

FINAL DRAINAGE REPORT

FOR

CROSSROADS MIXED USE
EL PASO COUNTY, COLORADO

AUGUST 2021

Prepared for:
Crossroads Metropolitan District No. 2
Mr. Danny Mientka
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Prepared by:



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Project #18-003A
PCD Filing No.: SP-20-011

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DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

The attached drainage plan and report was 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.

Virgil A. Sanchez, P.E. #37160
For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

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

BY: _____
Danny Mientka –Owner

DATE: _____

ADDRESS: The Equity Group, LLC
90 South Cascade Avenue, Suite 1500
Colorado Springs, CO 80903

EL PASO COUNTY'S STATEMENT

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

BY: _____ DATE: _____
Jennifer Irvine, P.E.
County Engineer / ECM Administrator

CONDITIONS:

**FINAL DRAINAGE REPORT
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CROSSROADS MIXED USE**

TABLE OF CONTENTS

PURPOSE	4
PROPERTY DESCRIPTION	4
SOILS	5
FLOODPLAIN STATEMENT	5
PREVIOUS STUDIES	5
HYDROLOGIC CALCULATIONS	6
HYDRAULIC CALCULATIONS	7
DRAINAGE CRITERIA	7
HISTORIC DRAINAGE CONDITIONS	7
EXISTING DRAINAGE CONDITIONS	9
FOUR STEP PROCESS	11
PROPOSED DRAINAGE CONDITIONS	11
WATER QUALITY PROVISIONS AND MAINTENANCE	16
EROSION CONTROL	16
DRAINAGE & BRIDGE FEES	17
CONSTRUCTION COST ESTIMATE	17
SUMMARY	17
REFERENCES	18

APPENDIX

Vicinity Map
Soils Map
FIRM Panels
Hydrologic Calculations
Hydraulic Calculations
Background
Drainage Maps

FINAL DRAINAGE REPORT FOR CROSSROADS MIXED USE

Purpose

This Final Drainage Report for Crossroads Mixed Use is in support of the Final Plat, Preliminary Plan, and Construction Drawings of the subject site. This report functions to identify the existing and proposed runoff patterns and recommend proposed drainage improvements which are intended to safely convey runoff through the proposed development, while minimizing impacts to downstream facilities and adjacent properties.

The Final Plat, Preliminary Plan, and Construction Drawings for this site will be submitted concurrently with this report. Individual drainage letters and/or reports shall be required with the development of each lot not otherwise clearly analyzed by this report for Crossroads Mixed Use. This report is subject to changes dependent upon future lot development. In such case, an updated report and accompanying drawings shall be submitted.

Project Location and Description

The subject site is located at 0 Meadowbrook Parkway in the southwestern quarter of Section 8, Township 14 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The 29.04 Acre site is currently undeveloped. The site is bound to the west by undeveloped Softball West Subdivision Filing No.2, to the north by Meadowbrook Crossing Subdivision, south by Highway 24, and to the east by Newt Drive.

The proposed site is will be developed into ten (10) commercial lots, one (1) multifamily residential and three (3) tracts. The development will extend Meadowbrook Parkway to the west and will include a single lane roundabout to be constructed at the intersection of the Meadowbrook Parkway and Newt Drive. The property is within the commercial aviation district overlay. A concurrent rezone application has been submitted to rezone 12.703 acres from CR to the RM-30 Zone.

The majority of the existing site is covered with native grasses with fair to good cover, the exception being portions of the future Meadowbrook Parkway corridor where exposed soils are present. Known earthwork operations for “borrow material” have occurred over a small area of the eastern portion of the site in early to mid 2019, but have since stabilized. A few dirt paths/trails are present along the far west end of the site, likely from recreational vehicles. Generally, the site slopes from east to west slightly greater than 1% with some localized depressions and general terrain undulations near the west boundary that have slopes ranging from 1- 20%. Some of these may be the results of previous earthwork activities. The site lies within the Sand Creek Drainage Basin. No existing drainage facilities or improvements are onsite. No known irrigation systems or wells are present.

Soils

Soils in the project area have been determined to be Blakeland Loamy Sand (8) and Blendon Sandy Loam (10), which are characterized to be part of Hydrologic Soil Types "A" & "B" as determined from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) "Web Soils Survey". A soils map illustrating the site location and soil types is provided in the appendix of this report.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Nos. 08041C0754 G & 08041C0752 G, effective date December 7th, 2018, none of the site lies within a designated floodplain. A copy of these annotated maps can be found in the appendix. The Sand Creek East Fork Channel is located to the northwest of the adjacent Meadowbrook Crossing subdivision.

Previous Studies

The area which encompasses Crossroads Mixed Use has been previously studied. Below is a short outline of the assumptions regarding the lands of the subject site and those based upon the previously assembled and approved drainage reports and how the assumptions within them impact the subject site.

"Sand Creek Drainage Basin Planning Study, Preliminary Design Report", prepared by Kiowa Engineering Corporation, dated January 1993, revised March 1996.

- Establishes that the subject site falls within the East Fork Sand Creek Drainage Basin, a portion of the larger Sand Creek Watershed
- Establishes that there are no requirements for major infrastructure improvements and subsequently no drainage-improvement related reimbursements with the development of this parcel
- Drainage fees shall be required to plat the subdivision

"Claremont Business Park Filing No.2 prepared by Matrix Design Group, revised November 2006

- Establishes the drainage patterns of offsite Basins 0S-4 and E2 which are to be conveyed within the Meadowbrook Rights of Way
- Established up-gradient offsite drainage to be directed under Meadowbrook north to offsite East Fork Sand Creek Channel, and away from the subject site

"Final Drainage Report, Lot 1 24/94 Business Park Filing No.1 prepared by Core Engineering Group, dated July 14, 2016

- The development of the 24/94 Business Park FDR shows future curb inlets along the future

Meadowbrook Parkway extension on the south and west corners of the intersection to capture runoff from up-gradient watersheds in addition to a proposed inlet which was to be located above the intersection at the northwest corner of the subject site.

- Establishes that flows from the parcel upstream of the convenience store (29/94 FDR Basin OS4) EX-B now to be collected by the extension of a 36" RCP along the south side of Meadowbrook Parkway. Runoff within the right of way/roadway separated out as Basin EX-A2.
- Continues assumption that flows from Newt Drive be conveyed north to East Fork Sand Creek.
- Evaluated pre-development drainage patterns for subject site including direct discharge flow rates to the CDOT rights of way of 1.9 and 14.5 cfs for the 5 and 100 year events, respectively. (Basin EX-E).

"Preliminary and Final Drainage Report Meadowbrook Crossing Filing No. 1 and Filing 2, El Paso County, Colorado prepared by Kiowa Engineering Corporation, dated July 25, 2017

- Proposed the installation of a future 10' Type R inlet at the southeast corner of Newt Drive and Meadowbrook Parkway with the extension of Meadowbrook Parkway to the west (along the northern boundary of the subject site). The inlet was to function to collect offsite runoff from a portion of the south half of Meadowbrook Parkway and Newt Drive north of Hwy 24. Intercepted runoff would be conveyed via a proposed 24" storm sewer to the existing storm sewer system within the Meadowbrook Crossings development.
- Proposed the installation of a 10' Type R inlet at the west end of future Meadowbrook Parkway. The inlet was to collect runoff from the north half of the future roadway. An 18" storm drain was proposed to convey collected runoff to the existing water quality pond located within the Meadowbrook Crossings Development. The report indicates a separate forebay or the modification of an existing forebay would be required.
- Shifted the location of the existing 10' Type R curb inlet to be installed upstream of the intersection of Newt Drive (as shown with the 24/94 Business Park FDR), flows in excess of the inlet capacity are to continue within the future Meadowbrook.

"Final Drainage Report for Meadowbrook Dirt Borrow Site, El Paso County Colorado, prepared by M&S Civil Consultants, November 2018.

- Evaluated onsite drainage patterns
- Excluded offsite runoff impacts from areas to the east of site.
- Allowed site to be utilized as a "borrow site" for offsite earthwork activities.

Hydrologic Calculations

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

Hydraulic Calculations

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report. Hydraulic grade line calculations shall be provided with the Final Drainage report.

Drainage Criteria

This drainage analysis has been prepared in accordance with current El Paso County Drainage Criteria Manual and, where applicable, City of Colorado Springs and Mile High Flood District Criteria Manuals. Calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres. See Appendix for supporting calculations.

Historic (Pre-Grading) Drainage Characteristics

The historic drainage patterns discussed within this report reflect the site conditions prior to the approval of the 2018 Meadowbrook Dirt Borrow Site Grading and Erosion Control Plan. This 'historic condition' generally coincides with the existing condition analysis and mapping that accompanied that project's hydrologic analysis.

The following excerpt is from the existing Drainage Characteristics section of the Final Drainage Report for Meadowbrook Dirt Borrow Site, El Paso County, Colorado, by M&S Civil Consultants and adequately describes the general site characteristics prior to grading.

"Site vegetation is sparse, consisting primarily of native grasses and weeds. The parcel possesses a ridgeline that bisects the parcel, directing runoff to the south and west boundaries, with slopes varying from 1% to 20%. A few small depressions are located on site, near the west boundary. For the purposes of hydrologic analysis, the small depressions are not considered to detain runoff."

Given the increase in breadth and scope of this study, significant consideration of the impacts of offsite drainage from the adjacent developments will be evaluated. This includes drainage from a small portion of Hwy 24 which combines with flows within existing from portions of Newt Drive. Runoff from this offsite area combines with by-pass flows from two inlets located within existing Meadowbrook Drive, prior to entering the site at its northeast corner. Runoff from these locations ultimately combines with onsite flows within the proposed Meadowbrook Parkway corridor, prior to discharging to downstream properties.

The detailed description of the historic (pre-grading) condition is as follows. Please refer to the historic conditions drainage map which is provided within the appendix of this report.

Historic Conditions - Detailed Drainage Discussion

Design Point 1

Basin E2 (Claremont Business Park Filing No.2) consists of a reported 3.86 developed acres of development located along the southeastern half of existing Meadowbrook Parkway, some 1200' northeast of the subject site. Runoff produced by the offsite development (CBPF2 Lot 46) is conveyed to Meadowbrook Parkway at flow rates of $Q_5=15.1$ and $Q_{100}=28.6$ cfs in the 5 and 100-year storm events respectively. The collected flows combines with runoff from **Basin EX-A2 (Lot 1 24/94 Business Park Filing No.1)** ($Q_5=2.5$, $Q_{100}=4.5$ cfs) which consists of 0.59 acres of the southeastern half of Meadowbrook Parkway, and is located immediately east of existing Newt Drive. The collected flows from the two basins culminate at **Design Point 1** at peak rates of $Q_5=14.2$ and $Q_{100}=26.5$ cfs. An existing 10' CDOT Type R at-grade inlet (**Inlet 1**) intercepts flows of $Q_5=8.4$ and $Q_{100}=11.1$ cfs, with subsequent by-pass flows of 5.8 and 15.4 cfs in the 5 and 100 year events. Surface flows continue west within the south half of existing Meadowbrook Parkway.

Design Point 2

Basin OS-A (Meadowbrook Crossing Filing 1 and 2) consists of 1.29 acres of the northern half of existing Meadowbrook Parkway located immediately east of Newt Drive. Runoff produced within this basin totals $Q_5=3.1$ and $Q_{100}=6.0$ cfs. An existing 10' CDOT Type R at grade inlet (**Inlet 2**) collects runoff of $Q_5=3.1$ and $Q_{100}=5.3$ cfs, with subsequent by-pass flows in only the 100 year event of 0.7 cfs. Runoff leaving the design point continuing west within the north half of existing Meadowbrook Parkway.

Design Point 3

Basin OS-1 consists of approximately 1.28 developed acres of existing Newt Drive located along the eastern boundary of the site. Runoff produced within the basin ($Q_5=5.8$ cfs, $Q_{100}=10.5$ cfs) combine with flow-by from **DP1** in the intersection at peak flow rates of 9.8 cfs, and 22.5 cfs in the 5 and 100-year storm events.

Surface runoff and by-pass flows from both **DP2** and **DP3** enter **Basin A** in the undeveloped rights of way of future Meadowbrook Parkway, at the northeast corner of the site.

Design Point 4

Basin A consists of 12.88 undeveloped acres located along the northern boundary that drains from east to west across the subject site. Runoff produced by this basin ($Q_5=1.9$ cfs, $Q_{100}=14.2$ cfs) combine with flows from **DP2** and **DP3**. The cumulative runoff at **DP4** of $Q_5=7.4$ cfs, $Q_{100}=27.7$ cfs discharges onto the adjacent property (Lot 1, Softball West Subdivision 2) along the western boundary of the site, approximately 250' to south of the northern property line.

Design Point 5

Basin B consists of 13.63 undeveloped acres located along the western side of the subject site. Runoff produced by the basin generally flows from northeast to southwest, discharging onto the adjacent property (Lot 2, Softball West Subdivision 2) approximately 200' north of the southern property line. Runoff reaching the boundary at **DP5** are calculated at 8.3 cfs and 18.2 cfs in the 5 year and 100 year events respectively.

Design Point 6

Basin C currently consists of 5.89 undeveloped acres located along the southern boundary of the site. Runoff produced within the basin travels east to west as sheet flow before eventually discharging into the existing barrow ditch which travels along the US HWY 24 CDOT right of way. Peak runoff rates reaching the subdivision boundary at **DP6** are calculated at 1.2 cfs and 8.5 cfs in the 5 year and 100 year events respectively.

Design Point 7

Basin OS-2 consists of 4.98 acres of a portion of the northern half of the US HWY 24 roadway and the adjoining, native, grass-lined barrow ditch. Runoff produced within the basin combines with flows from the subject site at cumulative peak runoff rates of 10.4 and 31.9 cfs in the 5 and 100 year storm events at **DP7**. A modeled hydraulic cross section of the ditch section at **DP7** calculates flow depths of 0.76 feet traveling at a velocity of approximately 3.54 feet per second. Input parameters for this analysis can be found in the Hydraulics section of the Appendix.

Runoff from **Design Points 4 and 5** ultimately combine with the flows from **DP7** within the barrow ditch of US Hwy 24 several hundred feet downstream of the subject site. An existing 36" RCP culvert located at the interchange of HWY 24 and Peterson Road aids in conveying a portion of the runoff from the subject site and adjacent offsite areas under the roadway. Flows in excess of the culverts carrying capacity, overtop the roadway before rejoining within a subsequent drainage swale that parallels the west bound HWY 24 on-ramp. Ultimately flows discharge into the East Fork of the Sand Creek via an existing riprap rundown. Site visits conducted by M&S Civil at the time of the writing of this report, found no significant signs of erosion or deposition along the aforementioned corridor.

A Drainageway Exhibit in the appendix of this report provides an aerial illustration of the aforementioned conveyance route to the channel, which will also serve to function as the emergency overflow path for the proposed site development.

Existing Drainage Characteristics

The subject site has been utilized as a "borrow site" to provide surplus earthwork to offsite developments in the area. This recent grading effort occurred during the spring and summer of 2019. At the request of El Paso County, an existing conditions drainage analysis has been provided to show the changes to the topography and drainage patterns as a result of this effort. As the only changes between the two conditions are onsite, the offsite drainage patterns calculations and

assumptions determined within the historical analysis will remain the same. It should be noted that the subject site was not disturbed to the full extent of the approved plan, with limited excavation primarily occurring within the eastern side of the subject site.

In the existing condition, vegetation remains sparse, consisting primarily of native grasses and weeds with good to fair cover. Areas disturbed by grading activities were reseeded and have since stabilized. With regards to historic versus existing drainage basin delineation, the bisecting parcel ridgeline has been relocated further to the south, which results in redirecting more of the runoff to the southwestern part of the site and less to the CDOT rights of way. The few small depressions remain on site, near the west boundary. For the purposes of hydrologic analysis, these small depressions will continue to not be evaluated for their ability to detain runoff. Ultimately, all runoff from the parcel is conveyed to the west towards existing drainage facilities located under Peterson Road and ultimately the East Fork of Sand Creek as in the historic condition.

This section only discusses the changes in basin geometry and drainage pattern and provides a direct comparison of the historic versus existing conditions, utilizing the same outfall (design) points, which have remained undisturbed.

Design Point 4

Basin A currently consists of 11.02 acres which continues to drain from east to west eventually discharging along the western boundary of the site, approximately 250' south of the northern property line. Peak runoff, post grading, has decreased to 7.1 and 25.5 cfs as compared to the historic condition flow rates of 7.4 and 27.7 cfs in the 5-year and 100-year events respectively.

Design Point 5

Basin B currently consists of 17.31 acres that drains from northeast to southwest, eventually discharging along the western boundary of the site, approximately 200' north of the southern property line. Peak runoff rates at this location are also than lower than the historic conditions with post grading flows of 5.0 cfs and 14.5 cfs, as compared to 8.3 cfs and 18.2 cfs in the 5-year and 100-year events respectively. Despite the basin currently being larger in area than in the historic condition, a decrease in the peak flow rates occurs as a result of a longer flow path to the given design point.

Design Point 6

Basin C consists of 3.99 undeveloped acres that drains from east to west into the US HWY 24 Right of Way at the southern boundary of the site. The peak runoff at this location is less than the historic condition at an estimated 0.9 and 6.3 cfs, as compared to 1.2 and 8.5 cfs in the 5-year and 100-year events, respectively.

Design Point 7

Basin OS-2 consists of 4.98 acres of the northern half of the US HWY 24 roadway and adjoining native grass lined barrow ditch. Runoff produced within the basin combines with runoff from the subject site at lower cumulative peak runoff rates of 9.9 and 28.0 cfs in the 5 and 100-year storm events at **DP7** as compared to 10.4 and 31.9 cfs in the historic condition.

Four Step Process

Step 1 Reduce Runoff By Disconnecting Impervious Area, Eliminating Unnecessary Impervious Area And Encouraging Infiltration Into Soils That Are Suitable – Approx. 2.54 acres of the proposed development is being set aside for a Full Spectrum Detention (FSD) Pond. Whenever possible, runoff produced within developable area containing impervious surfaces will be routed through landscaped areas or earthen swales (grass-lined where slope exceeds 2%) to minimize direct connection of impervious surfaces. In the interim, runoff will be reduced through the use of (4) temporary sediments ponds until the ground has been stabilized with vegetation or permanently developed.

Step 2 Treat And Slowly Release the WQCV – A Full Spectrum Detention Pond is proposed to reduce peak discharge rates and provide water quality treatment. In the interim stage, four (4) temporary Sedimentation Ponds are provided to collect sediment for the disturbed area; this will function to maintain existing water quality levels during construction and prior to permanent development.

Step 3 Stabilize Stream Channels– The site will use a Full Spectrum Detention (FSD) Pond to control developed runoff that is discharging into an existing CDOT ROW roadside ditch and ultimately into Sand Creek. The FSD outlet structure will be designed to drain the water quality event storm in 40 hours, while reducing the 100 year peak discharge to approximately 90% of the predevelopment conditions. As the flow is discharged offsite, it continues southwest in CDOT's manmade roadside ditch until it reaches Peterson Road. From here, it is conveyed to the other side of the road, into a similar earthen channel, via a 36" CMP culvert. The drainage continues southwest in the right of way, until it reaches the East Fork Sand Creek Channel. Existing rip rap barriers are lined throughout this portion of the pathway approximately every 90-100 feet within the ditch to the channel bank. The Drainageway Exhibit provided in the Drainage Maps section of the Appendix provides a visual representation of this information.

The development of this site is not anticipated to have negative effects on downstream drainage ways since flows released will be below historic rates. In the interim, the site proposes four temporary sedimentation ponds, before discharging at the southwest property corner of the site and onto an adjacent undeveloped property via riprap-lined spillways. This ensures that in this stage of the development negative effects on the downstream drainage ways will be avoided.

Step 4 Implement Source Controls – The proposed development will implement a Stormwater Management Plan including property housekeeping practices and spill containment procedures.

Proposed Drainage Characteristics

The proposed site is will be developed into ten (10) commercial lots, one (1) multifamily residential and three (3) tracts. The proposed development will extend Meadowbrook Parkway to the west and will include a single lane roundabout to be constructed at the intersection of the Meadowbrook Parkway and Newt Drive to aid in traffic control. A proposed private looped roadway, consisting

of Crossroad Heights, Southern Rail Point, and Pacific Rail Point will extend into the site to provide access and a utility corridor to both the commercial and residential developments. At this time, it is anticipated that the development and design of Lot 11 (by others) is planned to occur concurrently with the construction of the proposed utilities and infrastructure provided by this plan. Coordination is ongoing, and as such, the routing of the storm sewer main line thru the site and the planned outfall locations will be formalized with the Final Drainage Report. A separate drainage letter or report will be required for that portion of the development.

The following summary generalizes the proposed drainage patterns and drainage improvements required to safely route developed runoff to downstream facilities.

A storm sewer pipe and inlet will be constructed at the southwest corner of the newly constructed roundabout to aid in collecting runoff reaching the site from offsite watersheds. These facilities will connect to the existing system located inside the existing Meadowbrook Subdivision. Bypassed flows and developed flows within the newly constructed Meadowbrook Parkway will be collected by a pair of sump inlets located at the west end of the roadway. The drainage facilities located with the rights of way will be public and all remaining onsite storm sewer and drainage improvements shall be private. A private looped roadway will provide access and utility corridors for development. Private storm sewer mains, stubs, and inlets will be extended along these corridors to serve the development. The extension of these facilities beyond what is shown by this plan is likely with future development. Runoff collected by the infrastructure will be conveyed to a single full spectrum detention pond located in the southwest corner of the subdivision. The proposed outfall from the pond is planned to discharge into the existing barrow ditch located with the north half of the existing CDOT Right of Way. A drainage easement will be required from CDOT for the outfall and slope protection facilities that fall within the corridor. It should be noted that the storm outfall will be shaped into the existing hillside and any soil riprap protection will be buried. Runoff leaving the site and entering the CDOT corridor will discharge at less than historic rates. The previous discharge points along the west boundary of the subject site, which also previously contributed to the barrow ditch will be virtually eliminated, further reducing the peak flow rates to downstream facilities.

Proposed Detailed Drainage Discussion

Design Point 1

Basin E2 (Claremont Business Park Filing No.2) consists of a reported 3.86 developed acres of development located along the southeastern half of existing Meadowbrook Parkway some 1200' northeast of the subject site. Runoff produced by the offsite development (CBPF2 Lot 46) is conveyed to Meadowbrook Parkway at flow rates of $Q_5=15.1$ and $Q_{100}=28.6$ cfs in the 5 and 100-year storm events respectively. The collected flows combines with runoff from **Basin EX-A2 (Lot 1 24/94 Business Park Filing No.1)** ($Q_5=2.5$, $Q_{100}=4.5$ cfs) which consists of 0.59 acres of the southeastern half of Meadowbrook Parkway located immediately east of existing Newt Drive. The collected flows from the two basins culminate at **Design Point 1** at peak rates of $Q_5=14.2$ and $Q_{100}=26.5$ cfs. An existing 10' CDOT Type R at-grade inlet (**Inlet 1**) intercepts flows of $Q_5=8.4$

and $Q_{100}=11.1$ cfs, with subsequent by-pass flows of 5.8 and 15.4 cfs in the 5 and 100 year events. Surface flows continue west within the south half of existing Meadowbrook Parkway.

Design Point 2

Basin OS-A (Meadowbrook Crossing Filing 1 and 2) consists of 1.29 acres of the northern half of existing Meadowbrook Parkway located immediately east of Newt Drive. Runoff produced within this basin totals $Q_5=3.1$ and $Q_{100}=6.0$ cfs. An existing 10' CDOT Type R at grade inlet (**Inlet 2**) collects runoff of $Q_5=3.1$ and $Q_{100}=5.3$ cfs, with subsequent by-pass flows in only the 100 year event of 0.7 cfs. Runoff leaving the design point continuing west within the north half of existing Meadowbrook Parkway.

Design Point 3

In accordance with the assumptions outlined within the Meadowbrook Subdivision Final Drainage Report, an offsite public storm sewer pipe and inlet will be constructed at the southwest corner of the proposed roundabout to aid in collecting runoff from a portion of the offsite watershed located to the east of the site. A new manhole may be required to connect the outfall to the existing pipe located inside the existing Meadowbrook Subdivision. As this area is already paved, increases to the imperviousness of this area are not anticipated.

Basin OS-1 consists of approximately 1.40 acres of existing Newt Drive that will be retrofitted with new raised median as part of an intersection conversion to a roundabout. Runoff produced within the basin ($Q_5=6.4$ and $Q_{100}=11.5$ cfs) will combine with flow-by from **DP1** at a proposed public 10'a-grade inlet located at DP3. A proposed public 24" storm sewer (**PR1**) will convey water across the intersection to the existing 42" storm sewer with Meadowbrook Crossings in accordance with that subdivision's drainage report. A new larger manhole may be required to make the connection to the existing line. It is important to note that this connection remains feasible as the roundabout is not anticipated to significantly increase the overall imperviousness of the area above that of the existing condition. Runoff in excess of the inlet capacity ($Q_5=3.5$ and $Q_{100}=13.5$ cfs) will continue westward via the curb and gutter of Proposed Meadowbrook Parkway.

Design Point 4

Basin A consists of 1.67 acres of the north half of proposed Meadowbrook. Runoff within this basin ($Q_5=6.5$ and $Q_{100}=11.6$ cfs) combines with minor flow by from **DP2** for total flows of 6.5 and 12.4 cfs in the 5 year and 100 year events, respectively. A proposed 15' at grade inlet located at the west end of the roadway, just before the proposed temporary cul-de-sac, is anticipated to intercept all of the minor event flows, conveying them to **PR1.5**, a 24" RCP public storm sewer. 1.9 cfs of flowby in the 100 year event continues west towards **Inlet 4.5**, a **NEENAH R-6116** grated manhole lid and frame at the low point of the cul-de-sac. Supporting calculations for this non-standard inlet are provided in the Appendix. This inlet will convey the rest of the runoff ($Q_{100}=1.9$ cfs) underneath the roadway via a public 24" storm sewer (**PR2**). The NEENAH inlet is to be removed and replaced with a standard CDOT 5' Type R inlet when the roadway cul de sac is removed and the roadway is extended to the west with future development.

Design Point 5

Basin B consists of 1.48 acres of the south half of proposed Meadowbrook Parkway. Runoff produced within this basin ($Q_5=5.8$ and $Q_{100}=10.3$ cfs) combines with flow-by leaving **DP3**. A proposed public 15' sump inlet (**Inlet 5**) located at west end of the roadway will prevent developed flows from leaving exiting the roadway corridor. The intercepted runoff of 9.8 cfs and 25.8 cfs in the 5 and 100-year events will combine with **PR2** flows in a 36" private storm sewer system (**PR3, by others**). Combined flows within the proposed system are calculated to reach peak rates of 16.4 and 38.5 cfs. The storm sewer system is to be planned by others through the multi-family site (Lot 11) but ultimately will tie back into the system at **DP15**.

Design Point 6

Basin C consists of 4.61 acres of commercial lots (1-5 and portions of lot 6) located along the east side of the site. Earthen swales are proposed to convey flows along the basin edge to the proposed depression. Rip rap is proposed at the terminus and will protect the slopes of the depression. A private 30" storm sewer (**PR4-PR6**) is provided to collect flows of $Q_5=18.7$ and $Q_{100}=34.5$ cfs at **DP6** in the 5 and 100-year storm event, respectively. Intercepted flows are conveyed west underground within the roadway tract.

Design Point 7

Basin D consists of 2.22 acres of commercial lots located between Meadowbrook Parkway and the looped roadway. **Basin D**, which includes portions of Lots 9 and 10, will require a private 24" storm drain (**PR8**) to collect flows of $Q_5=9.3$ and $Q_{100}=17.0$ cfs in the 5 and 100 year storm events, respectively. Earthen swales are proposed to convey flows along the basin edge to the proposed depression. Rip rap is proposed at the terminus of the swale and will protect the slopes of the depression.

Design Points 8 and 9

Basin E consists of 2.71 acres of commercial lots and roadway located in the central portion of the site. Two private 10' CDOT Type R at-grade inlets (**Inlets 7 and 8**) located on the north and south sides of the roadway will each collect flows of 5.2 and 9.5 cfs in the 5 and 100 year storm events, respectively. Runoff bypassing the inlets continues to downstream infrastructure. Flows collected from the inlets will be conveyed to a box base manhole in the middle of the planned roadway via two private 30" (**PR9**) and 18" (**PR10**) storm drains. A proposed 36" private storm sewer (**PR11**) will then convey flows west underground at peak flow rates of 35.0 and 60.5 cfs in the 5 and 100-year events. **PR12**, a 42" private storm sewer, then directs the system south from another box base manhole.

Design Point 10

Basin G ($Q_5=2.1$, $Q_{100}=3.8$) cfs consists of 0.77 acres of multi-family lots and roadway located in the central portion of the site. A private 10' CDOT Type R sump inlet (**Inlet 8**) located on the west side of the street functions to collect the runoff from **Basin G**. **PR13**, a proposed 18" private storm sewer, will direct runoff east to a box base manhole at peak flow rates of 2.1 cfs and 3.8 cfs in the minor and major storm events, respectively.

Design Point 11

Basin G1 consists of 0.60 acres of commercial lots and roadway located in the central portion of the site. A private 15' CDOT Type R sump inlet (**Inlet 9**), located on the east side of the street functions to collect the runoff from **Basin G1** as well as any bypass flows from Design **DP8 and 9. PR14**, a proposed 30" private storm sewer, will direct runoff west to an underground box base manhole at peak flow rates of 3.6 cfs and 17.3 cfs in the minor and major storm events, respectively. From the junction, flows combine at **PR15** ($Q_5=39.4$, $Q_{100}=79.6$), a 42" private storm sewer, and are directed south.

Design Point 12

Basin F consists of 2.57 acres of commercial lots (Lot 8 and portions of Lot 7) located along the southern boundary of the site. An earthen swale is proposed to convey flows to the depression. A private 24" storm drain (**PR16**) is provided to collect flows of $Q_5=10.8$ and $Q_{100}=19.6$ cfs at **DP12** in the 5 and 100 year events, respectively. Intercepted flows are conveyed west underground to the main line, **PR17**, where they combine with flows from **PR15** at the manhole junction. **PR17 and PR18** (private 48" storm sewers) direct the collected runoff to the concrete forebay located within the east end of the proposed full spectrum detention pond at peak flow rates of $Q_5=49.1$ and $Q_{100}=97.4$ cfs.

Design Point 13

DP13 consists of a 2' bottom earthen swale that is designed to convey runoff from the proposed apartment site (Lot 11) to the northwest corner of the pond. A proposed 2' wide rip rap rundown with 2:1 side slopes will convey flows into the pond. The maximum runoff expected from the site is 2.0 and 7.5 cfs in the 5 and 100 year events, respectively. Calculations for the swale and rundown are included in the appendix of this report.

Design Point 14

DP14 represents the on-site portion of a proposed, v-shaped, earthen swale that collects flows not anticipated to be collected by storm sewer. Runoff collected within this swale (maximum $Q_5=0.6$ cfs, $Q_{100}=1.8$ cfs) is conveyed from north to south to the proposed FSD pond at **DP15**. Calculations for this swale are provided in the appendix of this report

Design Point 15

Basin J consists of 3.21 acres of the proposed Tract for the full spectrum detention pond. Runoff produced within this basin reaches peak runoff rates ($Q_5=2.3$ and $Q_{100}=10.0$ cfs) combines with flows from **DP14, PR18, and PR19** (48" RCP) in the pond. The cumulative flows at **FSD Pond 1** are $Q_5=97.0$ and $Q_{100}=206.9$ cfs. Flow exiting the pond will be routed to the existing 5' bottom earthen swale in CDOT's Right of Way at **DP16** via 18" private **PR20** ($Q_5=1.9$ and $Q_{100}=8.2$ cfs). A rip rap pad is provided as outlet protection.

Design Point 16

Basin OS-2 consists of 4.98 acres. Approximately half of this basin is comprised of the paved surface of U.S. Highway 24, while the other half is comprised of the 5 foot bottom earthen swale in CDOT's Right of Way. Runoff produced within this basin ($Q_5=8.7$ and $Q_{100}=19.6$ cfs) flows

from northeast to southwest, combining with flows from **DP15**. This combination of runoff collects in the existing swale in the right of way. The cumulative flows at **DP16** are $Q_5=9.9$ and $Q_{100}=27.7$ cfs, which are lower than the historic rates. Calculations for this swale are provided in the Appendix. Flows from this design point continue to downstream infrastructure. A rip rap pad is located at the terminus of the storm sewer, as previously mentioned in **DP15's** discussion.

Water Quality Provisions and Maintenance

The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the proposed development. This full spectrum detention pond will function to treat approximately 32.10 acres of 78.67% impervious, tributary area by providing 0.861 acre-feet of storage for the water quality event, 3.315 acre feet of storage at the EURV storm event, and 4.841 acre-feet of storage in the 100-year event. The 33' wide emergency spillway is designed with a foot of freeboard in the 100-year event. This spillway safely conveys flows to CDOT's Right of Way in the event of outlet clogging or failure, and will be armored with permanent erosion control fabric. The results show that the FSD pond remains functional in the 100-year event and the outlet structure is able to discharge flows to an existing swale and ultimately to Sand Creek. The sizing for the full spectrum detention facility has been determined using the guidelines set forth in the Urban Drainage and Flood Control District Criteria Manual. Refer to the UDFCD MHFD-Detention, Version 4.03, Excel Workbook located within the appendix of this report for calculations.

The proposed FSD pond will be privately owned and maintained by Crossroads Metropolitan District No.2. Access to the pond shall be granted to the owner/district and El Paso County for access and maintenance of the private facility. A private maintenance agreement document shall accompany this report submittal.

Erosion Control

It is the policy of the El Paso County that M&S Civil Consultants submit a grading and erosion control plan with the drainage report since pre-development grading is being requested. The plan includes proposed silt fence, vehicle tracking control, (4) temporary sediment basins, and straw bale barriers as proposed erosion control measures. The plan also includes provisions for stockpiling and staging. A stormwater management plan is provided to accompany the plans.

2021 Drainage & Bridge Fees:

Drainage Fees:	29.04	x	78.67%	x	20,387.00	=	\$ 465,756.67
Bridge Fees:	29.04	x	78.67%	x	8,339.00	=	\$ 190,510.86
Total							\$ 656,267.53

Drainage fees shall be paid at the time of platting.

Construction Cost Estimate (Non-Reimbursable)

Item	Amount	Unit	Unit Cost	Total Cost
10' CDOT Type R Inlet	4	EA	\$ 9,890.00	\$ 39,560.00
15' CDOT Type R Inlet	3	EA	\$ 13,002.00	\$ 39,006.00
Custom Grate Inlet	1	EA	\$ 5,000.00	\$ 5,000.00
Type I MH	8	EA	\$ 9,800.00	\$ 78,400.00
Type II MH	1	EA	\$ 6,000.00	\$ 6,000.00
Rip Rap Aprons	242	CY	\$ 65.00	\$ 15,730.00
18" SD	113	LF	\$ 45.00	\$ 5,085.00
24" SD	232	LF	\$ 81.00	\$ 18,792.00
30" SD	358	LF	\$ 100.00	\$ 35,800.00
36" SD	16	LF	\$ 124.00	\$ 1,984.00
42" SD	396	LF	\$ 166.00	\$ 65,736.00
48" SD	298	LF	\$ 202.00	\$ 60,196.00
Concrete Channel	2,416	SF	\$ 5.00	\$ 12,080.00
Outlet Structure	1	EA	\$ 15,000.00	\$ 50,000.00
Forebay	1	EA	\$ 8,000.00	\$ 8,000.00
TOTAL COST:	\$			441,369.00

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2021.

Summary:

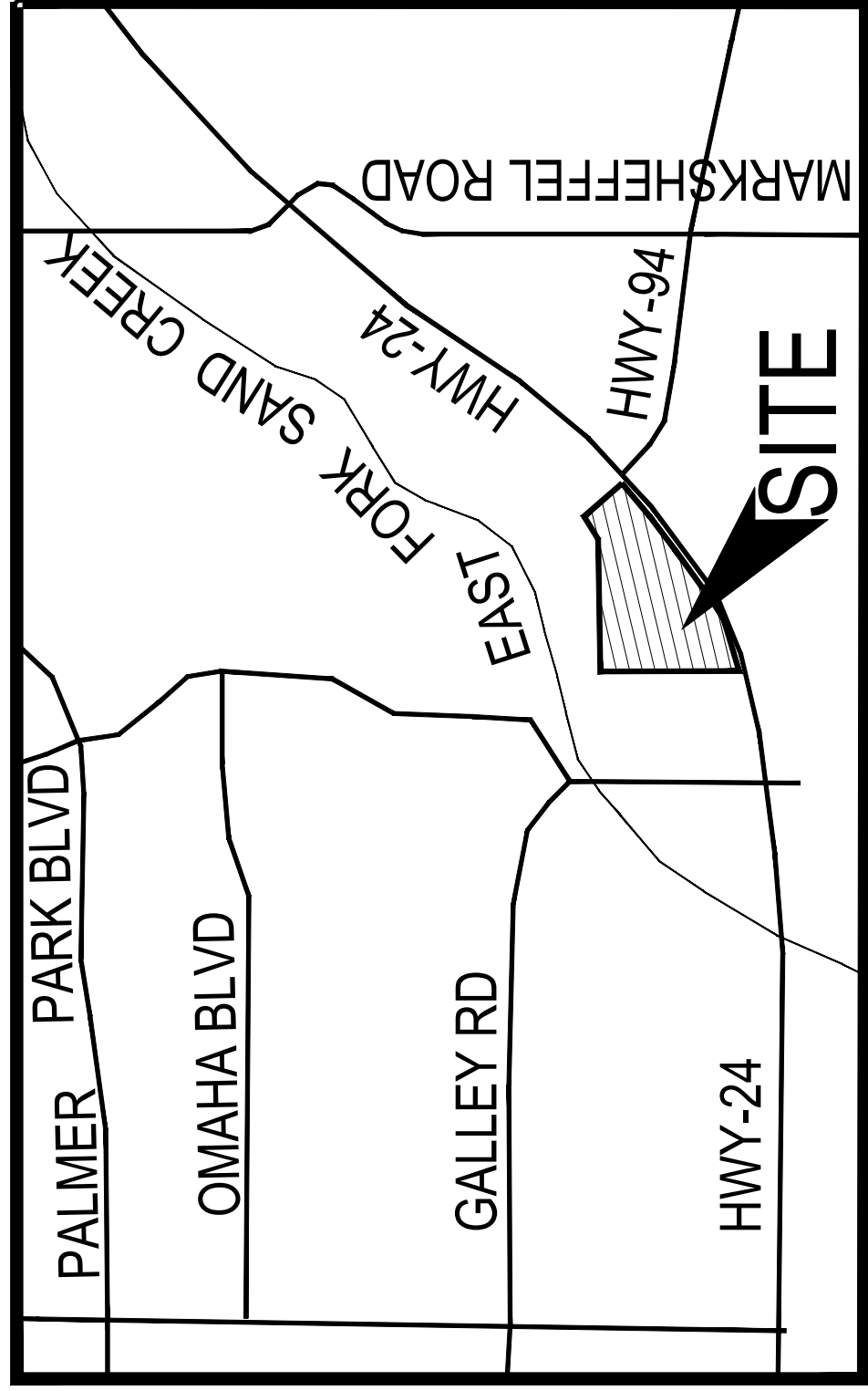
The construction of this site is for the purposes of creating commercial lots and an apartment site. The site will be graded and all disturbed areas will be seeded. Post construction runoff will be discharged to downstream property at rates that are below historic discharge rates. In the historic condition, the total flows leaving the site that reach the East Fork Sand Creek Channel are 19.0 cfs and 68.1 cfs in the 5 year and 100 year storm events, respectively. Through the strategic design and placement of storm sewer infrastructure components, the overall discharge rates are reduced to approximately 87% of the historic rates at 9.9 and 27.7 cfs in the proposed condition. Erosion control measures will be implemented to prevent sediment migration. The construction of Crossroads Mixed Use shall not adversely affect adjacent or downstream property. Subsequent drainage reports will be required when the site is developed behind the uses defined within this report.

References:

- 1.) "El Paso County and City of Colorado Springs Drainage Criteria Manual".
- 2.) "Urban Storm Drainage Criteria Manual"
- 3.) SCS Soils Map for El Paso County.
- 4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Revised date December 7th, 2018.
- 5.) "Final Drainage Report for Claremont Business Park Filing No. 2", dated November 2006, by Matrix Design Group, Inc.
- 6.) "Preliminary and Final Drainage Report Meadowbrook Crossing Filing 1 and Filing 2", dated July 25, 2017, by Kiowa Engineering Corporation.
- 7.) "Final Drainage Report Lot 1 24/94 Business Park Filing No. 1 on Platte Avenue and Meadowbrook Parkway", dated April 28, 2016 and revised July 14, 2016, by Core Engineering Group, LLC.
- 8.) "Final Drainage Report for Meadowbrook Dirt Borrow Site ", dated November 2018, by M&S Civil Consultants, Inc.
- 9.) "Sand Creek Drainage Basin Planning Study", revised March 1996, by Kiowa Engineering Corporation.

APPENDIX

VICINITY MAP

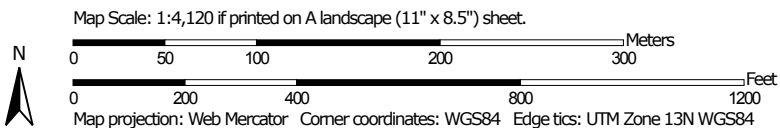


VICINITY MAP

N.T.S.

SOILS MAP

Soil Map—El Paso County Area, Colorado




**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

9/20/2018
Page 1 of 3


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 15, Oct 10, 2017

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

Date(s) aerial images were photographed: Jun 3, 2014—Jun 17, 2014

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
8	Blakeland loamy sand, 1 to 9 percent slopes	35.2	95.4%
10	Blendon sandy loam, 0 to 3 percent slopes	1.7	4.6%
Totals for Area of Interest		36.9	100.0%

FIRM PANELS

NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, NIMS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

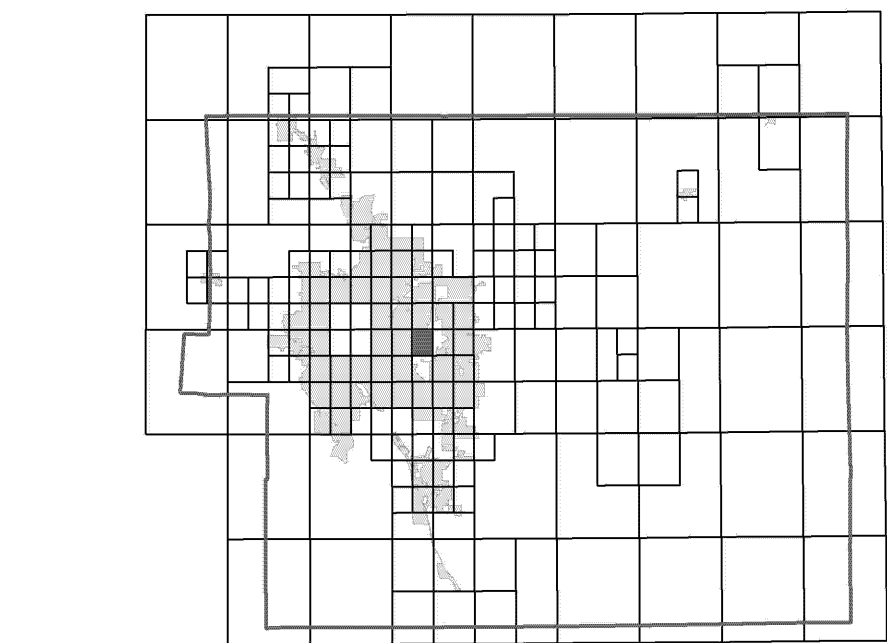
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

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

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

El Paso County Vertical Datum Offset Table	
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

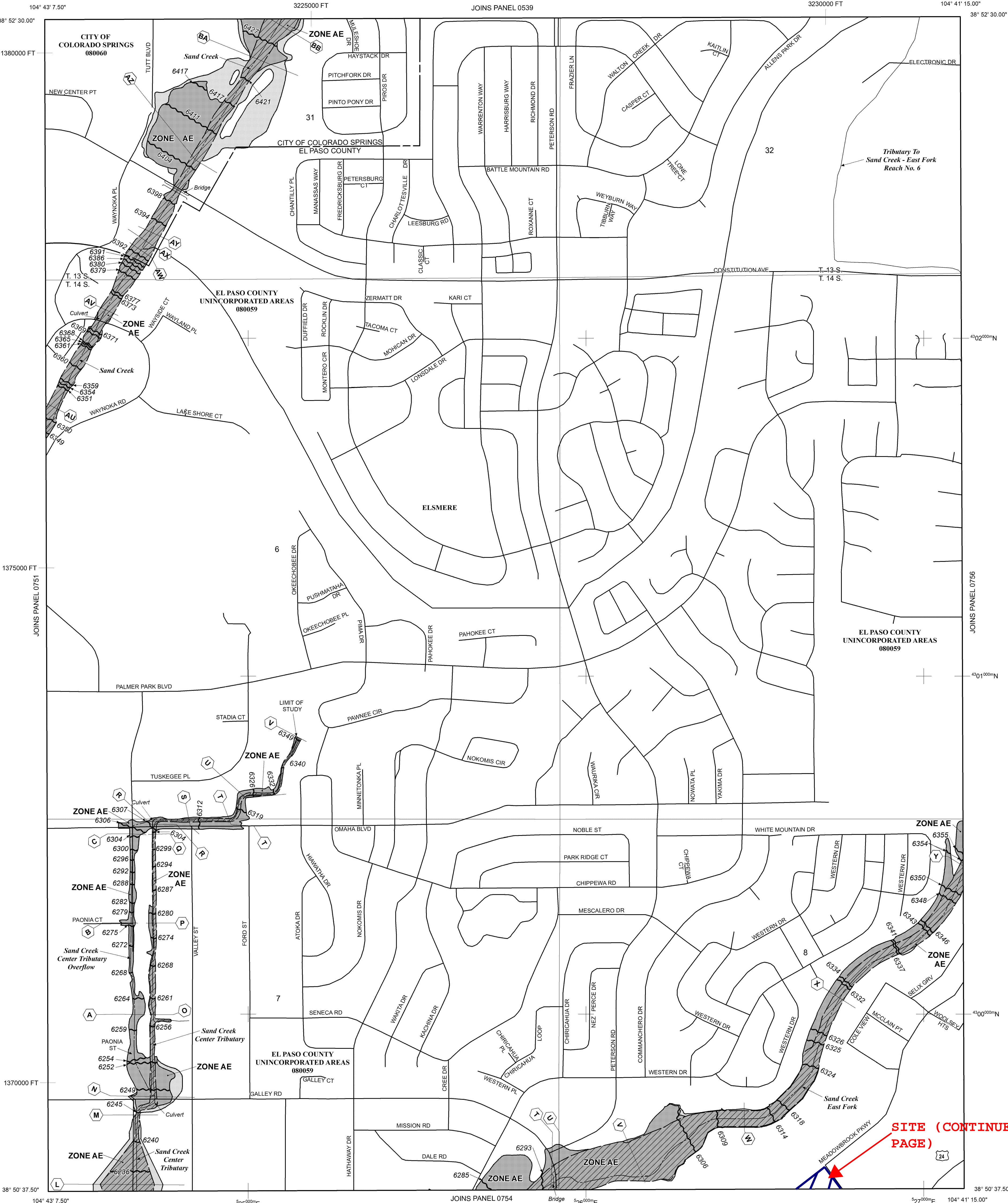
Panel Location Map



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



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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST, AND TOWNSHIP 14 SOUTH, RANGE 65 WEST.

LEGEND

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

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

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Legend Symbols:
Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Base Flood Elevation line and value; elevation in feet* (EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*
Cross section line
Transect line
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
1000-meter Universal Transverse Mercator grid ticks, zone 13
5000-foot grid ticks: Colorado State Plane coordinate system, central zone (RIPSONE 0502), Lambert Conformal Conic Projection
Bench mark (see explanation in Notes to Users section of this FIRM panel)
River Mile
MAP REPOSITORIES
Refer to Map Repositories list on Map Index
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

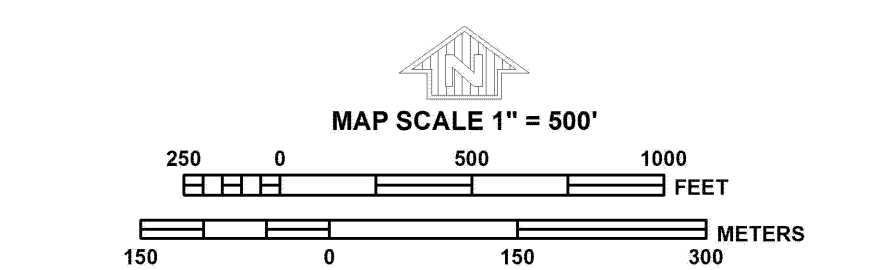
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Legend Symbols:
Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Base Flood Elevation line and value; elevation in feet* (EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*
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Transect line
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For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

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



PANEL 0752G

FIRM

FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 752 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	08060	0752	G
EL PASO COUNTY	08059	0752	G

Notice: This map was released on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice to User Letter that accompanied this correction for details.

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

MAP NUMBER
08041C0752G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOTES TO USERS

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NGS Information Services
NOAA, NIMS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

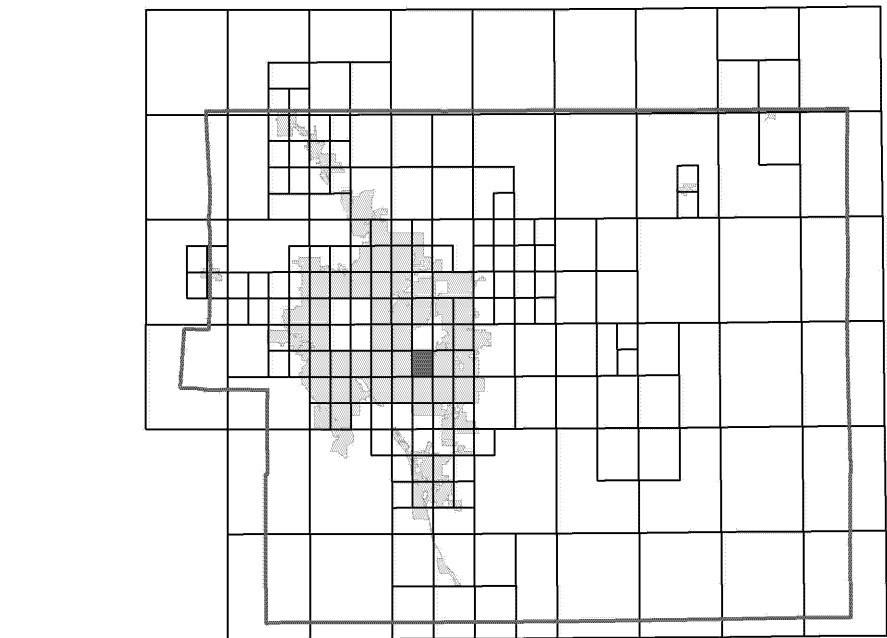
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

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

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

El Paso County Vertical Datum Offset Table	
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

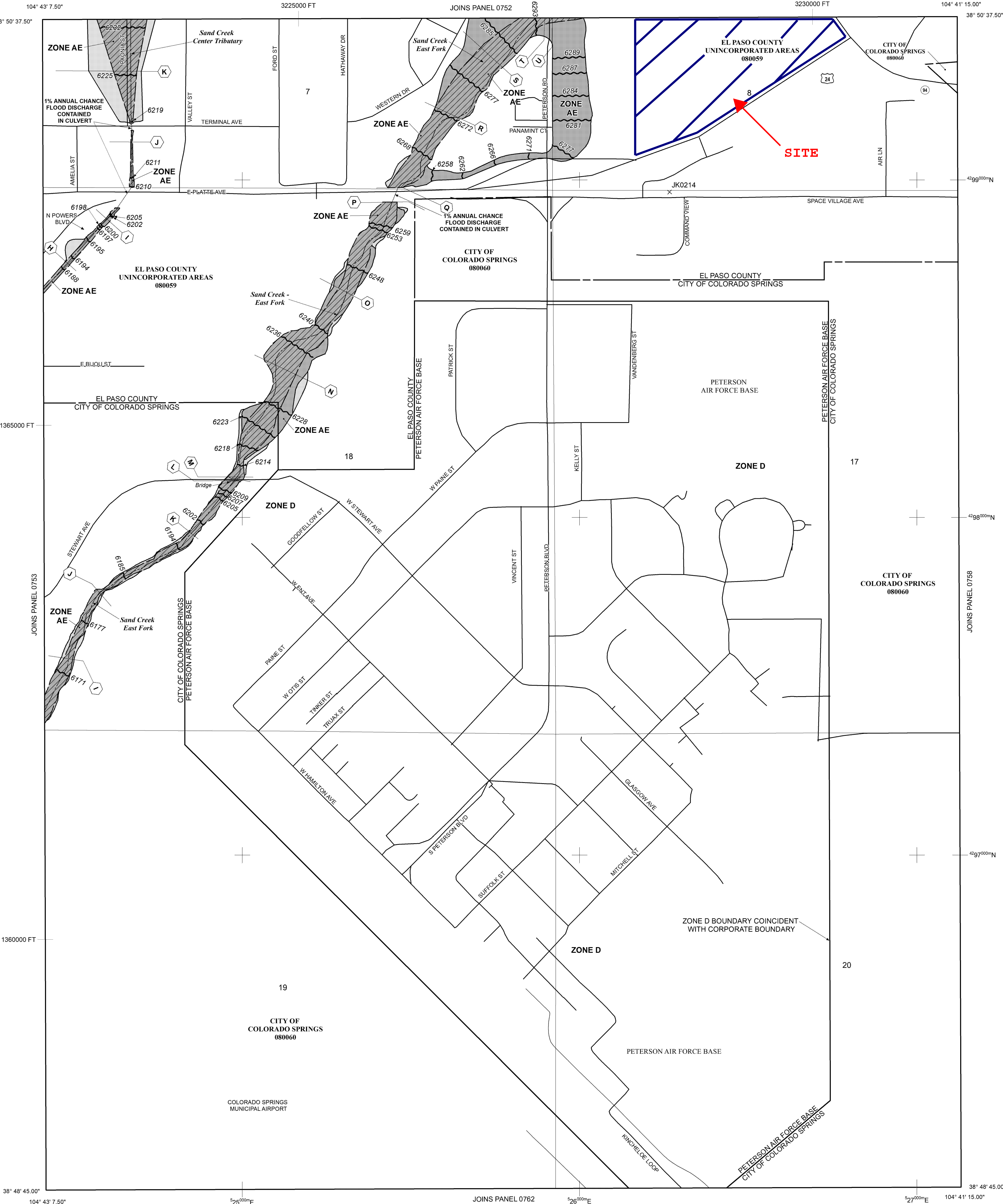
Panel Location Map



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



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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 65 WEST.

LEGEND

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

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

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet* (EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*

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

Cross section line

Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

River Mile

MAP REPOSITORIES

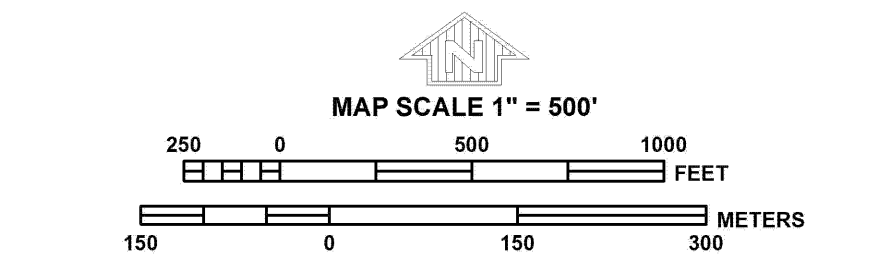
Refer to Map Repositories list on Map Index

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

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

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

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



PANEL 0754G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 754 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	08060	0754	G
EL PASO COUNTY	08059	0754	G

Notice: This map was reissued on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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



MAP NUMBER
08041C0754G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

Crossroads Mixed Use
FINAL DRAINAGE REPORT
(Historic Area Runoff Coefficient Summary)

			<i>STREETS / DEVELOPED</i>			<i>OVERLAND / DEVELOPED</i>			<i>WEIGHTED</i>	
BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	AREA (Acres)	C₅	C₁₀₀	AREA (Acres)	C₅	C₁₀₀	C₅	C₁₀₀
<i>C</i>	256383.3	5.89	0.00	0.90	0.96	5.89	0.08	0.35	<i>0.08</i>	<i>0.35</i>
<i>A</i>	561176.6	12.88	0.00	0.90	0.96	12.88	0.08	0.35	<i>0.08</i>	<i>0.35</i>
<i>B</i>	593693.4	13.63	0.00	0.90	0.96	13.63	0.08	0.35	<i>0.08</i>	<i>0.35</i>
<i>OS-1</i>	55560.16	1.28	1.28	0.90	0.96	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>OS-2</i>	216993.7	4.98	2.49	0.90	0.96	2.49	0.08	0.35	<i>0.49</i>	<i>0.66</i>
<i>EX-A2***</i>		0.59	0.59	0.90	0.96	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>OS-A**</i>		1.29	1.29	0.62	0.72	0.00	0.08	0.35	<i>0.62</i>	<i>0.72</i>
<i>E2*</i>		3.86	3.86	0.80	0.90	0.00	0.08	0.35	<i>0.80</i>	<i>0.90</i>

*FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2

***FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Crossroads Mixed Use

FINAL DRAINAGE REPORT

(Historic Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T_t)		INTENSITY ^		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C ₅	C ₁₀₀	C ₅	Length (ft)	Height (ft)	T _C (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	CHECK (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)
		From DCM Table 5-1															
<i>C</i>	5.89	0.08	0.35	0.08	300	9	22.2	500	2.0%	1.0	8.4	30.6	14.4	2.5	4.1	1.2	8.5
<i>A</i>	12.88	0.08	0.35	0.08	300	13	19.7	1350	1.6%	0.9	25.2	44.8	19.2	1.9	3.2	1.9	14.2
<i>B</i>	13.63	0.08	0.35	0.08	300	11	20.8	750	1.7%	0.9	13.7	34.5	15.8	2.3	3.8	2.5	18.2
<i>OS-1</i>	1.28	0.90	0.96	0.90	100	3	2.5	490	2.2%	3.0	2.8	5.3	13.3	5.1	8.5	5.8	10.5
<i>OS-2</i>	4.98	0.49	0.66	0.49	85	8	4.8	1165	1.8%	2.0	9.6	14.5	16.9	3.6	6.0	8.7	19.6
<i>EX-A2***</i>	0.59	0.90	0.96	0.90	10	0.2	0.9	916	1.9%	2.7	5.6	6.5	15.1	4.8	8.0	2.5	4.5
<i>OS-A**</i>	1.29	0.62	0.72	0.62	40	0.8	4.4	1310	1.9%	2.8	7.9	12.3	17.5	3.8	6.4	3.1	6.0
<i>E2*</i>	3.86	0.80	0.90	0.80	50	1	3.0	400	1.3%	2.3	2.9	6.0	12.5	4.9	8.2	15.1	28.6

^ Intensity equations assume a minimum travel time of 5 minutes.

*VALUES DERIVED USING DATA FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**VALUES DERIVED USING DATA FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2 PAGE 31

***VALUES DERIVED USING DATA FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Calculated by: CVW

Date: 2/23/2021

Checked by: DLM

Crossroads Mixed Use

FINAL DRAINAGE REPORT

(Historic Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T _t)		INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA ₅	CA ₁₀₀	C _s	Length (ft)	Height (ft)	T _C (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)		
1	E2 EX-A2	3.09	3.47				6.0	916	1.9%	2.7	5.6	11.6	3.9	6.6	14.2	26.5	EXISTING 10' CDOT TYPE R AT GRADE INLET	
		0.53	0.57															
		3.62	4.04	Tc for E2 Used														
2	OS-A	0.80	0.93									12.3	3.8	6.4	3.1	6.0	EXISTING 10' CDOT TYPE R AT GRADE INLET	
				See Area Drainage Sheet for Input														
3	OS-1 FB-DP1	1.15	1.22				11.6	150	1.0%	2.0	1.3	12.8	3.8	6.3	9.8	22.5	END OF PAVEMENT	
		1.47	2.35															
		2.62	3.57	Tc for DP1 Used														
4	A FB-INDP5 DP3	1.03	4.51				12.8	1470	1.6%	0.9	28.0	40.8	2.0	3.4	7.4	27.7	ADJACENT PARCEL (LOT 1)	
		0.00	0.10															
		2.62	3.57															
		3.65	8.19	Tc for DP3 Used														
5	B	1.09	4.77									34.5	2.3	3.8	8.3	18.2	ADJACENT PARCEL (LOT 2)	
				See Area Drainage Sheet for Input														
6	C	0.47	2.06									30.6	2.5	4.1	1.2	8.5	DISCHARGE TO CDOT ROW	
				See Area Drainage Sheet for Input														
7	OS2 DP6	2.44	3.26									14.5	3.6	6.0	10.4	31.9	BARROW DITCH SW CORNER OF SITE/CDOT ROW	
		0.47	2.06															
		2.91	5.32	Tc for OS2 Used														

Calculated by: CVW
Date: 2/23/2021
Checked by: DLM

Crossroads Mixed Use
FINAL DRAINAGE REPORT
(Existing Area Runoff Coefficient Summary)

			<i>STREETS / DEVELOPED</i>			<i>OVERLAND / DEVELOPED</i>			<i>WEIGHTED</i>	
BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	AREA (Acres)	C₅	C₁₀₀	AREA (Acres)	C₅	C₁₀₀	C₅	C₁₀₀
<i>C</i>	173960	3.99	0.00	0.90	0.96	5.89	0.08	0.35	<i>0.08</i>	<i>0.35</i>
<i>A</i>	480166.8	11.02	0.00	0.90	0.96	11.02	0.08	0.35	<i>0.08</i>	<i>0.35</i>
<i>B</i>	754121.6	17.31	0.00	0.90	0.96	17.31	0.08	0.35	<i>0.08</i>	<i>0.35</i>
<i>OS-1</i>	55560.16	1.28	1.28	0.90	0.96	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>OS-2</i>	216993.7	4.98	2.49	0.90	0.96	2.49	0.08	0.35	<i>0.49</i>	<i>0.66</i>
<i>EX-A2***</i>		0.59	0.59	0.90	0.96	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>OS-A**</i>		1.29	1.29	0.62	0.72	0.00	0.08	0.35	<i>0.62</i>	<i>0.72</i>
<i>E2*</i>		3.86	3.86	0.80	0.90	0.00	0.08	0.35	<i>0.80</i>	<i>0.90</i>

*FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**FROM TO FDR MEADOWBROOK CROSSING FILING 1 AND FILING 2

***FROM FDR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Crossroads Mixed Use
FINAL DRAINAGE REPORT
(Existing Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T_t)		INTENSITY ^		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C ₅	C ₁₀₀	C ₅	Length	Height	T _C	Length	Slope	Velocity	T _t	TOTAL	CHECK	I ₅	I ₁₀₀	Q ₅	Q ₁₀₀
		From DCM Table 5-1			(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(min)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)
C	3.99	0.08	0.35	0.08	120	2.8	15.3	555	1.5%	0.9	10.6	25.9	13.8	2.7	4.5	0.9	6.3
A	11.02	0.08	0.35	0.08	165	8	13.8	1730	1.3%	0.8	36.3	50.1	20.5	1.7	2.9	1.5	11.1
B	17.31	0.08	0.35	0.08	300	3	30.9	1390	1.2%	0.8	29.7	60.6	19.4	1.4	2.4	2.0	14.5
OS-1	1.28	0.90	0.96	0.90	100	3	2.5	490	2.2%	3.0	2.8	5.3	13.3	5.1	8.5	5.8	10.5
OS-2	4.98	0.49	0.66	0.49	85	8	4.8	1165	1.8%	2.0	9.6	14.5	16.9	3.6	6.0	8.7	19.6
EX-A2***	0.59	0.90	0.96	0.90	10	0.2	0.9	916	1.9%	2.7	5.6	6.5	15.1	4.8	8.0	2.5	4.5
OS-A**	1.29	0.62	0.72	0.62	40	0.8	4.4	1310	1.9%	2.8	7.9	12.3	17.5	3.8	6.4	3.1	6.0
E2*	3.86	0.80	0.90	0.80	50	1	3.0	400	1.3%	2.3	2.9	6.0	12.5	4.9	8.2	15.1	28.6

^ Intensity equations assume a minimum travel time of 5 minutes.

*VALUES DERIVED USING DATA FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**VALUES DERIVED USING DATA FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2 PAGE 31

***VALUES DERIVED USING DATA FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Calculated by: CVW

Date: 2/23/2021

Checked by: DLM

Crossroads Mixed Use

FINAL DRAINAGE REPORT

(Existing Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T _t)		INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA ₅	CA ₁₀₀	C _s	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)		
1	E2 EX-A2	3.09	3.47				6.0	916	1.9%	2.7	5.6	11.6	3.9	6.6	14.2	26.5	EXISTING 10' CDOT TYPE R AT GRADE INLET	
		0.53	0.57															
		3.62	4.04															Tc for E2 Used
2	OS-A	0.80	0.93									12.3	3.8	6.4	3.1	6.0	EXISTING 10' CDOT TYPE R AT GRADE INLET	
				See Area Drainage Sheet for Input														
3	OS-1 FB-DP1	1.15	1.22				11.6	150	1.0%	2.0	1.3	12.8	3.8	6.3	9.8	22.5	END OF PAVEMENT	
		1.47	2.35															
		2.62	3.57															Tc for DP1 Used
4	A FB-DP2 DP3	0.88	3.86				12.8	1470	1.6%	0.9	28.0	40.8	2.0	3.4	7.1	25.5	ADJACENT PARCEL (LOT 1)	
		0.00	0.10															
		2.62	3.57															
		3.50	7.54															Tc for DP3 Used
5	B	1.38	6.06									60.6	1.4	2.4	5.0	14.5	ADJACENT PARCEL (LOT 2)	
				See Area Drainage Sheet for Input														
6	C	0.32	1.40									25.9	2.7	4.5	0.9	6.3	DISCHARGE TO CDOT ROW	
				See Area Drainage Sheet for Input														
7	OS2 DP6	2.44	3.26									14.5	3.6	6.0	9.9	28.0	BARROW DITCH SW CORNER OF SITE/CDOT ROW	
		0.32	1.40															
		2.76	4.66															Tc for OS2 Used

Calculated by: CVW
Date: 2/23/21
Checked by: DLM

CROSSROADS MIXED USE FINAL DRAINAGE REPORT (Area Runoff Coefficient Summary)

			STREETS / COMMERC.			MULTI-FAMILY/PARKLAND			OVERLAND / UNDEVELOPED			WEIGHTED	
BASIN	TOTAL AREA (Sq Ft)	TOTAL AREA (Acres)	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
PROPOSED BASINS													
<i>OS-A**</i>		1.29	1.29	0.62	0.72	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.62</i>	<i>0.72</i>
<i>E2*</i>		3.86	3.86	0.80	0.90	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.80</i>	<i>0.90</i>
<i>EX-A2***</i>		0.59	0.59	0.90	0.96	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>OS-1</i>	<i>60793.3017</i>	1.40	1.40	0.90	0.96	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>OS-2</i>	<i>216993.7096</i>	4.98	2.49	0.90	0.96	0.00	0.49	0.62	2.49	0.08	0.35	<i>0.49</i>	<i>0.66</i>
<i>A</i>	<i>72787.0873</i>	1.67	1.67	0.90	0.96	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>B</i>	<i>64490.3787</i>	1.48	1.48	0.90	0.96	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>C</i>	<i>200631.5748</i>	4.61	4.46	0.81	0.88	0.00	0.49	0.62	0.15	0.08	0.35	<i>0.79</i>	<i>0.86</i>
<i>D</i>	<i>96773.7602</i>	2.22	2.22	0.81	0.88	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.81</i>	<i>0.88</i>
<i>E</i>	<i>118133.5827</i>	2.71	0.48	0.90	0.96	2.23	0.81	0.88	0.00	0.08	0.35	<i>0.83</i>	<i>0.89</i>
<i>F</i>	<i>112036.6061</i>	2.57	2.57	0.81	0.88	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.81</i>	<i>0.88</i>
<i>G</i>	<i>20057.4496</i>	0.46	0.46	0.90	0.96	0.00	0.49	0.62	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>
<i>J</i>	<i>139924.2472</i>	3.21	0.00	0.90	0.96	3.21	0.16	0.41	0.00	0.08	0.35	<i>0.16</i>	<i>0.41</i>
<i>A-6****</i>	<i>138956.4</i>	3.19	0.00	0.90	0.96	3.19	0.60	0.73	0.00	0.08	0.35	<i>0.60</i>	<i>0.73</i>
<i>Z-1****</i>	<i>16117.2</i>	0.37	0.00	0.90	0.96	0.37	0.33	0.52	0.00	0.08	0.35	<i>0.33</i>	<i>0.52</i>
<i>B-3****</i>	<i>33976.8</i>	0.78	0.00	0.90	0.96	0.78	0.62	0.75	0.00	0.08	0.35	<i>0.62</i>	<i>0.75</i>
<i>Z-2****</i>	<i>24393.6</i>	0.56	0.00	0.90	0.96	0.56	0.60	0.73	0.00	0.08	0.35	<i>0.28</i>	<i>0.49</i>
<i>G1</i>	<i>25962.0179</i>	0.60	0.60	0.90	0.96	0.00	0.16	0.41	0.00	0.08	0.35	<i>0.90</i>	<i>0.96</i>

*FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2

***FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

****FROM FDR FOR AURA AT CROSSROADS, DATED MAY 17, 2021

Calculated by: CVW

Date: 6/18/2021

Checked by: DLM

CROSSROADS MIXED USE FINAL DRAINAGE REPORT (Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T _t)		INTENSITY #		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C ₅	C ₁₀₀	C ₅	Length (ft)	Height (ft)	T _C (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	CHECK (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)
<i>Proposed Area Drainage Summary</i>																	
OS-A**	1.29	0.62	0.72	0.62	40	0.8	4.4	1310	1.9%	2.8	7.9	12.3	17.5	3.8	6.4	3.1	6.0
E2*	3.86	0.80	0.90	0.80	50	1	3.0	400	1.3%	2.3	2.9	6.0	12.5	4.9	8.2	15.1	28.6
EX-A2***	0.59	0.90	0.96	0.90	10	0.2	0.9	916	1.9%	2.7	5.6	6.5	15.1	4.8	8.0	2.5	4.5
OS-1	1.40	0.90	0.96	0.90	100	3	2.5	490	2.2%	3.0	2.7	5.2	13.3	5.1	8.6	6.4	11.5
OS-2	4.98	0.49	0.66	0.49	85	8	4.8	1165	1.8%	2.0	9.6	14.5	16.9	3.6	6.0	8.7	19.6
A	1.67	0.90	0.96	0.90	30	0.6	1.6	1325	0.7%	1.7	7.3	8.9	17.5	4.3	7.2	6.5	11.6
B	1.48	0.90	0.96	0.90	25	0.5	1.4	1335	0.7%	1.7	7.3	8.8	17.6	4.3	7.3	5.8	10.3
C	4.61	0.79	0.86	0.79	50	1	3.2	260	1.5%	2.4	1.4	5.0	11.7	5.2	8.7	18.7	34.5
D	2.22	0.81	0.88	0.81	50	1	2.9	200	1.5%	2.4	1.1	5.0	11.4	5.2	8.7	9.3	17.0
E	2.71	0.83	0.89	0.83	60	1.2	3.0	700	1.0%	2.0	3.8	6.9	14.2	4.7	7.9	10.5	19.1
F	2.57	0.81	0.88	0.81	50	0.8	3.2	300	1.3%	2.3	1.6	5.0	11.9	5.2	8.7	10.8	19.6
G	0.46	0.90	0.96	0.90	50	1	2.0	466	1.1%	2.1	2.6	5.0	12.9	5.2	8.7	2.1	3.8
J	3.21	0.16	0.41	0.16	50	2	7.6	0	0.0%	0.0	0.0	7.6	10.3	4.5	7.6	2.3	10.0
A-6****	3.19	0.60	0.73	0.60	REFER TO "FDR FOR AURA AT CROSSROADS" FOR DETAILS											6.77	13.85
Z-1****	0.37	0.33	0.52	0.33	REFER TO "FDR FOR AURA AT CROSSROADS" FOR DETAILS											0.47	1.27
B-3****	0.78	0.62	0.75	0.62	REFER TO "FDR FOR AURA AT CROSSROADS" FOR DETAILS											2.08	4.20
Z-2****	0.56	0.28	0.49	0.28	REFER TO "FDR FOR AURA AT CROSSROADS" FOR DETAILS											0.63	1.84
GI	0.60	0.90	0.96	0.90	50	1	2.0	466	1.1%	2.1	2.6	5.0	12.9	5.2	8.7	2.8	5.0

Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: CVW

Date: 6/18/2021

Checked by: DLM

*VALUES DERIVED USING DATA FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**VALUES DERIVED USING DATA FROM FDR MEADOWBROOK CROSSING FILING 1 AND FILING 2 PAGE 31

***VALUES DERIVED USING DATA FROM FDR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

****FROM FDR FOR AURA AT CROSSROADS, DATED MAY 17, 2021

CROSSROADS MIXED USE FINAL DRAINAGE REPORT (Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T _t)	INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA ₅	CA ₁₀₀	C ₅	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)	
PROPOSED DRAINAGE BASIN ROUTING SUMMARY																	
1	E2, EX-A2	3.62	4.04				6.0	916	1.9%	2.7	5.6	11.6	3.9	6.6	14.2	26.5	Existing 10' CDOT Type R At-Grade Inlet (Public)
2	OS-A	0.80	0.93	Tc for E2 Used								12.3	3.8	6.4	3.1	6.0	Existing 10' CDOT Type R At-Grade Inlet (Public)
				See Area Drainage Sheet for Input													
3	OS-1, FB-DP1	2.73	3.69				11.6	150	1.0%	2.0	1.3	12.8	3.8	6.3	10.2	23.3	Proposed 10' CDOT Type R At-Grade Inlet (Public)
4	A, FB-DP2, FB-IN4	1.50	1.71	Tc for DP1 Used								8.9	4.3	7.2	6.5	12.4	Proposed 15' CDOT Type R At-Grade Inlet Proposed NEENAH R-6116 MH Lid and Frame (Public)
				Tc for Basin A used													
5	B, FB-DP3, FB-IN4.5	2.28	3.56	Tc for Basin B Used								8.8	4.3	7.3	9.8	25.8	Proposed 15' CDOT Type R Sump Inlet (Public)
6	C	3.62	3.98									5.0	5.2	8.7	18.7	34.5	Proposed 30" RCP or PP Storm Sewer (Private)
				See Area Drainage Sheet for Input													
7	D	1.80	1.96									5.0	5.2	8.7	9.3	17.0	Proposed 24" RCP or PP Storm Sewer (Private)
				See Area Drainage Sheet for Input													
8	1/2 E	1.12	1.21									6.9	4.7	7.9	5.2	9.5	Proposed 10' CDOT Type R At-Grade Inlet (Private)
				See Area Drainage Sheet for Input													
9	1/2 E	1.12	1.21									6.9	4.7	7.9	5.2	9.5	Proposed 10' CDOT Type R At-Grade Inlet (Private)
				See Area Drainage Sheet for Input													
10	Basin G	0.41	0.44									5.0	5.2	8.7	2.1	3.8	Proposed 10' CDOT Type R Sump Inlet (Private)
				Tc for Basin G Used													
11	Basin G1 FB-DP8/9	0.51	1.32									5.0	5.2	8.7	3.6	17.3	Proposed 15' CDOT Type R Sump Inlet (Private)
		0.19	0.67														
		0.71	1.99	Tc for Basin G1 Used													
12	F	2.08	2.26									5.0	5.2	8.7	10.8	19.6	Proposed 24" RCP or PP Storm Sewer (Private)
				See Area Drainage Sheet for Input													
13	Basin A-6 Basin B-3	0.05	0.78									12.8	3.8	6.3	2.0	7.5	Proposed 2' Bottom Earthen Swale, Rip Rap Rundown
		0.48	0.42														
		0.53	1.20	Weighted Tc Used													
14	Basin Z-2	0.16	0.27									11.1	4.0	6.7	0.6	1.8	Proposed Earthen Swale (Private)
				Tc for Basin Z-2 Used													
15	J, DP14, PR17, PR 18	20.07	25.49									6.3	4.8	8.1	97.0	206.9	Full Spectrum Extended Detention Basin (Private)
				Weighted Tc Used													
16	POND OUTFALL OS-2	2.78	4.61									14.5	3.6	6.0	9.9	27.7	HISTORIC FLOW IN CDOT BARROW DITCH Q5= 10.4 CFS, Q100 = 31.9 CFS PER HISTORIC DRAINAGE ANALYSIS
				Tc for Basin OS-2 Used													

Intensity equations assume a minimum travel time of 5 minutes.

CVW
Date: 6/18/2021
Checked by: DLM

CROSSROADS MIXED USE FINAL DRAINAGE REPORT (Storm Sewer Routing Summary)

PIPE RUN	Contributing Pipes/Design Points	Equivalent CA_5	Equivalent CA_{100}	Maximum T_C	Intensity*		Flow		PIPE SIZE
					I_5	I_{100}	Q_5	Q_{100}	
1	INLET 3	1.78	1.55	12.8	3.8	6.3	6.7	9.8	24" SD
1.5	INLET 4	1.51	1.48	8.9	4.3	7.2	6.5	10.7	24" SD
2	PR1.5, INLET 4.5	1.51	1.74	8.9	4.3	7.2	6.5	12.6	24" SD
3	PR2, INLET 5	3.78	5.30	8.8	4.3	7.3	16.4	38.5	36" SD
4	DP6	3.62	3.98	5.0	5.2	8.7	18.7	34.5	30" SD
5	PR4	3.62	3.98	5.0	5.2	8.7	18.7	34.5	30" SD
6	PR5	3.62	3.98	5.0	5.2	8.7	18.7	34.5	30" SD
7	PR6	3.62	3.98	5.0	5.2	8.7	18.7	34.5	36" SD
8	DP7	1.80	1.96	5.0	5.2	8.7	9.3	17.0	24" SD
9	PR8, DP8	2.82	2.83	6.9	4.7	7.9	13.2	22.3	30" SD
10	DP9	1.02	0.88	6.9	4.7	7.9	4.8	6.9	18" SD
11	PR7, PR9, PR10	7.47	7.68	6.9	4.7	7.9	35.0	60.5	36" SD
12	PR11	7.47	7.68	6.9	4.7	7.9	35.0	60.5	42" SD
13	DP10	0.41	0.44	5.0	5.2	8.7	2.1	3.8	18" SD
14	DP11	0.51	1.99	5.0	5.2	8.7	2.7	17.3	30" SD
15	PR12, PR13, PR14	8.40	10.11	6.9	4.7	7.9	39.4	79.6	42" SD
16	DP12	2.08	2.26	5.0	5.2	8.7	10.8	19.6	24" SD
17	PR15, PR16	10.48	12.38	6.9	4.7	7.9	49.1	97.4	48" SD
18	PR17	10.48	12.38	6.9	4.7	7.9	49.1	97.4	48" SD
19*	DP13	8.92	11.52	15.2	3.5	5.9	31.2	67.7	48" RCP
20	POND OUTFALL	PER	MHFD	WKSHT			1.2	8.2	18" SD

*REFER TO FDR FOR AURA AT CROSSROADS FOR CONTRIBUTING PIPE FLOW DETAILS

DP - Design Point

EX - Existing Design Point

FB- Flow By from Design Point

INT- Intercepted Flow from Design Point

Calculated by: CVW

Date: 6/18/2021

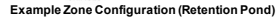
Checked by: DLM

<i>Weighted Percent Imperviousness of WQ Pond 1</i>				
<i>Contributing Basins</i>	<i>Area (Acres)</i>	<i>C_s</i>	<i>Impervious % (I)</i>	<i>(Acres)*(I)</i>
<i>A</i>	1.67	0.90	100	167.10
<i>B</i>	1.48	0.90	100	148.05
<i>C</i>	4.61	0.79	93	428.35
<i>D</i>	2.22	0.81	95	211.05
<i>E</i>	2.71	0.83	96	260.35
<i>F</i>	2.57	0.81	95	244.34
<i>G</i>	0.46	0.90	100	46.05
<i>Residential Lot</i>	12.67	N/A	76	962.92
<i>G1</i>	0.60	0.90	75	44.70
<i>J</i>	3.21	0.16	7	22.49
<i>Totals</i>	<i>32.20</i>			<i>2535.39</i>
<i>Imperviousness of WQ Pond 1</i>	<i>78.7</i>	<i>%</i>		

HYDRAULIC CALCULATIONS

MHFD-Detention, Version 4.03 (May 2020)

Basin ID: FULL SPECTRUM DETENTION POND



Initial Surcharge Area (A_{SV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	ft
Surcharge Volume Width (W_{SV})	=	user	ft
Depth of Basin Floor (H_{LFLOOR})	=	user	ft
Length of Basin Floor (L_{LFLOOR})	=	user	ft
Width of Basin Floor (W_{LFLOOR})	=	user	ft
Area of Basin Floor (A_{LFLOOR})	=	user	ft ²
Volume of Basin Floor (V_{LFLOOR})	=	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

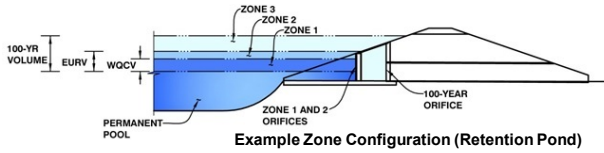
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **CROSSROADS MIXED USE**

Basin ID: **FULL SPECTRUM DETENTION POND**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.91	0.857	Orifice Plate
Zone 2 (EURV)	5.76	2.449	Orifice Plate
Zone 3 (100-year)	7.03	1.424	Weir&Pipe (Restrict)
Total (all zones)		4.729	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.92	3.84					
Orifice Area (sq. inches)	4.10	9.50	5.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

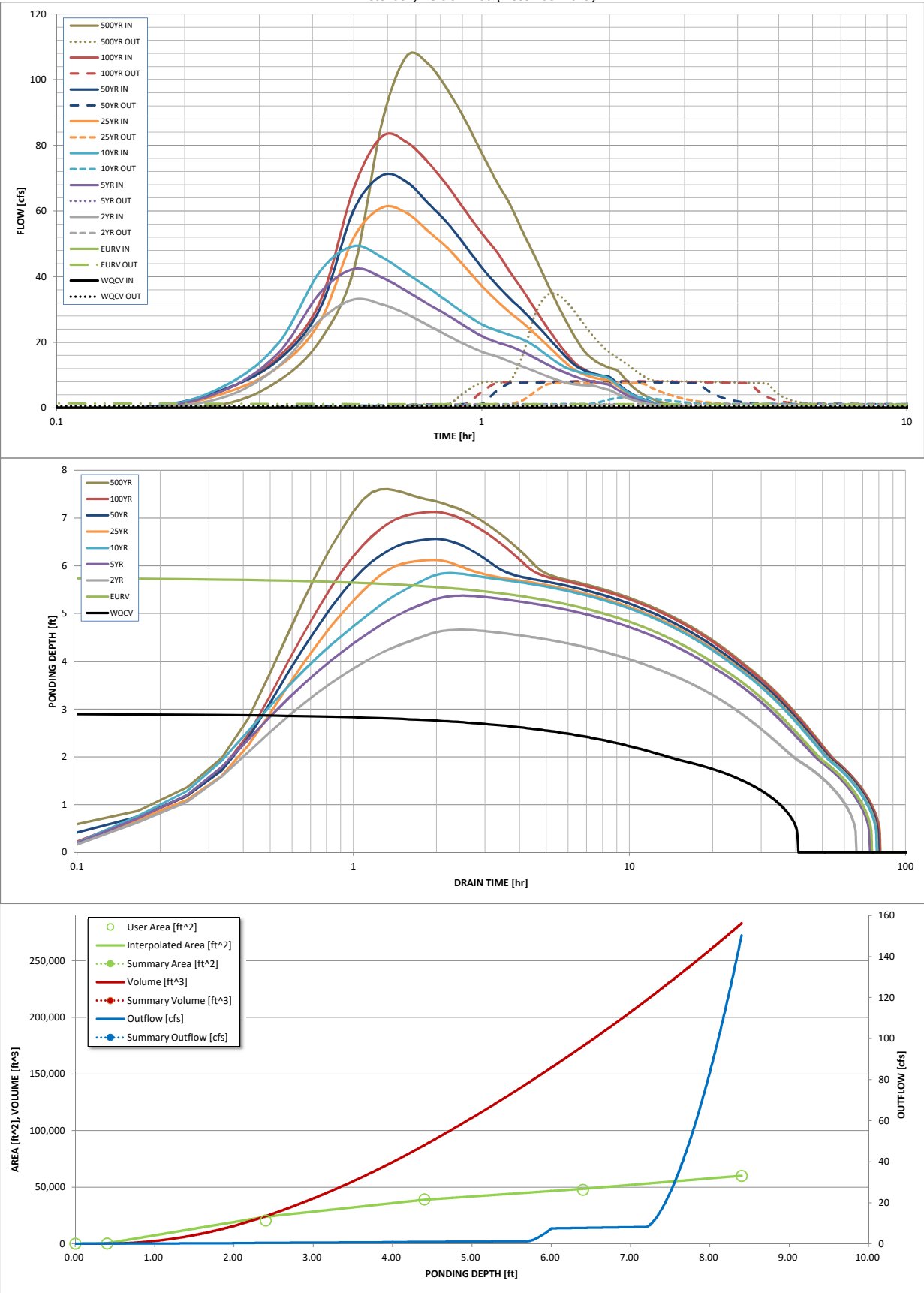
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in)	N/A	N/A	2.394	3.107	3.679	4.353	5.011	5.779	7.477
CUHP Runoff Volume (acre-ft)	N/A	N/A	2.394	3.107	3.679	4.353	5.011	5.779	7.477
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.2	0.3	0.4	4.0	8.1	13.5	24.8
CUHP Predevelopment Peak Q (cfs)	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.00	0.01	0.01	0.13	0.25	0.42	0.77
Peak Inflow Q (cfs)	N/A	N/A	33.0	42.4	49.3	61.1	70.9	82.7	107.3
Peak Outflow Q (cfs)	0.5	1.6	1.0	1.1	3.3	7.6	7.8	8.2	34.7
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	3.5	7.5	1.9	1.0	0.6	1.4
Structure Controlling Flow	Plate	Overflow Weir 1	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps)	N/A	0.05	N/A	N/A	0.2	0.5	0.6	0.6	0.6
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	66	59	65	68	67	66	66	63
Time to Drain 99% of Inflow Volume (hours)	40	72	64	71	75	74	75	75	74
Maximum Ponding Depth (ft)	2.91	5.76	4.66	5.37	5.85	6.12	6.56	7.13	7.60
Area at Maximum Ponding Depth (acres)	0.64	1.04	0.92	1.00	1.05	1.08	1.13	1.21	1.27
Maximum Volume Stored (acre-ft)	0.861	3.315	2.235	2.917	3.399	3.697	4.185	4.841	5.437

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.00 (December 2019)



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

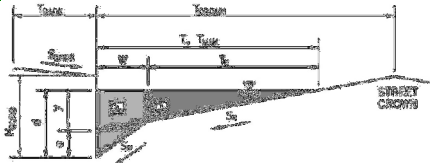
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use Existing Inlets

Inlet ID:

INLET 1

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 14.0$ 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

 $T_{CROWN} = 26.0$ 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

 $S_O = 0.010$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	20.0	26.0	ft
$d_{MAX} =$	6.0	12.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐☐

check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

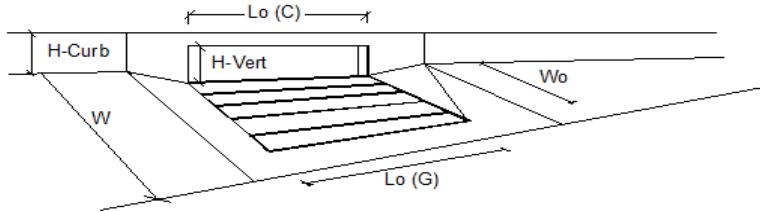
	Minor Storm	Major Storm	
$Q_{allow} =$	13.8	32.7	cfs

MAJOR STORM Allowable Capacity is based on Spread Criterion

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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)		N_o =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_r-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_r-C =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR STORM					
Total Inlet Interception Capacity		Q =	8.4	11.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	5.8	15.4	cfs
Capture Percentage = Q_i/Q_o =		C% =	59	42	%

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

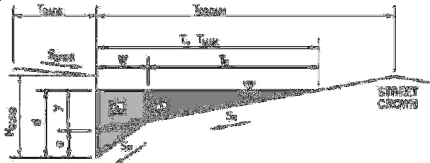
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use Existing Inlets

Inlet ID:

INLET 2

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 14.0$ 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

 $T_{CROWN} = 26.0$ 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

 $S_O = 0.010$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	20.0	26.0	ft
$d_{MAX} =$	6.0	12.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐☐

check = yes

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

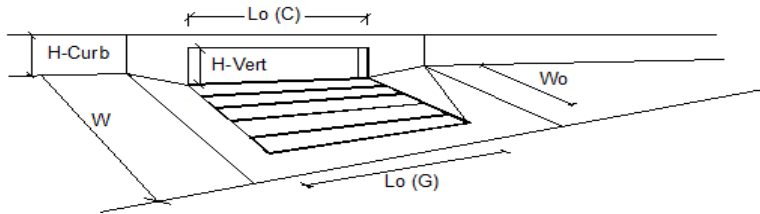
	Minor Storm	Major Storm	
$Q_{allow} =$	13.8	32.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity			
Total Inlet Interception Capacity	3.1	5.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	0.7	cfs
Capture Percentage = Q_i/Q_o =	100	88	%

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

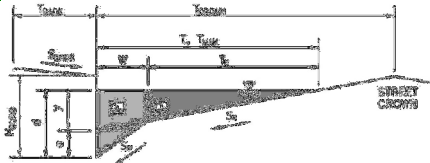
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use

Inlet ID:

Inlet 3

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 27.0$ ft

Gutter Width

 $W = 1.00$ 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

 $S_O = 0.005$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	22.8	27.0	ft
$d_{MAX} =$	6.0	12.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☐ check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	13.8	24.4	cfs

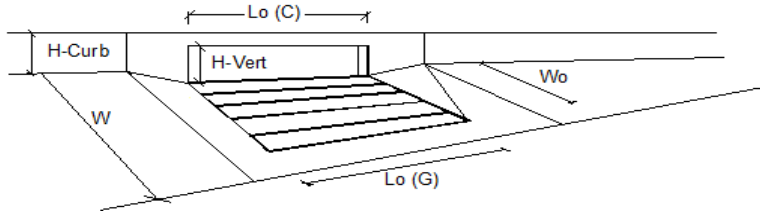
MAJOR STORM Allowable Capacity is based on Spread Criterion

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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)	$N_o = 1$	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_o = 10.00$	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	$W_o = N/A$	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_r-G = N/A$	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_r-C = 0.10$	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity			
Total Inlet Interception Capacity	$Q = 6.7$	9.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b = 3.5$	13.5	cfs
Capture Percentage = $Q_i/Q_o =$	$C\% = 65$	42	%

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

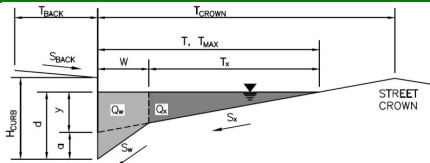
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use

Inlet ID:

Inlet 4 - AT-GRADE

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 26.0$ 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

 $S_o = 0.010$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	20.8	26.0	ft
$d_{MAX} =$	6.0	12.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☐ check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	13.8	32.7	cfs

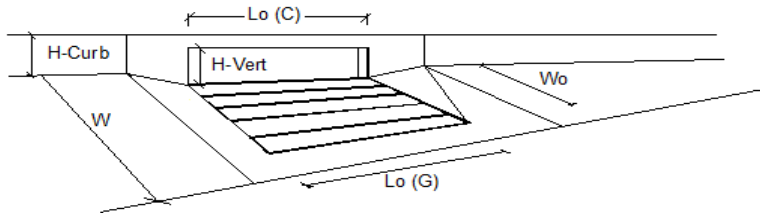
MAJOR STORM Allowable Capacity is based on Spread Criterion

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity			
Total Inlet Interception Capacity	6.6	10.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	-0.1	1.7	cfs
Capture Percentage = Q_i/Q_c =	102	86	%

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

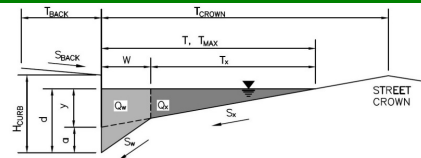
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use

Inlet ID:

Inlet 5

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} = 7.5$ ft
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.020$

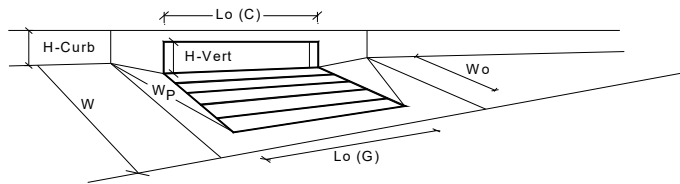
$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 26.0$ ft
 $W = 2.00$ ft
 $S_X = 0.020$ ft/ft
 $S_W = 0.083$ ft/ft
 $S_D = 0.000$ ft/ft
 $n_{STREET} = 0.016$

	Minor Storm	Major Storm	
$T_{MAX} =$	20.8	26.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

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

INLET IN A SUMP OR SAG LOCATION

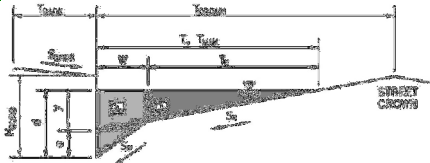
Version 4.06 Released August 2018



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 =	6.0	12.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _g (G) =	N/A	N/A	feet
Width of a Unit Grate		W _g =	N/A	N/A	feet
Area Opening 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 _r (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) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H _{weir} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		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 _r (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	
Grate Flow Analysis (Calculated)		MINOR		MAJOR	
Clogging Coefficient for Multiple Units		Coef =	N/A	N/A	
Clogging Factor for Multiple Units		Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{all} =	N/A	N/A	cfs
Interception with Clogging		Q _{weir} =	N/A	N/A	cfs
Grate Capacity as an Orifice (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{or} =	N/A	N/A	cfs
Interception with Clogging		Q _{or} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR		MAJOR	
Interception without Clogging		Q _{mi} =	N/A	N/A	cfs
Interception with Clogging		Q _{mi} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _{Grate} =	N/A	N/A	cfs
Curb Opening Flow Analysis (Calculated)		MINOR		MAJOR	
Clogging Coefficient for Multiple Units		Coef =	1.31	1.31	
Clogging Factor for Multiple Units		Clog =	0.04	0.04	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{all} =	10.4	51.0	cfs
Interception with Clogging		Q _{weir} =	9.9	48.8	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR		MAJOR	
Interception without Clogging		Q _{or} =	29.4	40.9	cfs
Interception with Clogging		Q _{or} =	28.1	39.1	cfs
Curb Opening Capacity as Mixed Flow		MINOR		MAJOR	
Interception without Clogging		Q _{mi} =	16.2	42.5	cfs
Interception with Clogging		Q _{mi} =	15.5	40.6	cfs
Resulting Curb Opening Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _{Curb} =	9.9	39.1	cfs
Resultant Street Conditions		MINOR		MAJOR	
Total Inlet Length		L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)		T =	18.9	43.7	ft. > T-Crown
Resultant Flow Depth at Street Crown		d _{CROWN} =	0.0	4.2	inches
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} =	0.34	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.79	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	9.9	39.1	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		MINOR		MAJOR	
		Q _{PEAK REQUIRED} =	9.8	25.8	cfs

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

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

Project: **Crossroads Mixed Use**Inlet ID: **Inlet 6****Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 14.5$ 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

 $S_O = 0.020$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	14.0	14.0	ft
$d_{MAX} =$	4.4	12.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

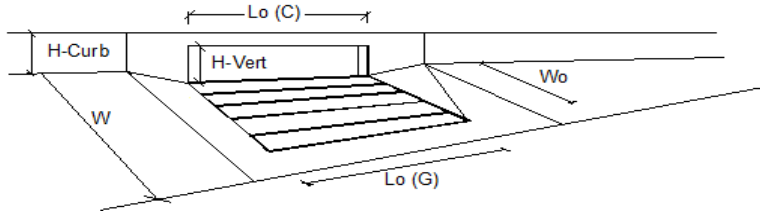
☐ ☐ check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	6.4	9.6	cfs

MAJOR STORM Allowable Capacity is based on Spread Criterion**Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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)		N_o =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W , Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_r-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_r-C =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	4.8	6.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.4	2.6	cfs
Capture Percentage = Q_i/Q_c =		$C\%$ =	93	73	%

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

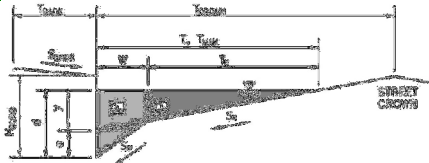
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use

Inlet ID:

Inlet 7

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

T_{BACK} = 7.5 ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

S_{BACK} = 0.020 ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

n_{BACK} = 0.020

Height of Curb at Gutter Flow Line

H_{CURB} = 6.00 inches

Distance from Curb Face to Street Crown

T_{CROWN} = 14.0 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 = 0.010 ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

n_{STREET} = 0.016

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
T _{MAX}	14.0	14.0	ft
d _{MAX}	4.5	12.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q _{allow}	5.2	93.9	cfs

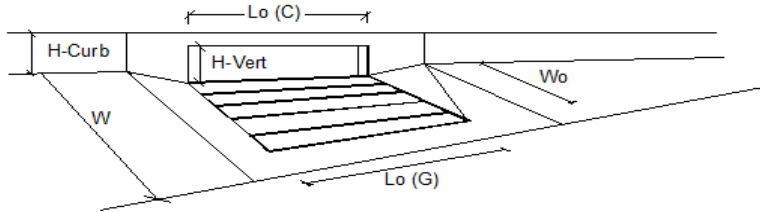
MAJOR STORM Allowable Capacity is based on Depth Criterion

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



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)		N_o =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_r-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_r-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	4.8	6.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.4	2.6	cfs
Capture Percentage = Q_i/Q_o =		C% =	92	72	%

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

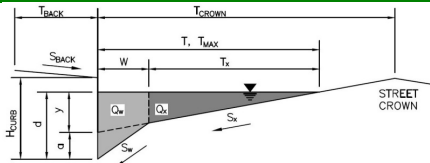
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use

Inlet ID:

Inlet 8

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

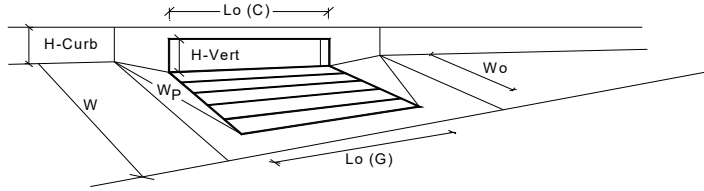
 $T_{BACK} = 7.5$ ft $S_{BACK} = 0.020$ ft/ft $n_{BACK} = 0.020$ $H_{CURB} = 6.00$ inches $T_{CROWN} = 14.0$ ft $W = 2.00$ ft $S_X = 0.020$ ft/ft $S_W = 0.083$ ft/ft $S_O = 0.000$ ft/ft $n_{STREET} = 0.016$

	Minor Storm	Major Storm	
$T_{MAX} =$	14.0	14.0	ft
$d_{MAX} =$	4.4	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)

Type of Inlet CDOT Type R Curb Opening

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	4.4	8.0	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	10.00	10.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.20	0.50	ft
$RF_{Combination}$ =	0.41	0.75	
RF_{Curb} =	0.82	1.00	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	3.3	16.3	cfs
$Q_{PEAK REQUIRED}$ =	2.1	3.8	cfs

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

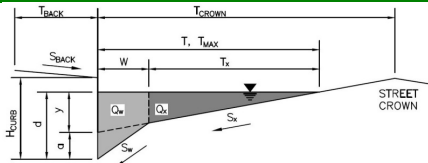
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use

Inlet ID:

Inlet 9

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

 $T_{BACK} = 7.5$ ft $S_{BACK} = 0.020$ ft/ft $n_{BACK} = 0.020$ $H_{CURB} = 6.00$ inches $T_{CROWN} = 14.0$ ft $W = 2.00$ ft $S_X = 0.020$ ft/ft $S_W = 0.083$ ft/ft $S_O = 0.000$ ft/ft $n_{STREET} = 0.016$

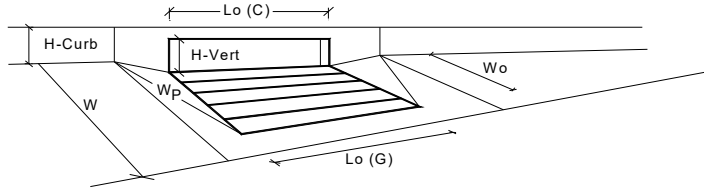
	Minor Storm	Major Storm	
$T_{MAX} =$	14.0	14.0	ft
$d_{MAX} =$	4.4	12.0	inches

☐☐

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

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)

Type of Inlet CDOT Type R Curb Opening

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

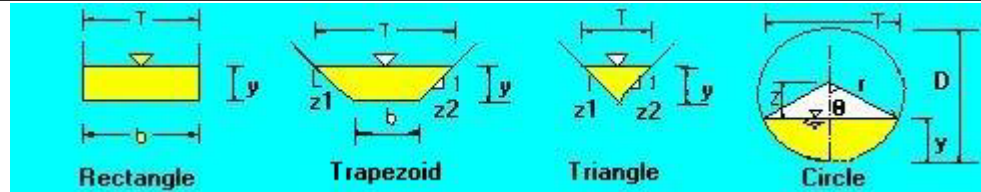
Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	4.4	8.0	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	15.00	15.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.20	0.50	ft
$RF_{Combination}$ =	0.41	0.75	
RF_{Curb} =	0.67	0.89	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	3.7	20.3	cfs
$Q_{PEAK REQUIRED}$ =	3.6	17.3	cfs

A-A' CDOT Roadside Ditch Proposed Analysis

Select Channel Type: Trapezoid ▼



Depth from Q ▼

Select unit system: Feet(ft) ▼

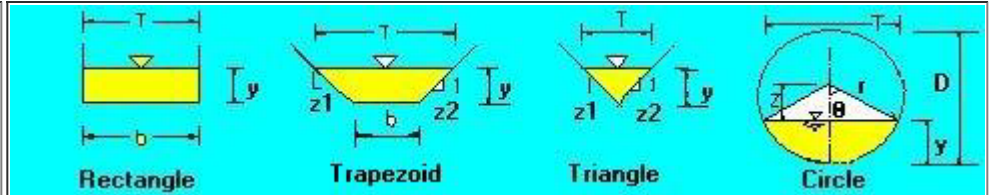
Channel slope: .018 ft/ft	Water depth(y): 0.76 ft	Bottom width(b): 5 ft
Flow velocity: 3.535 ft/s	LeftSlope (Z1): 4 to 1 (H:V)	RightSlope (Z2): 10 to 1 (H:V)
Flow discharge: 27.7 ft ³ /s	Input n value: 0.035 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter: 15.76 ft	Flow area: 7.84 ft ²	Top width(T): 15.63 ft
Specific energy: 0.95 ft	Froude number: 0.88	Flow status: Subcritical flow
Critical depth: 0.72 ft	Critical slope: 0.0225 ft/ft	Velocity head: 0.19 ft

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C-C' SWALE ANALYSIS

Select Channel Type:

Trapezoid ▼



Depth from Q ▼

Select unit system: Feet(ft) ▼

Channel slope: .0103

ft/ft

Water depth(y): 0.47

ft

Bottom width(b)

2

ft

Flow velocity: 2.557732

ft/s

LeftSlope (Z1): 14

to 1 (H:V)

RightSlope (Z2): 4

to 1 (H:V)

Flow discharge: 7.5

ft^3/s

Input n value: .025

or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter: 10.54

ft

Flow area: 2.93

ft^2

Top width(T): 10.47

ft

Specific energy: 0.57

ft

Froude number: 0.85

Flow status

Subcritical flow

Critical depth: 0.44

ft

Critical slope: 0.0143

ft/ft

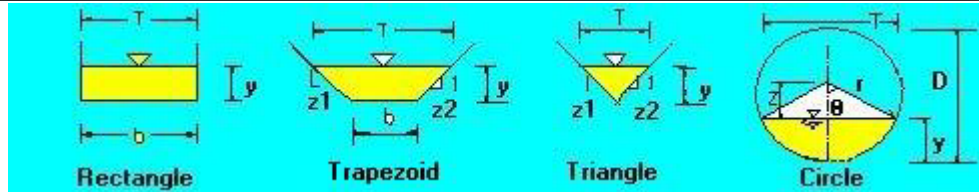
Velocity head: 0.1

ft

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B-B' SWALE ANALYSIS

Select Channel Type: Trapezoid ▼



Depth from Q ▼

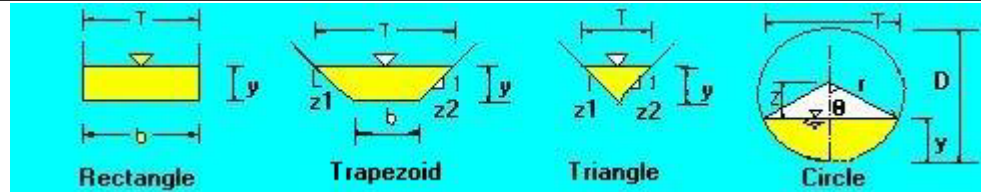
Select unit system: Feet(ft) ▼

Channel slope: .0152 ft/ft	Water depth(y): 0.48 ft	Bottom width(b): 0 ft
Flow velocity: 2.655924 ft/s	LeftSlope (Z1): 3 to 1 (H:V)	RightSlope (Z2): 3 to 1 (H:V)
Flow discharge: 1.8 ft ³ /s	Input n value: .025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter: 3.01 ft	Flow area: 0.68 ft ²	Top width(T): 2.85 ft
Specific energy: 0.58 ft	Froude number: 0.96	Flow status: Subcritical flow
Critical depth: 0.47 ft	Critical slope: 0.0154 ft/ft	Velocity head: 0.11 ft

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RIP RAP RUNDOWN ANALYSIS

Select Channel Type: Trapezoid ▼



Depth from Q ▼

Select unit system: Feet(ft) ▼

Channel slope: .25 ft/ft	Water depth(y): 0.38 ft	Bottom width(b): 2 ft
Flow velocity: 7.098551 ft/s	LeftSlope (Z1): 2 to 1 (H:V)	RightSlope (Z2): 2 to 1 (H:V)
Flow discharge: 7.5 ft ³ /s	Input n value: .045 or select n: clean,uncoated castiron:0.014 ▼	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter: 3.71 ft	Flow area: 1.06 ft ²	Top width(T): 3.53 ft
Specific energy: 1.16 ft	Froude number: 2.29	Flow status: Supercritical flow
Critical depth: 0.62 ft	Critical slope: 0.0412 ft/ft	Velocity head: 0.78 ft

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BACKGROUND

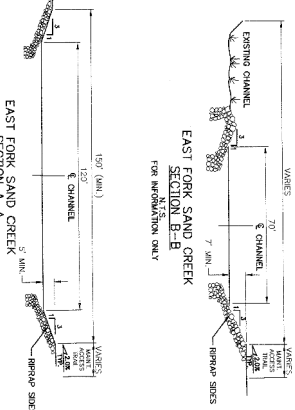
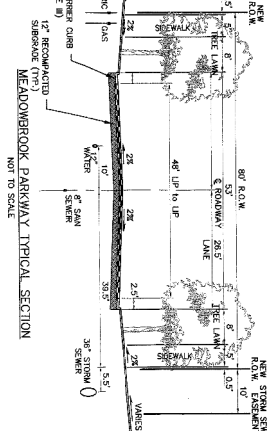
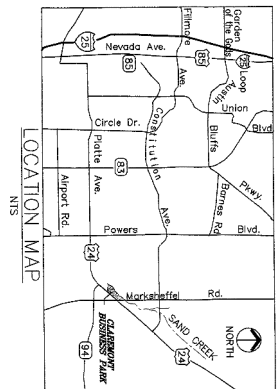
CLAREMONT BUSINESS PARK FILING NO. 2

OWNER = ADVANCED RV & SELF STORAGE LLP

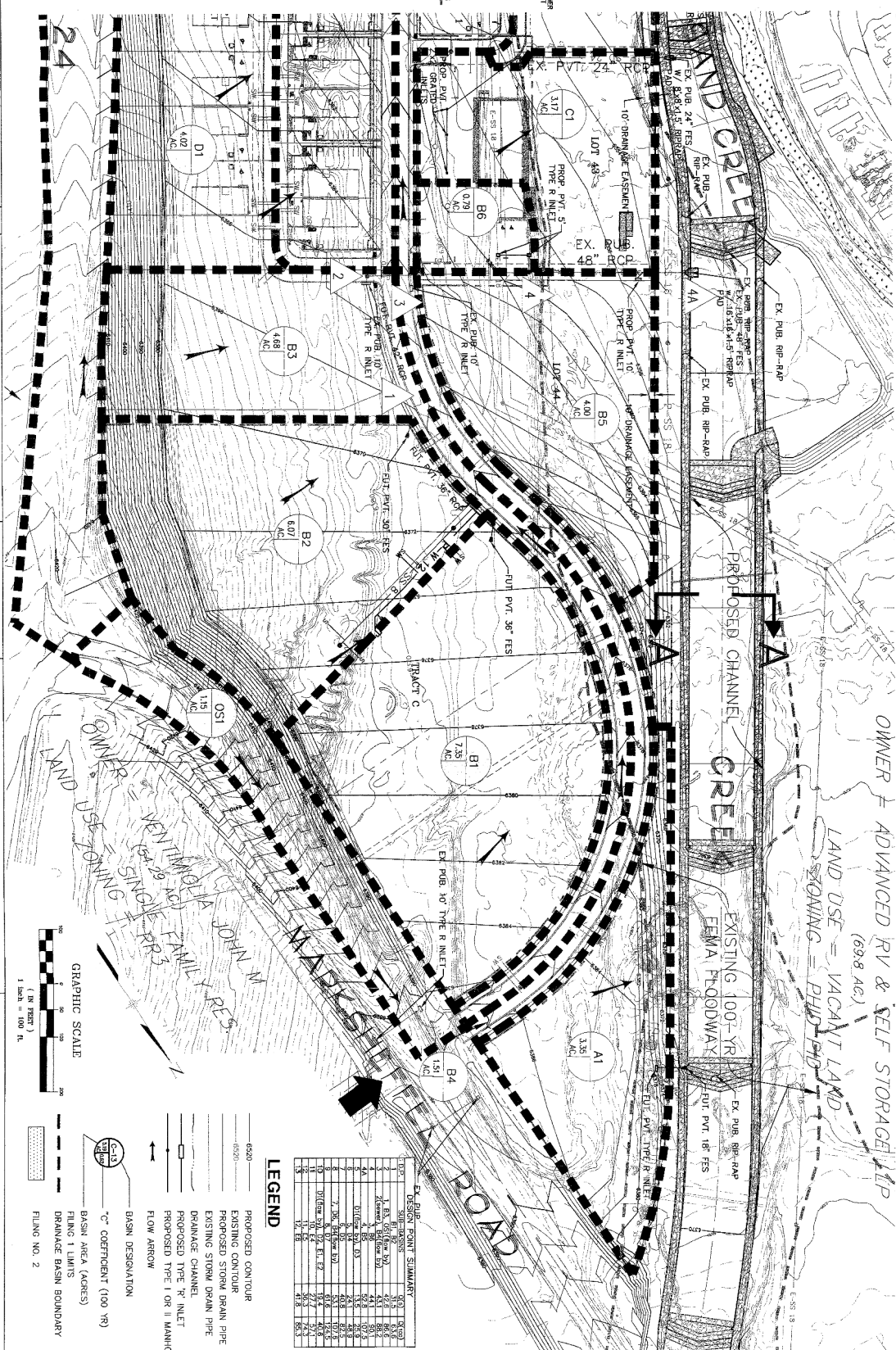
(69.8 AC.)

LAND USE = VACANT LAND

STAGING = PHASE 1/2/3

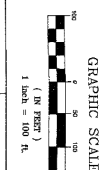


NOTE: CONSTRUCTION OF THE EAST FORK SAND CREEK CHANNEL IMPROVEMENTS WILL BE REQUIRED TO MAINTAIN FLOODPLAIN (PER FEMA FLOOD INSURANCE RATE MAPS 7027 AND 7047)



LEGEND

SYMBOL	DESCRIPTION
(Solid line)	PROPOSED CONTOUR
(Dashed line)	EXISTING CONTOUR
(Thick solid line)	PROPOSED STORM DRAIN PIPE
(Thin solid line)	EXISTING STORM DRAIN PIPE
(Dashed line with cross-hatch)	DRAINAGE CHANNEL
(Circle with cross-hatch)	PROPOSED TYPE 'R' INLET
(Circle with cross-hatch and arrow)	PROPOSED TYPE 'R' OR 'H' MANHOLE
(Arrow)	FLOW ARROW
(Circle with 'B')	BAIN DESIGNATION
(Circle with 'C')	"C" COEFFICIENT (100 YR)
(Circle with 'L')	BAIN AREA (ACRES)
(Circle with 'F')	FILING 1 LIMITS
(Circle with 'D')	DRAINAGE BASIN BOUNDARY
(Circle with 'N')	FILING NO. 2



Matrix Design Group, Inc.
Integrated Design Solutions 2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

SUBDIVIDER
HAWKINS CONSTRUCTION INC.
3460 CAPITAL DRIVE
COLORADO SPRINGS, CO 80915-9710

FOR AND ON BEHALF OF
MATRIX DESIGN GROUP, INC.

DR01

CLAREMONT BUSINESS PARK
FINAL DRAINAGE PLAN
MASTER DEVELOPMENT DRAINAGE PLAN
FINAL DRAINAGE PLAN
FILING NO. 2

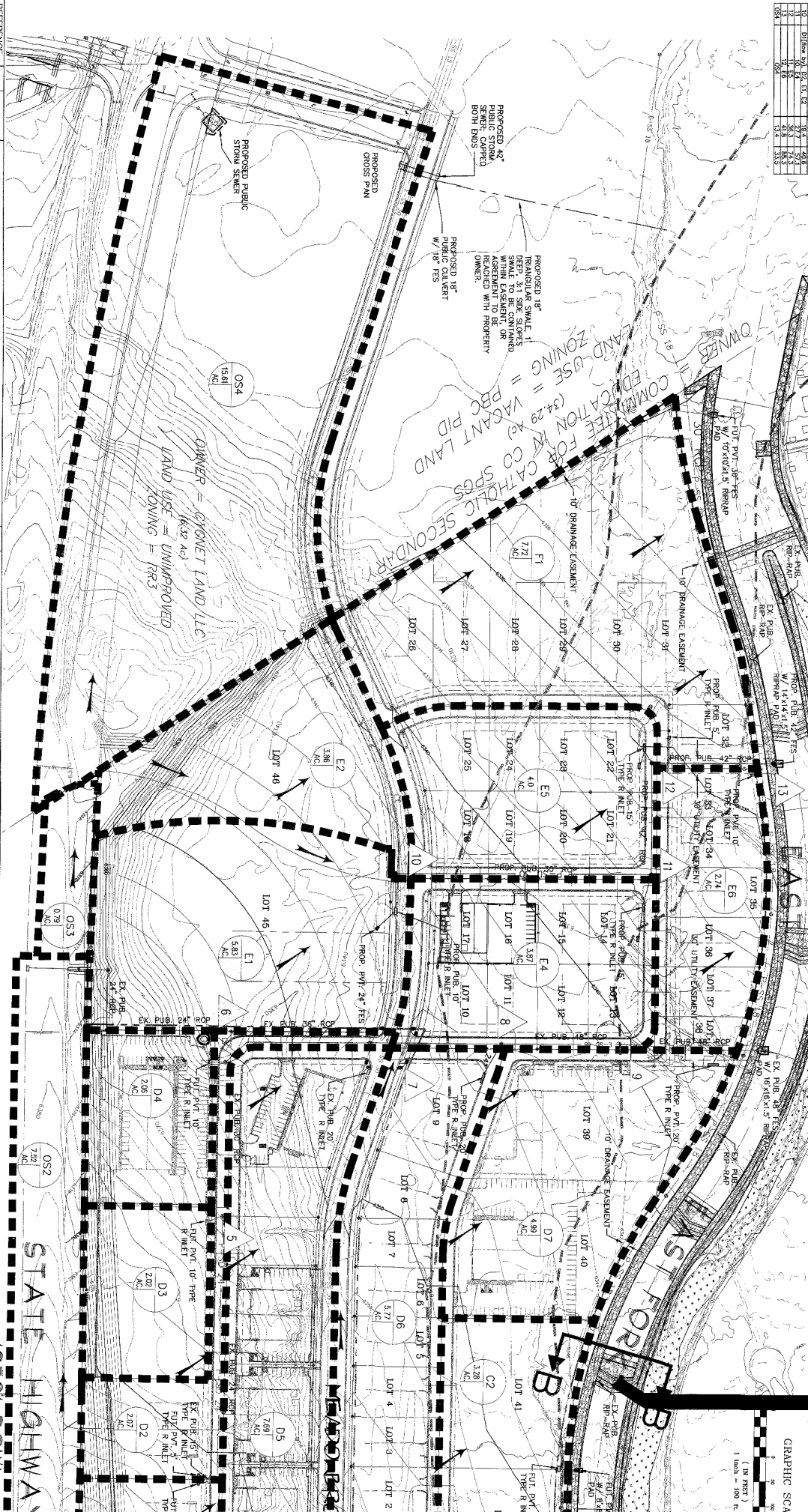
REFERENCE

NO.	DATE	DESCRIPTION	BY
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2	10/10/00	REVISIONS	BT
3	10/10/00	BENCHMARK DATA(ELEV.)	BT
4	10/10/00	(DATUM)	BT
5	10/10/00	(DESCRIPTION/LOCATION)	BT

5. VOA 111 (04/01/02) VSOI Water Resources VSOI - FTR (01/01 - 02/04)
7. (10/10/00) No. 2, 2000, 2000, 2000

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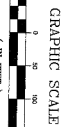
DRAINAGE PLAN CLAREMONT BUSINESS PARK FILING NO. 2

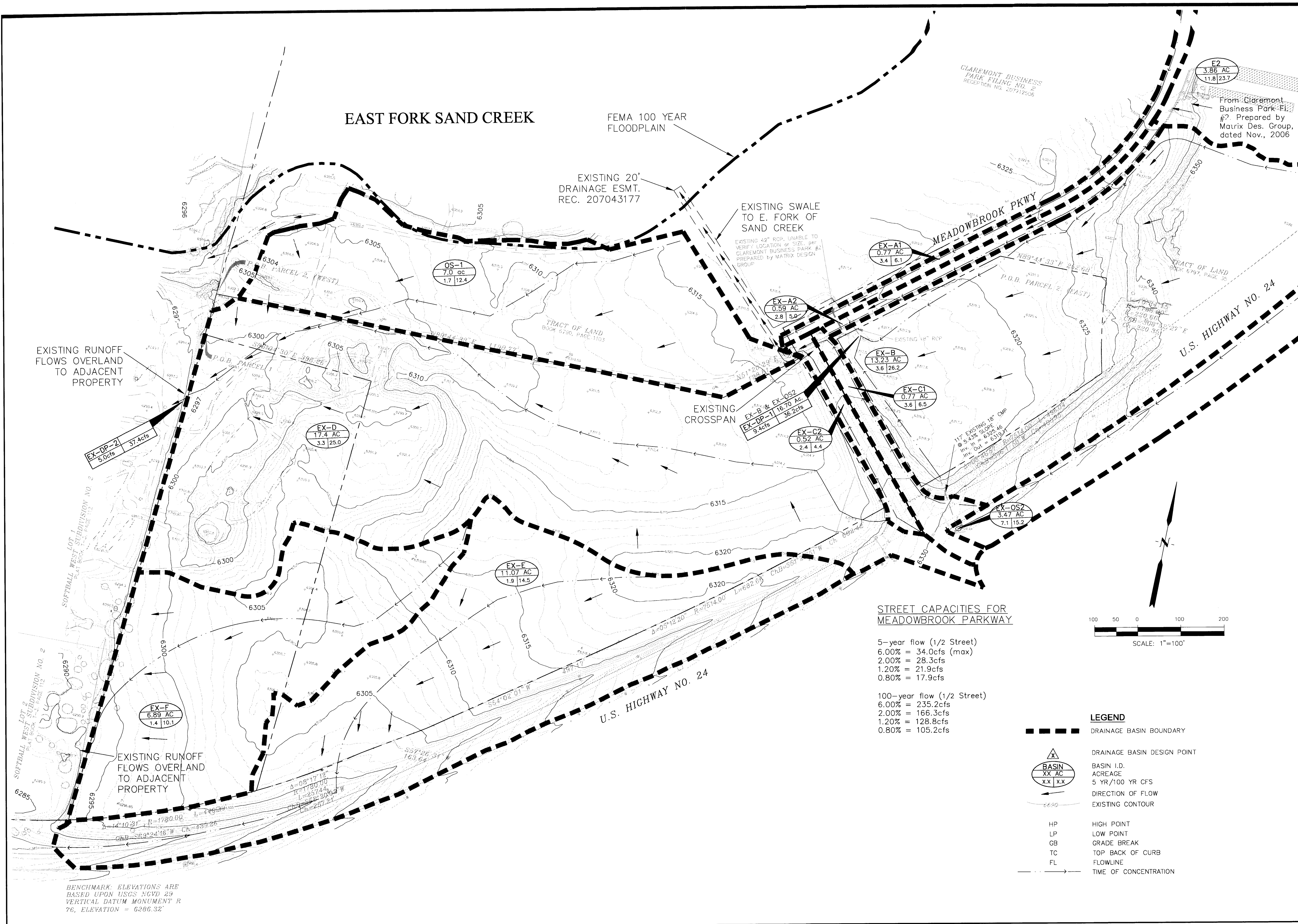


REFERENCE 1. SHEET 01 OF 02 (THIS SHEET) 2. SHEET 02 OF 02 (THIS SHEET) 3. SHEET 03 OF 02 (THIS SHEET) 4. SHEET 04 OF 02 (THIS SHEET) 5. SHEET 05 OF 02 (THIS SHEET) 6. SHEET 06 OF 02 (THIS SHEET) 7. SHEET 07 OF 02 (THIS SHEET) 8. SHEET 08 OF 02 (THIS SHEET) 9. SHEET 09 OF 02 (THIS SHEET) 10. SHEET 10 OF 02 (THIS SHEET)		REVISIONS <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> </tr> <tr> <td>9</td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		NO.	DATE	DESCRIPTION	BY	1				2				3				4				5				6				7				8				9				10			
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FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.		CLAREMONT BUSINESS PARK FINAL DRAINAGE PLAN MASTER DEVELOPMENT DRAINAGE PLAN FINAL DRAINAGE PLAN FILING NO. 2																																													



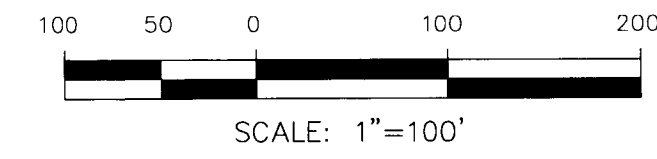
Matrix Design Group, Inc.
Integrated Design Solutions 2415 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0288





STREET CAPACITIES FOR
MEADOWBROOK PARKWAY

5-year flow (1/2 Street)
6.00% = 34.0cfs (max)
2.00% = 28.3cfs
1.20% = 21.9cfs
0.80% = 17.9cfs
100-year flow (1/2 Street)
6.00% = 235.2cfs
2.00% = 166.3cfs
1.20% = 128.8cfs
0.80% = 105.2cfs



LEGEND

- DRAINAGE BASIN BOUNDARY
- ▲ DRAINAGE BASIN DESIGN POINT
- BASIN I.D. XX AC
- 5 YR/100 YR CFS
- DIRECTION OF FLOW
- EXISTING CONTOUR
- HP HIGH POINT
- LP LOW POINT
- CB GRADE BREAK
- TC TOP BACK OF CURB
- FL FLOWLINE
- TIME OF CONCENTRATION

BENCHMARK: ELEVATIONS ARE
BASED UPON USGS NGVD 29
VERTICAL DATUM MONUMENT R
76, ELEVATION = 6286.32'

CORE ENGINEERING GROUP
15004 ST. AVENUE, SUITE 300
COPPELL, TEXAS 75019
PHONE: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rich@cegi.com

DATE: _____

DESCRIPTION: _____

NO: _____

PREPARED FOR:
Circle K Stores, Inc.
1199 South Belline Road, Suite 160
COPPELL, TEXAS 75019
CONTACT: Tim Peters

PROJECT:
24/94 BUSINESS PARK
Meadowbrook Parkway & Platte Avenue
COLORADO SPRINGS, COLORADO

DRAWN: LAB/09/15
DESIGNED: LAB/09/15
CHECKED: RL/03/15/15

EXISTING CONDITIONS DRAINAGE PLAN
24/94 BUSINESS PARK
EL PASO COUNTY, CO

DATE:
APRIL, 2016

PROJECT NO.
319.001

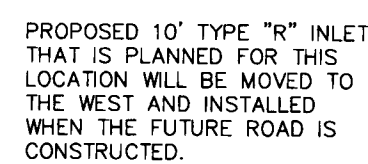
SHEET NUMBER
1

TOTAL SHEETS: **1**

FEMA 100 YEAR FLOODPLAIN

5-year flow (1/2 Street)
6.00% = 34.0cfs (max)
2.00% = 28.3cfs
1.20% = 21.9cfs
0.80% = 17.9cfs

100-year flow (1/2 Street)
6.00% = 235.2cfs
2.00% = 166.3cfs
1.20% = 128.8cfs
0.80% = 105.2cfs

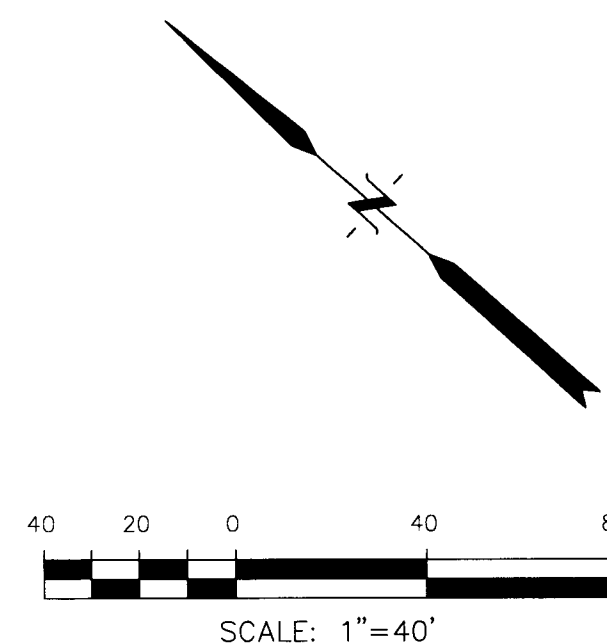



EXISTING 42" RCP
APPROX. INV. = 6306.44
(TO BE ABANDONED)

DRAINAGE,
EASEMENT

Future
Type "R" Inlet
When Road is
Extended

DESIGN POINT SUMMARY TABLE			
DESIGN POINT	RUNOFF 5 YR (cfs)	RUNOFF 100 YR (cfs)	COMMENTS
INLET #2	40.1	71.9	FLOW IN PIPE
INLET #1	44.4	83.2	FLOW IN PIPE
INLET #3	7.1	12.9	ON-SITE INLET, 24" RCP TO WQ VAULT
STMH #6	7.5	15.1	FROM BASIN EX-0S2



PROPOSED STORM SEWER PLAN LOT 1 OF 24/94 BUSINESS PARK Meadowbrook Pkwy, EL PASO COUNTY, CO		 CORE ENGINEERING GROUP 15004 1ST AVENUE S. BURNING WOOD, MO 65506 PHONE: 636.450.1100 CONTACT: RICHARD L. SCHNOLLEP - P.E. EMAIL: Rich@cegi.com	
DATE: JULY 2016 PROJECT NO. 319.001 SHEET NUMBER 2		DRAWN: LAB, 9/9/15 DESIGNED: LAB, 9/9/15 CHECKED: RLS, 9/10/15	
PROJECT: 24/94 BUSINESS PARK Meadowbrook Parkway & Platte Avenue COLORADO SPRINGS, COLORADO		PREPARED FOR: Circle K Stores, Inc. 1199 South Bellline Road, Suite 160 COPPELL, TEXAS 75019 (940) 453-0015	
NO. _____ DESCRIPTION _____ DATE _____			
TOTAL SHEETS: 2			

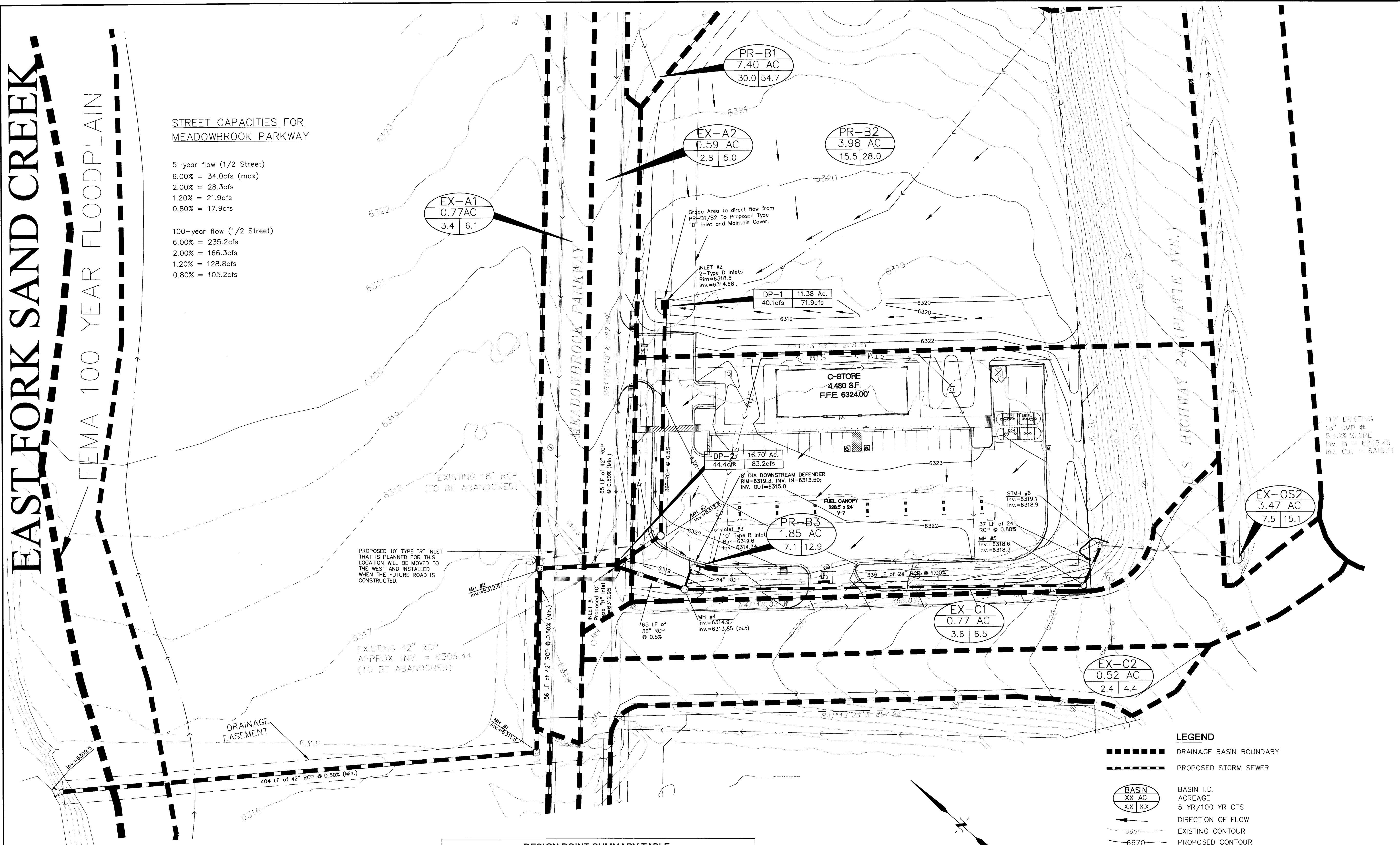
EAST FORK SAND CREEK

FEMA 100 YEAR FLOODPLAIN:

STREET CAPACITIES FOR MEADOWBROOK PARKWAY

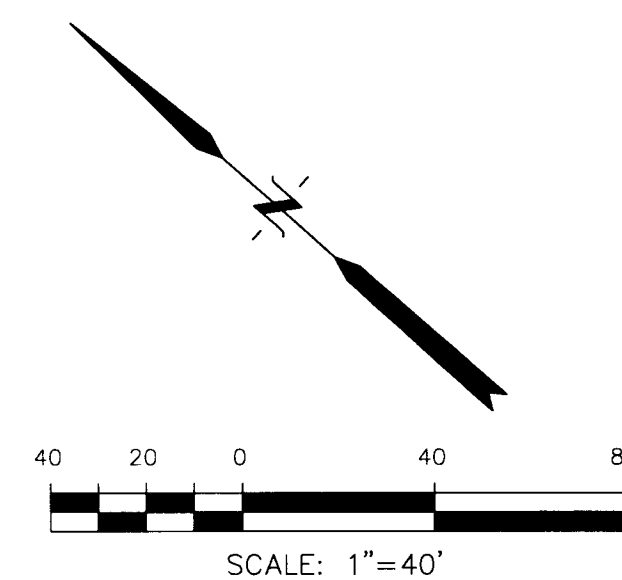
5-year flow (1/2 Street)
6.00% = 34.0cfs (max)
2.00% = 28.3cfs
1.20% = 21.9cfs
0.80% = 17.9cfs

100-year flow (1/2 Street)
6.00% = 235.2cfs
2.00% = 166.3cfs
1.20% = 128.8cfs
0.80% = 105.2cfs



DESIGN POINT SUMMARY TABLE

DESIGN POINT SUMMARY TABLE			
DESIGN POINT	RUNOFF 5 YR (cfs)	RUNOFF 100 YR (cfs)	COMMENTS
DP-1	40.1	71.9	FLOW IN PIPE
DP-2	44.4	83.2	FLOW IN PIPE
INLET #3	7.1	12.9	ON-SITE INLET, 24" RCP TO WQ VAULT
STMH #6	7.5	15.1	FROM BASIN EX-052



LEGEND

-
- DRAINAGE BASIN BOUNDARY
 - - - - - PROPOSED STORM SEWER
 (BASIN
 XX AC
 x.x | x.x)
 BASIN I.D.
 ACREAGE
 5 YR/100 YR CFS
 → DIRECTION OF FLOW
 - - - - - EXISTING CONTOUR
 ——— PROPOSED CONTOUR
 6670
 HP HIGH POINT
 LP LOW POINT
 GB GRADE BREAK
 TC TOP BACK OF CURB
 FL FLOWLINE
 → TIME OF CONCENTRATION

PROPOSED CONDITIONS DRAINAGE PLAN
LOT 1 OF 24/94 BUSINESS PARK
Meadowbrook Pkwy., EL PASO COUNTY, CO

DATE:
JULY, 2016

PROJECT NO.
319.001

SHEET NUMBER
1

TOTAL SHEETS: 2

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

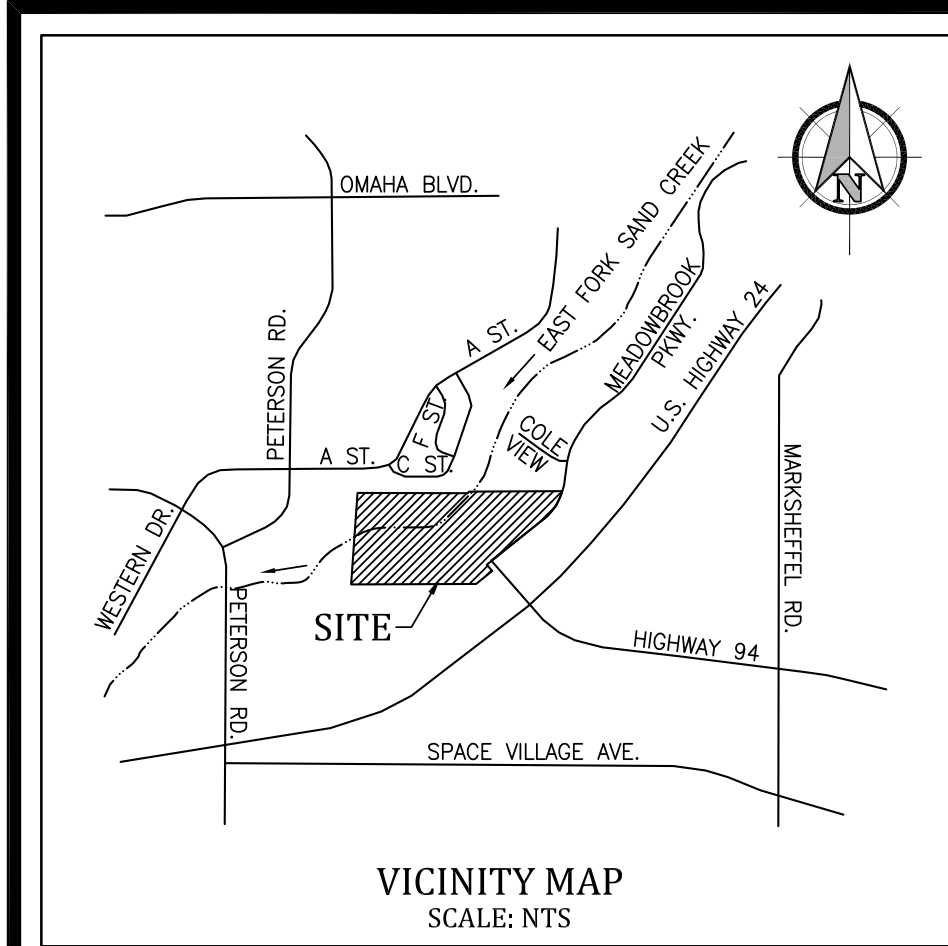
PREPARED FOR:

Circle K Stores, Inc.
1199 South Bellline Road, Suite 160
CORPELL, TEXAS 75019
(940) 453-0015
CONTACT: Tim Peters

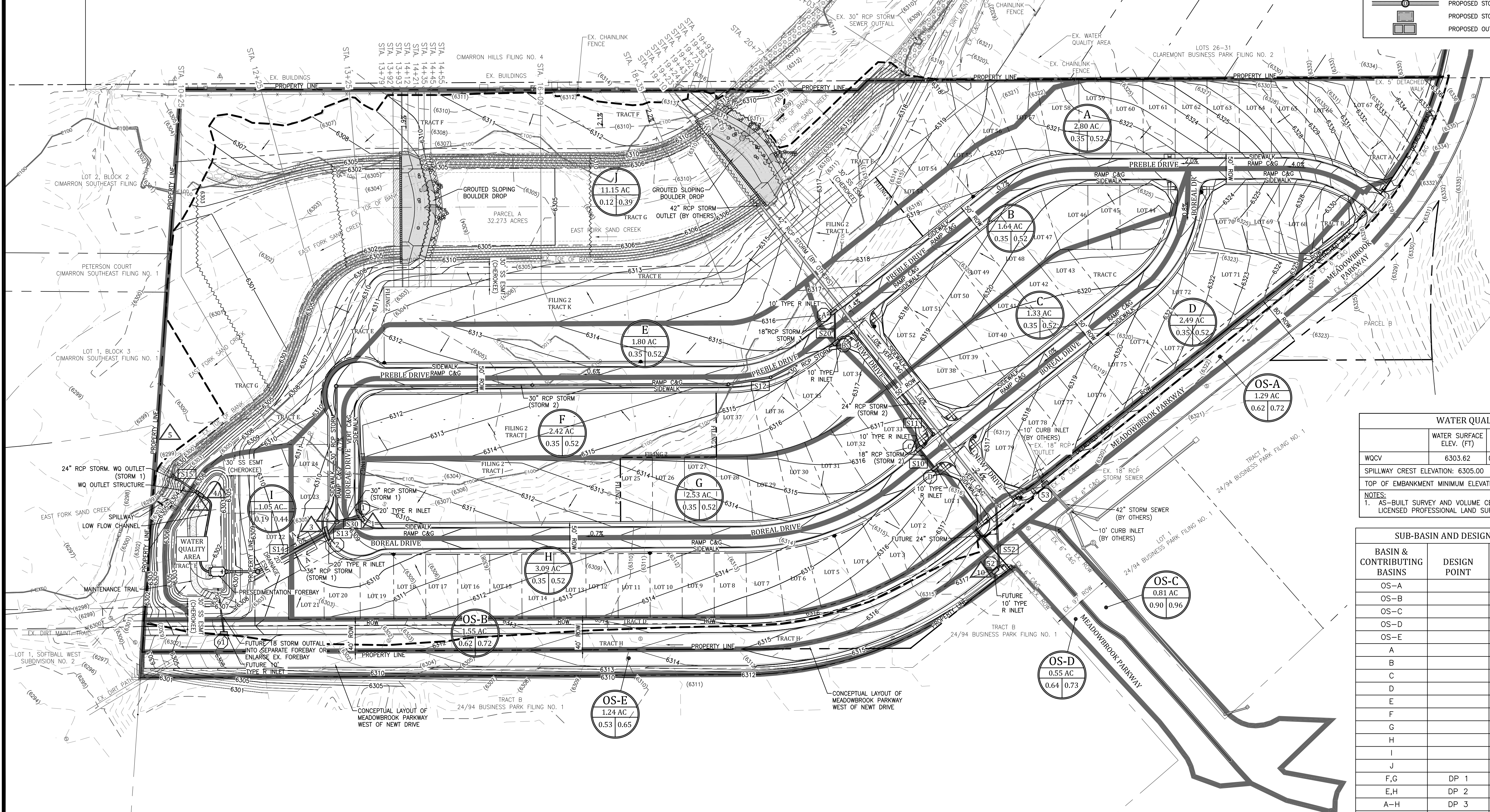
PROJECT:

24/94 BUSINESS PARK
Meadowbrook Parkway & Platte Avenue
COLORADO SPRINGS, COLORADO

PROPOSED CONDITIONS DRAINAGE PLAN
LOT 1 OF 24/94 BUSINESS PARK
Meadowbrook Pkwy., EL PASO COUNTY, CO



VICINITY MAP
SCALE: NTS



LEGEND

A

1.84 AC

C5 RUNOFF COEF

0.76 0.83

C100

RUNOFF COEFFICIENT

→

DIRECTIONAL FLOW ARROW

DRAINAGE BASIN BOUNDARY

10

S10

HYDRAULIC STRUCTURE IDENTIFIER

↑

↓

STORM SEWER IDENTIFIER

▲

▲

DESIGN POINT

STORMWATER EMERGENCY OVERFLOW PATH

R.O.W. / PROPERTY LINE

EXISTING EASEMENT

EXISTING STORM SEWER

EXISTING CONTOURS

PROPOSED CONTOURS

EXISTING FLOW DIRECTION AND SLOPE

PROPOSED FLOW DIRECTION AND SLOPE

PROPOSED CURB AND GUTTER

EXISTING 100 YEAR FLOODPLAIN

PROPOSED 100 YEAR FLOODPLAIN

PROPOSED 100 YEAR BASE FLOOD ELEVATION LINE

PROPOSED STORM SEWER PIPE AND MANHOLE

PROPOSED STORM CURB INLET

PROPOSED OUTLET STRUCTURE

WATER QUALITY BASIN				
	WATER SURFACE ELEV. (FT)	REQUIRED STORAGE VOLUME	RELEASE RATE	PROVIDED STORAGE VOLUME
WQCV	6303.62	0.36 AC-FT		
SPILLWAY CREST ELEVATION: 6305.00				
TOP OF EMBANKMENT MINIMUM ELEVATION: 6306.50				
NOTES:				
1. AS-BUILT SURVEY AND VOLUME CERTIFICATION REQUIRED BY A LICENSED PROFESSIONAL LAND SURVEYOR, SEE GRADING NOTES.				

SUB-BASIN AND DESIGN POINT DISCHARGES			
BASIN & CONTRIBUTING BASINS	DESIGN POINT	5-YR FLOW	100-YR FLOW
OS-A		3.0 cfs	5.9 cfs
OS-B		3.5 cfs	6.9 cfs
OS-C		3.8 cfs	6.7 cfs
OS-D		1.8 cfs	3.4 cfs
OS-E		2.4 cfs	5.0 cfs
A		3.4 cfs	8.6 cfs
B		2.1 cfs	5.3 cfs
C		1.8 cfs	4.4 cfs
D		3.1 cfs	7.9 cfs
E		2.2 cfs	5.4 cfs
F		2.9 cfs	7.3 cfs
G		3.1 cfs	7.7 cfs
H		3.7 cfs	9.3 cfs
I		0.8 cfs	3.1 cfs
J		4.1 cfs	23.4 cfs
F,G	DP 1	5.9 cfs	15.0 cfs
E,H	DP 2	5.8 cfs	14.6 cfs
A-H	DP 3	19.2 cfs	48.4 cfs
A-I	DP 4	19.6 cfs	50.2 cfs
A-I, OSB	DP 4A	22.1 cfs	55.1 cfs
A-J, OSB	DP 5	26.3 cfs	77.7 cfs
OSC, OSD	DP 10	5.5 cfs	10.1 cfs

Kiowa

Engineering Corporation

7175 West Jefferson Avenue, Suite 1300
Lakewood, Colorado 80235
(303) 692-0369

MEADOWBROOK SUBDIVISION

PRELIMINARY/FINAL DRAINAGE REPORT

DRAINAGE PLAN - PROPOSED CONDITION

EL PASO COUNTY, COLORADO

Project No.:	16039
Date:	July 25, 2017
Design:	ELS
Drawn:	ELS
Check:	MWE
Revisions:	

EXHIBIT

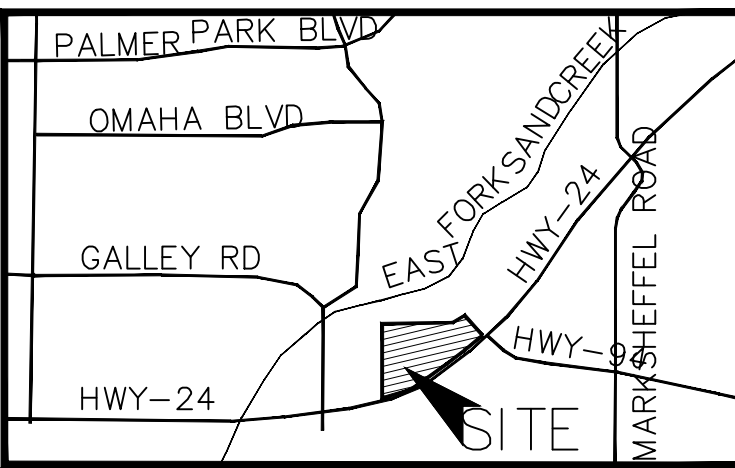
B

DRAINAGE MAPS

CROSSROADS MIXED USE HISTORIC CONDITIONS DRAINAGE MAP

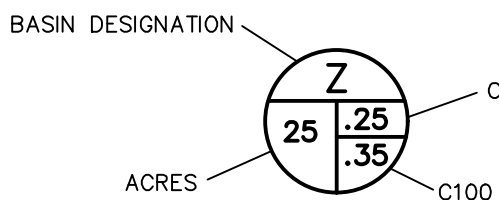
*NOTES:

1.) NOT SHOWN IS BASIN "E2". THIS BASIN LIES TO THE EAST OF BASIN "EX-A2". DELINEATION AND HYDROLOGIC DETAILS OF THIS BASIN CAN BE FOUND IN THE "FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2" ON PAGES 39 AND 41, RESPECTIVELY.



VICINITY MAP
N.T.S.

LEGEND



SURFACE DESIGN POINT



BASIN BOUNDARY



EXIST MAJ CONT



EXIST MIN CONT



EXISTING FLOW DIRECTION ARROW



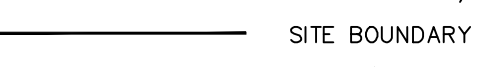
HIGH POINT



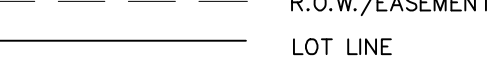
LOW POINT



PROPOSED SWALE



EXISTING SWALE



CONSTRUCTION/DISTURBANCE LIMITS



SITE BOUNDARY



R.O.W./EASEMENT



LOT LINE



EX. STORM SEWER LINE



EX. UNDERGROUND ELECTRIC LINE



EX. SANITARY SEWER LINE



EX. WATER LINE



EX. STORM SEWER LINE



LOT NUMBER



EX. IRRIGATION VALVE



EX. STORM INLET



EX. GAS TEST NODE



EX. TELEPHONE PEDESTAL



EX. ELECTRIC VAULT



EX. SANITARY MANHOLE



EX. WATER VALVE

HISTORIC DRAINAGE MAP
CROSSROADS MIXED USE
JOB NO. 18-003
DATE PREPARED: FEBRUARY 23, 2021
DATE REVISED:

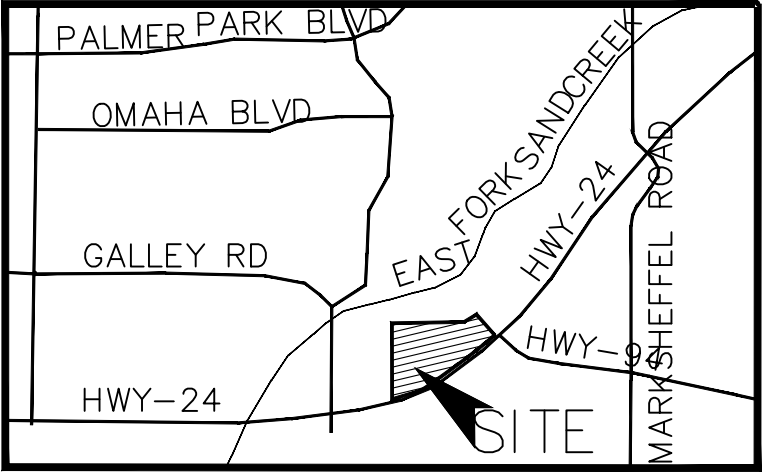


212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CROSSROADS MIXED USE EXISTING CONDITIONS DRAINAGE MAP

*NOTES:

1.) NOT SHOWN IS BASIN "E2". THIS BASIN LIES TO THE EAST OF BASIN "EX-A2". DELINEATION AND HYDROLOGIC DETAILS OF THIS BASIN CAN BE FOUND IN THE "FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2" ON PAGES 39 AND 41, RESPECTIVELY.



VICINITY MAP
N.T.S.

LEGEND

- BASIN DESIGNATION
- ACRES
- 1
- 25
- 1.25
- 0.35
- C5
- C100
- 1
- SURFACE DESIGN POINT
- BASIN BOUNDARY
- EXIST MAJ CONT
- EXIST MIN CONT
- EXISTING FLOW DIRECTION ARROW
- H.P.
- X
- L.P.
- X
- PROPOSED SWALE
- EXISTING SWALE
- CONSTRUCTION/DISTURBANCE LIMITS
- SITE BOUNDARY
- R.O.W./EASEMENT
- LOT LINE
- ST
- EX. STORM SEWER LINE
- UE
- EX. UNDERGROUND ELECTRIC LINE
- SS
- EX. SANITARY SEWER LINE
- WL
- EX. WATER LINE
- ST
- EX. STORM SEWER LINE
- 9
- LOT NUMBER
- ICV
- EX. IRRIGATION VALVE
- ST
- EX. STORM INLET
- GS
- EX. GAS TEST NODE
- TE
- EX. TELEPHONE PEDESTAL
- EV
- EX. ELECTRIC VAULT
- SM
- EX. SANITARY MANHOLE
- WV
- EX. WATER VALVE

BASIN I.D.	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
C	3.99	0.9	6.3
A	11.02	1.5	11.1
B	17.31	2.0	14.5
OS-1	1.28	5.8	10.5
OS-2	4.98	8.7	19.6
EX-A2***	0.59	2.5	4.5
OS-A**	1.29	3.1	6.0
E2*	3.86	15.1	28.6

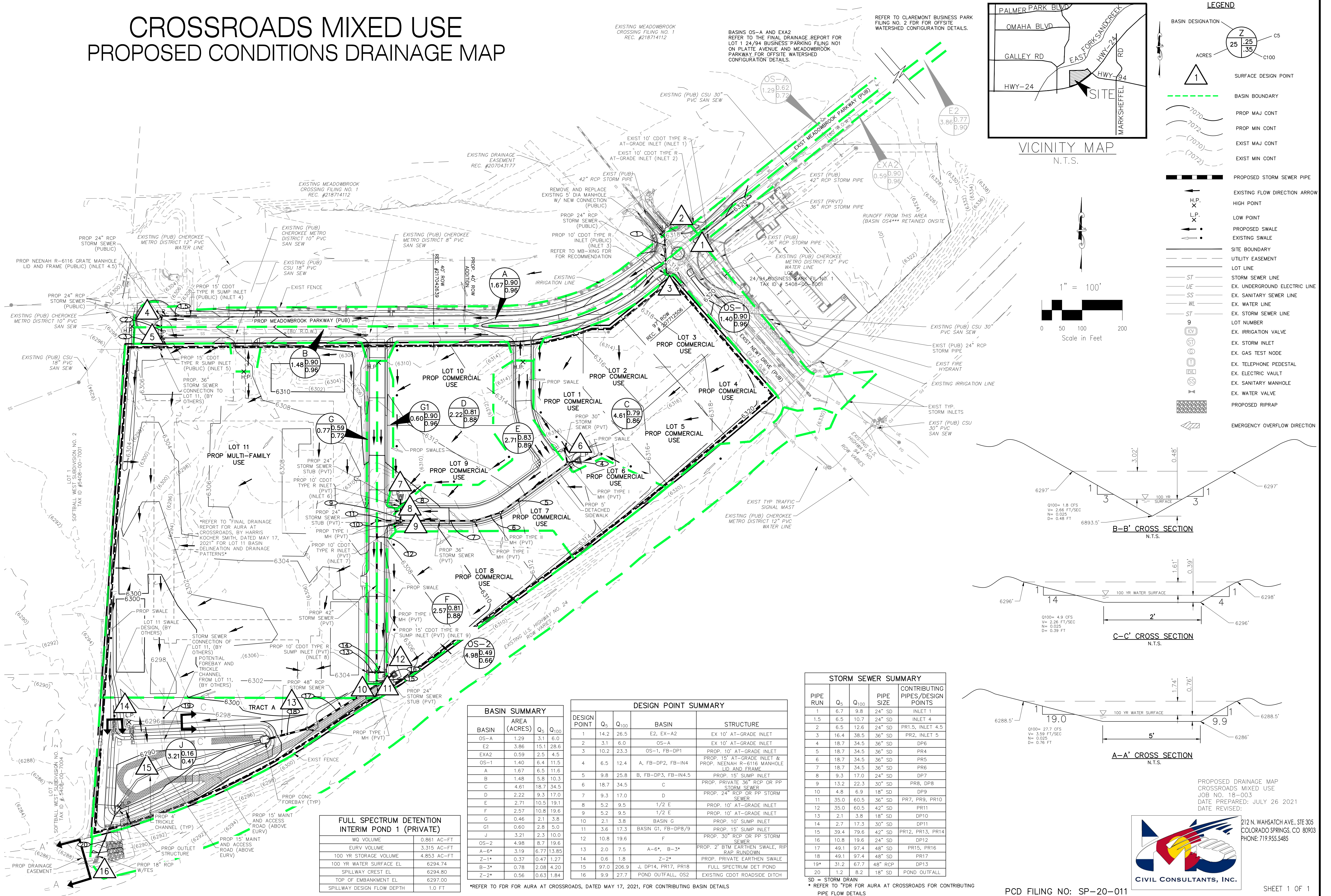
DESIGN POINT	Q5	Q100	BASIN(S)/FLOWBYS	OUTFALL
1	14.2	26.5	E2, EX-A2	EXIST 10' CDOT TYPE R AT GRADE INLET
2	3.1	6.0	OS-A	EXIST 10' CDOT TYPE R AT GRADE INLET
3	9.8	22.5	OS-1, FB-DP1	END OF PAVEMENT
4	7.1	25.5	A, FB-DP2, DP3	DISCHARGE TO ADJACENT PARCEL (LOT 1)
5	5.0	14.5	B	DISCHARGE TO ADJACENT PARCEL (LOT 2)
6	0.9	6.3	C	DISCHARGE TO CDOT ROW
7	9.9	28.0	OS2, DP6	CDOT BARROW DITCH

EXISTING DRAINAGE MAP
CROSSROADS MIXED USE
JOB NO. 18-003
DATE PREPARED: FEBRUARY 23, 2021
DATE REVISED:



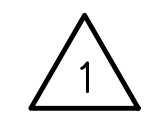
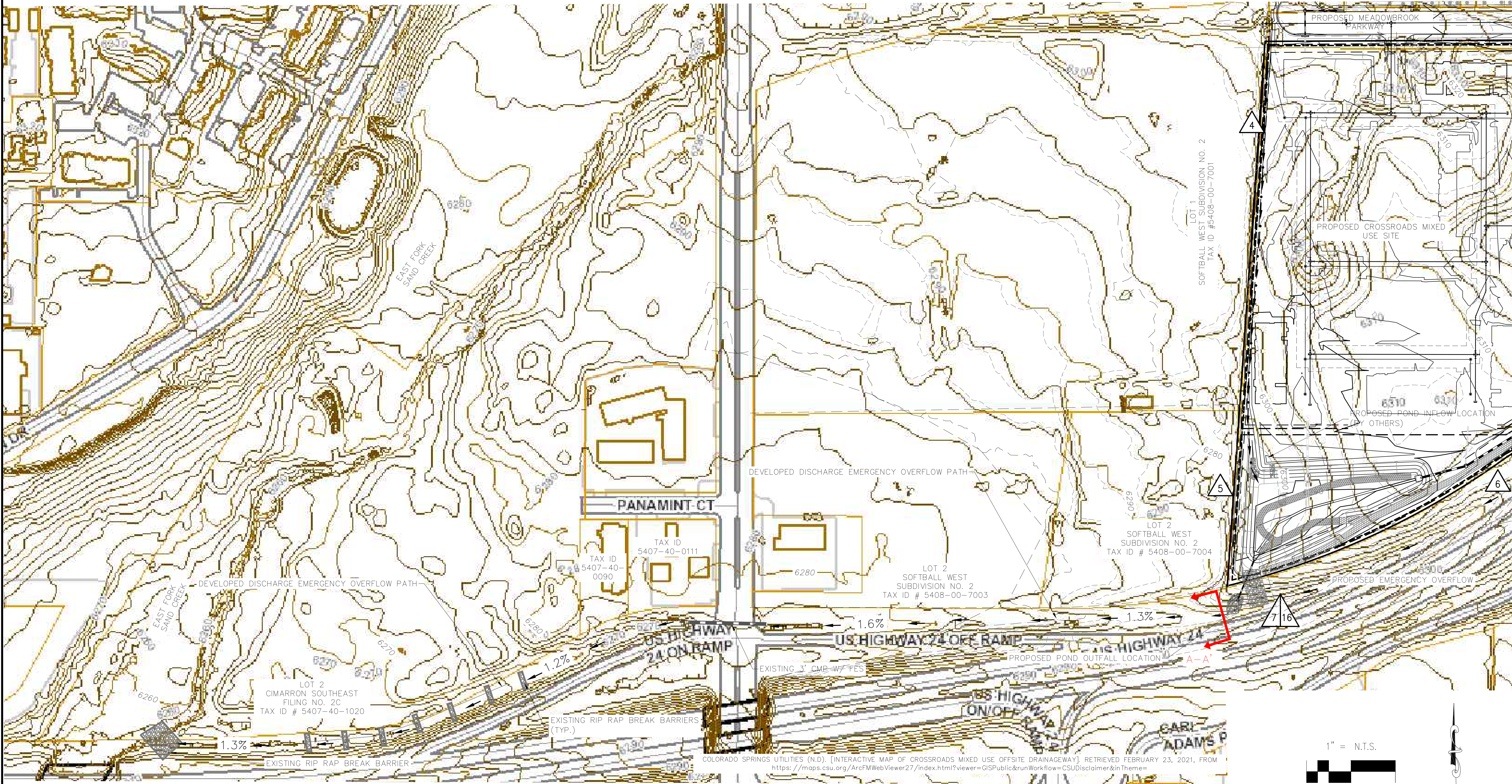
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CROSSROADS MIXED USE PROPOSED CONDITIONS DRAINAGE MAP



CROSSROADS MIXED USE

DRAINAGEWAY EXHIBIT
FEBRUARY 2021



SURFACE DESIGN POINT



SITE BOUNDARY



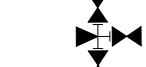
EXISTING RIP RAP BARRIERS

6280

PROPOSED CONTOUR

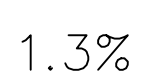
6290

EXISTING CONTOUR



PROPOSED WATER FITTING

1.3%



EXISTING FLOW ARROW



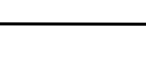
EXISTING DITCH SLOPE



EXISTING STORM SEWER AND FES



PROPOSED STORM SEWER



R.O.W./EASEMENT



PROPOSED SWALE



PROPOSED SANITARY SEWER MANHOLE



PROPOSED SEWER LINE



PROPOSED WATER LINE

PROPOSED EMERGENCY OVERFLOW DIRECTION

HISTORIC DESIGN POINT SUMMARY

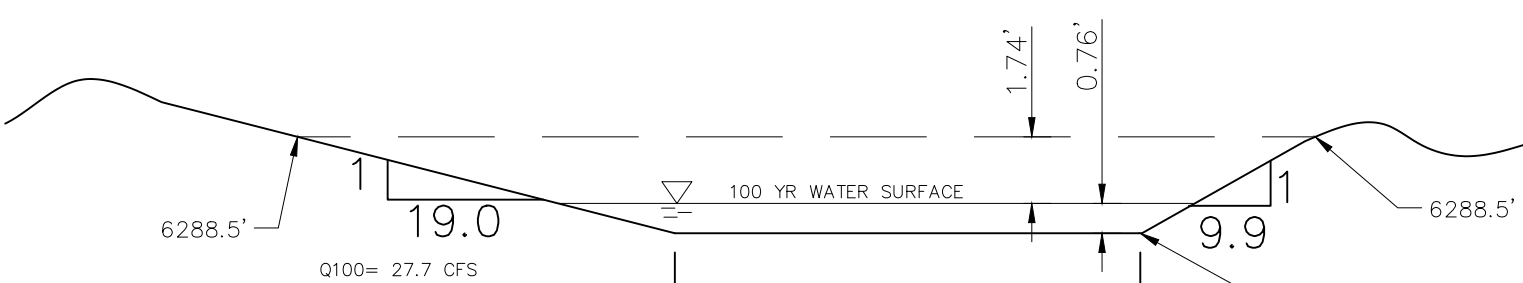
DESIGN POINT	Q5 (CFS)	Q100 (CFS)
4	7.4	27.7
5	8.3	18.2
6	1.2	8.5
7	10.4	31.9

PROPOSED DESIGN POINT SUMMARY

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
16	9.9	27.7

NOTES:

1.) REFER TO DRAINAGE MAPS IN PRELIMINARY DRAINAGE REPORT FOR CROSSROADS MIXED USE FOR DETAILED ON SITE FLOWS AS WELL AS HYDROLOGIC AND HYDRAULIC ANALYSES CORRESPONDING TO CHANGES FROM HISTORIC AND EXISTING CONDITIONS



A-A' CROSS SECTION
N.T.S.

1" = N.T.S.



Scale in Feet

PCD FILING NO: SP-20-011



212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485