V5_Drainage letter_comments.pdf Markup Summary

File Attachment (1)

Subject: File Attachment
Page Label: 39
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:20:34 AM
Status:
Color:
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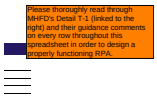
SW - Textbox (2)



Subject: SW - Textbox
Page Label: 39
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:20:45 AM
Status:
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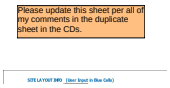
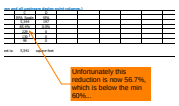
Please thoroughly read through MHFD's Detail T-1 (linked to the right) and their guidance comments on every row throughout this spreadsheet in order to design a properly functioning RPA.



Subject: SW - Textbox
Page Label: 54
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 11:06:52 AM
Status:
Color:
Layer:
Space:

Please update this sheet per all of my comments in the duplicate sheet in the CDs.

SW - Textbox with Arrow (17)



Subject: SW - Textbox with Arrow
Page Label: 41
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:39:26 AM
Status:
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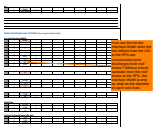
Unfortunately this reduction is now 56.7%, which is below the min 60%...



Subject: SW - Textbox with Arrow
Page Label: 44
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:54:18 AM
Status:
Color:
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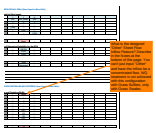
How can this be the Interface Width when the two inflows from the UIA to the RPA are concentrated point discharges from roof drains? Without a level spreader from the roof drains to the RPA, the Interface Width is only as wide as the diameter of each roof drain.



Subject: SW - Textbox with Arrow
Page Label: 44
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:54:14 AM
Status:
Color:
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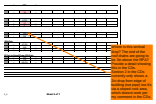
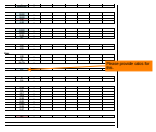
Space:

What is the designed "Other" Sheet Flow Inflow Feature? Describe in the Notes at the bottom of this page. You can't just input "Other" and have the inflow be a concentrated flow, WQ treatment is not achieved with this configuration with Grass Buffers, only with Grass Swales.



Subject: SW - Textbox with Arrow
Page Label: 44
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:54:22 AM
Status:
Color:
Layer:
Space:

Where is this vertical drop? The end of the roof drains are going to be 3in above the RPA? Provide a detail showing this in the CDs.
Section 2 in the CDs currently only shows a 2in drop from edge of building (not pipe) but it's via a sloped rock area, which doesnt work per my comment in the CDs.



Subject: SW - Textbox with Arrow
Page Label: 41
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:52:39 AM
Status:
Color:
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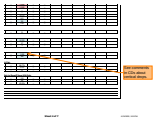
Space:

Please provide calcs for this.



Subject: SW - Textbox with Arrow
Page Label: 42
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:41:54 AM
Status:
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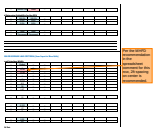
See comments in CDs about vertical drops.



Subject: SW - Textbox with Arrow
Page Label: 42
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:41:05 AM
Status:
Color:
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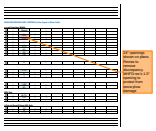
Per the MHFD recommendation in the spreadsheet comment for this row, 2ft spacing on center is recommended.



Subject: SW - Textbox with Arrow
Page Label: 42
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:41:09 AM
Status:
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Space:

24" openings shown on plans. Revise to remove discrepancy. MHFD rec's 1.5" opening to protect from snow plow damage

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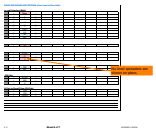
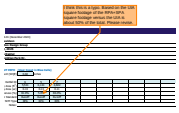


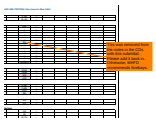
Subject: SW - Textbox with Arrow
Page Label: 44
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:54:20 AM
Status:
Color:
Layer:
Space:

No level spreaders are shown on plans.



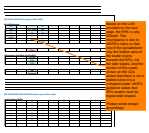
Subject: SW - Textbox with Arrow
Page Label: 39
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:55:08 AM
Status:
Color:
Layer:
Space:

I think this is a typo. Based on the UIA square footage of the RPA+SPA square footage versus the UIA is about 50% of the total. Please revise.



Subject: SW - Textbox with Arrow
Page Label: 41
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 9:58:11 AM
Status:
Color:
Layer:
Space:

This was removed from the notes in the CDs with this submittal. Please add it back in. Otherwise, MHFD recommends forebays.



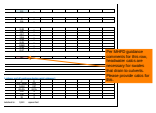
Subject: SW - Textbox with Arrow
Page Label: 40
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:21:55 AM
Status:
Color:
Layer:
Space:

Based on the LxW provided on the next page, the RPA is only 530sqft. This discrepancy is due to MHFD's notes on that row of the spreadsheet: only the bottom area of the swale counts towards the RPA, not the side slopes. And the section of this swale shown on the CDs shows that there is not a bottom since it is a v-shaped swale. MHFD guidance states that RPA swales must be trapezoidal shaped.

Please revise design accordingly.

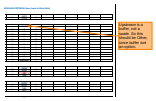
Subject: SW - Textbox with Arrow
Page Label: 37
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 11:07:30 AM
Status:
Color:
Layer:
Space:

For this swale (and Swale-G), please also show calcs to get 2-yr Discharge that is shown in Runoff Reduction calcs (inputted at 0.5cfs on PDF pg 41 below.



Subject: SW - Textbox with Arrow
Page Label: 41
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:52:43 AM
Status:
Color:
Layer:
Space:

Per MHFD guidance comments for this row, headwater calcs are necessary for swales that drain to culverts. Please provide calcs for this.



Subject: SW - Textbox with Arrow
Page Label: 43
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:47:18 AM
Status:
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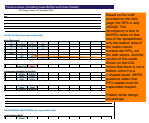
Space:

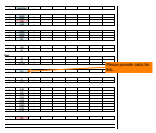
Upstream is a buffer, not a swale. So this should be Other, since buffer isnt an option.



Subject: SW - Textbox with Arrow
Page Label: 42
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:51:55 AM
Status:
Color:
Layer:
Space:

Based on the LxW provided on the next page, the RPA is only 180sqft. This discrepancy is due to MHFD's notes on that row of the spreadsheet: only the bottom area of the swale counts towards the RPA, not the side slopes. And the section of this swale shown on the CDs shows that there is not a bottom since it is a v-shaped swale. MHFD guidance states that RPA swales must be trapezoidal shaped.

Please revise design accordingly.



Subject: SW - Textbox with Arrow
Page Label: 43
Author: Glenn Reese - EPC Stormwater
Date: 7/2/2025 10:52:48 AM
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Space:

Please provide calcs for this.

FINAL DRAINAGE REPORT
LOT 2, BENT GRASS EAST COMMERCIAL FILING NO. 4
CARUBIA PROPERTIES

PCD FILE NO. PPR256

PREPARED FOR:

CARUBIA PROPERTIES
8035 MERIDIAN PARK DRIVE
FALCON, CO 80831
719-640-1962
CONTACT: LUCAS CARUBIA

PREPARED BY:

PERCEPTION DESIGN GROUP, INC.
6901 SOUTH PIERCE STREET, SUITE 220
LITTLETON, CO 80128
CONTACT: JERRY W. DAVIDSON, P.E.
(303) 232-8088

JOB #2024-019

JUNE 19, 2025

Engineers 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.

_____
Jerry W. Davidson, P.E.
CO Reg No. 30226
For and On Behalf Of
Perception Design Group, Inc.

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: _____

By: _____

Title: _____

Address: _____

El Paso County:

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

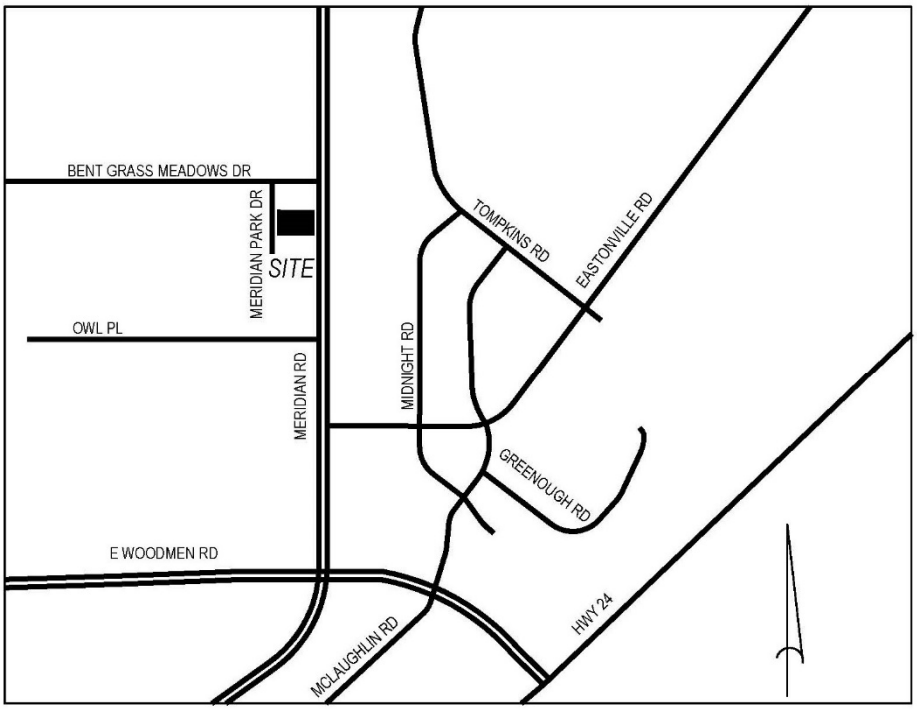
_____ _____
Joshua Palmer, P.E. Date
County Engineer / ECM Administrator

Conditions:

Table of Contents

Section A: GENERAL LOCATION

The Carubia Properties project is located on the east side of Meridian Park Drive approximately 300 feet south of Bent Grass Meadows Drive in Falcon, Colorado. The site address is 8035 Meridian Park Drive, Falcon, CO 80831. It is in unincorporated El Paso County. Meridian Park Drive is located to the west of the property and Meridian Road is to the east.



VICINITY MAP
1" = 1000' ±

By rectangular survey coordinates the project is located in the Northeast Quarter of Section 1, Township 13 South, Range 65 West of the 6th P.M. County Of El Paso, State of Colorado.

There are no major drainageways within the property. There are no existing stormwater facilities within the property.

Surrounding developments include Lot 1 Bent Grass East Commercial Filing No.1 to the north. This site is developed as a 7-Eleven fuel station and convenience store. To the west Is Bent Grass East Commercial Filing No 2B and Filing No. 3 which are vacant ground and a veterinary clinic. To the south is vacant ground in Bent Grass East Commercial Filing No 4. To the east is Woodmen Hills Fil No 8, a residential subdivision.

Section B: DESCRIPTION OF PROPERTY

The subject property contains 0.87 acres of land and is zoned CS. Ground cover consists of bare dirt and native grass. Site topography slopes from north to south at average 3%. The easterly side of the site discharges to the roadside ditch of Meridian Road while the westerly side of the site discharges onto the adjacent property south.

Site soils as illustrated on the NRCS Web Soil Survey indicate Columbine gravelly sandy loam soils are present at the site. This soil is a well-drained soil with hydrologic soil group A designation.

There are no major drainageways or irrigation facilities on the property.

The property is generally free of encumbrances with utility easements around the perimeter of the property. These easements are generally free of utilities with the exception of dry utilities along the west side of the property.

Proposed development includes the construction of a commercial medical office building with associated parking and utilities.

Section C: MAJOR BASIN DESCRIPTIONS

There are no major drainageways thru or adjacent to the property. By graphic plotting only the subject property is situated in flood zone "X" according to Flood Insurance Rate Map (FIRM) community panel no. 08041C0553G with an effective date of December 17, 2018. Zone X Flood Areas are “Areas determined to be outside the 100-year floodplain”. The Site falls in the Middle Tributary Basin within the Falcon Drainage Basin. Receiving waters is the Falcon Drainage Basin. Major basin characteristics include a mixture of residential, commercial and open range land. There are no obstructions on the property that would affect the major basin drainage flow patterns.

Drainage basin fees were paid when the property was platted.

Section D: SUB-BASIN DESCRIPTIONS

In the existing / historic condition, site topography slopes from north to south at an average of 3%. The easterly side of the site discharges to the roadside ditch of Meridian Road while the westerly side of the site discharges onto the adjacent property south. Offsite flow patterns have no impact on the property. Up-gradient flows are intercepted along the north property line and conveyed around the property via storm sewer. Historic sub-basins are described below:

Basin Dn: This basin represents the adjusted historic basin D. Basin D is illustrated on the drainage map prepared for the Bent Grass East report and included in the appendix. Basin Dn is 82.9% of the original basin D area. Allowable runoff from Dn is adjusted from the allowable reported in the Bent Grass East report based upon the size percentage of the new Dn Basin. Basin Dn defines allowable flows to the roadside ditch of Meridian Road. Basin parameters are summarized as follows:

Design Point	A
Area	0.34 ac
Percentage of original basin D	82.9 %
Q5 Allowable	1.7 cfs
Q100 Allowable	2.5 cfs

Basin D1n: This basin represents the adjusted historic basin D1. Basin D1 is illustrated on the drainage map prepared for the Bent Grass East report and included in the appendix. Basin D1n is 68.2% of the original basin D1 area. Allowable runoff from D1n is adjusted from the allowable reported in the Bent Grass East report based upon the size percentage of the new D1n basin. Basin D1n defines allowable flows to Meridian Drive and thence to the existing detention and water quality facility. Basin parameters are summarized as follows:

Design Point	B
Area	0.43 ac
Percentage of original basin D	68.2 %
Q5 Allowable	2.0 cfs
Q100 Allowable	3.4 cfs

Section E: DRAINAGE DESIGN CRITERIA

1. Hydrologic Criteria

Minor and major storm frequencies used in the design are 5 year for the minor, and 100 year for the major. Rainfall data was obtained from the Bent Grass East Commercial Phase 1 Preliminary Drainage Report to provide continuity. Results are summarized below.

Storm Frequency (Year)	Rainfall Intensity (in/hr)
5	5.10
100	9.07

The rational method was used, as described in MHFD manual, to calculate developed direct runoff for the 5-year and 100-year storm frequencies. As the site is relatively small, a time of concentration value of 5 minutes is used for a conservative solution. Composite C values are calculated per MHFD criteria.

The rational method equation (Q=CIA) is used to determine the maximum rate of runoff for each basin. In which:

Q= the maximum rate of runoff (cubic feet per second)
C= the runoff coefficient
I= the average intensity of rainfall for a duration equal to the time of concentration (inches/hour)
A= basin area (acres)

Water quality volumes are calculated using MHFD equations 3-1 and 3-2. Water quality discharge is calculated based upon 12 hour minimum drain time.

2. Hydraulic Criteria

Minor and major storm frequencies used in the design are 5 year for the minor, and 100 year for the major. The storm sewer pipes and inlets will be sized for the 100 year storm.

3. Previous Reports and Studies

The site was previously studied in a report entitled “Preliminary Drainage Report for Bent Grass East Commercial – Phase 1 (Preliminary Plan) and Final Drainage Report for Bent Grass East Commercial Filing No. 1 – Lot 1 (Final Plat),” prepared by Classic Consulting Engineers & Surveyors, approved March 15, 2013.

The site was further studied in a report entitled “Dunkin Bent Grass Lot 1A of Bent Grass East Commercial Filing No. 2A 8035 Meridian Park Drive, Peyton, CO 80831 Final Drainage Report” prepared by M&S Civil Consultants, Inc, approved September 06, 2023.

The Dunkin project has not been built to date thus the Bent Grass East report is used as a reference in this study.

In the Bent Grass East report, the Carubia site is shown in Basins D and D1. Subsequent re-plat has changed the property such that a portion of basins D and D1 are no longer contained within the site. New basins Dn (D new) and D1n (D1 new) are established to assist in runoff analysis. These new basins are compared by area to the original establishing a percentage of the original size. This percentage is then applied to the allowable runoff to determine compliance with the original report. Results are presented in the table below:

Basin	Area (Acres)	Percentage of Original Basin	Q5 (cfs)	Q100 (cfs)
D	0.41	100%	2	3
D1	0.63	100%	3	5
Dn	0.34	82.9%	1.7	2.5
D1n	0.43	68.2%	2.0	3.4

The Bent Grass East report further provides for detention and water quality for basin D1, while neither detention nor water quality are provided for basin D. The report calls for water quality only for basin D to be provided on-site.

Section F: FOUR STEP PROCESS

1. Step 1 – Runoff Reduction

Runoff reduction is achieved for a portion of the site. The roof area of basin E is routed via pipes to the top of the grass swale for infiltration in proposed Grass Swale C. Grass Swale C is for water quality only. Detention is not provided. The roof area of basin G is routed via pipes to the top of the grass buffer for infiltration into the landscape area shown as Grass Buffer J. The parking areas for basin F is surface discharge via 12" curb cuts with 10' spacing O.C. through grass buffer F and existing Grass Swale G.

2. Step 2 – Stabilization of Drainageways

As no drainageways exist on the site, no stabilization is proposed.

3. Step 3 – Stormwater Quality Capture Volume

Stormwater Quality Capture Volume is provided for basins A, B, and C in the existing detention and water quality facility offsite to the southwest of the property. This pond is known as Pond 2 designed with SF1411 and SF1412. Stormwater Quality Capture Volume is provided for basin E, F, G and OS-1 via Runoff Reduction. The table below illustrates water quality treatment for the site:

Basin ID(s)	PCM Trib. Area (ac)	PCM ID
A,B,C	0.45	Pond 2 designed with SF1411 and SF1412
E	0.12	WQ treatment via Runoff Reduction via Grass Swale C
F and OS-1	0.07	WQ treatment via Runoff Reduction via Grass Swale G and RPA Grass Buffer F
G	0.15	WQ treatment via Runoff Reduction via Grass Buffer J

4. Step 4 – BMP's for Commercial and Industrial Pollutants

Industrial and commercial pollutants will be limited for the site. No industrial activities are proposed, and commercial activities are limited to a parking lot.

Section G: DRAINAGE FACILITY DESIGN

1. General Concept

The general drainage concept is to grade the site such that the original basin division line of basins D and D1 dividing runoff between flows east and west are more or less maintained. Basins A, B, and C are directed to the west to the adjacent street and conveyed southwesterly to the existing detention and water quality facility for the site known as Pond 2 designed with SF1411 and SF1412. Examination of aerial google photography indicates the pond is constructed. As discussed in E.3 above, the allowable runoff to pond 2 is 3.4 cfs 100 year. Runoff generated for the development in this report is 2.93 cfs 100 year indicating the pond is adequately sized for this development. Basins E, F, and G are directed to the east to Meridian Road. Water quality will be provided in grass swale A for basin E with exclusion for basins F and G as noted in section F.3 above.

2. Specific Details

Site development is to be accomplished in a single phase. The site is divided into sub-basins to quantify flows at various locations in the site. Sub-basins are described as follows:

Basin A: This basin represents paved parking area and landscape areas west of the proposed building. 100-year runoff is collected at a curb chase at the southwest corner of the basin and conveyed into Meridian Park Drive. Runoff is then conveyed to the detention and water quality pond 2 designed with SF1411 and SF1412 via surface flow and underground storm sewer. Basin parameters are summarized as follows:

Area	0.21 ac
Imperviousness	91 %
C5	0.77
C100	0.82
Q5	0.82 cfs
Q100	1.56 cfs

Basin B: This basin represents paved driveway area northwest of the proposed building and landscape area along the east edge of Meridian Park Drive. 100-year runoff is discharged directly into Meridian Park Drive. Runoff is then conveyed to the detention and water quality pond 2 designed with SF1411 and SF1412 via surface flow and underground storm sewer. Basin parameters are summarized as follows:

Area	0.08 ac
Imperviousness	67 %
C5	0.52
C100	0.63
Q5	0.21 cfs
Q100	0.46 cfs

Basin C: This basin represents paved parking, landscape, and driveway area southwest of the proposed building. 100-year runoff is directed out the proposed access offsite south of the property and discharged directly into Meridian Park Drive. Runoff is then conveyed to the

detention and water quality pond 2 designed with SF1411 and SF1412 via surface flow and underground storm sewer. Basin parameters are summarized as follows:

Area	0.16 ac
Imperviousness	67 %
C5	0.52
C100	0.63
Q5	0.42 cfs
Q100	0.91 cfs

Basin E: This basin represents the roof of the proposed building and landscape areas south of the building. 100-year runoff is directed south into a proposed water quality grass swale. The roof drains exit at the top of the grass swale five feet from the building and directly into the grass swale. After treatment, stormwater is discharged via storm sewer into the roadside ditch adjacent to Meridian Road. Water quality is provided on site for this basin with Grass Swale A. Detention is not provided per the Bent Grass East report. Basin parameters are summarized as follows:

Area	0.16 ac
Imperviousness	81 %
C5	0.66
C100	0.74
Q5	0.54 cfs
Q100	0.96 cfs

Basin F: This basin represents paved areas north of the proposed building. 100-year runoff is directed northeast to an existing curb cut. Runoff thence travels overland east to an existing culvert with discharge into the roadside ditch adjacent to Meridian Road. Water quality is not provided for this basin. Detention is not provided per the Bent Grass East report. Basin parameters are summarized as follows:

Area	0.06 ac
Imperviousness	95 %
C5	0.81
C100	0.85
Q5	0.25 cfs
Q100	0.44 cfs

Basin G: This basin represents landscape areas east of the proposed building. 100-year runoff is directed east to the roadside ditch adjacent to Meridian Road. Formal water quality is not provided for this basin. However, since the basin is totally landscape area, de-facto water quality is achieved via the overland flow across a landscape area. Detention is not provided per the Bent Grass East report. Basin parameters are summarized as follows:

Area	0.10 ac
Imperviousness	5 %
C5	0.02
C100	0.15
Q5	0.01 cfs
Q100	0.14 cfs

As presented in section 3B above, proposed runoff rates are reduced from that anticipated in the original Bent Grass East report. The channel is fully vegetated and stable per google drive by photography. The flow entering the channel for the 100-year is 1.53 cfs. From the final Drainage Report for Bent Grass East Commercial Filing No. 2 (SF1411) the calculated 100-year flow from OS-3 is 11 cfs. Therefore, downstream facilities are assumed to be adequate to service the Carubia project. Summarized flow rates are presented below:

Design Point 1 is a summation of flows entering Meridian Park Drive via overland flow. Basins A, B, and C are tributary to design point 1.

Q5	1.46 cfs
Q100	2.93 cfs
Allowable Q5	2.0 cfs
Allowable Q100	3.4 cfs

Design Point 2 is a summation of flows entering the roadside ditch of Meridian Road. Basins E, F, and G are tributary to design point 2.

Q5	0.80 cfs
Q100	1.53 cfs
Allowable Q5	1.7 cfs
Allowable Q100	2.5 cfs

A portion of the site is to be serviced by a new private grass swale located along the south side of the property. SCM Design – v4.01 is used to size the grass swale C. Maintenance of the grass swale will be by the property owner.
Grass Swale Results are summarized below:

Total Area for Design Point 6	5,023 sf
UIA-A Area	4,046 sf
RPA-C Area	780 sf
SPA-D Area	197sf
Imperviousness	81%
Length of Swale	53 ft
Bottom Width	10 ft
Bottom Area	530 sf
Side Slopes	4:1
Longitudinal Slope	0.03
2-year Discharge	0.5 cfs
Flow Depth	0.08 ft
Flow Area	0.8 sf
Top Width	10.6 ft
Hydraulic Radius	0.08 ft
VR Product	0.05 sf/sec
Manning's n value	0.08
Froude Number	0.07

Section H: OTHER GOVERNMENT AGENCY REQUIREMENTS

Government approvals are limited to EL Paso County.

Section I: LIST OF REFERENCES

1. *Urban Storm Drainage Criteria Manual, Vol. 1 and Vol. 2*, Urban Drainage and Flood Control District, 2024.

2. *Urban Storm Drainage Criteria Manual, Vol. 3*, Urban Drainage and Flood Control District, November 2024.

3. *Federal Emergency Management Agency,* Flood Insurance Rate Map (FIRM) 08041C0553G Effective Date December 7, 2018

4. *USDA Web Soil Survey*

5. *El Paso County Drainage Criteria Manual*

6. *Preliminary Drainage Report for Bent Grass East Commercial – Phase 1 (Preliminary Plan) and Final Drainage Report for Bent Grass East Commercial Filing No. 1 – Lot 1 (Final Plat)," prepared by Classic Consulting Engineers & Surveyors, approved March 15, 2013.*

7. *Final Drainage Report for Bent Grass East Commercial Filing No. 2 prepared by Classic Consulting Engineer & Surveyors, approved July 2014.*

Section J: APPENDICES

1. Soil, Floodplain

2. Hydrologic Computations

3. Grass Swale Computations

4. Excerpts from Prior Report

5. Drainage Plans

1. Soil, Precipitation, Floodplain

NRCS Custom Soil Resource Report – Geotech Report Excerpts

FEMA Firmette

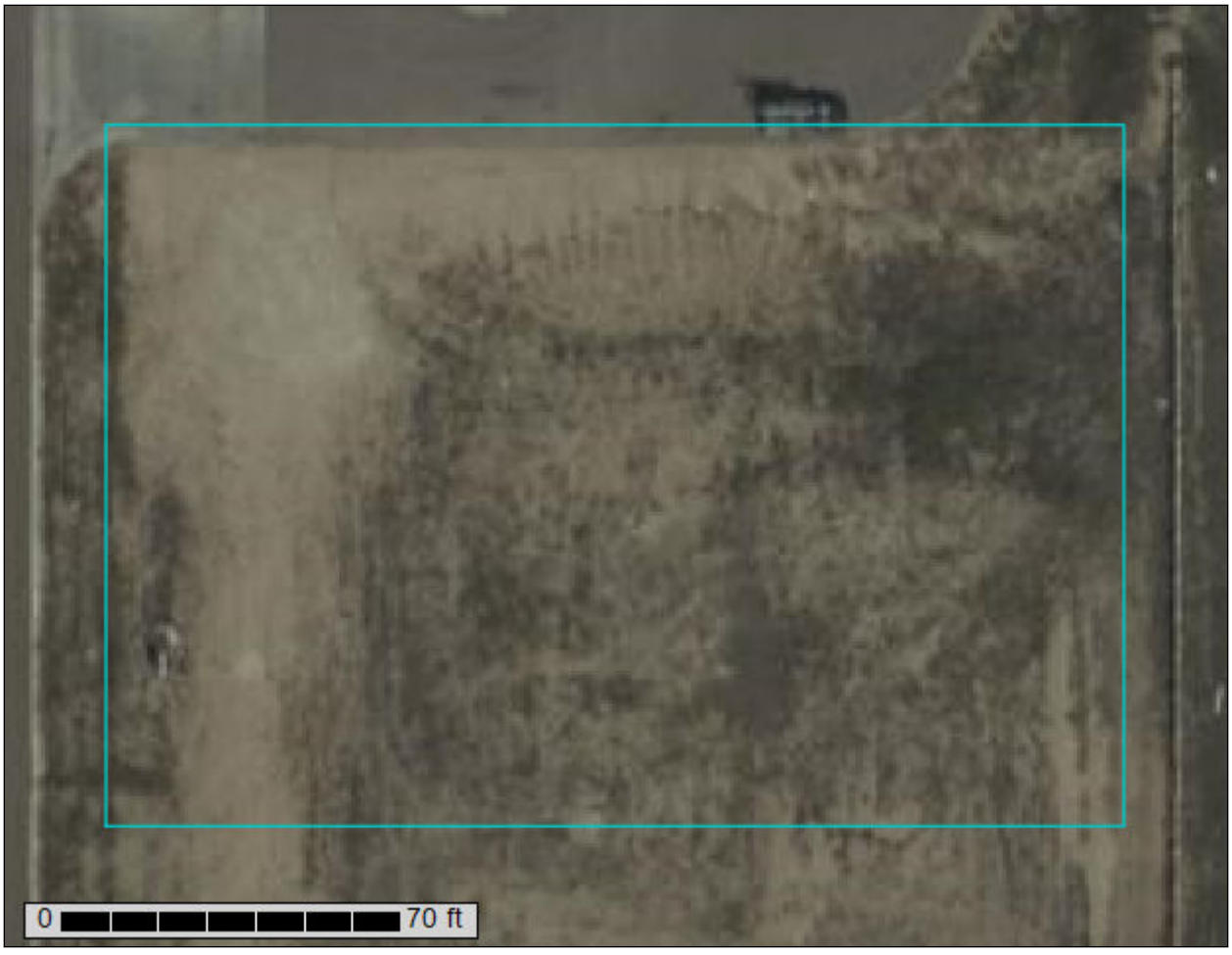
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado



December 13, 2024

Preface

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

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

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

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

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

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

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

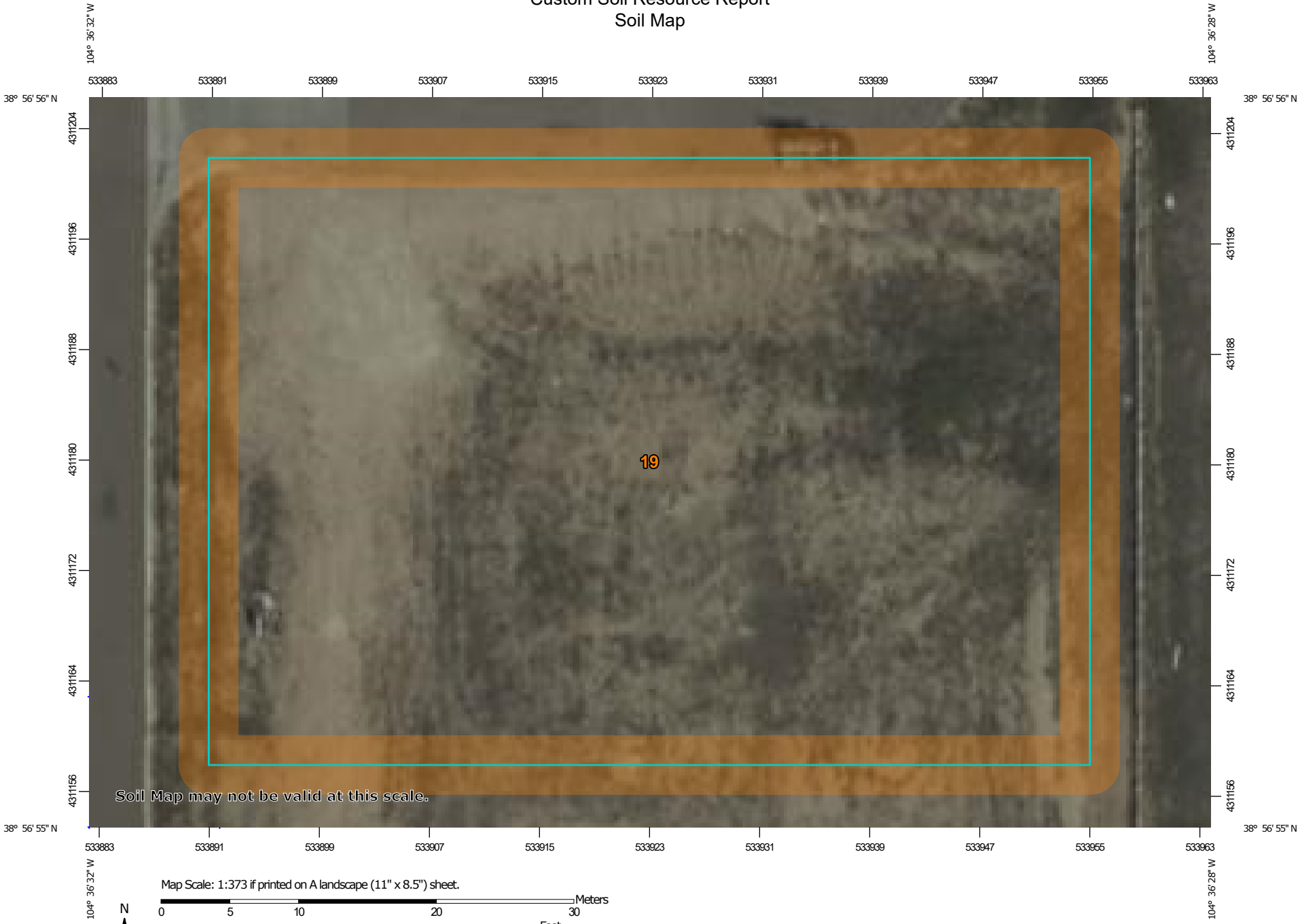
alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:373 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 15 30 60 90

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: 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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	0.7	100.0%
Totals for Area of Interest		**0.7**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Fans, fan terraces, flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

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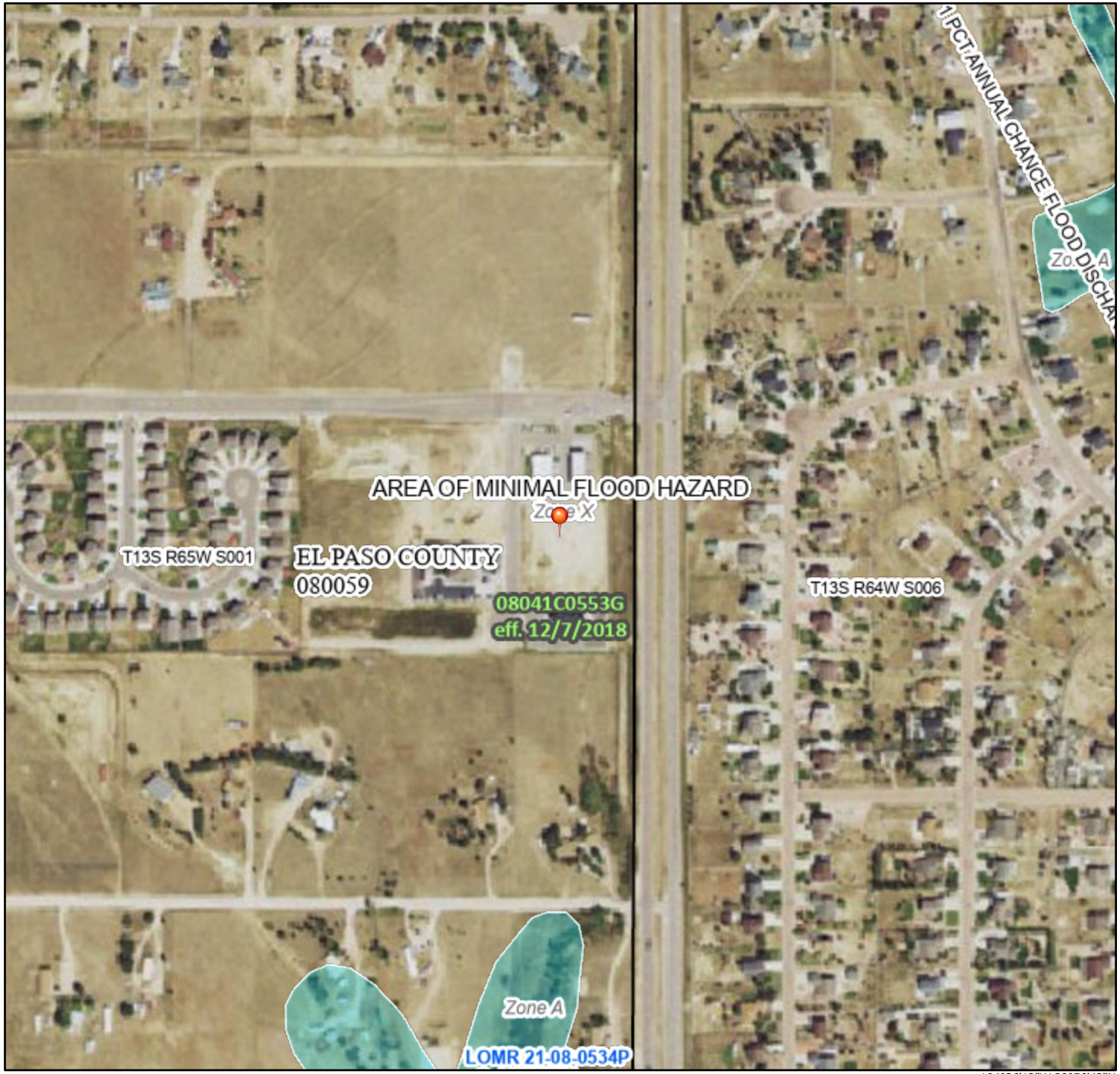
National Flood Hazard Layer FIRMette

FEMA

104°36'50"W 38°57'10"N



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

1:6,000

104°36'12"W 38°56'42"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/13/2024 at 8:38 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

2. Hydrologic Computations

Land Use Assumptions, C Values

Determination of Runoff Coefficients, Time of Concentration, Runoff Calculations

Peak Flow Rate Calculations

4.5 RAINFALL INTENSITY

The calculated rainfall intensity, I, is the average rainfall rate in inches per hour over a duration equal to t_c. Obtain 1-hour point precipitation depths from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the average return periods of interest and apply Equation 5-1 in the *Rainfall* chapter using t_c as the storm duration, t_d. Use the centroid of the catchment to determine the 1-hour point precipitation depths. The MHFD-Rational and MHFD-Inlet Excel workbooks automatically calculate rainfall intensity based on 1-hour point precipitation depths for a specified location.

4.6 RUNOFF COEFFICIENTS

Any watershed can be conceptualized as a combination of pervious and impervious surfaces. Pervious surfaces allow water to infiltrate into the ground, while impervious surfaces do not allow for infiltration. In urban hydrology, the relationships between pervious and impervious surfaces is important. Urbanization increases impervious area, causing rainfall-runoff relationships to change significantly. In the absence of stormwater management controls that infiltrate or detain runoff, urbanization increases peak runoff rates, volumes, and frequency of runoff and decreases the time to peak.

When analyzing a catchment for planning or design purposes, estimates of the existing and probable future imperviousness of the drainage area are needed. In some cases, the pre-development (i.e., historic) condition also must be analyzed. Table 6-2 provides recommended imperviousness values based on land use types and is appropriate for master planning analysis and conceptual design. Note that the land use classifications in Table 6-2 incorporate roads that are included within the land use. Table 6-3 provides recommended imperviousness values for different surface types and is appropriate for use during later stages of design when the layout of different types of impervious and pervious areas on the site is known and the area of each surface type can be quantified.

The runoff coefficient, C, represents the integrated effects of infiltration, evaporation, depression storage, and interception, all of which affect the rate and volume of runoff. Determining representative runoff coefficients requires judgment based on the experience and expertise of the engineer.

Volume-based runoff coefficients were derived to improve consistency between CUHP and the Rational Method for peak flow predictions (Guo 2013; Guo and Urbonas 2013). The coefficients developed by Dr. Guo were recalibrated using CUHP Version 2.0.0 (Rapp et al. 2017). Using imperviousness, expressed as a decimal, and the Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG), the equations in Table 6-5 can be used to calculate runoff coefficients for design storm return periods for the Rational Method.

TABLE 6-5. RUNOFF COEFFICIENT EQUATIONS BASED ON NRCS HSG AND STORM RETURN PERIOD

NRCS HSG	STORM RETURN PERIOD						
	WQE & 2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.840I^{1.302}$	$C_A = 0.861I^{1.276}$	$C_A = 0.873I^{1.232}$	$C_A = 0.884I^{1.124}$	$C_A = 0.854I + 0.025$	$C_A = 0.779I + 0.110$	$C_A = 0.645I + 0.254$
B	$C_B = 0.835I^{1.169}$	$C_B = 0.857I^{1.088}$	$C_B = 0.807I + 0.057$	$C_B = 0.628I + 0.249$	$C_B = 0.558I + 0.328$	$C_B = 0.465I + 0.426$	$C_B = 0.366I + 0.536$
C/D	$C_{C/D} = 0.834I^{1.122}$	$C_{C/D} = 0.815I + 0.035$	$C_{C/D} = 0.735I + 0.132$	$C_{C/D} = 0.560I + 0.319$	$C_{C/D} = 0.494I + 0.393$	$C_{C/D} = 0.409I + 0.484$	$C_{C/D} = 0.315I + 0.588$

Perception Design Group, Inc.
6901 South Pierce Street, Suite 220
Littleton, Colorado 80128
(303) 232-8088 Fax (303) 232-5255

Designed by: JWD
Date: 25-Jun-25
Job Number: 2024-019

Project: Carubia Dental

COMPOSITE RUNOFF COEFFICIENTS - TYPE A SOIL

	ROOF	PAVEMENT	LANDSCAPING	GRAVEL PATHS	OPEN WATER	NATIVE GRASS			
Catchment	Area (Ac.)	Area (Ac.)	Area (Ac.)	Area (Ac.)	Area (Ac.)	Area (Ac.)	Catchment Area	Composite Imperviousness	Composite C
	Imperviousness = 95%	Imperviousness = 95%	Imperviousness = 20%	Imperviousness = 60%	Imperviousness = 100%	Imperviousness = 5%	(Ac.)	%	
A (5-Year)	0.00	0.20	0.01	0.00	0.00	0.00	**0.21**	**91%**	**0.77**
A (100-Year)	0.00	0.20	0.01	0.00	0.00	0.00	**0.21**	**91%**	**0.82**
B (5-Year)	0.00	0.05	0.03	0.00	0.00	0.00	**0.08**	**67%**	**0.52**
B (100-Year)	0.00	0.05	0.03	0.00	0.00	0.00	**0.08**	**67%**	**0.63**
C (5-Year)	0.00	0.10	0.04	0.00	0.00	0.00	**0.14**	**75%**	**0.59**
C (100-Year)	0.00	0.10	0.04	0.00	0.00	0.00	**0.14**	**75%**	**0.69**
To Ex Pond (5-Year)	0.00	0.35	0.08	0.00	0.00	0.00	**0.43**	**81%**	**0.66**
To Ex Pond (100-Year)	0.00	0.35	0.08	0.00	0.00	0.00	**0.43**	**81%**	**0.74**
E (5-Year)	0.09	0.00	0.03	0.00	0.00	0.00	**0.12**	**76%**	**0.61**
E (100-Year)	0.09	0.00	0.03	0.00	0.00	0.00	**0.12**	**76%**	**0.70**
F (5-Year)	0.00	0.07	0.00	0.00	0.00	0.00	**0.07**	**95%**	**0.81**
F (100-Year)	0.00	0.07	0.00	0.00	0.00	0.00	**0.07**	**95%**	**0.85**
G (5-Year)	0.04	0.00	0.00	0.00	0.00	0.11	**0.15**	**29%**	**0.18**
G (100-Year)	0.04	0.00	0.00	0.00	0.00	0.11	**0.15**	**29%**	**0.34**
OS1 (5-Year)	0.00	0.02	0.00	0.00	0.00	0.01	**0.03**	**58%**	**0.43**
OS1 (100-Year)	0.00	0.02	0.00	0.00	0.00	0.01	**0.03**	**58%**	**0.56**
To Meridian Rd (5-Year)	0.13	0.07	0.03	0.00	0.00	0.11	**0.34**	**60%**	**0.45**
To Meridian Rd (100-Year)	0.13	0.07	0.03	0.00	0.00	0.11	**0.34**	**60%**	**0.58**

Perception Design Group, Inc.
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(303) 232-8088 Fax (303) 232-5255

Designed by: JWD
Date: 25-Jun-25
Job Number: 2024-019

Project: Carubia Dental

RUNOFF CALCULATIONS

(RATIONAL METHOD)

Design Storm: 5-Yr.

		Direct Runoff						
	Design	Basin	Area	Runoff	C*A	Tc	I	Q=CIA
	Point	Desig.	(Acres)	Coefficient		(min)	(in/hr)	(cfs)
	3	A	0.21	0.77	0.16	5.0	5.10	0.82
	4	B	0.08	0.52	0.04	5.0	5.10	0.21
	1	C	0.14	0.52	0.07	5.0	5.10	0.36
Flow to Pond								1.40
	6	E	0.12	0.61	0.07	5.0	5.10	0.37
	7	F	0.07	0.81	0.06	5.0	5.10	0.29
	5	G	0.15	0.18	0.03	5.0	5.10	0.14
		OS1	0.03	0.48	0.01	5.0	5.10	0.07
Flow to Meridian Rd								0.80

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Designed by: JWD
Date: 25-Jun-25
Job Number: 2024-019

Project: Carubia Dental

RUNOFF CALCULATIONS

(RATIONAL METHOD)

Design Storm: 100-Yr.

		Direct Runoff						
	Design	Basin	Area	Runoff	C*A	Tc	I	Q=CIA
	Point	Desig.	(Acres)	Coefficient		(min)	(in/hr)	(cfs)
	3	A	0.21	0.82	0.17	5.0	9.07	1.56
	4	B	0.08	0.63	0.05	5.0	9.07	0.46
	1	C	0.16	0.63	0.10	5.0	9.07	0.91
Flow to Pond								2.93
	6	E	0.12	0.70	0.08	5.0	9.07	0.76
	7	F	0.06	0.81	0.05	5.0	9.07	0.44
	5	G	0.15	0.34	0.05	5.0	9.07	0.46
Flow to Meridian Rd								1.67

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Designed by: JWD
Date: 25-Jun-25
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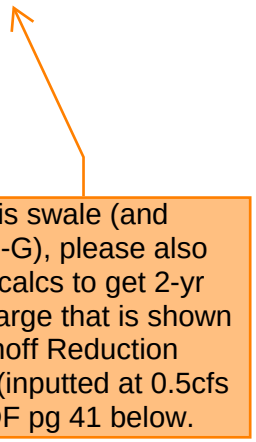
Project: Carubia Dental

MANNING'S EQUATION

100-YEAR STORM

Contributing Basins	Pipe Location Design Points	Q req'd (cfs)	Slope (%)	n	Diam (in)	Q calc (cfs)	V (Full Flow) (fps)	Friction Slope (%)
E	Grass Swale C - DP2	0.76	5.41	0.013	18	24.50	0.43	0.01



3. Grass Swale Computations

SCM Site Layout

RPA 6 Spreadsheet (Basin E)

RPA 7 Spreadsheet (Basin F and OS-1)

RPA 5 Spreadsheet (Basin G)

I think this is a typo. Based on the UIA square footage of the RPA+SPA square footage versus the UIA is about 50% of the total. Please revise.

Please thoroughly read through MHFD's Detail T-1 (linked to the right) and their guidance comments on every row throughout this spreadsheet in order to design a properly functioning RPA.

Site Layout

SCM Design, Version 4.01 (December 2024)

Designer: **Jerry Davidson**
Company: **Perception Design Group**
Date: **June 19, 2025**
Project: **Carubia Dental**
Location: **8059 Meridian Park Dr.**

Imperviousness values revised for all fields.

SITE LAYOUT INFO (User Input in Blue Cells)

Water Quality Event (WQE): 0.60 inches

Outfall ID	6	5	7									
Total Tributary Area (ft^2)	5,541	6,141	4,822									
Total Tributary Area (ac)	0.13	0.14	0.11									
Imperviousness (%)	81.0%	5.0%	86.0%									
MS4 Design Standard	Runoff	Runoff	Runoff									
SCM Type	RPA	RPA	RPA									

Notes:

OUTFALL RESULTS

SCM Worksheet Name	RPA_6	RPA_5	RPA_7									
Untreated Area (ft^3)	0	0	0									
Default WQCV (ft^3)	155	18	148									
Optional Override WQCV (ft^3)												
WQCV Reduction (ft^3)	130	18	143									
Remaining WQCV (ft^3)	25	0	6									
WQCV Reduction (%)	84%	100%	96%									
Design WQCV of SCM (ft^3)	0	0	0									
Pollutant Removal (ft^3)	0	0	0									
Untreated WQCV (ft^3)	25	0	6									

TOTAL SITE RESULTS (Sums results from all Outfalls)

Total Site Area	16,504	ft^2	0.38	acres
Treated Area	16,504	ft^2	0.38	acres
Untreated Area	0	ft^2	0.00	acres
Total Site Imperviousness	54.2%	%		
Default (or Override) WQCV	321	ft^3	0.007	acre-feet
Remaining WQCV	30	ft^3	0.001	acre-feet
WQCV Reduction	91%	%		
Design WQCV	0	ft^3	0.000	acre-feet
Untreated WQCV	30	ft^3	0.001	acre-feet

Confirm with local jurisdiction whether design meets Runoff Reduction Standard

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer: Jerry Davidson
Company: Perception Design Group
Date: June 19, 2025
Project: Carubia Dental
Location: 8059 Meridian Park Dr.
Outfall ID: 6

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	6	A		C	D						
Area Type	RPA	UIA		RPA_Swale	SPA						
Downstream Design Point ID	--	C		6	6						
DCIA (ft^2)	--	--		--	--						
UIA (ft^2)	--	4,565		--	--						
RPA (ft^2)	--	--		779	--						
SPA (ft^2)	--	--		--	197						

2. Protect the RPA from Traffic

RPA Protection Type	--	--		None	--						

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--		100.0%	--						
HSG B (%)	--	--		0.0%	--						
HSG C/D (%)	--	--		0.0%	--						

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--		Seed	--						
Irrigation Type	--	--		Permanent	--						

Notes:

Based on the LxW provided on the next page, the RPA is only 530sqft. This discrepancy is due to MHFD's notes on that row of the spreadsheet: only the bottom area of the swale counts towards the RPA, not the side slopes. And the section of this swale shown on the CDs shows that there is not a bottom since it is a v-shaped swale. MHFD guidance states that RPA swales must be trapezoidal shaped.

Please revise design accordingly.

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--		--	--						
Is Concrete Edger used?	--	--		--	--						
Spacing between slots (ft)	--	--		--	--						
Slot Opening Length (in)	--	--		--	--						
Blind Swale Type	--	--		--	--						
Spreader Energy Dissipation	--	--		--	--						
Total Area of UIA:RPA (ft^2)	--	--		--	--						
UIA:RPA Ratio	--	--		--	--						
UIA:RPA Interface Width (ft)	--	--		--	--						
L / W Ratio of UIA:RPA	--	--		--	--						

Areas revised for the revised designs. The swale changed to a trapezoid.

2. Buffer Length

Average Buffer Length (ft)	--	--		--	--						

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--		--	--						
Effective Distance (ft)	--	--		--	--						
Number of Level Spreaders	--	--		--	--						

4. Provide a Vertical Drop

Vertical Drop (in)	--	--		--	--						
Mowing Strip Provided?	--	--		--	--						

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--		--	--						
UIA:RPA Runoff (in)	--	--		--	--						
UIA:RPA Runoff (ft^3)	--	--		--	--						

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--		--	--						
Runoff Reduction (ft^3)	--	--		--	--						
Runoff Reduction (%)	--	--		--	--						

Notes:

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--		5,344	--						
Imperviousness (%)	--	--		85.4%	--						
2. Swale Inflows											
Concentrated Flow Type	--	--		Pipe	--						
Blind Swale Type	--	--		--	--						
Spreader Energy Dissipation	--	--		--	--						
Vertical Drop (in)	--	--		--	--						
Gutter Depression (in)	--	--		--	--						
Curb Opening Length (ft)	--	--		--	--						
Concrete Sediment Pad	--	--		YES	--						
Min. Forebay Volume (ft^3)	--	--		--							
Design Forebay Volume (ft^3)	--	--		--	--						
Max. Forebay Depth (in)	--	--		--	--						
Design Forebay Depth (in)	--	--		--	--						
Calculated Notch Width (in)	--	--		--	--						
Design Notch Width (in)	--	--		--	--						
Drain Time (minutes)	--	--		--	--						
Energy Dissipation Type	--	--		Vegetation	--						
3. Swale Cross Section											
Length of Swale (ft)	--	--		53.00	--						
Bottom Width (ft)	--	--		10.00	--						
Bottom Area (ft^2)	--	--		530	--						
Side Slopes (horiz/vert)	--	--		4.00	--						
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--		0.030	--						
Design Slope (ft/ft)	--	--		0.030	--						
Total Drop Height (ft)	--	--		0.00	--						
Underdrains Provided?	--	--		NO	--						
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--		229	--						
Reduced Trib. Runoff (ft^3)	--	--		229	--						
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--		130	--						
Swale Discharge (ft^3)	--	--		99	--						
Runoff Reduction (%)	--	--		56.7%	--						
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--		0.5	--						
8. Design Velocity											
Vegetal Retardance Curve	--	--		E	--						
Velocity, V2 (fps)	--	--		0.6	--						
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--		0.08	--						
Flow Area, A (ft^2)	--	--		0.8	--						
Wetted Perimeter, P (ft)	--	--		10.7	--						
Top Width, T (ft)	--	--		10.6	--						
Hydraulic Radius, Rh (ft)	--	--		0.08	--						
VR Product (ft^2/sec)	--	--		0.05	--						
Manning's n value	--	--		0.080	--						
Hydraulic Depth, Dh (ft)	--	--		0.08	--						
Froude Number	--	--		0.07	--						
10. Swale Outflows											
Outflows Considered?	--	--		NO	--						

Notes:

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	6	A		C	D						
Area Type	RPA	UIA		RPA_Swale	SPA						
Total Area (ft^2)	5,541	4,565		5,344	197						
Imperviousness (%)		100.0%		85.4%	0.0%						
Tributary Runoff (ft^3)	229	190		229	0						
Runoff Reduction (ft^3)	130	0		130	0						
Runoff Remaining (ft^3)	99	190		99	0						

Total Tributary Area entered on Site Layout Worksheet is: 5,541 square feet

This was removed from the notes in the CDs with this submittal. Please add it back in. Otherwise, MHFD recommends forebays.

Sediment plans added to CDs and Drainage Plans.

Please provide calcs for this.

See runoff year 2 for calcs.

Per MHFD guidance comments for this row, headwater calcs are necessary for swales that drain to culverts. Please provide calcs for this.

Calcs included in appendix for the outflows.

Unfortunately this reduction is now 56.7%, which is below the min 60%...

Design revised to be above 60%.

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer: Jerry Davidson
Company: Perception Design Group
Date: June 19, 2025
Project: Carubia Dental
Location: 8059 Meridian Park Dr.
Outfall ID: 7

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	7	E	F	G	H						
Area Type	RPA	UIA	RPA_Buffer	RPA_Swale	SPA						
Downstream Design Point ID	--	F	G	7	G						
DCIA (ft^2)	--	--	--	--	--						
UIA (ft^2)	--	3,620	--	--	--						
RPA (ft^2)	--	--	555	260							
SPA (ft^2)	--	--	--	--	387						

2. Protect the RPA from Traffic

RPA Protection Type	--	--	Slotted Curb	None	--						

Areas revised.

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	100.0%	100.0%	--						
HSG B (%)	--	--	0.0%	0.0%	--						
HSG C/D (%)	--	--	0.0%	0.0%	--						

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Seed	Seed	--						
Irrigation Type	--	--	Permanent	Permanent	--						

Notes:

Based on the LxW provided on the next page, the RPA is only 180sqft. This discrepancy is due to MHFD's notes on that row of the spreadsheet: only the bottom area of the swale counts towards the RPA, not the side slopes. And the section of this swale shown on the CDs shows that there is not a bottom since it is a v-shaped swale. MHFD guidance states that RPA swales must be trapezoidal shaped.

Please revise design accordingly.

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Slotted	--	--						
Is Concrete Edger used?	--	--	--	--	--						
Spacing between slots (ft)	--	--	10.00	--	--						
Slot Opening Length (in)	--	--	12.00	--	--						
Blind Swale Type	--	--	--	--	--						
Spreader Energy Dissipation	--	--	--	--	--						
Total Area of UIA:RPA (ft^2)	--	--	4,175	--	--						
UIA:RPA Ratio	--	--	6.5	--	--						
UIA:RPA Interface Width (ft)	--	--	50	--	--						
L / W Ratio of UIA:RPA	--	--	1.67	--	--						

Spacing and openings changed on spreadsheet and plans.

Per the MHFD recommendation in the spreadsheet comment for this row, 2ft spacing on center is recommended.

24" openings shown on plans. Revise to remove discrepancy. MHFD rec's 1.5" opening to protect from snow plow damage

2. Buffer Length

Average Buffer Length (ft)	--	--	11	--	--						

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.333	--	--						
Effective Distance (ft)	--	--	17	--	--						
Number of Level Spreaders	--	--	1	--	--						

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	2.00	--	--						
Mowing Strip Provided?	--	--	NO	--	--						

See comments in CDs about vertical drops.

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	86.7%	--	--						
UIA:RPA Runoff (in)	--	--	0.15	--	--						
UIA:RPA Runoff (ft^3)	--	--	51	--	--						

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	151	--	--						
Runoff Reduction (ft^3)	--	--	99	--	--						
Runoff Reduction (%)	--	--	65.9%	--	--						

Notes:

Note added to site plan to make the finished grade for the grass 3 inches lower than the steel edger around the rock.

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale											
Total Tributary Area (ft^2)	--	--	--	4,822	--						
Imperviousness (%)	--	--	--	75.1%	--						
2. Swale Inflows											
Concentrated Flow Type	--	--	--	Swale	--						
Blind Swale Type	--	--	--	--	--						
Spreader Energy Dissipation	--	--	--	--	--						
Vertical Drop (in)	--	--	--	--	--						
Gutter Depression (in)	--	--	--	--	--						
Curb Opening Length (ft)	--	--	--	--	--						
Concrete Sediment Pad	--	--	--	--	--						
Min. Forebay Volume (ft^3)	--	--	--	--	--						
Design Forebay Volume (ft^3)	--	--	--	--	--						
Max. Forebay Depth (in)	--	--	--	--	--						
Design Forebay Depth (in)	--	--	--	--	--						
Calculated Notch Width (in)	--	--	--	--	--						
Design Notch Width (in)	--	--	--	--	--						
Drain Time (minutes)	--	--	--	--	--						
Energy Dissipation Type	--	--	--	Vegetation	--						
3. Swale Cross Section											
Length of Swale (ft)	--	--	--	18.00	--						
Bottom Width (ft)	--	--	--	10.00	--						
Bottom Area (ft^2)	--	--	--	180	--						
Side Slopes (horiz/vert)	--	--	--	3.00	--						
4. Longitudinal Slope											
Available Slope (ft/ft)	--	--	--	0.030	--						
Design Slope (ft/ft)	--	--	--	0.030	--						
Total Drop Height (ft)	--	--	--	0.00	--						
Underdrains Provided?	--	--	--	NO	--						
5. Calculate Runoff from Tributary Area											
Tributary Runoff (ft^3)	--	--	--	164	--						
Reduced Trib. Runoff (ft^3)	--	--	--	64	--						
6. Calculate Runoff Reduction through Swale Bottom											
Volume Infiltrated (ft^3)	--	--	--	43	--						
Swale Discharge (ft^3)	--	--	--	21	--						
Runoff Reduction (%)	--	--	--	67.2%	--						
7. Design Discharge											
2-year Discharge, Q2 (cfs)	--	--	--	0.3	--						
8. Design Velocity											
Vegetal Retardance Curve	--	--	--	E	--						
Velocity, V2 (fps)	--	--	--	0.5	--						
9. Design Flow Depth											
Flow Depth, D2 (ft)	--	--	--	0.06	--						
Flow Area, A (ft^2)	--	--	--	0.6	--						
Wetted Perimeter, P (ft)	--	--	--	10.4	--						
Top Width, T (ft)	--	--	--	10.4	--						
Hydraulic Radius, Rh (ft)	--	--	--	0.06	--						
VR Product (ft^2/sec)	--	--	--	0.03	--						
Manning's n value	--	--	--	0.080	--						
Hydraulic Depth, Dh (ft)	--	--	--	0.06	--						
Froude Number	--	--	--	0.06	--						
10. Swale Outflows											
Outflows Considered?	--	--	--	NO	--						

Notes:

Upstream is a buffer, not a swale. So this should be Other, since buffer isnt an option.

Changed to other with notes added at the bottom of sheet.

Please provide calcs for this.

See yr 2 runoff table for calcs.

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	7	E	F	G	H						
Area Type	RPA	UIA	RPA_Buffer	RPA_Swale	SPA						
Total Area (ft^2)	4,822	3,620	4,175	4,822	387						
Imperviousness (%)		100.0%	86.7%	75.1%	0.0%						
Tributary Runoff (ft^3)	164	151	151	164	0						
Runoff Reduction (ft^3)	143	0	99	143	0						
Runoff Remaining (ft^3)	21	151	51	21	0						

Total Tributary Area entered on Site Layout Worksheet is: 4,822 square feet

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.01 (December 2024)

Designer: Jerry Davidson
Company: Perception Design Group
Date: June 19, 2025
Project: Carubia Dental
Location: 8059 Meridian Park Dr.
Outfall ID: 5

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	5	I	J	K							
Area Type	RPA	UIA	RPA_Buffer	SPA							
Downstream Design Point ID	--	J	5	5							
DCIA (ft^2)	--	--	--	--							
UIA (ft^2)	--	3,226	--	--							
RPA (ft^2)	--	--	1,591	--							
SPA (ft^2)	--	--	--	1,324							

2. Protect the RPA from Traffic

RPA Protection Type	--	--	None	--							

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	100.0%	--							
HSG B (%)	--	--	0.0%	--							
HSG C/D (%)	--	--	0.0%	--							

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Seed	--							
Irrigation Type	--	--	Permanent	--							

Notes:

Other changed to Spreader

What is the designed "Other" Sheet Flow Inflow Feature? Describe in the Notes at the bottom of this page. You can't just input "Other" and have the inflow be a concentrated flow, WQ treatment is not achieved with this configuration with Grass Buffers, only with Grass Swales.

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Other	--							
Is Concrete Edger used?	--	--	--	--							
Spacing between slots (ft)	--	--	--	--							
Slot Opening Length (in)	--	--	--	--							
Blind Swale Type	--	--	--	--							
Spreader Energy Dissipation	--	--	--	--							
Total Area of UIA:RPA (ft^2)	--	--	4,817	--							
UIA:RPA Ratio	--	--	2.0	--							
UIA:RPA Interface Width (ft)	--	--	85	--							
L / W Ratio of UIA:RPA	--	--	0.67	--							

Level spreader added to plans for the length needed.

How can this be the Interface Width when the two inflows from the UIA to the RPA are concentrated point discharges from roof drains? Without a level spreader from the roof drains to the RPA, the Interface Width is only as wide as the diameter of each roof drain.

2. Buffer Length

Average Buffer Length (ft)	--	--	19	--							

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.333	--							
Effective Distance (ft)	--	--	17	--							
Number of Level Spreaders	--	--	2	--							

One level spreader added to plans. One is adequate for the distance between the rock and the existing swale.

4. Provide a Vertical Drop

Vertical Drop (in)	--	--	3.00	--							
Mowing Strip Provided?	--	--	NO	--							

No level spreaders are shown on plans.

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	67.0%	--							
UIA:RPA Runoff (in)	--	--	0.00	--							
UIA:RPA Runoff (ft^3)	--	--	0	--							

The vertical drop is located on the downhill side of the level spreader.

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft^3)	--	--	134	--							
Runoff Reduction (ft^3)	--	--	134	--							
Runoff Reduction (%)	--	--	100.0%	--							

Notes:

Where is this vertical drop? The end of the roof drains are going to be 3in above the RPA? Provide a detail showing this in the CDs. Section 2 in the CDs currently only shows a 2in drop from edge of building (not pipe) but it's via a sloped rock area, which doesnt work per my comment in the CDs.

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale

Total Tributary Area (ft^2)	--	--	--	--							
Imperviousness (%)	--	--	--	--							

2. Swale Inflows

Concentrated Flow Type	--	--	--	--							
Blind Swale Type	--	--	--	--							
Spreader Energy Dissipation	--	--	--	--							
Vertical Drop (in)	--	--	--	--							
Gutter Depression (in)	--	--	--	--							
Curb Opening Length (ft)	--	--	--	--							
Concrete Sediment Pad	--	--	--	--							
Min. Forebay Volume (ft^3)	--	--	--	--							
Design Forebay Volume (ft^3)	--	--	--	--							
Max. Forebay Depth (in)	--	--	--	--							
Design Forebay Depth (in)	--	--	--	--							
Calculated Notch Width (in)	--	--	--	--							
Design Notch Width (in)	--	--	--	--							
Drain Time (minutes)	--	--	--	--							
Energy Dissipation Type	--	--	--	--							

3. Swale Cross Section

Length of Swale (ft)	--	--	--	--							
Bottom Width (ft)	--	--	--	--							
Bottom Area (ft^2)	--	--	--	--							
Side Slopes (horiz/vert)	--	--	--	--							

4. Longitudinal Slope

Available Slope (ft/ft)	--	--	--	--							
Design Slope (ft/ft)	--	--	--	--							
Total Drop Height (ft)	--	--	--	--							
Underdrains Provided?	--	--	--	--							

5. Calculate Runoff from Tributary Area

Tributary Runoff (ft^3)	--	--	--	--							
Reduced Trib. Runoff (ft^3)	--	--	--	--							

6. Calculate Runoff Reduction through Swale Bottom

Volume Infiltrated (ft^3)	--	--	--	--							
Swale Discharge (ft^3)	--	--	--	--							
Runoff Reduction (%)	--	--	--	--							

7. Design Discharge

2-year Discharge, Q2 (cfs)	--	--	--	--							

8. Design Velocity

Vegetal Retardance Curve	--	--	--	--							
Velocity, V2 (fps)	--	--	--	--							

9. Design Flow Depth

Flow Depth, D2 (ft)	--	--	--	--							
Flow Area, A (ft^2)	--	--	--	--							
Wetted Perimeter, P (ft)	--	--	--	--							
Top Width, T (ft)	--	--	--	--							
Hydraulic Radius, Rh (ft)	--	--	--	--							
VR Product (ft^2/sec)	--	--	--	--							
Manning's n value	--	--	--	--							
Hydraulic Depth, Dh (ft)	--	--	--	--							
Froude Number	--	--	--	--							

10. Swale Outflows

Outflows Considered?	--	--	--	--							

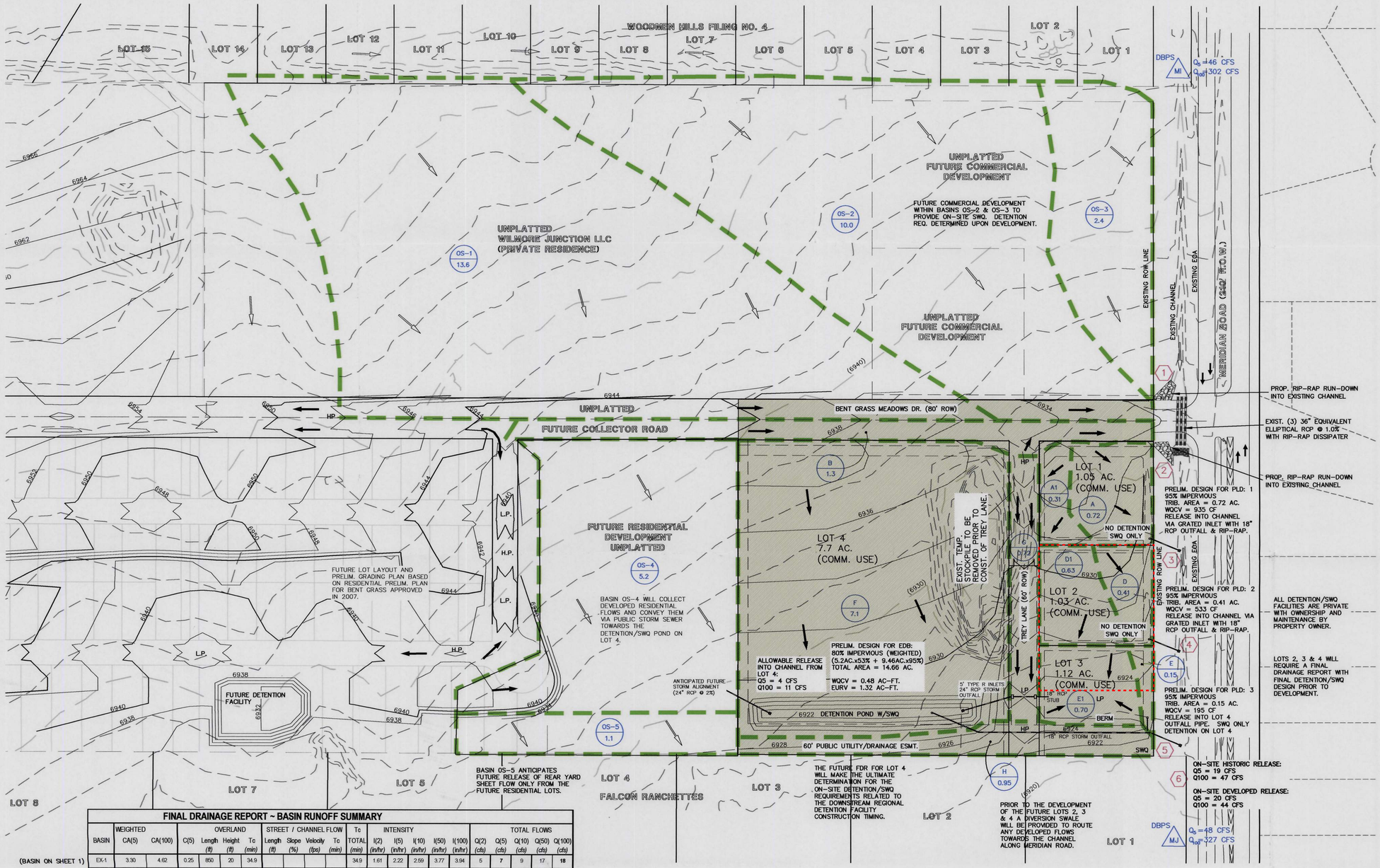
Notes:

DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	5	I	J	K							
Area Type	RPA	UIA	RPA_Buffer	SPA							
Total Area (ft^2)	6,141	3,226	4,817	1,324							
Imperviousness (%)		100.0%	67.0%	0.0%							
Tributary Runoff (ft^3)	134	134	134	0							
Runoff Reduction (ft^3)	134	0	134	0							
Runoff Remaining (ft^3)	0	134	0	0							

Total Tributary Area entered on Site Layout Worksheet is: 6,141 square feet

4. Excerpts from Prior Report



FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

	BASIN	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(10) (in/hr)	INTENSITY I(50) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(10) (cfs)	TOTAL FLOWS Q(50) (cfs)	TOTAL FLOWS Q(100) (cfs)
(BASIN ON SHEET 1)	EX-1	3.30	4.62	0.25	850	20	34.9					34.9	1.61	2.22	2.69	3.77	3.94	5	**7**	9	17	**18**
(BASIN ON SHEET 1)	EX-2	6.33	8.86	0.25	1000	23	38.2					38.2	1.53	2.10	2.45	3.57	3.74	10	**13**	16	32	**33**
(BASIN ON SHEET 1)	EX-3	0.60	0.84	0.25	500	12	26.6					26.6	1.88	2.59	3.02	4.40	4.60	1	**2**	2	4	**4**
	OS-1	4.38	5.66	0.25	1000	22	38.7					38.7	1.51	2.08	2.43	3.54	3.71	7	**9**	11	20	**21**
	OS-2	2.70	3.68	0.25	700	16	32.0					32.0	1.70	2.33	2.72	3.97	4.15	5	**6**	7	15	**15**
	OS-3	0.60	0.84	0.25	500	12	26.6					26.6	1.88	2.59	3.02	4.40	4.60	1	**2**	2	4	**4**
	OS-4	2.86	3.38	0.25	100	2	12.6	600	2.0%	4.9	2.0	14.7	2.54	3.50	4.08	5.95	6.22	7	**10**	12	20	**21**
	OS-5	0.44	0.55	0.25	75	4	7.9					7.9	3.24	4.46	5.20	7.58	7.93	1	**2**	2	4	**4**
	A	0.58	0.59	0.25								5.0	3.71	5.10	5.96	8.68	9.07	2	**3**	3	5	**5**
	A1	0.25	0.25	0.25								5.0	3.71	5.10	5.96	8.68	9.07	0.9	**1.3**	1.5	2.2	**2.3**
	B	1.04	1.06	0.25	10	0.3	3.5	1200	1.5%	4.3	4.7	8.2	3.21	4.41	5.15	7.50	7.85	3	**5**	5	8	**8**
(BASIN ON SHEET 3)	C	0.27	0.27	0.25								5.0	3.71	5.10	5.96	8.68	9.07	1.0	**1.4**	1.6	2.3	**2.5**
	D	0.34	0.34	0.25								5.0	3.71	5.10	5.96	8.68	9.07	1	**2**	2	3	**3**
	D1	0.53	0.54	0.25								5.0	3.71	5.10	5.96	8.68	9.07	2	**3**	3	5	**5**
	E	0.08	0.09	0.25								5.0	3.71	5.10	5.96	8.68	9.07	0.3	**0.4**	0.5	0.7	**0.8**
	E1	0.60	0.60	0.25								5.0	3.71	5.10	5.96	8.68	9.07	2	**3**	4	5	**5**
	F	6.39	6.39	0.25	20	0.4	5.7	800	2.0%	4.9	2.7	8.3	3.18	4.36	5.11	7.45	7.79	20	**28**	33	48	**50**
	G	0.65	0.65	0.25								5.0	3.71	5.10	5.96	8.68	9.07	2	**3**	4	6	**6**
	H	0.30	0.39	0.25	60	5	6.1					6.1	3.51	4.83	5.64	8.22	8.59	1.1	**1.5**	1.7	3.2	**3.3**

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
A	EX-1, EX-2	9.63	13.48	42.2	1.98	3.52	19	47	**Total Site (Historic Release)**
B	EX-3	0.60	0.84	26.6	2.59	4.60	2	4	Historic Release
1	OS-1 & OS-2	7.07	9.34	39.7	2.05	3.65	15	34	Rip-Rap Pad
2	B	1.04	1.06	8.2	4.41	7.85	5	8	Rip-Rap Pad
3	A	0.58	0.59	5.0	5.10	9.07	3	5	Rip-Rap Pad
3A	A1, C	0.52	0.52	6.9	4.66	8.29	2	4	Rip-Rap Pad
3B	DP1, DP2, DP3, DP3A	9.21	11.51	39.9	2.05	3.64	19	42	**Total Developed Site Release (Interim)**
4	D	0.34	0.34	5.0	5.10	9.07	2	3	Rip-Rap Pad
5	E & Release of Lot 4 Pond	See Pond Pack Data	See Pond Pack Data	See Pond Pack Data	See Pond Pack Data	See Pond Pack Data	3	6	Rip-Rap Pad
6	All Basins	See Pond Pack Data	See Pond Pack Data	See Pond Pack Data	See Pond Pack Data	See Pond Pack Data	20	44	**Total Developed Site Release (Ultimate)**

LEGEND

- EXISTING GROUND CONTOUR — 5910
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- DIRECTION OF DRAINAGE
- EXISTING STORM SEWER
- LOW POINT/HIGH POINT — LP/HP
- BASIN IDENTIFIER / AREA IN ACRES — D / 1.41
- DESIGN POINT — 1
- PRELIMINARY PLAN AREA

N

100 50 0 100 200

SCALE: 1" = 100'

CLASSIC CONSULTING ENGINEERS & SURVEYORS SM
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Colorado Springs, Colorado 80919 (719)785-0799 (Fax)

BENT GRASS EAST COMMERCIAL
PHASE 1
PRELIMINARY / FINAL DRAINAGE REPORT
DEVELOPED DRAINAGE MAP (PRELIMINARY PLAN)

CLASSIC CONSULTING ENGINEERS & SURVEYORS

DESIGNED BY	MAW	SCALE		DATE	1-31-13
DRAWN BY	MAW	(H) 1" = 100'		SHEET	2 OF 3
CHECKED BY		(V) 1" = N/A		JOB NO.	2177.50

NEW DOC

FINAL DRAINAGE REPORT
FOR
BENT GRASS EAST COMMERCIAL FILING NO. 2

MAY 2014
REVISED JULY 2014

Prepared for:

LAND FIRST, INC.
154 DEL ORO CIRCLE
COLORADO SPRINGS, CO 80919
Contact: Ron Waldthasuen

Prepared by:
CLASSIC CONSULTING ENGINEERS & SURVEYORS, LLC
6385 CORPORATE DRIVE, SUITE 101
COLORADO SPRINGS, CO 80919
(719) 785-0790

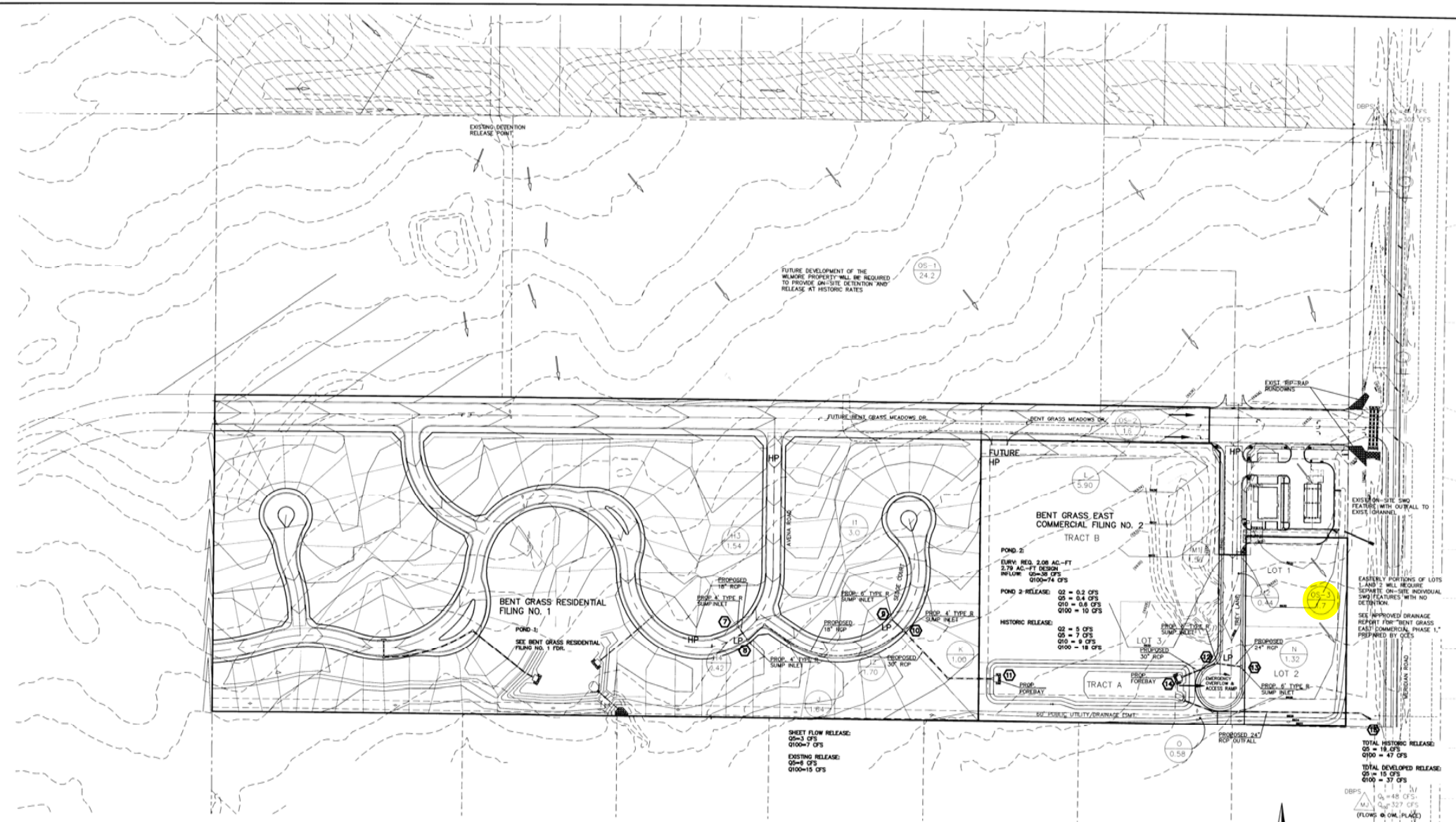
Job no. 2177.53

CLASSIC CONSULTING ENGINEERS & SURVEYORS

JOB NAME: *BENT GRASS EAST COMMERCIAL FIL. 2*
JOB NUMBER: *2177.53*
DATE: *07/01/14*
CALC'D BY: *MAW*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY						TOTAL FLOWS					
	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(10) (cfs)	Q(25) (cfs)	Q(50) (cfs)	Q(100) (cfs)
OS-1	6.05	8.47	0.25	950	22	37.1					37.1	1.55	2.14	2.49	3.21	3.63	3.80	9	13	15	27	31	32
OS-2	1.38	1.46	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	5	7	8	11	13	13
OS-3	1.34	1.44	0.25	30	0.6	6.9	200	1.5%	4.3	0.8	7.7	3.27	4.50	5.25	6.75	7.65	8.00	4	6	7	10	11	11
H3	0.85	1.00	0.25	100	2	12.6	350	2.0%	4.9	1.2	13.8	2.61	3.59	4.19	5.39	6.11	6.38	2	3	4	5	6	6
H4	0.23	0.27	0.25	50	1	8.9	150	2.0%	4.9	0.5	9.4	3.05	4.19	4.89	6.29	7.12	7.45	0.7	1.0	1.1	1.7	1.9	2.0
I1	1.65	1.95	0.25	50	1	8.9	550	2.0%	4.9	1.9	10.8	2.89	3.98	4.65	5.97	6.77	7.08	5	7	8	12	13	14
I2	0.94	1.11	0.25	50	1	8.9	300	2.0%	4.9	1.0	10.0	2.99	4.11	4.79	6.16	6.99	7.31	3	4	4	7	8	8
J	0.66	0.90	0.25	75	4	7.9					7.9	3.24	4.46	5.20	6.69	7.58	7.93	2	3	3	6	7	7
K	0.40	0.55	0.25	65	3	7.7					7.7	3.27	4.49	5.24	6.74	7.64	7.99	1	2	2	4	4	4
L	4.60	4.93	0.25	30	0.6	6.9	800	1.0%	3.5	3.8	10.7	2.90	3.99	4.66	5.99	6.78	7.10	13	18	21	29	33	35
M1	1.33	1.40	0.25	30	0.6	6.9	300	1.0%	3.5	1.4	8.4	3.18	4.38	5.11	6.57	7.44	7.78	4	6	7	9	10	11
M2	0.37	0.40	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	1.4	1.9	2.2	3.0	3.4	3.6
N	1.12	1.19	0.25	20	0.4	5.7	330	2.0%	4.9	1.1	6.8	3.41	4.69	5.47	7.04	7.97	8.34	4	5	6	8	9	10
O	0.15	0.20	0.25	60	5	6.1					6.1	3.51	4.83	5.64	7.25	8.22	8.59	0.5	0.7	0.8	1.5	1.7	1.7



LEGEND

XISTING GROUND CONTOUR	5910	PROPOSED STORM SEWER	
ROPOSED FINISHED CONTOUR	5910	PROPOSED STORM INLET	
UBDIVISION BOUNDARY		LOW POINT/HIGH POINT	LP/HP
OT LINE		BASIN IDENTIFIER	D
ROPOSED BASIN BOUNDARY		AREA IN ACRES	1.41
RECTION OF DRAINAGE		DESIGN POINT	1
ISTING STORM SEWER			
ISTING STORM INLET			

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tt (min)	To TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(10) (in/hr)	I(25) (in/hr)	I(50) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(10) (cfs)	Q(25) (cfs)	Q(50) (cfs)	Q(100) (cfs)
OS-1	0.09	0.47	0.25	100	22	27.1					27.1	1.42	2.14	2.46	3.04	3.43	3.90	4	10	15	27	31	38
OS-2	1.38	1.46	0.25								5.0	3.71	5.55	6.36	7.86	8.88	10.07	2	7	9	11	12	15
OS-3	1.34	1.44	0.25	30	0.6	6.9	200	1.5%	4.3	0.8	7.7	3.27	4.90	5.75	6.75	7.65	8.70	4	6	7	10	11	14
H3	0.85	1.00	0.25	100	2	12.5	350	2.0%	4.9	1.2	13.8	2.61	3.91	4.59	5.39	6.11	6.96	2	3	4	5	6	6
H4	0.23	0.27	0.25	50	1	8.9	150	2.0%	4.9	0.5	9.4	3.05	4.56	4.85	6.29	7.12	7.45	0.7	1.0	1.1	1.7	1.9	2.0
I1	1.65	1.95	0.25	50	1	8.9	550	2.0%	4.9	1.9	10.8	2.93	4.38	4.85	5.97	6.77	7.08	5	7	8	12	13	14
I2	0.94	1.11	0.25	50	1	8.9	300	2.0%	4.9	1.0	10.0	2.99	4.11	4.75	5.85	6.64	7.31	3	4	4	7	8	8
J	0.66	0.90	0.25	15	4	7.0					7.5	3.24	4.45	5.20	6.69	7.58	7.93	2	3	3	6	7	7
K	0.40	0.55	0.25	65	3	7.7					7.7	3.27	4.49	5.24	6.74	7.64	7.99	1	2	2	4	4	4
L	4.60	4.93	0.25	30	0.6	6.9	800	1.0%	3.5	3.8	10.7	2.90	3.99	4.66	5.99	6.78	7.13	13	18	21	35	39	35
M1	1.33	1.40	0.25	30	0.6	6.9	300	1.0%	3.5	1.4	8.4	3.18	4.38	5.11	6.57	7.44	7.78	4	5	7	9	10	11
M2	0.37	0.40	0.25								5.0	3.71	5.10	5.96	7.66	8.68	9.07	1.4	1.9	2.2	3.0	3.4	3.6
N	1.12	1.19	0.25	30	0.4	5.7	330	2.0%	4.9	1.1	6.8	3.61	4.93	5.64	7.25	8.22	8.59	4	5	6	8	9	10
O	0.15	0.20	0.25	60	5	6.1					6.1	3.51	4.83	5.64	7.25	8.22	8.59	0.5	0.7	0.8	1.3	1.7	1.7

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility Size
7	H3	0.85	1.00	13.8	3.59	6.38	3	6	4' TYPE R SUMP INLET
8	H4	0.23	0.27	9.4	4.19	7.45	1	2	4' TYPE R SUMP INLET
9	I1	1.65	1.95	10.8	3.98	7.08	7	14	6' TYPE R SUMP INLET
10	I2	0.94	1.11	10.0	4.11	7.31	4	8	4' TYPE R SUMP INLET
11	DP 7 - DP 10 (Westerly Flow into Pond 2)	3.66	4.33	16.9	3.27	5.82	12	25	30" RCP
12	M1	1.33	1.40	8.4	4.38	7.78	6	11	4' TYPE R SUMP INLET
13	M2 & N	1.50	1.58	6.8	4.69	8.34	7	13	6' TYPE R SUMP INLET
14	DP 12 & DP 13 (Easterly Flow into Pond 2)	2.82	2.99	8.9	4.09	7.63	12	23	30" RCP
	Total Flow into Pond 2 (Incl. Basins K & L)	11.48	12.79	16.9	3.27	5.82	38	74	2.3 AC-FT. POND 2
15	OS-1, OS-2, OS-3, O AND POND 2 RELEASE	SCS MODEL					15	37	

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BENT GRASS EAST COMM. FILING NO. 2

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS MAP

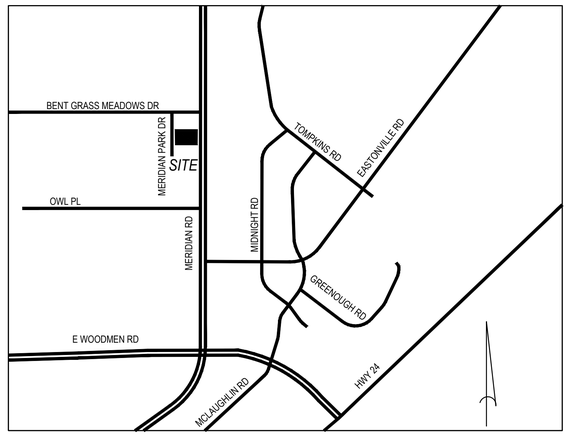
DESIGNED BY	MAW	SCALE		DATE	07-22-14
DRAWN BY	MAW	(H) 1"= 100'		SHEET	1 OF 1
CHECKED BY		(V) 1"= N/A		JOB NO.	2177.53

5. Drainage Plans

CARUBIA PROPERTIES - EXISTING DRAINAGE PLAN

LOT 2, BENT GRASS EAST COMMERCIAL FILING NO. 4

A PORTION OF THE NORTHEAST QUARTER OF SECTION 1,TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH P.M.
COUNTY OF EL PASO, STATE OF COLORADO



VICINITY MAP
1" = 1000' ±

RUNOFF SUMMARY

DATA FROM ORIGINAL BASINS D AND D1 AS PRESENTED IN BENT GRASS EAST COMMERCIAL PHASE 1 REPORT

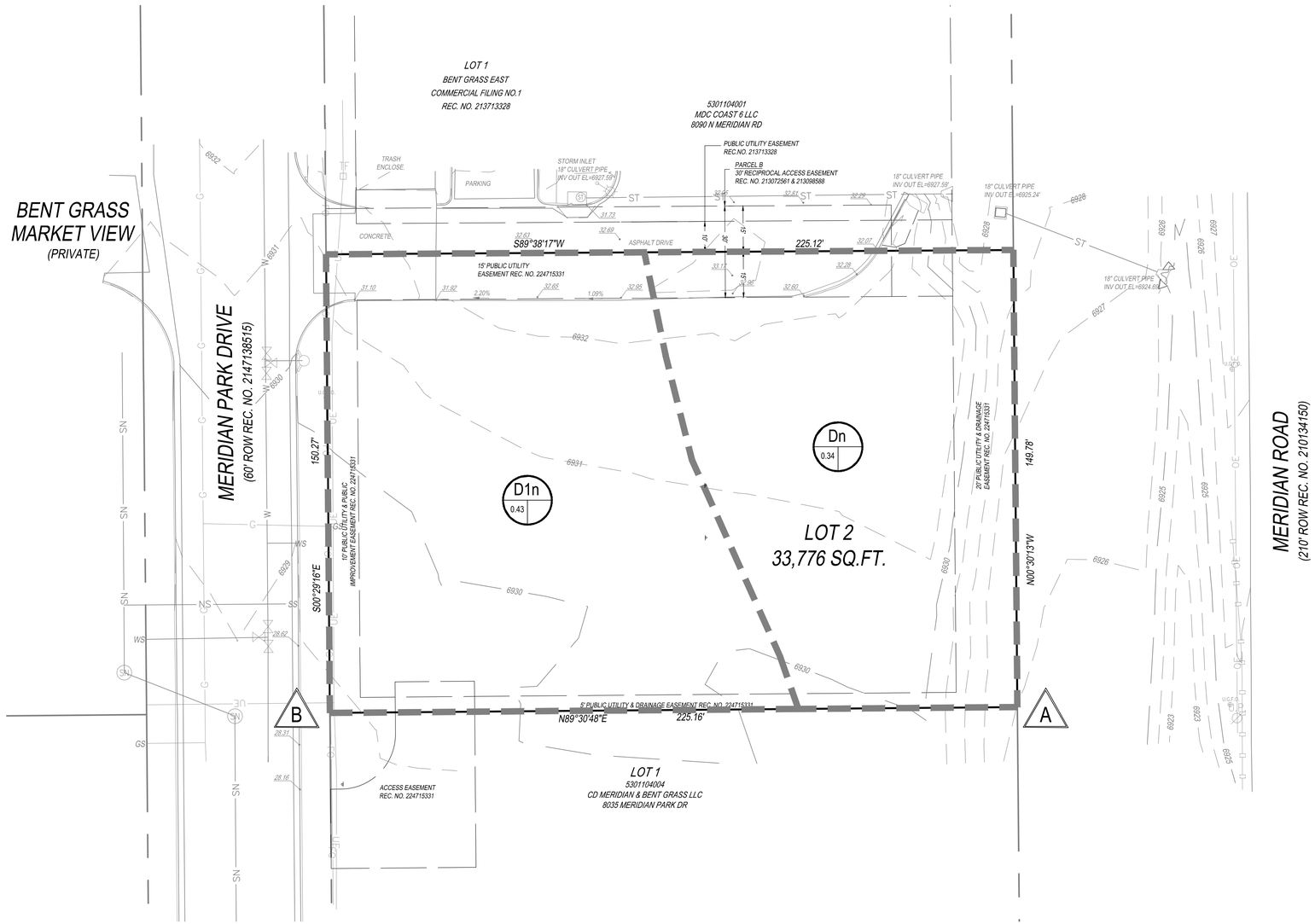
BASIN	AREA	Q5 (CFS)	Q100 (CFS)
D	0.41	2	3
D1	0.63	3	5

MODIFIED BASINS D AND D1 AS PRESENTED IN THIS REPORT

BASIN	AREA	IMP (%)	Q5 (CFS)	Q100 (CFS)
Dn	0.34	91	0.82	1.56
D1n	0.43	67	0.21	0.46

PRORATED BASINS Dn AND D1n BASED UPON NEW REDUCED AREAS

BASIN	% OF D AND D1	ALLOWABLE Q5 (CFS)	ALLOWABLE Q100 (CFS)
Dn	82.9%	1.7	2.5
D1n	68.3%	2.0	3.4



LEGAL DESCRIPTION

PARCEL A:
LOT 2, BENT GRASS EAST COMMERCIAL FILING NO. 4, COUNTY OF EL PASO, STATE OF COLORADO.
THE ABOVE LOT CONTAINS 33,776 SQUARE FEET, MORE OR LESS.

PARCEL B:
THOSE NON-EXCLUSIVE EASEMENT RIGHTS FOR VEHICULAR AND PEDESTRIAN INGRESS AND EGRESS AS CREATED BY RECIPROCAL ACCESS EASEMENT AND TEMPORARY CONSTRUCT/ON AND MAINTENANCE EASEMENT AGREEMENT RECORDED JUNE 04, 2013 UNDER RECEPTION NO. 213072561 AND FIRST AMENDMENT TO RECIPROCAL ACCESS EASEMENT AND TEMPORARY CONSTRUCTION
AND MAINTENANCE EASEMENT AGREEMENT RECORDED JULY 07, 2013 UNDER RECEPTION NO. 213098588.

PARCEL C:
THOSE NON-EXCLUSIVE EASEMENT RIGHTS FOR PEDESTRIAN AND VEHICULAR INGRESS AND EGRESS AS CREATED BY DECLARATION OF CROSS-ACCESS EASEMENT RECORDED NOVEMBER 3, 2023 UNDER RECEPTION NO. 223092254 AND JUNE 11, 2024 UNDER RECEPTION NO. 224044076.

BENCHMARK

1.5" ALUMINUM CAP PLS 30118 BEING THE SOUTHWEST CORNER OF LOT 1, BENT GRASS EAST COMMERCIAL FILING NO.4, RECORDED AT RECEPTION NO.224715331, IN THE RECORDS OF EL PASO COUNTY COLORADO.

ELEV.=6927.80' NVGD29

BASIS OF BEARINGS:

BEARINGS ARE BASED ON THE SOUTH LINE OF LOT 1, BENT GRASS EAST COMMERCIAL FILING NO.4, RECORDED AT RECEPTION NO. 224715331, IN THE RECORDS OF EL PASO COUNTY COLORADO. SAID LINE BEARS N89°30'48"E FROM MONUMENTS SHOWN.

LEGEND

- PROPERTY LINE
- LS — PROPOSED LANDSCAPED AREA
- PROPOSED SIDEWALK
- PROPOSED HANDICAP RAMP
- PROPOSED HEAVY-DUTY CONCRETE PAVEMENT
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- SN — EXISTING SANITARY SEWER
- G — EXISTING GAS
- W — EXISTING WATER
- UE — EXISTING ELECTRIC
- FO — EXISTING FIBER OPTIC
- ST — EXISTING STORM SEWER
- 5340 — EXISTING CONTOUR
- 5340 — PROPOSED CONTOUR
- R1 / 0.20 / 0.79 / 0.83 — BASIN DESIGNATION, 5 YR RUNOFF COEFFICIENT, 100 YR RUNOFF COEFFICIENT, BASIN AREA
- BASIN BOUNDARY LINE
- 1 — DESIGN POINT

20 0 10 20 40
1 inch = 20 ft.

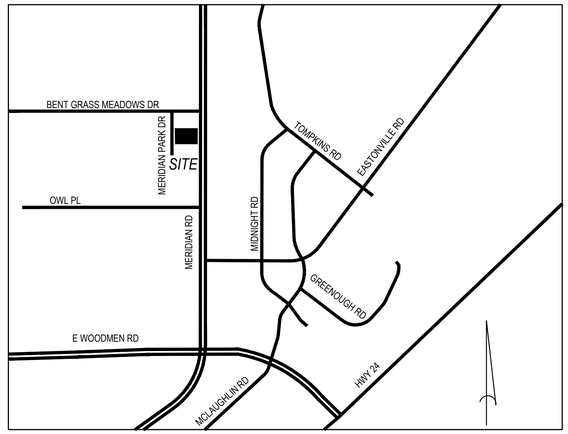
PERCEPTION
DESIGN GROUP, INC.
6901 SOUTH PIERCE STREET, SUITE 220, LITTLETON, CO 80128 303-232-8088
WWW.PERCEPTIONDESIGNGROUP.COM

DATE: JUNE 19, 2025
SCALE: AS INDICATED
DRAWN BY: JWD
CHECKED BY: JWD
[redacted]
PROJECT NUMBER
2024-019
[redacted]
SHEET
1 OF 3
EXISTING
DRAINAGE PLAN

CARUBIA PROPERTIES - PROPOSED DRAINAGE PLAN

LOT 2, BENT GRASS EAST COMMERCIAL FILING NO. 4

A PORTION OF THE NORTHEAST QUARTER OF SECTION 1,TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH P.M.
COUNTY OF EL PASO, STATE OF COLORADO



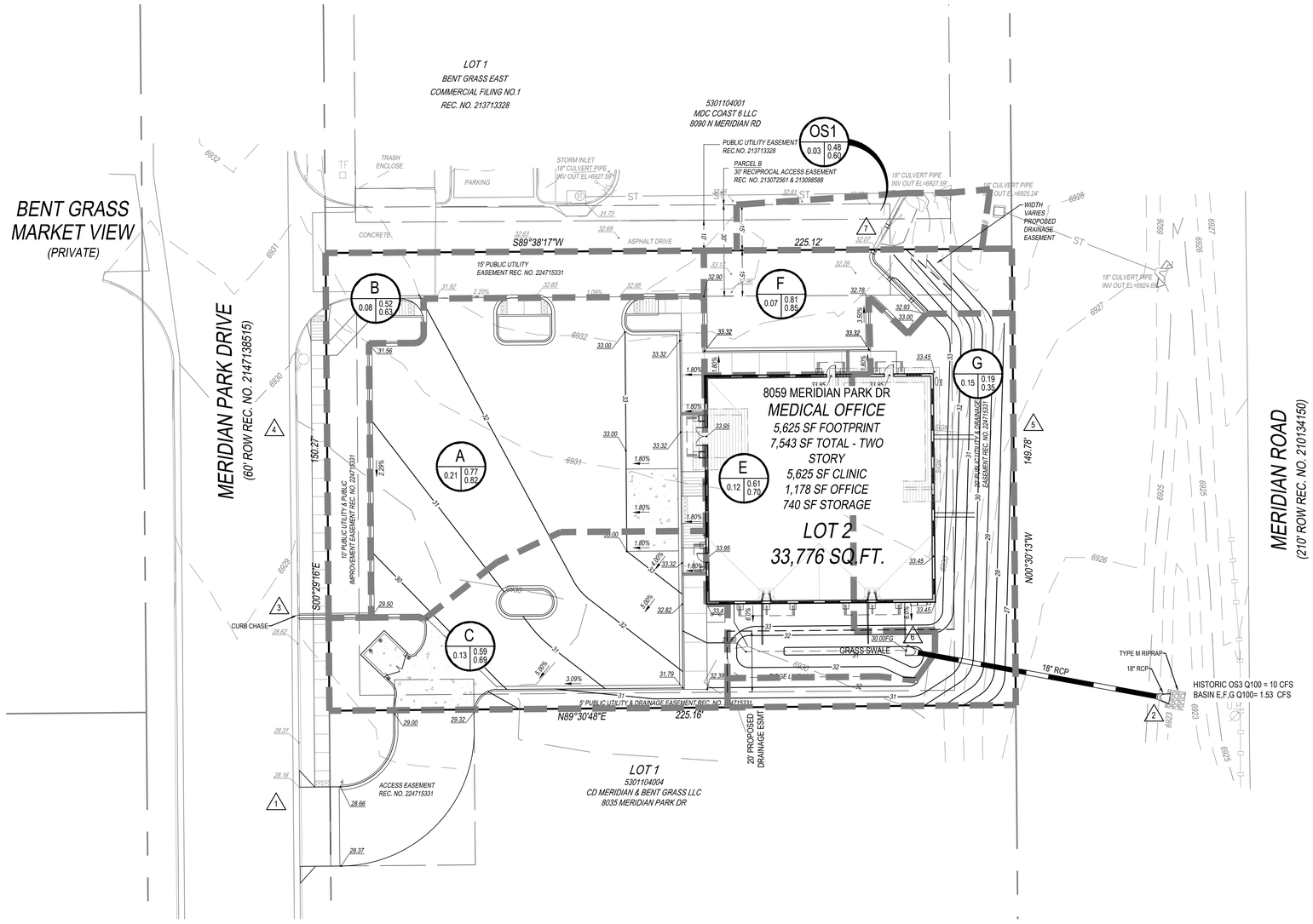
VICINITY MAP
1" = 1000' ±

RUNOFF SUMMARY

BASIN	DESIGN POINT	AREA	IMP (%)	Q5 (CFS)	Q100 (CFS)
A	3	0.21	91	0.82	1.56
B	4	0.08	67	0.21	0.46
C	1	0.16	67	0.42	0.91
E	6	0.12	76	0.37	0.76
F	7	0.06	95	0.25	0.44
G	5	0.15	29	0.14	0.46

ACCUMULATED RUNOFF SUMMARY

DESIGN POINT	BASINS	Q5 (CFS)	Q100 (CFS)	ALLOWABLE Q5 (CFS)	ALLOWABLE Q100 (CFS)
1	A,B,C	1.46	2.93	2.5	3.4
2	E,F,G	0.76	1.66	1.7	2.5



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DATE: JUNE 19, 2025
SCALE: AS INDICATED
DRAWN BY: JWD
CHECKED BY: JWD

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SHEET
2 OF 3

PROPOSED DRAINAGE PLAN

CARUBIA PROPERTIES - PROPOSED DRAINAGE PLAN

LOT 2, BENT GRASS EAST COMMERCIAL FILING NO. 4

A PORTION OF THE NORTHEAST QUARTER OF SECTION 1,TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH P.M.
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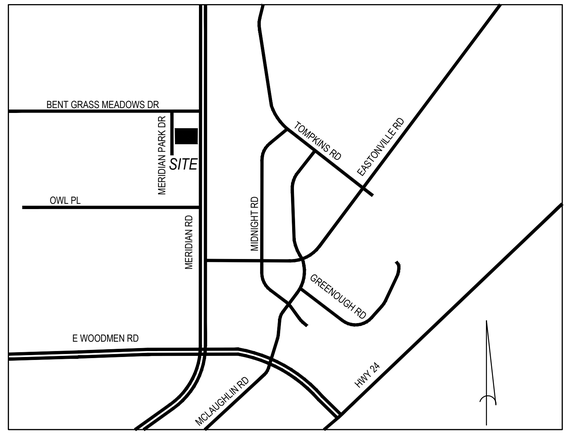

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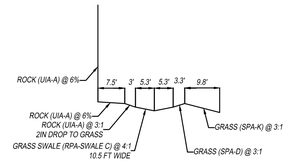
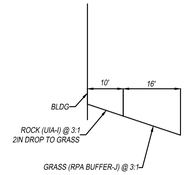
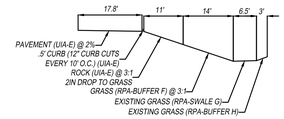


SECTION 1



SECTION 2



SECTION 3

RPA NOTES

ALL RPAS AND SPAS WILL NEED TO BE WITHIN A NO BUILD DRAINAGE EASEMENT OR TRACT.

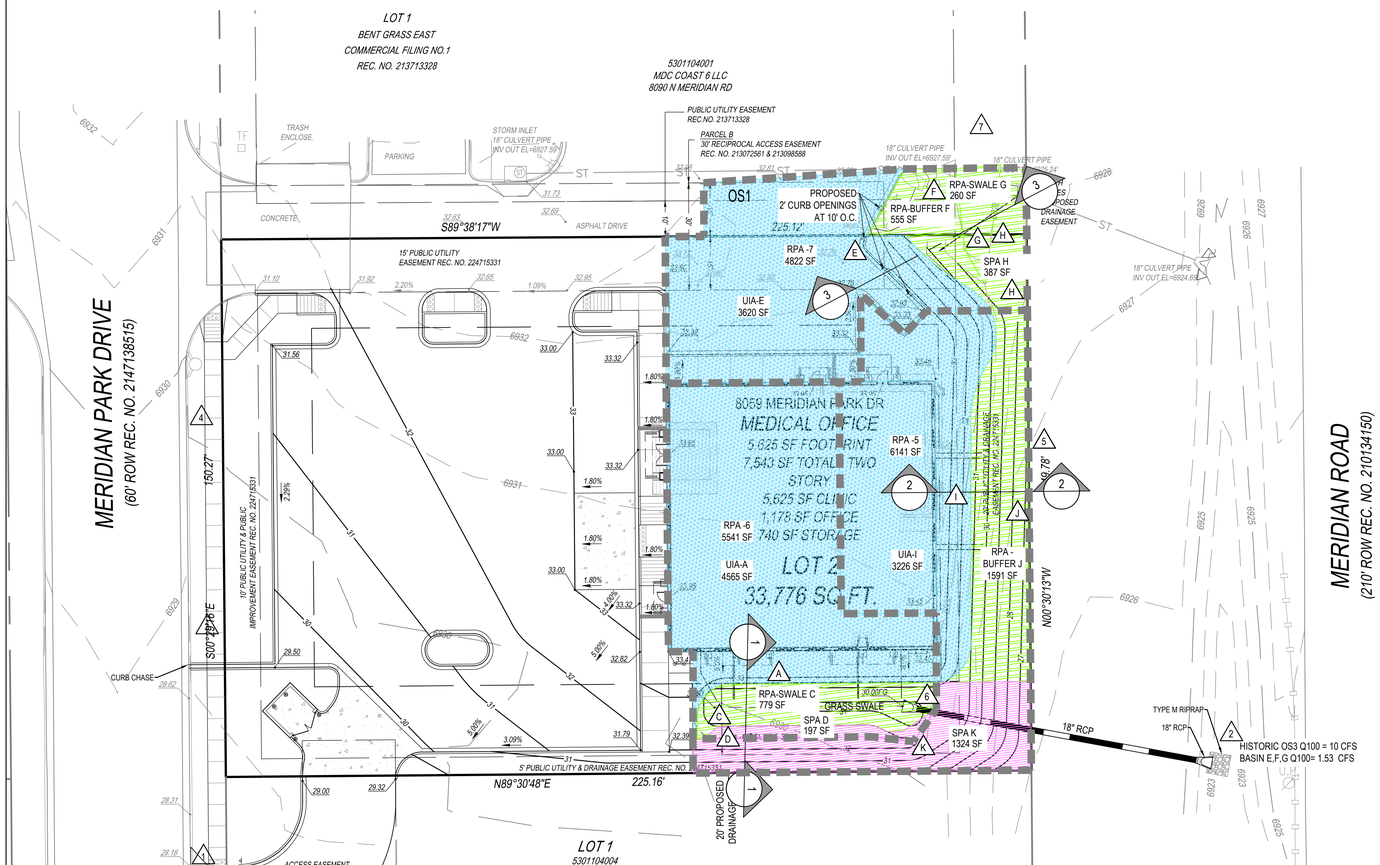
VEGETATION IN RPAS AND SPAS SHOULD HAVE A UNIFORM DENSITY OF AT LEAST 80%.

See cds for responses.

Please update this sheet per all of my comments in the duplicate sheet in the CDs.

LEGEND

- PROPERTY LINE
- 6260 — EXISTING CONTOUR
- 59 — PROPOSED CONTOUR
- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER SPILL PAN
- PROPOSED CURB AND GUTTER CATCH PAN
- BW — FINISHED GRADE AT BOTTOM OF WALL
- TW — TOP OF WALL
- 59.40 — PROPOSED SPOT ELEVATION
- 59.40 — EXISTING SPOT ELEVATION
- FLOW DIRECTION
- RECEIVING PERVIOUS AREA
- UNCONNECTED IMPERVIOUS AREA
- SEPARATE PERVIOUS AREA
- DIRECTLY CONNECTED IMPERVIOUS AREA



SITE LAYOUT INFO (User Input in Blue Cells)

Water Quality Event (WQE): 0.60 inches

Outfall ID	6	5	7									
Total Tributary Area (ft²)	5,541	6,141	4,822									
Total Tributary Area (ac)	0.13	0.14	0.11									
Imperviousness (%)	81.0%	5.0%	86.0%									
MS4 Design Standard	Runoff	Runoff	Runoff									
SCM Type	RPA	RPA	RPA									
Notes:												

OUTFALL RESULTS

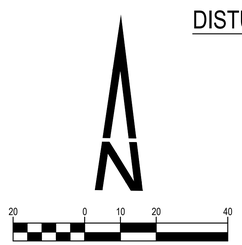
SCM Worksheet Name	RPA_6	RPA_5	RPA_7									
Untreated Area (ft²)	0	0	0									
Default WQCV (ft³)	155	18	148									
Optional Override WQCV (ft³)												
WQCV Reduction (ft³)	130	18	143									
Remaining WQCV (ft³)	25	0	6									
WQCV Reduction (%)	84%	100%	96%									
Design WQCV of SCM (ft³)	0	0	0									
Pollutant Removal (ft³)	0	0	0									
Untreated WQCV (ft³)	25	0	6									

TOTAL SITE RESULTS (Sums results from all Outfalls)

Total Site Area	16,504	ft²	0.38	acres
Treated Area	16,504	ft²	0.38	acres
Untreated Area	0	ft²	0.00	acres
Total Site Imperviousness	54.2%	%		
Default (or Override) WQCV	321	ft³	0.007	acre-feet
Remaining WQCV	30	ft³	0.001	acre-feet
WQCV Reduction	91%	%		
Design WQCV	0	ft³	0.000	acre-feet
Untreated WQCV	30	ft³	0.001	acre-feet

Confirm with local jurisdiction whether design meets Runoff Reduction Standard

DISTURBED AREA RUNOFF REDUCTION RESULTS



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3 OF 3

UIA - RPA EXHIBIT