FINAL DRAINAGE REPORT for

McDonald's at Fontaine and Marksheffel Village at Lorson Ranch Filing No. 1, Lot 2 El Paso County, CO

Prepared for:

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Prepared by:

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Project #: 096806032

Prepared: July 30, 2024
Resubmitted: 10/17/2024

Kimley»Horn

CERTIFICATION

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 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.

SIGNATURE (Affix Seal): ______________________________ 10/15/2024
Colorado P.E. No. 59054 Date

DEVELOPER'S STATEMENT

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

____
Business Name

____
Authorized Signature Date

____
Printed Name

____
Title

____
Address:

EL PASO COUNTY

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

______________________________ ______________________
Director of Public Works Date

Conditions:

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INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this report is to outline the Final Drainage Report for Lot 2 of the Village at Lorson Ranch Filing No. 1 subdivision, located near the northeast corner of Marksheffel Road and Fontaine Boulevard (the “Property”), El Paso County, Colorado (the “County”). This Final Drainage Report identifies on-site and offsite drainage patterns, storm sewer and inlet locations, and areas tributary to the site and proposes to safely route developed storm water to adequate outfalls. The Property is approximately 1.263 acres in size.

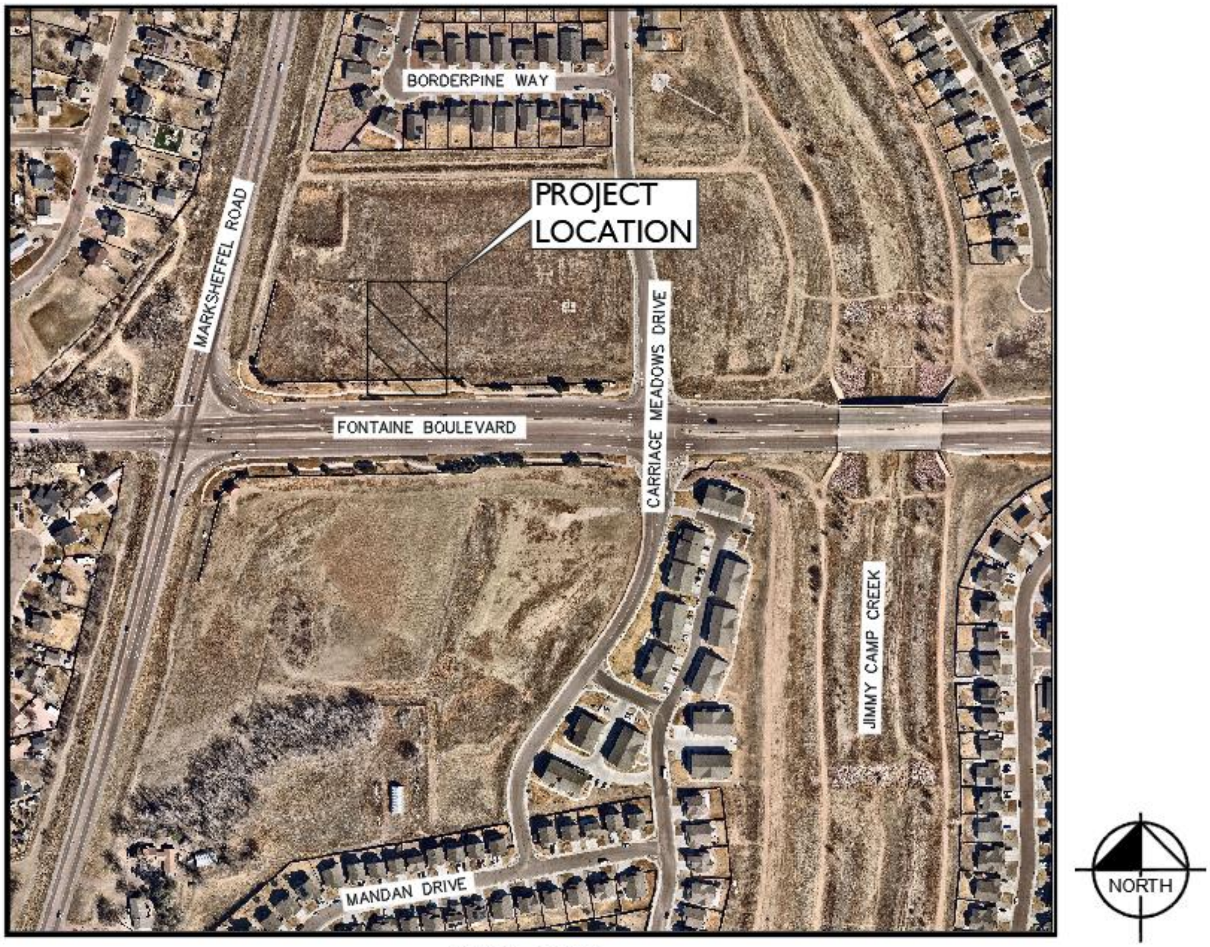
The Property is located within the Jimmy Camp Creek Drainage Basin and is part of the subject area of the *Final Drainage Plan for Village at Lorson Ranch* dated June 2024, prepared by Core Engineering Group, LLC (the “FDP”). The FDP is in conformance with the *Lorson Ranch MDDP1* by Pentacor Engineering (approved November 7, 2006) and *Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1* (approved September 7, 2017).

GENERAL PROJECT DESCRIPTION

The proposed improvements consist of the construction of an approximately 3,694-gross square-foot McDonald’s, fast-food restaurant building with a dual drive-thru, parking lot, and landscaping (the “Project”) within the Property (the “Site”). The Project will be processed through El Paso County. Additional outside agency review or processing is not anticipated as part of the Project.

The Project is located within a portion of the south half of the southeast quarter of Section 15, Township 15 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado (see Vicinity Map). The Property is bounded by Lot 1 of Village at Lorson Ranch Filing No. 1 to the west, private road and Lot 6 of Village at Lorson Ranch Filing No. 1 to the north, Lot 3 of Village at Lorson Ranch Filing No. 1 to the east, and Fontaine Boulevard to the south. The Property is currently undeveloped and native vegetation (grass with no shrubs). The Property generally slopes from northwest to southeast with the existing stormwater outfall being the existing 34”x53” HERCP south of the Site, routing flow under existing Fontaine Boulevard. Per the FDP, the anticipated ultimate outfall for this Property is the existing Pond G1/G2 south of the Site, ultimately tributary to Jimmy Camp Creek.

An ALTA and topographic field survey were completed for the Project by Kimley-Horn and Associates, Inc. dated September 6, 2024 and is the basis for design for the drainage improvements in conjunction with the Master Development design documents.



VICINITY MAP
NOT TO SCALE

PROJECT CHARACTERISTICS

The Project Site is 1.263 acres in size. The Project involves the construction of an approximately 3,694 square foot McDonald's eating restaurant with a dual drive-thru and accompanying infrastructure.

The proposed building, parking lot, paved drives, and other impervious surfaces comprise 75.5 percent (41,538 square feet) of the overall Project Site. Landscape areas internal and on the perimeter of the site consist of landscape islands within the parking lot, and landscape zones adjacent to the building and landscape setback areas. The proposed internal landscaping areas make up 24.5 percent (13,486 square feet) of the Project Site.

Generally, the existing site slopes approximately 1-3% from the northwest to the southeast. This historic runoff pattern will generally be maintained and unaffected with the proposed Project.

There are no major irrigation facilities within the Site. The Project does not provide on-site water quality or detention for the Project area, but per the FDP, existing offsite full spectrum detention pond, Pond G1/G2 (the "EDB"), provides water quality and detention for the Site. The existing land use is undeveloped vacant land. The proposed land use is a fast-food restaurant with drive-thru.

SOILS CONDITIONS

NRCS soil data is available for this Site (see Appendix) and the onsite soils are USCS Hydrologic Soil Group C. Group C soils have a slow infiltration rate and possess a slow rate of water transmission. This site specifically is predominately comprised of Manzanst clay loam. The Soils Map is provided in Appendix A.

DRAINAGE DESIGN CRITERIA

REGULATIONS

The proposed development does not propose any deviations from the Drainage Criteria Manual County of El Paso, Colorado, dated October 31, 2018.

DEVELOPMENT DESIGN CRITERIA REFERENCE AND CONSTRAINTS

The proposed stormwater facilities follow the Drainage Criteria Manual County of El Paso, Colorado (the “CRITERIA”), El Paso County Engineering Criteria Manual (the “ECM”), and the Urban Storm Drainage Criteria Manual (the “MANUAL”). Site drainage is not significantly impacted by constraints such as utilities or existing development. Further detail regarding onsite drainage patterns is provided in the Proposed Drainage Conditions Section.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per Section 6 of the CRITERIA. Table 6-2 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-6 of the CRITERIA by calculating weighted impervious values for each specific site basin. Results of the hydrologic calculations are summarized in appendix B. The 100-year detention and water quality capture volume are provided in the EDB. Based upon this approach, we feel that the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

HYDRAULIC CRITERIA

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA. Results of the hydraulic calculations are summarized in the Appendix C.

VARIANCES FROM CRITERIA

No variances are proposed for this project.

EXISTING DRAINAGE CONDITIONS

EXISTING DRAINAGE BASIN

The FDP defines 14 basins on the developed conditions drainage map. The Project lies within sub-basins PR3, PR4, PR5, and PR6. The sub-basins have 5-year and 100-year runoff coefficients of 0.83 and 0.90, respectively. The runoff for all sub-basins flows south towards the master developer-proposed 34"x53" HERCP. This historic surface runoff pattern will generally be maintained with the proposed Project. Per the FDP, the ultimate discharge from the Site is the master developer-proposed 34"x53" HERCP south of the Site.

MAJOR DRAINAGE BASIN DESCRIPTION

The Project is within the Jimmy Camp Creek Drainage Basin. The major drainage basin is mostly undeveloped land. Drainage facilities downstream of this Project are to be constructed per the master development. There are no known major irrigation facilities within 100 feet of the property.

The proposed drainage facilities for the Project are designed to generally follow the historic flow patterns of the Property as well as the intent of the original storm water design for the overall development. Please refer to the FDP for a full discussion of the original design for the subdivision. Applicable portions of the FDP are included in the Appendix for reference.

As documented within the FDP, this proposed Project lies within sub-basins PR3, PR4, PR5, and PR6. Drainage within sub-basin PR3 on the north side of the Site was designed to flow east to an inlet within the private drive. Drainage within sub-basin PR4 in the southwest corner of the Site was designed to flow southwest to an inlet within the drive aisle. Drainage within sub-basin PR5 on the west and south sides of the Site was designed to flow southeast to an inlet within the drive aisle. Drainage within sub-basin PR6, the majority of the site, on the north and east sides of the Site was designed to flow southwest to an inlet within the shared drive aisle. All sub-basins ultimately discharge to the master developer-proposed 34"x53" HERCP south of the Site which outfalls to the existing EDB south of the Site. The FDP states that both water quality capture volume ("WQCV") and 100-year detention would be provided within the EDB.

Table 1: Developed Drainage Conditions per the FDP

FDP Sub-Basin	Sub-Basin Area (acres)	FDP Developed Flows (Entire Sub-Basin)		DP Description	Ultimate Outfall
		5-year (CFS)	100-year (CFS)		
PR3	0.11	0.50	0.90	5' Type R, SUMP	Existing EDB
PR4	1.68	7.20	13.1	10' Type R on-grade curb inlet	Existing EDB
PR5	0.39	1.70	3.00	5' Type R, SUMP	Existing EDB
PR6	0.72	3.10	5.60	10' Type R on-grade curb inlet	Existing EDB

PROPOSED DRAINAGE CONDITIONS

The developed runoff from the Project will generally be collected by means of private roof drains and storm sewer inlets located in the paved driveways within each delineated basin area. The runoff collected from each basin and the roof system of the proposed building will be conveyed to the private storm sewer system and outfall to the master developer-proposed 34"x53" HERCP south of the Project. The master developer-proposed 34"x53" HERCP ultimately outfalls to the EDB south of the project. The storm sewer infrastructure connecting to the master developer-proposed 34"x53" HERCP is anticipated to be constructed in fourth quarter of 2024 or first quarter of 2025. The ultimate outfall per the FDP is to the EDB south of the Site and Jimmy Camp Creek.

The Property has been divided into 8 sub-basins, A1-A3, R1, EX1A, EX4, EX5, and OS1. The runoff generated on the building roof area, sub-basin R1, is collected and conveyed via a private roof drain system which outfalls to the master developer-proposed private storm sewer. Sub-basins A1-A3 are all internal areas within the parking lot, sidewalk, and landscaping areas. Sub-basins A1-A3 drain to inlets within the parking lot and drive aisles and are routed to the private storm sewer system. Sub-basin EX1A consists mostly of master development proposed private road and sidewalk and drains to master developer-proposed inlet within the private road. Sub-basins EX4 and EX5 consist of site area but drain to master developer-proposed inlets on-site that were sized to accommodate site flows. Sub-basin OS1 consists of landscape area that drains to the Fontaine Boulevard public right-of-way. A proposed conditions map is provided in the Appendix. No offsite flow will affect the site under proposed conditions.

Table 2: Peak Stormwater Runoff Calculation Summary

SUMMARY - PROPOSED RUNOFF TABLE					
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)*	DIRECT 100-YR RUNOFF (CFS)	BASIN IMP. (%)
A1	A1	0.38	1.28	2.50	73.9%
A2	A2	0.15	0.65	1.19	91.9%
A3	A3	0.03	0.15	0.27	98.8%
R1	R1	0.09	0.32	0.68	90.0%
EX1A	EX1A	0.08	0.36	0.66	94.1%
EX4	EX4	0.09	0.39	0.71	94.6%
EX5	EX5	0.30	1.15	2.19	80.3%
OS1	OS1	0.15	0.16	0.58	12.1%

Table 3: Proposed Sub-basin Outfall Descriptions

DESIGN POINT (DP)/BASIN	CONVEYANCE TO DP	DP OUTFALL	OUTFALL DESCRIPTION[(1)]	OUTFALL CONDITION	ULTIMATE OUTFALL	TREATMENT METHOD
A1	SHEET FLOW/ C&G	STRC A1	5' CDOT TYPE R	IN SUMP	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2
A2	SHEET FLOW/ C&G	STRC A2	COMBINATION DEN. NO. 13 GRATE INLET	IN SUMP	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2
A3	SHEET FLOW/ C&G	STRC A3	COMBINATION DEN. NO. 13 GRATE INLET	ON GRADE	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2
R1	ROOF DRAIN	R1	6" PVC ROOF DRAIN TO EX. 24" RCP		EX. EDB, JIMMY CAMP CREEK	EX. PONDS G1/G2
EX1A	SHEET FLOW/ C&G	STRC EX1A	EX. 5' CDOT TYPE R	IN SUMP	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2
EX4	SHEET FLOW/ C&G	STRC EX4	EX. 10' CDOT TYPE R	ON GRADE	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2
EX5	SHEET FLOW/ C&G	STRC EX5	EX. 5' CDOT TYPE R	IN SUMP	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2
OS1	SHEET FLOW	FONTAINE BLVD ROW	EX. 25' CDOT TYPE R	IN SUMP	EX. EDB, JIMMY CAMP CREEK	EX. POND G1/G2

EMERGENCY OVERFLOW ROUTING

Emergency overflow routing for onsite clogged inlets is from northwest to southeast towards the existing 25' Type R sump inlet within the Fontaine Blvd ROW.

MAJOR DRAINAGEWAYS

There are no major drainageways on site or near the site.

HYDRAULIC ANALYSIS METHODOLOGY

The proposed drainage facilities will be designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA. Hydraulic calculations were computed using STORMCAD, which makes use of the Standard Step method to compute the hydraulic profile. Results of the hydraulic calculations are provided in Appendix C. There will be no additional provisions selected or deviations from the CRITERIA.

Inlet capacity calculations are provided in Appendix C for the calculated 5-year and 100-year flows routed to the Type R curb inlets and private area drains on site. The capacity of each inlet is adequate for the 100 year developed flows for each sub-basin.

Storm Sewer Requirements

Proposed pipe sizes are 18” RCP.

DETENTION AND WATER QUALITY REQUIREMENTS

Detention and water quality for the proposed major and minor events is provided within the existing extended full spectrum detention Pond G1/G2. This pond was constructed with Carriage Meadows South at Lorson Ranch Filing No. 1 subdivision.

Pond G1/G2 provides 2.301 acre feet of water quality storage and 12.881 acre feet of storage for the 100-year event. The excess urban runoff volume (EURV) is 0.357 acre feet. The outlet structure was designed to release the WQCV in at least 40 hours and the EURV in 72 hours per County requirements.

Four-Step Process

The four-step process per the CRITERIA provides guidance and requirements for the selection of siting of structural Best Management Practices (BMPs) for new development and significant redevelopment.

Step 1: Employ Runoff Reduction Practices
Currently the site is vacant land. Development of the site will increase current runoff conditions due to the site being vacant. However, implementation of landscaping throughout the site and the proposed storm sewer infrastructure will help slow runoff and encourage infiltration.

Step 2: Stabilize Drainageways
Jimmy Camp Creek is the adjacent drainageway to the development. Jimmy Camp Creek was reconstructed and stabilized in 2006.

Step 3: Provide Water Quality Capture Volume (WQCV)
The water quality capture volume will be provided by the regional detention Pond G1/G2.

Step 4: Consider Need for Industrial and Commercial BMPs
Erosion control BMPs for both the initial and final stages of the Project were designed to reduce contamination. Source control BMPs will include the use of vehicle tracking control, inlet protection, silt fences, concrete washout areas, stockpile management, and stabilized staging areas. The Grading and Erosion Control Plans will be submitted as a separate

construction document set. There are no Covering of Storage/Handling Areas or Spill Containment and Control BMP's anticipated with this development.

EROSION CONTROL PLAN

Erosion Control Plans will be submitted separately as a standalone construction document.

FLOODPLAIN STATEMENT

The Flood Insurance Rate Maps (FIRM) 08041C0543G effective date December 7, 2018, by FEMA, indicates that the Site is located in Zone X (outside of the 500-year flood plain). This panel is included in the Appendix A.

COMPLIANCE WITH FDP

The FDP provides final drainage calculations for the Village at Lorson Ranch master development. This report shows compliance with the FDP.

Sub-Basins PR3, PR5, and PR6 in the FDP have assumed 5-year runoff coefficient of 0.83 and a 100-year runoff coefficient of 0.90. The proposed Project has a 5-year runoff coefficient of 0.71 and a 100-year runoff coefficient of 0.83. The 5-year and 100-year runoff events from the FDP for Sub-Basins PR3-PR6 total to 6.5 and 14.4 cfs, respectively. The cumulative proposed 5-year and 100-year runoff events for the Project sub-basins calculated by this report are 4.04 and 7.95 cfs, respectively. Please reference Appendix B for the cumulative flow calculations. Therefore, the proposed Project Site is generally in compliance with the FDP.

The proposed Project Site drainage basins are captured by a private storm sewer network and routed to the existing full spectrum extended detention Pond G1'G2. Therefore, the proposed Project Site is in general compliance with the FDP.

Reference Appendix E for applicable FDP sections.

FEES DEVELOPMENT

DRAINAGE AND BRIDGE FEES

Lorson Ranch initiated the closure of Jimmy Camp Creek drainage basin for drainage/bridge fees and is awaiting a recorded closure agreement with El Paso County. There is an interim agreement with El Paso County that no fees are required at this time. Therefore, not drainage and bridge fees are required for this Project.

PRIVATE DRAINAGE FACILITY COST (NON-REIMBURSABLE)

Fee	QUANTITY	UNIT	$/UNIT	Fee Total
18" RCP	160	LF	82.00	$13,120
5' CDOT TYPE R	3	EA	7,212.00	$21,636
TOTAL				$34,756

GROUNDWATER CONSIDERATIONS

Per the Geotechnical Engineering Report prepared by Universal Engineering Sciences (UES), Inc on August 18, 2023 for McDonald's, groundwater was encountered within the top three feet of one boring at the time of field exploration. However, seasonal fluctuations in groundwater elevations and above average precipitation levels prior to the collection of boring samples may have influenced groundwater levels. Therefore, the shallow spread footing foundation and shallow excavations proposed for the Project are not anticipated to be affected by groundwater.

A perimeter drain system will not be provided for this Project.

SUMMARY

COMPLIANCE WITH STANDARDS

The drainage design presented within this report for Lot 2 of the Village at Lorson Ranch Filing No. 1 subdivision, conforms to the El Paso County Storm Drainage Criteria and the Mile High Flood District Manual. Additionally, the Site runoff and storm drain facilities is not anticipated to adversely affect the downstream and surrounding developments. This report and its findings are consistent with the drainage requirements documented in the FDP.

REFERENCES

1. El Paso County Drainage Criteria Manual, Vol. 1 and 2, October 1994
2. Mile High Flood District Drainage Criteria Manual (MHFD), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.
3. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0543G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).
4. Lorson Ranch MDDP 1, November 7, 2006 by Pentacor.
5. Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, approved September 7, 2017
6. Master Development Drainage Plan for Village at Lorson Ranch Filing No. 1 and Final Drainage Report for Village at Lorson Ranch Filing No. 1 Initial Infrastructure. Prepared by Core Engineering Group, LLC., April 2024. ("FDP")
7. Custom Soil Resource Report for El Paso County Area, Colorado. Prepared by NRCS, July 2024.
8. Final Plat for Village at Lorson Ranch Filing No. 1. Prepared by Civil Consultants, Inc., April 2024.

APPENDIX

APPENDIX A – SOILS MAP AND FEMA FIRM PANEL

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

July 22, 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

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

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.

Soil Map


104° 38' 55" W
104° 38' 51" W
530540
530550
530560
530570
530580
530590
530600
530610
530620
38° 44' 19" N
38° 44' 15" N
4287840
4287830
4287820
4287810
4287800
4287790
4287780
4287770
4287760
4287750
4287740
4287730
52
Soil Map may not be valid at this scale.
Map Scale: 1:585 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 5 10 20 30
Feet
0 25 50 100 150
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 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52	Manzanst clay loam, 0 to 3 percent slopes	1.3	100.0%
Totals for Area of Interest		**1.3**	**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

52—Manzanst clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w4nr
Elevation: 4,060 to 6,660 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Manzanst and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manzanst

Setting

Landform: Terraces, drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Clayey alluvium derived from shale

Typical profile

A - 0 to 3 inches: clay loam
Bt - 3 to 12 inches: clay
Btk - 12 to 37 inches: clay
Bk1 - 37 to 52 inches: clay
Bk2 - 52 to 79 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Slightly saline (4.0 to 7.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: C
Ecological site: R067BY037CO - Saline Overflow
Hydric soil rating: No

Minor Components

Ritoazul

Percent of map unit: 7 percent
Landform: Drainageways, interfluves
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY042CO - Clayey Plains
Hydric soil rating: No

Arvada

Percent of map unit: 6 percent
Landform: Drainageways, interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY033CO - Salt Flat
Hydric soil rating: No

Wiley

Percent of map unit: 2 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY002CO - Loamy Plains
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

Wind Erodibility Index

The wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Custom Soil Resource Report
Map—Wind Erodibility Index

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- 0
- 38
- 48
- 56
- 86
- 134
- 160
- 180
- 220
- 250
- 310
- Not rated or not available

Soil Rating Lines

- 0
- 38
- 48
- 56
- 86
- 134
- 160
- 180
- 220
- 250
- 310
- Not rated or not available

Soil Rating Points

- 0
- 38
- 48
- 56
- 86
- 134
- 160
- 180
- 220
- 250
- 310
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 2018

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Table—Wind Erodibility Index

Map unit symbol	Map unit name	Rating (tons per acre per year)	Acres in AOI	Percent of AOI
52	Manzanst clay loam, 0 to 3 percent slopes	86	1.3	100.0%
Totals for Area of Interest			**1.3**	**100.0%**

Rating Options—Wind Erodibility Index

Units of Measure: tons per acre per year

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

K Factor, Whole Soil

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Map—K Factor, Whole Soil

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Lines

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Points

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 2018

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Table—K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52	Manzanst clay loam, 0 to 3 percent slopes	.32	1.3	100.0%
Totals for Area of Interest			**1.3**	**100.0%**

Rating Options—K Factor, Whole Soil

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

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

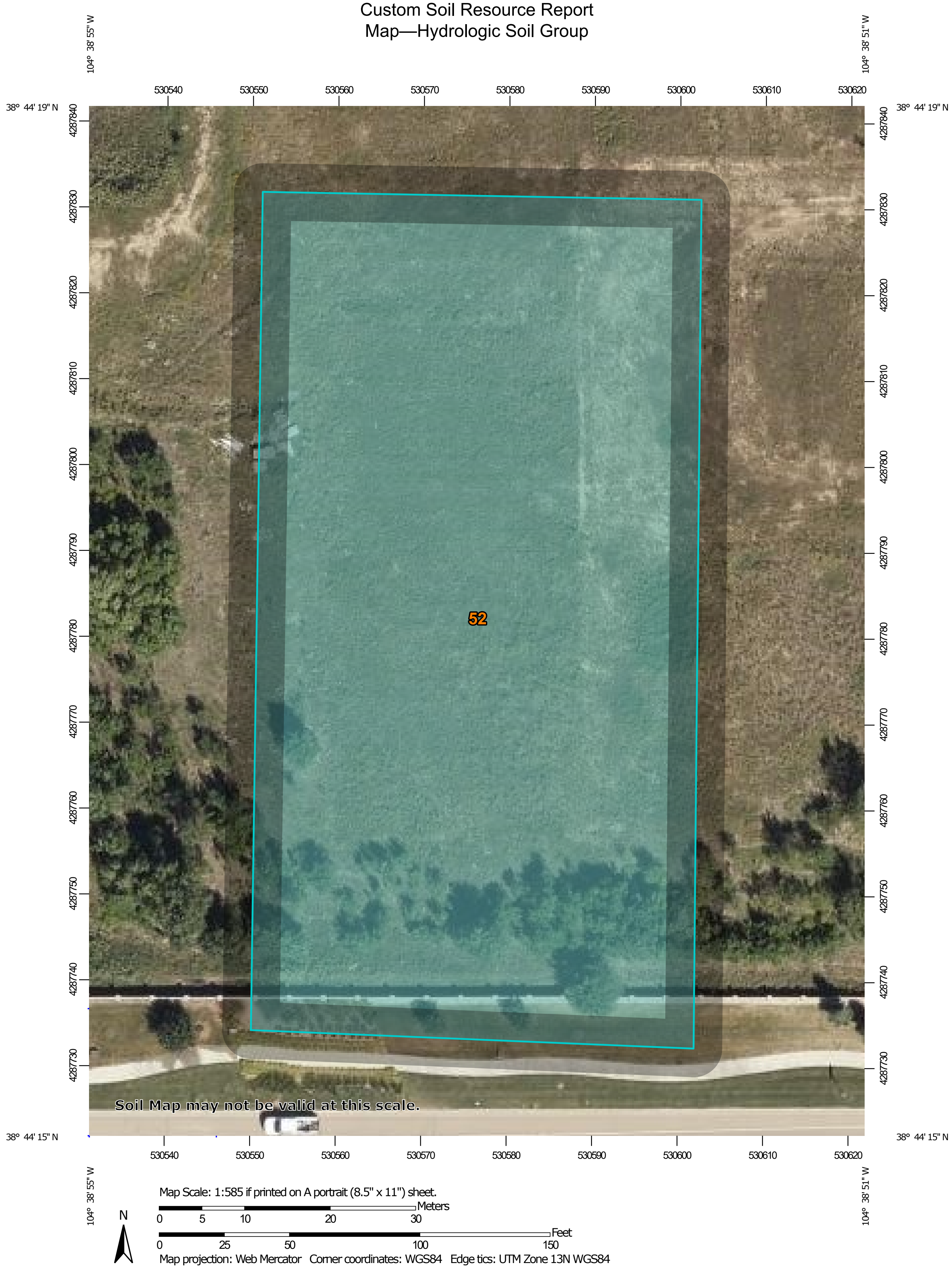
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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Coordinate System: Web Mercator (EPSG:3857)

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52	Manzanst clay loam, 0 to 3 percent slopes	C	1.3	100.0%
Totals for Area of Interest			**1.3**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

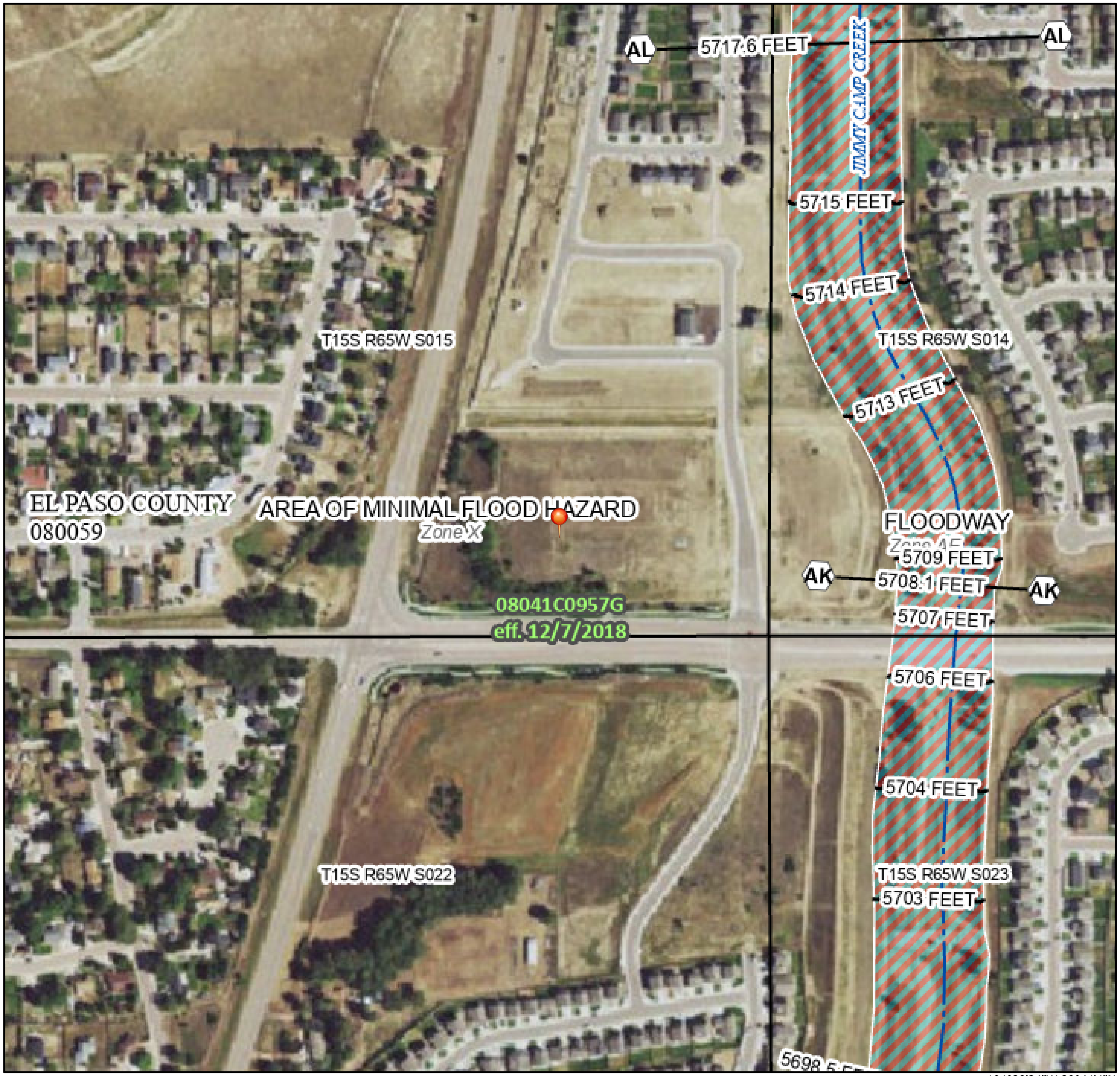
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

National Flood Hazard Layer FIRMette

FEMA

104°39'11"W 38°44'32"N



104°38'34"W 38°44'4"N

Feet

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

1:6,000

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	B 20.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
	513	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 7/10/2024 at 11:50 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX B - HYDROLOGIC CALCULATIONS

IDF Equations:

$I_{100} = -2.52\ln(D) + 12.735$
$I_{50} = -2.25\ln(D) + 11.375$
I_{25} $-2.00\ln(D) + 10.111$
I_{10} $-1.75\ln(D) + 8.847$
I_{5} $-1.50\ln(D) + 7.583$
I_{2} $-1.19\ln(D) + 6.035$

Where:
I = Rainfall Intensity (in/hr)
D= Duration (minutes)

	2-yr	5-yr	10-yr	100-yr
P_1 =	1.19	1.5	1.75	2.52

Time Intensity Frequency Tabulation

Time	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
5	4.12	5.17	6.03	6.89	7.75	8.68
10	3.29	4.13	4.82	5.51	6.19	6.93
15	2.81	3.52	4.11	4.69	5.28	5.91
30	1.99	2.48	2.89	3.31	3.72	4.16
60	1.16	1.44	1.68	1.92	2.16	2.42
120	0.34	0.40	0.47	0.54	0.60	0.67

*The Design Point Rainfall Values and Time Intensity Frequency Tabulation are found in Table 6-2 and Figure 6-5 respectively, of the Colorado Springs Drainage Criteria Manual, Volume 1

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	WEIGHTED COEFFICIENTS C5	WEIGHTED COEFFICIENTS C10	WEIGHTED COEFFICIENTS C100
A1	16,437	0.38	0	90%	0.73	0.75	0.90	0.95	4,286	0%	0.04	0.15	0.30	0.45	12,151	100%	0.89	0.90	0.90	0.95	73.9%	0.67	0.70	0.74	0.82
A2	6,545	0.15	0	90%	0.73	0.75	0.90	0.95	530	0%	0.04	0.15	0.30	0.45	6,015	100%	0.89	0.90	0.90	0.95	91.9%	0.82	0.84	0.85	0.91
A3	1,451	0.03	0	90%	0.73	0.75	0.90	0.95	18	0%	0.04	0.15	0.30	0.45	1,433	100%	0.89	0.90	0.90	0.95	98.8%	0.88	0.89	0.89	0.94
R1	3,719	0.09	3,719	90%	0.73	0.75	0.90	0.95	0	0%	0.04	0.15	0.30	0.45	0	100%	0.89	0.90	0.90	0.95	90.0%	0.73	0.75	0.90	0.95
EX1A	3,589	0.08	0	90%	0.73	0.75	0.90	0.95	212	0%	0.04	0.15	0.30	0.45	3,377	100%	0.89	0.90	0.90	0.95	94.1%	0.84	0.86	0.86	0.92
EX4	3,855	0.09	0	90%	0.73	0.75	0.90	0.95	207	0%	0.04	0.15	0.30	0.45	3,648	100%	0.89	0.90	0.90	0.95	94.6%	0.84	0.86	0.87	0.92
EX5	12,991	0.30	0	90%	0.73	0.75	0.90	0.95	2,564	0%	0.04	0.15	0.30	0.45	10,427	100%	0.89	0.90	0.90	0.95	80.3%	0.72	0.75	0.78	0.85
OS1	6,447	0.15	0	90%	0.73	0.75	0.90	0.95	5,669	0%	0.04	0.15	0.30	0.45	778	100%	0.89	0.90	0.90	0.95	12.1%	0.14	0.24	0.37	0.51
TOTAL	55,034	1.26	3,719	90%	0.73	0.75	0.90	0.95	13,486	0%	0.04	0.15	0.30	0.45	37,829	100%	0.89	0.90	0.90	0.95	74.8%	0.67	0.71	0.75	0.83

McDonald's - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	2.50	Fallow or Cultivation	5.00
Short Grass Pasture & Lawns	7.00	Nearly Bare Ground	10.00
Grassed Waterway	15.00	Paved Area & Shallow Gutter	20.00

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
A1	A1	16,437	0.38	0.70	100	2.1%	5.7	91	1.3%	20.00	2.3	0.7	6.4	191	11.1	6.4
A2	A2	6,545	0.15	0.84	100	1.6%	4.1	64	1.1%	20.00	2.1	0.5	5.0	164	10.9	5.0
A3	A3	1,451	0.03	0.89	25	2.8%	1.4	51	1.1%	20.00	2.1	0.4	5.0	76	10.4	5.0
R1	R1	3,719	0.09	0.75	80	1.0%	5.7			20.00	0.0	0.0	5.7	80	10.4	5.7
EX1A	EX1A	3,589	0.08	0.86	37	86.0%	0.6	131	1.4%	20.00	2.3	0.9	5.0	168	10.9	5.0
EX4	EX4	3,855	0.09	0.86	0	0.0%		205	1.2%	20.00	2.2	1.6	5.0	205	11.1	5.0
EX5	EX5	12,991	0.30	0.75	77	2.0%	4.5	94	1.6%	20.00	2.6	0.6	5.1	171	11.0	5.1
OS1	OS1	6,447	0.15	0.24	37	2.2%	7.3	28	4.2%	20.00	4.1	0.1	7.4	65	10.4	7.4

McDonald's - Drainage Report
Proposed Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	0.38	0.70	6.4	0.27	4.81	1.28					
A2	A2	0.15	0.84	5.0	0.13	5.17	0.65					
A3	A3	0.03	0.89	5.0	0.03	5.17	0.15					
R1	R1	0.09	0.75	5.7	0.06	4.97	0.32	7.4	0.89	4.52	4.04	cumulative runoff basins A1-A3, R1, EX1A-EX5, and OS1
EX1A	EX1A	0.08	0.86	5.0	0.07	5.17	0.36					
EX4	EX4	0.09	0.86	5.0	0.08	5.17	0.39					
EX5	EX5	0.30	0.75	5.1	0.22	5.14	1.15					
OS1	OS1	0.15	0.24	7.4	0.04	4.58	0.16					

McDonald's - Drainage Report
Proposed Runoff Calculations
(Rational Method Procedure)

Design Storm ***100 Year***

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
A1	A1	0.38	0.82	6.4	0.31	8.07	2.50					
A2	A2	0.15	0.91	5.0	0.14	8.68	1.19					
A3	A3	0.03	0.94	5.0	0.03	8.68	0.27					
R1	R1	0.09	0.95	5.7	0.08	8.35	0.68	7.4	1.05	7.60	7.95	cumulative runoff basins A1-A3, R1, EX1A-EX5, and OS1
EX1A	EX1A	0.08	0.92	5.0	0.08	8.68	0.66					
EX4	EX4	0.09	0.92	5.0	0.08	8.68	0.71					
EX5	EX5	0.30	0.85	5.1	0.25	8.62	2.19					
OS1	OS1	0.15	0.51	7.4	0.08	7.69	0.58					

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	**BASIN DESIGNATION**	**BASIN AREA (ACRES)**	**DIRECT 5-YR RUNOFF (CFS)**	**DIRECT 100-YR RUNOFF (CFS)**	**CUMMULATIVE 5-YR RUNOFF (CFS)**	**CUMMULATIVE 100-YR RUNOFF (CFS)**
A1	A1	0.38	1.28	2.50	1.28	2.50
A2	A2	0.15	0.65	1.19	0.65	1.19
A3	A3	0.03	0.15	0.27	0.81	1.46
R1	R1	0.09	0.32	0.68	0.32	0.68
EX1A	EX1A	0.08	0.36	0.66	0.36	0.66
EX4	EX4	0.09	0.39	0.71	1.20	2.17
EX5	EX5	0.30	1.15	2.19	2.35	4.36
OS1	OS1	0.15	0.16	0.58	0.16	0.58
TOTAL		1.26	4.04	7.95		

APPENDIX C - HYDRAULIC CALCULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet A1	Inlet A2	Inlet A3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT/Denver 13 Combination	CDOT/Denver 13 Combination

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.3	0.7	0.2
Major Q_{Known} (cfs)	2.5	1.2	0.3

Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.3	0.7	0.2
Major Total Design Peak Flow, Q (cfs)	2.5	1.2	0.3
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet EX1A	Inlet EX4	Inlet EX5
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.4	0.4	1.2
Major Q_{Known} (cfs)	0.7	0.7	2.2

Bypass (Carry-Over) Flow from Upstream

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

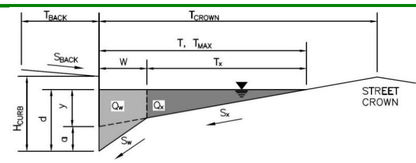
Minor Total Design Peak Flow, Q (cfs)	0.4	0.4	1.2
Major Total Design Peak Flow, Q (cfs)	0.7	0.7	2.2
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

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

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

Project: McDonald's Fontaine and Marksheffel

Inlet ID: Inlet A1



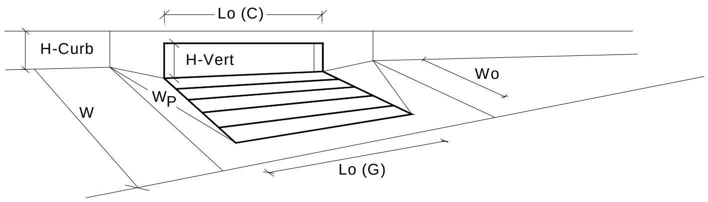
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	9.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.032		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	9.0	9.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.7	4.7	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

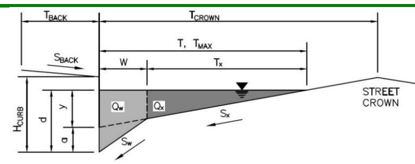
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.22	0.22	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	2.9	2.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.3	2.5	cfs

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

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

Project: McDonald's Fontaine and Marksheffel
Inlet ID: Inlet A2



Gutter Geometry:

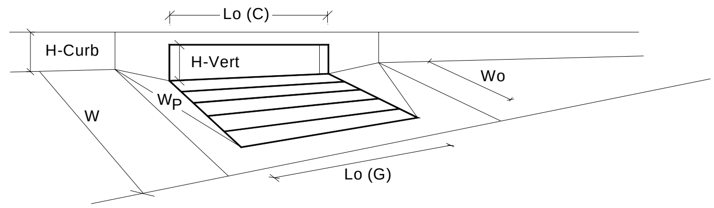
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



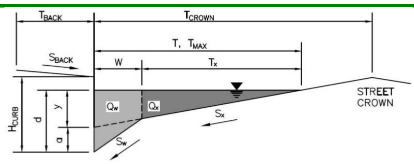
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Combination)	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	3.9	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.35	0.35	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.16	0.16	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.61	0.61	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	0.61	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	1.4	1.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.7	1.2	cfs

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

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

Project: McDonald's Fontaine and Marksheffel

Inlet ID: Inlet A3



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.024	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

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

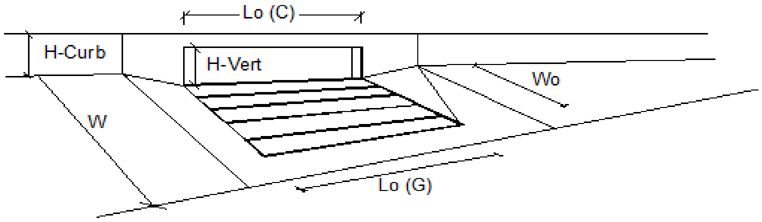
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	1.4	1.4	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.15 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.27 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



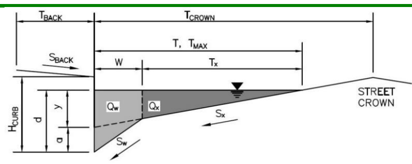
Design Information (Input)	CDOT/Denver 13 Combination		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	0.2	0.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.0	0.0	cfs
Capture Percentage = Q_a/Q_o		C% =	100	100	%

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

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

Project: McDonald's Fontaine and Marksheffel

Inlet ID: Inlet EX1A



Gutter Geometry:

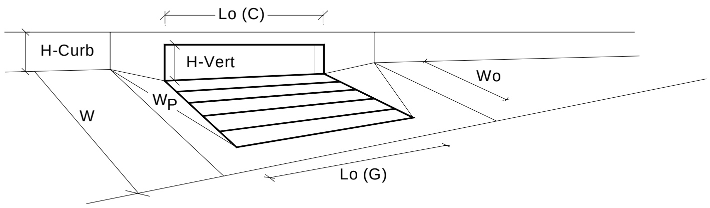
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	7.0	7.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.2	3.2	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.10	0.10	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.96	0.96	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

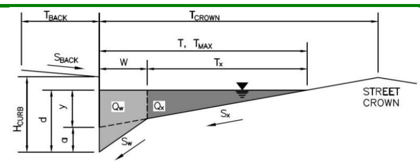
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	0.8	0.8	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.4	0.7	cfs

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

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

Project: McDonald's Fontaine and Marksheffel

Inlet ID: Inlet EX4



Gutter Geometry:

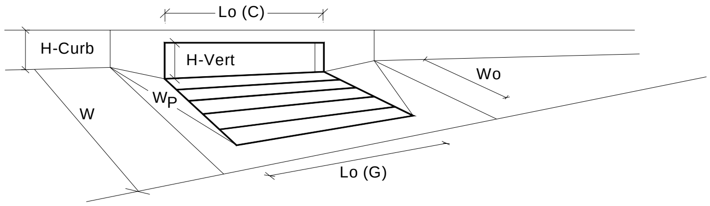
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.023	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	10.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



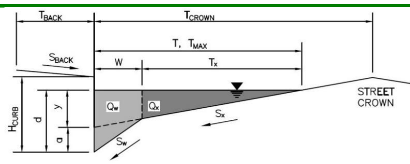
			MINOR	MAJOR	
<u>Design Information (Input)</u>	CDOT Type R Curb Opening				
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.2	4.2	inches
<u>Grate Information</u>			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
<u>Curb Opening Information</u>			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
<u>Low Head Performance Reduction (Calculated)</u>			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.19	0.19	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.81	0.81	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		Q_a =	3.0	3.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	0.4	0.7	cfs

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

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

Project: McDonald's Fontaine and Marksheffel

Inlet ID: Inlet EX5



Gutter Geometry:

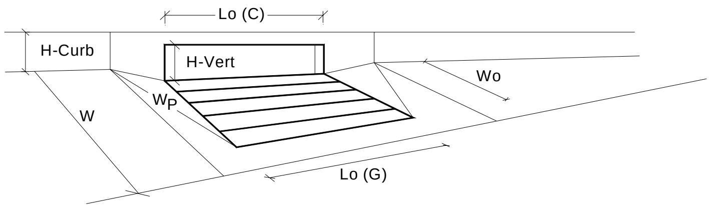
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.018	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.8	4.8	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.23	0.23	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		Q_a =	3.2	3.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	1.2	2.2	cfs

APPENDIX D - DRAINAGE EXHIBIT

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMMULATIVE 5-YR RUNOFF (CFS)	CUMMULATIVE 100-YR RUNOFF (CFS)
A1	A1	0.38	1.28	2.50	1.28	2.50
A2	A2	0.15	0.65	1.19	0.65	1.19
A3	A3	0.03	0.15	0.27	0.81	1.46
R1	R1	0.09	0.32	0.68	0.32	0.68
EX1A	EX1A	0.08	0.36	0.66	0.36	0.66
EX4	EX4	0.09	0.39	0.71	1.20	2.17
EX5	EX5	0.30	1.15	2.19	2.35	4.36
OS1	OS1	0.15	0.16	0.58	0.16	0.58
TOTAL		1.26	4.47	8.77		

DRAINAGE EXHIBIT – MCDONALD'S MARKSHEFFEL ROAD AND FONTAINE BOULEVARD, EL PASO COUNTY, CO

Kimley»Horn

APPENDIX E – MASTER DRAINAGE STUDIES

FINAL DRAINAGE PLAN
SF 248

VILLAGE AT LORSON RANCH

JUNE, 2024

Prepared for:

Lorson, LLC
212 N. Wahsatch Ave, Suite 301
Colorado Springs, Colorado 80903
(719) 635-3200

Prepared by:

Core Engineering Group, LLC
15004 1ST Avenue South
Burnsville, MN 55306
(719) 570-1100

Project No. 100.070

CORE
ENGINEERING GROUP

TABLE OF CONTENTS

ENGINEER'S STATEMENT

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

Richard L. Schindler, P.E. #33997 Date
For and on Behalf of Core Engineering Group, LLC

OWNER'S STATEMENT

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

Lorson, LLC Date

By
Jeff Mark

Title
Manager

Address
212 N. Wahsatch Avenue, Suite 301, Colorado Springs, CO 80903

FLOODPLAIN STATEMENT

To the best of my knowledge and belief, this development is not located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. and 08041C0957 G, dated December 7, 2018. (See Appendix A, FEMA FIRM Exhibit)

Richard L. Schindler, #33997 Date

EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volume 1 and 2, and Engineering Criteria Manual, As Amended.

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

Conditions: ____

1.0 LOCATION and DESCRIPTION

Village at Lorson Ranch is located west of Jimmy Camp Creek. The site is located on approximately 9.722 acres of vacant land. This project will develop this site into a commercial development. The land for the commercial lots is currently owned by Cradlan, LLC.

The site is located in the Southeast 1/4 of Section 15, Township 15 South and Range 65 West of the 6th Principal Meridian. The site is bounded on the north by Carriage Meadows North Filing No. 1, on the west by Marksheffel Road, on the east by Carriage Meadows Drive, and the south by Fontaine Boulevard. For reference, a vicinity map is included in Appendix A of this report.

Conformance with applicable Drainage Basin Planning Studies

There is an existing (unapproved) DBPS for Jimmy Camp Creek prepared by Wilson & Company in 1987, and is referenced in this report. The only major drainage improvements for this study area according to the 1987 Wilson study was the reconstruction of the main stem of Jimmy Camp Creek. In 2006 the main stem of Jimmy Camp Creek was reconstructed in accordance with the 1987 study. There are no further improvements to be made on Jimmy Camp Creek.

Conformance with Lorson Ranch MDDP1 by Pentacor Engineering (approved November 7, 2006) and Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1 (approved September 7, 2017)

Core Engineering Group has an approved MDDP for Lorson Ranch, which covers this study area for major infrastructure. The major infrastructure in the MDDP includes storm sewer in Fontaine Boulevard and relocation of the FMIC irrigation ditch which was constructed in 2006 conforming to the MDDP for Lorson Ranch. Other major infrastructure improvements constructed to serve this site include Pond G1/G2 constructed as part of Carriage Meadows South at Lorson Ranch Filing No. 1. Pond G1/G2 is an offsite full spectrum detention pond constructed in 2017 and included detention and water quality provisions that serve Village at Lorson Ranch.

The Village at Lorson Ranch is located within the ***"Jimmy Camp Creek Drainage Basin"***, which is a fee basin in El Paso County. Jimmy Camp Drainage Basin will be a closed basin within Lorson Ranch within a few months and drainage fees will not be administered per agreements with the county.

2.0 DRAINAGE CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs and El Paso County "Drainage Criteria Manual (DCM)", dated November, 1991, the El Paso County "Engineering Criteria Manual", Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, and the UDFCD "Urban Storm Drainage Criteria Manual" Volumes 1, 2 and 3 for inlet sizing and full spectrum ponds. No deviations from these published criteria are requested for this site.

The Rational Method as outlined in Section 6.3.0 of the May 2014 "Drainage Criteria Manual" and in Section 3.2.8.F of the El Paso County "Engineering Criteria Manual" was used for basins less than 130 acres to determine the rainfall and runoff conditions for the proposed development of the site. The runoff rates for the 5-year initial storm and 100-year major design storm were calculated.

Current updates to the Drainage Criteria manual for El Paso County states the if detention is necessary, Full Spectrum Detention will be included in the design, based on this criteria, Full Spectrum Detention will not be required for this development.

3.0 EXISTING HYDROLOGICAL CONDITIONS

This site is currently undeveloped with native vegetation (grass with no shrubs) and gentle slopes in a southerly direction to the north side of Fontaine Boulevard.

The Soil Conservation Service (SCS) classifies the soils within the Village at Lorson Ranch property as Manzanst clay loam and Ellicot loamy coarse sand. The clay loam is considered to be hydrologic soil group C and the sandy loams are considered hydrologic soil group A (see table 3.1 below). The clay loams are difficult to vegetate and comprise of the majority of the study area. These soils can be mitigated easily by limiting their use as topsoil since they this is a commercial site and most areas will be paved or landscaped with rock bedding.

Table 3.1: SCS Soils Survey for the Study Area

Soil No.	Soil	Hydro. Group	Shrink/Swell Potential	Permeability	Surface Runoff Potential	Erosion Hazard
28	Ellicott Loamy Coarse Sand (0.8%)	A	Low	Moderate	Medium	Moderate
52	Manzanst Clay Loam (2.2%)	C	High	Slow	Medium	Moderate

Excerpts from the SCS "Soil Survey of El Paso County Area, Colorado" are provided in ***Appendix A*** for further reference.

For the purpose of preparing hydrologic calculations for this report, the soils of each basin are assumed to be wholly comprised of the majority soil hydrologic group.

This site is not located within the delineated 100-year floodplain of the East Tributary of Jimmy Camp Creek per the Federal Emergency Management Agency (FEMA) Flood Rate Insurance Map (FIRM) number 08041C10957 G, effective December 7, 2018.

<u>Basin EX1</u>
This existing basin consists primarily of flows from the existing FMIC channel, a majority of these flows are from the offsite area west of the channel. Runoff from basin EX1 flows to the existing FMIC channel, then continues west toward Carriage Meadows Drive. The existing runoff from this 0.95 acre basin is 0.3cfs and 1.6cfs for the 5-year and 100-year events. No other runoff is directed to this basin.

The FMIC historically consisted of an open channel from Cottonwood Meadows to Jimmy Camp Creek (culvert under Marksheffel). Upon development of Lorson Ranch in 2007, a 48" pipe was installed from Cottonwood Meadows west and under Marksheffel Road. The 48" pipe carries FMIC water (50cfs) and stormwater to the east side of Marksheffel Road where a reconstructed open channel directs water east to Carriage Meadows Drive. In addition, this open channel section is designed to handle runoff from the full buildout of Marksheffel Road which is carried in a 30" RCP under Marksheffel Road. The 30" RCP is located directly north of the 48" FMIC pipe. Stormwater and FMIC water (113cfs & 214cfs in 5/100 year storm) travels east to Carriage Meadows Drive where a diversion structure and a box culvert effectively separate stormwater from FMIC water. The diversion structure is a 25' D-10-R inlet with a 1.5' opening and the box culvert is a 3x4 culvert with a gate to regulate or shut off flow. During times of FMIC operation, the gate is adjusted so that only the FMIC water is allowed to pass east in the FMIC channel. Additional runoff at this gate will pond up and flow into the 25' diversion structure. During times the FMIC is not operating, the gate is closed which forces all runoff into the 25' diversion structure. The outlet structure is drained by a 48" RCP that flows east under Carriage Meadows Drive. A 60" RCP at 0.95% slope continues east and outlets directly into Jimmy Camp Creek with a capacity of 270cfs. Just north of the 60" RCP, a 36" stub has been constructed to accept flows from a WQ basin in the Carriage

Meadows residential areas. This entire system is in place and has been fully operational since August, 2006.

Basin EX2
This existing basin consists of on-site undeveloped basin located approximately 100' east of Marksheffel Road, south of and adjacent to the existing FMIC channel, and north of Fontaine Boulevard. This basin has moderate slopes and flows overland south downstream to Fontaine Boulevard, then to an existing 34"x53" HERCP storm sewer that routes runoff southerly under Fontaine Boulevard. The total pre-developed flow from this 8.44 acre basin is 3.4cfs and 19.0cfs in the 5 and 100-year storm events.

Basin EX3
Basin EX3 is a self-contained basin and does not accept any offsite flows. Surface flows are FROM Marksheffel Road and are directed to an existing drainage swale that flows in a southerly-southwesterly direction to an existing 18" RCP, these flows are then routed within this existing 18" RCP to the aforementioned existing 34"x53" HERCP that flows southerly under Fountain Boulevard. The existing runoff from this 0.73 acre site is 0.4cfs and 2.4cfs for the 5-year and 100-year events. The drainage area and flows have not changed from the previous reports when the inlets/storm was designed.

Basin EX4
Basin EX4 consists of the west half of Carriage Meadows Drive, a developed north-south road. Flow is directed westerly to the existing curb and gutter, then continues southerly to an existing 5' Type "R" inlet. This inlet is located on west side of Carriage Meadows Drive, at the northwest corner of Fountaine Boulevard and Carriage Meadows Drive. Flow is routed westerly from this inlet to the aforementioned 34"x53" HERCP via an existing 30" RCP. The existing runoff from this 0.57 acre site is 2.6cfs and 4.7cfs for the 5-year and 100-year events.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for **Village at Lorson Ranch** drainage report was based on the City of Colorado Springs/El Paso County Drainage Criteria. Sub-basins that lie within this project were determined and the 5-year and 100-year peak discharges for the developed conditions have been presented in this report. Based on these flows, storm inlets will be added when the street capacity is exceeded.

Soil types A/B & C/D have been assumed for the developed hydrologic conditions. See Appendix A for SCS Soils Map.

The time of concentration for each basin and sub-basin was developed using an overland, ditch, street and pipe flow components. The maximum overland flow length for developed conditions was limited to 100 feet. Travel time velocities ranged from 2 to 6 feet per second. The travel time calculations are included in the back of this report.

Runoff coefficients for the various land uses were obtained from Table 6-6 dated May 2014 from the updated City of Colorado Springs/El Paso County Drainage Criteria Manual. See Appendix B.

Drainage for the site was divided into 8 proposed basins and 3 existing basins. Runoff coefficients for the 5/100-year events are 0.83 and 0.90 respectively. This is a commercial site, and most areas will be paved or landscaped with rock bedding. Analysis for each of the basins are briefly discussed as follows:

Basins EX1, EX3 & EX4
These offsite basins have been discussed in the existing Hydrological Conditions portion of this report, any additional discussion is not required.

Basin PR1
This basin consists of a commercial area, surface runoff will be directed to a future 10' Type "R" inlet in a sump condition at the southwest corner of this basin. Runoff from this inlet, (design point #7) will be conveyed westerly via future 18" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 1.24 acre basin is 5.3cfs for the 5-year storm event and 9.7cfs for the 100-year storm event. See the appendix for detailed calculations. Interim flows from this area (non-developed) will be conveyed south overland to a temporary sediment basin which flows into Inlet DP8 (5' Type R).

Basin PR2
This basin consists of a commercial area, surface runoff will be directed to a proposed 20' Type "R" inlet in a sump condition at the south-center part of this basin. Runoff from this inlet, (design point #1) will be conveyed southerly by a proposed 24" RCP, then easterly via proposed 36" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 2.41 acre basin is 9.4cfs for the 5-year storm event and 17.0cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR3
This basin consists of a commercial area and street, surface runoff will be directed to a proposed 5' Type "R" inlet in a sump condition at the south-center portion of this basin. Runoff from this inlet, (design point #1a) will be conveyed southerly by a proposed 24" RCP, then easterly via proposed 36" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 0.11 acre basin is 0.5cfs for the 5-year storm event and 0.9cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR4
This basin consists of a commercial area, surface runoff will be directed to a proposed continuous on-grade 10' Type "R" inlet at the southeast corner of this basin. Runoff from this inlet, (design point #4) will be conveyed easterly via proposed 18", 24", & 36" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 1.68 acre basin is 7.2cfs for the 5-year storm event and 13.1cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR5
This basin consists of a fast-food type of commercial area, surface runoff from this basin is directed southerly, then easterly to a proposed 5' Type "R" inlet in a sump condition at the southeast corner of this basin. Runoff from this inlet, (design point #5) is routed by a proposed 24" RCP to the previously discussed proposed 36" RCP then continues easterly to the previously mentioned existing 34"x53" HERCP. Developed flow from this 0.39 acre basin is 1.7cfs for the 5-year storm event and 3.0cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR6
This basin consists of a fast-food type of commercial area, surface runoff from this basin is directed easterly and southerly to a proposed 10' Type "R" inlet in a sump condition at the southeast corner of this basin. Runoff from this inlet, (design point #3) is routed southeasterly by a proposed 24" RCP to the previously discussed proposed 36" RCP then continues easterly to the existing 34"x53" HERCP. Developed flow from this 0.72 acre basin is 3.1cfs for the 5-year storm event and 5.6cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR7
This basin consists of a fast-food type of commercial area, surface runoff from this basin is directed southerly to a future 10' Type "R" inlet in a sump condition at the south-center portion of this basin. Runoff from this inlet, (design point #8a) is routed by proposed 18" & 24" RCP's southwesterly and westerly to the existing 34"x53" HERCP. Developed flow from this 1.41 acre basin is 6.0cfs for the 5-year storm event and 11.0cfs for the 100-year storm event. See the appendix for detailed calculations.

Interim flows from this area (non-developed) will be conveyed south overland to a temporary sediment basin which flows into Inlet DP8 (5' Type R).

<u>Basin PR8</u>
This basin consists of parking for a future fast-food type of commercial area, surface flow from this basin is directed northerly to a proposed 5' Type "R" inlet in a sump condition at the north-center portion of this basin. This inlet will be constructed as part of the first phase of construction and stubs will be provided for future inlets for Basins PR1 and PR7. Runoff from this inlet, (design point #8) is routed westerly by proposed 24" RCP to the existing 34"x53" HERCP. Developed flow from this 0.22 acre basin is 0.9cfs for the 5-year storm event and 1.7cfs for the 100-year storm event. See the appendix for detailed calculations. Interim flows from this area (non-developed) will be conveyed directly to a temporary sediment basin which flows into Inlet DP8 (5' Type R).

See the Developed Conditions Hydrology Calculations in the back of this report and the Developed Conditions Drainage Map (Map Pocket) for the 5-year and 100-year storm event amounts.

5.0 HYDRAULIC SUMMARY

The sizing of the hydraulic structures was prepared by using the *StormSewers* software programs developed by Intellisolve, which conforms to the methods outlined in the "City of Colorado Springs/El Paso County Drainage Criteria Manual". Street capacities and Inlets were sized by Denver Urban Drainage's xcel spreadsheet UD-Inlet.

It is the intent of this drainage report to use the proposed parking area curb/gutter and storm sewer to convey runoff to an existing storm sewer system, then to the existing detention and water quality pond G1/G2 located in Carriage Meadows South. This pond has been adequately sized to accept the developed flow from this development. See Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, Reference SF1711, approved September 7, 2017. Flows will then outlet to the East Tributary of Jimmy Camp Creek. Inlet size and location are shown on the storm sewer layout in the appendix. See the appendix for detailed calculations and the storm sewer model.

Table 1: Street Capacities (100-year capacity is only ½ of street)

	Residential Local		Residential Collector		Principal Arterial	
Street Slope	5-year	100-year	5-year	100-year	5-year	100-year
0.5%	6.3	26.4	9.7	29.3	9.5	28.5
0.6%	6.9	28.9	10.6	32.1	10.4	31.2
0.7%	7.5	31.2	11.5	34.6	11.2	33.7
0.8%	8.0	33.4	12.3	37.0	12.0	36.0
0.9%	8.5	35.4	13.0	39.3	12.7	38.2
1.0%	9.0	37.3	13.7	41.4	13.4	40.2
1.4%	10.5	44.1	16.2	49.0	15.9	47.6
1.8%	12.0	45.4	18.4	50.4	18.0	50.4
2.2%	13.3	42.8	19.4	47.5	19.5	47.5
2.6%	14.4	40.7	18.5	45.1	18.5	45.1
2.7%	14.7	40.6	18.4	45.0	18.4	45.0
3.0%	15.5	39.0	17.7	43.2	17.8	43.2
3.5%	16.7	37.2	16.9	41.3	17.0	41.3
4.0%	17.9	35.7	16.2	39.7	16.3	39.7
4.5%	19.0	34.5	15.7	38.3	15.7	38.3
5.0%	19.9	33.4	15.2	37.1	15.2	37.1

Note: all flows are in cfs (cubic feet per second).

Design Point 1

Design Point 1 is located on the north side of Center Village and accepts developed flows from Basin PR2. The runoff will be conveyed to Design Point 1 via curb/gutter. The street capacity of Street B (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)
Tributary Basins: PR2 **Inlet/MH Number:** Inlet DP1
Upstream flowby: **Total Street Flow:** 9.4cfs

Flow Intercepted: 9.4cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay half flow from each side

(100-year storm)
Tributary Basins: PR2 **Inlet/MH Number:** Inlet DP1
Upstream flowby: **Total Street Flow:** 17.0cfs

Flow Intercepted: 17.0cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 20' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 1a

Design Point 1a is located on the south side of Center Village and accepts developed flows from Basin PR3. The runoff will be conveyed to Design Point 1a via curb/gutter. The street capacity of Street B (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)
Tributary Basins: PR3 **Inlet/MH Number:** Inlet DP1a
Upstream flowby: **Total Street Flow:** 0.5cfs

Flow Intercepted: 0.5cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay half flow from each side

(100-year storm)
Tributary Basins: PR3 **Inlet/MH Number:** Inlet DP1a
Upstream flowby: **Total Street Flow:** 0.9cfs

Flow Intercepted: 0.9cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 2

Design Point 2 is located on the south side of Center Village and is the total pipe flow from Des. Pts 1 & 1a. The runoff will be conveyed to Design Point 3 via a 24" storm sewer. The total pipe flow is 9.8cfs/17.8cfs in the 5/100-year storm events.

Design Point 3

Design Point 3 is located on the north side of an access street and accepts developed flows from Basin PR6. The runoff will be conveyed to Design Point 3 via curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR6 **Inlet/MH Number:** Inlet DP3
Upstream flowby: **Total Street Flow:** 3.1cfs

Flow Intercepted: 3.1cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR6 **Inlet/MH Number:** Inlet DP3
Upstream flowby: **Total Street Flow:** 5.6cfs

Flow Intercepted: 5.6cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 10' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 3a

Design Point 3a is located on the north side of an access street and is the total pipe flow from Des. Pts 2 & 3. The runoff will be conveyed to Design Point 6 via a 24" storm sewer. The total pipe flow is 12.5cfs/22.8cfs in the 5/100-year storm events.

Design Point 4

Design Point 4 is located on the south side of an access street and accepts developed flows from Basin PR4. The runoff will be conveyed to Design Point 4 via curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR4 **Inlet/MH Number:** Inlet DP4
Upstream flowby: **Total Street Flow:** 7.2cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:** 1.3cfs to DP5
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR4 **Inlet/MH Number:** Inlet DP4
Upstream flowby: **Total Street Flow:** 13.1cfs

Flow Intercepted: 8.1cfs **Flow Bypassed:** 5.0cfs to DP5
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 5

Design Point 5 is located on the south side of an access street and accepts developed flows from Basin PR5. The runoff will be conveyed to Design Point 5 via curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)
Tributary Basins: PR5 **Inlet/MH Number:** Inlet DP5
Upstream flowby: 1.3cfs from DP4 **Total Street Flow:** 1.7+1.3=3.0cfs

Flow Intercepted: 3.0cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)
Tributary Basins: PR5 **Inlet/MH Number:** Inlet DP5
Upstream flowby: 5.0cfs from DP4 **Total Street Flow:** 5.0+3.0=8.0cfs

Flow Intercepted: 8.0cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 5a

Design Point 5a is located on the south side of an access street and is the total pipe flow from Des. Pts 4 & 5. The runoff will be conveyed to Design Point 6 via a 24" storm sewer. The total pipe flow is 8.9cfs/16.1cfs in the 5/100-year storm events.

Design Point 6

Design Point 6 is located on the south side of an access street and is the total pipe flow from Des. Pts 3a & 5a. The runoff will be conveyed to Design Point 6 via a 24" storm sewer. The total pipe flow is 20.5cfs/37.3cfs in the 5/100-year storm events.

Design Point 7

Design Point 7 is located on the east end of an access street and accepts developed flows from Basin PR1 which will be developed in the future. The runoff will be conveyed to Design Point 7 via future curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded. A future inlet will be designed and the size verified before construction at this design point when the adjacent lot is developed. Interim flows from this area (non-developed) will be conveyed south overland to a temporary sediment basin which flows into Inlet DP8 (5' Type R).

(5-year storm)

Tributary Basins: PR1 **Inlet/MH Number:** future Inlet DP7
Upstream flowby: **Total Street Flow:** 5.3cfs

Flow Intercepted: 5.3cfs **Flow Bypassed:** 0.0cfs
Inlet Size: future 10' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR1 **Inlet/MH Number:** future Inlet DP7
Upstream flowby: **Total Street Flow:** 9.7cfs

Flow Intercepted: 9.7cfs **Flow Bypassed:** 0.0cfs
Inlet Size: future 10' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 8

Design Point 8 is located on the east end of an access street and accepts developed flows from Basin PR8 which will be developed in the future. The runoff will be conveyed to Design Point 8 via future curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded. Interim flows from this area (non-developed) will be conveyed overland directly to a temporary sediment basin which flows into Inlet DP8 (5' Type R).

(5-year storm)

Tributary Basins: PR8 **Inlet/MH Number:** Inlet DP8
Upstream flowby: **Total Street Flow:** 0.9cfs

Flow Intercepted: 0.9cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR8 **Inlet/MH Number:** Inlet DP8
Upstream flowby: **Total Street Flow:** 1.7cfs

Flow Intercepted: 1.7cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 8a
Design Point 8a is located on the east end of an access street and accepts developed flows from Basin PR7 which will be developed in the future. The runoff will be conveyed to Design Point 8a via future curb/gutter. The total surface flow is 6.0cfs/11.0cfs in the 5/100-year storm events. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded. A future inlet will be designed and the size verified before construction at this design point when the adjacent lot is developed.

Design Point 9
Design Point 9 is located on the south side of an access street and is the total pipe flow from Des. Pts 7, 8 & 8a. The runoff will be conveyed to Design Point 10 via a 24" storm sewer. The total pipe flow is 12.2cfs/22.4cfs in the 5/100-year storm events.

Design Point 10
Design Point 10 is located on the south side of an access street and is the total pipe flow from Des. Pts 6 & 9. The runoff will be conveyed to an existing 34"x53" HERCP. The total pipe flow is 31.5cfs/57.3cfs in the 5/100-year storm events. The allowable flow into the existing HERCP is 32.2cfs/59.0cfs per the Fontaine Blvd. Phase 1 FDR which designed the existing system.

6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for Village at Lorson Ranch will be provided for in existing Pond G1/G2 located south of Fontaine Boulevard. Pond G1/G2 is an existing full spectrum detention pond constructed in 2017 as part of the Carriage Meadows South at Lorson Ranch Filing No. 1 subdivision (SF 1711) per El Paso County criteria. Pond G1/G2 was as-builted and certified on June 27, 2023 by Core Engineering Group. A copy of the certification letter, as-builts, and a pond drainage area map are located in the appendix of this report.

For additional information, see the approved Final Drainage Report and Plan for "Carriage Meadows South at Lorson Ranch Filing No. 1, SF 1711, dated 08/10/2017.

The following text was taken from the Carriage Meadows South final drainage report:

Detention Pond G1/G2 (Full Spectrum Design), (District Facility, SF1711)
This is an on-site permanent full spectrum detention pond that includes water quality. Pond G1/G2 is designed as a single pond in the UDCF Full Spectrum spreadsheets. The full spectrum print outs are in the appendix of this report. See map in appendix for watershed areas. This pond is sized to provide full spectrum and water quality for the Brownsville Subdivision No. 2 should it become a part of Lorson Ranch.

- Watershed Ares: 96 acres
- Watershed Imperviousness: 79%
- Hydrologic Soils Group A, B, C/D
- Zone 1 WQCV: 2.301 ac-ft, WSEL: 5683.93
- Zone 2 EURV: 8.104 ac-ft, WSEL: 5686.29
- Zone 3 (100-yr): 12.881ac-ft, WSEL: 5687.93
- Pipe Outlet: 36" RCP at 0.4%
- 5-yr outflow = 4.2cfs, 100-yr outflow = 55.6cfs

7.0 DRAINAGE AND BRIDGE FEES

Village at Lorson Ranch is located within the Jimmy Camp Creek drainage basin which is currently a fee basin in El Paso County. Current El Paso County regulations require drainage and bridge fees to be paid for platting of land as part of the plat recordation process. Lorson Ranch initiated the closure of Jimmy Camp Creek drainage basin for drainage/bridge fees a few years ago and will be approved by El Paso County and the Pikes Peak Drainage Board before this plat is recorded. In the event the basin isn't closed Lorson Ranch has interim agreements with the county that no fees are required at this time. Therefore, no drainage fees or bridge fees are required to be paid at this time. A copy of the drainage board meeting minutes is in the appendix of this report.

Table 7.1: Private Drainage Facility Costs (non-reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
5' Inlet	3	EA	$5,000/EA	$15,000
10' Inlet	4	EA	$8,000/EA	$32,000
20' Inlet	1	EA	$12,000/EA	$12,000
18" Storm	206	LF	$180	$37,080
24" Storm	351	LF	$240	$84,240
36" Storm	73	LF	$360	$26,280
Manholes	2	EA	$10,000	$20,000
			Subtotal	$226,600
			Eng/Cont (10%)	$22,660
			Total Est. Cost	$249,260

8.0 FOUR STEP PROCESS

The site has been developed to minimize wherever possible the rate of developed runoff that will leave the site and to provide water quality management for the runoff produced by the site as proposed on the development plan. The following four step process should be considered and incorporated into the storm water collection system and storage facilities where applicable.

Step 1: Employ Runoff Reduction Practices
Village at Lorson Ranch has employed several methods of reducing runoff.

- The street configuration was laid out to minimize the length of streets. Many streets are straight and perpendicular resulting in lots with less wasted space. Landscape buffers are provided for adjacent residential development
- Utilize existing Full Spectrum Detention Outlet Structure (Pond G1/G2) which has been previously constructed and sized for runoff from this development. The full spectrum detention mimics existing storm discharges and includes water quality.

Step 2: Stabilize Drainageways
Jimmy Camp Creek is a major drainageway located east of this site. In 2006 Jimmy Camp Creek was reconstructed and stabilized per county criteria. The design included a natural sand bottom and armored sides.

Step 3: Provide Water Quality Capture Volume

Treatment of the water quality capture volume (WQCV) is required for all new developments. Village at Lorson Ranch utilizes an existing full spectrum stormwater extended detention basin outlet structure within existing Pond G1/G2 which include Water Quality Volumes and WQ outlet structures.

Step 4: Consider Need for Industrial and Commercial BMP's

There are no industrial areas within this site. This site is commercial but will be mostly light use commercial areas such as restaurants, gas station, mini storage, etc which does not need specific BMP's.

9.0 CONCLUSIONS

This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development discussed above are summarized as follows:

- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- Jimmy Camp Creek has been reconstructed east of this study area
- Detention and water quality for this site will be provided in Pond G1/G2 constructed as part of Carriage Meadows South (SF1711)

10.0 REFERENCES

1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs “Drainage Criteria Manual, Volume 2
5. El Paso County “Engineering Criteria Manual”
6. Lorson Ranch MDDP 1, November 7, 2006 by Pentacor.
7. El Paso County Resolution #15-042, El Paso County adoption of Chapter 6 and Section 3.2.1 of the City of Colorado Springs Drainage Criteria Manual dated May, 2014.
8. Final Drainage Report for Fontaine Boulevard Phase 1 Improvements prepared by Pentacor, dated November, 2006
9. Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, Reference SF1711, approved September 7, 2017
10. Final Drainage Report for Carriage Meadows North prepared by Core Engineering Group, Reference SF1723, approved April 12, 2018

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP

APPENDIX B – HYDROLOGY CALCULATIONS

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR
Design Storm: **5 - Year Event (Developed)**

Street or Basin	Design Point	Area Design	Direct Runoff: Area (A) ac.	Direct Runoff: Runoff Coeff. (C)	Direct Runoff: tc min.	Direct Runoff: CA	Direct Runoff: i in/hr	Direct Runoff: Q cfs	Total Runoff: tc min	Total Runoff: Σ (CA)	Total Runoff: i in/hr	Total Runoff: Q cfs	Street: Slope / Pipe Slope %	Street: Full Street Max Flow cfs	Street: Max Allow street flow cfs	Street: Street Velocity min	Pipe: Design Pipe Flow cfs	Pipe: Slope %	Pipe: Pipe Size in	Pipe: Min Pipe Flow cfs	Pipe: Pipe Velocity fps
EX1			0.95	0.15	40.3	0.14	2.04	0.3													
EX3			0.73	0.15	11.1	0.11	3.98	0.4													
EX4			0.57	0.90	5.0	0.51	5.17	2.6													
PR1	7		1.24	0.83	5.0	1.03	5.17	5.3													
PR2	1		2.41	0.83	6.9	2.00	4.68	9.4													
PR3	1a		0.11	0.83	5.0	0.09	5.17	0.5													
(PR2-PR3)	2	2.52		0.83					6.9	2.09	4.68	9.8									
PR4	4		1.68	0.83	5.0	1.39	5.17	7.2													
PR5			0.39	0.83	5.0	0.32	5.17	1.7													
(PR4-PR5)	5a	2.07		0.83					5.0	1.72	5.17	8.9									
PR6 (PR2,PR3&PR6)	3a		0.72	0.83	5.0	0.60	5.17	3.1	7.0	2.69	4.66	12.5									
(PR2-PR6)	6	5.31		0.83					7.1	4.41	4.65	20.5									
PR7	8a		1.41	0.83	5.0	1.17	5.17	6.0													
PR8	8		0.22	0.83	5.0	0.18	5.17	0.9													
(PR1,PR7&PR8)	9	2.87							5.1	2.38	5.14	12.2									
(PR1-PR8)	10	8.18							7.1	6.79	4.64	31.5									

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR Design
Storm: **100 - Year Event (Developed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street				Pipe				
		Area Design	Area (A)	Runoff Coeff. (C)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope / Pipe Slope	Full Street Max Flow	Max Allow street flow	Street Velocity	Design Pipe Flow	Slope	Pipe Size	Min Pipe Flow	Pipe Velocity
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	min	cfs	%	ft	cfs	fps
EX1			0.95	0.50	40.3	0.48	3.42	1.6													
EX3			0.73	0.50	11.1	0.37	6.68	2.4													
EX4			0.57	0.96	5.0	0.55	8.68	4.7													
PR1	7		1.24	0.90	5.0	1.12	8.68	9.7													
PR2	1		2.41	0.90	6.9	2.17	7.85	17.0													
PR3	1a		0.11	0.90	5.0	0.10	8.68	0.9													
(PR2-PR3)	2	2.52		0.90					7.0	2.27	7.83	17.8									
PR4	4		1.68	0.90	5.0	1.51	8.68	13.1													
PR5			0.39	0.90	5.0	0.35	8.68	3.0													
(PR4-PR5)	5a	2.07		0.90					5.0	1.86	8.66	16.1									
PR6 (PR2,PR3&PR6)	3a		0.72	0.90	5.0	0.65	8.68	5.6	7.0	2.92	7.83	22.8									
(PR2-PR6)	6	5.31		0.90					7.1	4.78	7.81	37.3									
PR7	8a		1.41	0.90	5.0	1.27	8.68	11.0													
PR8	8		0.22	0.90	5.0	0.20	8.68	1.7													
(PR1,PR7&PR8)	9	2.87							5.0	2.58	8.68	22.4									
(PR1-PR8)	10	8.18	8.18	0.90	7.1	7.36	7.79	57.3	7.1	7.36	7.79	57.3									

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch

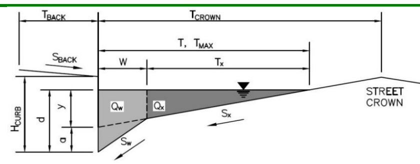
Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed tc Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
EX1	0.15	0.95	15.0	51.00	10.78%	0.15	5.59	1398.00	0.20%	0.67	34.73	40.32			40.32
EX3	0.15	0.73	15.0	37.00	4.05%	0.09	6.58	442.00	1.20%	1.64	4.48	11.06			11.06
EX4	0.90	0.66	20.0	22.00	2.00%	0.27	1.35	462.00	1.75%	2.65	2.91	4.26			4.26
PR1	0.90	1.24	20.0	15.00	2.00%	0.22	1.12	410.00	1.22%	2.21	3.09	4.21	425.00	12.36	4.21
PR2	0.90	2.41	7.0	36.00	2.00%	0.35	1.73	114.00	1.00%	0.70	2.71				
			20.0					300.00	1.00%	2.00	2.50	6.94	450.00	12.50	6.94
PR3	0.90	0.11	20.0	22.00	2.00%	0.27	1.35	128.00	1.00%	2.00	1.07	2.42	150.00	10.83	2.42
PR4	0.90	1.68	20.0	10.00	2.00%	0.18	0.91	597.00	1.60%	2.53	3.93	4.85	607.00	13.37	4.85
PR5	0.90	0.39	20.0	10.00	1.96%	0.18	0.92	353.00	1.60%	2.53	2.33	3.24	363.00	12.02	3.24
PR6	0.90	0.72	20.0	10.00	2.00%	0.18	0.91	368.00	1.34%	2.32	2.65	3.56	378.00	12.10	3.56
PR7	0.90	1.41	20.0	15.00	2.20%	0.23	1.08	320.00	1.56%	2.50	2.14	3.22	335.00	11.86	3.22
PR8	0.90	0.22	20.0	25.00	2.00%	0.29	1.44	108.00	1.56%	2.50	0.72	2.16	133.00	10.74	2.16

APPENDIX C – HYDRAULIC CALCULATIONS

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

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

Project: Village at Lorson Ranch
Inlet ID: Inlet DP1

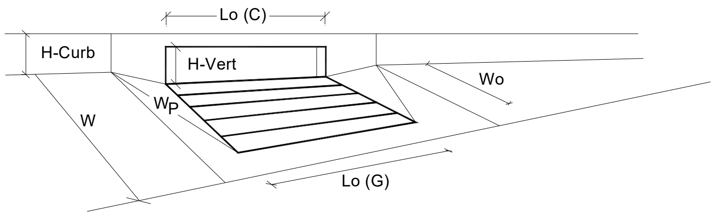


Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

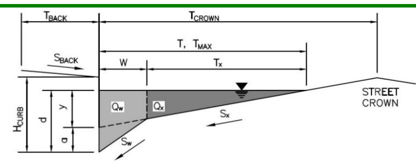


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	6.9	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.29	0.41	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.75	0.84	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**9.8**	**18.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	9.4	17.0	cfs

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

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

Project: Village at Lorson Ranch
Inlet ID: Inlet DP1a



Gutter Geometry:

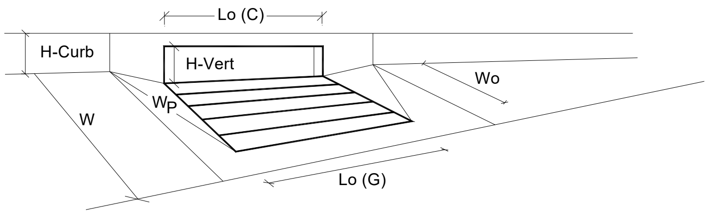
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	5.6	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

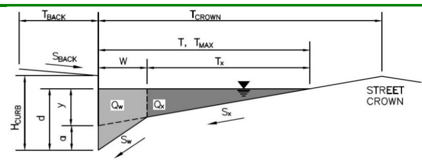
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.5	0.9	cfs

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

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

Project: Village at Lorson Ranch
Inlet ID: Inlet DP3



Gutter Geometry:

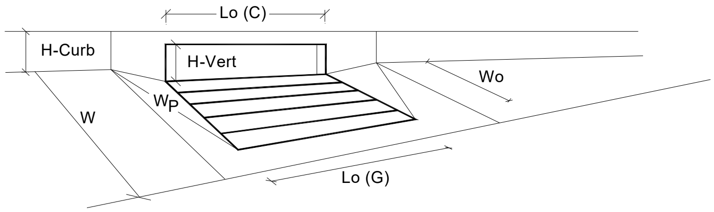
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

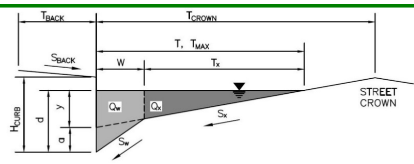
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.90	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**6.6**	**6.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.1	5.6	cfs

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

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

Project: Village at Lorson Ranch
Inlet ID: Inlet DP4



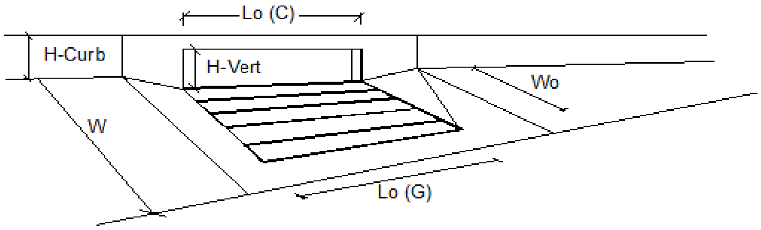
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	19.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.009		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	19.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.7**	**13.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 7.20 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 13.10 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



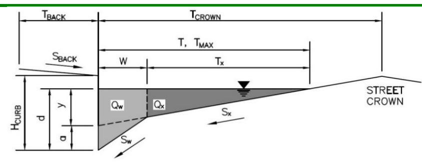
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10	10.10	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.9**	**8.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.3**	**5.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**81**	**61**	**%**

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP5**



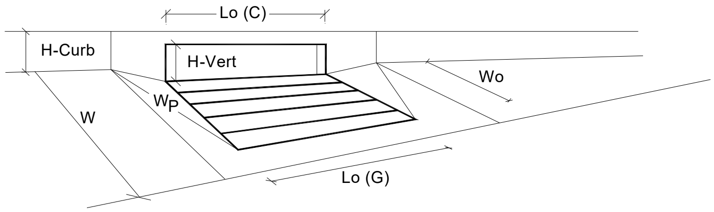
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	5.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	7.2	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

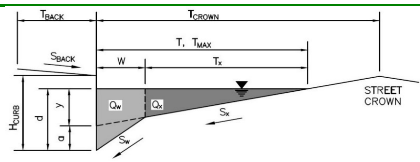
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.43	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**8.0**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	3.0	8.0	cfs

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

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

Project: Village at Lorson Ranch
Inlet ID: Inlet DP7



Gutter Geometry:

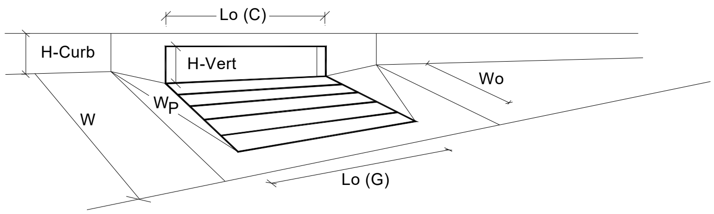
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

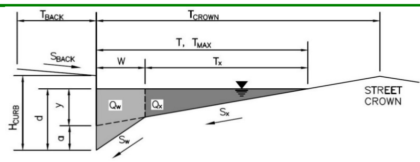
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.90	0.96	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**10.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	5.3	9.7	cfs

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

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

Project: Village at Lorson Ranch
Inlet ID: Inlet DP8



<u>Gutter Geometry:</u>

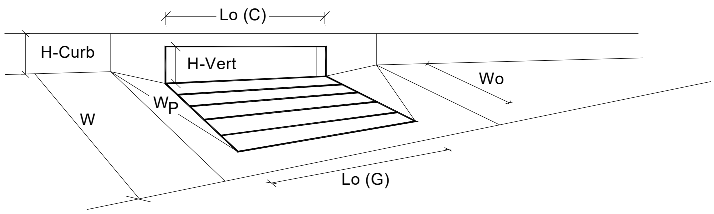
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

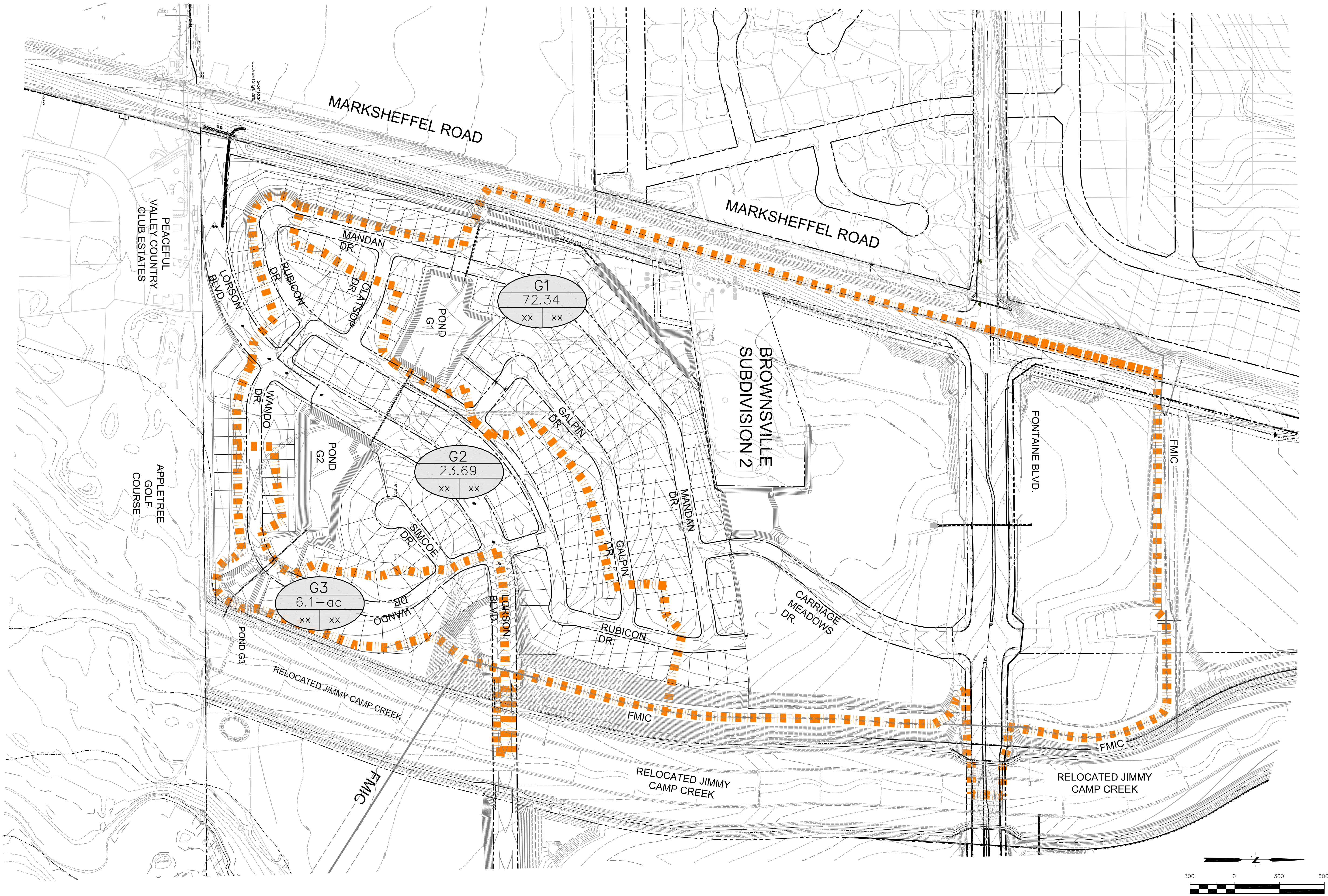
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	5.6	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.9	1.7	cfs

APPENDIX D – POND G1/G2



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH FILING NO. 1
FONTAINE BLVD. – OLD GLORY DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DETENTION POND WATERSHEDS
DRAINAGE PLAN
CARRIAGE MEADOWS SOUTH

DATE
JANUARY, 2017

PROJECT NO.
100.030

SHEET NUMBER
1

TOTAL SHEETS: 1

CORE ENGINEERING GROUP

June 27, 2023

El Paso County Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

RE: Carriage Meadows South Filing No. 1 (SF 17-011)
Certification Letter

Dear El Paso County PCD,

Based upon information gathered from as-built surveys and periodic visits to the project, Core Engineering Group is of the opinion that the subdivision improvements have been constructed in general conformance with the approved design plans as filed with El Paso County.

The site and adjacent properties (as affected by work performed under the County permit) appear to be stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and the improvements (public improvements, common development improvements, site grading and paving) visually appear to meet or exceed the minimum design requirements. There have been some service line utility trench settlements but that is currently being addressed as part of the punchlist process.

The sanitary and watermain located in the public ROW has also been completed in accordance with Widefield Water and Sanitation Districts criteria.

In addition, Core Engineering Group has verified that the Extended Detention Basin/WQ Pond G1, G2, and G3 have been constructed and certified and meet the volume and elevation requirements and have been constructed in general compliance with the approved construction plans. The outlet structure for Pond G3 did change slightly from the design so the full spectrum spreadsheet was updated for this pond and it meets the design output as shown in the approved final drainage report.

Based on information gathered during construction and post-construction, Core Engineering Group is of the opinion that the public streets and storm sewer have been constructed in general accordance with the approved construction documents.

Sincerely,
Core Engineering Group, LLC

COLORADO REGISTERED RICHARD L. SCHINDLER 33997 PROFESSIONAL ENGINEER
7-3-2023

Richard L. Schindler, P.E. 33997

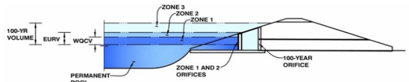
Pond G1/G2, G3 As-builts
Street/storm As-builts

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Carriage Meadows South at Lorson Ranch

Basin ID: Full Spectrum Pond G3 - asbuilt



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB			
Watershed Area =	6.02	acres		
Watershed Length =	790	ft		
Watershed Slope =	0.016	ft/ft		
Watershed Imperviousness =	55.00%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	100.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	0.111	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	0.357	acre-feet		
2-yr Runoff Volume (P1 = 1.16 in.) =	0.283	acre-feet	1.16	inches
5-yr Runoff Volume (P1 = 1.44 in.) =	0.378	acre-feet	1.44	inches
10-yr Runoff Volume (P1 = 1.68 in.) =	0.501	acre-feet	1.68	inches
25-yr Runoff Volume (P1 = 1.92 in.) =	0.678	acre-feet	1.92	inches
50-yr Runoff Volume (P1 = 2.16 in.) =	0.802	acre-feet	2.16	inches
100-yr Runoff Volume (P1 = 2.42 in.) =	0.966	acre-feet	2.42	inches
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet		inches
Approximate 2-yr Detention Volume =	0.265	acre-feet		
Approximate 5-yr Detention Volume =	0.355	acre-feet		
Approximate 10-yr Detention Volume =	0.463	acre-feet		
Approximate 25-yr Detention Volume =	0.503	acre-feet		
Approximate 50-yr Detention Volume =	0.525	acre-feet		
Approximate 100-yr Detention Volume =	0.580	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.111	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.246	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.223	acre-feet
Total Detention Basin Volume =	0.580	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

asblt orifice=82.94

Depth Increment = 0.1 ft

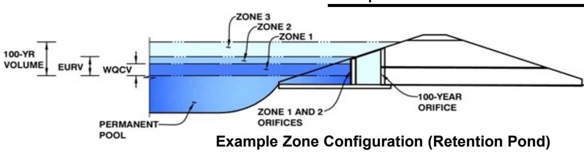
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
5684	--	1.06	--	--	--	1,284	0.029	694	0.016
5685	--	2.06	--	--	--	5,841	0.134	4,269	0.098
5686	--	3.06	--	--	--	8,575	0.197	11,477	0.263
5687	--	4.06	--	--	--	10,539	0.242	21,034	0.483
5yr=5687.22	--	4.28	--	--	--	10,921	0.251	23,395	0.537
100yr=5687.81	--	4.87	--	--	--	11,948	0.274	30,141	0.692
5688	--	5.06	--	--	--	12,279	0.282	32,443	0.745
5689	--	6.06	--	--	--	14,100	0.324	45,632	1.048

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Carriage Meadows South at Lorson Ranch

Basin ID: Full Spectrum Pond G3 - asbuilt



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.16	0.111	Orifice Plate
Zone 2 (EURV)	3.52	0.246	Rectangular Orifice
Zone 3 (100-year)	4.45	0.223	Weir&Pipe (Restrict)
		0.580	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.16	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	0.61	sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =	4.236E-03	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.45					
Orifice Area (sq. inches)	0.61	0.61	0.61					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.16	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.80	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	2.00	N/A	inches
Vertical Orifice Width =	2.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.03	N/A	ft^2
Vertical Orifice Centroid =	0.08	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	5.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.50	N/A	feet
Over Flow Weir Slope Length =	5.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.92	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	14.00	N/A	ft^2
Overflow Grate Open Area w/ Debris =	7.00	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	18.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Orifice Centroid =	0.75	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.56	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

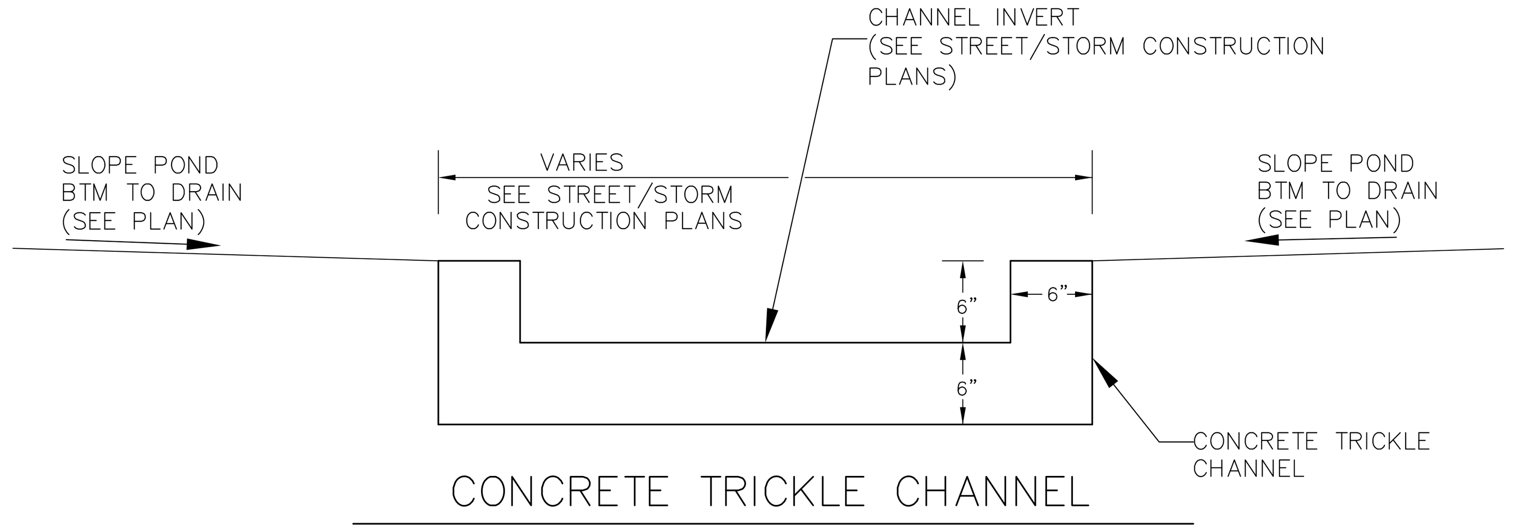
Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.30	feet
Stage at Top of Freeboard =	5.86	feet
Basin Area at Top of Freeboard =	0.32	acres

asblt orifice-82.94

Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.16	1.44	1.68	1.92	2.16	2.42	0.00
Calculated Runoff Volume (acre-ft) =	0.111	0.357	0.283	0.378	0.501	0.678	0.802	0.966	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.110	0.356	0.283	0.377	0.501	0.678	0.802	0.966	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.17	0.57	0.80	1.08	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.1	0.1	1.0	3.5	4.8	6.5	0.0
Peak Inflow Q (cfs) =	1.7	5.4	4.3	5.8	7.6	10.3	12.1	14.6	#N/A
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	2.4	5.5	7.4	10.2	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.3	2.3	1.6	1.5	1.6	#N/A
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.5	0.7	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	29	42	39	42	42	40	39	37	#N/A
Time to Drain 99% of Inflow Volume (hours) =	31	46	43	47	47	46	45	44	#N/A
Maximum Ponding Depth (ft) =	2.07	3.35	3.01	3.44	3.64	3.76	3.82	3.90	#N/A
Area at Maximum Ponding Depth (acres) =	0.13	0.21	0.19	0.21	0.22	0.23	0.23	0.23	#N/A
Maximum Volume Stored (acre-ft) =	0.098	0.320	0.254	0.342	0.385	0.412	0.426	0.445	#N/A



CONCRETE TRICKLE CHANNEL

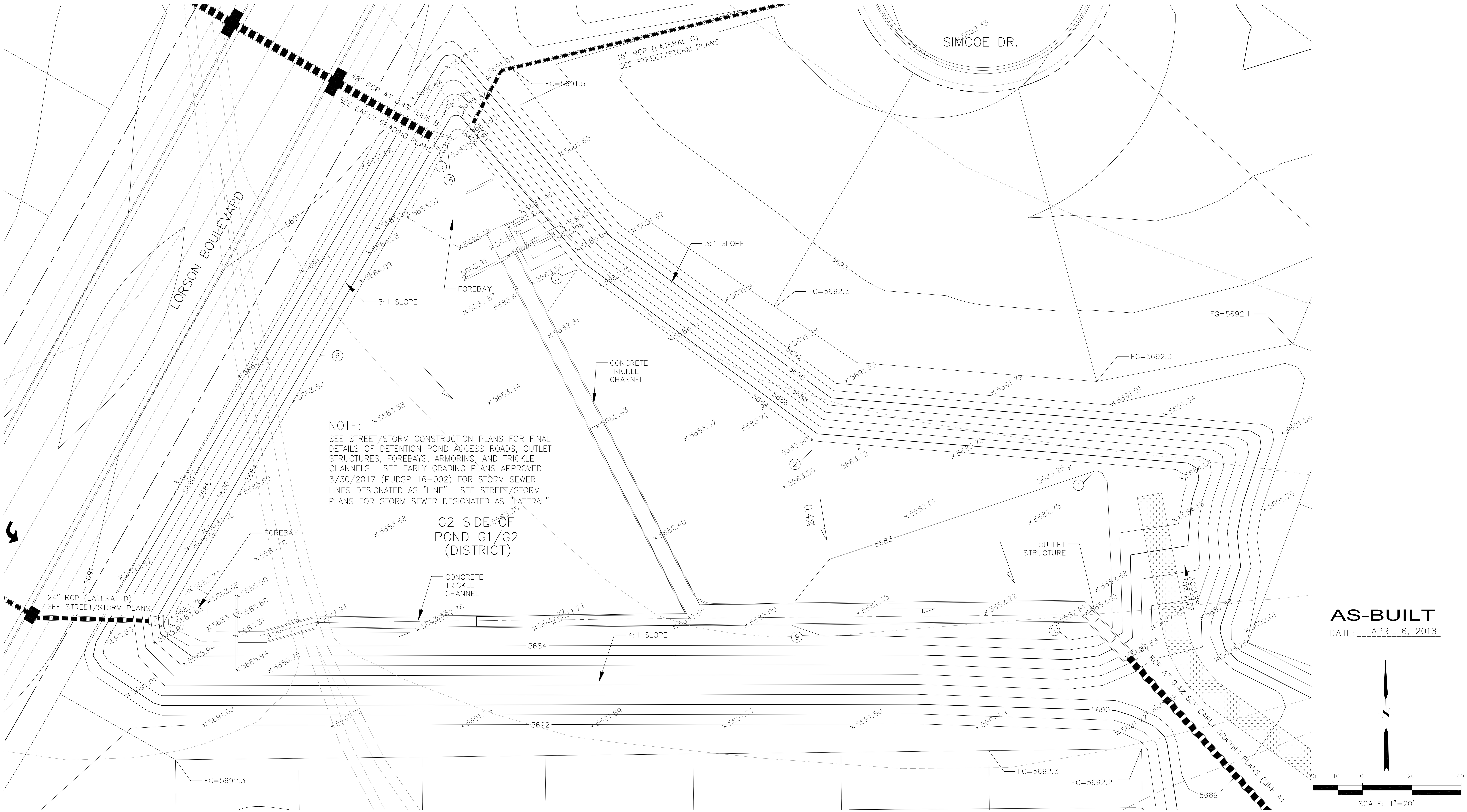
N.T.S.

POINT TABLE

NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20426.91	20695.07	5683.00	POND BOTTOM
2	20435.42	20580.07	5683.19	POND BOTTOM
3	20508.55	20484.61	5683.80	POND BOTTOM
4	20562.75	20440.18	5684.00	POND BOTTOM
5	20556.24	20428.64	5684.00	POND BOTTOM
6	20473.78	20380.35	5684.00	POND BOTTOM
9	20360.30	20583.01	5683.00	POND BOTTOM

POINT TABLE

NUMBER	NORTHING	EASTING	ELEVATION	NOTES
10	20358.26	20684.49	5683.00	POND BOTTOM
16	20558.92	20432.02	5683.55	INVERT 48" RCP



AS-BUILT

DATE: APRIL 6, 2018

CORE ENGINEERING GROUP

15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT: CARRIAGE MEADOWS SOUTH AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. – CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

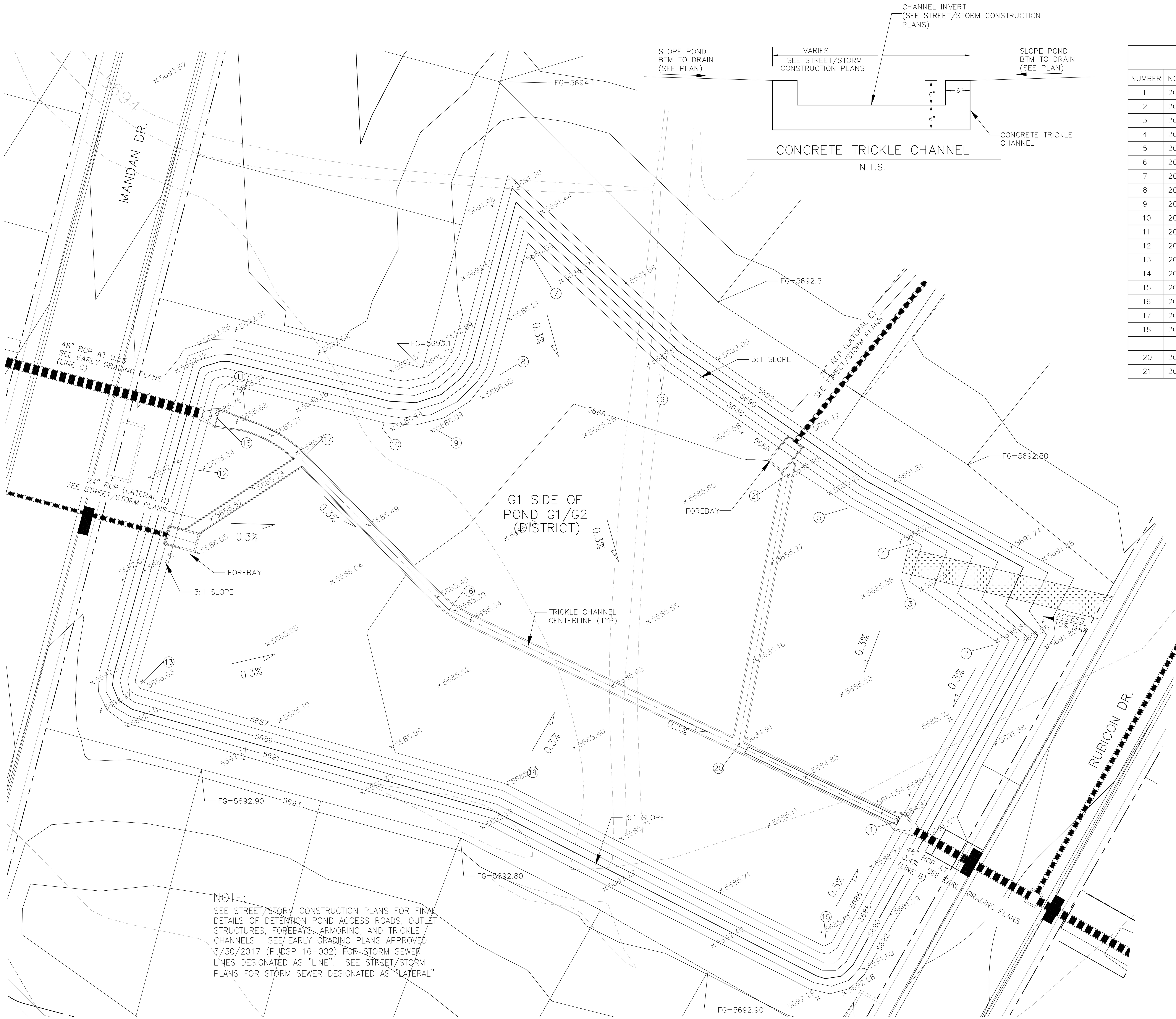
G2 SIDE OF DETENTION POND G1/G2 (DISTRICT) CARRIAGE MEADOWS SOUTH

DATE: AUGUST 10, 2017

PROJECT NO. 100.030

SHEET NUMBER: C4.4

TOTAL SHEETS: 12



POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20714.71	20158.47	5684.80	INV 48" RCP (LINE B)
2	20786.15	20197.19	5685.54	POND BOTTOM
3	20812.62	20159.51	5685.65	POND BOTTOM
4	20827.21	20164.67	5685.70	POND BOTTOM
5	20841.64	20138.20	5685.74	POND BOTTOM
6	20895.71	20061.76	5686.10	POND BOTTOM
7	20943.87	20009.80	5686.20	POND BOTTOM
8	20895.38	19997.02	5686.11	POND BOTTOM
9	20873.70	19970.67	5686.17	POND BOTTOM
10	20873.69	19949.53	5686.21	POND BOTTOM
11	20889.83	19884.81	5686.30	POND BOTTOM
12	20856.85	19874.86	5686.55	POND BOTTOM
13	20770.85	19852.26	5686.28	POND BOTTOM
14	20730.51	19999.53	5685.88	POND BOTTOM
15	20665.63	20129.13	5685.60	POND BOTTOM
16	20800.21	19976.50	5685.40	TRICKLE CHANNEL INVERT
17	20861.06	19916.81	5685.66	TRICKLE CHANNEL INVERT
18	20878.04	19882.51	5685.80	INV 48" RCP (LINE C)
20	20745.23	20093.52	5685..01	TRICKLE CHANNEL INVERT
21	20855.30	20113.66	5685.45	TRICKLE CHANNEL INVERT

NOTE:
SEE STREET/STORM CONSTRUCTION PLANS FOR FINAL DETAILS OF DETENTION POND ACCESS ROADS, OUTLET STRUCTURES, FOREBAYS, ARMORING, AND TRICKLE CHANNELS. SEE EARLY GRADING PLANS APPROVED 3/30/2017 (PUDSP 16-002) FOR STORM SEWER LINES DESIGNATED AS "LINE". SEE STREET/STORM PLANS FOR STORM SEWER DESIGNATED AS "LATERAL"

AS-BUILT

DATE: APRIL 6, 2018

SCALE: 1"=20'

CORE ENGINEERING GROUP
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NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

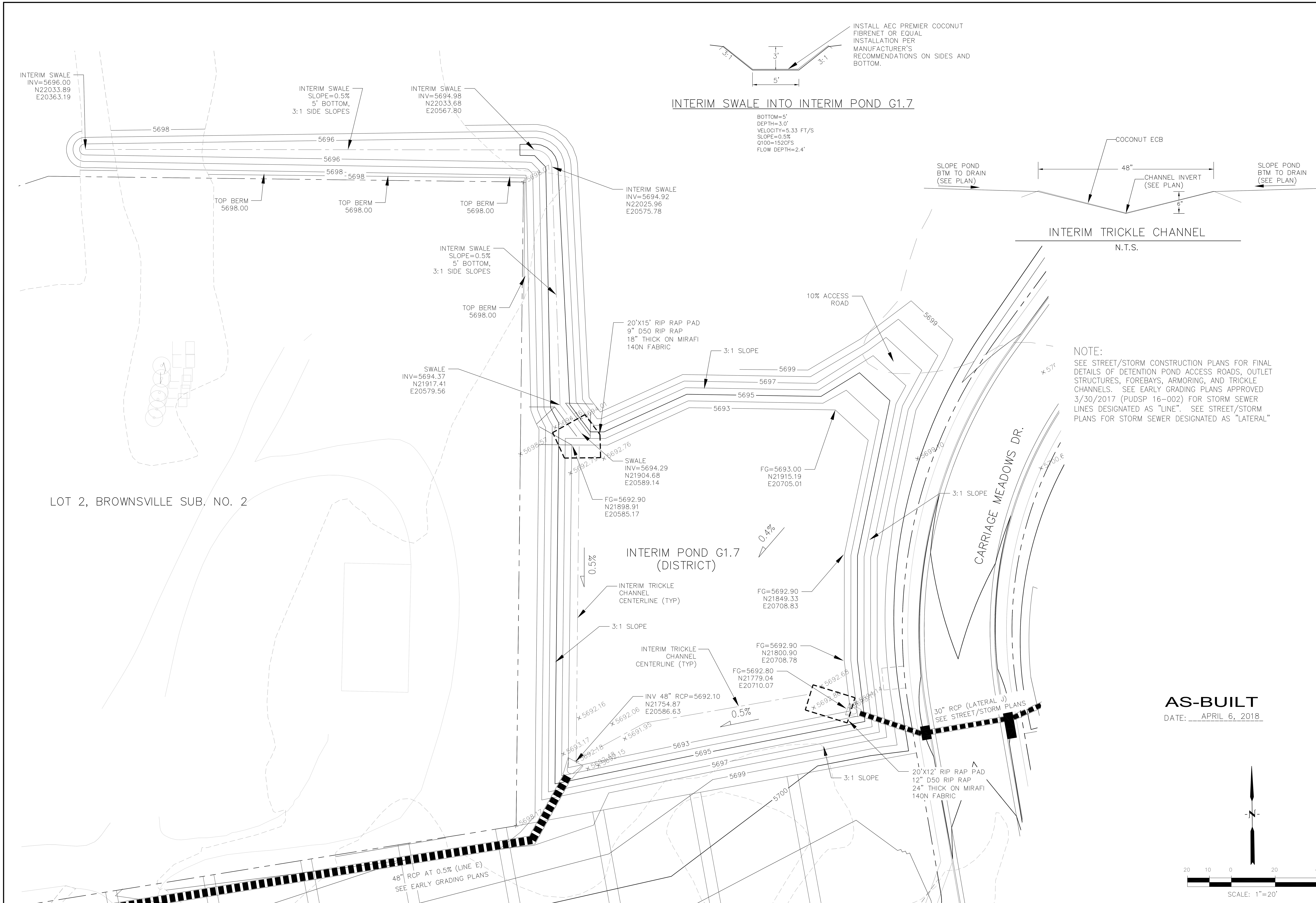
G1 SIDE OF DETENTION POND G1/G2 (DISTRICT) CARRIAGE MEADOWS SOUTH

DATE
AUGUST 10, 2017

PROJECT NO.
100.030

SHEET NUMBER
C4.5

TOTAL SHEETS: 12



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EMAIL: Rich@ceg1.com

NO. | DESCRIPTION | DATE

PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT: CARRIAGE MEADOWS SOUTH AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

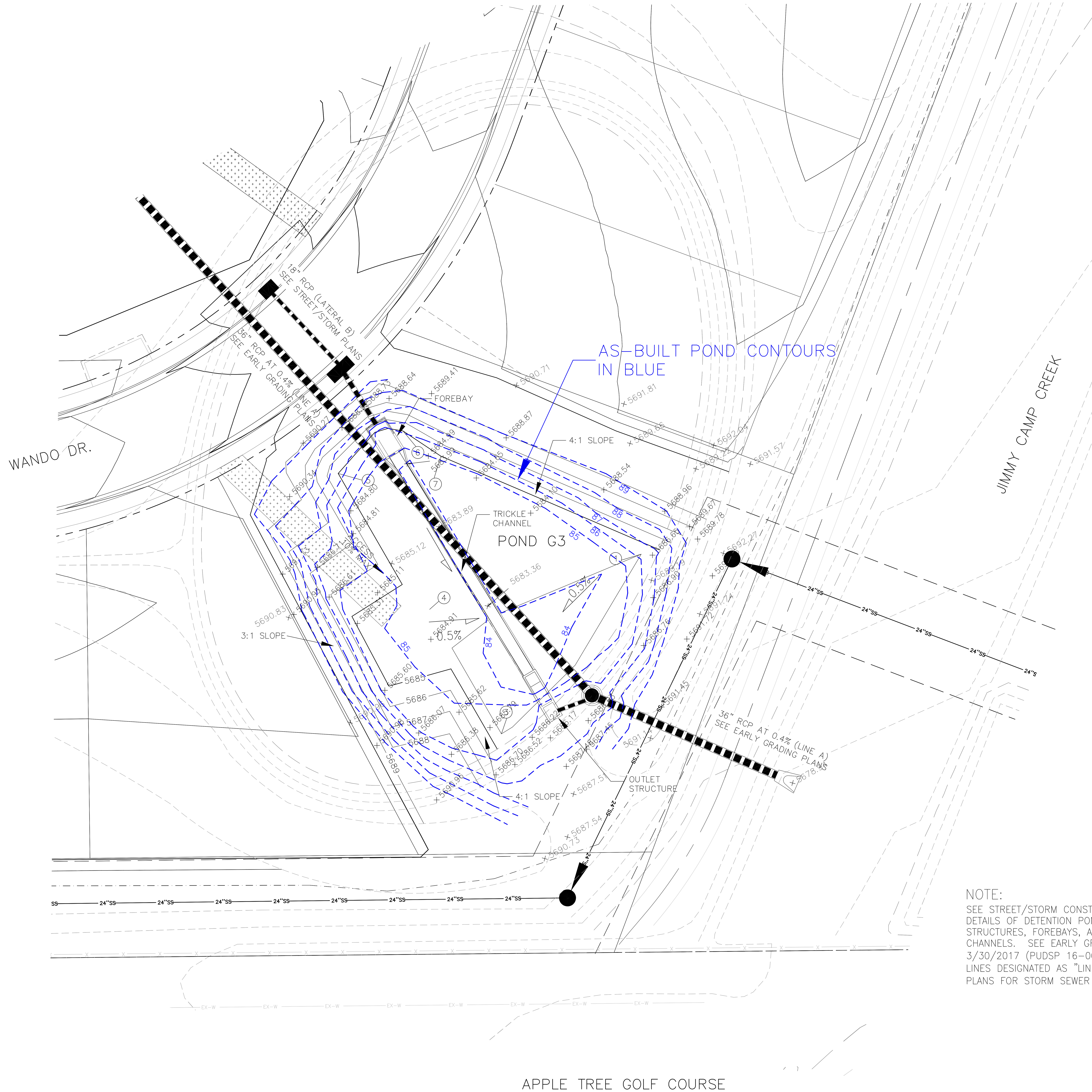
(DISTRICT) INTERIM DETENTION POND G1.7 CARRIAGE MEADOWS SOUTH

DATE
AUGUST 10, 2017

PROJECT NO.
100.030

SHEET NUMBER
C4.6

TOTAL SHEETS: 12



POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20152.70	20951.65	5684	POND BOTTOM
3	20088.79	20901.93	5684	POND BOTTOM
4	20133.08	20876.39	5684.20	POND BOTTOM
5	20181.43	20843.88	5685	POND BOTTOM
6	20196.53	20866.94	5685	POND BOTTOM
7	20187.57	20880.42	5685	POND BOTTOM

NOTE:
SEE STREET/STORM CONSTRUCTION PLANS FOR FINAL DETAILS OF DETENTION POND ACCESS ROADS, OUTLET STRUCTURES, FOREBAYS, ARMORING, AND TRICKLE CHANNELS. SEE EARLY GRADING PLANS APPROVED 3/30/2017 (PUDSP 16-002) FOR STORM SEWER LINES DESIGNATED AS "LINE". SEE STREET/STORM PLANS FOR STORM SEWER DESIGNATED AS "LATERAL"

AS-BUILT
DATE: APRIL 6, 2018

SCALE: 1"=20'

CORE ENGINEERING GROUP
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CONTACT: RICHARD L. SCHINDLER, P.E.
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NO. | DESCRIPTION | DATE

PREPARED FOR:
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212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

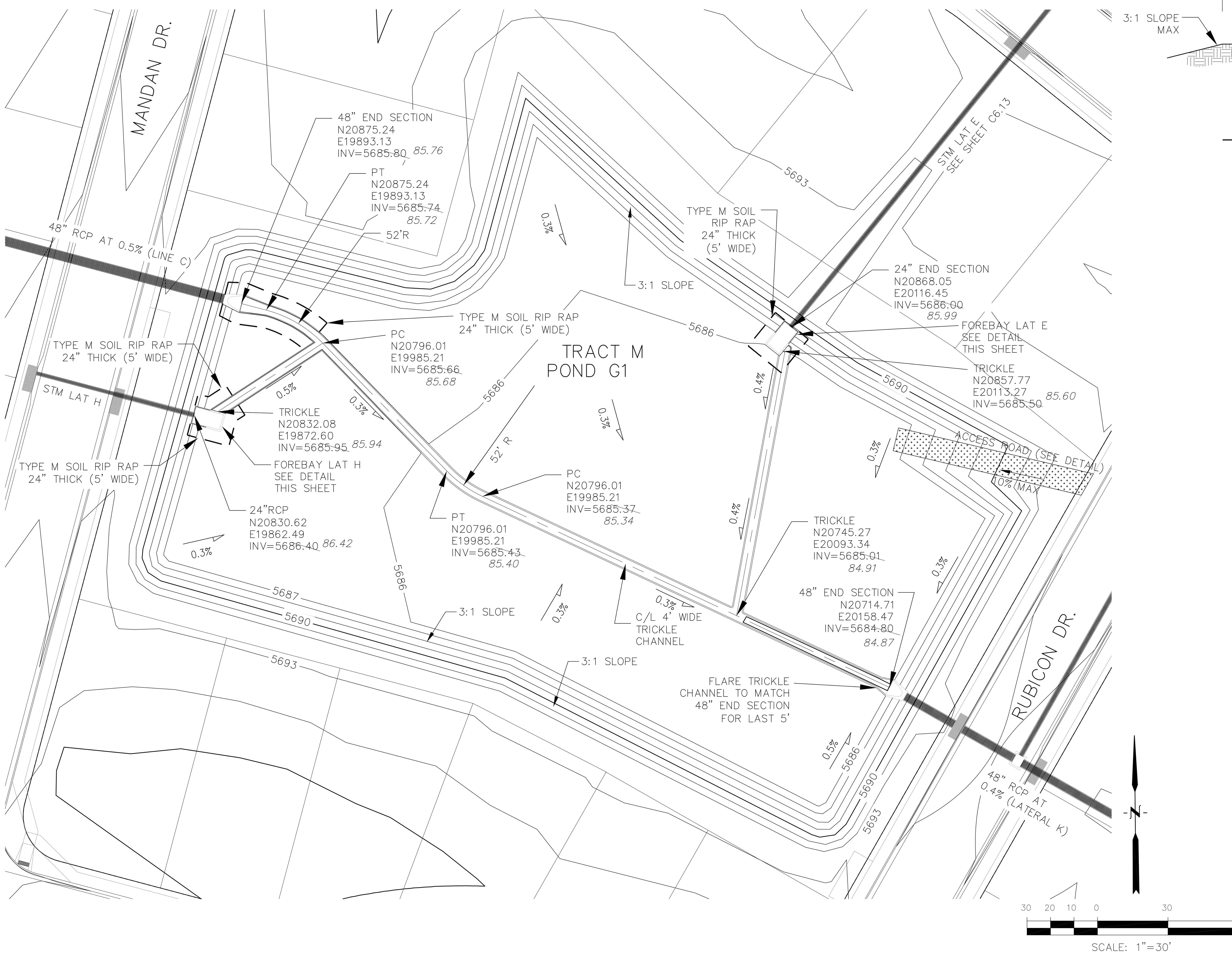
DETENTION POND G3 (DISTRICT)
CARRIAGE MEADOWS SOUTH

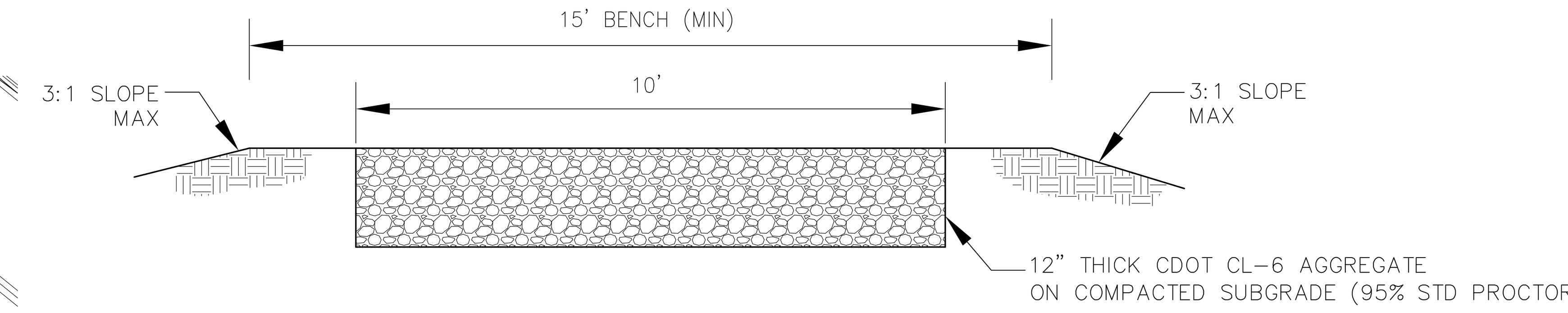
DATE
AUGUST 10, 2017

PROJECT NO.
100.030

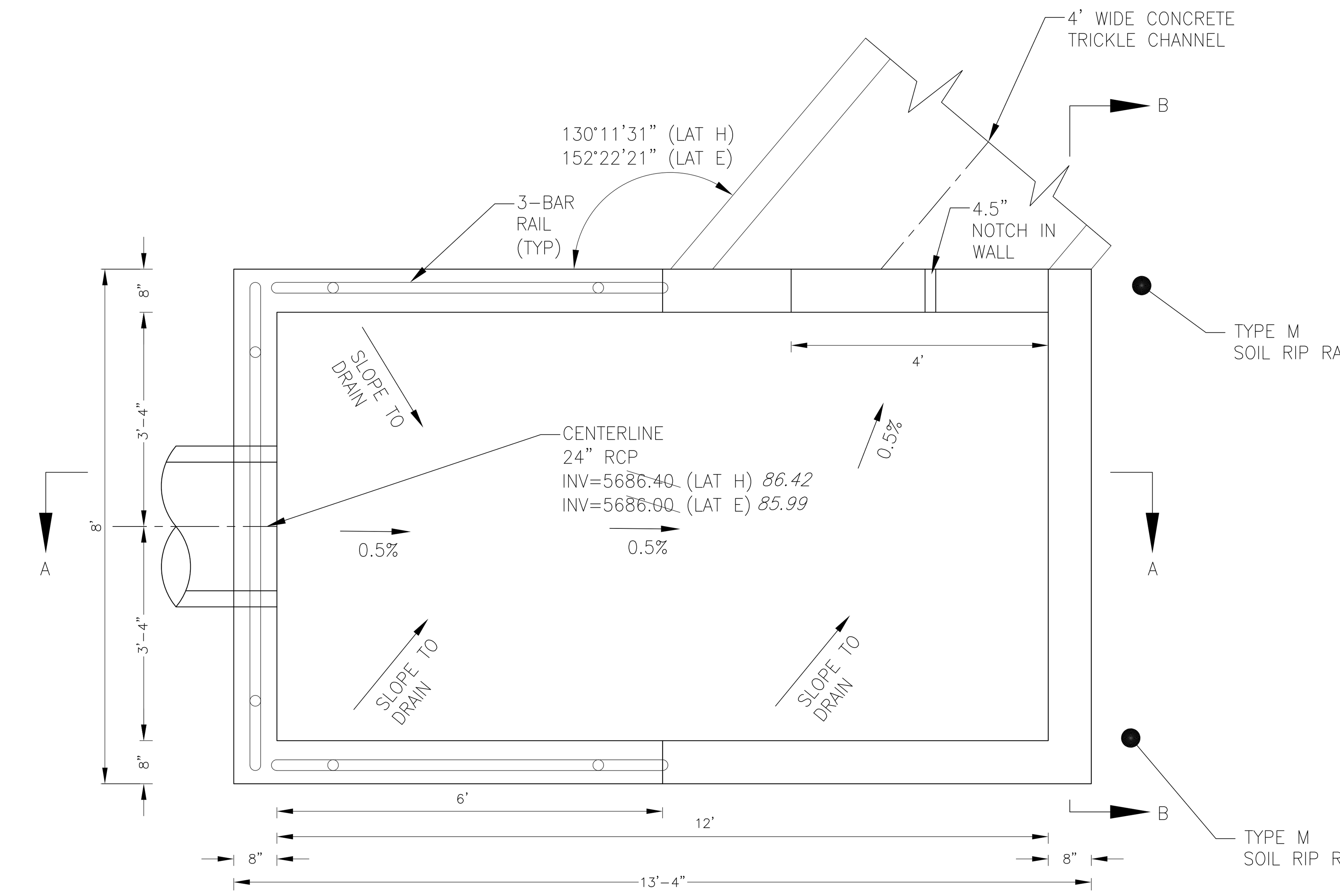
SHEET NUMBER
C4.8

TOTAL SHEETS: 12

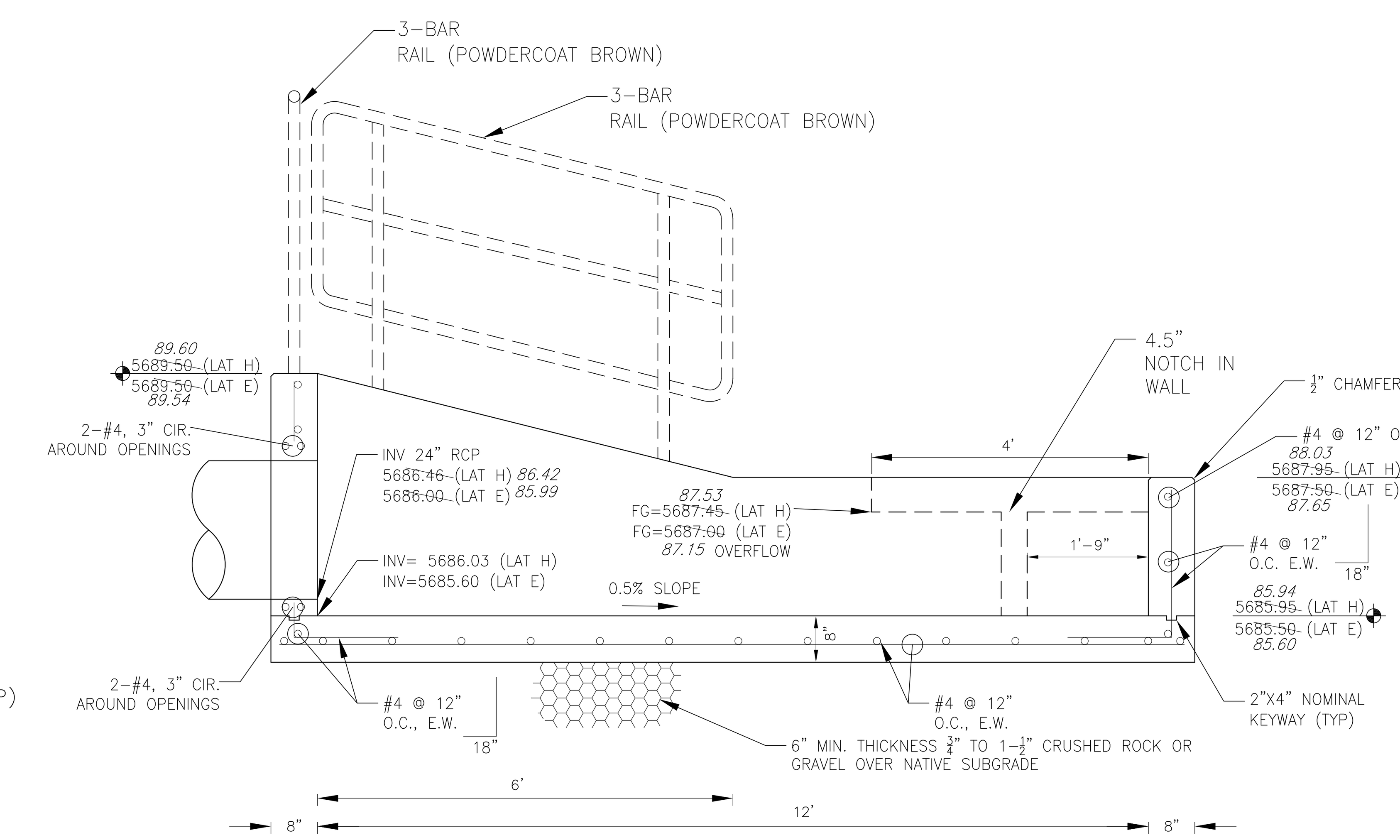




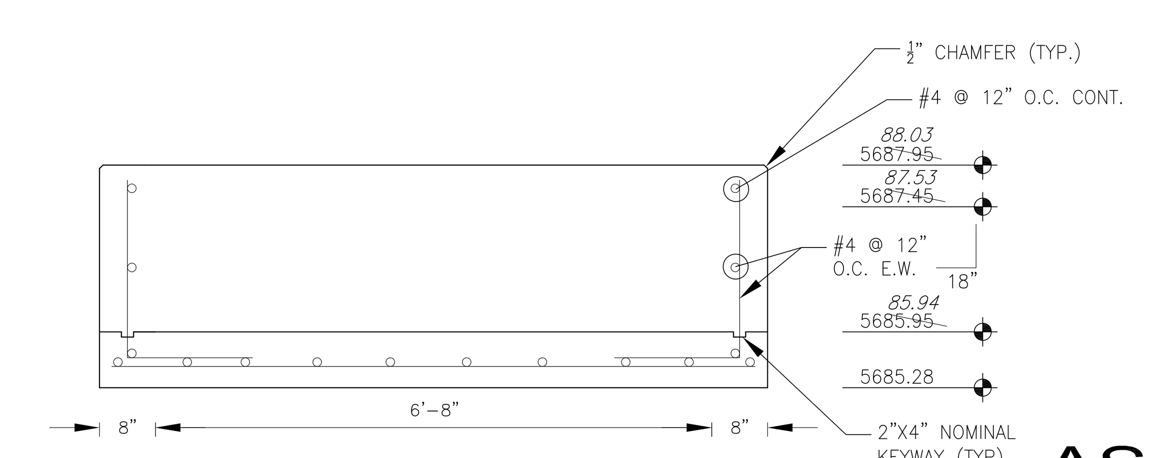
MAINTENANCE ACCESS ROAD
NO SCALE



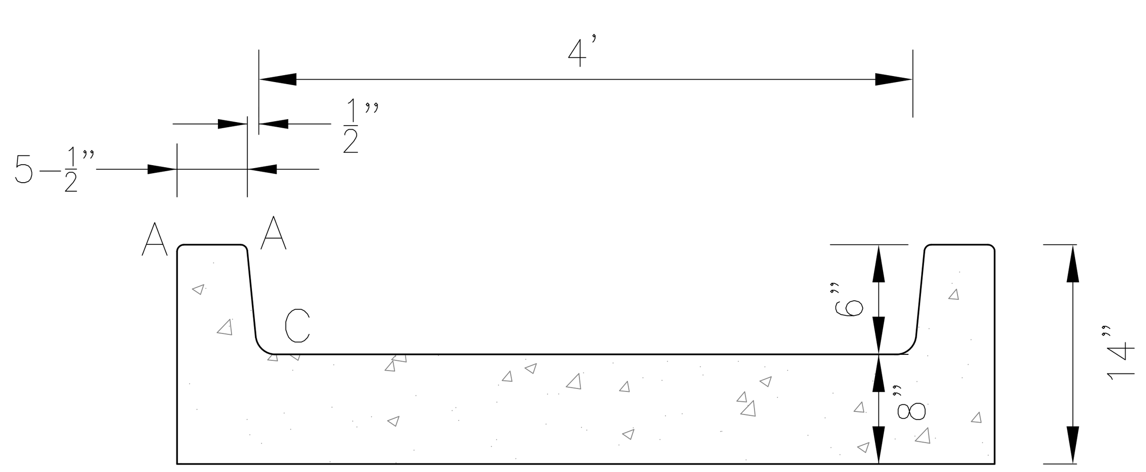
FOREBAY DETAIL
NO SCALE



FOREBAY SECTION A-A
NO SCALE

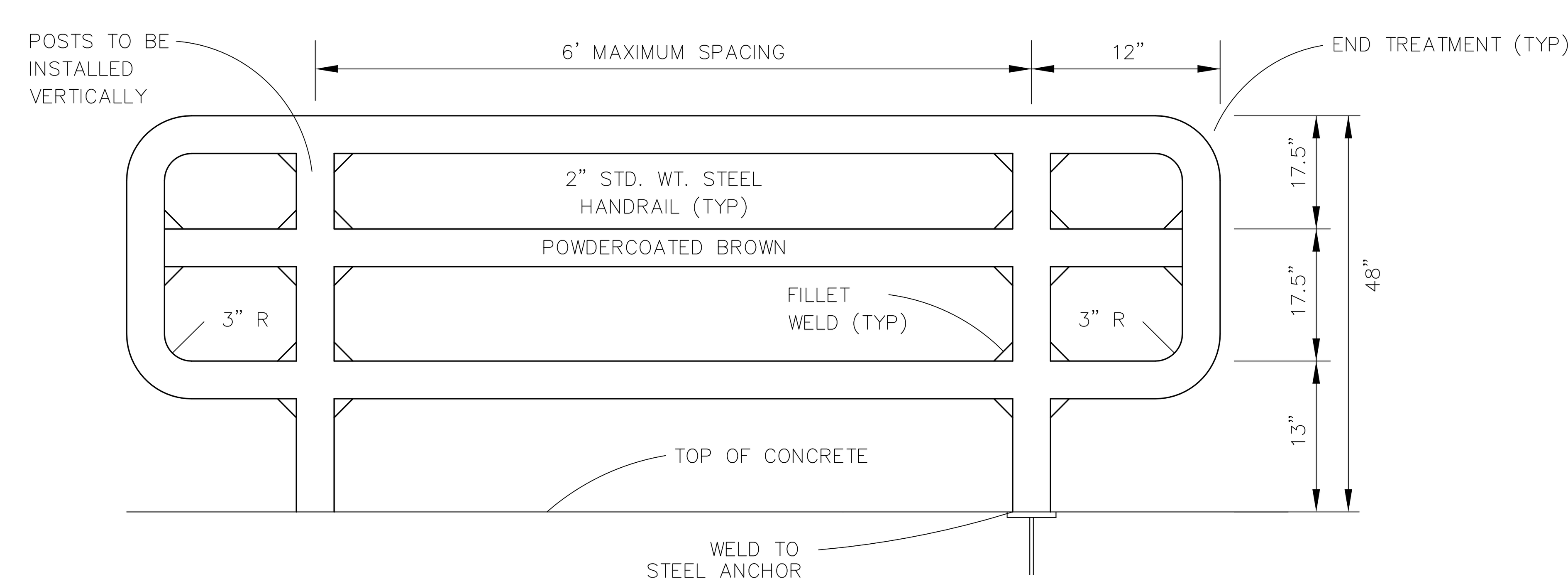


FOREBAY SECTION B-B
NO SCALE



TRICKLE CHANNEL DETAIL
NO SCALE

LENGTH FOR RADII
A = 1/2"
C = 1-1/2"



3-BAR RAIL DETAIL
NO SCALE

AS-BUILT
DATE: APRIL 6, 2018

CORE
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EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G1/G2 (DISTRICT)
G1 SIDE OF POND
TRICKLE AND FOREBAY DETAILS

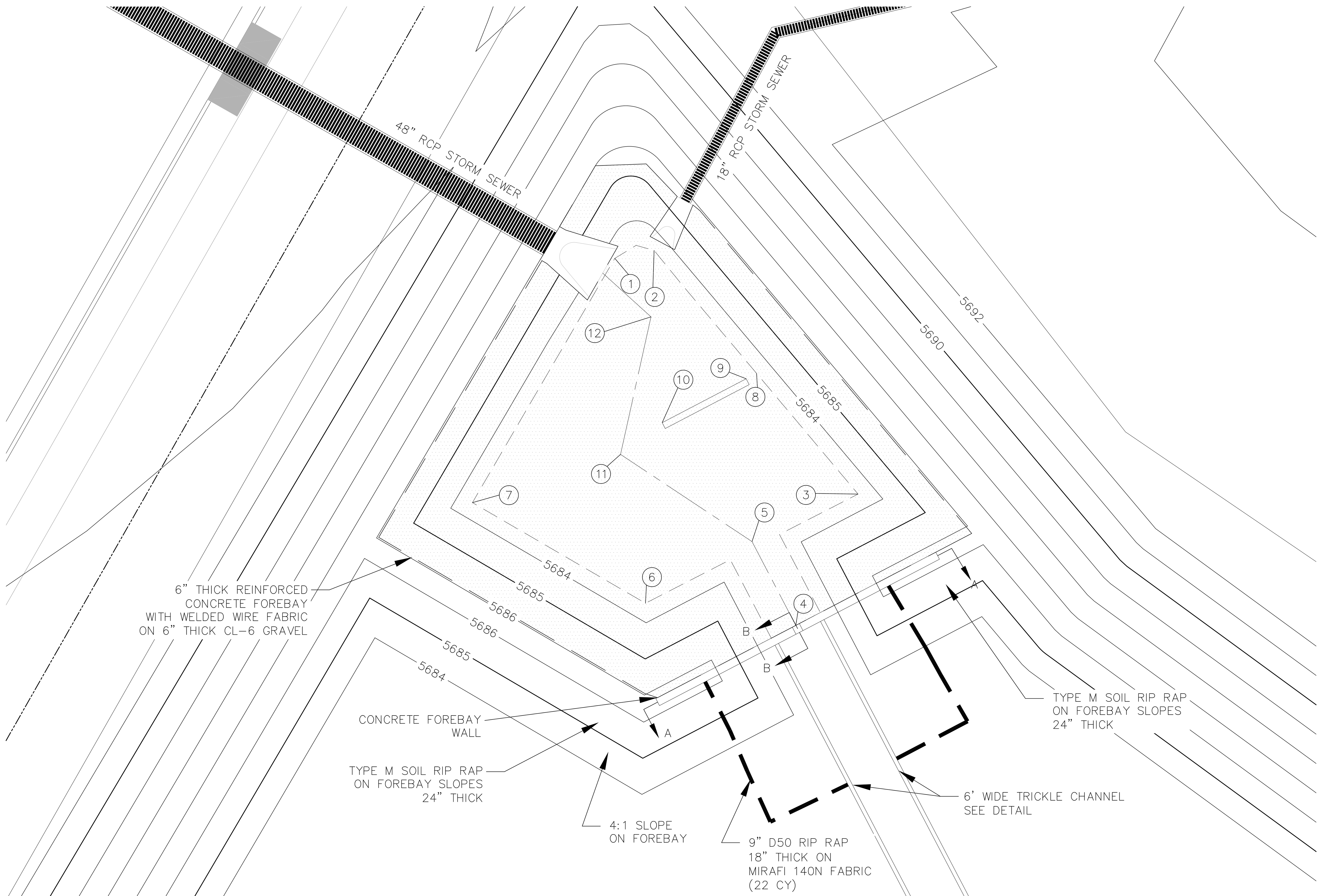
DATE
AUGUST 28, 2017

PROJECT NO.
100.030

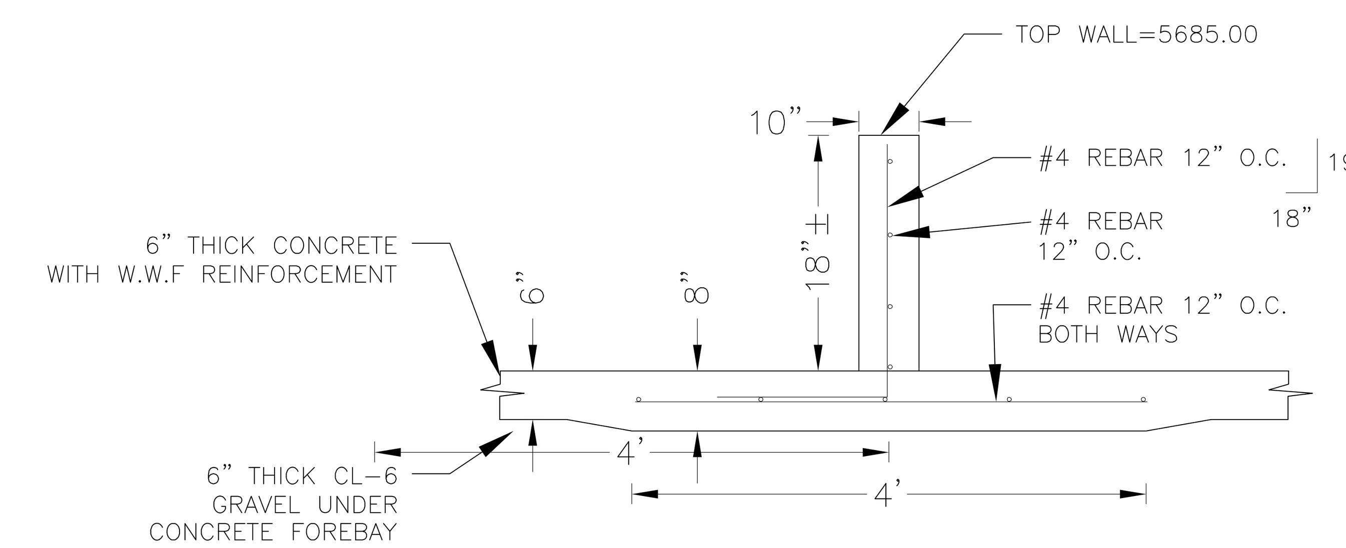
SHEET NUMBER
C9.1

TOTAL SHEETS: 39

POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20560.79	20433.55	5683.54	FOREBAY BOTTOM
2	20561.80	20438.53	5683.54	FOREBAY BOTTOM
3	20530.94	20464.35	5683.54	FOREBAY BOTTOM
4	20514.32	20456.47	5683.30	FOREBAY BOTTOM
5	20524.93	20450.92	5683.35	FOREBAY BOTTOM
6	20517.12	20437.44	5683.54	FOREBAY BOTTOM
7	20529.87	20415.52	5683.54	FOREBAY BOTTOM
8	20546.23	20451.50	5683.54	FOREBAY BOTTOM
9	20545.54	20450.19	5683.53	ENERGY DISSIPATER WALL
10	20539.98	20439.55	5683.48	ENERGY DISSIPATER WALL
11	20535.97	20434.28	5683.43	FOREBAY BOTTOM
12	20553.38	20438.13	5683.50	FOREBAY BOTTOM

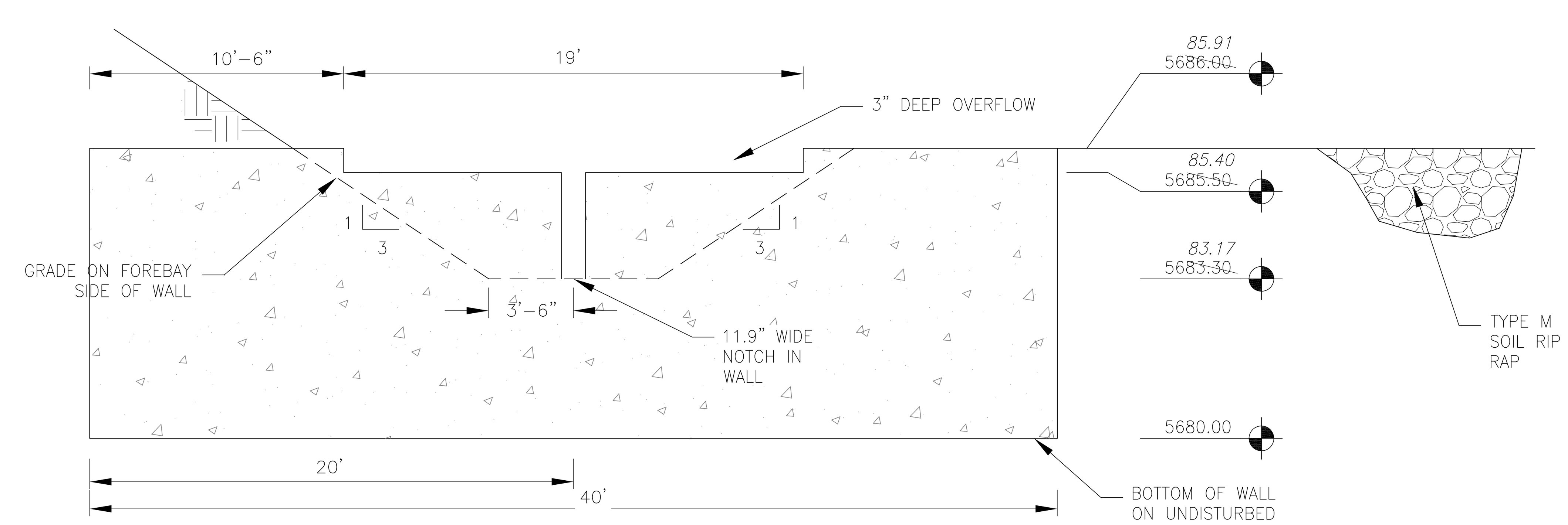


FOREBAY "B" DETAIL
1"=10'

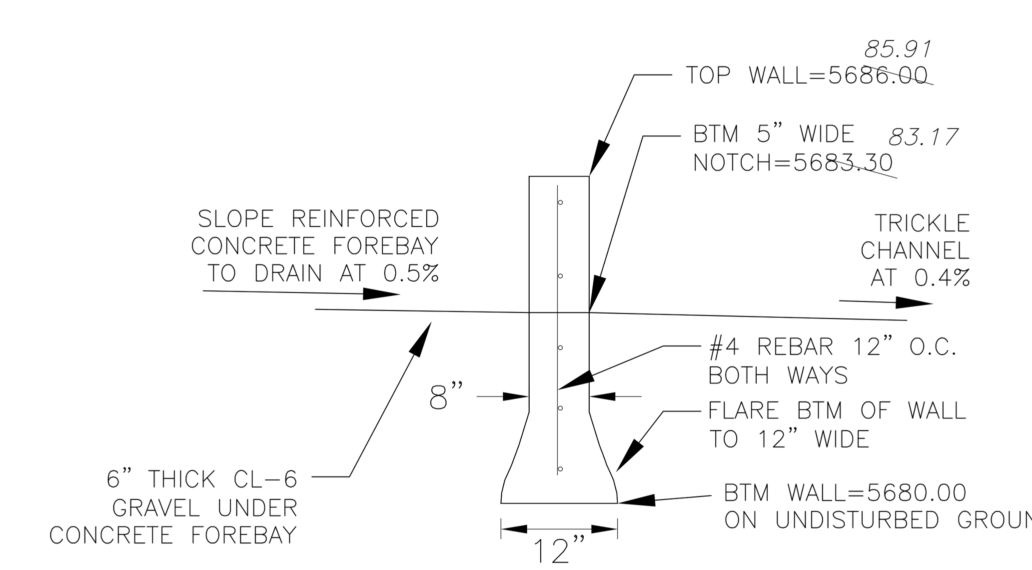


NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D

ENERGY DISSIPATER WALL
NO SCALE



WALL SECTION A–A
1"=10'



NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D

WALL SECTION B–B
NO SCALE

AS-BUILT
DATE: APRIL 6, 2018

CORE ENGINEERING GROUP
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PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
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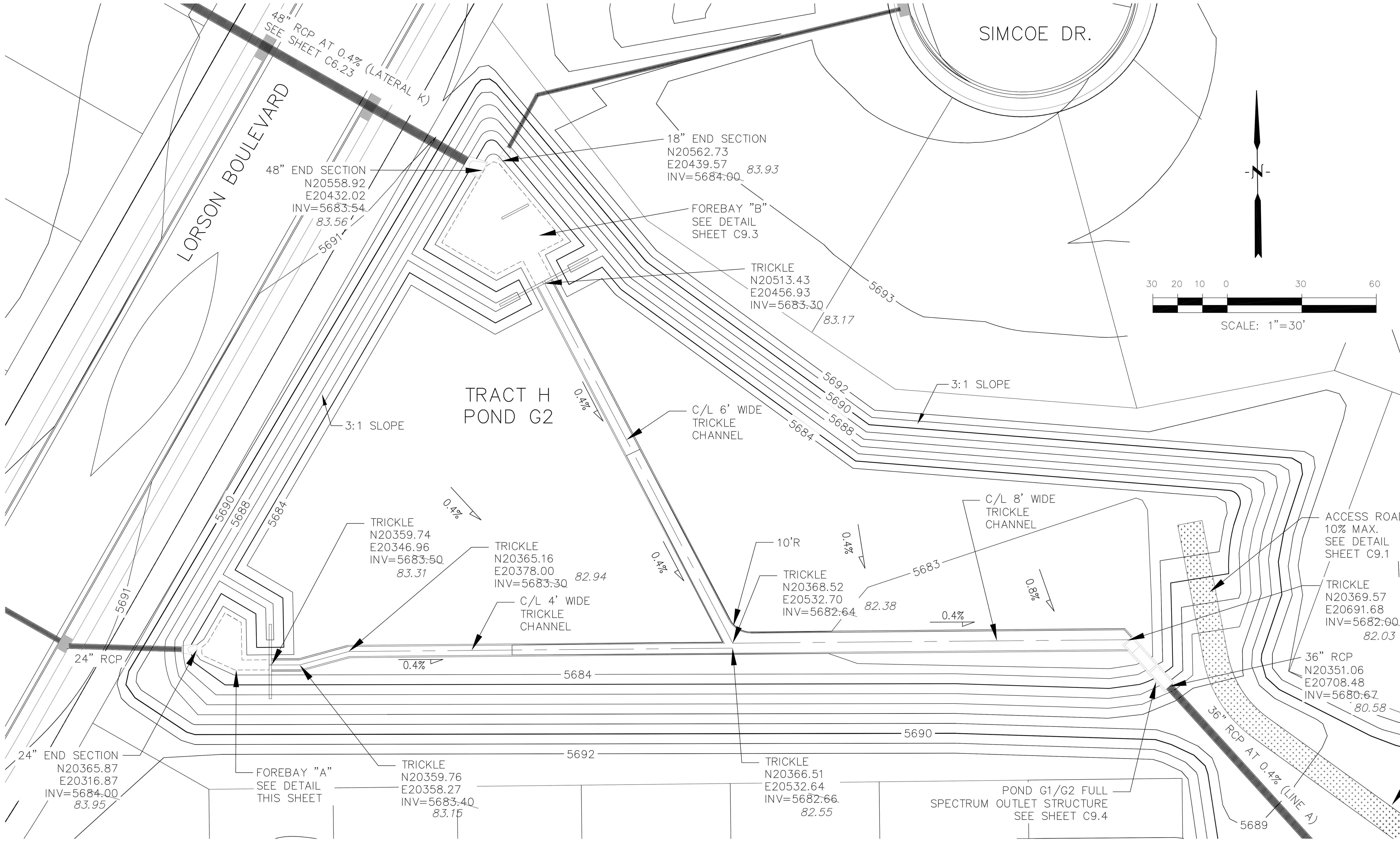
CONTACT: JEFF MARK

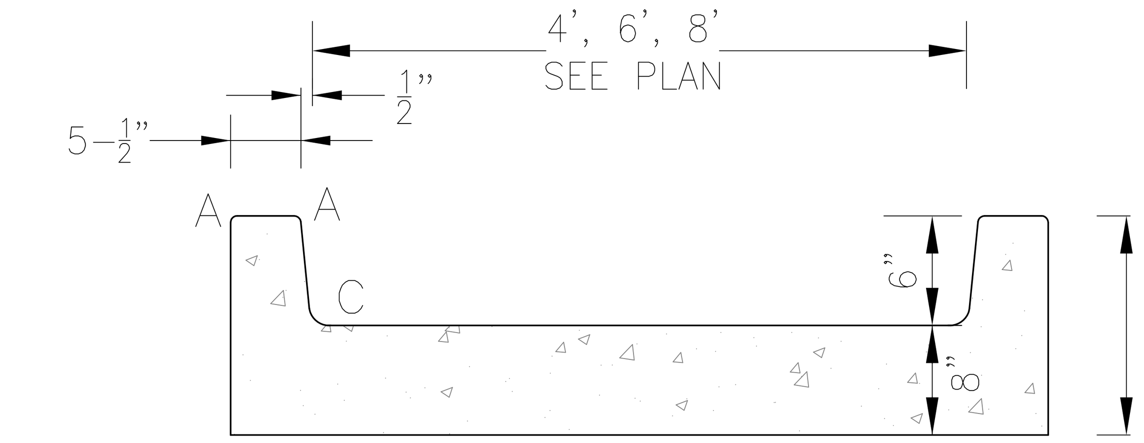
PROJECT: CARRIAGE MEADOWS SOUTH AT LORSON RANCH FIL NO. 1
FONTAINE BLVD. – CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G1/G2 (DISTRICT) G2 SIDE OF POND - FOREBAY "B" TRICKLE AND FOREBAY DETAILS

DATE: AUGUST 28, 2017
PROJECT NO. 100.030
SHEET NUMBER C9.3
TOTAL SHEETS: 39





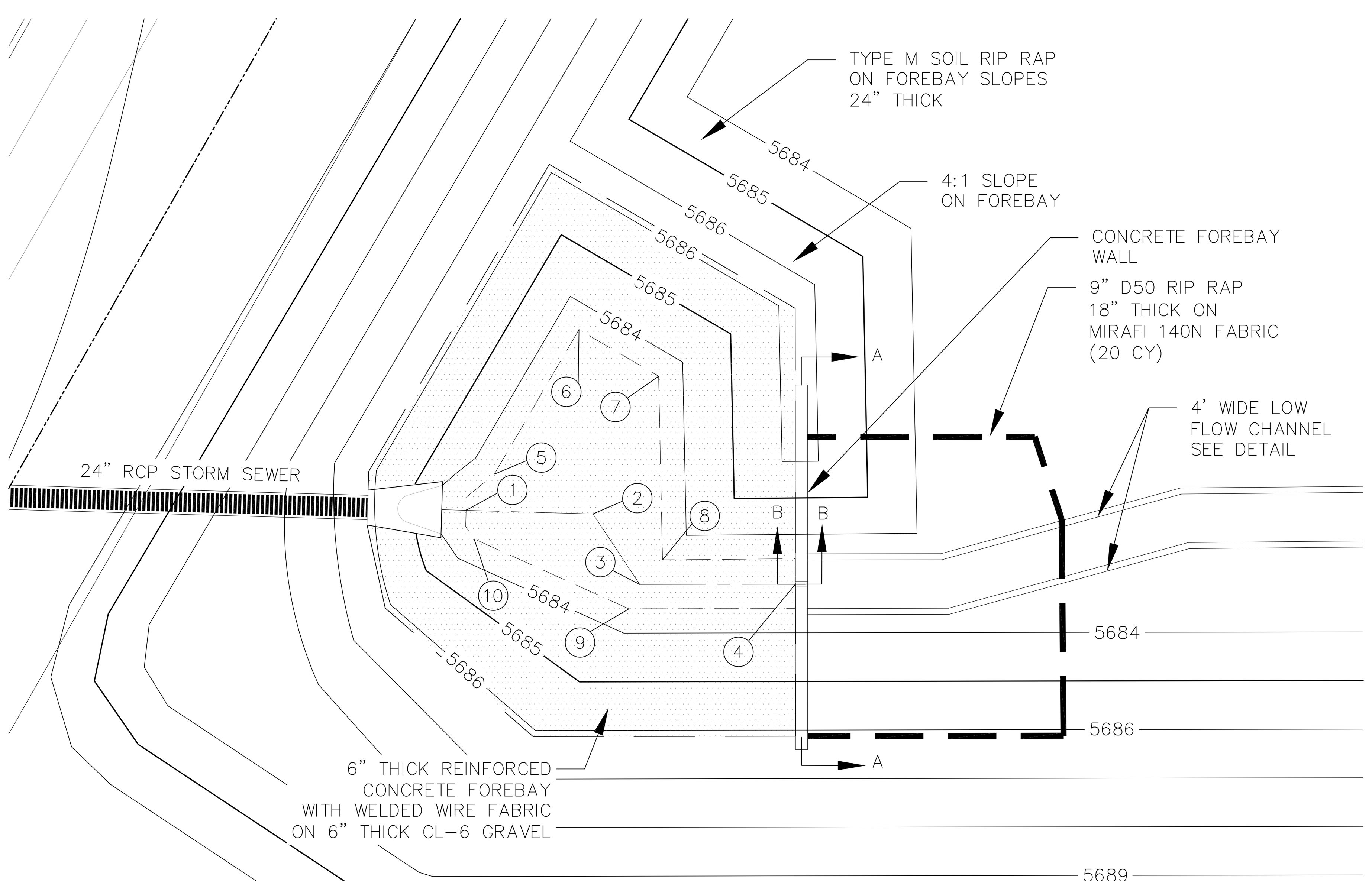
TRICKLE CHANNEL DETAIL

NO SCALE

LENGTH FOR RADII
A = 1/2"
C = 1-1/2"

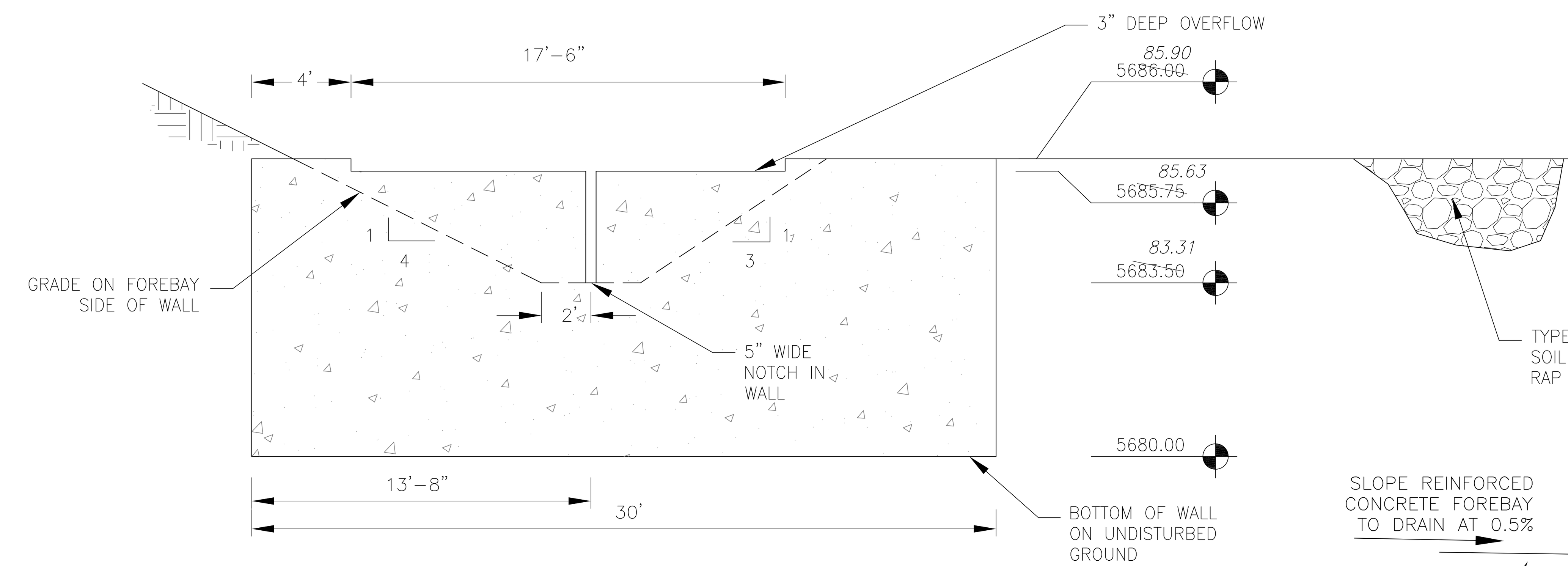
POINT TABLE

NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20365.82	20318.86	5683.65	FOREBAY BOTTOM
2	20365.52	20329.30	5683.60	FOREBAY BOTTOM
3	20359.71	20333.16	5683.57	FOREBAY BOTTOM
4	20359.74	20345.96	5683.50	FOREBAY BOTTOM
5	20368.80	20321.19	5683.67	FOREBAY BOTTOM
6	20380.69	20328.16	5683.67	FOREBAY BOTTOM
7	20376.85	20334.70	5683.66	FOREBAY BOTTOM
8	20361.75	20335.03	5683.58	FOREBAY BOTTOM
9	20357.71	20332.26	5683.58	FOREBAY BOTTOM
10	20363.46	20319.53	5683.67	FOREBAY BOTTOM



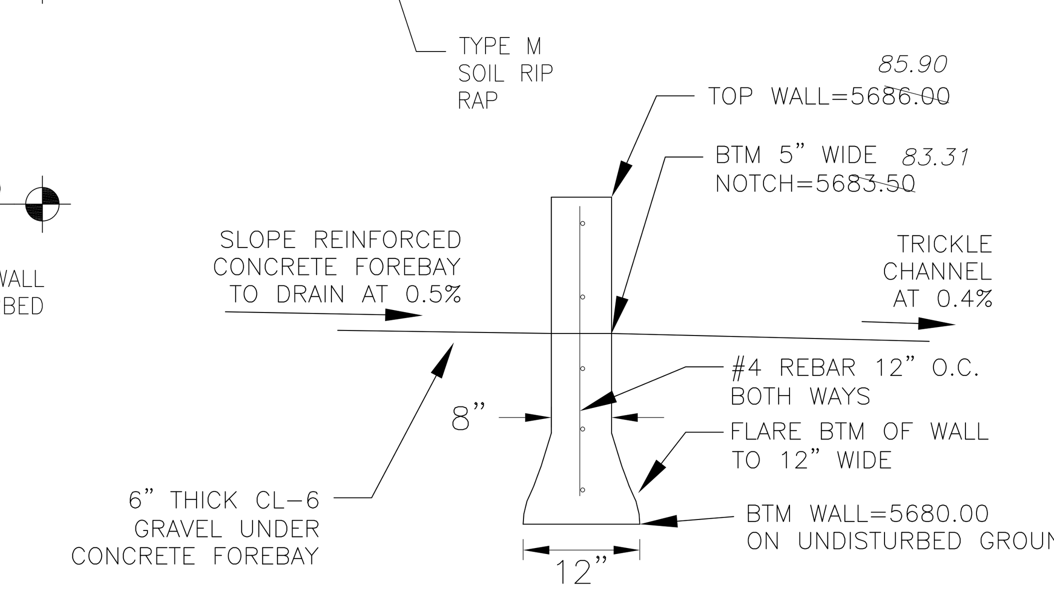
FOREBAY "A" DETAIL

1"=10'



WALL SECTION A–A

1"=10'



WALL SECTION B–B

NO SCALE

NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D

AS-BUILT

DATE: APRIL 6, 2018

CORE ENGINEERING GROUP
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CONTACT: RICHARD L. SCHINDLER, P.E.
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NO.	DESCRIPTION	DATE

PREPARED FOR:
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212 N. WAHSATCH AVE., SUITE 301
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(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH AT LORSON RANCH FIL NO. 1
FONTAINE BLVD. – CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

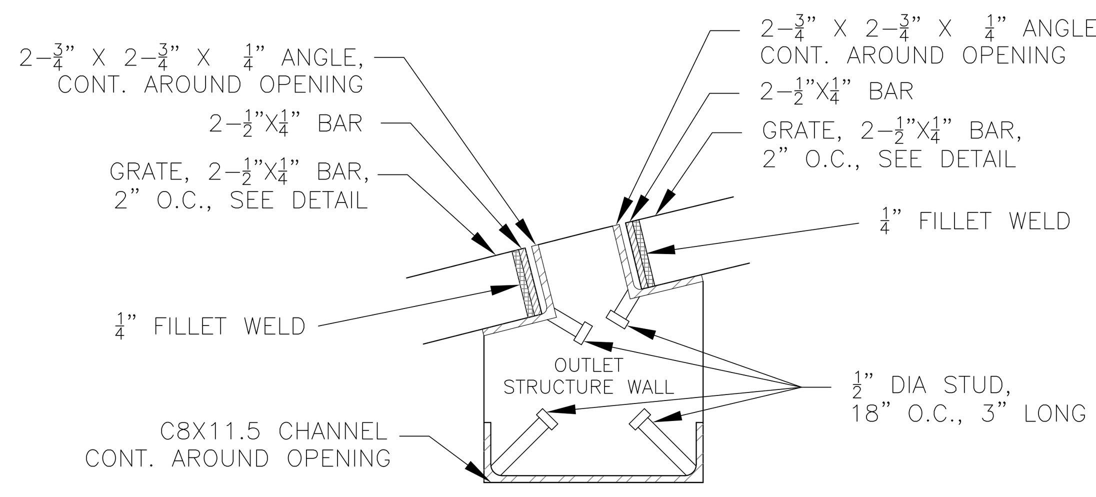
POND G1/G2 (DISTRICT) G2 SIDE OF POND TRICKLE AND FOREBAY DETAILS

DATE: AUGUST 28, 2017

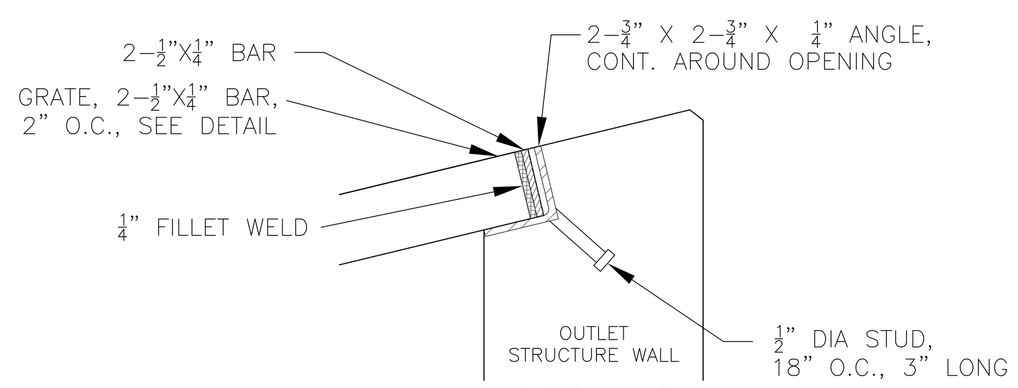
PROJECT NO. 100.030

SHEET NUMBER C9.2

TOTAL SHEETS: 39



DETAIL A
NO SCALE



DETAIL B
NO SCALE

NOTE:
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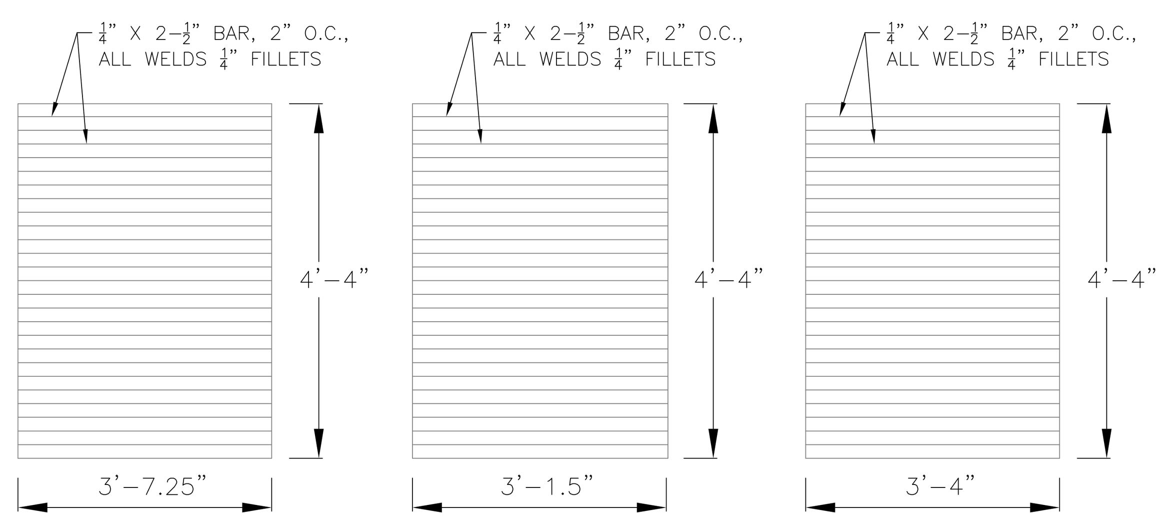
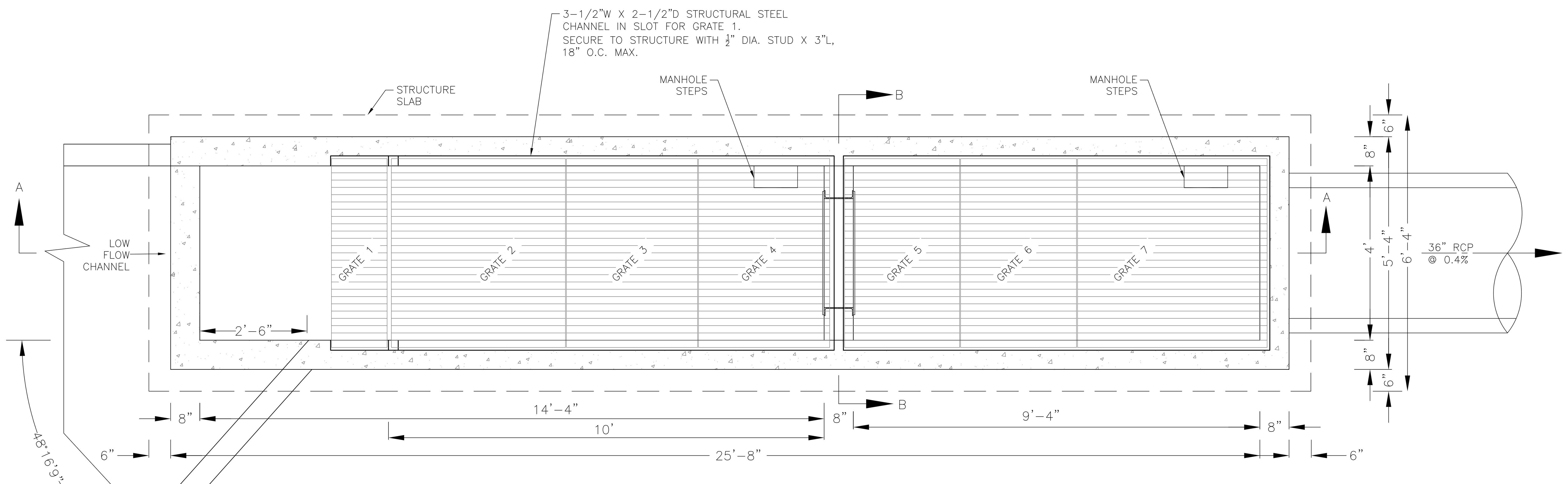
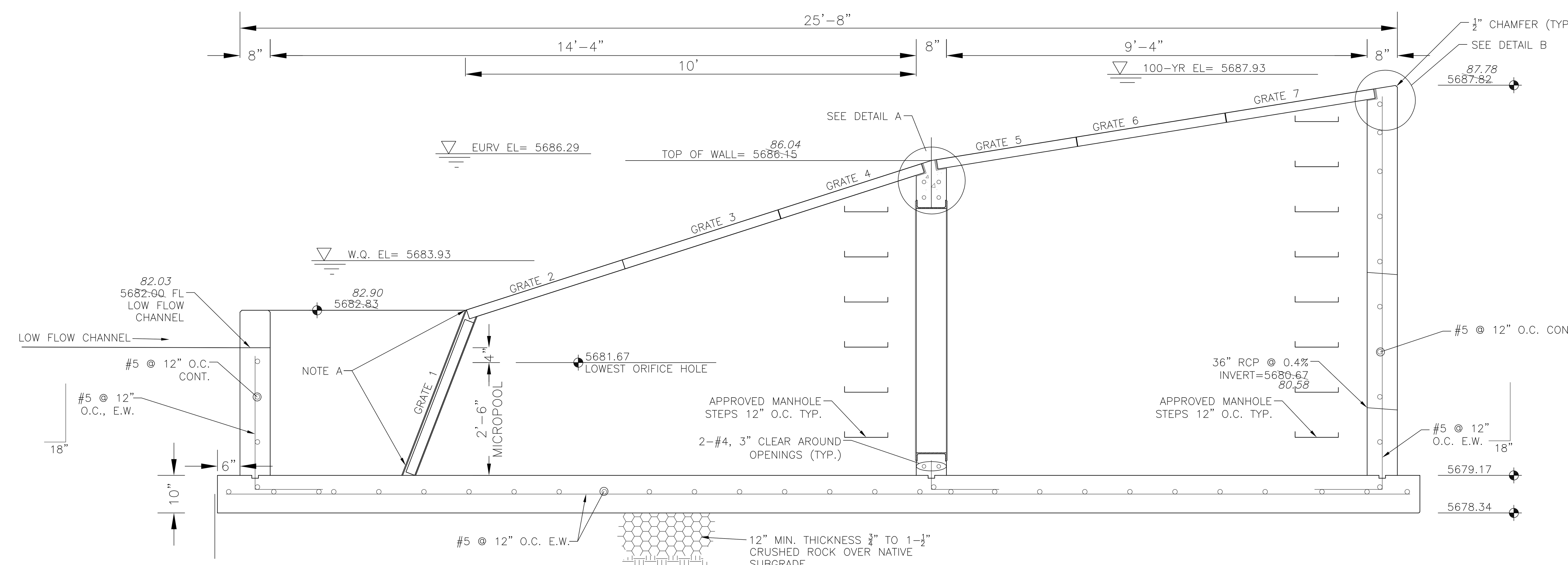


GRATE 1,2,3 — NO SCALE
GRATE 5 — NO SCALE
GRATE 4, 6, 7 — NO SCALE

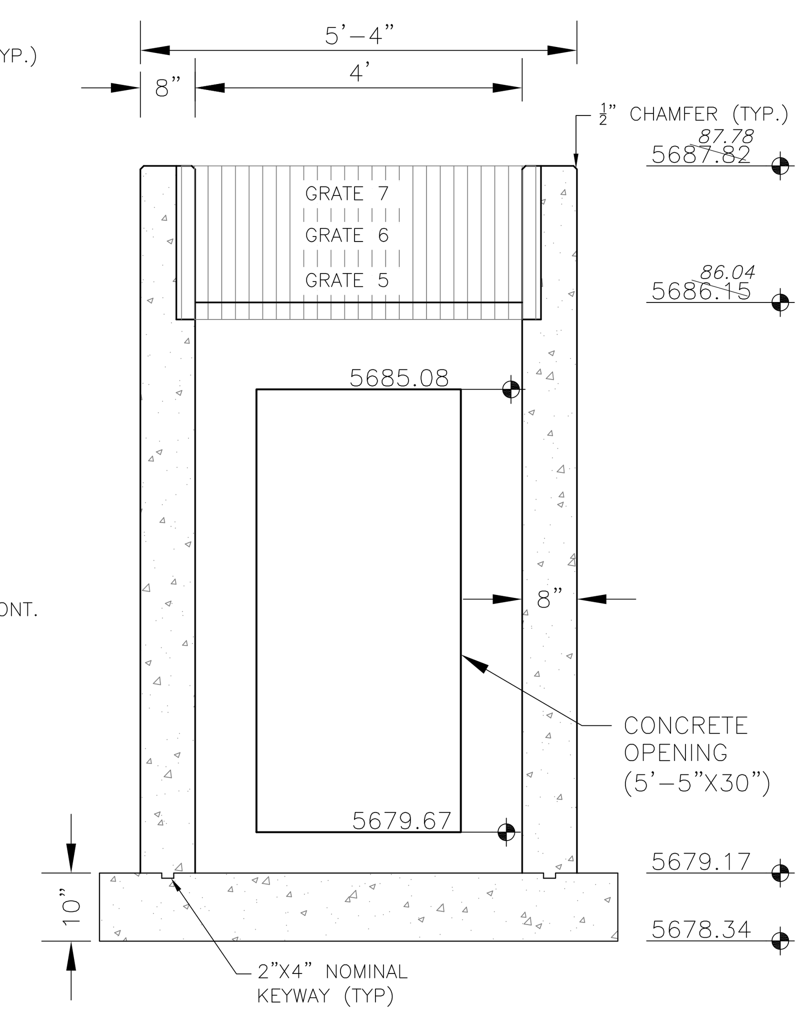


OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

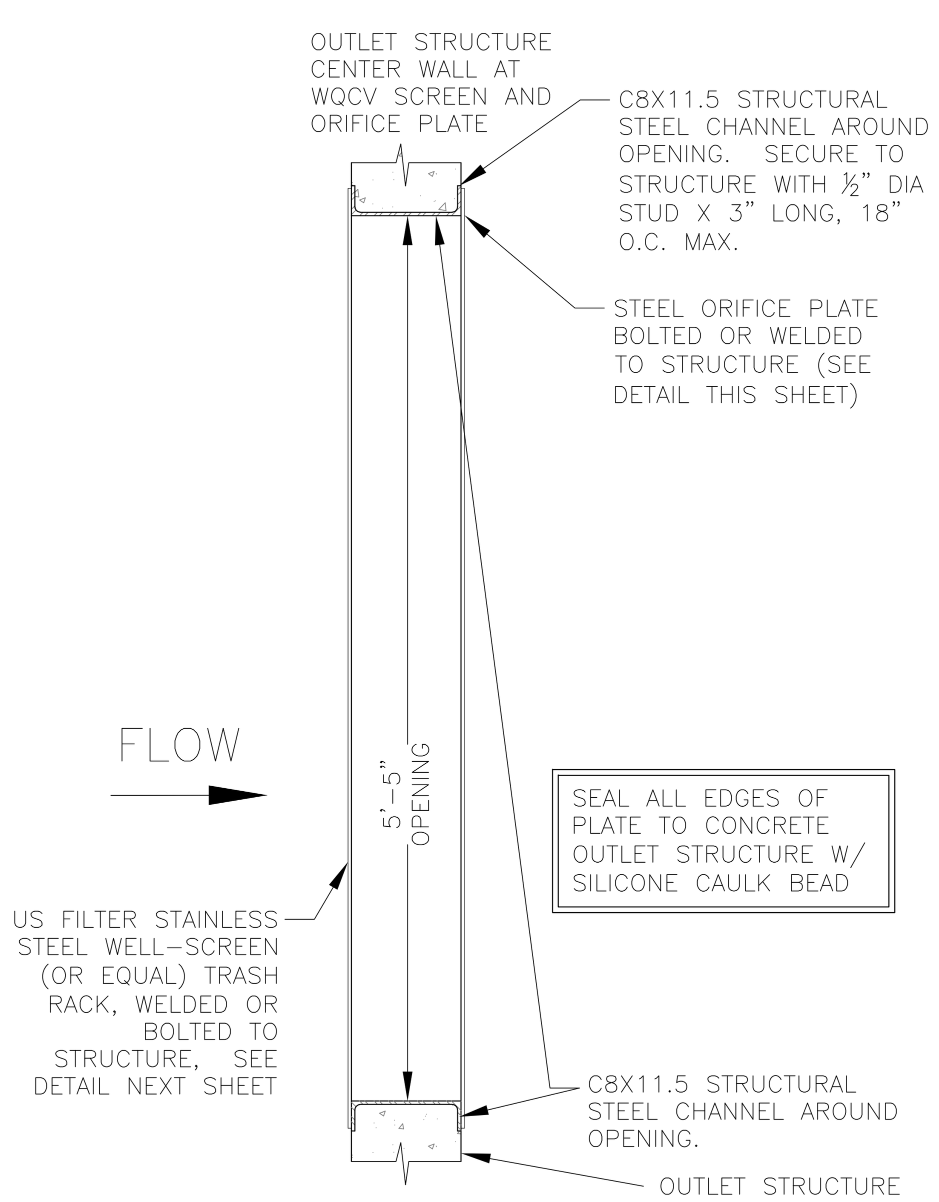


NOTE A:
3-1/2"W X 2-1/2"D STRUCTURAL STEEL CHANNEL IN SLOT FOR GRATE 1.
SECURE TO STRUCTURE WITH 1/2" DIA. STUD X 3"L, 18" O.C. MAX.

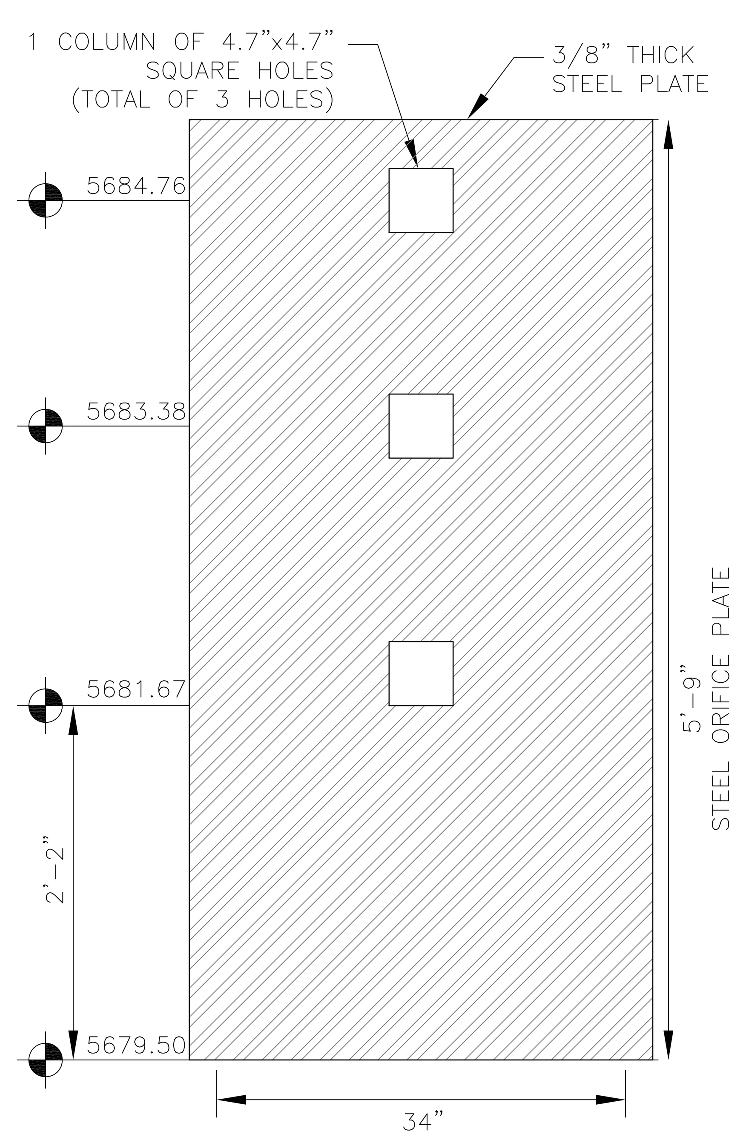
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

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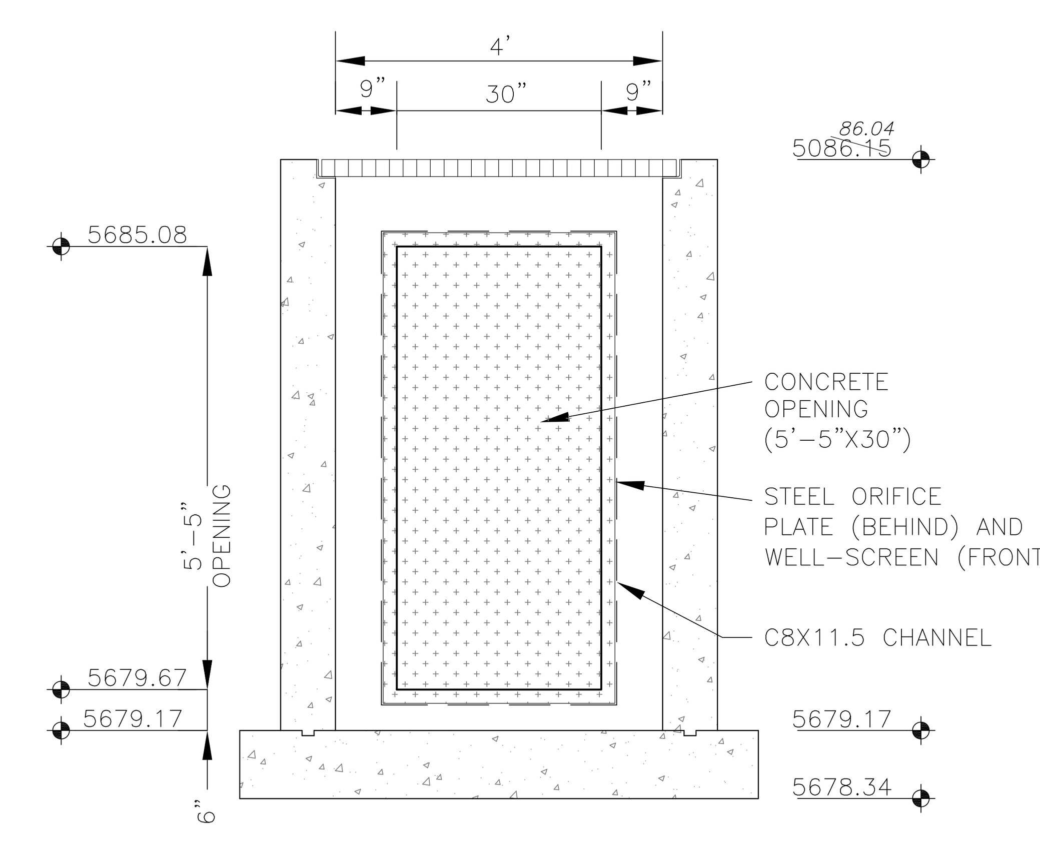
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/4" CHAMFER UNLESS OTHERWISE NOTED.

7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.

8. REFER TO SHEET XX FOR PRESEDIMENTATION/FOREBAY DESIGN.

9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

AS-BUILT
DATE: APRIL 6, 2018



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

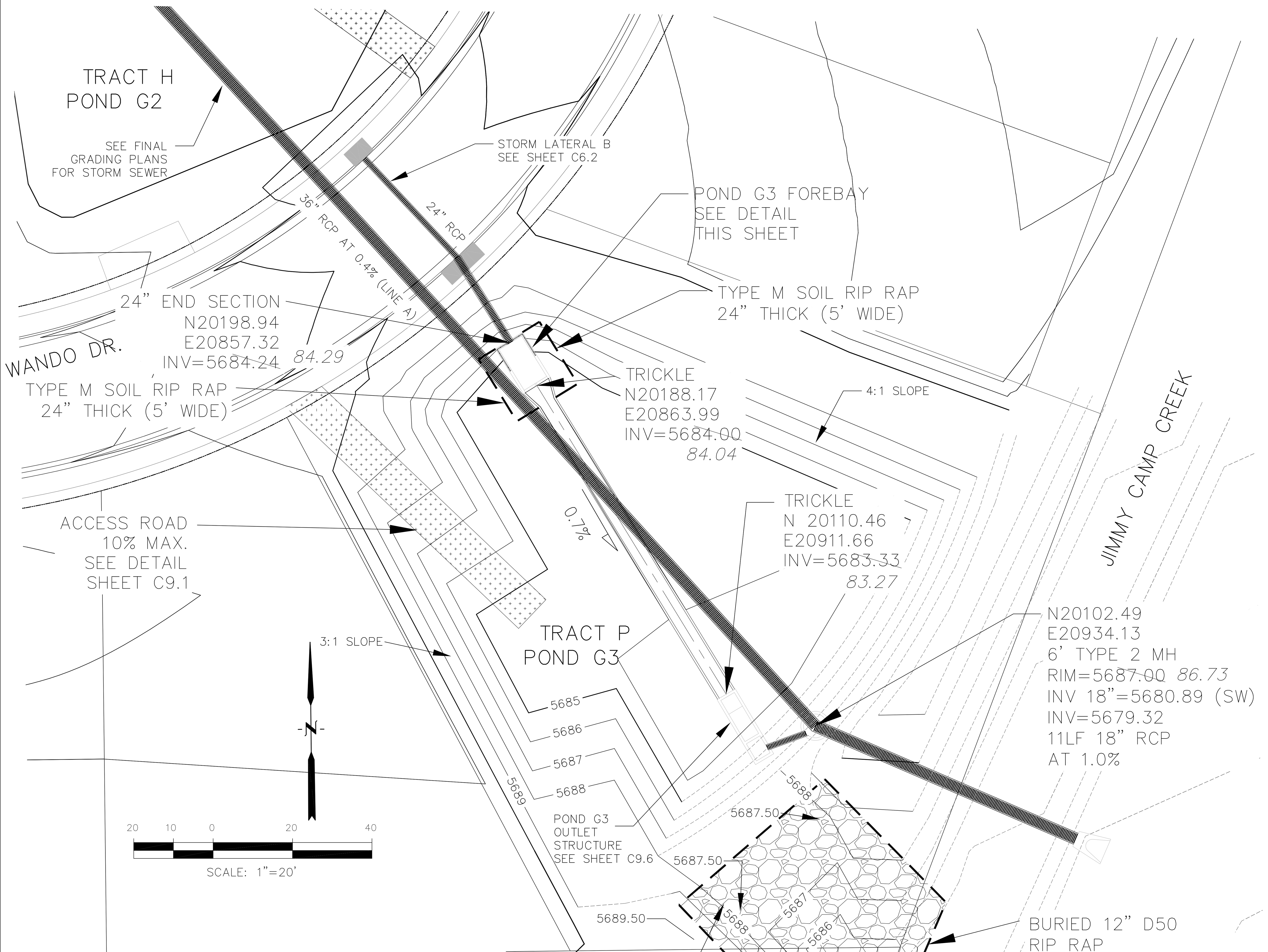
PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVENUE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

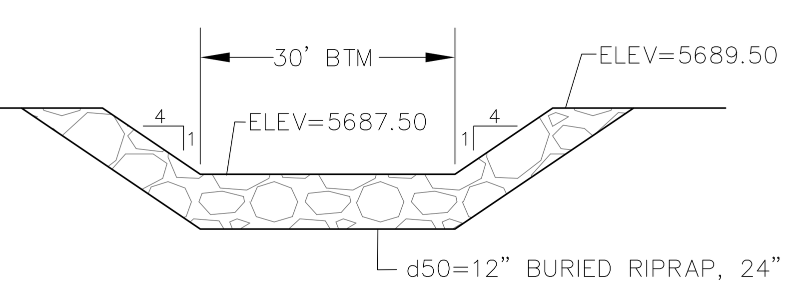
PROJECT: CARRIAGE MEADOWS SOUTH
FONTAINE BLVD.-MARKSHEFFEL RD
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

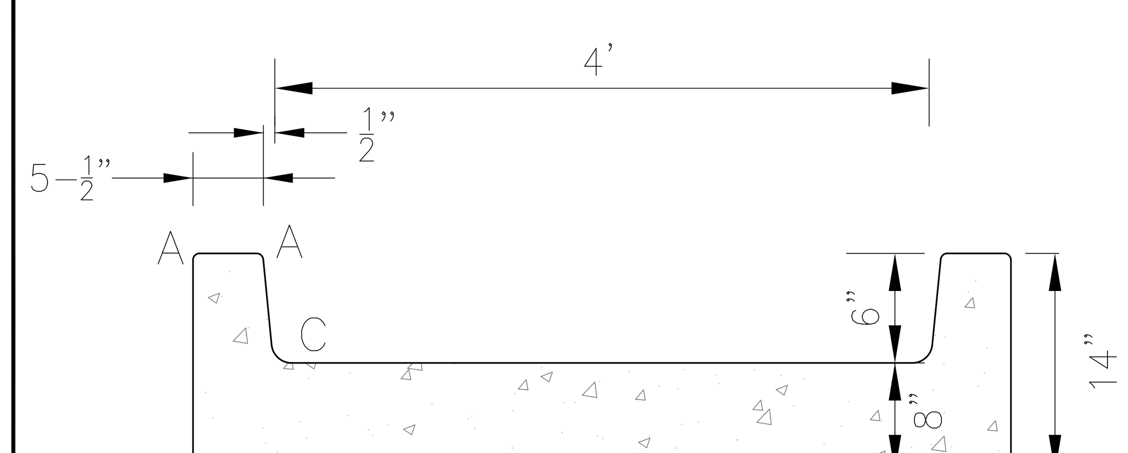
POND G1/G2 FULL SPECTRUM OUTLET STRUCTURE DETAILS

DATE: AUGUST 28, 2017
PROJECT NO. 100.030
SHEET NUMBER C9.4
TOTAL SHEETS: 39



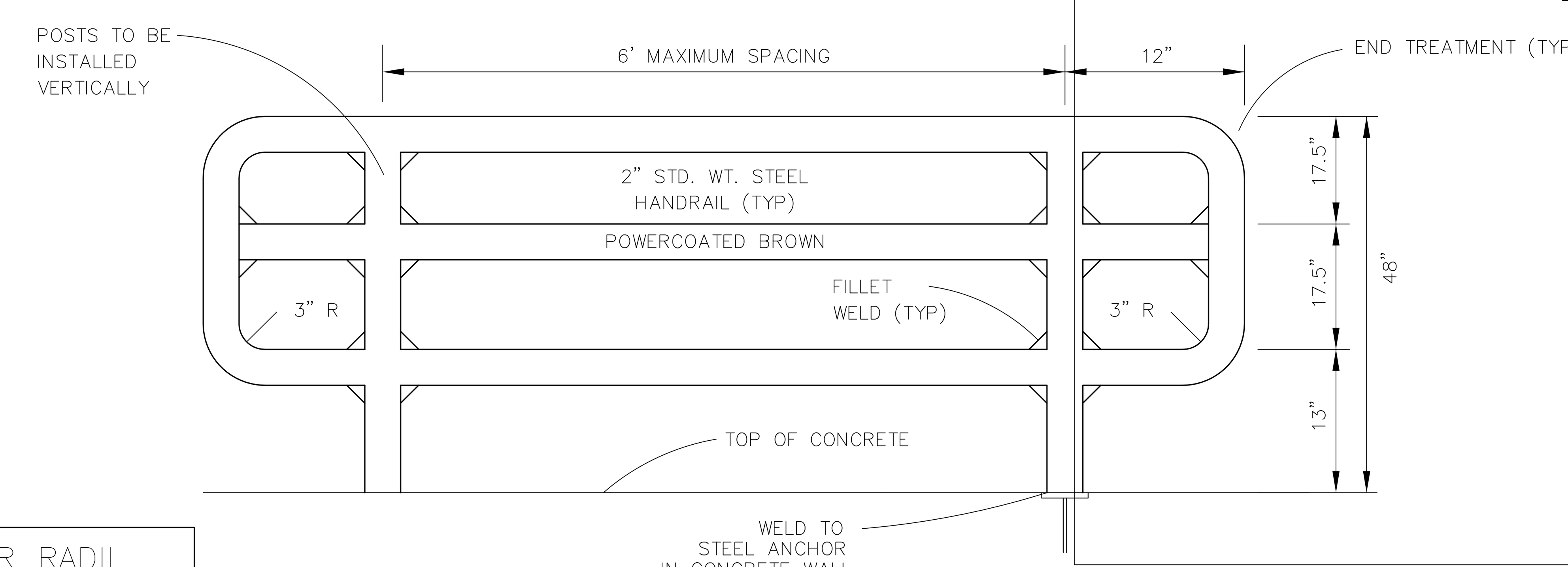


EMERGENCY SPILLWAY DETAIL
SCALE: NTS

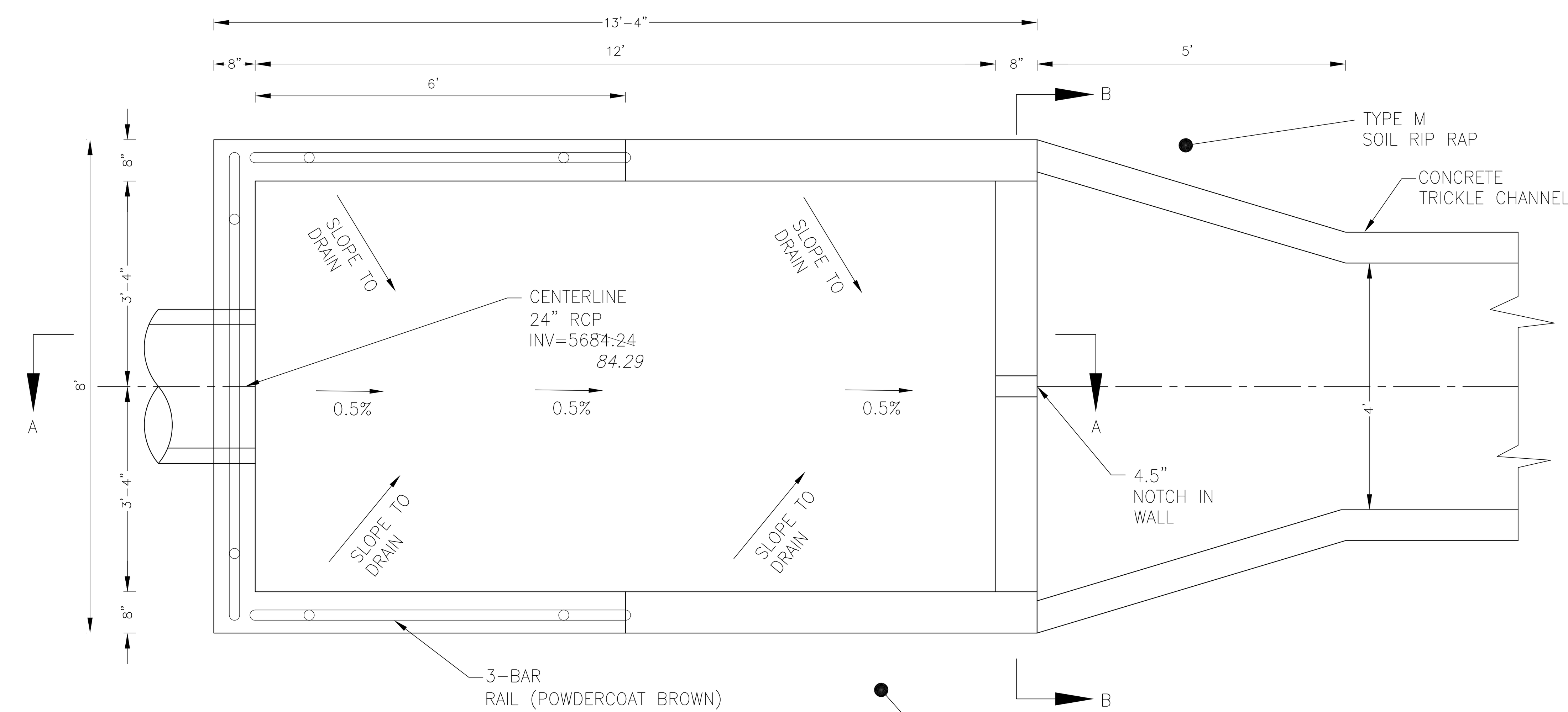


TRICKLE CHANNEL DETAIL
NO SCALE

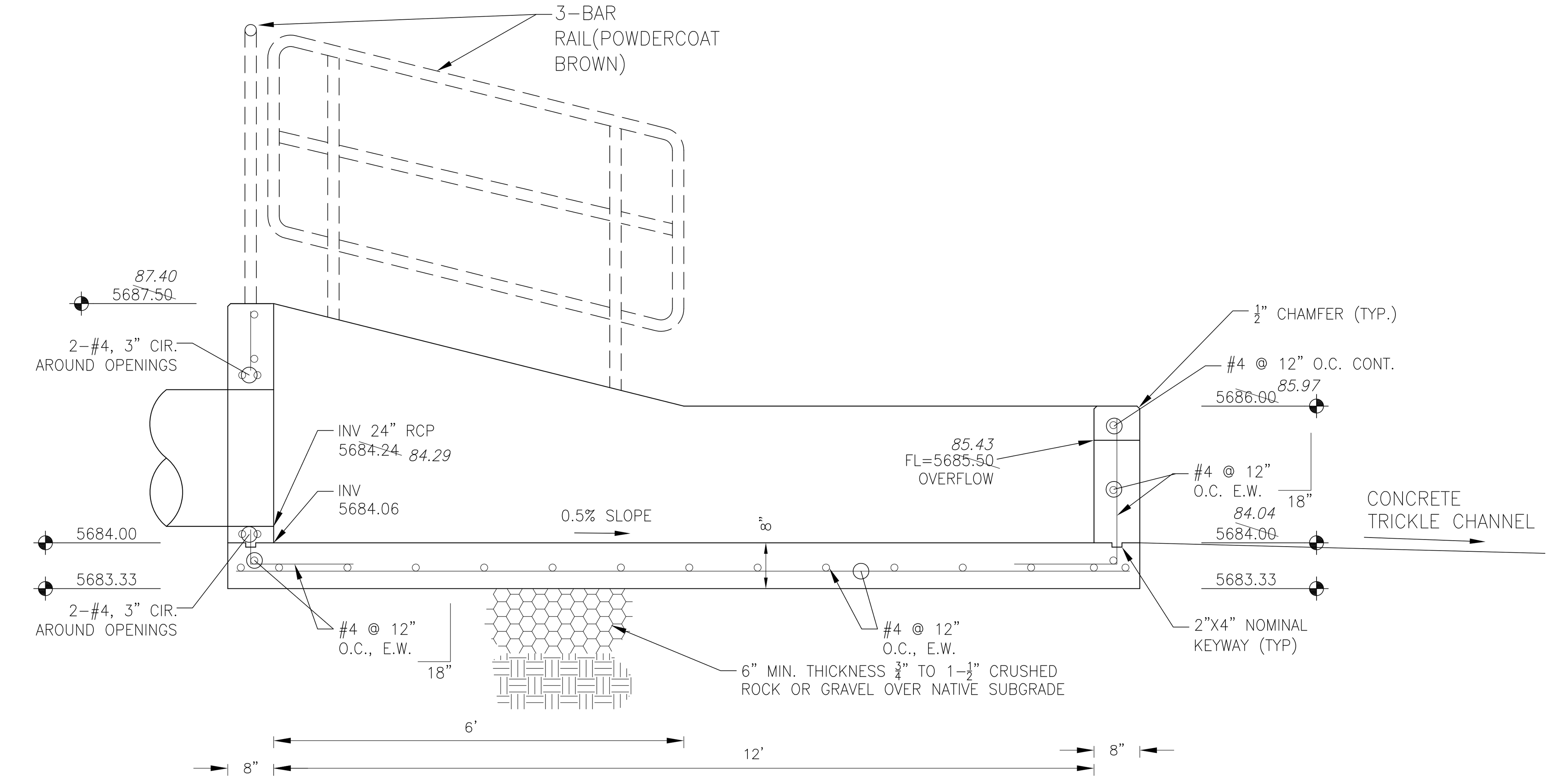
LENGTH FOR RADII
A = 1/2"
C = 1-1/2"



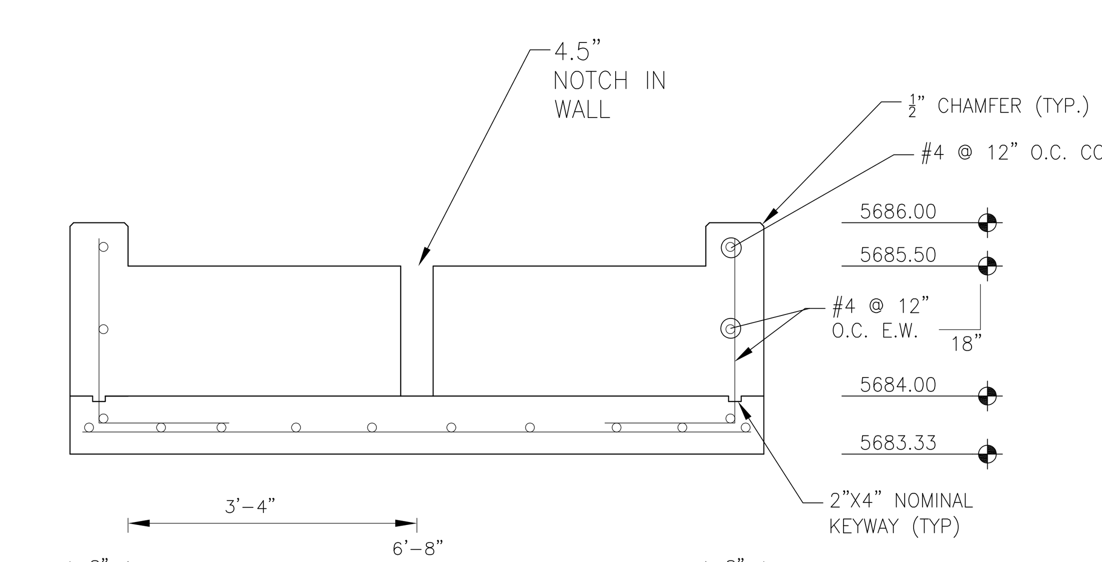
3-BAR RAIL DETAIL
NO SCALE



FOREBAY DETAIL
NO SCALE



FOREBAY SECTION A–A
NO SCALE



FOREBAY SECTION B–B
NO SCALE

AS-BUILT
DATE: APRIL 6, 2018

CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
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NO. | DESCRIPTION | DATE

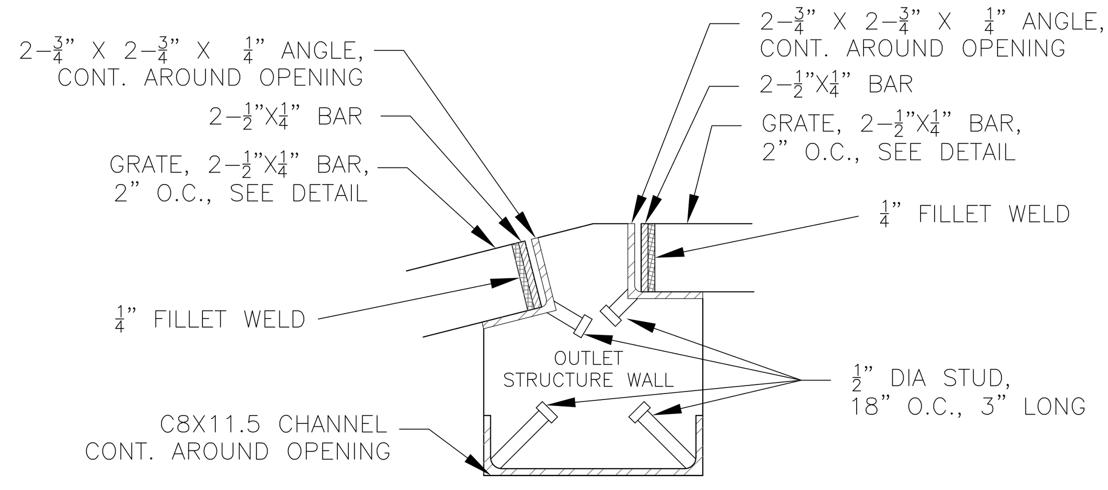
PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL NO. 1
FONTAINE BLVD. – CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

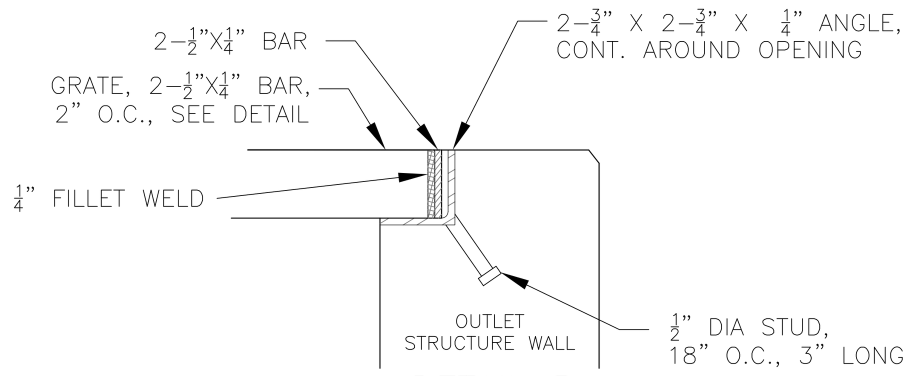
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G3 (DISTRICT) TRICKLE AND FOREBAY DETAILS

DATE
AUGUST 28, 2017
PROJECT NO.
100.030
SHEET NUMBER
C9.5
TOTAL SHEETS: 39



DETAIL A
NO SCALE



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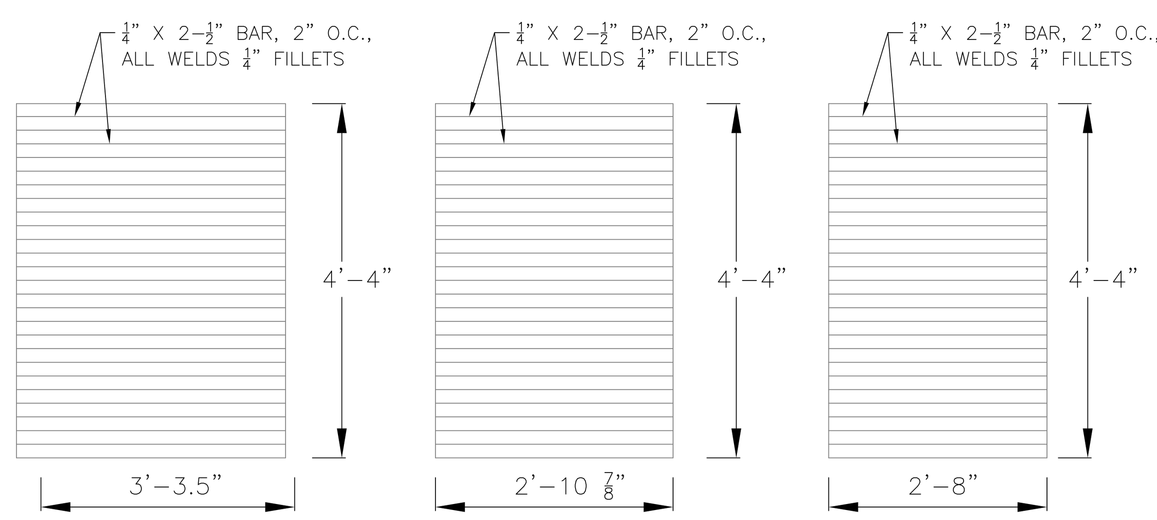
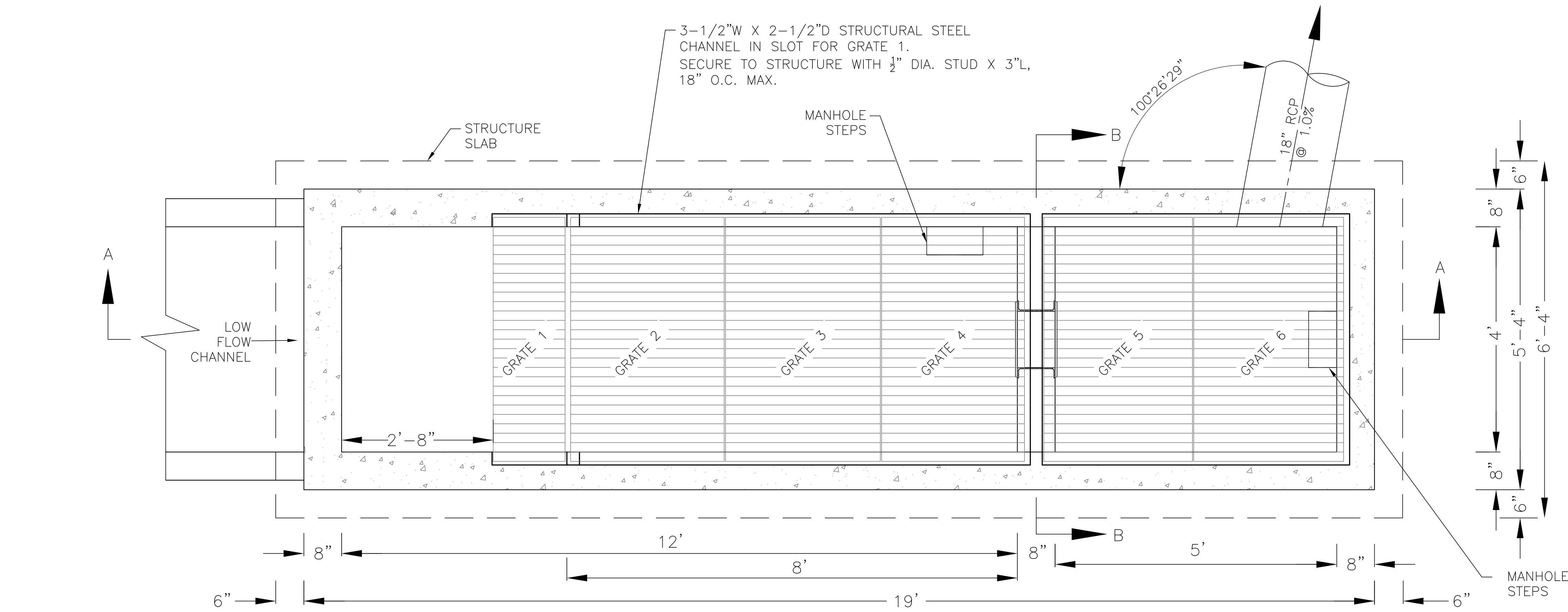


GRATE 1 — NO SCALE
GRATE 2,3 — NO SCALE
GRATE 4, 5, 6 — NO SCALE



OUTLET STRUCTURE DETAIL – PLAN VIEW
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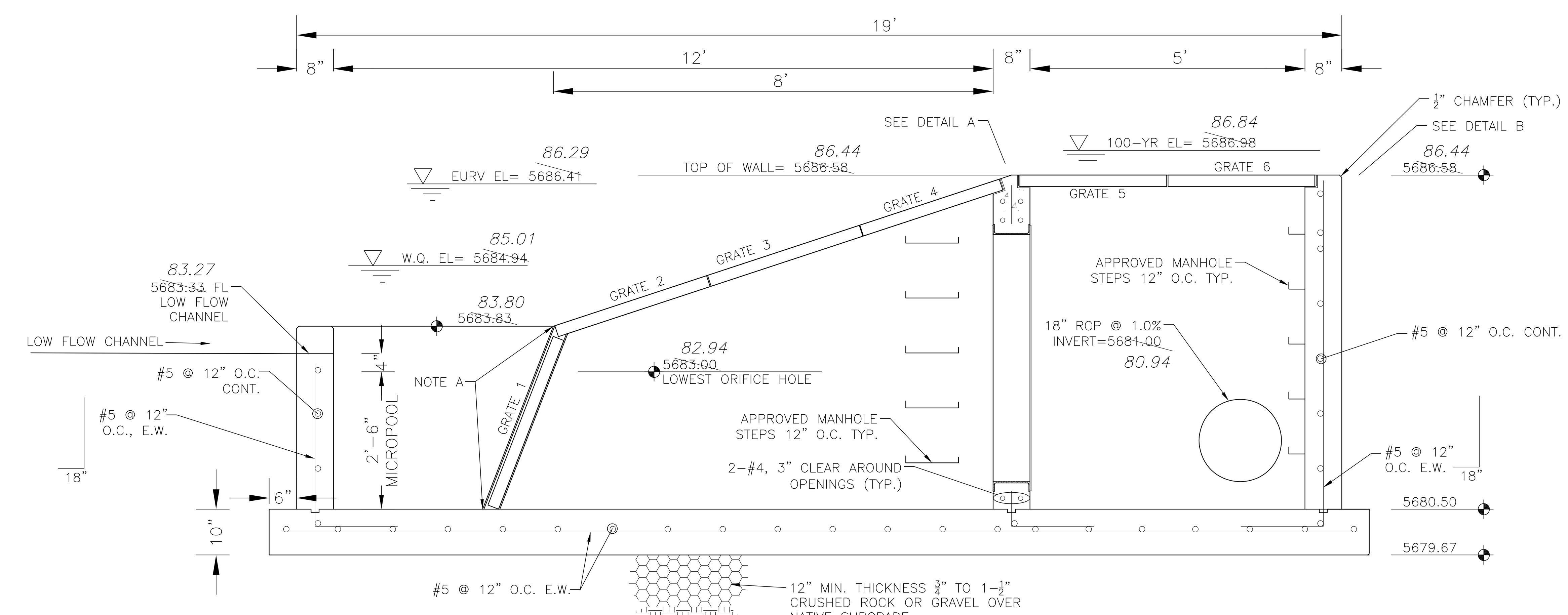

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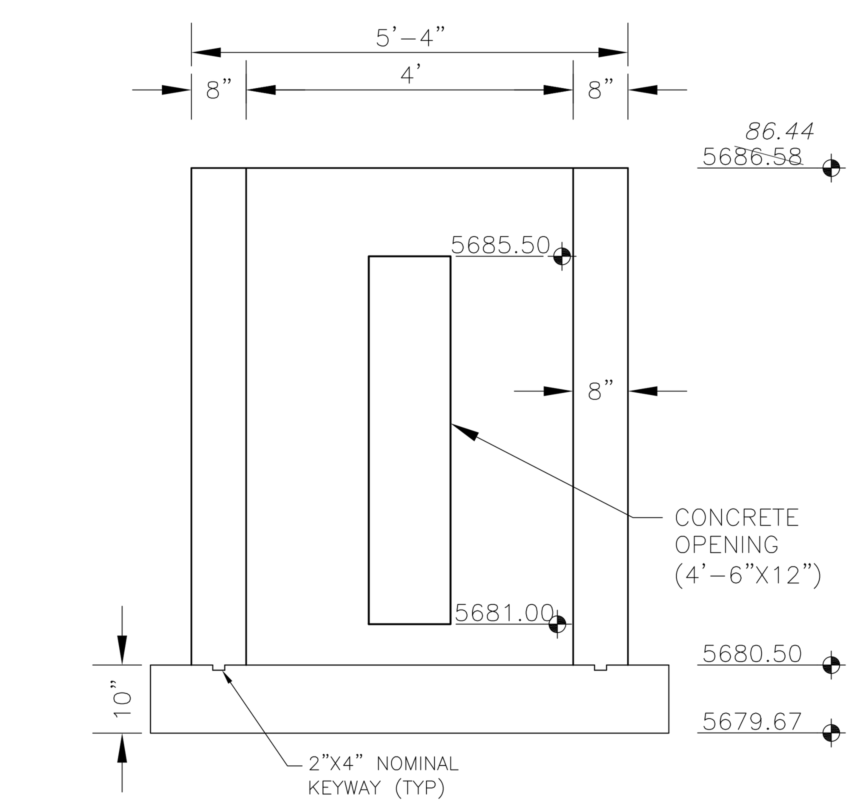
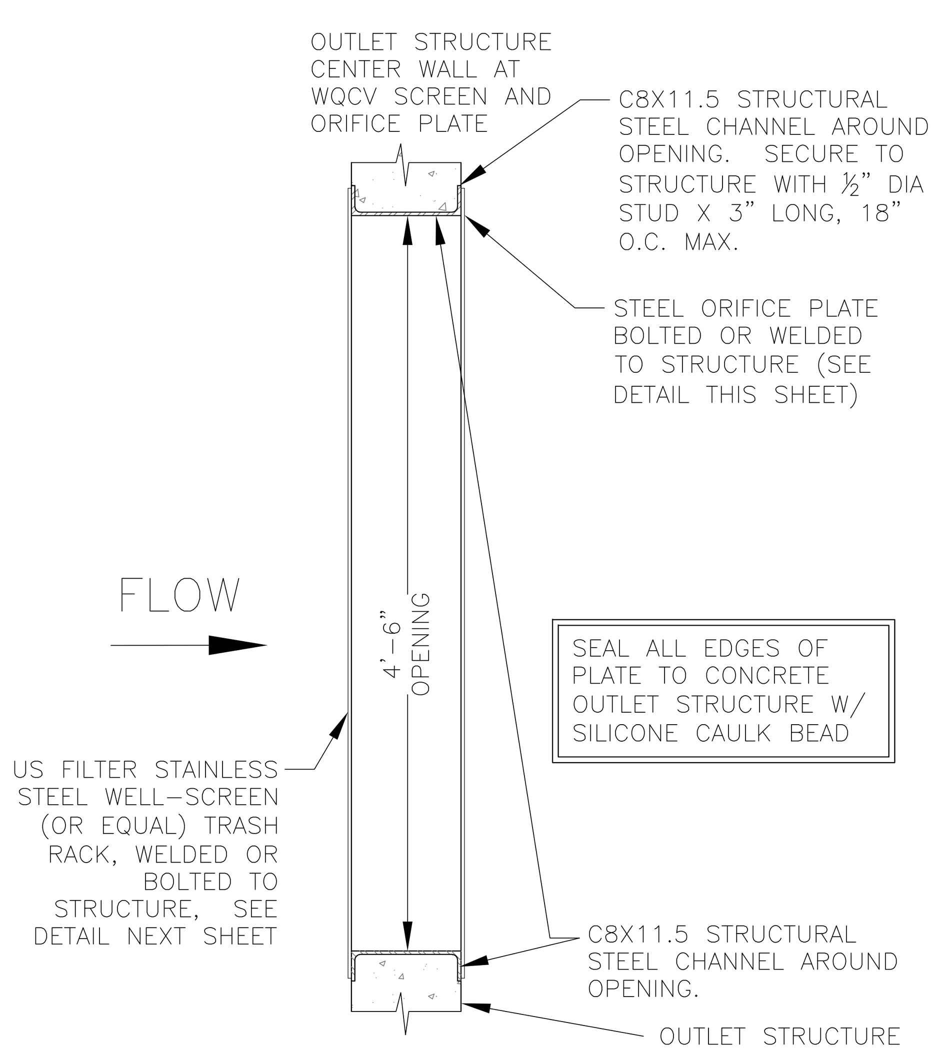


OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
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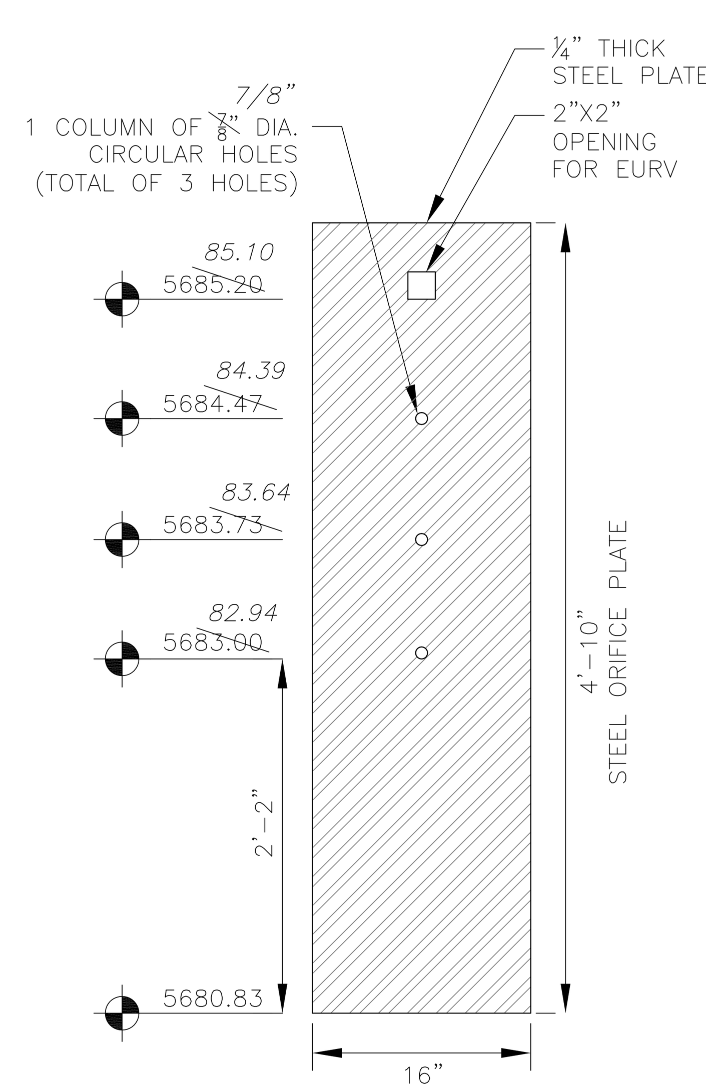

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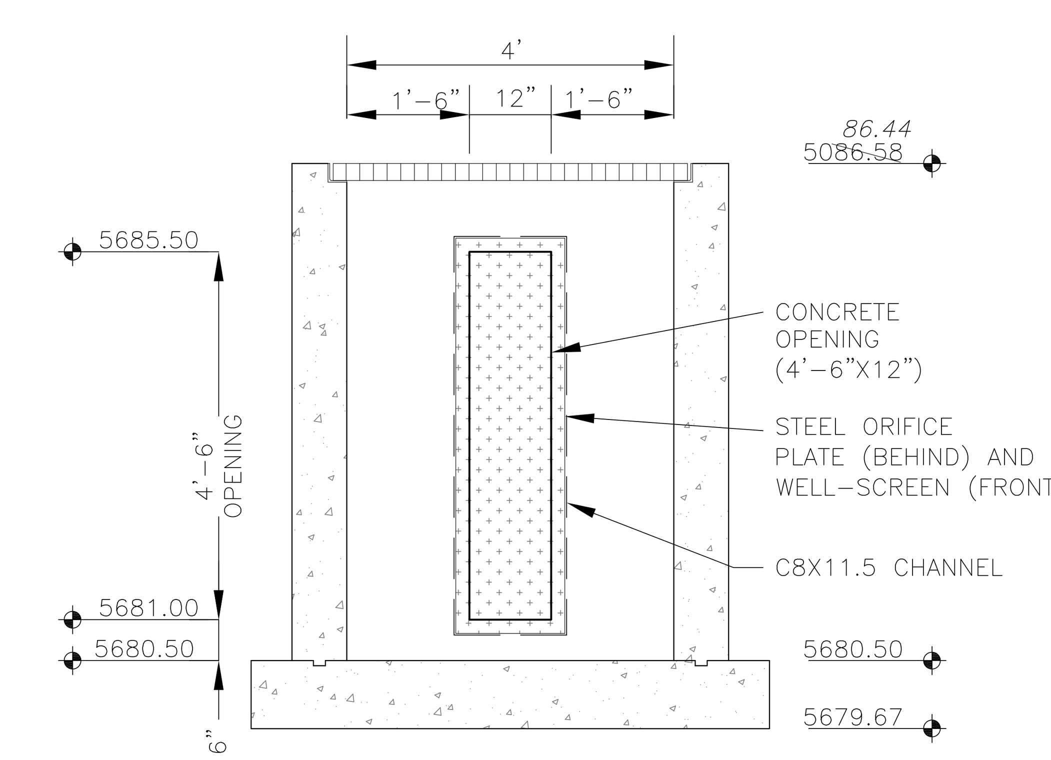
AS-BUILT
DATE: APRIL 6, 2018



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION	DATE

PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVENUE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT: CARRIAGE MEADOWS SOUTH
FONTAINE BLVD.–MARKSHEFFEL RD
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G3
FULL SPECTRUM
OUTLET STRUCTURE DETAILS

DATE: AUGUST 28, 2017
PROJECT NO. 100.030
SHEET NUMBER C9.6
TOTAL SHEETS: 39

APPENDIX E– DRAINAGE BOARD MINUTES, STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

Minutes
City of Colorado Springs/ El Paso County
Drainage Board Meeting Summary
January 23, 2024

The City of Colorado Springs/ El Paso County Drainage Board held its meeting at 1:30 PM, Tuesday, January 23, 2024, at Pikes Peak Regional Building in the Pikes Peak Hearing Room.

MEMBERS PRESENT: Tim McConnell (Chair), Marc Whorton (Vice Chair), Grant Petik, Brett Louk, Mark Sherwood, Scott Smith

OTHERS PRESENT: Christina Aragon (City), Erin Powers (City), Erica Schmitz (City), Amy Tuten (City), Rebecca Greenberg (City), Daniel Torres (El Paso County), Carlos Hernandez (El Paso County), Jeff Rice (El Paso County), Greg Shaner (Matrix), Jesse Sullivan (Matrix), Tina Buschar (View Homes), JM Turley (View Homes), Jeff Mark (Landhuis), Rich Wray (Kiowa), Dave Gorman (MVE)

Item 1: Meeting called to order by ***Tim McConnell*** at 1:31 PM.

Item 2:

a) Approval of the November 14, 2023, Drainage Board minutes

Approval of the minutes from the November 14, 2023, Drainage Board Meeting. Motion was made by ***Scott Smith*** to approve the minutes of November 14, 2023, ***with the amendment to remove Marc Whorton's duplicate naming in the "Members Present"***. Motion was seconded by ***Mark Sherwood***.

Motion Passed 6-0

Item 3: Old Business – None.

Item 4: New Business

a) **Partial Closure of Jimmy Camp Creek for Bull Hill/Rolling Meadows (County)** – presented by ***Jeff Rice (County)***, ***Jeff Mark (Landhuis),*** and ***Rich Wray (Kiowa)***

Jeff Rice introduces the request for the closure of a portion of Jimmy Camp Creek Basin for Bull Hill, Rolling Meadows, and the remaining unplatted portions of Lorson Ranch development in unincorporated El Paso County. El Paso County supports the approval of the partial closure, but they are still reviewing to ensure this action will not significantly increase the drainage fee for the remaining parcels in the basin. *Tim McConnell* asks if this item will need to come back to Drainage Board once the determinations are made, or will it be approved administratively. *Jeff Rice* responds that could be decided by the Board whether or not they would like to have the item come back to the Board. *Jeff Mark* then states it would be preferred if the Item could be settled administratively, but agrees it is the Board's decision. *Jeff Rice* displays the map of Lorson Ranch to show the area of concern for this Item. *Jeff Mark* continues to describe the area in question and explain the background of the improvements already installed and future installments. Jeff explains this request is being brought to the Board because the cost of the improvements is anticipated to far exceed what the basin fees would be based on the analysis. Mark Sherwood asks if they are fairly confident about the required improvements to be installed in the area. Jeff Rice answers that they are confident about the final design and associated fees. Rich Wray arrives and offers further details on the calculations of the drainage fees for the area. He then continues to explain justifications to support this request. Scott Smith asks Jeff Mark about the current status of this portion of Lorson Ranch in terms of the fees and reimbursable cost and if it's in balance. Jeff Rice responds by explaining the current status of this portion of Lorson Ranch discussing the fees and credits for the basin. Marc Whorton asks if the channel improvements have been accepted by the County. Jeff Rice confirms that the channels have been completed and accepted, and the metro district maintains it. Marc Whorton then asks when the updated DBPS will be completed, and Jeff Rice responds that it is anticipated to be completed within the year.

Marc Whorton asks if Jeff Mark would be ok with splitting up the request to close the portion of the basin with completed improvements while the County finishes their review and completes the updated DBPS. Jeff agrees the would be acceptable if the Board agrees.

Marc Whorton moves to approve the partial closure of Jimmy Camp Creek just for the remaining Lorson developments, pending confirmation that this action will not significantly raise the resulting drainage fees for the remaining parcels in the basin with the expectation that the applicant will bring the same request back to the Board for Rolling Meadows/ Bull Hill. ***Scott Smith*** seconds the motion.

Motion Passed 6-0

b) Sand Creek Channel Stabilization Reimbursement Request (City) – presented by ***Erica Schmitz (City)*** and ***Gregory Shaner (Matrix)***

Erica Schmitz introduces the request for reimbursement for Sand Creek channel improvements. Erica continues providing a bit of background for the request and states that City staff is remaining neutral on this request because the reimbursement request is greater than the 10% allotted by code. *Gregory Shaner* is introduced and continues to provide background on the project and history of the site. Gregory describes the difficulties and obstacles with the project, which helps to justify why they are requesting a larger reimbursement. Grant Petik asks for clarification on some of the additional costs shown in their analysis. Gregory explains the costs depicted and discusses more details about the project. Board members and applicant discuss the cost breakdown, and Tim McConnell mentions an analysis to determine whether a fee increase is warranted. There is further discussion amongst the Board.

Tim McConnell moves to approve the $553,188.31 channel improvements reimbursement request. ***Mark Sherwood*** seconds the motion.

Motion Passed 6-0

c) Sand Creek Request to Designate Reimbursable Infrastructure (City) – presented by ***Erica Schmitz (City)***

Erica Schmitz introduces the request for channel improvements associated with the Final Plat for The Crossing at Palmer Park Filing No. 5 be designated as reimbursable. Erica adds that City staff is remaining neutral on this request but offers options for possible motions. Erica introduces *Dave Gorman*, who takes the stand to explain the background of their improvements and the reason for their request. Dave explains there has been no improved or stabilization of the channel in this area previously. *Mike Turley* asks about drainage fees in association with platting the area. *Erin Powers* addresses Mike's question with City policy. *Scott Smith* then asks if these improvements are installed already, and Dave responds that they have not. Dave explains that plans have been reviewed by the City and this is just an estimated cost for the improvements. *Scott Smith* confirms that this is a request to improvement costs to be considered reimbursable and Dave confirms. There is further discussion between the Board and applicant describing the project and development for The Crossing at Palmer Park Filing No. 5.

Scott Smith moves to approve the request to add this reimbursable amount to the Sand Creek Drainage Basin with a request for a fee analysis of the Sand Creek Basin upon request for reimbursement. ***Marc Whorton*** seconds the motion.

Motion Passed 6-0

e) Housekeeping

a. **February meeting cancellation**

Mark Sherwood moves to approve the cancellation of the schedule meeting in February 2024. ***Marc Whorton*** seconds the motion.

Motion Passed 6-0

f) Open Discussion

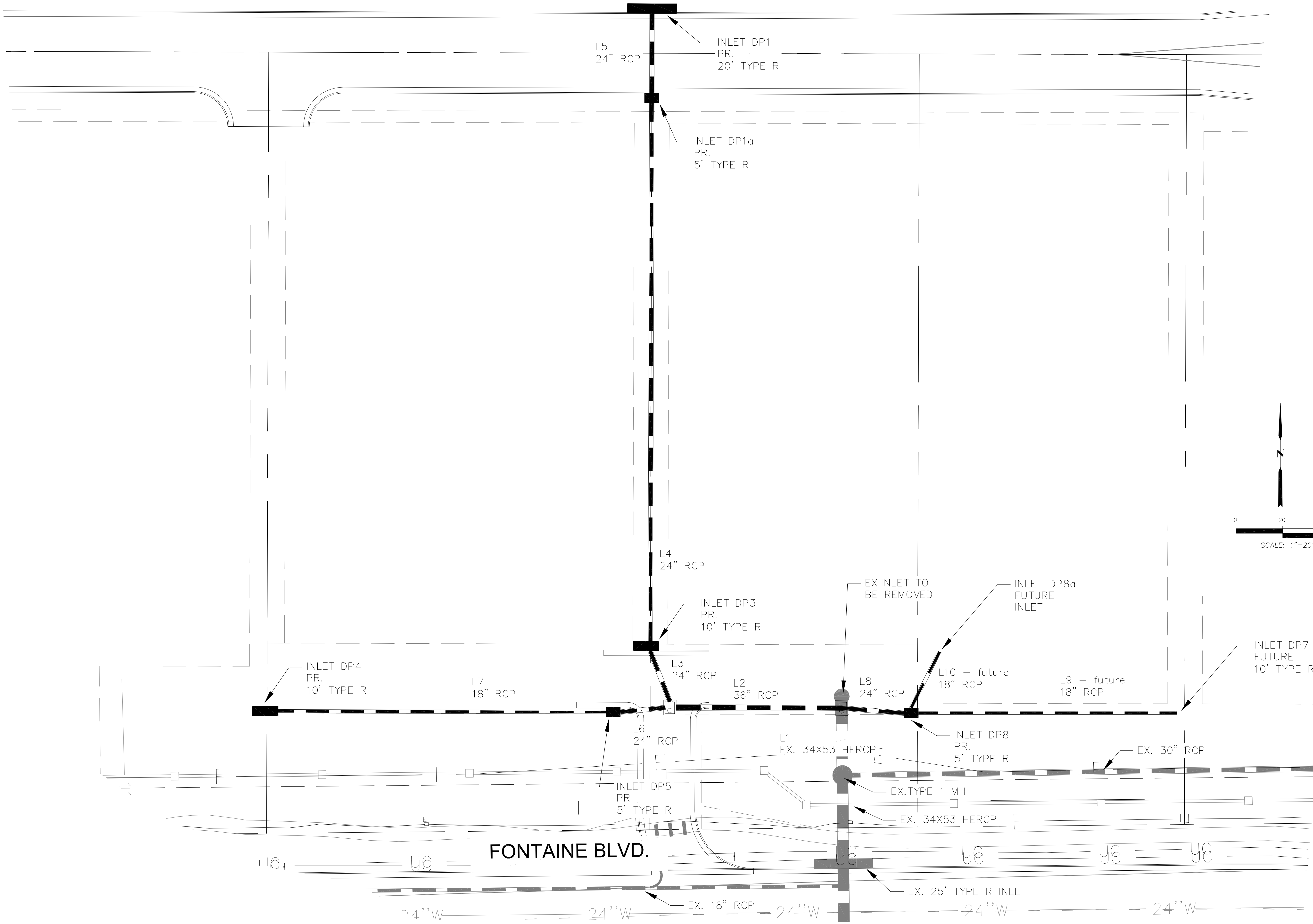
Tim McConnell asks about Gary's vacancy and the upcoming vacancies when his and Marc's terms expire in May 2024. *Erin Powers* responds explaining that the vacancies are posted and reviews the process for hiring.

Tim McConnell then asks about the financial update from the County and requests they could provide an update at the next meeting.

Tim McConnell asked about Amy's financial update and the unclaimed reimbursements, wanting more details on where the additional unclaimed funds were reallocated to. *Erin Powers* responds that she will speak with Amy to find out if the unclaimed funds will be reallocated to each individual basin versus the Interest fund.

Item 5: ***Tim McConnell -*** Meeting adjourned at 3:43 PM.

STORM SCHEMATIC



CORE
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NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
VILLAGES AT LORSON RANCH
FONTAINE BLVD - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
VILLAGE AT LORSON RANCH

DATE
JUNE, 2024

PROJECT NO.
100.070

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	1	31.50	34x53	Ell	28.90	5701.86	5702.05	0.657	5704.47	5703.75	0.38	5703.75	End	Manhole
2	2	20.50	36	Cir	72.76	5702.15	5702.51	0.495	5703.75	5703.96	n/a	5703.96	1	Manhole
3	3	12.50	24	Cir	26.00	5703.26	5703.52	1.001	5704.32	5704.79	0.23	5704.79	2	Manhole
4	4	9.80	24	Cir	239.29	5703.62	5706.01	0.999	5704.79	5707.13	n/a	5707.13 j	3	Manhole
5	5	9.40	24	Cir	35.00	5706.11	5706.46	1.000	5707.13	5707.56	0.44	5707.56	4	Manhole
6	6	8.90	24	Cir	22.46	5703.26	5703.38	0.535	5704.31	5704.44	n/a	5704.44	2	Manhole
7	7	5.90	18	Cir	151.60	5703.88	5704.63	0.495	5704.89	5705.64	0.34	5705.98	6	Manhole
8	8	12.20	24	Cir	28.65	5702.90	5703.19	1.012	5703.94	5704.44	0.51	5704.44	1	Manhole
9	9	5.30	18	Cir	125.20	5703.69	5704.94	0.998	5704.44	5705.83	n/a	5705.83	8	None
10	10	6.00	18	Cir	29.57	5703.69	5703.99	1.016	5704.50	5704.94	0.41	5704.94	8	None

Village 5yr | Number of lines: 10 | Run Date: 3/28/2024

NOTES: Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	28.899	0.00	0.00	0.00	0.00	0.00	0.0	2.0	0.0	31.50	89.44	6.35	34 x 53 e	0.66	5701.86	5702.05	5704.47	5703.75	5707.84	5707.59	1
2	1	72.756	0.00	0.00	0.00	0.00	0.00	0.0	1.6	0.0	20.50	47.54	5.70	36	0.51	5702.15	5702.52	5703.75	5703.97	5707.59	5707.92	2
3	2	26.003	0.00	0.00	0.00	0.00	0.00	0.0	1.5	0.0	12.50	22.63	6.66	24	1.00	5703.26	5703.52	5704.32	5704.79	5707.92	5708.05	3
4	3	239.285	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	9.80	22.60	5.28	24	1.00	5703.62	5706.01	5704.79	5707.13	5708.05	5712.13	4
5	4	35.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	9.40	22.62	5.59	24	1.00	5706.11	5706.46	5707.13	5707.56	5712.13	5711.46	5
6	2	22.463	0.00	0.00	0.00	0.00	0.00	0.0	0.8	0.0	8.90	16.54	5.30	24	0.53	5703.26	5703.38	5704.31	5704.44	5707.92	5707.94	6
7	6	151.599	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.90	7.43	4.67	18	0.50	5703.88	5704.64	5704.89	5705.65	5707.94	5709.01	7
8	1	28.652	0.00	0.00	0.00	0.00	0.00	0.0	0.7	0.0	12.20	22.76	6.63	24	1.01	5702.90	5703.19	5703.94	5704.44	5707.59	5707.55	8
9	8	125.197	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.30	10.49	5.42	18	1.00	5703.69	5704.94	5704.44	5705.83	5707.55	5706.88	9
10	8	29.568	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.00	10.58	5.64	18	1.02	5703.69	5703.99	5704.50	5704.94	5707.55	5707.54	10

Village 5yr | Number of lines: 10 | Run Date: 6/9/2024

NOTES:Intensity = 501.75 / (Inlet time + 28.20) ^ 1.31; Return period =Yrs. 5 ; c = cir e = ellip b = box

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	1	57.30	34x53	Ell	29.00	5701.86	5702.05	0.655	5704.41	5704.32	n/a	5704.32	End	Manhole
2	2	37.30	36	Cir	72.76	5702.15	5702.51	0.495	5704.32	5704.52	0.81	5705.32	1	Manhole
3	3	22.80	24	Cir	26.00	5703.26	5703.52	1.001	5705.32*	5705.59*	0.34	5705.93	2	Manhole
4	4	17.80	24	Cir	239.29	5703.62	5706.01	0.999	5705.93	5707.53	n/a	5707.53 j	3	Manhole
5	5	17.00	24	Cir	35.00	5706.11	5706.46	1.000	5707.53	5707.95	0.72	5707.95	4	Manhole
6	6	16.10	24	Cir	22.46	5703.26	5703.38	0.535	5705.32*	5705.44*	0.06	5705.50	2	Manhole
7	7	8.10	18	Cir	151.60	5703.88	5704.63	0.495	5705.50*	5706.40*	0.33	5706.73	6	Manhole
8	8	22.40	24	Cir	29.00	5702.90	5703.19	1.000	5704.52	5704.88	0.92	5704.88	1	Manhole
9	9	9.70	18	Cir	125.20	5703.69	5704.94	0.998	5704.88	5706.14	0.64	5706.14	8	None
10	10	11.00	18	Cir	29.57	5703.69	5703.99	1.016	5704.98	5705.28	0.72	5706.00	8	None

Village 100yr | Number of lines: 10 | Run Date: 3/28/2024

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

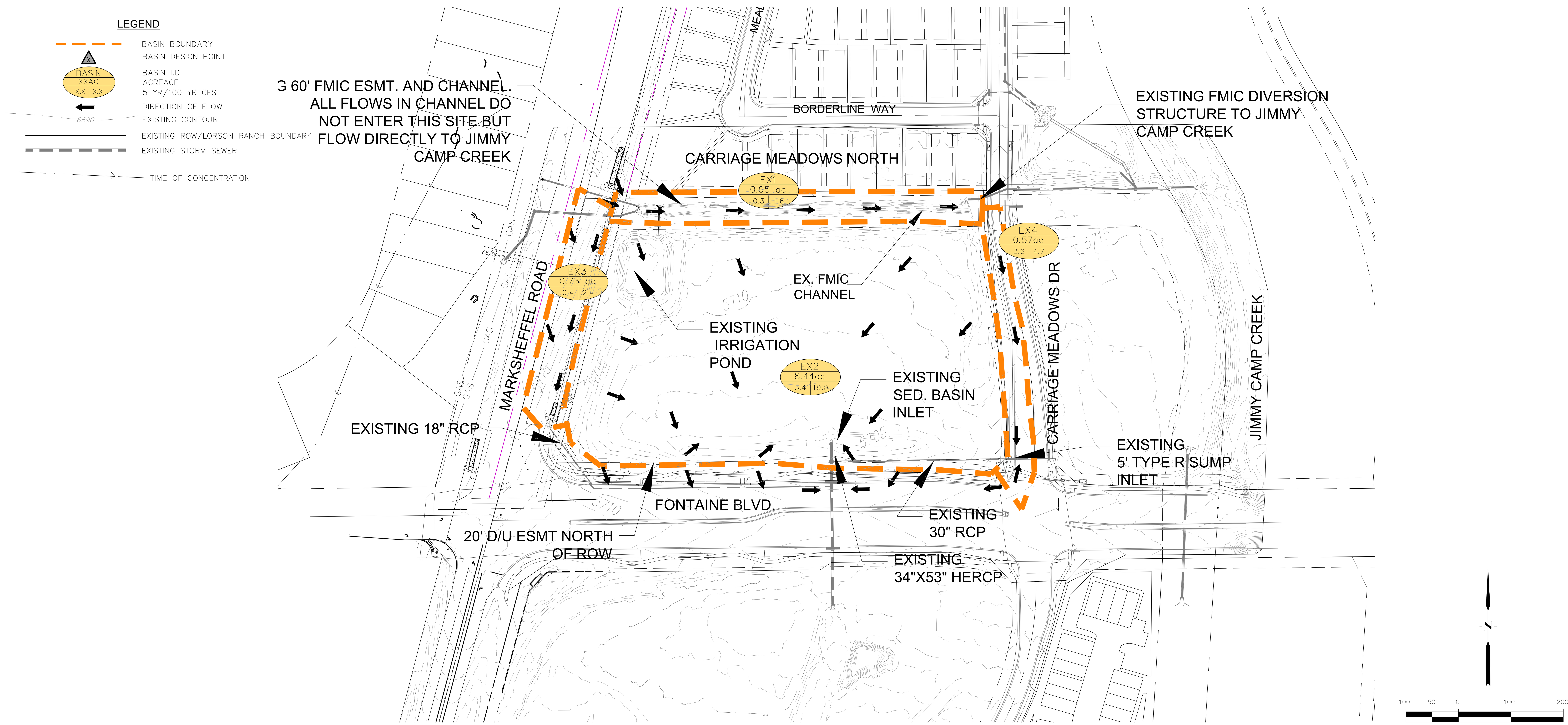
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	29.000	0.00	0.00	0.00	0.00	0.00	0.0	1.1	0.0	57.30	89.28	7.87	34 x 53 e	0.65	5701.86	5702.05	5704.41	5704.32	5707.84	5708.48	1
2	1	72.756	0.00	0.00	0.00	0.00	0.00	0.0	0.9	0.0	37.30	47.54	7.15	36	0.51	5702.15	5702.52	5704.32	5704.51	5708.48	5708.48	2
3	2	26.003	0.00	0.00	0.00	0.00	0.00	0.0	0.8	0.0	22.80	22.63	7.26	24	1.00	5703.26	5703.52	5705.33	5705.60	5708.48	5708.71	3
4	3	239.285	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	17.80	22.60	6.31	24	1.00	5703.62	5706.01	5705.94	5707.53	5708.71	5712.17	4
5	4	35.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	17.00	22.62	6.96	24	1.00	5706.11	5706.46	5707.53	5707.95	5712.17	5711.79	5
6	2	22.463	0.00	0.00	0.00	0.00	0.00	0.0	0.6	0.0	16.10	16.54	5.13	24	0.53	5703.26	5703.38	5705.33	5705.45	5708.48	5707.92	6
7	6	151.599	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	8.10	7.43	4.58	18	0.50	5703.88	5704.64	5705.51	5706.41	5707.92	5709.01	7
8	1	29.000	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	22.40	22.62	8.07	24	1.00	5702.90	5703.19	5704.52	5704.88	5708.48	5708.74	8
9	8	125.197	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	9.70	10.49	6.43	18	1.00	5703.69	5704.94	5704.88	5706.14	5708.74	5706.75	9
10	8	29.568	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	11.00	10.58	6.80	18	1.02	5703.69	5703.99	5704.98	5705.28	5708.74	5705.79	10

Village 100yr | Number of lines: 10 | Run Date: 6/9/2024

NOTES:Intensity = 1020.33 / (Inlet time + 30.10) ^ 1.34; Return period =Yrs. 100 ; c = cir e = ellip b = box

MAP POCKET



CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO.	DESCRIPTION

PREPARED FOR:
LORSON LLC
212 NORTH WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
VILLAGES AT LORSON RANCH
FONTAINE BLVD/CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: RLS

EXISTING CONDITIONS
FINAL PLAT
VILLAGES AT LORSON RANCH

DATE:
JUNE, 2024

PROJECT NO.
100.070

SHEET NUMBER
1

TOTAL SHEETS: 1

D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
				DESIGN POINT SUMMARY
1		9.4	17.0	STREET FLOW
1a		0.5	0.9	STREET FLOW
2		9.8	17.8	PIPE FLOW
3		3.1	5.6	STREET FLOW
3a		12.5	22.8	PIPE FLOW
4		7.2	13.1	STREET FLOW
5		3.0	8.0	STREET FLOW (INCLUDES BYPASS FROM DP4)
5a		8.9	16.1	PIPE FLOW
6		20.5	37.3	PIPE FLOW
7		5.3	9.7	STREET FLOW

DESIGN POINT SUMMARY

D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
8		0.9	1.7	STREET FLOW
8a		6.0	11.0	STREET FLOW
9		12.2	22.4	PIPE FLOW
10		31.5	57.3	PIPE FLOW

DETENTION POND AREAS:

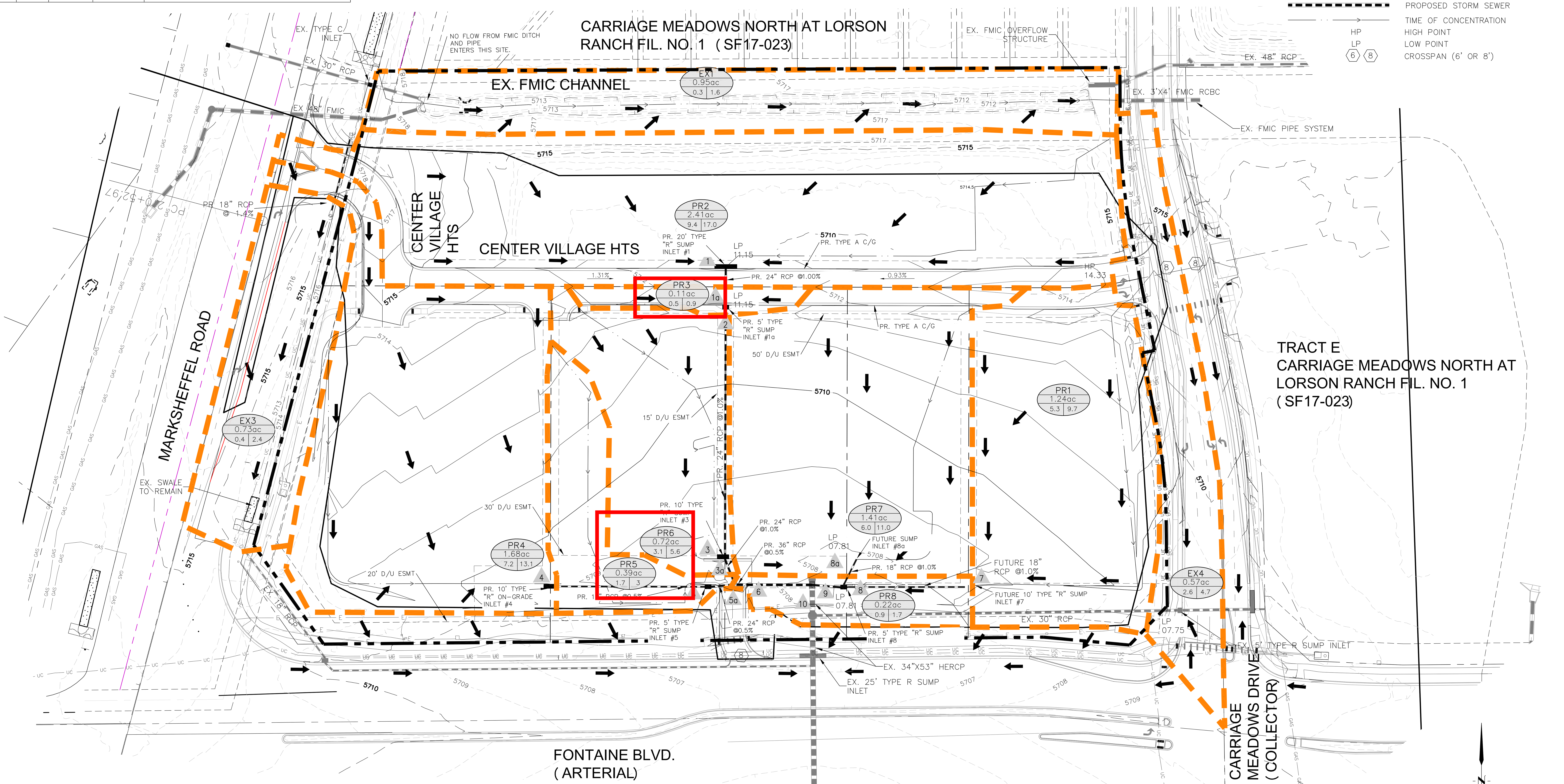
1. ALL BASINS DRAIN TO POND G1/G2 LOCATED IN CARRIAGE MEADOWS SOUTH AT LORSON RANCH
2. POND G1/G2 PROVIDES DETENTION AND WQ FOR THIS DEVELOPMENT
3. DETENTION POND G1/G2 WAS CONSTRUCTED PER SF 17-011 (CARRIAGE MEADOWS SOUTH AT LORSON RANCH FDR, APPROVED ON SEPTEMBER 7, 2017)

NOTES:

1. ALL PROPOSED STORM SEWER IS RCP ROUND PIPE AND IS A PRIVATE STORM SEWER SYSTEM UNLESS NOTED OTHERWISE.
2. CURB/GUTTER IS TYPE A EXCEPT AS NOTED

LEGEND

PLAT BOUNDARY
BASIN BOUNDARY
BASIN DESIGN POINT
DENOTES OVERALL BASIN — BASIN XX AC X.X X.X — BASIN I.D. ACREAGE 5 YR/100 YR CFS
DIRECTION OF FLOW
6690 EXISTING CONTOUR
6670 PROPOSED CONTOUR
ROW/LORSON RANCH BOUNDARY
EXISTING STORM SEWER
PROPOSED STORM SEWER
TIME OF CONCENTRATION
HP HIGH POINT
LP LOW POINT
6 8 CROSSPAN (6' OR 8')



CORE ENGINEERING GROUP
15004 1ST AVENUE S.
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PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

NO. | DESCRIPTION

PREPARED FOR:
LORSON LLC
212 NORTH WAHSATCH AVE, SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
VILLAGES AT LORSON RANCH
FONTAINE BLVD/CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: RLS

DEVELOPED CONDITIONS FINAL PLAT VILLAGES AT LORSON RANCH

DATE: JUNE, 2024

PROJECT NO. 100.070

SHEET NUMBER 1

TOTAL SHEETS: 1