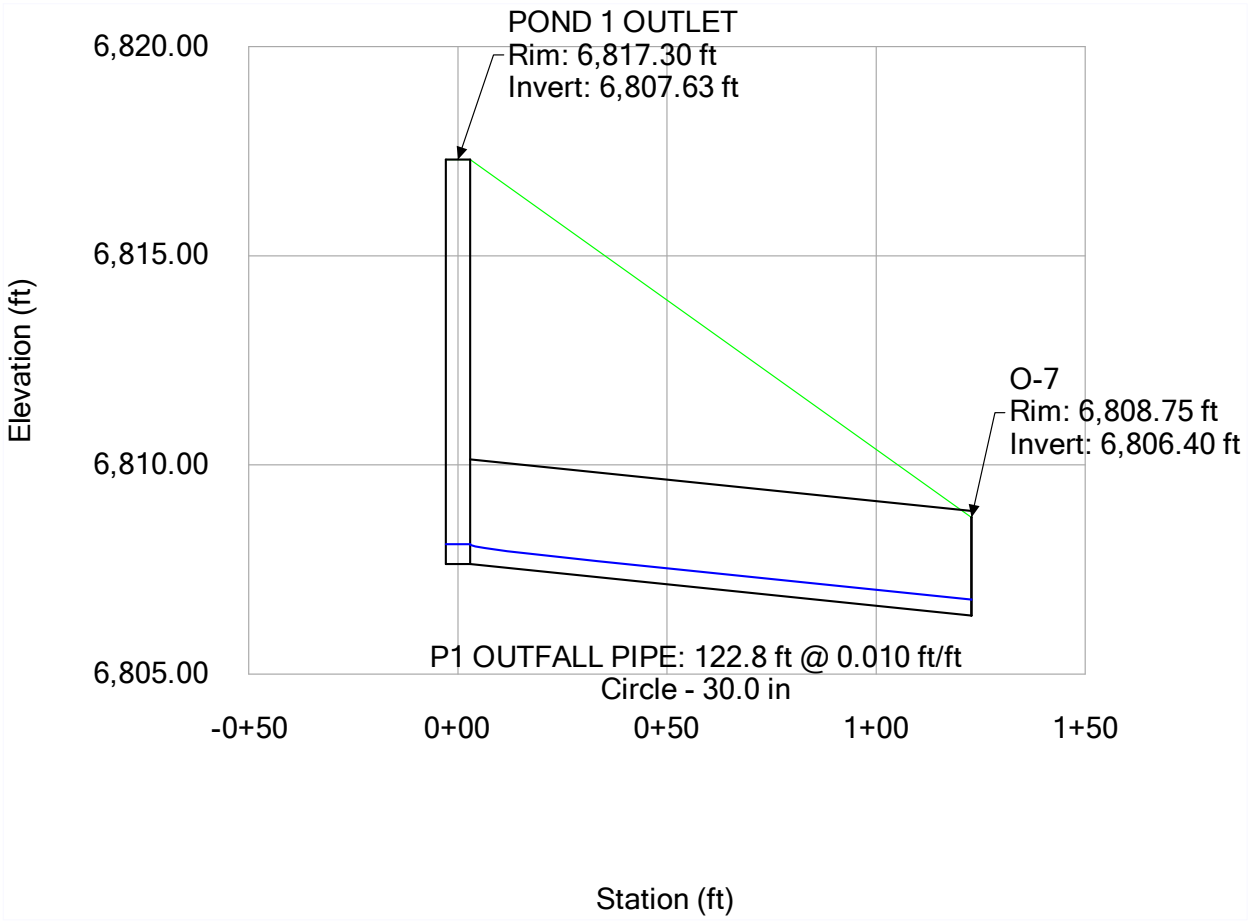
Profile Report
Engineering Profile - POND 1-INLET 1 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



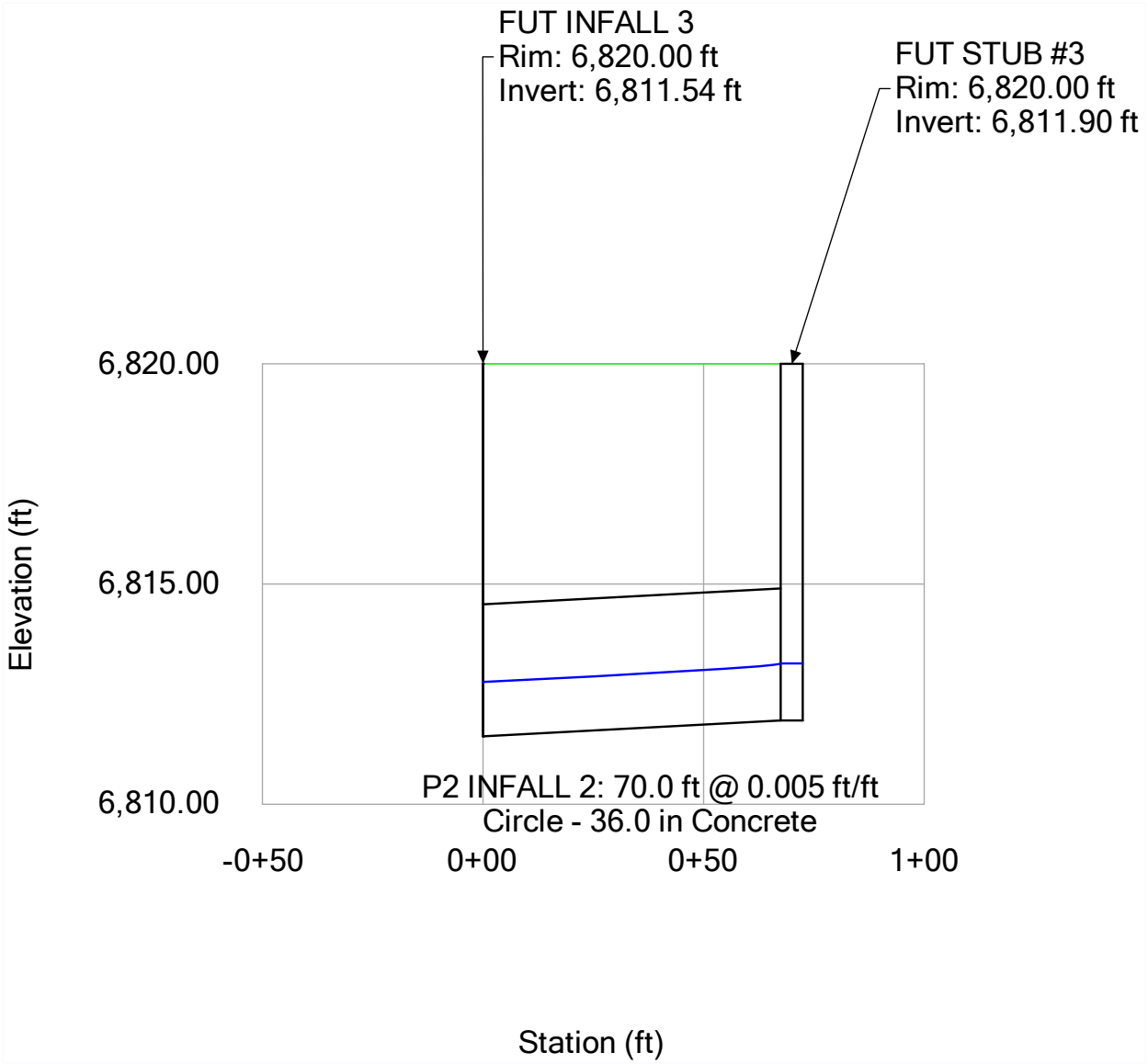
Profile Report
Engineering Profile - POND 1-INLET 2 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



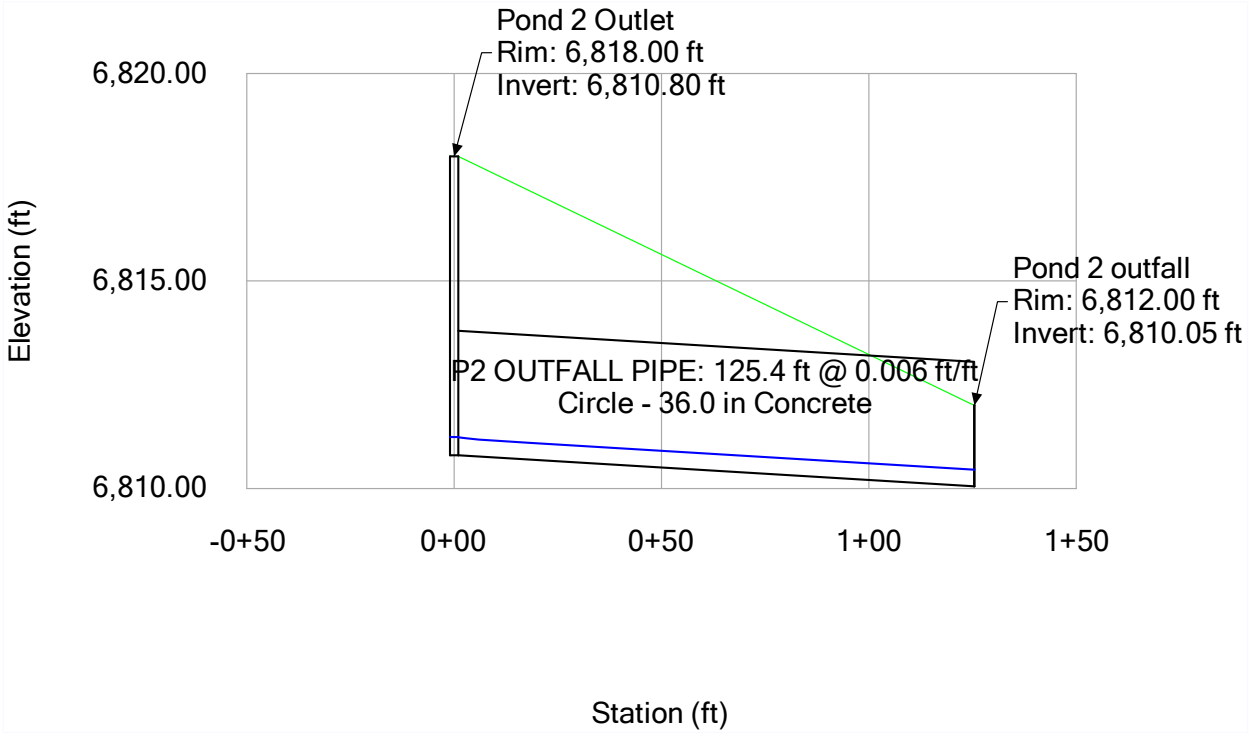
Profile Report
Engineering Profile - POND 1 OUTFALL (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



Profile Report
Engineering Profile - pond 2 inlet 2 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year



Profile Report
Engineering Profile - pond 2 oufall (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 5-year

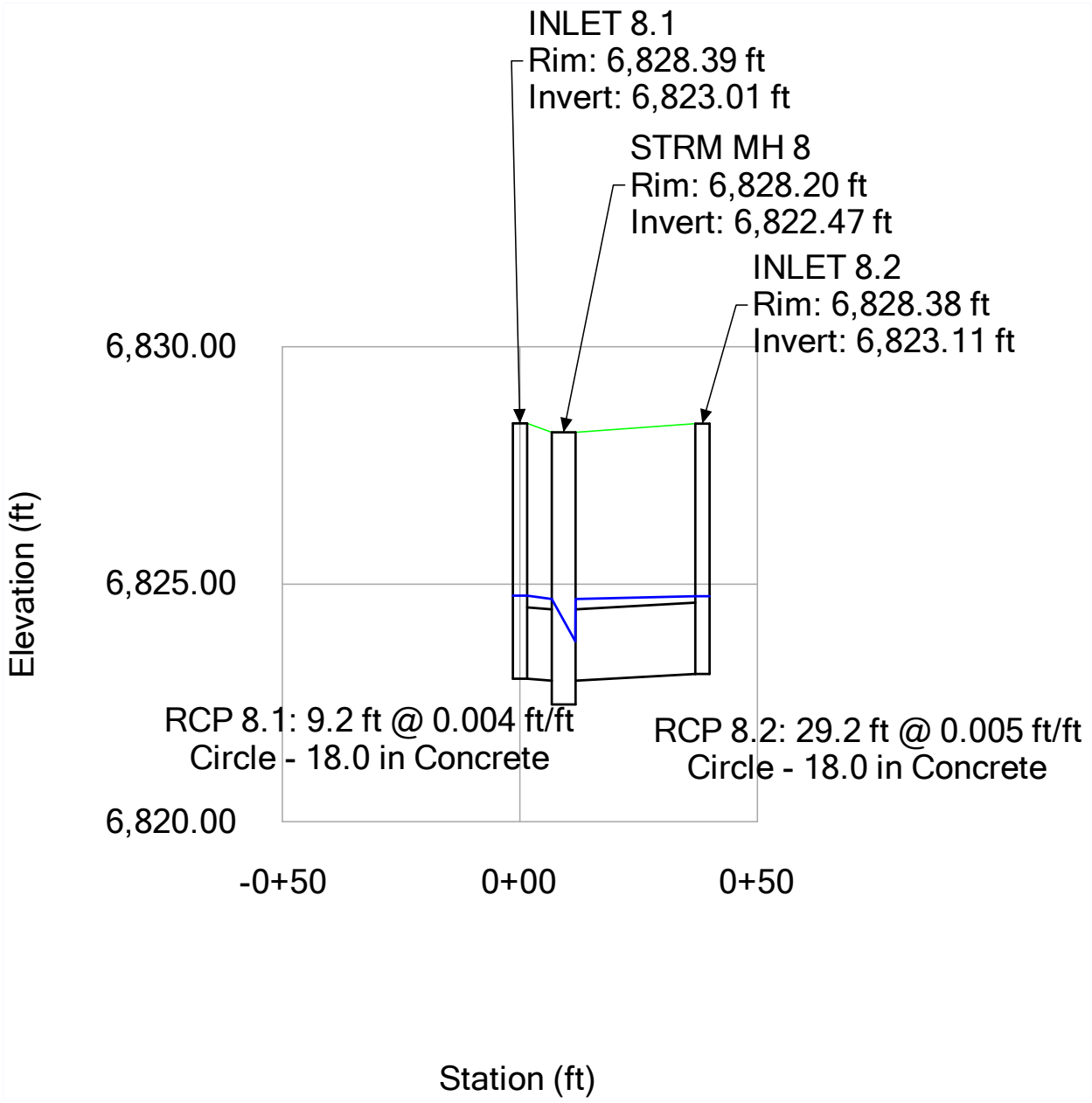


FlexTable: Conduit Table

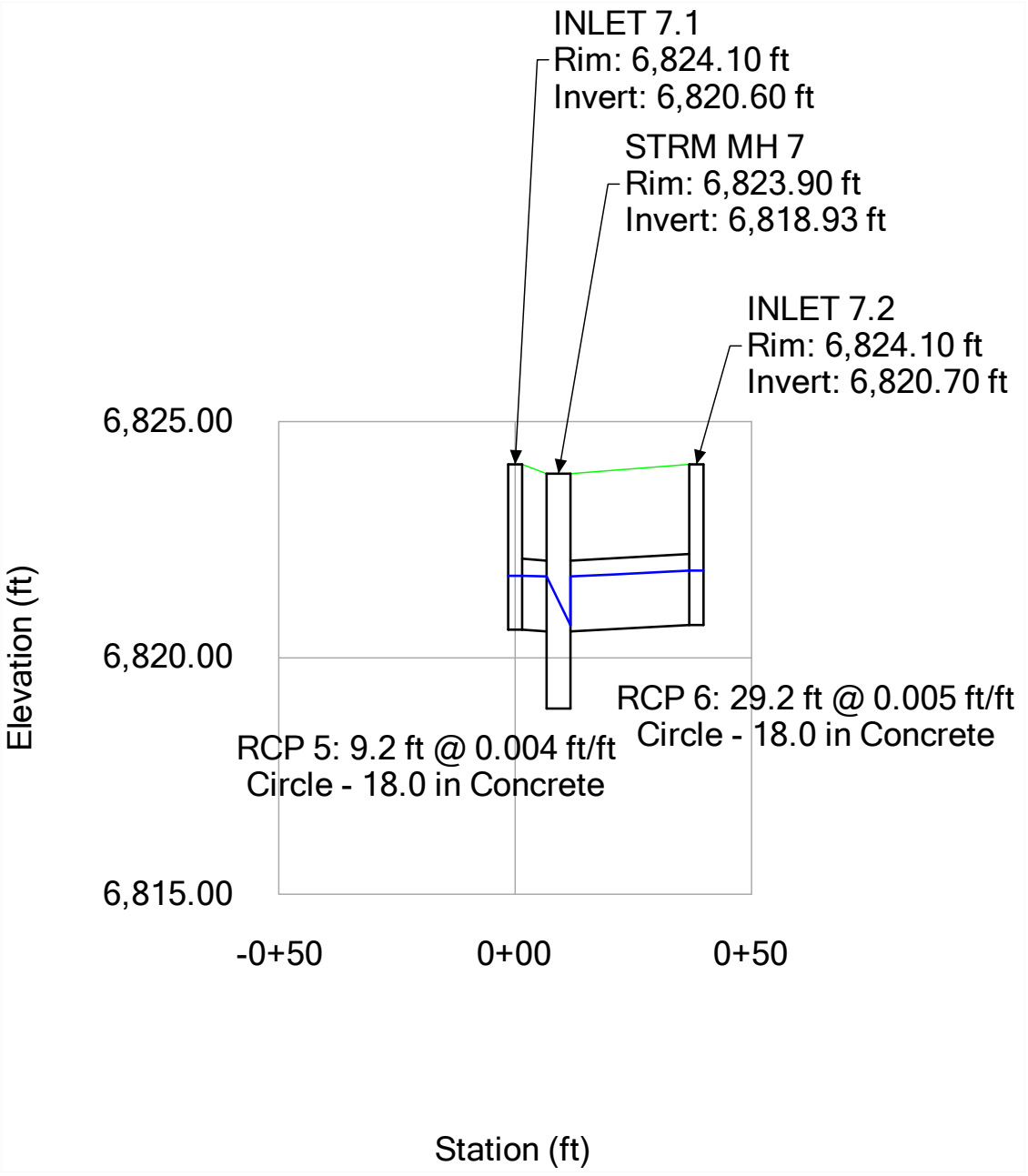
Active Scenario: 100-year

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Flow (cfs)	Length (3D) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
RCP 8.3	STRM MH 8	STRM MH 7	6,822.47	6,819.43	13.62	239.1	0.013	24.0	0.013	8.23	6,823.80	6,821.73
RCP 6	INLET 7.2	STRM MH 7	6,820.70	6,820.56	6.62	23.8	0.005	18.0	0.013	4.67	6,821.85	6,821.73
RCP 5	INLET 7.1	STRM MH 7	6,820.60	6,820.56	4.67	11.9	0.004	18.0	0.013	4.21	6,821.74	6,821.73
RCP 10	STRM MH 7	STRM MH 8	6,814.83	6,814.36	23.76	94.9	0.005	48.0	0.013	1.89	6,819.00	6,818.98
RCP 11	STRM MH 8	STRM MH 9	6,814.26	6,812.98	23.35	254.8	0.005	48.0	0.013	1.86	6,818.97	6,818.90
RCP 12	STRM MH 9	STRM MH 10	6,812.88	6,812.53	22.27	71.7	0.005	48.0	0.013	1.77	6,818.90	6,818.88
RCP 13	STRM MH 10	P2 INFALL 1	6,812.03	6,811.13	21.95	192.4	0.005	54.0	0.013	1.38	6,818.85	6,818.83
P1-INFALL 1-PIPE	FUT STUB #1	FUT INFALL 1	6,809.77	6,809.56	47.45	63.4	0.005	36.0	0.013	6.71	6,816.59	6,816.39
P1-INFALL 2-PIPE	FUT STUB #2	FUT INFALL 2	6,813.10	6,812.85	64.88	191.7	0.005	36.0	0.013	9.18	6,816.86	6,816.39
P2 INFALL 2	FUT STUB #3	FUT INFALL 3	6,811.90	6,811.54	50.49	93.7	0.005	36.0	0.013	7.14	6,819.23	6,818.83
RCP 7	STRM MH 7	STRM MH 5	6,818.93	6,817.91	24.46	206.7	0.005	30.0	0.013	6.63	6,820.69	6,819.60
RCP 8.1	INLET 8.1	STRM MH 8	6,823.01	6,822.97	9.03	13.3	0.004	18.0	0.013	5.11	6,824.76	6,824.69
RCP 8.2	INLET 8.2	STRM MH 8	6,823.11	6,822.97	4.62	30.3	0.005	18.0	0.013	2.61	6,824.75	6,824.69
P1 OUTFALL PIPE	POND 1 OUTLET	O-7	6,807.63	6,806.40	17.00	123.1	0.010	30.0	0.013	7.97	6,809.02	6,807.52
P2 OUTFALL PIPE	Pond 2 Outlet	Pond 2 outfall	6,810.80	6,810.05	20.40	129.6	0.006	36.0	0.013	6.87	6,812.25	6,811.36
8	STRM MH 5	MH-19	6,817.41	6,817.15	24.17	31.8	0.005	36.0	0.013	6.71	6,819.35	6,819.33
9	MH-19	STRM MH 7	6,817.05	6,815.83	24.10	265.2	0.005	36.0	0.013	6.70	6,819.31	6,819.09

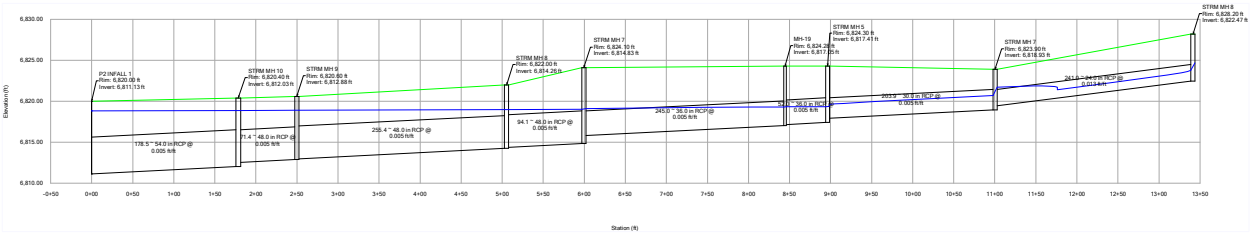
Profile Report
Engineering Profile - STORM RUN 1.1 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



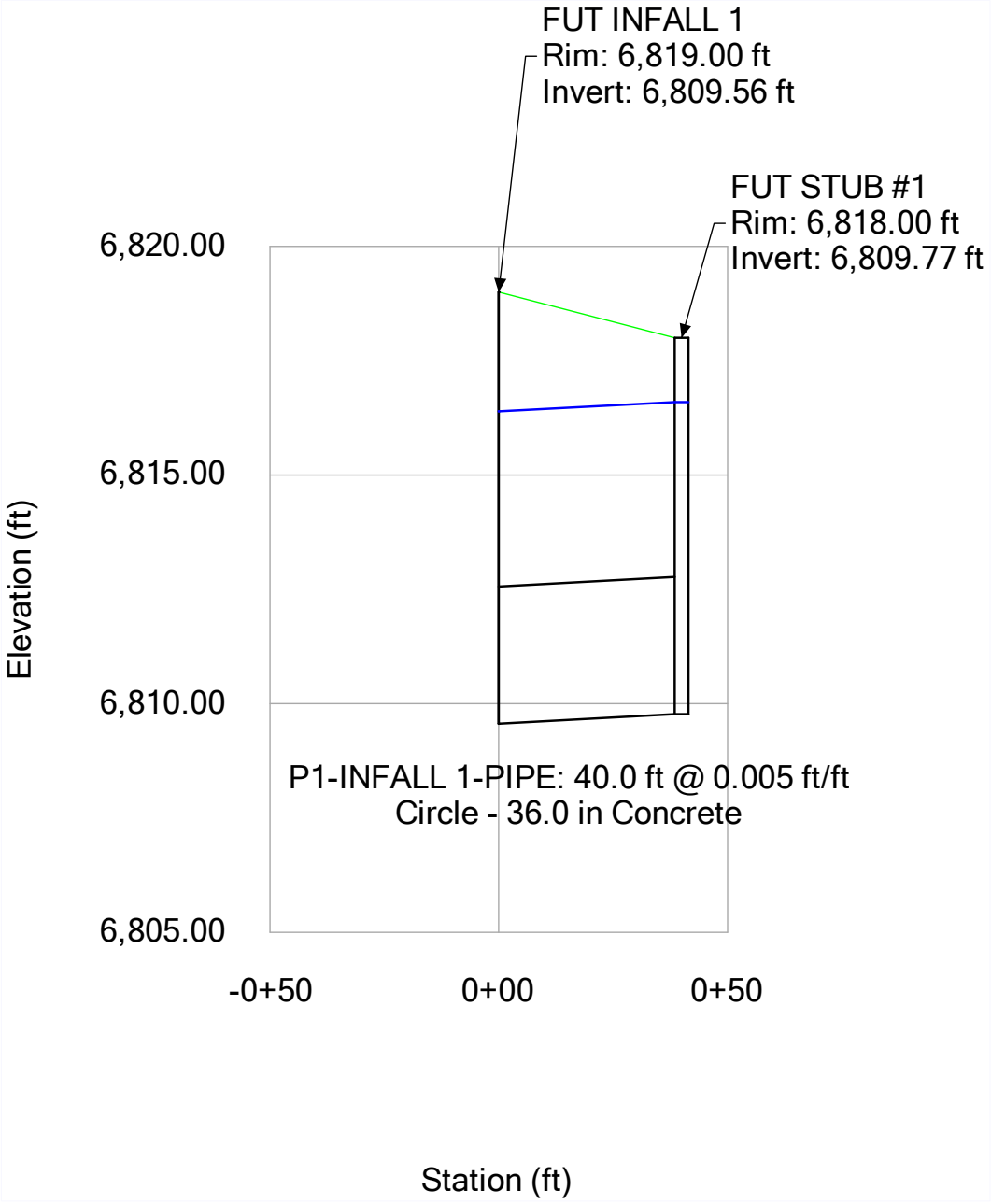
Profile Report
Engineering Profile - STORM RUN 1.2 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



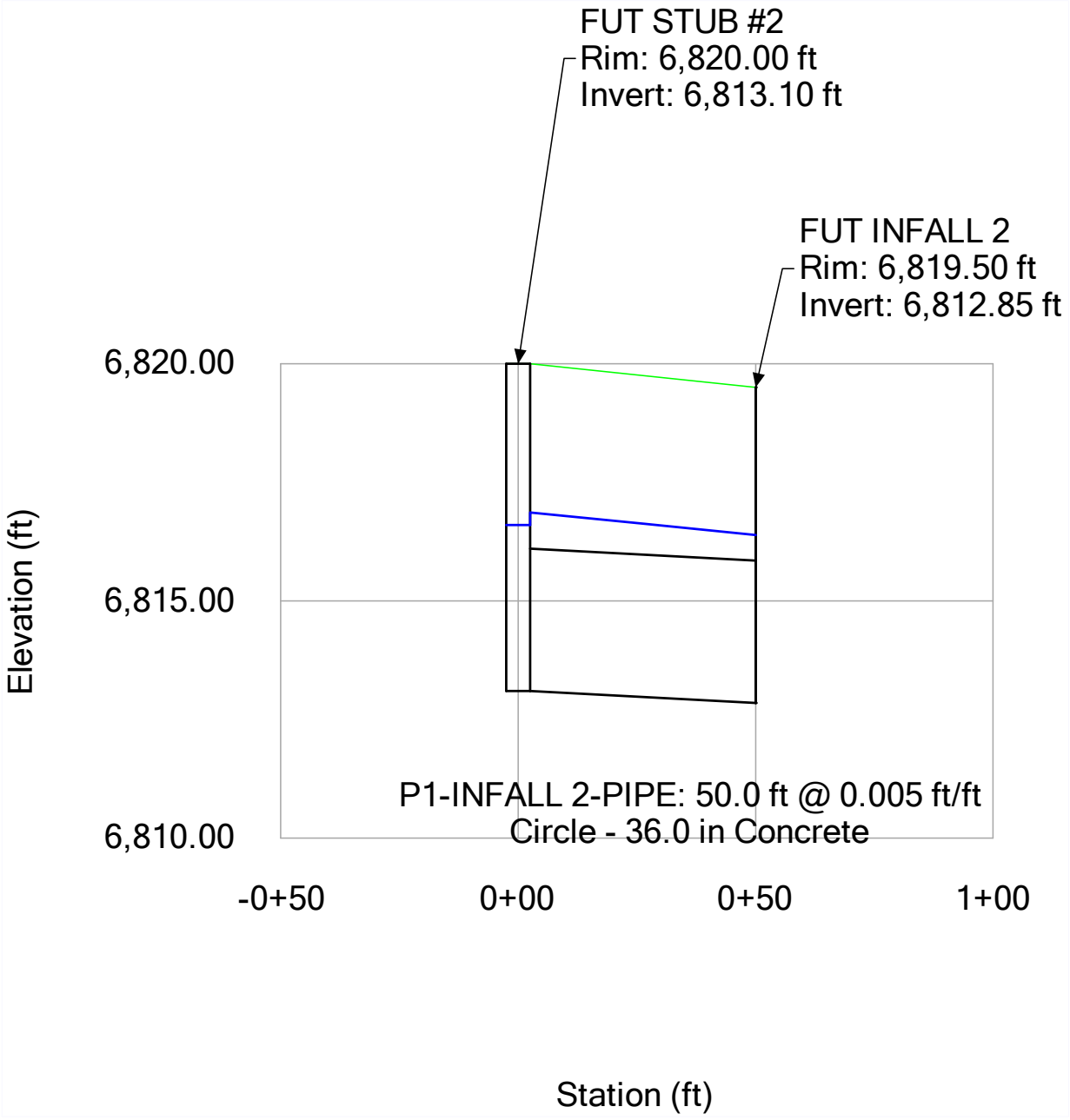
Profile Report
Engineering Profile - STORM RUN 1 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



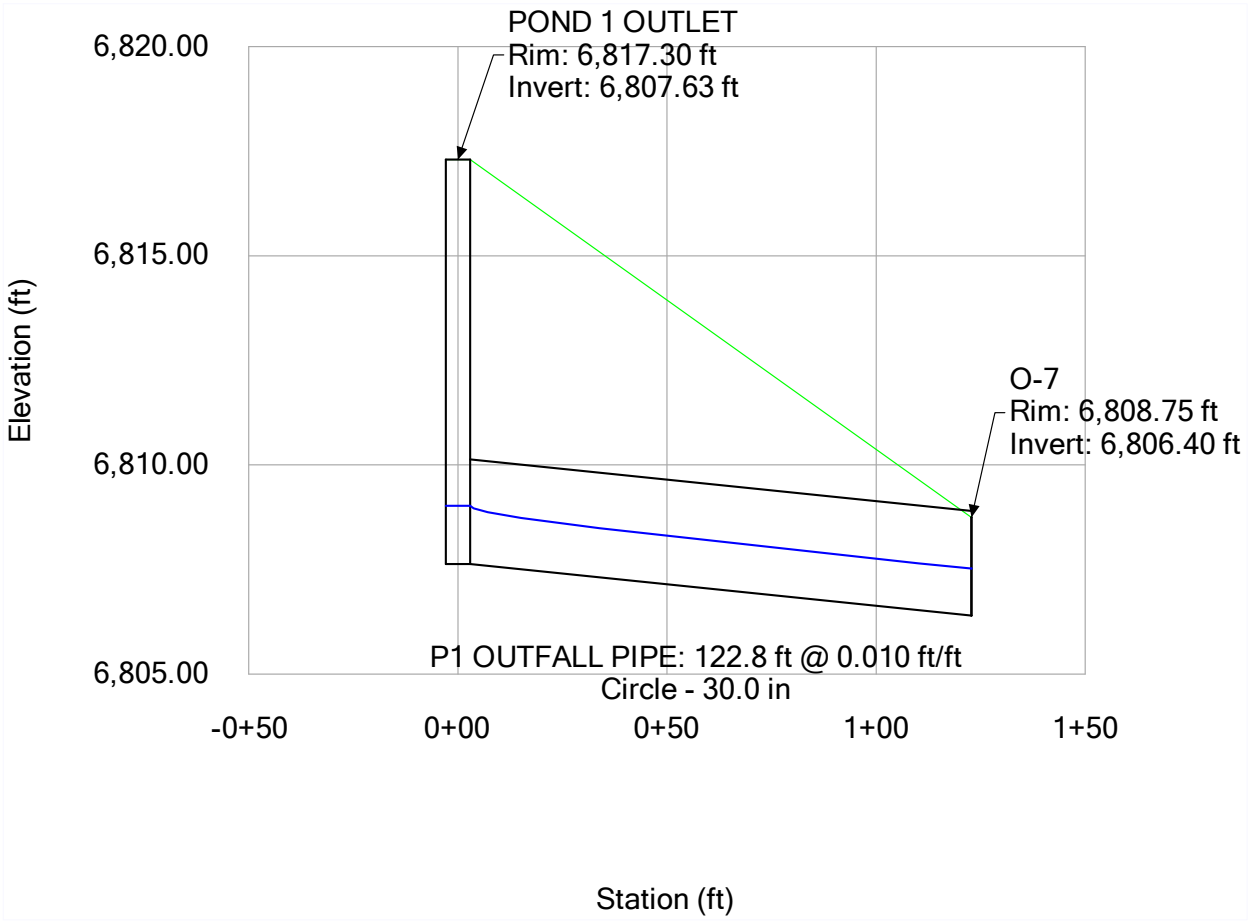
Profile Report
Engineering Profile - POND 1-INLET 1 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



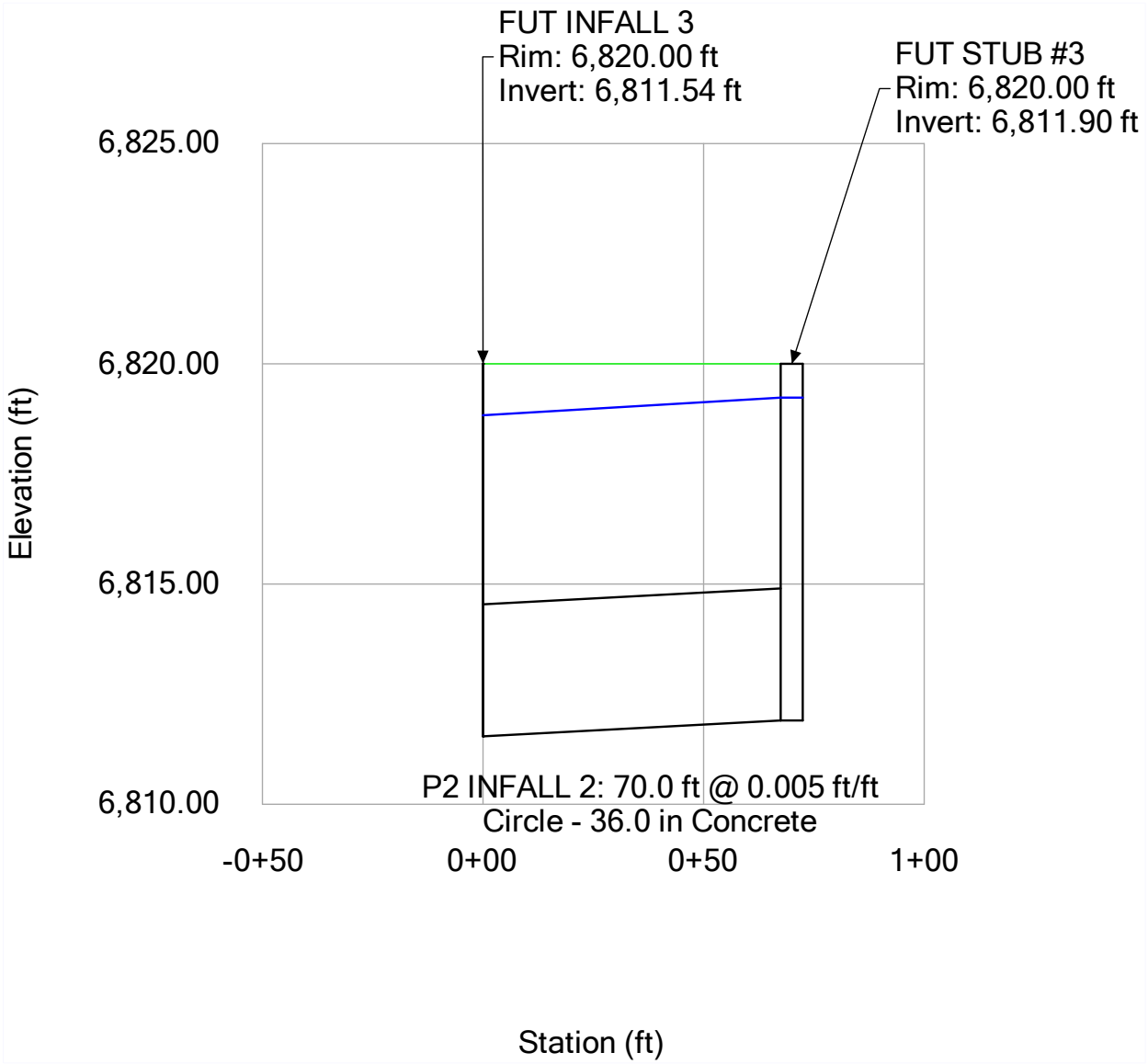
Profile Report
Engineering Profile - POND 1-INLET 2 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



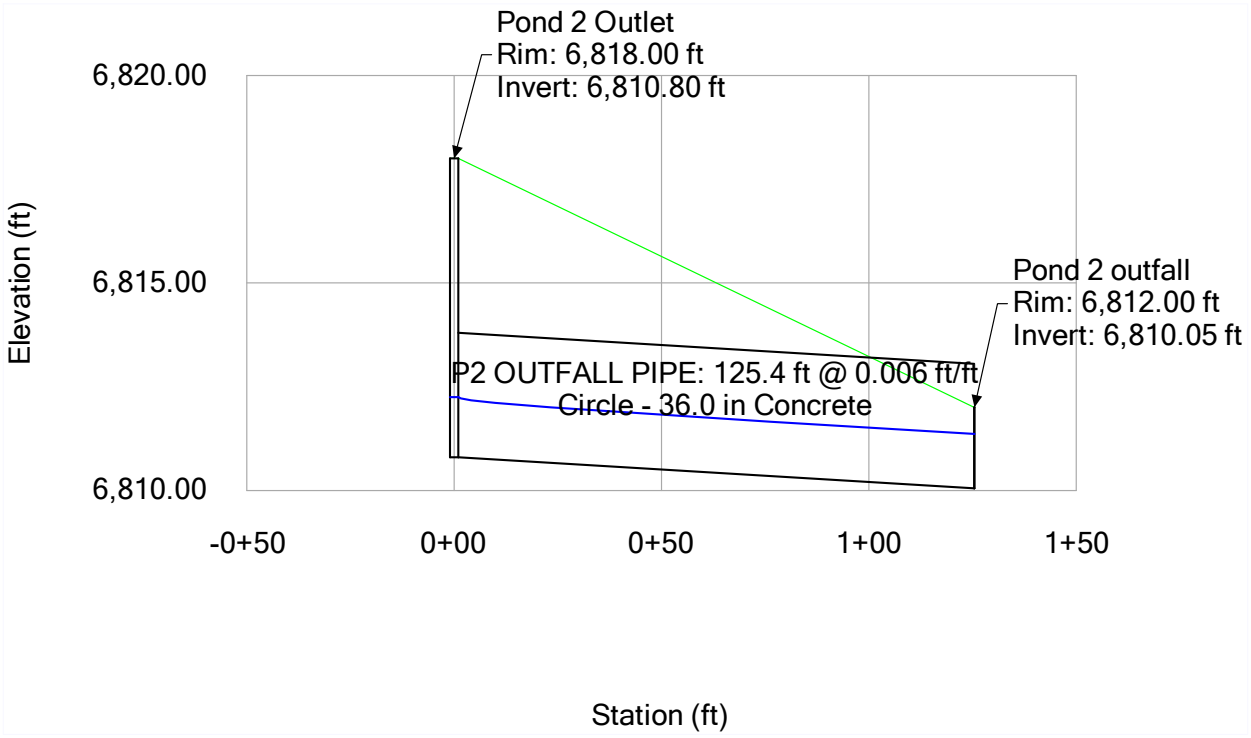
Profile Report
Engineering Profile - POND 1 OUTFALL (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



Profile Report
Engineering Profile - pond 2 inlet 2 (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



Profile Report
Engineering Profile - pond 2 oufall (24004308-StormCAD-2024-12-11.stsw)
Active Scenario: 100-year



Appendix F

Reference Material

Excerpts from:

Falcon Highlands Filing No. 2 & 3

Final Drainage Report

Terra Nova Engineering, Inc.

Rev'd Nov. 2005

SF-05-033

SF-D5-033

Terra Nova Engineering, Inc.
"Creative Civil Engineering Solutions"

FALCON HIGHLANDS FILING NO. 2 & 3
FINAL DRAINAGE REPORT
COLORADO SPRINGS, COLORADO

JULY 2005
REVISED OCTOBER 2005
REVISED NOVEMBER 2005

Prepared For:

TAMLIN ADVENTURES, LLC
25 N. TEJON STREET, Suite 300
Colorado Springs, CO 80903
(719) 227-1022

Prepared By:

TERRA NOVA ENGINEERING, INC.
125 N. Wahsatch Avenue Suite 101
Colorado Springs, CO 80903
(719) 635-6422

Job No. 0429.00

60" Storm Main

HYDRAULIC GRADE LINE CALCULATIONS

From Station	To Station	Loss Type	Start Inv. [ft]	Dia. [ft]			Flow [cfs]			Slope	Horiz	Manning	Friction Slope [%]			H.G.L	Head	Velocity
				D_1	D_2	D_3	Q_1	Q_2	Q_3	S_1 [%]	Bend [°]	n Coeff.	S_{f-1}	S_{f-3}	S_{f-3}	Elev. [ft]	Loss [ft]	fps
1+50.00	3+76.49	1	6813.04	5			196			0.50%		0.013	0.57%	--	--	***6816.10***	0.00	9.98
3+76.49	3+76.49	2	6814.17	5			196			0.50%	45	0.013	0.57%	--	--	***6818.62***	0.22	9.98
3+76.49	4+23.02	1	6814.17	5			196			0.50%		0.013	0.57%	--	--	***6818.84***	0.26	9.98
4+23.02	4+23.02	2	6814.40	5			196			0.50%	45	0.013	0.57%	--	--	***6819.10***	0.22	9.98
4+23.02	7+17.62	1	6814.40	5			196			0.50%		0.013	0.57%	--	--	***6819.32***	1.67	9.98
7+17.62	7+17.62	3	6815.84	5			196			0.50%		0.013	0.57%	--	--	***6820.99***	0.08	9.98
7+17.62	7+23.33	1	6815.84	5			196			0.50%		0.013	0.57%	--	--	***6821.07***	0.03	9.98
7+23.33	9+35.99	1	6816.04	5			196			0.50%		0.013	0.57%	--	--	***6821.10***	1.20	9.98
9+35.99	9+35.99	2	6817.10	5			196			0.50%	2	0.013	0.57%	--	--	***6822.30***	0.05	9.98
9+35.99	11+21.12	1	6817.10	5			196			0.50%		0.013	0.57%	--	--	***6822.35***	1.05	9.98
11+21.12	11+21.12	3	6818.03	5			196			0.50%		0.013	0.57%	--	--	***6823.39***	0.08	9.98
11+21.12	11+26.87	1	6818.03	5			196			0.50%		0.013	0.57%	--	--	***6823.47***	0.03	9.98
11+26.87	11+26.87	6	6818.23	5	5	3	166	196	30	0.50%	45	0.013	0.41%	0.57%	0.20%	***6823.50***	0.73	8.45
11+26.87	11+95.80	1	6818.23	5			166			0.50%		0.013	0.41%	--	--	***6824.24***	0.28	8.45
11+95.80	11+95.80	3	6818.57	5			166			0.50%		0.013	0.41%	--	--	***6824.52***	0.06	8.45
11+95.80	12+01.55	1	6818.57	5			166			0.50%		0.013	0.41%	--	--	***6824.57***	0.02	8.45
12+01.55	12+01.55	6	6820.07	3.5	5	3	84	166	41	0.50%	45	0.013	0.70%	0.41%	0.38%	***6824.60***	1.07	8.73
12+01.55	16+79.95	1	6820.07	3.5			84			1.00%		0.013	0.70%	--	--	***6825.66***	3.33	8.73
16+79.95	16+79.95	3	6824.87	3.5			84			1.00%		0.013	0.70%	--	--	***6828.99***	0.06	8.73
16+79.95	16+84.86	1	6824.87	3.5			84			1.00%		0.013	0.70%	--	--	***6829.05***	0.03	8.73
16+84.86	19+24.03	1	6825.07	3.5			84			0.90%		0.013	0.70%	--	--	***6829.09***	1.67	8.73
19+24.03	19+24.03	6	6827.23	3.5	3.5	1.5	63	84	11	0.90%	45	0.013	0.39%	0.70%	1.10%	***6830.75***	0.88	6.55
19+24.03	19+28.53	1	6827.23	3.5			63			0.90%		0.013	0.39%	--	--	***6831.63***	0.02	6.55
19+28.53	22+22.51	1	6827.73	3.5			63			1.93%		0.013	0.39%	--	--	***6831.65***	1.15	6.55
22+22.51	22+22.51	6	6833.40	2.5	3.5	2.5	33	63	30	1.93%	45	0.013	0.65%	0.39%	0.53%	***6835.05***	0.26	6.72
22+22.51	22+42.51	1	6833.40	2.5			33			1.93%		0.013	0.65%	--	--	***6835.31***	0.13	6.72
22+42.51	22+42.51	2	6833.79	2.5			33			1.93%	45	0.013	0.65%	--	--	***6835.44***	0.10	6.72
22+42.51	22+53.36	1	6833.79	2.5			33			1.93%		0.013	0.65%	--	--	***6835.53***	0.07	6.72
22+53.36			6781.90									0.013	--	--	--	***6835.60***	--	

Type.... C and Area
Name.... BASIN B, OS-1&2 Tag: POST

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

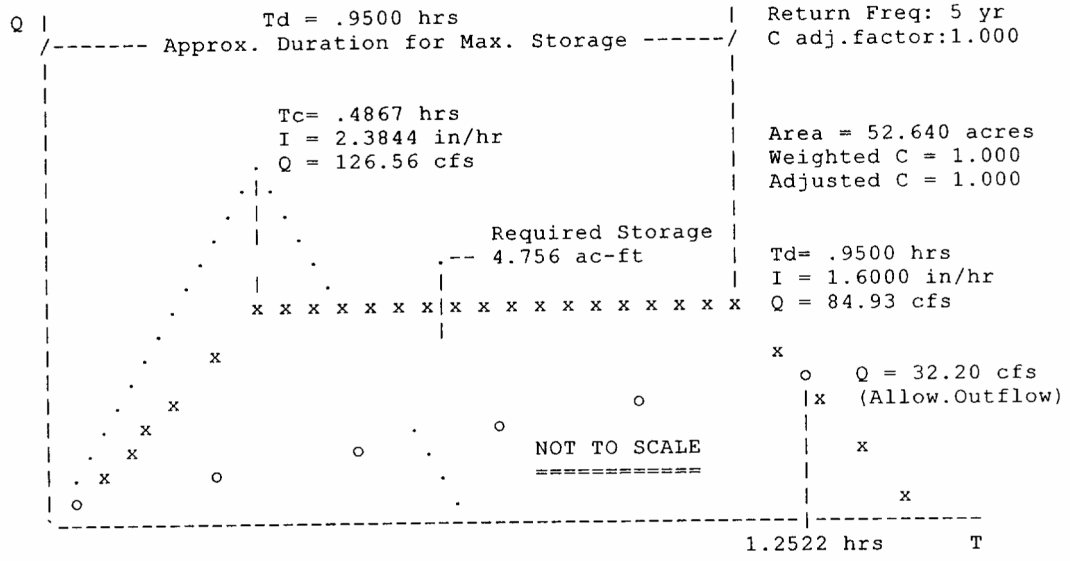
RATIONAL C COEFFICIENT DATA

Soil/Surface Description	C	Area acres	C x Area acres
basin b	1.0000	52.640	52.640
WEIGHTED C & TOTAL AREA --->	1.0000	52.640	52.640

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----
Method I

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

RETURN FREQUENCY: 5 yr	Allowable Outflow: 32.20 cfs
'C' Adjustment: 1.000	Required Storage: 4.756 ac-ft
Peak Inflow: 84.93 cfs	
.HYG File: 5Y	



File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R2 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
6812.00	.00	Free Outfall		WS below an invert; no flow.
6812.50	.00	Free Outfall		WS below an invert; no flow.
6813.00	.00	Free Outfall		WS below an invert; no flow.
6813.50	.00	Free Outfall		WS below an invert; no flow.
6814.00	.00	Free Outfall		WS below an invert; no flow.
6814.50	.00	Free Outfall		WS below an invert; no flow.
6814.61	.00	Free Outfall		WS below an invert; no flow.
6815.00	9.94	Free Outfall		Weir: H =.39
6815.50	31.79	Free Outfall		
	Orifice: H =.89			
6816.00	39.72	Free Outfall		
	Orifice: H =1.39			
6816.50	46.32	Free Outfall		
	Orifice: H =1.89			
6817.00	52.09	Free Outfall		
	Orifice: H =2.39			
6817.50	57.28	Free Outfall		
	Orifice: H =2.89			
6818.00	62.03	Free Outfall		
	Orifice: H =3.39			

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R1 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = O1 (Orifice-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
6812.50	10.52	6812.50	Free	6809.25	.000	.000	Free Outfall	
		Weir: H =.50						
6813.00	24.90	6813.00	6813.00	6813.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6813.50	26.21	6813.50	6813.50	6813.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6814.00	27.46	6814.00	6814.00	6814.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6814.50	28.65	6814.50	6814.50	6814.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6814.61	28.91	6814.61	6814.61	6814.61	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6815.00	29.80	6815.00	6815.00	6815.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6815.50	30.90	6815.50	6815.50	6815.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6816.00	31.97	6816.00	6816.00	6816.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6816.50	33.00	6816.50	6816.50	6816.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.00	34.00	6817.00	6817.00	6817.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.50	34.97	6817.50	6817.50	6817.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6818.00	35.92	6818.00	6818.00	6818.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						

Type.... Individual Outlet Curves
Name.... Outlet 3

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

UPstream ID = R1 (Inlet Box)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.00	.00	.00	Free	Free	.000	.000	Free Outfall	
6812.50	10.52	6809.25	Free	Free	.000	.070	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .544ft	Dcr= 1.205ft		CRIT.DEPTH	
6813.00	24.90	6813.00	Free	Free	.000	.000	Free Outfall	
		H =4.63						
6813.50	26.21	6813.50	Free	Free	.000	.000	Free Outfall	
		H =5.13						
6814.00	27.46	6814.00	Free	Free	.000	.000	Free Outfall	
		H =5.63						
6814.50	28.65	6814.50	Free	Free	.000	.000	Free Outfall	
		H =6.13						
6814.61	28.91	6814.61	Free	Free	.000	.000	Free Outfall	
		H =6.23						
6815.00	29.80	6815.00	Free	Free	.000	.000	Free Outfall	
		H =6.63						
6815.50	30.90	6815.50	Free	Free	.000	.000	Free Outfall	
		H =7.13						
6816.00	31.97	6816.00	Free	Free	.000	.000	Free Outfall	
		H =7.63						
6816.50	33.00	6816.50	Free	Free	.000	.000	Free Outfall	
		H =8.13						
6817.00	34.00	6817.00	Free	Free	.000	.000	Free Outfall	
		H =8.63						
6817.50	34.97	6817.50	Free	Free	.000	.000	Free Outfall	
		H =9.13						
6818.00	35.92	6818.00	Free	Free	.000	.000	Free Outfall	
		H =9.63						

Type.... Pond Routing Summary
Name.... POND WEST OUT Tag: 5Y
Event: 5 yr
File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW
Storm... cos5yr Tag: 5Y

LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\
Inflow HYG file = NONE STORED - POND WEST IN 5Y
Outflow HYG file = NONE STORED - POND WEST OUT 5Y

Pond Node Data = POND WEST
Pond Volume Data = POND WEST
Pond Outlet Data = Outlet 3

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	6812.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	84.93 cfs	at	.5500 hrs
Peak Outflow	=	28.88 cfs	at	1.2500 hrs
Peak Elevation	=	6814.60 ft		
Peak Storage	=	3.919 ac-ft		

Value used as override for Pond 1 interim and final Predevelopment Peak Flows for 5 and 10 year event

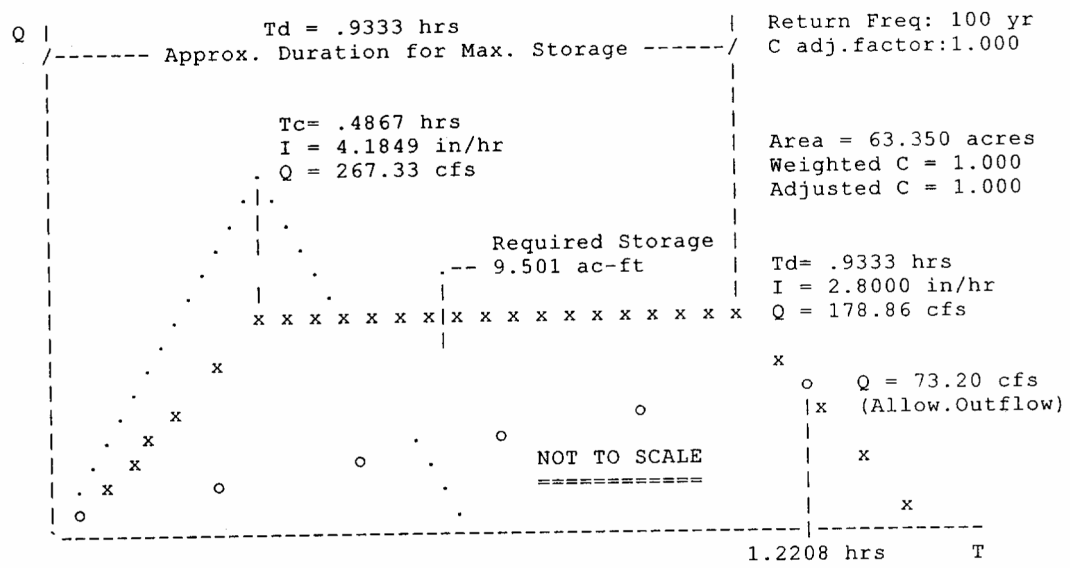
MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	6.661
- Infiltration	=	.000
- HYG Vol OUT	=	6.661
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----
Method I

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

```
**************************************************************************
*  RETURN FREQUENCY: 100 yr     |  Allowable Outflow: 73.20 cfs          *
*  'C' Adjustment: 1.000        |  Required Storage: 9.501 ac-ft         *
*-------------------------------------------------------------------------*
*  Peak Inflow: 178.86 cfs                                                *
* .HYG File:   100y                                                       *
**************************************************************************
```



Type.... Individual Outlet Curves
Name.... Outlet 3

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R2 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
6812.00	.00	Free Outfall		WS below an invert; no flow.
6812.50	.00	Free Outfall		WS below an invert; no flow.
6813.00	.00	Free Outfall		WS below an invert; no flow.
6813.50	.00	Free Outfall		WS below an invert; no flow.
6814.00	.00	Free Outfall		WS below an invert; no flow.
6814.50	.00	Free Outfall		WS below an invert; no flow.
6814.61	.00	Free Outfall		WS below an invert; no flow.
6815.00	9.94	Free Outfall		Weir: H =.39
6815.50	31.79	Free Outfall		
	Orifice: H =.89			
6816.00	39.72	Free Outfall		
	Orifice: H =1.39			
6816.50	46.32	Free Outfall		
	Orifice: H =1.89			
6817.00	52.09	Free Outfall		
	Orifice: H =2.39			
6817.50	57.28	Free Outfall		
	Orifice: H =2.89			
6818.00	62.03	Free Outfall		
	Orifice: H =3.39			

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R1 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = O1 (Orifice-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
6812.50	10.52	6812.50	Free	6809.25	.000	.000	Free Outfall	
		Weir: H =.50						
6813.00	24.90	6813.00	6813.00	6813.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6813.50	26.21	6813.50	6813.50	6813.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6814.00	27.46	6814.00	6814.00	6814.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6814.50	28.65	6814.50	6814.50	6814.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6814.61	28.91	6814.61	6814.61	6814.61	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6815.00	29.80	6815.00	6815.00	6815.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6815.50	30.90	6815.50	6815.50	6815.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6816.00	31.97	6816.00	6816.00	6816.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6816.50	33.00	6816.50	6816.50	6816.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.00	34.00	6817.00	6817.00	6817.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.50	34.97	6817.50	6817.50	6817.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6818.00	35.92	6818.00	6818.00	6818.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						

Type.... Individual Outlet Curves
Name.... Outlet 3

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND 1 WEST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

UPstream ID = R1 (Inlet Box)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.00	.00	.00	Free	Free	.000	.000	Free Outfall	
6812.50	10.52	6809.25	Free	Free	.000	.070	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .544ft	Dcr= 1.205ft		CRIT.DEPTH	
6813.00	24.90	6813.00	Free	Free	.000	.000	Free Outfall	
		H =4.63						
6813.50	26.21	6813.50	Free	Free	.000	.000	Free Outfall	
		H =5.13						
6814.00	27.46	6814.00	Free	Free	.000	.000	Free Outfall	
		H =5.63						
6814.50	28.65	6814.50	Free	Free	.000	.000	Free Outfall	
		H =6.13						
6814.61	28.91	6814.61	Free	Free	.000	.000	Free Outfall	
		H =6.23						
6815.00	29.80	6815.00	Free	Free	.000	.000	Free Outfall	
		H =6.63						
6815.50	30.90	6815.50	Free	Free	.000	.000	Free Outfall	
		H =7.13						
6816.00	31.97	6816.00	Free	Free	.000	.000	Free Outfall	
		H =7.63						
6816.50	33.00	6816.50	Free	Free	.000	.000	Free Outfall	
		H =8.13						
6817.00	34.00	6817.00	Free	Free	.000	.000	Free Outfall	
		H =8.63						
6817.50	34.97	6817.50	Free	Free	.000	.000	Free Outfall	
		H =9.13						
6818.00	35.92	6818.00	Free	Free	.000	.000	Free Outfall	
		H =9.63						

LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\
Inflow HYG file = NONE STORED - POND WEST IN 100y
Outflow HYG file = NONE STORED - POND WEST OUT 100y

Pond Node Data = POND WEST
Pond Volume Data = POND WEST
Pond Outlet Data = Outlet 3

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	6812.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	178.86 cfs	at	.5500 hrs
Peak Outflow	=	73.25 cfs	at	1.2000 hrs
Peak Elevation	=	6816.10 ft		
Peak Storage	=	8.944 ac-ft		

Value used as override for Pond 1 interim and final Predevelopment Peak Flows for 100 year event

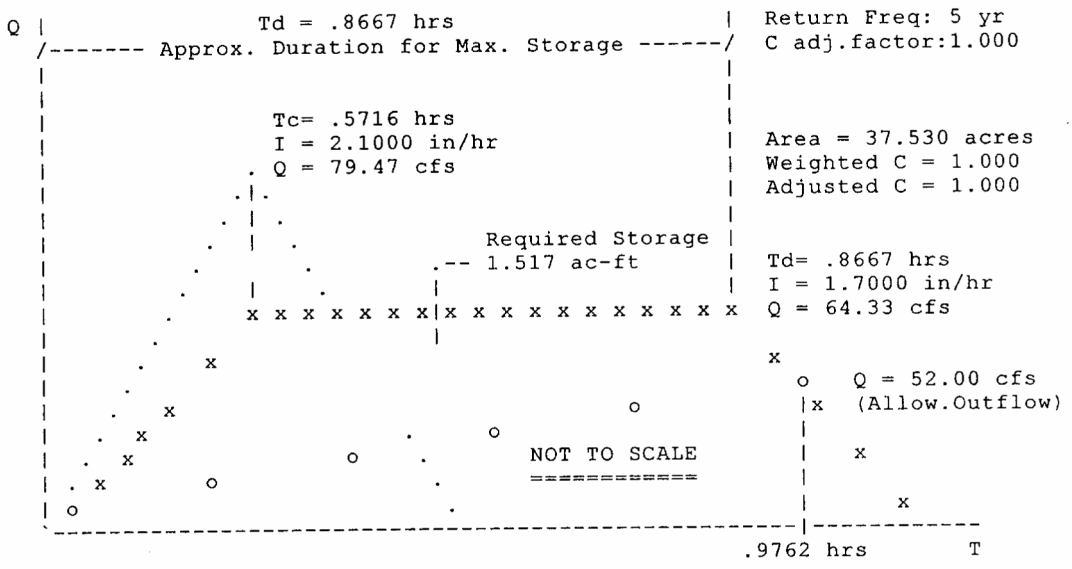
MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	13.795
- Infiltration	=	.000
- HYG Vol OUT	=	13.795
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----
Method I

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

RETURN FREQUENCY: 5 yr	Allowable Outflow: 52.00 cfs
'C' Adjustment: 1.000	Required Storage: 1.517 ac-ft
Peak Inflow: 64.33 cfs	
.HYG File: 5YR	



Type.... Individual Outlet Curves
Name.... Outlet 3

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R2 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
6812.50	.00	Free Outfall		WS below an invert; no flow.
6813.00	.00	Free Outfall		WS below an invert; no flow.
6813.50	.00	Free Outfall		WS below an invert; no flow.
6814.00	.00	Free Outfall		WS below an invert; no flow.
6814.26	.00	Free Outfall		WS below an invert; no flow.
6814.50	4.80	Free Outfall		Weir: H =.24
6815.00	25.98	Free Outfall		Weir: H =.74
6815.50	37.52	Free Outfall		
	Orifice: H =1.24			
6816.00	44.44	Free Outfall		
	Orifice: H =1.74			
6816.50	50.43	Free Outfall		
	Orifice: H =2.24			
6817.00	55.77	Free Outfall		
	Orifice: H =2.74			
6817.50	60.65	Free Outfall		
	Orifice: H =3.24			
6818.00	65.16	Free Outfall		
	Orifice: H =3.74			

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R1 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = O1 (Orifice-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.50	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
6813.00	14.42	6813.00	Free	6810.12	.000	.000	Free Outfall	
		Weir: H =.50						
6813.50	33.69	6813.50	Free	6811.09	.000	.000	Free Outfall	
		Orifice: H =1.00						
6814.00	41.26	6814.00	Free	6811.42	.000	.000	Free Outfall	
		Orifice: H =1.50						
6814.26	44.69	6814.26	Free	6811.57	.000	.000	Free Outfall	
		Orifice: H =1.76						
6814.50	47.65	6814.50	Free	6811.69	.000	.000	Free Outfall	
		Orifice: H =2.00						
6815.00	53.27	6815.00	Free	6811.90	.000	.000	Free Outfall	
		Orifice: H =2.50						
6815.50	58.35	6815.50	Free	6812.26	.000	.000	Free Outfall	
		Orifice: H =3.00						
6816.00	96.78	6816.00	6816.00	6816.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6816.50	100.81	6816.50	6816.50	6816.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.00	104.69	6817.00	6817.00	6817.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.50	108.43	6817.50	6817.50	6817.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6818.00	112.05	6818.00	6818.00	6818.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

UPstream ID = R1 (Inlet Box)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.50	.00	.00	Free	Free	.000	.000	Free Outfall	
6813.00	14.42	6810.12	Free	Free	.000	.010	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .436ft	Dcr= 1.181ft		CRIT.DEPTH	
6813.50	33.69	6811.09	Free	Free	.000	.090	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .751ft	Dcr= 1.837ft		CRIT.DEPTH	
6814.00	41.26	6811.42	Free	Free	.000	.042	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .876ft	Dcr= 2.046ft		CRIT.DEPTH	
6814.26	44.69	6811.57	Free	Free	.000	.041	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .934ft	Dcr= 2.132ft		CRIT.DEPTH	
6814.50	47.65	6811.69	Free	Free	.000	.029	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .984ft	Dcr= 2.202ft		CRIT.DEPTH	
6815.00	53.27	6811.90	Free	Free	.000	.040	Free Outfall	
		H =1.78						
6815.50	58.35	6812.26	Free	Free	.000	.017	Free Outfall	
		H =2.13						
6816.00	96.78	6816.00	Free	Free	.000	.000	Free Outfall	
		H =5.88						
6816.50	100.81	6816.50	Free	Free	.000	.000	Free Outfall	
		H =6.38						
6817.00	104.69	6817.00	Free	Free	.000	.000	Free Outfall	
		H =6.88						
6817.50	108.43	6817.50	Free	Free	.000	.000	Free Outfall	
		H =7.38						
6818.00	112.05	6818.00	Free	Free	.000	.000	Free Outfall	
		H =7.88						

Type.... Pond Routing Summary
Name.... POND EAST OUT Tag: 5YR
Event: 5 yr
File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW
Storm... cos5yr Tag: 5YR

LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\
Inflow HYG file = NONE STORED - POND EAST IN 5YR
Outflow HYG file = NONE STORED - POND EAST OUT 5YR

Pond Node Data = POND EAST
Pond Volume Data = POND EAST
Pond Outlet Data = Outlet 3

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	6812.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	64.33 cfs	at	.6500 hrs
Peak Outflow	=	44.58 cfs	at	1.0500 hrs
Peak Elevation	=	6814.25 ft		
Peak Storage	=	1.218 ac-ft		

Value used as override for Pond 2 interim and final Predevelopment Peak Flows for 5 and 10 year event

MASS BALANCE (ac-ft)

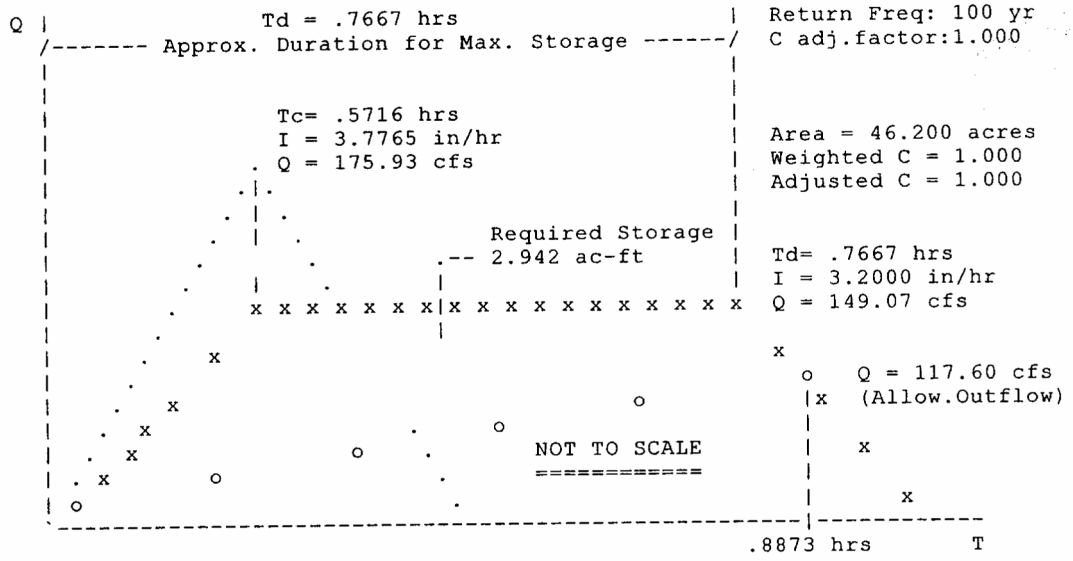
+ Initial Vol	=	.000
+ HYG Vol IN	=	4.605
- Infiltration	=	.000
- HYG Vol OUT	=	4.605
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

Type.... Mod. Rational Graph
Name.... BASIN C & OS-2 Tag: 100yr
Event: 100 yr
File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW
Storm... cos100yr Tag: 100yr

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----
Method I

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

RETURN FREQUENCY: 100 yr	Allowable Outflow: 117.60 cfs
'C' Adjustment: 1.000	Required Storage: 2.942 ac-ft
Peak Inflow: 149.07 cfs	
.HYG File: 100yr	



File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R2 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
6812.50	.00	Free Outfall		WS below an invert; no flow.
6813.00	.00	Free Outfall		WS below an invert; no flow.
6813.50	.00	Free Outfall		WS below an invert; no flow.
6814.00	.00	Free Outfall		WS below an invert; no flow.
6814.26	.00	Free Outfall		WS below an invert; no flow.
6814.50	4.80	Free Outfall		Weir: H =.24
6815.00	25.98	Free Outfall		Weir: H =.74
6815.50	37.52	Free Outfall		
	Orifice: H =1.24			
6816.00	44.44	Free Outfall		
	Orifice: H =1.74			
6816.50	50.43	Free Outfall		
	Orifice: H =2.24			
6817.00	55.77	Free Outfall		
	Orifice: H =2.74			
6817.50	60.65	Free Outfall		
	Orifice: H =3.24			
6818.00	65.16	Free Outfall		
	Orifice: H =3.74			

File.... C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\FDR POND EAST.PPW

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R1 (Inlet Box)

Upstream ID = (Pond Water Surface)
DNstream ID = O1 (Orifice-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.50	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
6813.00	14.42	6813.00	Free	6810.12	.000	.000	Free Outfall	
		Weir: H =.50						
6813.50	33.69	6813.50	Free	6811.09	.000	.000	Free Outfall	
		Orifice: H =1.00						
6814.00	41.26	6814.00	Free	6811.42	.000	.000	Free Outfall	
		Orifice: H =1.50						
6814.26	44.69	6814.26	Free	6811.57	.000	.000	Free Outfall	
		Orifice: H =1.76						
6814.50	47.65	6814.50	Free	6811.69	.000	.000	Free Outfall	
		Orifice: H =2.00						
6815.00	53.27	6815.00	Free	6811.90	.000	.000	Free Outfall	
		Orifice: H =2.50						
6815.50	58.35	6815.50	Free	6812.26	.000	.000	Free Outfall	
		Orifice: H =3.00						
6816.00	96.78	6816.00	6816.00	6816.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6816.50	100.81	6816.50	6816.50	6816.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.00	104.69	6817.00	6817.00	6817.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6817.50	108.43	6817.50	6817.50	6817.50	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						
6818.00	112.05	6818.00	6818.00	6818.00	.000	.000	Free Outfall	
		DS HGL+Loss > crest: Flow set to Downstream outlet.						

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

UPstream ID = R1 (Inlet Box)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
6812.50	.00	.00	Free	Free	.000	.000	Free Outfall	
6813.00	14.42	6810.12	Free	Free	.000	.010	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .436ft	Dcr= 1.181ft		CRIT.DEPTH	
6813.50	33.69	6811.09	Free	Free	.000	.090	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .751ft	Dcr= 1.837ft		CRIT.DEPTH	
6814.00	41.26	6811.42	Free	Free	.000	.042	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .876ft	Dcr= 2.046ft		CRIT.DEPTH	
6814.26	44.69	6811.57	Free	Free	.000	.041	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .934ft	Dcr= 2.132ft		CRIT.DEPTH	
6814.50	47.65	6811.69	Free	Free	.000	.029	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .984ft	Dcr= 2.202ft		CRIT.DEPTH	
6815.00	53.27	6811.90	Free	Free	.000	.040	Free Outfall	
		H =1.78						
6815.50	58.35	6812.26	Free	Free	.000	.017	Free Outfall	
		H =2.13						
6816.00	96.78	6816.00	Free	Free	.000	.000	Free Outfall	
		H =5.88						
6816.50	100.81	6816.50	Free	Free	.000	.000	Free Outfall	
		H =6.38						
6817.00	104.69	6817.00	Free	Free	.000	.000	Free Outfall	
		H =6.88						
6817.50	108.43	6817.50	Free	Free	.000	.000	Free Outfall	
		H =7.38						
6818.00	112.05	6818.00	Free	Free	.000	.000	Free Outfall	
		H =7.88						

LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Terra Nova Engineering\Jobs\0429.00\DRAINAGE\
Inflow HYG file = NONE STORED - POND EAST IN 100yr
Outflow HYG file = NONE STORED - POND EAST OUT 100yr

Pond Node Data = POND EAST
Pond Volume Data = POND EAST
Pond Outlet Data = Outlet 3

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	6812.50 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	149.07 cfs	at	.6500 hrs
Peak Outflow	=	101.18 cfs	at	.9500 hrs
Peak Elevation	=	6815.56 ft		
Peak Storage	=	3.526 ac-ft		

Value used as override for Pond 2 interim and final Predevelopment Peak Flows for 100 year event

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	9.438
- Infiltration	=	.000
- HYG Vol OUT	=	9.438
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

Excerpts from:

Falcon Highlands Filing No. 2

Construction Drawings, Sept. 2005

Terra Nova Engineering, Inc.

Approved Nov. 17, 2005

SF-05-033

FALCON HIGHLANDS FILING NO. 2
COUNTY OF EL PASO
CONSTRUCTION DRAWINGS
SEPTEMBER 2005

GENERAL NOTES:

ALL DRAINAGE CONSTRUCTION SHALL MEET THE SPECIFICATIONS OF THE CITY OF COLORADO SPRINGS AND EL PASO COUNTY CRITERIA MANUAL.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE NOTIFICATION AND FIELD LOCATION OF ALL EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT, BEFORE BEGINNING CONSTRUCTION. LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO ACTUAL CONSTRUCTION.
THE CONTRACTOR SHALL HAVE ONE (1) SIGNED COPY OF THESE APPROVED PLANS AND (1) COPY OF THE APPROPRIATE DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATION AT THE JOB SITE AT ALL TIMES.
A. STATE OF COLORADO SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
B. EL PASO COUNTY ENGINEERING CRITERIA MANUAL & WOODMEN METRO DISTRICT STANDARDS
C. CITY OF COLORADO SPRINGS/EL PASO COUNTY DRAINAGE CRITERIA MANUAL.
D. CDOT M & S STANDARDS
E. CITY OF COLORADO SPRINGS WATER & WASTEWATER STANDARD SPECIFICATIONS.
ALL DISTURBED AREA SHALL REQUIRE SEEDING WITHIN TWENTY ONE (21) DAYS FOLLOWING THE ESTABLISHMENT OF FINAL GRADE. AREAS TO RECEIVE PAVEMENT DURING THE CONSTRUCTION OF THE ROAD SYSTEM SHALL NOT RECEIVE ANY SEEDING. SEEDING SHOULD BE ACCOMPLISHED USING AN APPROPRIATE GRASS DRILL, BY BROADCASTING OR BY HYDROMULCHING. IF SEEDING BY THE BROADCAST METHOD IS SELECTED THE APPLICATION RATE SHOULD BE DOUBLED. IF HYDROMULCHING IS SELECTED TWO (2) OPERATIONS SHOULD BE CONSIDERED, APPLYING THE SEED FIRST AND THE MULCH IN A SECOND OPERATION. UPON COMPLETION OF THE SEEDING OPERATION THE SITE SHOULD BE COVERED WITH WEED FREE MULCH AT A RATE OF 4,0000 LBS. PER ACRE. BELOW IS THE ACCEPTED GRASS MIX FOR SANDY SOILS.
ALL RIPRAP APRONS SHALL BE CONSTRUCTED PER CDOT M-601-12. MIRAFI 600Z FILTER FABRIC OR EQUAL IS REQUIRED.
ALL WATER PIPE SHALL BE AWWA C900, DR-14 PVC PIPE UNLESS INDICATED OTHERWISE. ALL DUCTILE IRON WATER PIPE SHALL BE THICKNESS CLASS 52. PIPE SHALL BE INSTALLED WITH A MAXIMUM DEFLECTION AT ANY JOINT OF 3°.
ALL WATER MAIN FITTINGS AND VALVES SHALL HAVE MECHANICAL RESTRAINTS AND CONCRETE THRUST BLOCKS.
ALL WATER MAINS SHALL BE INSTALLED WITH A MINIMUM COVER OVER THE TOP OF PIPE OF -6" WITH A NOMINAL COVER OF 5'-0".
ALL SANITARY SEWER PIPE SHALL BE SDR35 PVC OR DUCTILE IRON PIPE, THICKNESS CLASS 2 WITH DOUBLE CEMENT MORTAR LINING.
0. ALL PIPE MATERIAL, BACKFILL, COMPACTION AND INSTALLATION SHALL CONFORM TO THIS SET OF CONSTRUCTION DOCUMENTS AND THE APPLICABLE SPECIFICATIONS OF THE FALCON HIGHLANDS METRO DISTRICT, CITY OF COLORADO SPRINGS OR THE COLORADO DEPARTMENT OF TRANSPORTATION AS APPROPRIATE.
1. ALL STATIONING IS CENTERLINE UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE FLOWLINE UNLESS OTHERWISE NOTED.
3. STATIONS AT CULVERTS ARE UPSTREAM TO END OF PIPE.
4. THE CONTRACTOR SHALL NOTIFY THE FALCON HIGHLANDS METRO DISTRICT PRIOR TO MAKING ANY CONNECTIONS TO EXISTING WATER MAINS. ALL EXISTING WATER MAIN CONTROL VALVES ARE TO BE OPERATED BY THE DISTRICT ONLY. THE CONTRACTOR SHALL COORDINATE ANY REQUIRED SHUTDOWN OF WATER MAINS WITH THE DISTRICT AND AFFECTED WATER USERS.
5. A PRE-CONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, FALCON HIGHLANDS METRO DISTRICT, WOODMEN METROPOLITAN DISTRICT AND EL PASO COUNTY DEPARTMENT OF TRANSPORTATION SHALL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE MEETING TIME AND PLACE WITH ALL PERSONS TO ATTEND.
6. BENDS, DEFLECTION & CUT PIPE LENGTHS SHALL BE USED TO HOLD HORIZONTAL ALIGNMENT OF SEWER AND WATER LINES TO NO MORE THAN 0.5' FROM THE DESIGNED ALIGNMENT. CONSTRUCTION STAKES TO BE AT 25' INTERVALS ALONG CURVED TO ASSURE LOCATION OF PIPE LINE CONSTRUCTION.
7. DEVELOPER TO PROVIDE GEOTECHNICAL DESIGN FOR ASPHALT & BASE COURSE UPON COMPLETION OF UTILITIES AND PRIOR TO PLACEMENT OF ABC OR CURB & GUTTER. PRIOR TO PLACEMENT OF ABC/HBP EL PASO COUNTY SHALL REVIEW AND APPROVE THE PAVEMENT DESIGN BY A COLORADO REGISTERED PROFESSIONAL ENGINEER.
8. ALL APPROPRIATE PERMITS (SUCH AS, NPDES, FLOODPLAIN DEVELOPMENT, 404 ETC.) MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
9. ALL DISTURBED PAVEMENT EDGES SHALL BE CUT TO NEAT LINES. THE THICKNESS AT HBP AND ABC REPAIRS SHALL EQUAL OR EXCEED EXISTING.
0. ALL ROADS MUST BE COMPLETED TO SUBGRADE ELEVATION PRIOR TO UTILITY INSTALLATION.
1. ALL CURB RETURN RADII SHALL BE 20' FOR URBAN LOCAL AND URBAN RESIDENTIAL MINOR COLLECTOR. ALL CURB AND RETURNS ON A MAJOR COLLECTOR SHALL BE 25'. TRANSITION RAMP CURB TO VERTICAL CURB AT ALL CURB RETURNS AND INLETS PER CITY OF COLORADO SPRINGS DETAIL.
2. AT ALL LOCATIONS WHERE SANITARY SEWER MAINS AND WATER MAINS ARE STUBBED INTO FUTURE DEVELOPMENT AREAS, INSTALL A WATER TIGHT CAP AND MARKER POST ON THE END OF THE SANITARY SEWER MAINS AND INSTALL A CONCRETE REVERSE ANCHOR, PLUG W/ 2" CAP AND A 2" TEMPORARY BLOWOFF ASSEMBLY ON THE WATER LINES.
3. ADDITIONAL STRUCTURES MAY BE REQUIRED AT TIME OF CONSTRUCTION.
4. BUILDING CONTRACTOR(S) WILL BE RESPONSIBLE FOR CONSTRUCTING POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES.
5. SANITARY SEWER LENGTHS ARE MH CENTER-MH CENTER.
6. SANITARY MANHOLES SHALL BE VACUUM TESTED AFTER INSTALLATION AND PRIOR TO BEING CONNECTED TO SANITARY SEWER PIPE. MANHOLES SHALL BE WRAPPED WITH SEALER AT ALL JOINTS PER THE REQUIREMENTS OF WOODMEN HILLS METRO DISTRICT. ALL SEWER SHALL BE TELEVISED PER WOODMEN HILLS METRO DISTRICT. IF POSSIBLE, ALL SEWER AND WATER SERVICES SHALL BE MARKED WITH A W OR S AT THE CURB LINE AT THE TIME THE CURB IS POURED. NO SEWER SERVICE SHALL BE CLOSER THAN 5' TO A MANHOLE.
7. STORM SEWER LENGTHS ARE INSIDE OF STRUCTURE-INSIDE OF STRUCTURE.
8. ALL STORM DRAIN PIPE IS CLASS III RCP UNLESS NOTED.
9. A TRAFFIC CONTROL PLAN WILL BE REQUIRED OF THE CONTRACTOR PRIOR TO CONSTRUCTION.
0. EROSION CONTROL BLANKET TO BE EXCELSIOR HI-VELOCITY CURLEX BLANKET OR EQUIVALENT FOR SLOPES EQUAL TO OR STEEPER THAN 3:1.
1. STORM SEWER MANHOLES SHALL BE SLAB BASE PER EL PASO COUNTY TYPE I MANHOLE.
2. HANDICAP RAMPS TO BE CONSTRUCTED AT ALL INTERSECTIONS WITH SIDEWALKS PER EL PASO COUNTY STANDARD DRAWINGS SD_2-40 AND SD_2-50
3. CONSTRUCTION EASEMENTS WILL BE THE RESPONSIBILITY OF THE DEVELOPER.
4. SIGNING WILL BE COMPLETED PER EL PASO COUNTY DEPARTMENT OF TRANSPORTATION CRITERIA & MUTCD.
5. THE LOCATIONS AND DEPTHS TO BEDROCK & WATER SURFACES ARE NOT SHOWN IN THESE PLANS. CONTRACTOR SHALL REVIEW THE GEOTECH REPORT BY "ENTECH ENGINEERING" FOR ADDITIONAL INFORMATION PRIOR TO CONSTRUCTION. THE THICKNESS, HARDNESS AND COHESIVENESS OF THE ROCK IS UNKNOWN AND WILL VARY. THE GROUNDWATER ELEVATIONS ARE SEASONAL AND WILL VARY. CONTRACTOR SHALL PROVIDE ALL DEWATERING (LABOR, EQUIPMENT & POWER) AS NECESSARY TO PROPERLY INSTALL REQUIRED FACILITIES.
6. PROFILE DESIGN LINES ARE BASED ON FLOWLINE, AS SHOWN, UNLESS OTHERWISE NOTED. SLOPE, CAPACITY AND SIZE OF UNDERDRAIN TO BE VERIFIED BY GEOTECHNICAL ENGINEER.
7. CONTRACTOR TO REMOVE AND RESET EXISTING STREET SIGNS.
8. PASSIVE OR ACTIVE UNDERDRAIN TO BE DETERMINED AT TIME OF CONSTRUCTION BY GEOTECHNICAL ENGINEER.

SOIL TYPES:

ONSITE SOILS ARE TYPE "A", BLAKELAND LOAMY SOIL "8", BLAKELAND COMPLEX "9" AND A SMALL PORTION IS COLUMBINE "19" PER SCS SOILS MAP

NOTE:

AT LEAST 10 DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB 1 ACRE OR MORE, THE OWNER OR OPERATOR OF THE CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY CONTROL DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A GRADING STORMWATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT,
WATER QUALITY CONTROL DIVISION
WQCD-PERMITS
4300 CHERRY CREEK DRIVE SOUTH
DENVER, CO 80246-1530
ATTN: PERMITS UNIT

48 HOURS BEFORE YOU DIG,
CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES
GAS, ELECTRIC, WATER AND WASTEWATER

UNDERDRAIN NOTE:

THE FINAL UNDERDRAIN SIZE AND TYPE SHALL BE APPROVED BY THE THE GEOTECH ENGINEER PRIOR TO INSTALLATION

BASIS OF BEARING:

BEARINGS ARE BASED ON THE NORTH LINE OF THE NW 1/4 OF SECTION 12, T13S, R65W MONUMENTED ON EACH SIDE WITH A 2 1/2" METAL CAP LS # 17664 AND ASSUMED TO BEAR S89°44'55"E

BENCHMARKS:

INTERSECTION OF WOODMEN RD AND MERIDIAN RD AT SW CORNER (BRASS CAP W/ NO. GF-9
ELEVATION = 6874.00

GRADING GENERAL NOTES:

1. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES ALONG THE SITE. THE OMISSION FROM OR THE INCLUSION OF UTILITY LOCATIONS ON THE PLAT IS NOT TO BE CONSIDERED AS THE NONEXISTENCE OF OR A DEFINITE LOCATION OF EXISTING UNDERGROUND UTILITIES.
2. THE CONTRACTOR WILL TAKE THE NECESSARY PRECAUTIONS TO PROJECT EXISTING UTILITIES, BUILDINGS, FENCES, AND ROADWAYS FROM DAMAGE DUE TO THIS OPERATION. ANY DAMAGE TO THE ABOVE WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, AND ANY SERVICE DISRUPTION WILL BE SETTLED BY THE CONTRACTOR.
3. GRADING SHALL BE COMPLETED TO A SUBGRADE TOLERANCE OF PLUS OR MINUS 0.1".
4. CONTRACTOR TO OBTAIN COPIES OF THE SOILS REPORT FROM THE GEOTECHNICAL ENGINEER AND TO BE KEPT ONSITE DURING ALL EARTHWORK OPERATIONS.
5. MAXIMUM CUT/FILL SLOPES SHALL NOT EXCEED 3:1, UNLESS OTHERWISE NOTED.
6. HEAVY EQUIPMENT SHALL NOT CROSS TAMLIN ROAD.
7. REGIONAL POND/TAMLIN ROAD GRADING SHALL NOT OCCUR AS PART OF THIS PLAN.
8. ALL PROPOSED MODIFICATIONS TO THE APPROVED GRADING AND EROSION CONTROL PLANS MUST BE SUBMITTED ALONG WITH SUPPORTING MATERIALS TO THE ENGINEERING DIVISION. NO WORK IN CONNECTION WITH THE PROPOSED MODIFICATIONS SHALL BE PERMITTED WITHOUT PRIOR APPROVAL, APPROVAL FOR WHICH MAY BE ISSUED IF THE APPLICANT CAN DEMONSTRATE THAT THE MODIFICATIONS WILL PROVIDE SOIL EROSION CONTROLS EQUIVALENT TO, OR BETTER THAN THAT OF THE ORIGINALLY APPROVED SOIL DISTURBANCE PLANS.
9. ANY AREA TO BE LEFT DORMANT FOR LONGER THAN 21 DAYS WILL NEED TO BE RESEEDED PER COUNTY CRITERIA. SEE NOTE 10.
10. COUNTY CRITERIA FOR SEEDING:

NATIVE SEEDING

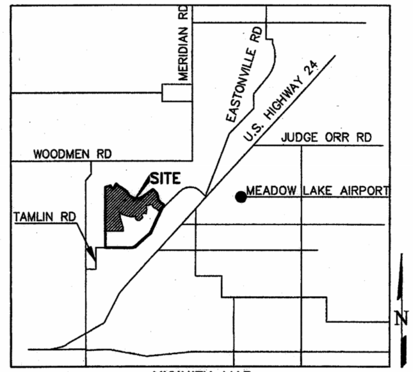
Soil preparation, fertilizer, seeding, mulching and mulch tackifier will be required for an estimated 14 acres of disturbed area within the right-of-way limits which are not surfaced. The following types and rates shall be used:

COMMON NAME	VARIETY	LBS PLS/ACRE
SIDEOATS GAMMA	EL RENO	3.0
WESTERN WHEATGRASS	BARTON	2.5
SLENDER WHEATGRASS	NATIVE	2.0
LITTLE BLUESTEM	PASTURA	2.0
SAND DROPSEED	NATIVE	0.5
SWITCH GRASS	NEBRASKA 28	3.0
WEEPING LOVE GRASS	MORPHA	1.0
TOTAL		14.0

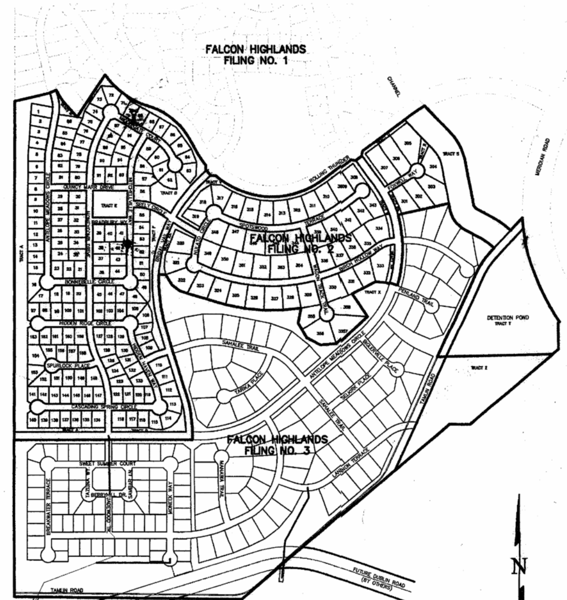
11. PRECONSTRUCTION MEETING REQUIRED PRIOR TO ANY CONSTRUCTION.
12. CONTRACTOR SHALL HAVE A COPY OF ENTECH, INC.'S SOILS REPORTS – NO.:39431 ________ ONSITE. MITIGATION MEASURES ARE REQUIRED FOR THIS SITE, SEE ENTECH REPORT.
13. SWELLING SOILS OR MODERATE TO HIGH PLASTIC SOILS ARE NOT TO BE PLACED WITHIN UPPER TWO FEET OF THE ROADWAY AND SIDEWALK SUBGRADE.
14. GRADING ALLOWED UNDER THIS PLAN SHALL INCLUDE ONLY THE FOLLOWING: CLEARING, GRUBBING, EXCAVATION, EMBANKMENT AND GRADING FOR INSTALLATION OF DRAINAGE FACILITIES OR STRUCTURES ONLY WHEN SUCH ARE REQUIRED TO BE CONSTRUCTED AS PART OF THIS EARLY GRADING PLAN.
15. IF OFFSITE GRADING BECOMES NECESSARY, OWNER SHALL OBTAIN ANY NECESSARY TEMPORARY CONSTRUCTION EASEMENTS.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY FEDERAL, STATE OR LOCAL PERMITS.
17. THE CONTRACTOR SHALL ADHERE TO THE STORMWATER MANAGEMENT PLAN FOR THIS SITE.
18. THE CONTRACTOR SHALL KEEP COPIES OF THE APPLICABLE COUNTY STANDARDS ONSITE AT ALL TIMES.

WOODMEN HILLS METROPOLITAN DISTRICT SANITARY SEWER NOTES:

1. ALL UTILITY CONSTRUCTION TO BE CONDUCTED IN CONFORMANCE WITH THE CURRENT WOODMEN HILLS METROPOLITAN DISTRICT SPECIFICATIONS. COMPACTION REQUIREMENTS SHALL BE 95% STANDARD PROCTOR AS DETERMINED BY ASTM D698, UNLESS OTHERWISE APPROVED BY THE WOODMEN HILLS METROPOLITAN DISTRICT OR A HIGHER STANDARD IS IMPOSED BY ANOTHER AGENCY HAVING RIGHT-OF-WAY JURISDICTION.
2. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE WOODMEN HILLS METROPOLITAN DISTRICT. THE WOODMEN HILLS METROPOLITAN DISTRICT RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO IT'S STANDARDS AND SPECIFICATIONS.
3. PVC MAIN LINES SHALL BE INSTALLED WITH COATED NO. 12 COATED TRACER WIRE. TRACER WIRE ACCESS POINT SHALL BE LOCATED A MAXIMUM OF 500 FEET APART.
4. THE CONTRACTOR IS REQUIRED TO NOTIFY THE WOODMEN HILLS METROPOLITAN DISTRICT (495-2500) A MINIMUM OF 48 HOURS AND A MAXIMUM OF 96 HOURS PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL ALSO NOTIFY AFFECTED UTILITY COMPANIES 48 HOURS PRIOR TO CONSTRUCTION ADJACENT TO THE KNOWN UTILITY LINES.
5. THE LOCATION OF ALL UTILITIES AS SHOWN ON THESE DRAWINGS ARE APPROXIMATE ONLY. THE LOCATION OF ALL UTILITIES SHALL BE VERIFIED PRIOR TO CONSTRUCTION BY THE CONTRACTOR.
6. THE CONTRACTOR SHALL FIELD EXCAVATE AND VERIFY THE VERTICAL AND HORIZONTAL LOCATION OF ALL TIE-INS. CONTRACTOR SHALL NOTIFY THE WOODMEN HILLS METROPOLITAN DISTRICT AND THE ENGINEER OF THE FIELD VERIFIED INFORMATION PRIOR TO CONSTRUCTION.
7. ALL BENDS SHALL BE FIELD STAKED PRIOR TO CONSTRUCTION.
8. THE CONTRACTOR SHALL AT HIS EXPENSE SUPPORT AND PROTECT ALL UTILITY MAINS SO THAT THEY WILL FUNCTION CONTINUOUSLY DURING CONSTRUCTION. SHOULD A UTILITY MAIN FAIL AS A RESULT OF THE CONTRACTOR'S OPERATION, IT WILL BE REPLACED IMMEDIATELY BY EITHER THE CONTRACTOR OR THE WOODMEN HILLS METROPOLITAN DISTRICT AT FULL COST OF LABOR AND MATERIALS TO THE CONTRACTOR.
9. ANY PUMPING OR BYPASS OPERATIONS MUST BE REVIEWED AND APPROVED PRIOR TO EXECUTION BY BOTH THE WOODMEN HILLS METROPOLITAN DISTRICT AND THE ENGINEER.
10. CONTRACTOR MUST REPLACE OR REPAIR ANY DAMAGE TO ALL SURFACE IMPROVEMENTS, INCLUDING BUT NOT LIMITED TO FENCES, CURB AND GUTTER AND/OR ASPHALT THAT MAY BE CAUSED DURING CONSTRUCTION.
11. ALL SEWER LINES 8" AND LARGER, SHALL HAVE "AS-BUILT" PLANS PREPARED AND APPROVED PRIOR TO FINAL ACCEPTANCE BY THE WOODMEN HILLS METROPOLITAN DISTRICT.
12. PRIOR TO CONSTRUCTION, A PRE-CONSTRUCTION CONFERENCE IS REQUIRED A MINIMUM OF 48 HOURS IN ADVANCE OF COMMENCEMENT OF WORK. A REPRESENTATIVE OF THE OWNER OR DEVELOPER, A REPRESENTATIVE OF THE CONTRACTOR AND DESIGN ENGINEER ARE REQUIRED TO ATTEND. TO SET THE PRE-CONSTRUCTION CONFERENCE, CONTACT TIM HUNKER (495-2500) OF THE WOODMEN HILLS METROPOLITAN DISTRICT FOR A TIME. NO PRE-CONSTRUCTION CONFERENCE TIMES WILL BE SET UNTIL 4 SETS OF SIGNED DRAWINGS ARE RECEIVED BY THE WOODMEN HILLS METROPOLITAN DISTRICT.



VICINITY MAP
N.T.S.



KEY MAP
1" = 500'

EL PASO COUNTY

FILED IN ACCORDANCE WITH SECTION 51-1 OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, AS AMENDED.

JOHN A. McCARTY, P.E. — DATE 2-6-06
COUNTY ENGINEER/DIRECTOR

DEVELOPER'S STATEMENT

I, THE DEVELOPER, HAVE REVIEWED AND WILL COMPLY WITH THE REQUIREMENTS OF THIS GRADING AND EROSION CONTROL PLAN.

BY:			, MGR
TITLE:	TAMLIN VENTURES, LLC	CYGNET LAND, LLC	MASON INVESTMENTS 1
ADDRESS:	25 NORTH TEJON STREET, SUITE 300	24 N. TEJON STREET, 2ND FLOOR	101 N. CASCADE, SUITE 300
	COLORADO SPRINGS, COLORADO 80903	COLO. SPRINGS, COLORADO 80903	COLO. SPRINGS, COLORADO 80903

CONTACT INFORMATION:

OWNER:	FALCON HIGHLANDS, LLC 25 N. TEJON STREET, SUITE 300 COLORADO SPRINGS, CO 80903 MR. MIKE SCOTT, (719) 227-1022	SANITATION DISTRICT:	WOODMEN HILLS METRO DISTRICT 11720 WOODMEN HILLS DRIVE FALCON, CO 80831 MR. TIM HUNKER, (719) 495-2500
CIVIL ENGINEER:	TERRA NOVA ENGINEERING, INC. 125 N. WAHSATCH AVENUE COLORADO SPRINGS, CO 80903 MR. QUENTIN N. ARMIJO, P.E. (719) 635-6422	ELECTRIC:	MOUNTAIN VIEW ELECTRIC ASSOCIATION 11140 E. WOODMEN ROAD FALCON, CO 80831 (719) 495-2283
COUNTY ENGINEERING:	EL PASO COUNTY-DEVELOPMENT SERVICES 2880 INTERNATIONAL CIRCLE, SUITE 110 COLORADO SPRINGS, CO 80910 MS. JENNIFER E. POWELL, P.E. (719) 520-6952	GAS: TELEPHONE:	AQUILA NATURAL GAS SERVICE DISTRICT 1-800-303-0752 EL PASO COUNTY TELEPHONE COMPANY MR. MATT SEARLE, (719) 683-2501
WATER DISTRICT:	FALCON HIGHLANDS METRO DISTRICT 24 N. TEJON STREET COLORADO SPRINGS, CO 80903 MR. JOHN POPOVICH, (719) 243-4997	FIRE DISTRICT:	FALCON FIRE PROTECTION DISTRICT: 7030 MERIDIAN ROAD PEYTON, CO 80831 (719) 494-4050

APPROVALS:

DETAILED DRAINAGE CONSTRUCTION PLANS & 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 CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED STREET AND 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 LIABILITY CAUSED BY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

QUENTIN N. ARMIJO, COLORADO P.E. #37170 — DATE 10/24/05

OWNER/DEVELOPER — DATE 10-24-05

COMPANY: TAMLIN VENTURES, LLC
25 N. TEJON STREET, SUITE 300
COLORADO SPRINGS, CO 80903
MR. MIKE SCOTT, (719) 227-1022

, Manager
CYGNET LAND
Manager
MASON INVESTMENTS I

FALCON HIGHLANDS METRO DISTRICT

GREGORY D. TIMM, PRESIDENT — DATE 10/24/05

EL PASO COUNTY

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 OF THIS DOCUMENT. RESPONIBILITY FOR COMPLETENESS AND/OR ACCURACY

for JOHN A. McCARTY, P.E. — DATE 11-17-05
COUNTY ENGINEER/DIRECTOR

WOODMEN HILLS METRO DISTRICT

WATER AND SEWER MAIN EXTENSIONS

ANY CHANGES OR ALTERATIONS AFFECTING THE GRADE, ALIGNMENT, ELEVATION AND/OR DEPTH OF COVER OF ANY WATER OR SEWER MAINS OR OTHER APPURTENANCE SHOWN ON THIS DRAWING SHALL BE THE RESPONSIBILITY OF THE OWNER/DEVELOPER. THE OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR ALL OPERATIONAL DAMAGES AND DEFECTS IN INSTALLATION AND MATERIAL FOR MAINS AND SERVICES FROM THE DATE OF APPROVAL UNTIL FINAL ACCEPTANCE IS ISSUED.

SIGNED ________ DATE 10-24-05
OWNER/DEVELOPER

WILLARD E. CLAREY
PRINTED NAME

DBA TAMLIN VENTURES, LLC

ADDRESS 25 N. TEJON ST. STE 300

COLORADO SPRINGS, CO. 80903

FIRE AUTHORITY APPROVAL

THE NUMBER OF FIRE HYDRANTS AND HYDRANT LOCATIONS SHOWN ON THIS WATER INSTALLATION PLAN ARE CORRECT AND ADEQUATE TO SATISFY THE FIRE PROTECTION REQUIREMENTS AS SPECIFIED BY THE FIRE DISTRICT SERVING THE PROPERTY NOTED ON THE PLANS.

FIRE PROTECTION DISTRICT________

SIGNED________ DATE ________
FIRE PROTECTION DISTRICT

DISTRICT APPROVALS

THE WOODMEN HILLS METROPOLITAN DISTRICT RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN. THE WOODMEN HILLS METROPOLITAN DISTRICT HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY.

WOODMEN HILLS METROPOLITAN DISTRICT
WASTEWATER DESIGN APPROVAL

DISTRICT MANAGER ________
DISTRICT ENGINEER ________
DATE: 10/24/5
PROJECT NO. FH-2

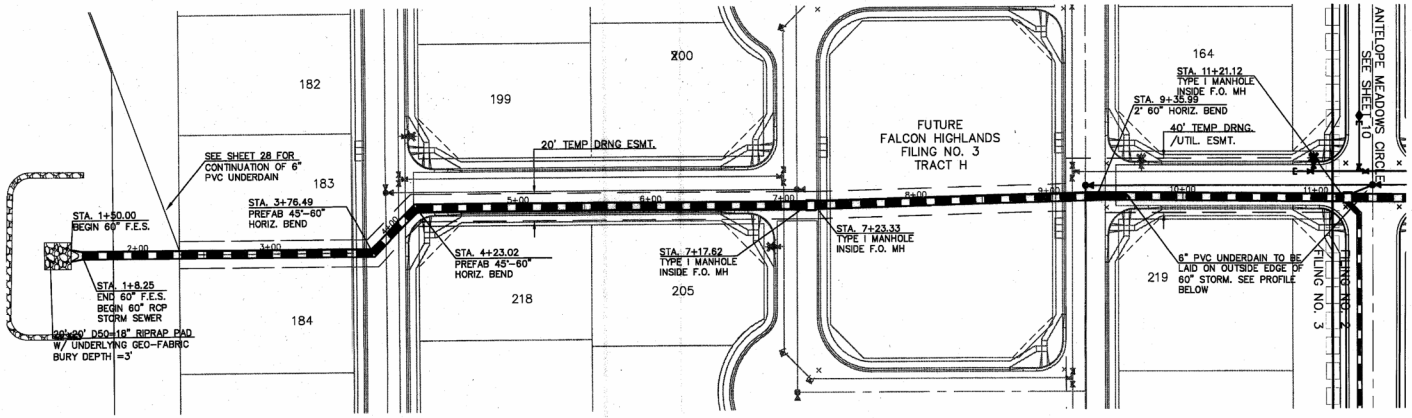
IN CASE OF ERRORS OR OMISSIONS WITH THE SEWER DESIGN AS SHOWN ON THIS DOCUMENT THE STANDARDS AS DEFINED IN THE "RULES AND REGULATIONS FOR INSTALLATION OF SEWER MAINS AND SERVICES" SHALL GOVERN.

GRADING APPROVALS

ENGINEER'S STATEMENT

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, IF INDICATED GRADING IS PERFORMED IN ACCORDANCE WITH THIS PLAN, THE WORK WILL NOT BECOME A HAZARD TO LIFE AND LIMB, ENDANGER PROPERTY OR ADVERSELY AFFECT THE SAFETY, USE OR STABILITY OF A PUBLIC WAY, DRAINAGE CHANNEL OR OTHER PROPERTY.

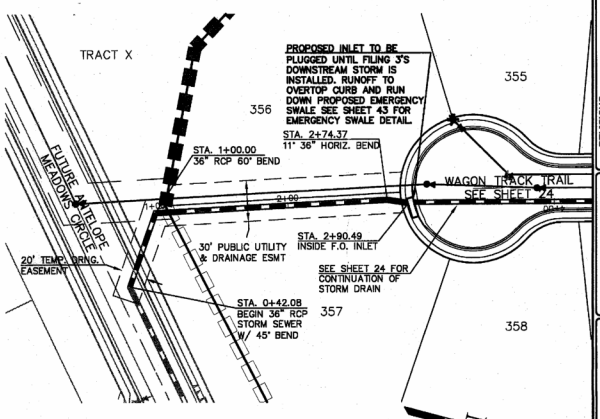
QUENTIN N. ARMIJO, COLORADO P.E. #37170 — DATE 10/24/05
FOR AND ON BEHALF OF TERRA NOVA ENGINEERING, INC.



60" RCP STORM SEWER

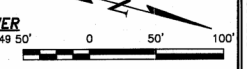
STA. 1+50.00 ~ STA. 11+21.12

SCALE: 1"=50'



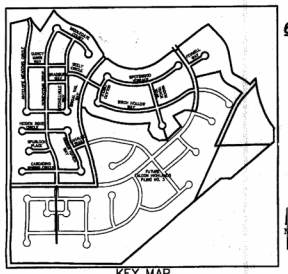
36" RCP STORM SEWER

STA. 1+00.00 ~ STA. 2+90.49



SCALE: 1"=50'

NOTE: THESE PLANS FOR STORM SEWER PLAN AND PROFILE ONLY.



KEY MAP

NOTE:
SEE CONSTRUCTION DRAWINGS FOR FALCON HIGHLANDS FILING NO. 3 BY TERRA NOVA ENGINEERING FOR EXISTING SANITARY AND STORM SEWER INFORMATION

NOTE:
SEE SHEET 35-39 FOR SANITARY, WATER, STORM AND CURB RETURN LINE TABLES

EL PASO COUNTY RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN. THE COUNTY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY.

RESUBMITTAL REQUIRED IF CONSTRUCTION HAS NOT COMMENCED WITHIN 180 DAYS AFTER REVIEW DATE.

ASPHALT DATA FOR: _____

ASPHALT THICKNESS: ALT. 1: ALT. 2:

AC SURFACE: _____

AC BASE: _____

AGGREGATE BASE THICKNESS: ALT. 1: ALT. 2:

CLASS 6: _____

CLASS 5: _____

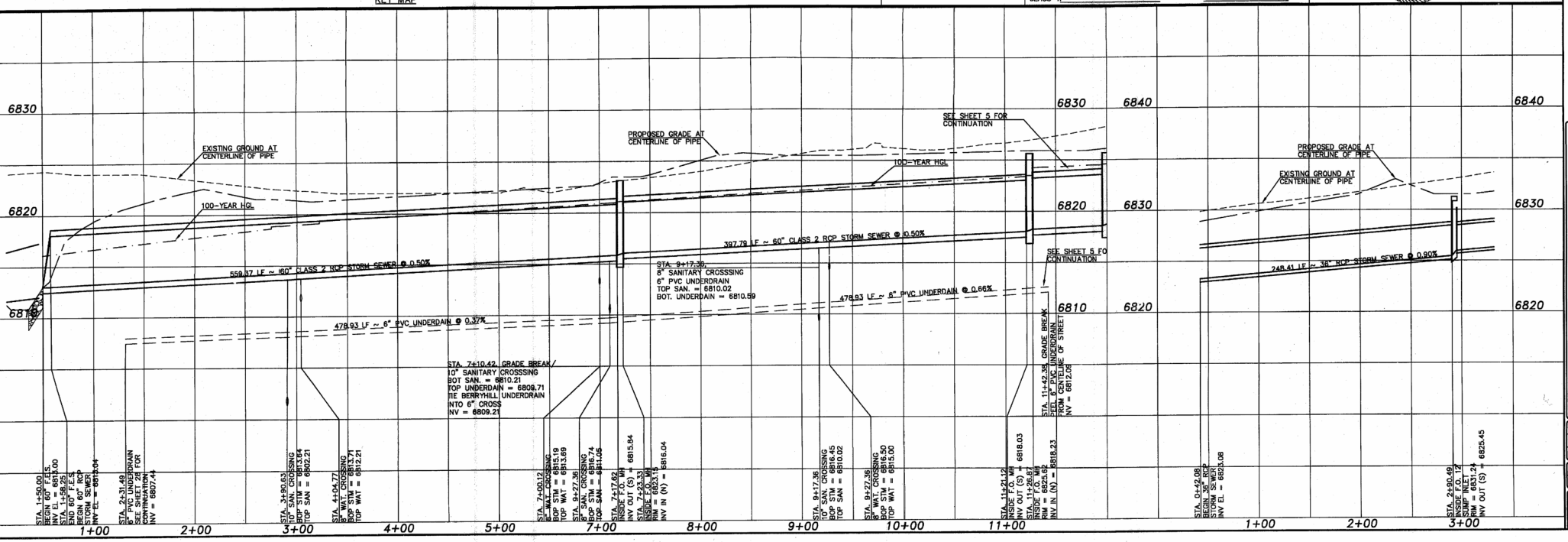
CLASS 4: _____

THIS DESIGN WAS PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF TERRA NOVA ENGINEERING, INC.

STATE OF COLORADO REGISTERED QUENTIN N. ARMIJO 37470 PROFESSIONAL ENGINEER

QUENTIN N. ARMIJO PROFESSIONAL ENGINEER
COLORADO P.E. NO. 37470

11/16/05



REVISIONS			
NO.	DESCRIPTION	DATE
1	PER COUNTY/IN-HOUSE COMMENTS	10/17/05
2	PER WOODMEN DIST. COMMENTS	10/21/05

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AUTHORITY, TERRA NOVA ENGINEERING

PREPARED FOR:
TAMLIN VENTURES, LLC
MR. MIKE SCOTT
25 N. TEJON AVENUE

125 N. WAHSATCH AVE., SUITE 101
COLORADO SPRINGS, CO. 80903

FALCON HIGHLANDS FILING NO. 2

DESIGNED BY	
DRAWN BY	
CHECKED BY	
H-SCALE	
V-SCALE	
JOB NO.	04
DATE ISSUED	
SHEET NO.	

Excerpts from:

Falcon Highlands South

Preliminary Drainage Report

Atwell, LLC

Approved April 22, 2024

PUDSP-22-005

Falcon Highlands South

Preliminary Drainage Report

Owner/Developer
Challenger Homes
8605 Explorer Drive Ste. 250
Colorado Springs, CO 80920
(719) 598-5192
Contact: Jim Byers

Engineer
Atwell, LLC
143 Union Blvd., Suite 700
Lakewood, CO 80228
303-462-1100
Contact: Daniel Madruga, PE

Atwell Project Number
21005234

Submitted by: Atwell, LLC

March 06, 2024

PUDSP-22-005

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City/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.

Daniel Madruga, PE 36834 — 3/12/24 — Date — Seal:

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: Challenger Homes

By:

Title: VP of Community Development

Address: 8605 Explorer DR 80920

El Paso County Approval:

Filed in accordance with requirements of Section 51.1 of the El Paso Land Development Code as amended.

Gilbert LaForce, P.E. Digitally signed by Gilbert LaForce, P.E. Reason: On Behalf of the County Engineer Date: 2024.04.22 13:30:26-06'00' — 4/22/2024

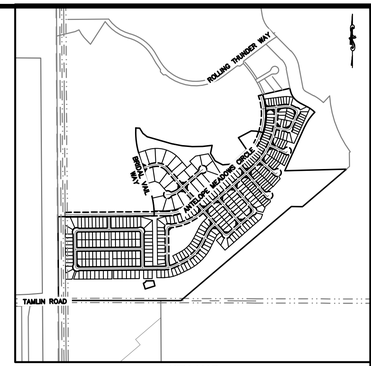
Joshua Palmer, P.E., — Date
County Engineer, ECM Administrator
Conditions:

NOTE:
SEE SHEETS DR-3 THRU DR-5 FOR SUB-BASINS B, C, & D

SECTION 1
19.0'
2.3' 4:1 4:1 1.0'

SECTION 2
30.0'
2.3' 4:1 4:1 12.0'

GRASS LINED SWALE SECTIONS
N.T.S.



KEY MAP
1" = 1000'

OS-1 6.4 10.7 21.7
OS-2 3.1 7.8 13.6
OS-3 1.1 3.4 6.0
OS-4 13.1 12.3 26.3
OS-5 62.2 86.4 173.7
OS-6 35.8 31.9 58.4
OS-7 6.5 5.2 18.3
OS-8 13.8 4.6 31.1
A 4.03 1.1 7.7
B 33.21 44.5 109.9
C 59.71 79.3 204.7
D 10.5 16.5 37.6
E 1.8 0.8 4.3
F 6.1 2.3 15.6
G 8.8 6.8 16.0

POINT OF OFFSITE FLOW
ROLLING THUNDER WAY
TALMENA TERRACE
INDIAN ECHO TERRACE
SYCAMORE WAY
FALCON BASIN - SAND CREEK BASIN
BRIDAL VAIL WAY
FEMA FLOODPLAIN BOUNDARY (TYP.)
ANTELOPE MEADOWS CIRCLE
FALCON HIGHLANDS FILING NO. 1
SAND CREEK/FALCON DRAINAGE BASIN BOUNDARY (TYP.)
MIDDLEGATE COURT
HONEYCOMB DRIVE
QUINCY MARR DRIVE
FILING NO. 1
FILING NO. 2
SEELY CIRCLE
MICHELLVILLE WAY
SPOTSWOOD TERRACE
FALCON HIGHLANDS FILING NO. 2
NULATO CIRCLE
MADISON WAY
EX. PUBLIC 36" RCP STORM SEWER
BIRCH HOLLOW WAY
TRACT X
FILING NO. 3
BONNEBELLE CIRCLE
PUB. D-10-R CURB INLET (TYP.)
EX. PUB. 36" RCP STORM SEWER
HIDDEN RIDGE CIRCLE
SPURLOCK PLACE
HIDDEN RIDGE CIRCLE
EX. PUB. 42" RCP STORM SEWER
CASCADING SPRING CIRCLE
ANTELOPE MEADOWS CIR.
TRACT C
DRNG. ESMT. REC. NO. 206066535
DRNG. & UTIL. ESMT. REC. NO. 206066537 TO BE VACATED
30' FORCE MAIN ESMT. REC. NO. 220130580
EX. PUBLIC 60" RCP STORM SEWER
DRNG. & UTIL. ESMT. REC. NO. 206066537
RYLAND WAY
ALMUR TRAIL
EX. PUBLIC 8" PVC SANITARY SEWER
DRNG. ESMT. REC. NO. 206066536
FALCON HIGHLANDS METRO DIST. REC. NO. 206055833
TRACT J
TRACT K
30' DRAINAGE ESMT. REC. NO. 206133777
FILING NO. 3 BOUNDARY
OWNER: H2O SUB BLH LLC TAX NO. 5313000103
60' ROAD R.O.W. BOOK A, PAGE 78
SAND CREEK BASIN
FALCON BASIN
EXISTING DETENTION POND 2 RETROFIT/PROPOSED CONDITIONS ARE THE FOLLOWING:
VOLUME PROVIDED: 10.49 AC.
WQCV WSEL = 6812.00
EURV WSEL = 6814.43
100 YR. WSEL = 6816.00
TOP OF POND = 6817.50
RELEASE FLOWS:
WQCV: 0.8 CFS @ 40 HRS
EURV: 4.5 CFS @ 52 HRS
100-YR: 5.2 CFS @ 63 HRS
EMERGENCY OVERFLOW: 69.5 CFS
EX. POND 2 OUTLET STRUCTURE
POND 2 EX. 42" RCP OUTLET PIPE
GRASSLINED SWALE SECTION 2
EX. OFFSITE DITCH
OWNER: BLH NO. 2, LLC. TAX NO. 5300000642
TAMLIN RD EXISTING 60' ROW
FEMA FLOODPLAIN BOUNDARY
FLOOD ZONE AE
BASE FLOOD ELEVATION (TYP.)
US HWY 24
PROPOSED GRASSLINED SWALE TO EX. POND 2 SECTION 2
OWNER: KLK 1031 INVESTMENTS LLC TAX NO. 5312100006
ROLLING THUNDER WAY
FOXMELL WAY
HP: 6450
FALCON BASIN
SAND CREEK BASIN
UTIL. ESMT. REC. NO. 206066535 TO BE VACATED
BIRCH HOLLOW WAY
50' TEMP. ACCESS ESMT. REC. NO. 206066534 TO BE VACATED
TAMLIN RD EXISTING 60' ROW
TRACT T
EXISTING REGIONAL POND WJ
PROPOSED GRASSLINED SWALE TO EX. POND WJ
OWNER: CYGNET LAND, LLC TAX. NO. 5312406001
EX. POND OUTLET STRUCTURE (BY GALLOWAY, 2020)
EX. PVT. 48" RCP OUTLET PIPE AND (3) 60" RCP OUTLET PIPES
PEAK OUTFLOW AT CULVERTS #1 THROUGH #4 + SPILLWAY AT ELEVATION 6830.20 = 1,402.6 CFS (SEE STAGE-STORAGE-DISCHARGE TABLE IN MDDP FOR MORE INFORMATION)
FILING NO. 3 BOUNDARY
GRASSLINED SWALE SECTION 1
TRACT Z
PROPOSED GRASSLINED SWALE TO EX. POND 2 SECTION 2
DRNG. ESMT. REC. NO. 206066535
DRNG. & UTIL. ESMT. REC. NO. 206066537 TO BE VACATED
FOX KESTREL COURT
SWALE TRAIL
APLOMADO TRAIL
BANDED FALCON COURT
GREY FALCON LANE
SPOTTED KESTREL WAY
DUNLIN LANE
LANNER LANE
SCOOTY LANE
TRACT A
OWNER: WALTON COLORADO LLC TAX NO. 5300000716
BASIN A 4.2 AC
ITEM #11 50' ELECTRIC TRANSMISSION EASEMENT BOOK 2649, PAGE 17
ITEM #9 60' ROAD RIGHT-OF-WAY BOOK A, PAGE 78
EXISTING DETENTION POND 1 RETROFIT CONDITIONS ARE THE FOLLOWING:
VOLUME PROVIDED: 15.77 AC.
WQCV WSEL = 6811.65
EURV WSEL = 6813.50
100 YR. WSEL = 6815.00
TOP OF POND = 6817.00
RELEASE FLOWS:
WQCV: 0.9 CFS @ 40 HRS
EURV: 3.5 CFS @ 72 HRS
100-YR: 5.6 CFS @ 86 HRS
EMERGENCY OVERFLOW: 72.2 CFS
EX. POND 1 OUTLET STRUCTURE
EX. POND 1 42" RCP OUTLET PIPE
TAMLIN ROAD (EXISTING R.O.W.)

200 0 200 400
(IN FEET)
1 inch = 200 ft.

LEGEND

- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING LOT LINE
- PROPOSED LOT LINE
- EXISTING SECTION LINE
- EXISTING EASEMENT
- EXISTING CONTOURS
- PROPOSED CONTOURS
- SAND CREEK / FALCON DRAINAGE BASINS DELINEATION
- FEMA FLOODPLAIN LINE
- BASIN ID (BASIN / AREA / C5 C100)
- DESIGN POINT ID (X)
- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- FLOW ARROW

PROPOSED CONDITIONS COMMULATIVE DRAINAGE BASIN SUMMARY

Basin	Design Point	Area (acres)	WEIGHTED C_5	WEIGHTED C_{100}	Q_5 (cfs)	Q_{100} (cfs)
A	1	4.03	0.08	0.33	1.1	7.7
B	2	33.21	0.36	0.54	45.4	112.3
C	3	62.88	0.34	0.53	87.0	222.9
D	4	7.36	0.42	0.57	11.5	26.7
E	5	1.77	0.09	0.36	0.6	4.3
F	6	6.06	0.10	0.41	2.3	15.6
G	6	8.84	0.09	0.36	6.8	16.0
OS-1	7	6.38	0.27	0.48	10.7	21.7
OS-2	8	3.12	0.30	0.50	7.8	13.6
OS-3	9	1.14	0.90	0.96	3.4	6.0
OS-4	10	13.09	0.34	0.44	12.3	26.3
OS-5	11	62.20	0.34	0.55	86.4	173.7
OS-6	12	35.75	0.22	0.46	31.9	58.4
OS-7	13	6.47	0.22	0.46	5.4	19.1
OS-8	4	13.79	0.09	0.36	4.8	32.5
TOTAL		266.09			317.6	756.8

Know what's below. Call before you dig.

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NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

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CLIENT
CHALLENGER HOMES
8605 EXPLORER DRIVE STE. 250
COLORADO SPRINGS, CO 80920
(719) 598-5192
JIM BYERS

PROJECT
CHALLENGER HOMES
FALCON HIGHLANDS FILING NO. 3
EL PASO COUNTY, COLORADO
DRAINAGE MAP
MAJOR BASINS PROPOSED CONDITIONS

DATE: 08/26/2022

A	1st SUBMITTAL TO EPC 02/11/2022 - RDL
B	2nd SUBMITTAL TO EPC 08/26/2022 - RDL
C	3rd SUBMITTAL TO EPC 04/28/2023 - RDL
D	4TH SUBMITTAL TO EPC 07/21/2023 - DJM

REVISIONS

DR. SLP CH. DJM
P.M. DJM
JOB 21002568
SHEET NO. 1
DR-02

CAD FILE: 21002568-DRAINAGE MAPS-OVERALL SITE.DWG

On-site Basins (Falcon Highlands South, Undeveloped):

The site has been broken down into seven major on-site basins upstream within the limits of Falcon Highlands South. A drainage map is in the appendix.

Basin A (3.74 ac, Q_5 = 1.15 cfs, Q_{100} = 7.7 cfs) is the basin located southwest of Antelope Meadow Circle, just below basin OS-4, west of Basin B. The majority of the basin is comprised of Tract F and consists of some rear yard runoff from the PUD lots at the western edge of Basin B. The storm water runoff from this basin sheet flows south and off-site at **Design Point 1** with the combined flow of OS-4, and per existing drainage patterns is not tributary to on-site detention ponds.

Basin B (38.93 ac, Q_5 = 11.65 cfs, Q_{100} = 78.20 cfs) is located south of Antelope Meadow Circle, adjacent to basin A. The site is covered in native grasses with limited grading work from a previous development. Runoff from the site sheet flows southwesterly overland to existing Pond 1 **(Design Point 2**). The private 42" RCP outlet pipe from the outlet structure of the pond daylights at the grassland swale south of the abandoned future Tamlin Road right-of-way at **Design Point 5**.

Basin C (57.81 ac, Q_5 = 18.4 cfs, Q_{100} = 123.57 cfs) is located adjacent to Basin B and covered in native grasses and weeds. The site has limited grading due to work from a previous development that did not finish. Runoff from the site sheet flows southwesterly overland to an existing diversion ditch that spans from an existing public 24" RCP storm sewer main that daylights within Falcon Highlands South south of Wagon Track Way. The diversion ditch flows directly to existing Pond 2 (**Design Point 3**). The private 42" RCP outlet pipe from the outlet structure of the pond daylights at the grassland swale south of the project site at **Design Point 6**.

Basin D (10.54 ac, Q_5 = 3.47 cfs, Q_{100} = 23.31 cfs) is located to the northeast of the Filing and consists of undeveloped area with native grasses. The basin's runoff drains directly to existing Pond WU (**Design Point 4**).

Basin E (3.14 ac, Q_5 = 1.12 cfs, Q_{100} = 7.5 cfs) is the undeveloped, natural landscaped area between Tamlin Road and the existing Pond 1. Runoff from Basin E is directed by a ditch section to a low point between the future Dublin Road and Highway 24 (**Design Point 5**). This drainage concept and its associated storm infrastructure is presented in the previous master plan and is to remain as the intended plan. The 2005 PDR suggested that an inline grate inlet be installed but there is no evidence that this was installed. The existing drainage pattern consists of pooling within the local low point of the ditch that surcharges and is directed south through the grassland swale.

Basin F (3.67 ac, Q_5 = 1.19 cfs, Q_{100} = 7.99 cfs) is the undeveloped area between Tamlin Road and the existing Detention Pond 2. The runoff from Basin F is directed to the low point in the downstream grasslined swale between the Site and Tamlin Road (**Design Point 6**). This drainage concept and its associated storm infrastructure is presented in the previous master plan and is to remain as the intended plan. The 2005 PDR suggested that a 4'x4' area inlet be constructed but

there is no evidence that this was installed. The existing drainage pattern consists of pooling within the local low point of the ditch that surcharges and is directed south through the grassland swale.

Basin G (8.84 ac, Q_5 = 6.8 cfs, Q_{100} = 16.0 cfs) is the area east of Basin C that is not to be disturbed and remain as open, natural landscape. The runoff from Basin G is collected in a local topographic low point and when overtopping the low point, the runoff continues southeast to the low point in the grasslined swale along Highway 24, **Design Point 6**.

PROPOSED DRAINAGE BASINS

This report has been prepared in accordance with the EPC DCM and the MHFD Criteria Manual. The 5-year storm was used as the minor storm event, while the 100-year storm was used as the major event. The one-hour point rainfall depth used for the 5-year storm was 1.50 inches and 2.52 inches for the 100-year event.

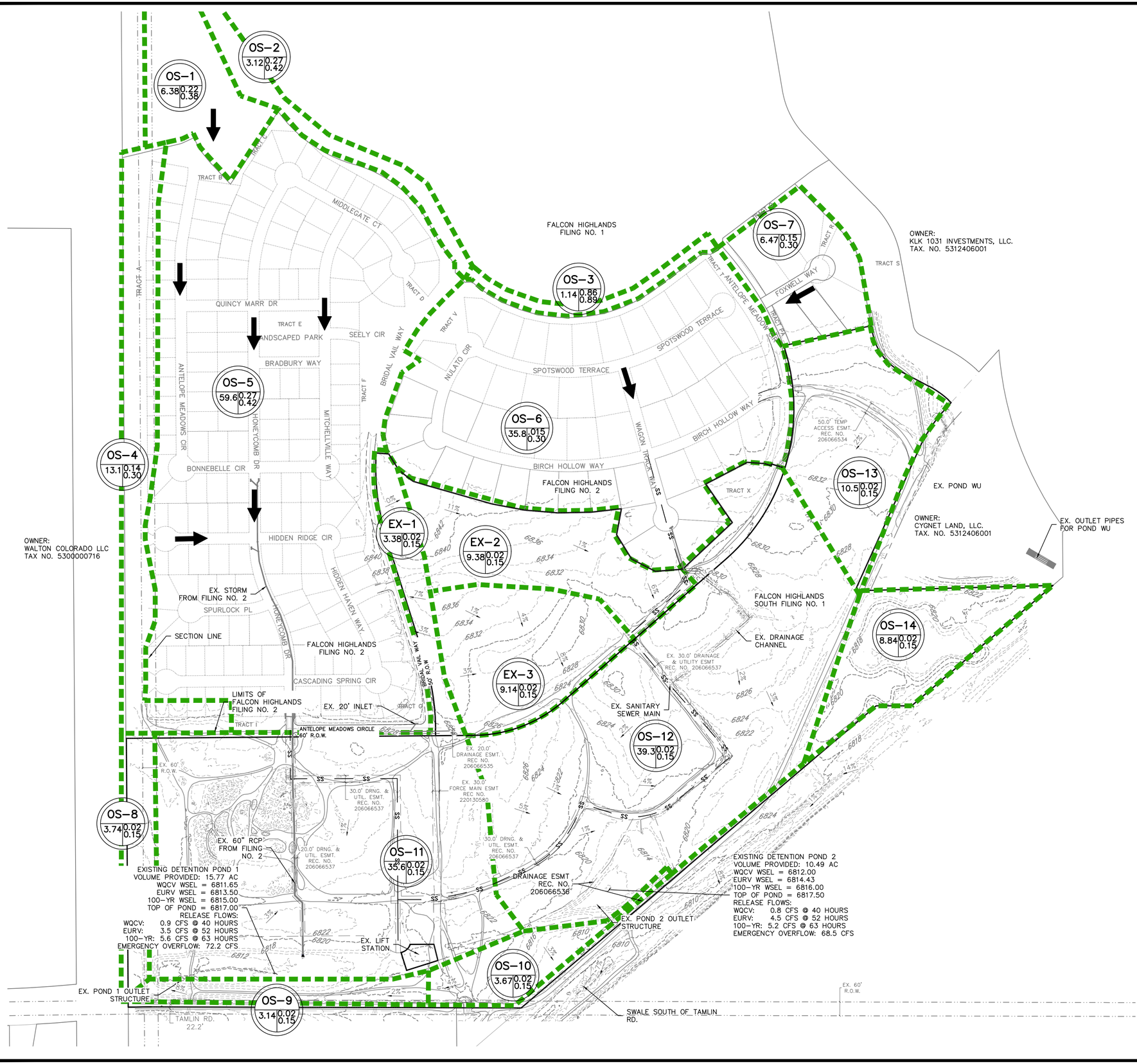
Preliminary grading design of the site has been completed to include right of way design and assignment of lot type A, B, Transition (T), and Walkout (WO). The assigned lots drain per a typical lot template into roadways where sump inlets are located to convey stormwater though the public storm system and outfall to their respective ponds.

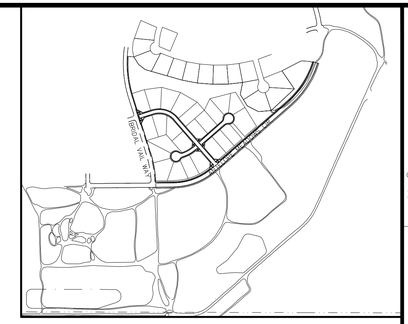
The overarching premise of the drainage design is to route overland flow from residential lots and units to adjacent rights-of-way where public storm infrastructure will be installed and ultimately convey the storm water to respective ponds to provide water quality treatment as well as flow attenuation and detention. Previous studies designed Ponds 1 and 2 in order to provide full spectrum detention and water quality for Filing Nos. 2 and 3. The analysis within this report provides more defined pond sizing requirements due to the change in layout for Falcon Highlands South as well as preliminary locations and sizes for inlets, pipes, culverts, and swales. This idea is intended to be followed for the entirety of the developed site. Basins which are not along the main drainageways within the proposed developed areas or which are expected to flow offsite have been analyzed. There are no engineered channels that exit the Site.

There is a proposed grass-lined, natural swale to convey stormwater from the rear of B-lot sites and cul-de-sacs that are the downstream area of roadways within Basin C to existing Pond 2. The design of this swale is to be included in the Final Drainage Report, but preliminary calculations and design have been done for the PDR to accurately assess the width and depth of the drainageway for the minor and major storm events including freeboard requirements. All Pond outlets daylight to south of the future Tamlin Road right-of-way via existing public RCP culvert pipes, but are not directed to any formal channels or drainageways.

The existing Ponds will be analyzed as part of this PDR to ensure that the design meets the standards set forward in the El Paso County Engineering Criteria Manual as well as the Mile-High Flood Control Criteria Manual. The existing pond's detention volume capacity will be confirmed as adequate and infrastructure will be retrofitted as required.

Appendix G
Drainage Maps





Existing Basin Summary Runoff Table

Basin ID	Total Area (ac)	Design Point	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
EX-1	3.38		0.02	0.15	0.12	1.60
Ex-2	9.38		0.02	0.15	0.36	4.85
EX-3	9.14		0.02	0.15	0.42	5.53
OS-1	6.38		0.22	0.38	5.58	16.11
OS-2	3.12		0.27	0.42	2.29	6.06
OS-3	1.14		0.86	0.89	4.06	7.04
OS-4	13.09		0.14	0.30	4.44	15.98
OS-5	59.62		0.27	0.42	51.26	135.79
OS-6	35.75		0.15	0.30	14.22	49.60
OS-7	6.47		0.15	0.30	2.29	7.97
OS-8	3.74		0.02	0.15	0.15	2.03
OS-9	3.14		0.02	0.15	0.20	2.62
OS-10	3.67		0.02	0.15	0.18	2.42
OS-11	35.55		0.02	0.15	1.32	17.58
OS-12	39.29		0.02	0.15	1.57	20.90
OS-13	10.54		0.02	0.15	0.44	5.86
OS-14	8.84		0.02	0.15	0.39	5.14
TOTAL	252.24					

LEGEND

- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING LOT LINE
- PROPOSED LOT LINE
- EXISTING SECTION LINE
- EXISTING EASEMENT
- EXISTING CONTOURS
- PROPOSED CONTOURS

BASIN SIZE IN ACRES — A-1 | 1.2 | 0.50 | 0.75 — BASIN ID; 5-YR RATIONAL C COEFFICIENT; 100-YR RATIONAL C COEFFICIENT

- X — DESIGN POINT ID
- BASIN BOUNDARY
- X.X% — GRADE AND FLOW DIRECTION
- FLOW ARROW

200 0 200 400

(IN FEET)
1 inch = 200 ft.

BENCHMARK:

ELEVATIONS ARE BASED UPON SW COR SEC. 12, T13S, R65W, 6TH PM, FND. 3.25" ALUM. CAP. (ELEVATION: 6810.43=NAVD88).

BASIS OF BEARINGS:

BEARINGS ARE BASED UPON THE WEST LINE OF THE SOUTHWEST QUARTER OF SECTION 12, TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, MONUMENTED AT THE SOUTH END BY A FOUND 3-1/4" ALUMINUM CAP STAMPED "AZTEC CONSULTANTS PLS 38256" AND AT THE NORTH END BY A FOUND 3-1/4" ALUMINUM CAP STAMPED "PLS 4842".

811 Know what's below. Call before you dig.

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CHALLENGER HOMES
8605 EXPLORER DRIVE
SUITE 250
COLORADO SPRINGS, CO 80920
719-598-5192
JIM BYERS

CLIENT

CHALLENGER HOMES
FALCON HIGHLANDS SOUTH – FILING 1
EL PASO COUNTY, COLORADO
DRAINAGE MAPS
EXISTING DRAINAGE MAP

DATE 07/12/2024

A	1st SUBMITTAL TO JURISDICTION 07/12/2024 – KB
B	2nd SUBMITTAL TO JURISDICTION 01/08/2025 – KB
C	3rd SUBMITTAL TO JURISDICTION 04/15/2025 – KB
D	4th SUBMITTAL TO JURISDICTION 06/02/2025 – CS

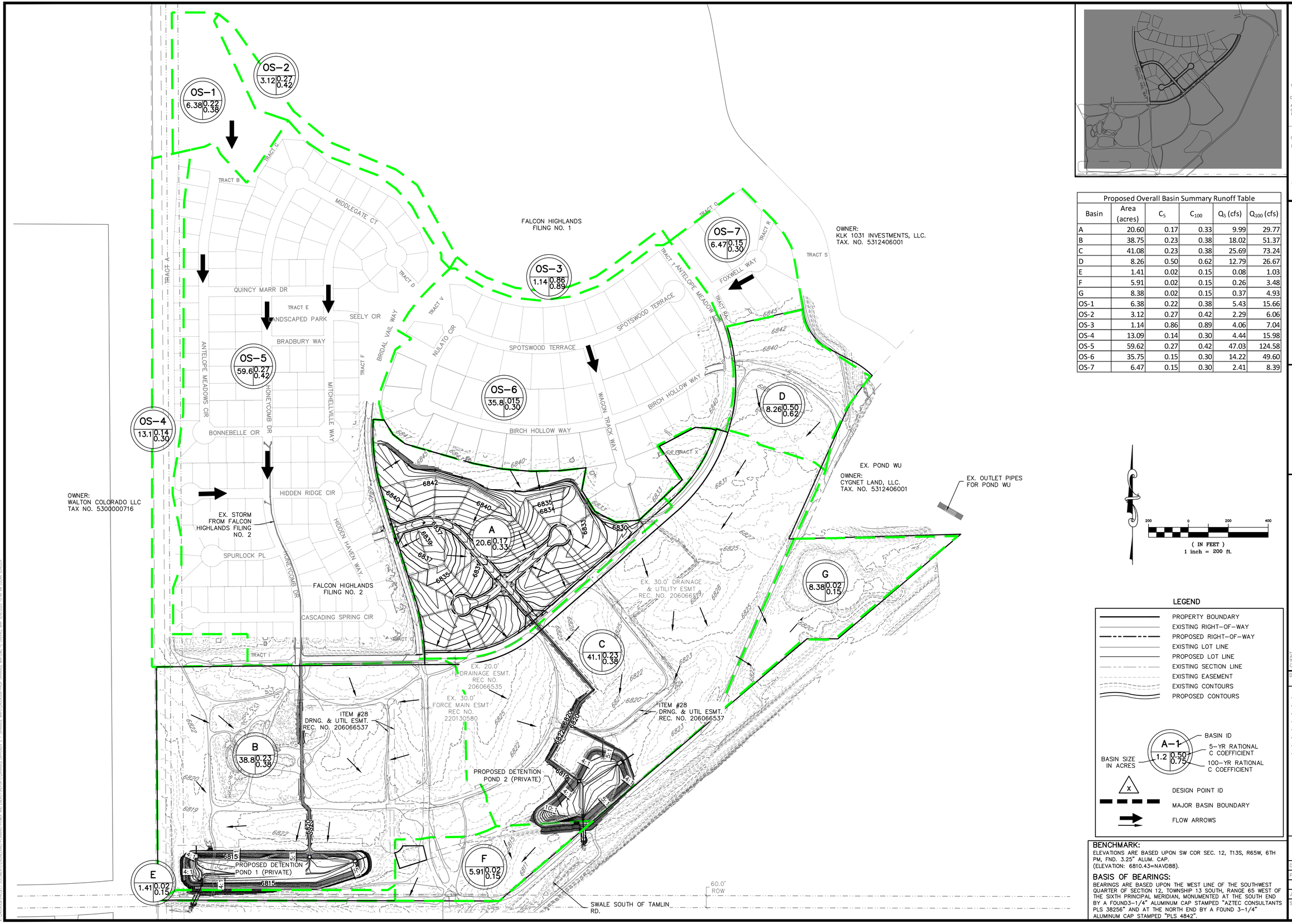
REVISIONS

COUNTY FILE NO.:

DR.	TN	CH.	KB
P.M.	DM		
JOB	24004308		
SHEET NO.			

CAD FILE: 24004308-EX DRAINAGE MAP.DWG

DOCUMENT SET: 1 OF 1 | THE ORIGINAL DOCUMENT WAS PREPARED BY ATWELL LLC IN ACCORDANCE WITH COLORADO STATE STATUTES. ANY UNAUTHORIZED CHANGES TO THIS DOCUMENT ARE NOT THE RESPONSIBILITY OF ATWELL LLC



Proposed Overall Basin Summary Runoff Table					
Basin	Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
A	20.60	0.17	0.33	9.99	29.77
B	38.75	0.23	0.38	18.02	51.37
C	41.08	0.23	0.38	25.69	73.24
D	8.26	0.50	0.62	12.79	26.67
E	1.41	0.02	0.15	0.08	1.03
F	5.91	0.02	0.15	0.26	3.48
G	8.38	0.02	0.15	0.37	4.93
OS-1	6.38	0.22	0.38	5.43	15.66
OS-2	3.12	0.27	0.42	2.29	6.06
OS-3	1.14	0.86	0.89	4.06	7.04
OS-4	13.09	0.14	0.30	4.44	15.98
OS-5	59.62	0.27	0.42	47.03	124.58
OS-6	35.75	0.15	0.30	14.22	49.60
OS-7	6.47	0.15	0.30	2.41	8.39

200 0 200 400
(IN FEET)
1 inch = 200 ft.

LEGEND

- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING LOT LINE
- PROPOSED LOT LINE
- EXISTING SECTION LINE
- EXISTING EASEMENT
- EXISTING CONTOURS
- PROPOSED CONTOURS
- BASIN ID (A-1: 1.2 / 0.50 / 0.75)
- BASIN SIZE IN ACRES
- 5-YR RATIONAL C COEFFICIENT
- 100-YR RATIONAL C COEFFICIENT
- DESIGN POINT ID (X)
- MAJOR BASIN BOUNDARY
- FLOW ARROWS

BENCHMARK:
ELEVATIONS ARE BASED UPON SW COR SEC. 12, T13S, R65W, 6TH PM, FND. 3.25" ALUM. CAP. (ELEVATION: 6810.43=NAVD88).

BASIS OF BEARINGS:
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JIM BYERS

CLIENT: CHALLENGER HOMES

FALCON HIGHLANDS SOUTH – FILING 1
EL PASO COUNTY, COLORADO
DRAINAGE MAPS

PROPOSED OVERALL DRAINAGE MAP

DATE 07/12/2024

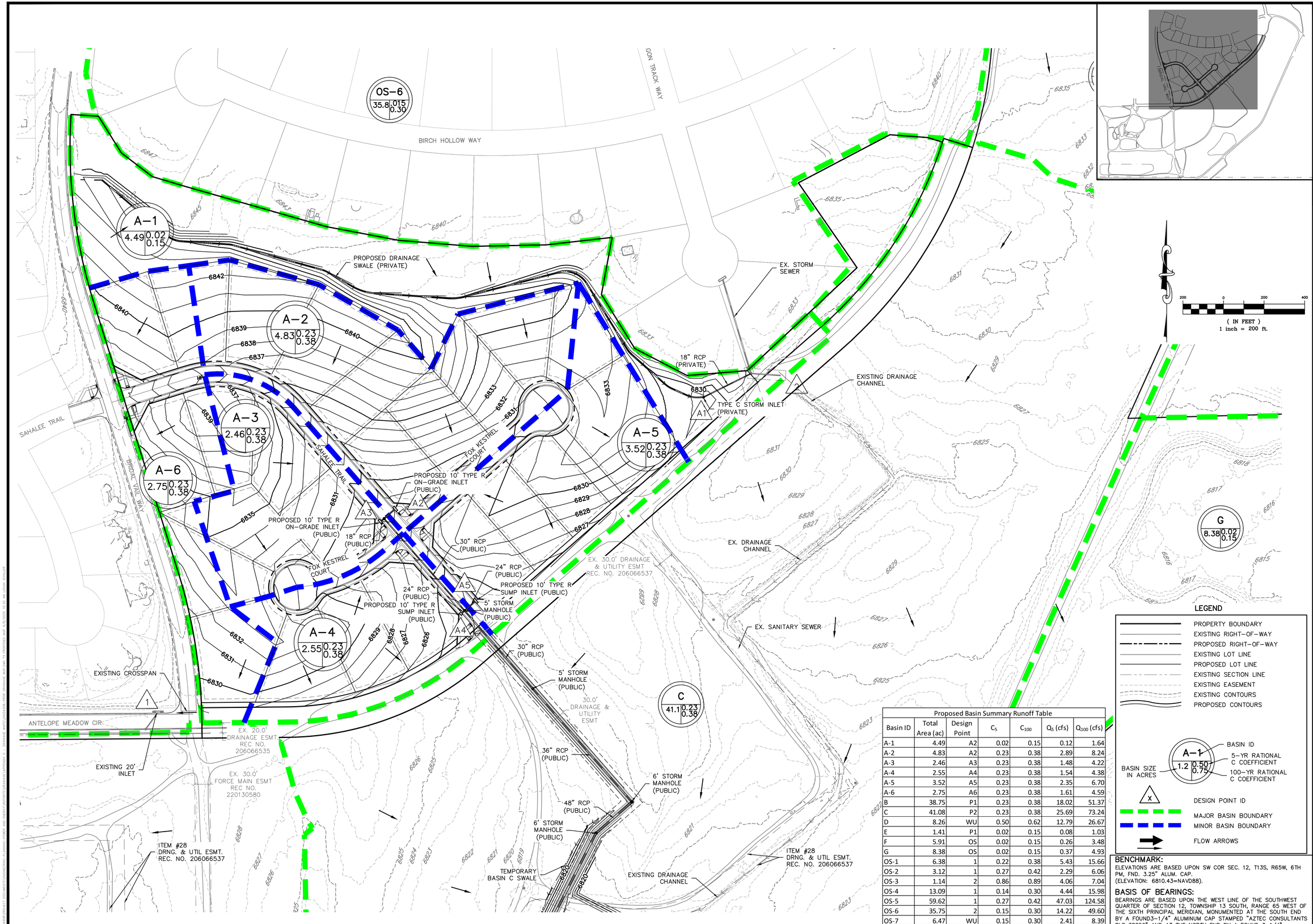
A	1st SUBMITTAL TO JURISDICTION 07/12/2024 – KB
B	2nd SUBMITTAL TO JURISDICTION 01/08/2025 – KB
C	3rd SUBMITTAL TO JURISDICTION 04/15/2025 – KB
D	4th SUBMITTAL TO JURISDICTION 06/02/2025 – CS

REVISIONS

COUNTY FILE NO.:

DR. TN | CH. KB
P.M. DM
JOB 24004308
SHEET NO. 01 OF 04

CAD FILE: 24004308-PROP DRAINAGE MAP.DWG



LEGEND

- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING LOT LINE
- PROPOSED LOT LINE
- EXISTING SECTION LINE
- EXISTING EASEMENT
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- A-1 / 1.2 / 0.50 / 0.75 — BASIN ID, 5-YR RATIONAL C COEFFICIENT, BASIN SIZE IN ACRES, 100-YR RATIONAL C COEFFICIENT
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- MINOR BASIN BOUNDARY
- FLOW ARROWS

Proposed Basin Summary Runoff Table

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A-1	4.49	A2	0.02	0.15	0.12	1.64
A-2	4.83	A2	0.23	0.38	2.89	8.24
A-3	2.46	A3	0.23	0.38	1.48	4.22
A-4	2.55	A4	0.23	0.38	1.54	4.38
A-5	3.52	A5	0.23	0.38	2.35	6.70
A-6	2.75	A6	0.23	0.38	1.61	4.59
B	38.75	P1	0.23	0.38	18.02	51.37
C	41.08	P2	0.23	0.38	25.69	73.24
D	8.26	WU	0.50	0.62	12.79	26.67
E	1.41	P1	0.02	0.15	0.08	1.03
F	5.91	OS	0.02	0.15	0.26	3.48
G	8.38	OS	0.02	0.15	0.37	4.93
OS-1	6.38	1	0.22	0.38	5.43	15.66
OS-2	3.12	1	0.27	0.42	2.29	6.06
OS-3	1.14	2	0.86	0.89	4.06	7.04
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DATE 07/12/2024

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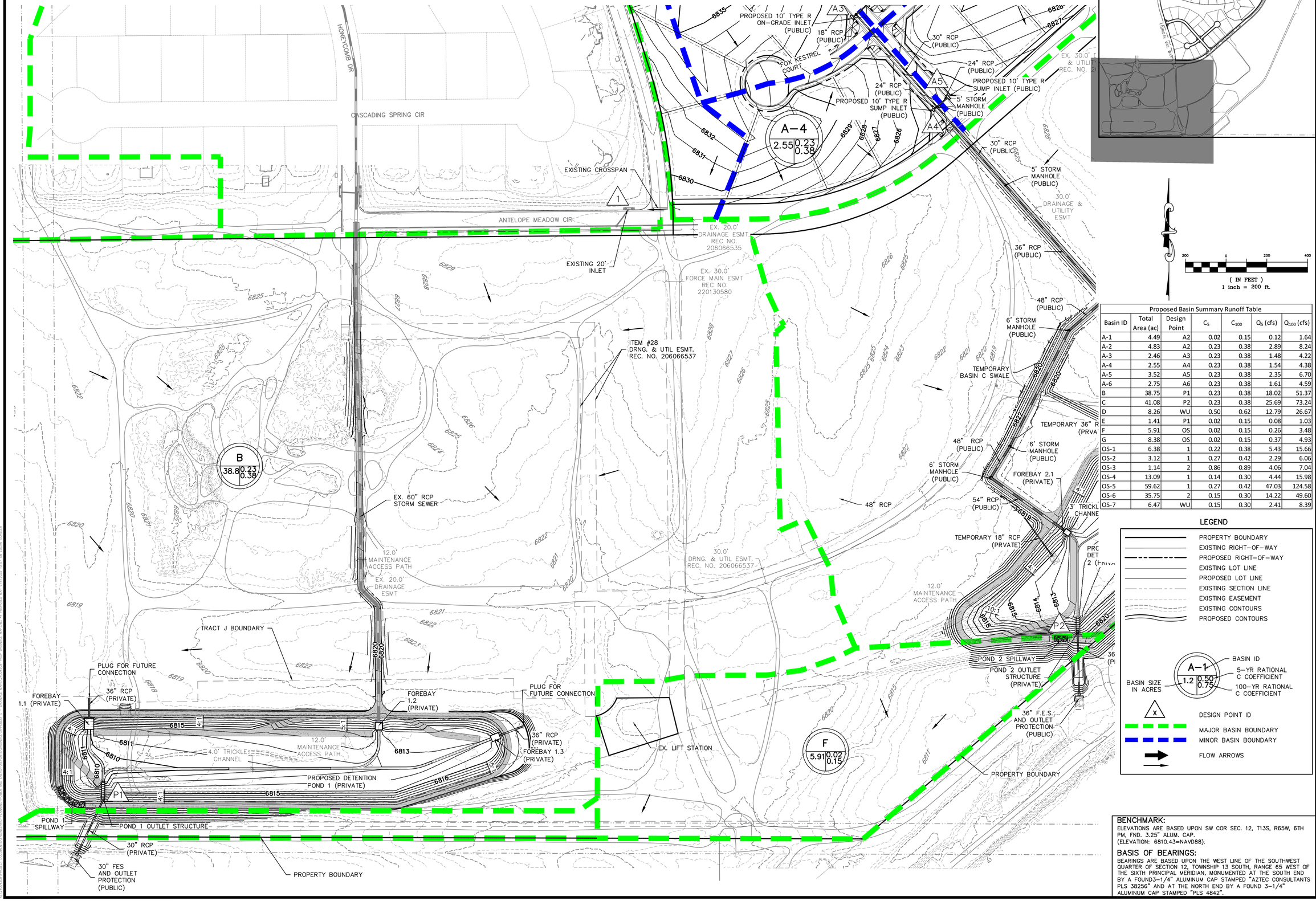
REVISIONS

COUNTY FILE NO.:

DR. TN | CH. KB
P.M. DM
JOB 24004308
SHEET NO. 01 OF 04

CAD FILE: 24004308-PROP DRAINAGE MAP.DWG



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A-6	2.75	A6	0.23	0.38	1.61	4.59
B	38.75	P1	0.23	0.38	18.02	51.37
C	41.08	P2	0.23	0.38	25.69	73.24
D	8.26	WU	0.50	0.62	12.79	26.67
E	1.41	P1	0.02	0.15	0.08	1.03
F	5.91	OS	0.02	0.15	0.26	3.48
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LEGEND

- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING LOT LINE
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- EXISTING SECTION LINE
- EXISTING EASEMENT
- EXISTING CONTOURS
- PROPOSED CONTOURS
- BASIN ID (A-1)
- BASIN SIZE IN ACRES (1.2)
- 5-YR RATIONAL C COEFFICIENT (0.50)
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EL PASO COUNTY, COLORADO
DRAINAGE MAPS

PROPOSED DRAINAGE MAP

DATE 07/12/2024

	REVISIONS
A	1st SUBMITTAL TO JURISDICTION 07/12/2024 – KB
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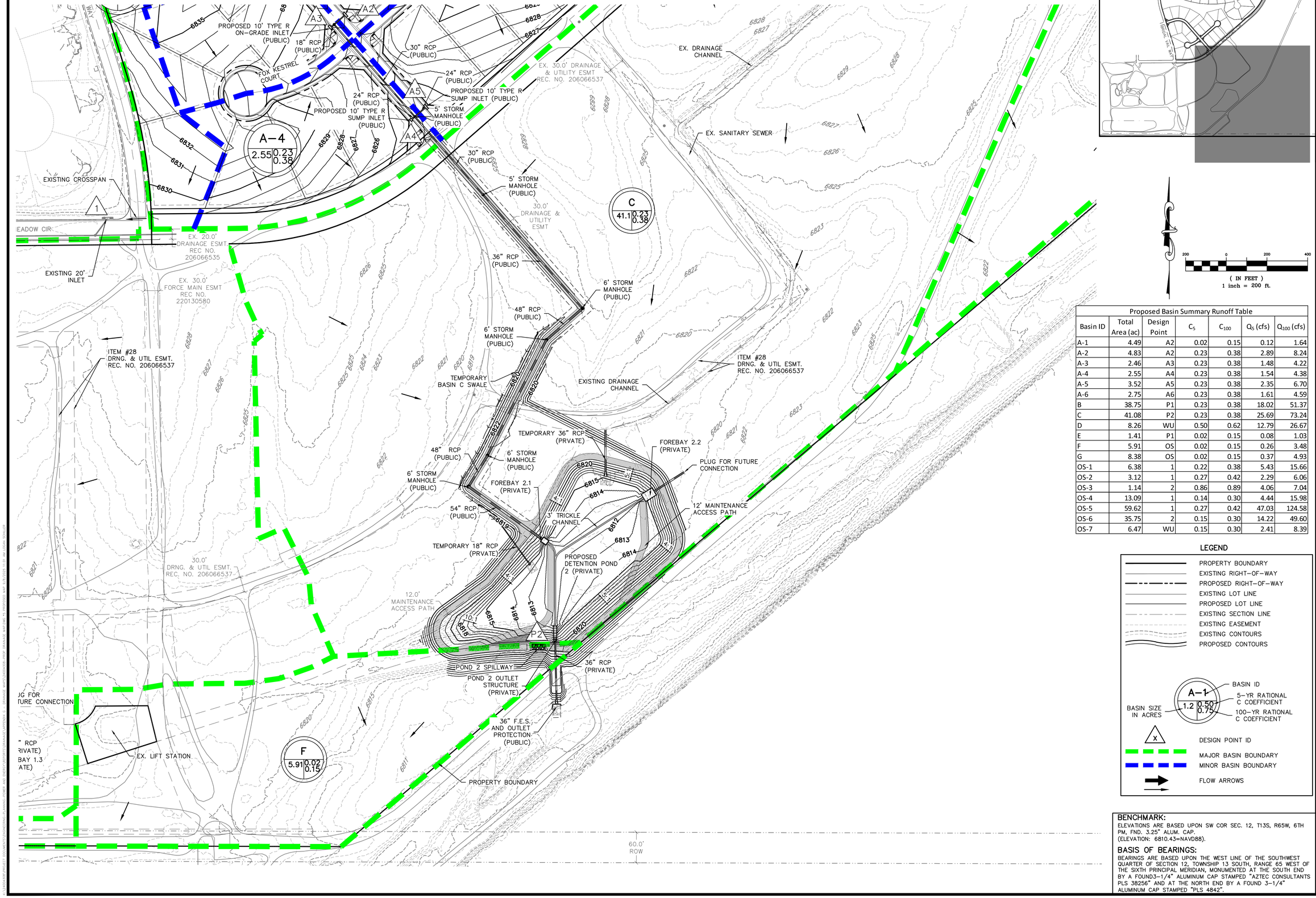
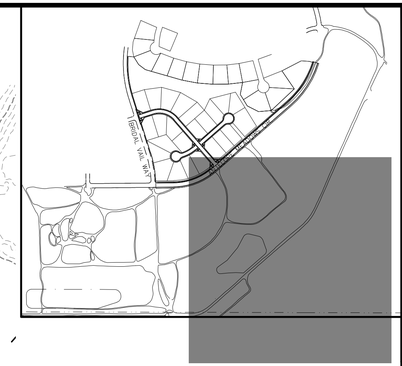
D	4th SUBMITTAL TO JURISDICTION 06/02/2025 – CS

COUNTY FILE NO.:

DR. TN CH. KB
P.M. DM
JOB 24004308
SHEET NO. 03 OF 04

CAD FILE: 24004308-PROP DRAINAGE MAPDWG





(IN FEET)
1 inch = 200 ft.

Proposed Basin Summary Runoff Table

Basin ID	Total Area (ac)	Design Point	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
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A-2	4.83	A2	0.23	0.38	2.89	8.24
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D	8.26	WU	0.50	0.62	12.79	26.67
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OS-1	6.38	1	0.22	0.38	5.43	15.66
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- 0.50 — 5-YR RATIONAL C COEFFICIENT
- 0.75 — 100-YR RATIONAL C COEFFICIENT
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- MINOR BASIN BOUNDARY
- FLOW ARROWS

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DRAINAGE MAPS

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DATE 07/12/2024

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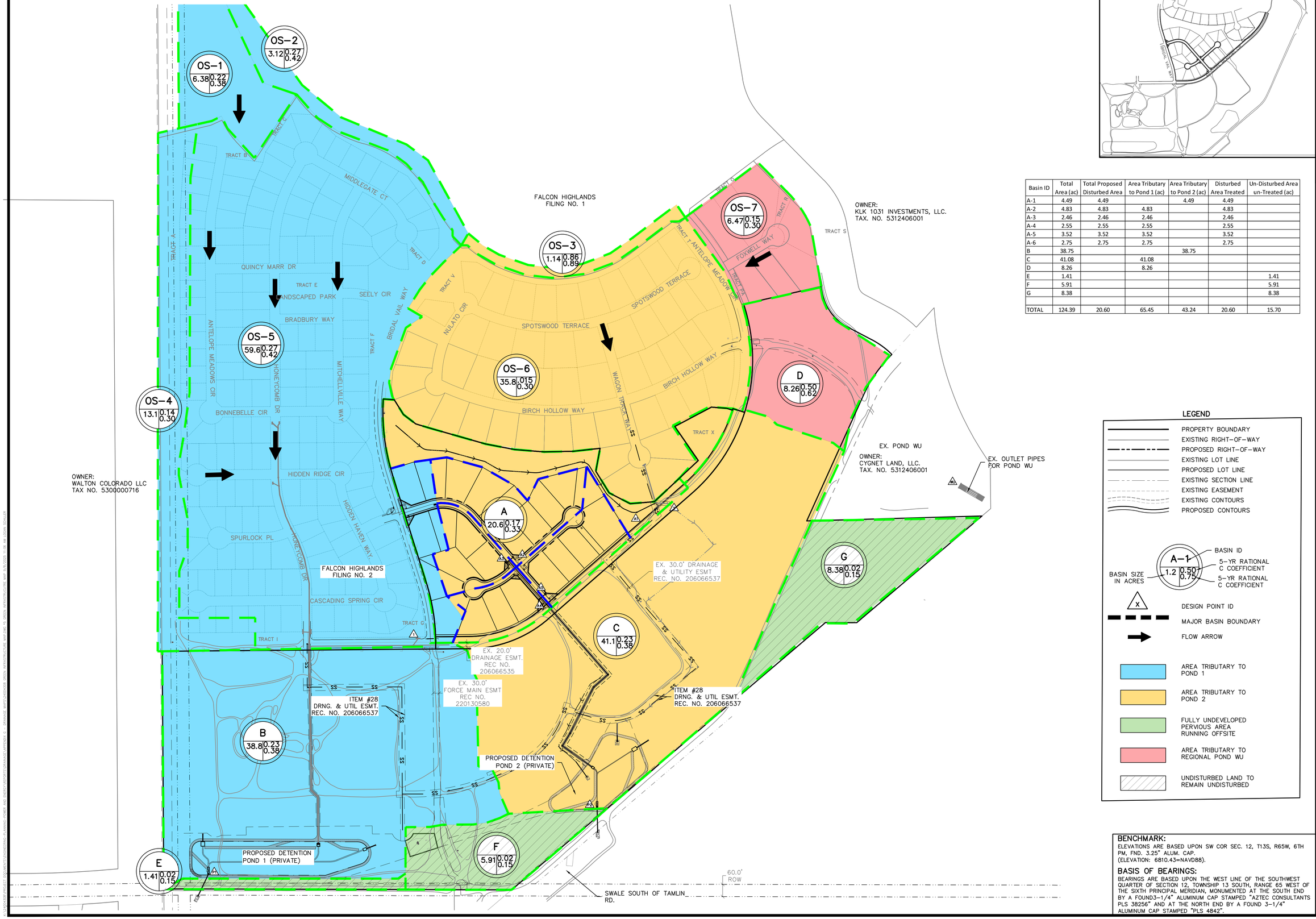
REVISIONS

COUNTY FILE NO.:

DR. TN | CH. KB
P.M. DM
JOB 24004308
SHEET NO. 04 OF 04

CAD FILE: 24004308-PROP DRAINAGE MAP.DWG



Basin ID	Total Area (ac)	Total Proposed Disturbed Area	Area Tributary to Pond 1 (ac)	Area Tributary to Pond 2 (ac)	Disturbed Area Treated	Un-Disturbed Area un-Treated (ac)
A-1	4.49	4.49		4.49	4.49	
A-2	4.83	4.83	4.83		4.83	
A-3	2.46	2.46	2.46		2.46	
A-4	2.55	2.55	2.55		2.55	
A-5	3.52	3.52	3.52		3.52	
A-6	2.75	2.75	2.75		2.75	
B	38.75			38.75		
C	41.08		41.08			
D	8.26		8.26			
E	1.41					1.41
F	5.91					5.91
G	8.38					8.38
TOTAL	124.39	20.60	65.45	43.24	20.60	15.70

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DRAINAGE MAPS

GREEN INFRASTRUCUTRE MAP

DATE 07/12/2024

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JOB 24004308
SHEET NO. ----

CAD FILE: 24004308 GREEN INFRASTRUCTURE MAP.DWG