

PRELIMINARY DRAINAGE REPORT

FOR

CROSSROADS MIXED USE EL PASO COUNTY, COLORADO

JUNE 2021

Prepared for:
Crossroads Metropolitan District No. 2
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Prepared by:



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

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FOR
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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:

**PRELIMINARY DRAINAGE REPORT
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**PRELIMINARY DRAINAGE REPORT
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Purpose

This preliminary drainage report for Crossroads Mixed Use is in support of a Preliminary Plan and Rezone 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.

A Final Drainage Report for this site and Construction Drawings will be submitted concurrently with the Final Plat. Individual drainage letters and/or reports shall be required with the development of each lot not otherwise clearly analyzed by the aforementioned Final Drainage Report for Crossroads Mixed Use.

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 Q5=15.1 and Q100=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)** (Q5=2.5, Q100=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 Q5=14.2 and Q100=26.5 cfs. An existing 10' CDOT Type R at-grade inlet (**Inlet 1**) intercepts flows of Q5=8.4

and Q100=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 Q5=3.1 and Q100=6.0 cfs. An existing 10' CDOT Type R at grade inlet (**Inlet 2**) collects runoff of Q5=3.1 and Q100=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 (Q5=6.4 and Q100=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 (Q5=3.5 and Q100=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 (Q5=6.5 and Q100=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 (Q100=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 4.853 acre-feet of storage in the 100-year event. The 28' 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
Type I MH	8	EA	\$ 9,800.00	\$ 78,400.00
Type II MH	1	EA	\$ 6,000.00	\$ 6,000.00
18" SD	14	LF	\$ 67.00	\$ 938.00
24" SD	224	LF	\$ 81.00	\$ 18,144.00
30" SD	358	LF	\$ 100.00	\$ 35,800.00
36" SD	229	LF	\$ 124.00	\$ 28,396.00
42" SD	396	LF	\$ 166.00	\$ 65,736.00
48" SD	298	LF	\$ 202.00	\$ 60,196.00
FSD Pond	1	EA	\$ 50,000.00	\$ 50,000.00
TOTAL COST:				\$ 382,616.00

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:

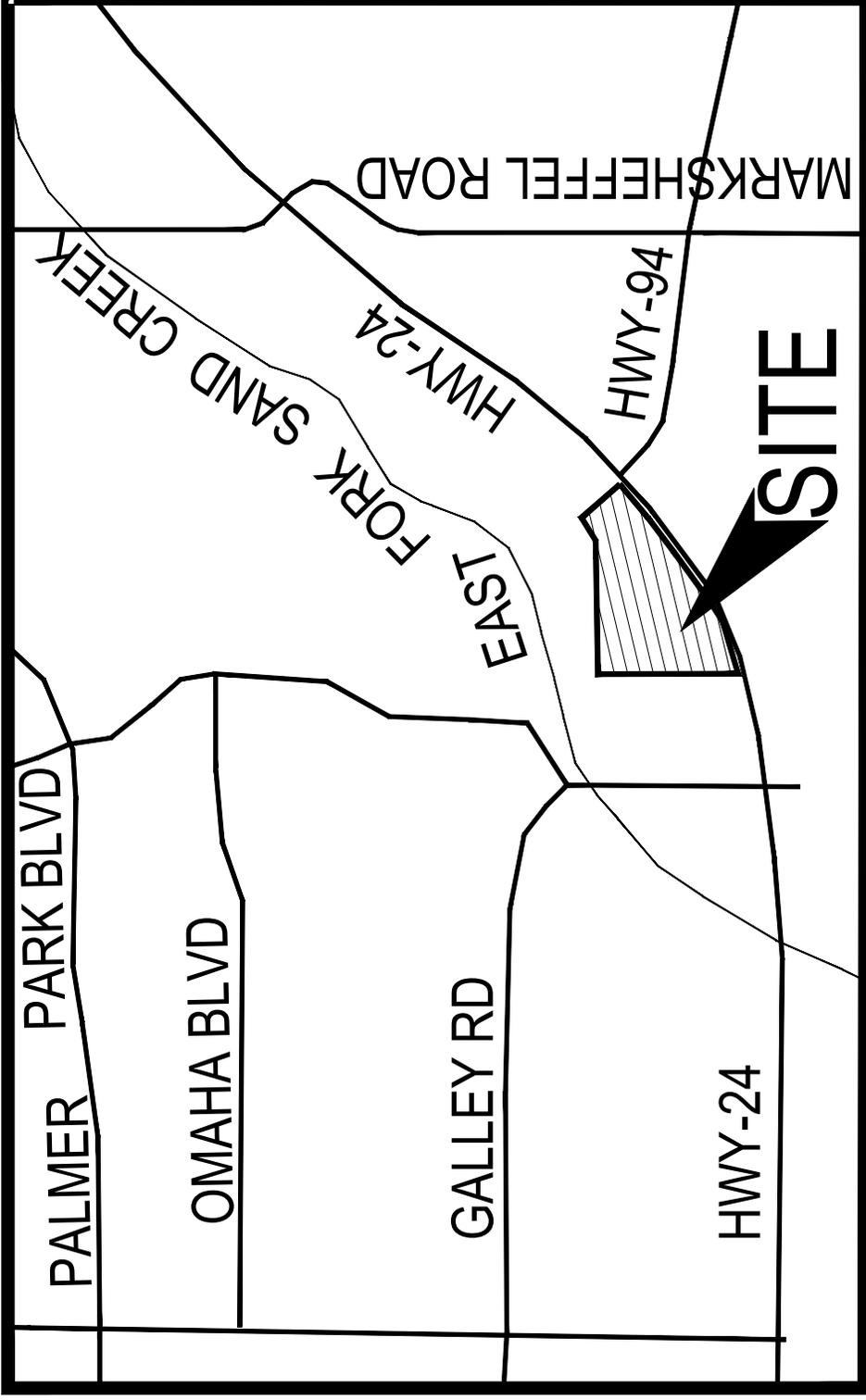
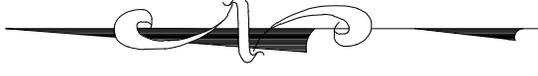
The construction of this site is for the purposes of creating commercial lots and an apartment site. The site will be graded and all disturbed areas will be seeded and mulched. Post construction runoff will be discharged to downstream property at rates that are below historic discharge rates. In the 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.

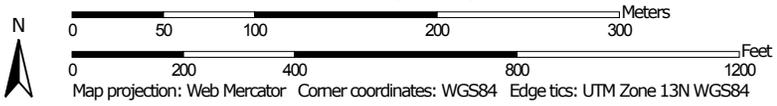
SOILS MAP

Soil Map—El Paso County Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:4,120 if printed on A landscape (11" x 8.5") sheet.



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

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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.

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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.

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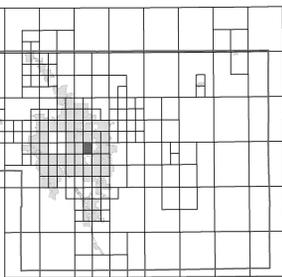
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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/nfp>.

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	

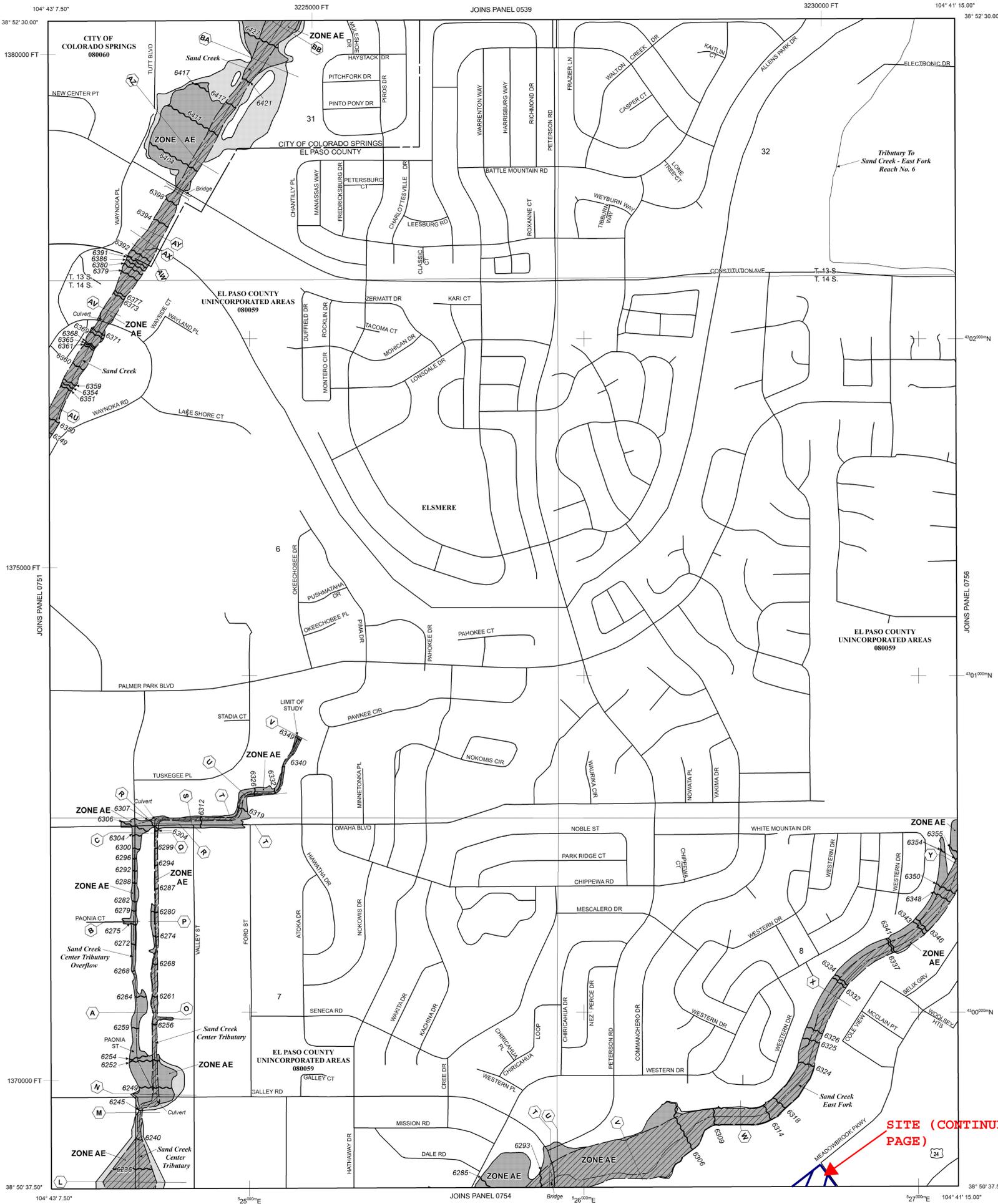
Panel Location Map



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.

SITE (CONTINUES ON NEXT PAGE)

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, AV, 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)

A Cross section line

23 Transsect line

97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4250000N 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT 5000-foot grid ticks; Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 River Mile

MAP REPOSITORIES Refer to Map Repositories list on Map Index

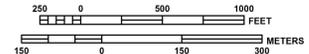
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP MARCH 17, 1997

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

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

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

MAP SCALE 1" = 500'



NFIP

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 06/15/2020 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, NUNCS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
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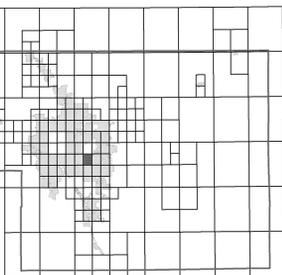
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El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

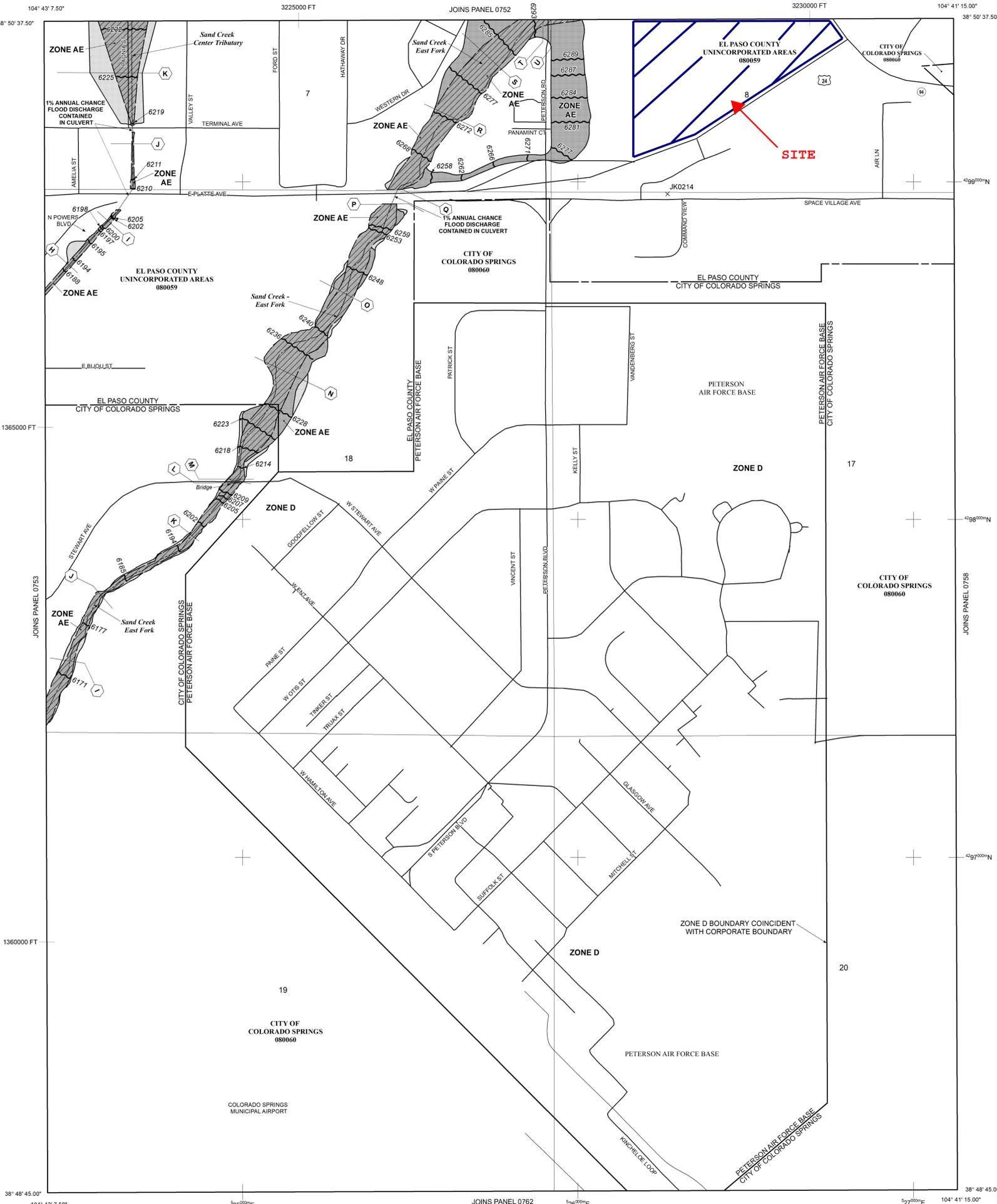
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Panel Location Map



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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.

~ 513 ~ 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

— Transsect line

97° 07' 30.00" Datum of 1983 (NAD 83)

42° 50' 00" 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 River Mile

MAP REPOSITORIES Refer to Map Repositories list on Map Index

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

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

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 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
08041C0754G

MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

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

BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	STREETS / DEVELOPED			OVERLAND / DEVELOPED			WEIGHTED	
			AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
<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
PRELIMINARY 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.

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

*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

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Historic Basin Routing Summary)

<i>From Area Runoff Coefficient Summary</i>				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T_t)	INTENSITY *			TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA₅	CA₁₀₀	C_s	Length (ft)	Height (ft)	T_c (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	I₅ (in/hr)	I₁₀₀ (in/hr)	Q₅ (c.f.s.)	Q₁₀₀ (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
PRELIMINARY DRAINAGE REPORT
(Existing Area Runoff Coefficient Summary)***

BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	STREETS / DEVELOPED			OVERLAND / DEVELOPED			WEIGHTED	
			AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
<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
PRELIMINARY 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 (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>	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
<i>A</i>	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
<i>B</i>	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
<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.

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

*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

Crossroads Mixed Use
PRELIMINARY 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
PRELIMINARY DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)**

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

*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 PRELIMINARY 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.)
		<small>From DCM Table S-1</small>															
Proposed Area Drainage Summary																	
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 PRELIMINARY 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 _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.)	
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)
							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 (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)
							Tc for DP1 Used										
4	A, FB-DP2, FB-IN4	1.50	1.71									8.9	4.3	7.2	6.5	12.4	Proposed 15' CDOT Type R At-Grade Inlet (Public) 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									8.8	4.3	7.3	9.8	25.8	Proposed 15' CDOT Type R Sump Inlet (Public)
							Tc for Basin B Used										
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 0.19	1.32 0.67									5.0	5.2	8.7	3.6	17.3	Proposed 15' CDOT Type R Sump Inlet (Private)
		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 0.48	0.78 0.42									12.8	3.8	6.3	2.0	7.5	Proposed 2' Bottom Earthen Swale, Rip Rap Rundown
		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
PRELIMINARY DRAINAGE CALCULATIONS
(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

Weighted Percent Imperviousness of WQ Pond 1				
Contributing Basins	Area (Acres)	C_s	Impervious % (I)	(Acres)*(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
Residential Lot	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
Totals	32.20			2535.39
Imperviousness of WQ Pond 1	78.7	%		

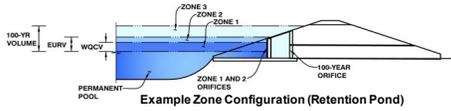
HYDRAULIC CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **CROSSROADS MIXED USE**

Basin ID: **POND 1**



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	32.10 acres
Watershed Length =	1,725 ft
Watershed Length to Centroid =	1,000 ft
Watershed Slope =	0.006 ft/ft
Watershed Imperviousness =	78.67% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Optional User Overrides

Water Quality Capture Volume (WQCV) =	0.857	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.306	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.394	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.107	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.679	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.353	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.011	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.779	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	7.477	acre-feet		inches
Approximate 2-yr Detention Volume =	2.169	acre-feet		
Approximate 5-yr Detention Volume =	2.821	acre-feet		
Approximate 10-yr Detention Volume =	3.370	acre-feet		
Approximate 25-yr Detention Volume =	4.007	acre-feet		
Approximate 50-yr Detention Volume =	4.381	acre-feet		
Approximate 100-yr Detention Volume =	4.729	acre-feet		

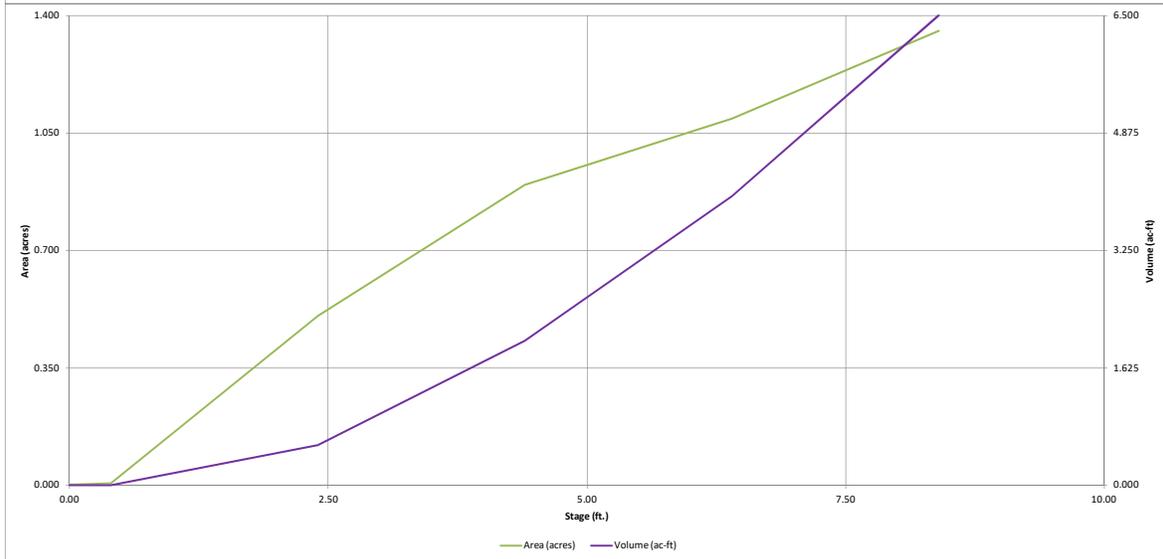
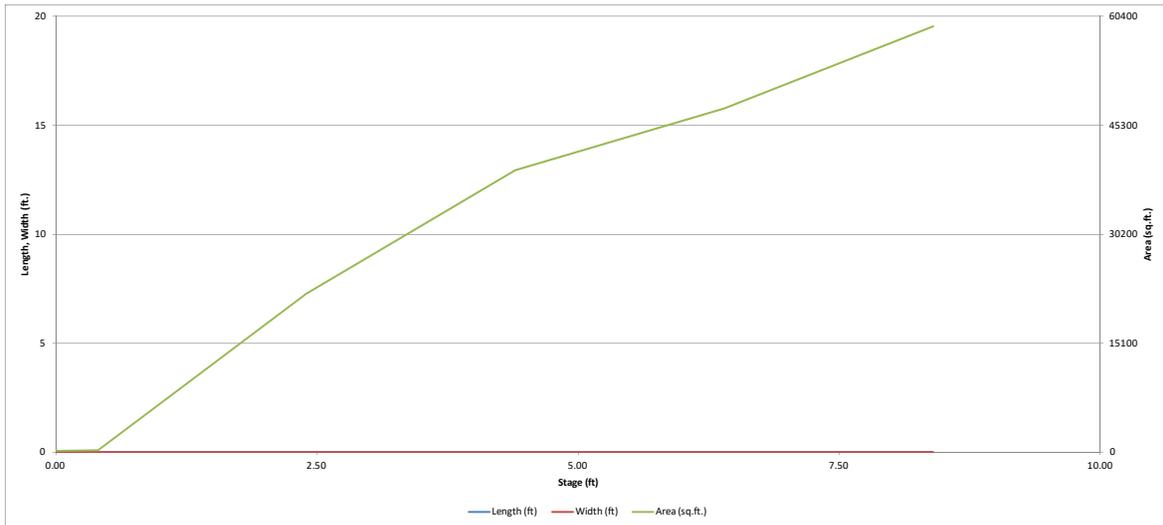
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.857	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.449	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.424	acre-feet
Total Detention Basin Volume =	4.729	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H _{total}) =	user	ft
Depth of Trickle Channel (H _{tc}) =	user	ft
Slope of Trickle Channel (S _{tc}) =	user	ft/ft
Slopes of Main Basin Sides (S _{main}) =	user	H:V
Basin Length-to-Width Ratio (R _{LW}) =	user	
Initial Surcharge Area (A _{ISV}) =	user	ft ²
Surcharge Volume Length (L _{ISV}) =	user	ft
Surcharge Volume Width (W _{ISV}) =	user	ft
Depth of Basin Floor (H _{FLOOR}) =	user	ft
Length of Basin Floor (L _{FLOOR}) =	user	ft
Width of Basin Floor (W _{FLOOR}) =	user	ft
Area of Basin Floor (A _{FLOOR}) =	user	ft ²
Volume of Basin Floor (V _{FLOOR}) =	user	ft ³
Depth of Main Basin (H _{MAIN}) =	user	ft
Length of Main Basin (L _{MAIN}) =	user	ft
Width of Main Basin (W _{MAIN}) =	user	ft
Area of Main Basin (A _{MAIN}) =	user	ft ²
Volume of Main Basin (V _{MAIN}) =	user	ft ³
Calculated Total Basin Volume (V _{total}) =	user	acre-feet

Depth Increment =	2.00	ft							
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
6287.6 Top of Micropool	--	0.00	--	--	--	125	0.003		
	--	0.40	--	--	--	240	0.006	85	0.002
	--	2.40	--	--	--	21,991	0.505	24,351	0.559
	--	4.40	--	--	--	39,042	0.896	87,080	1.999
	--	6.40	--	--	--	47,632	1.093	174,450	4.005
	--	8.40	--	--	--	59,044	1.355	283,066	6.498

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

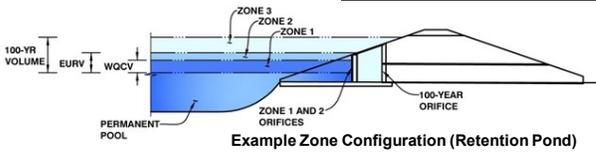


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention, Version 4.03 (May 2020)*

Project: CROSSROADS MIXED USE

Basin ID: POND 1



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

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft ²
Underdrain Orifice Centroid =	N/A feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	5.76	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate	
WQ Orifice Area per Row =	N/A ft ²
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft ²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	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)

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

Calculated Parameters for Vertical Orifice	
Vertical Orifice Area =	N/A ft ²
Vertical Orifice Centroid =	N/A feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.77	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.70	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.91	N/A	feet
Overflow Gate Open Area % =	70%	N/A	% gate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir	
Height of Gate Upper Edge, H _u =	5.77 feet
Overflow Weir Slope Length =	2.91 feet
Gate Open Area / 100-yr Orifice Area =	18.27
Overflow Gate Open Area w/o Debris =	11.61 ft ²
Overflow Gate Open Area w/ Debris =	5.81 ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	7.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Outlet Orifice Area =	0.64 ft ²
Outlet Orifice Centroid =	0.34 feet
Half-Central Angle of Restrictor Plate on Pipe =	1.35 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.20	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	28.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway	
Spillway Design Flow Depth =	0.92 feet
Stage at Top of Freeboard =	9.12 feet
Basin Area at Top of Freeboard =	1.38 acres
Basin Volume at Top of Freeboard =	6.50 acre-ft

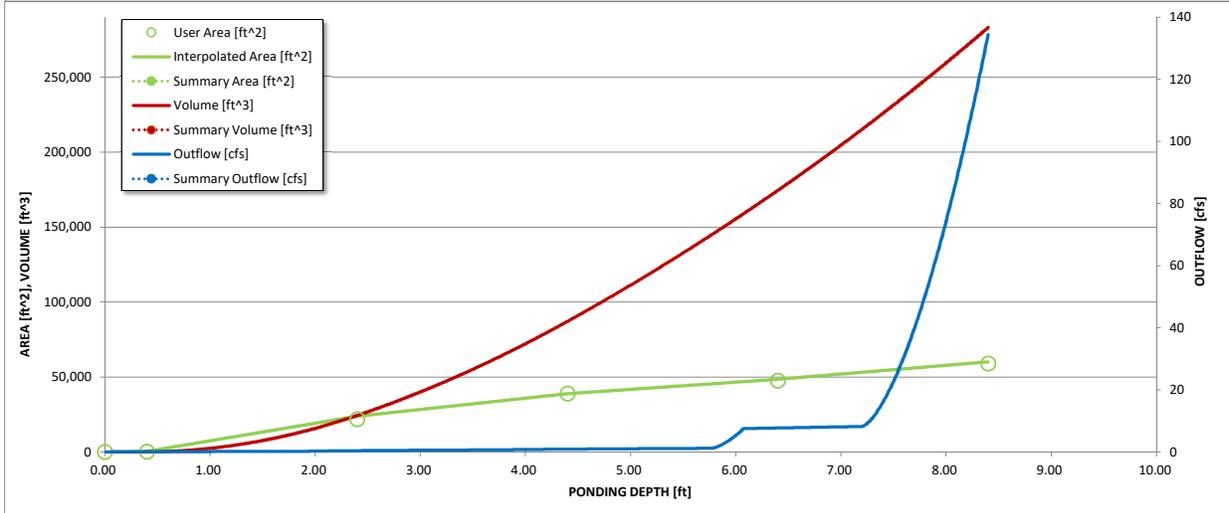
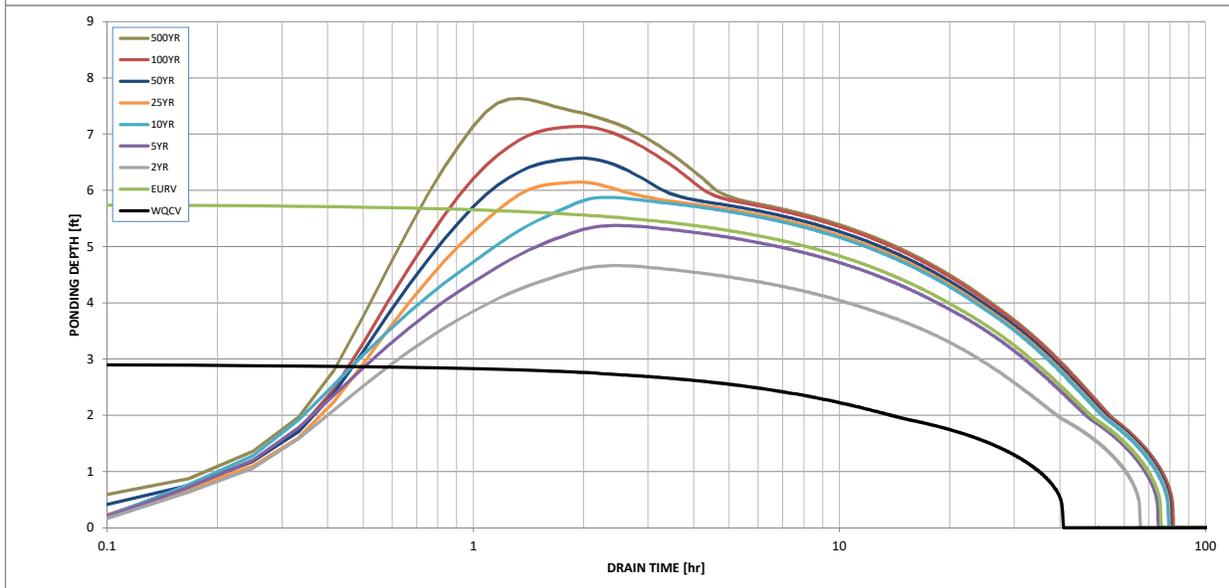
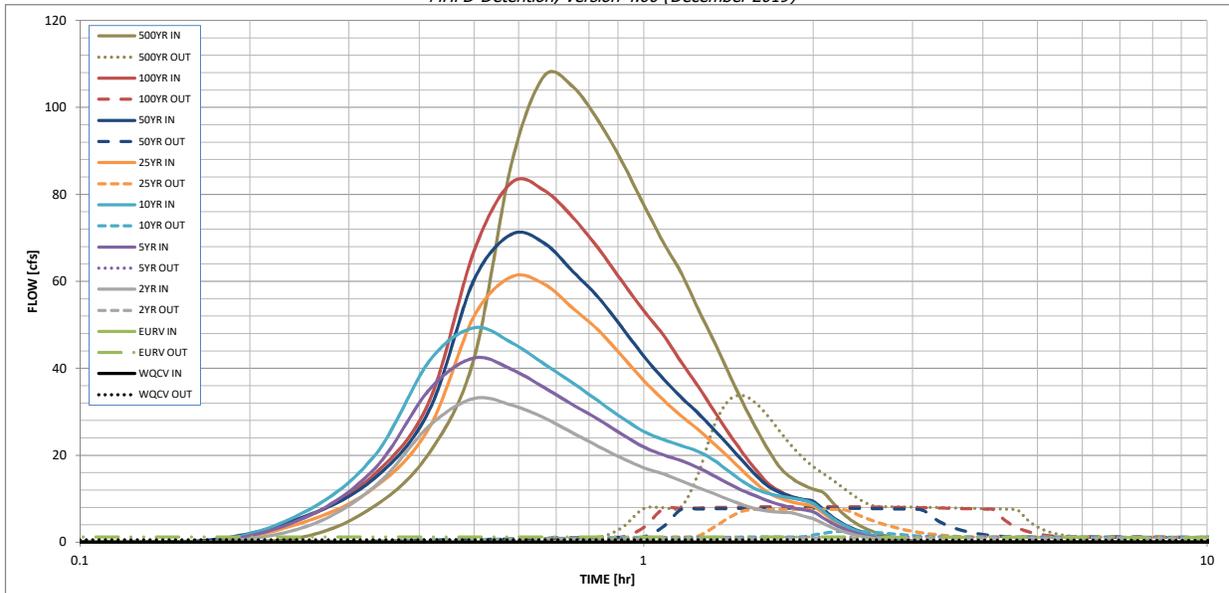
Routed Hydrograph Results

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	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.857	3.306	2.394	3.107	3.679	4.353	5.011	5.779	7.477
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.394	3.107	3.679	4.353	5.011	5.779	7.477
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.3	0.4	4.0	8.1	13.5	24.8
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	1.2	1.0	1.1	2.5	7.6	7.8	8.2	33.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.5	5.6	1.9	1.0	0.6	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.5	0.6	0.6	0.6
Max Velocity through Gate 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	69	68	67	66	63
Time to Drain 99% of Inflow Volume (hours) =	40	72	64	71	75	75	75	76	74
Maximum Ponding Depth (ft) =	2.91	5.76	4.66	5.37	5.88	6.15	6.57	7.14	7.63
Area at Maximum Ponding Depth (acres) =	0.64	1.04	0.92	1.00	1.05	1.08	1.14	1.21	1.28
Maximum Volume Stored (acre-ft) =	0.861	3.315	2.235	2.917	3.430	3.719	4.196	4.853	5.475

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



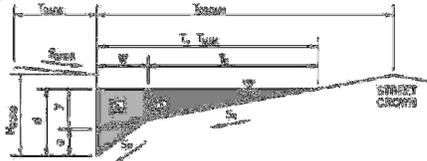
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

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

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

Project: _____
 Inlet ID: _____ **Crossroads Mixed Use Existing Inlets**

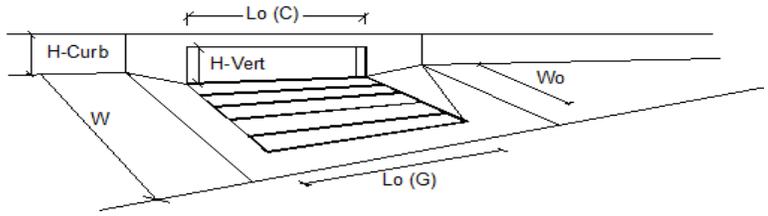
INLET 1



Gutter Geometry (Enter data in the blue cells)							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="14.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="26.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft						
Street Transverse Slope	$S_X = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = $ <input style="width: 50px;" type="text" value="0.010"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.016"/>						
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="width: 50px;">Minor Storm</th> <th style="width: 50px;">Major Storm</th> <th style="width: 20px;">ft</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input style="width: 40px;" type="text" value="20.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="26.0"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	<input style="width: 40px;" type="text" value="20.0"/>	<input style="width: 40px;" type="text" value="26.0"/>	
Minor Storm	Major Storm	ft					
<input style="width: 40px;" type="text" value="20.0"/>	<input style="width: 40px;" type="text" value="26.0"/>						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="width: 50px;">Minor Storm</th> <th style="width: 50px;">Major Storm</th> <th style="width: 20px;">inches</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="12.0"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>	
Minor Storm	Major Storm	inches					
<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="12.0"/>						
Allow Flow Depth at Street Crown (leave blank for no)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="width: 50px;">Minor Storm</th> <th style="width: 50px;">Major Storm</th> <th style="width: 20px;">check = yes</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	check = yes	<input type="checkbox"/>	<input type="checkbox"/>	
Minor Storm	Major Storm	check = yes					
<input type="checkbox"/>	<input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
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'							
$Q_{allow} = $	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="width: 50px;">Minor Storm</th> <th style="width: 50px;">Major Storm</th> <th style="width: 20px;">cfs</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input style="width: 40px;" type="text" value="13.8"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="32.7"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	<input style="width: 40px;" type="text" value="13.8"/>	<input style="width: 40px;" type="text" value="32.7"/>	
Minor Storm	Major Storm	cfs					
<input style="width: 40px;" type="text" value="13.8"/>	<input style="width: 40px;" type="text" value="32.7"/>						

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018

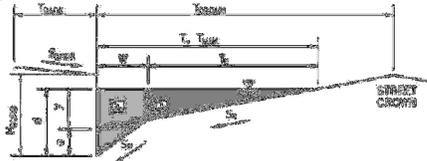


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width 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: WARNING: Q > ALLOWABLE Q FOR MINOR STORM!			
Total Inlet Interception Capacity	8.4	11.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	5.8	15.4	cfs
Capture Percentage = Q_c/Q_o =	59	42	%

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

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

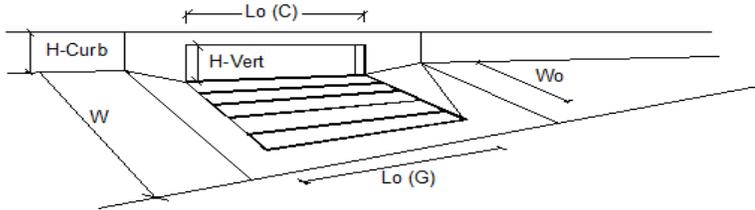
Project: _____
 Inlet ID: _____ **Crossroads Mixed Use Existing Inlets**
INLET 2



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	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> <tr> <td>20.0</td> <td>26.0</td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	20.0	26.0	
Minor Storm	Major Storm	ft					
20.0	26.0						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> <tr> <td>6.0</td> <td>12.0</td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	6.0	12.0	
Minor Storm	Major Storm	inches					
6.0	12.0						
Allow Flow Depth at Street Crown (leave blank for no)	<table border="1"> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>check = yes</td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>	check = yes			
<input type="checkbox"/>	<input type="checkbox"/>	check = yes					
MINOR STORM Allowable Capacity is based on Depth Criterion							
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'	$Q_{allow} = 13.8$ cfs						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	$Q_{allow} = 32.7$ cfs						

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018

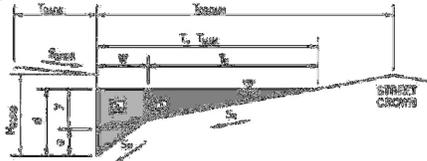


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width 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_c =	100	88	%

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

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

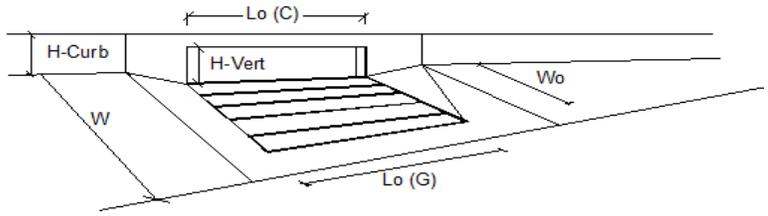
Project: _____
 Inlet ID: _____ **Crossroads Mixed Use**
Inlet 3



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	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">ft</th> </tr> <tr> <td style="text-align: center; padding: 2px;">22.8</td> <td style="text-align: center; padding: 2px;">27.0</td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	22.8	27.0	
Minor Storm	Major Storm	ft					
22.8	27.0						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">inches</th> </tr> <tr> <td style="text-align: center; padding: 2px;">6.0</td> <td style="text-align: center; padding: 2px;">12.0</td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	6.0	12.0	
Minor Storm	Major Storm	inches					
6.0	12.0						
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input type="checkbox"/> check = yes						
MINOR STORM Allowable Capacity is based on Depth Criterion							
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'							
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">cfs</th> </tr> <tr> <td style="text-align: center; padding: 2px;">13.8</td> <td style="text-align: center; padding: 2px;">24.4</td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	13.8	24.4	
Minor Storm	Major Storm	cfs					
13.8	24.4						

INLET ON A CONTINUOUS GRADE

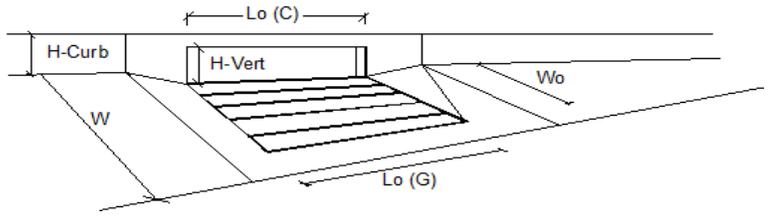
Version 4.06 Released August 2018



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	6.7	9.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	3.5	13.5	cfs
Capture Percentage = Q_i/Q_c =	65	42	%

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



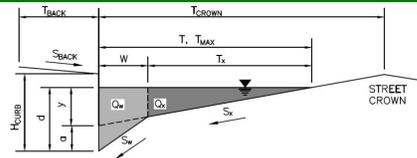
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width 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**

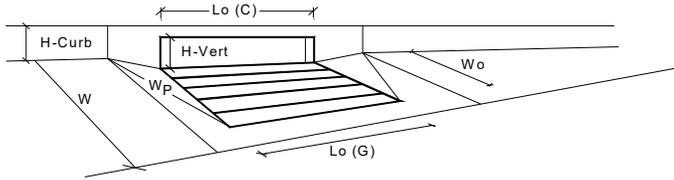
Inlet ID: **Inlet 5**



Gutter Geometry (Enter data in the blue cells)	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 7.5$ 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	$S_o = 0.000$ 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	$T_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 20.8 & 26.0 \end{matrix}$ ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 6.0 & 12.0 \end{matrix}$ inches
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>
MINOR STORM Allowable Capacity is based on Depth Criterion	
MAJOR STORM Allowable Capacity is based on Depth Criterion	
	$Q_{allow} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ \text{SUMP} & \text{SUMP} \end{matrix}$ cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018

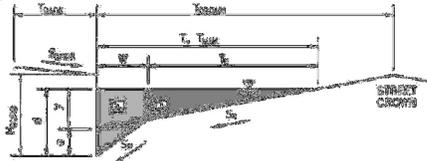


Design Information (Input)	MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)	a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
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 _{vert} =	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 _{we} =	N/A	N/A	cfs
Interception with Clogging	Q _{we} =	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)	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 _{we} =	10.4	51.0	cfs
Interception with Clogging	Q _{we} =	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)	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)	Q _s =	9.9	39.1	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	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)

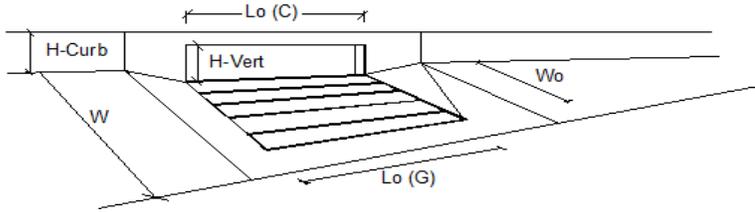
Project: _____
 Inlet ID: _____ **Crossroads Mixed Use** **Inlet 6**



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	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="text-align: center;">Minor Storm</th> <th style="text-align: center;">Major Storm</th> <th></th> </tr> <tr> <td style="text-align: center;">14.0</td> <td style="text-align: center;">14.0</td> <td style="text-align: right;">ft</td> </tr> </table>	Minor Storm	Major Storm		14.0	14.0	ft
Minor Storm	Major Storm						
14.0	14.0	ft					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="text-align: center;">Minor Storm</th> <th style="text-align: center;">Major Storm</th> <th></th> </tr> <tr> <td style="text-align: center;">4.4</td> <td style="text-align: center;">12.0</td> <td style="text-align: right;">inches</td> </tr> </table>	Minor Storm	Major Storm		4.4	12.0	inches
Minor Storm	Major Storm						
4.4	12.0	inches					
Allow Flow Depth at Street Crown (leave blank for no)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">check = yes</td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>	check = yes			
<input type="checkbox"/>	<input type="checkbox"/>	check = yes					
MINOR STORM Allowable Capacity is based on Depth Criterion							
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'							
Allowable Capacity	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="text-align: center;">Minor Storm</th> <th style="text-align: center;">Major Storm</th> <th></th> </tr> <tr> <td style="text-align: center;">6.4</td> <td style="text-align: center;">9.6</td> <td style="text-align: right;">cfs</td> </tr> </table>	Minor Storm	Major Storm		6.4	9.6	cfs
Minor Storm	Major Storm						
6.4	9.6	cfs					

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018

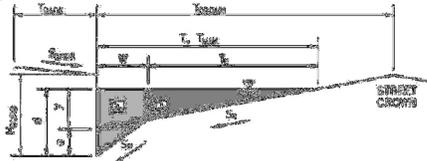


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width 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	4.8	6.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.4	2.6	cfs
Capture Percentage = Q_i/Q_c =	93	73	%

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

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

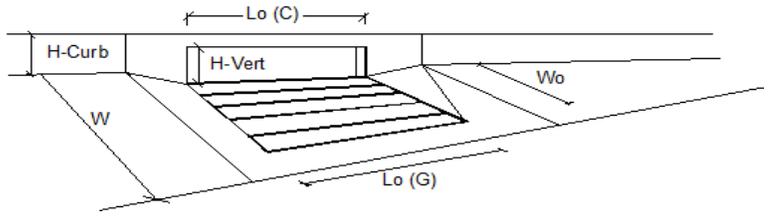
Project: _____
 Inlet ID: _____ **Crossroads Mixed Use**
Inlet 7



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	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">ft</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">14.0</td> <td style="text-align: center;">14.0</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	14.0	14.0	
Minor Storm	Major Storm	ft					
14.0	14.0						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">inches</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">4.5</td> <td style="text-align: center;">12.0</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	4.5	12.0	
Minor Storm	Major Storm	inches					
4.5	12.0						
Allow Flow Depth at Street Crown (leave blank for no)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="padding: 2px;">check = yes</td> </tr> </tbody> </table>	Minor Storm	Major Storm		<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes
Minor Storm	Major Storm						
<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes					
MINOR STORM Allowable Capacity is based on Depth Criterion							
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'	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">cfs</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">5.2</td> <td style="text-align: center;">93.9</td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	5.2	93.9	
Minor Storm	Major Storm	cfs					
5.2	93.9						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

INLET ON A CONTINUOUS GRADE

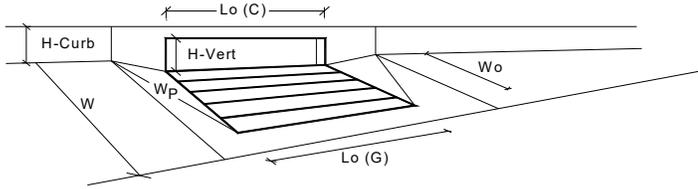
Version 4.06 Released August 2018



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	4.8	6.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.4	2.6	cfs
Capture Percentage = Q_i/Q_c =	92	72	%

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018

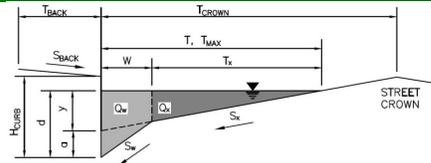


Design Information (Input)	CDOT Type R Curb Opening	
Type of Inlet	Type = CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	MINOR	MAJOR
Number of Unit Inlets (Grate or Curb Opening)	No = 1	No = 1
Water Depth at Flowline (outside of local depression)	Ponding Depth = 4.4	Ponding Depth = 8.0
Grate Information	MINOR	MAJOR <input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	L _o (G) = N/A	L _o (G) = N/A
Width of a Unit Grate	W _o = N/A	W _o = N/A
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A _{ratio} = N/A	A _{ratio} = N/A
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C _r (G) = N/A	C _r (G) = N/A
Grate Weir Coefficient (typical value 2.15 - 3.60)	C _w (G) = N/A	C _w (G) = N/A
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C _o (G) = N/A	C _o (G) = N/A
Curb Opening Information	MINOR	MAJOR
Length of a Unit Curb Opening	L _o (C) = 10.00	L _o (C) = 10.00
Height of Vertical Curb Opening in Inches	H _{vert} = 6.00	H _{vert} = 6.00
Height of Curb Orifice Throat in Inches	H _{throat} = 6.00	H _{throat} = 6.00
Angle of Throat (see USDCM Figure ST-5)	Theta = 63.40	Theta = 63.40
Side Width for Depression Pan (typically the gutter width of 2 feet)	W _p = 2.00	W _p = 2.00
Clogging Factor for a Single Curb Opening (typical value 0.10)	C _r (C) = 0.10	C _r (C) = 0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C _w (C) = 3.60	C _w (C) = 3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C _o (C) = 0.67	C _o (C) = 0.67
Low Head Performance Reduction (Calculated)	MINOR	MAJOR
Depth for Grate Midwidth	d _{grate} = N/A	d _{grate} = N/A
Depth for Curb Opening Weir Equation	d _{curb} = 0.20	d _{curb} = 0.50
Combination Inlet Performance Reduction Factor for Long Inlets	RF _{Combination} = 0.41	RF _{Combination} = 0.75
Curb Opening Performance Reduction Factor for Long Inlets	RF _{curb} = 0.82	RF _{curb} = 1.00
Grated Inlet Performance Reduction Factor for Long Inlets	RF _{grate} = N/A	RF _{grate} = N/A
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q _a = 3.3	Q _a = 16.3
	Q _{PEAK REQUIRED} = 2.1	Q _{PEAK REQUIRED} = 3.8

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

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

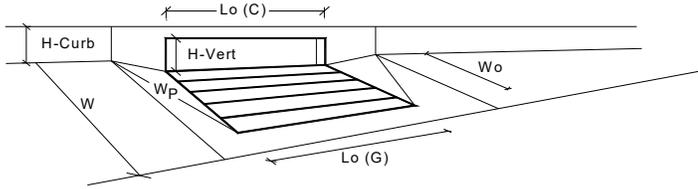
Project: _____
 Inlet ID: _____ **Crossroads Mixed Use**
Inlet 9



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	$S_o = 0.000$ 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	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">ft</th> </tr> <tr> <td style="text-align: center; padding: 2px;">$T_{MAX} = 14.0$</td> <td style="text-align: center; padding: 2px;">14.0</td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 14.0$	14.0	
Minor Storm	Major Storm	ft					
$T_{MAX} = 14.0$	14.0						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">inches</th> </tr> <tr> <td style="text-align: center; padding: 2px;">$d_{MAX} = 4.4$</td> <td style="text-align: center; padding: 2px;">12.0</td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 4.4$	12.0	
Minor Storm	Major Storm	inches					
$d_{MAX} = 4.4$	12.0						
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Depth Criterion							
MAJOR STORM Allowable Capacity is based on Depth Criterion							
Allowable Capacity	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th style="padding: 2px;">Minor Storm</th> <th style="padding: 2px;">Major Storm</th> <th style="padding: 2px;">cfs</th> </tr> <tr> <td style="text-align: center; padding: 2px;">$Q_{allow} = \text{SUMP}$</td> <td style="text-align: center; padding: 2px;">SUMP</td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = \text{SUMP}$	SUMP	
Minor Storm	Major Storm	cfs					
$Q_{allow} = \text{SUMP}$	SUMP						

INLET IN A SUMP OR SAG LOCATION

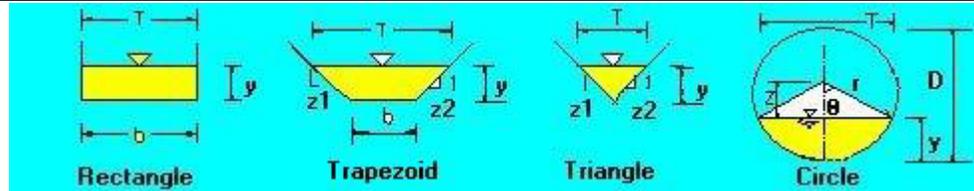
Version 4.06 Released August 2018



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	4.4	8.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.20	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.41	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	0.67	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Q_a	3.7	20.3	cfs
Q _{PEAK REQUIRED}	3.6	17.3	cfs

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

A-A' EXISTING SWALE ANALYSIS

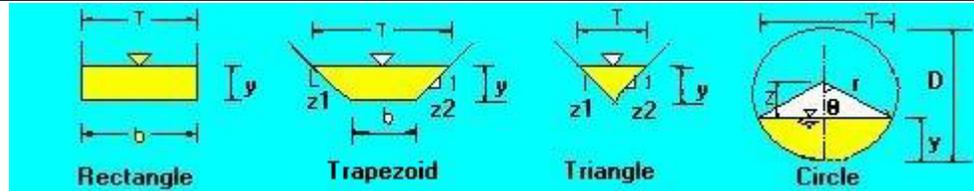
 Select Channel Type: Trapezoid ▾

 Depth from Q ▾

 Select unit system: Feet(ft) ▾

Channel slope: <input type="text" value=".018"/> <input type="text" value="ft/ft"/>	Water depth(y): <input style="color: red;" type="text" value="0.76"/> <input type="text" value="ft"/>	Bottom width(b) <input type="text" value="5"/> <input type="text" value="ft"/>
Flow velocity <input type="text" value="3.574"/> <input type="text" value="ft/s"/>	LeftSlope (Z1): <input type="text" value="4"/> <input type="text" value="to 1 (H:V)"/>	RightSlope (Z2): <input type="text" value="10"/> <input type="text" value="to 1 (H:V)"/>
Flow discharge <input type="text" value="28"/> <input type="text" value="ft^3/s"/>	Input n value <input type="text" value=".035"/> <input type="button" value="or select n"/>	
<input type="button" value="Calculate!"/>	Status: Calculation finished	<input type="button" value="Reset"/>
Wetted perimeter <input type="text" value="15.76"/> <input type="text" value="ft"/>	Flow area <input type="text" value="7.84"/> <input type="text" value="ft^2"/>	Top width(T) <input type="text" value="15.63"/> <input type="text" value="ft"/>
Specific energy <input type="text" value="0.96"/> <input type="text" value="ft"/>	Froude number <input type="text" value="0.89"/>	Flow status Subcritical flow
Critical depth <input type="text" value="0.72"/> <input type="text" value="ft"/>	Critical slope <input type="text" value="0.023"/> <input type="text" value="ft/ft"/>	Velocity head <input type="text" value="0.2"/> <input type="text" value="ft"/>

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A-A' CDOT Roadside Ditch Proposed Analysis

 Select Channel Type: Trapezoid ▾

 Depth from Q ▾

 Select unit system: Feet(ft) ▾

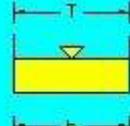
Channel slope: <input type="text" value=".018"/> <input type="text" value="ft/ft"/>	Water depth(y): <input style="color: red;" type="text" value="0.76"/> <input type="text" value="ft"/>	Bottom width(b) <input type="text" value="5"/> <input type="text" value="ft"/>
Flow velocity <input type="text" value="3.535"/>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

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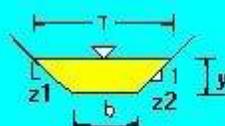
C-C' SWALE ANALYSIS

Select Channel Type:

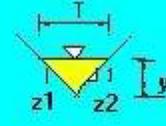
Trapezoid ▾



Rectangle



Trapezoid



Triangle



Circle

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

ft³/s

Input n value .025

or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 10.54

ft

Flow area 2.93

ft²

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

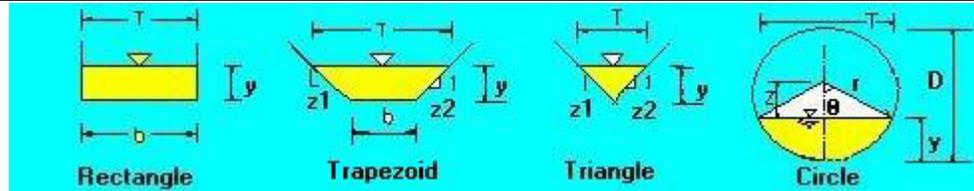
Velocity head 0.1

ft

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B-B' SWALE ANALYSIS

Select Channel Type: Trapezoid ▼



Depth from Q ▼

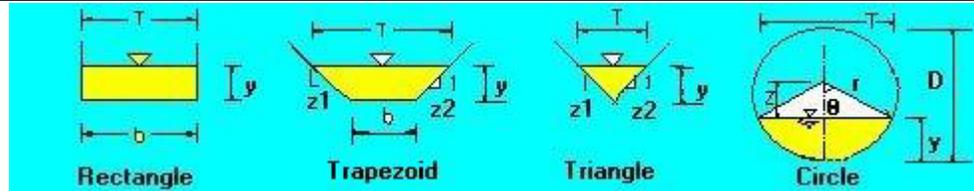
Select unit system: Feet(ft) ▼

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) ▼

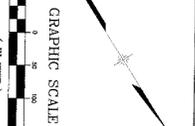
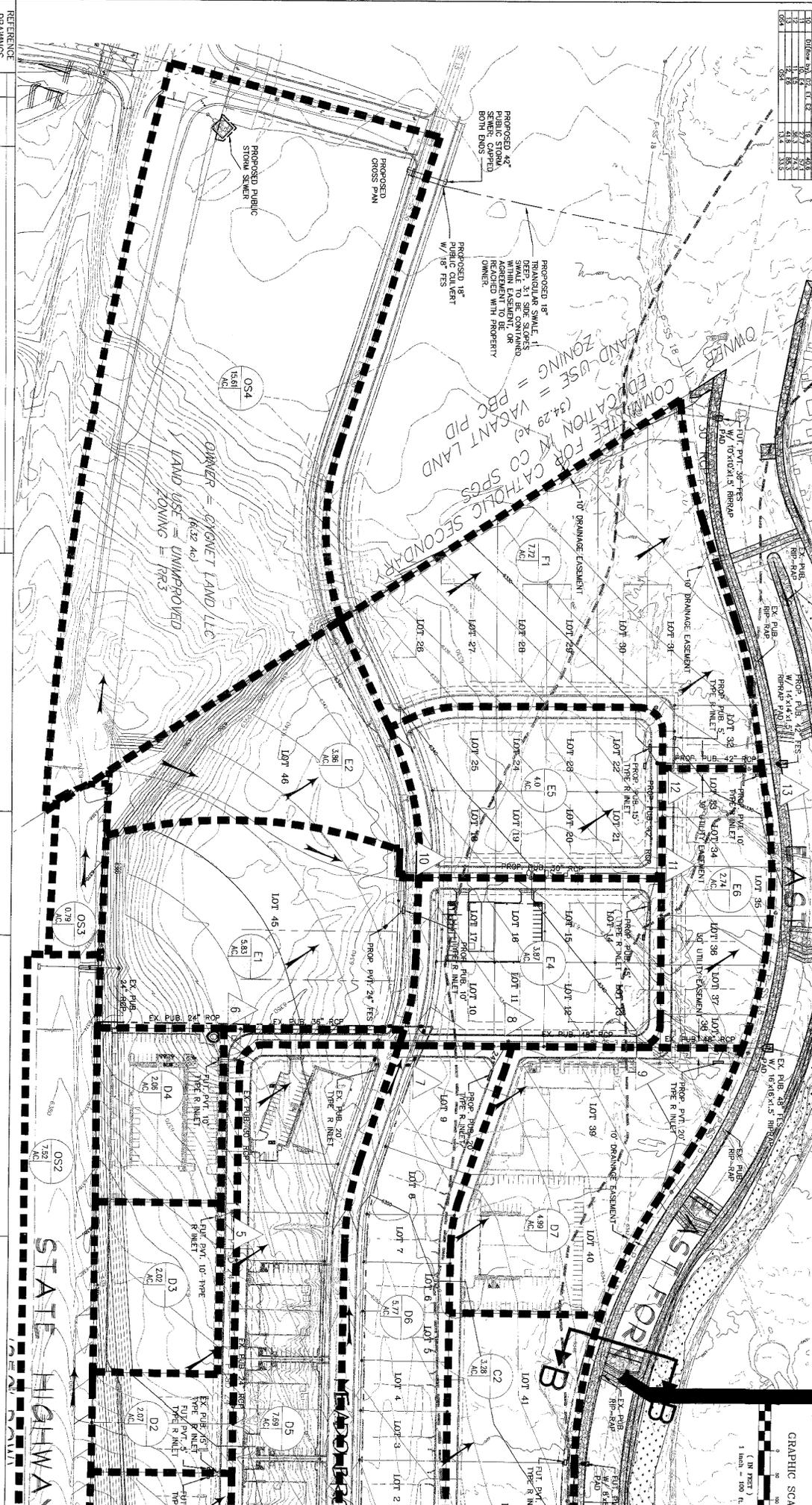
Channel slope: <input type="text" value=".25"/> <input type="text" value="ft/ft"/>	Water depth(y): <input type="text" value="0.38"/> <input type="text" value="ft"/>	Bottom width(b) <input type="text" value="2"/> <input type="text" value="ft"/>
Flow velocity <input type="text" value="7.098551"/> <input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

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BACKGROUND

NO.	DATE	DESCRIPTION
1	01/10/10	PRELIMINARY
2	02/10/10	REVISED
3	03/10/10	REVISED
4	04/10/10	REVISED
5	05/10/10	REVISED
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98	02/18/18	REVISED
99	03/18/18	REVISED
100	04/18/18	REVISED

DRAINAGE PLAN CLAREMONT BUSINESS PARK FILING NO. 2



REFERENCE DRAWINGS

1	CLAREMONT BUSINESS PARK FILING NO. 1
2	CLAREMONT BUSINESS PARK FILING NO. 2
3	CLAREMONT BUSINESS PARK FILING NO. 3
4	CLAREMONT BUSINESS PARK FILING NO. 4
5	CLAREMONT BUSINESS PARK FILING NO. 5
6	CLAREMONT BUSINESS PARK FILING NO. 6
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40	CLAREMONT BUSINESS PARK FILING NO. 40
41	CLAREMONT BUSINESS PARK FILING NO. 41
42	CLAREMONT BUSINESS PARK FILING NO. 42

NO.	DATE	DESCRIPTION	BY
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100	04/18/18	REVISED	JD

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

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

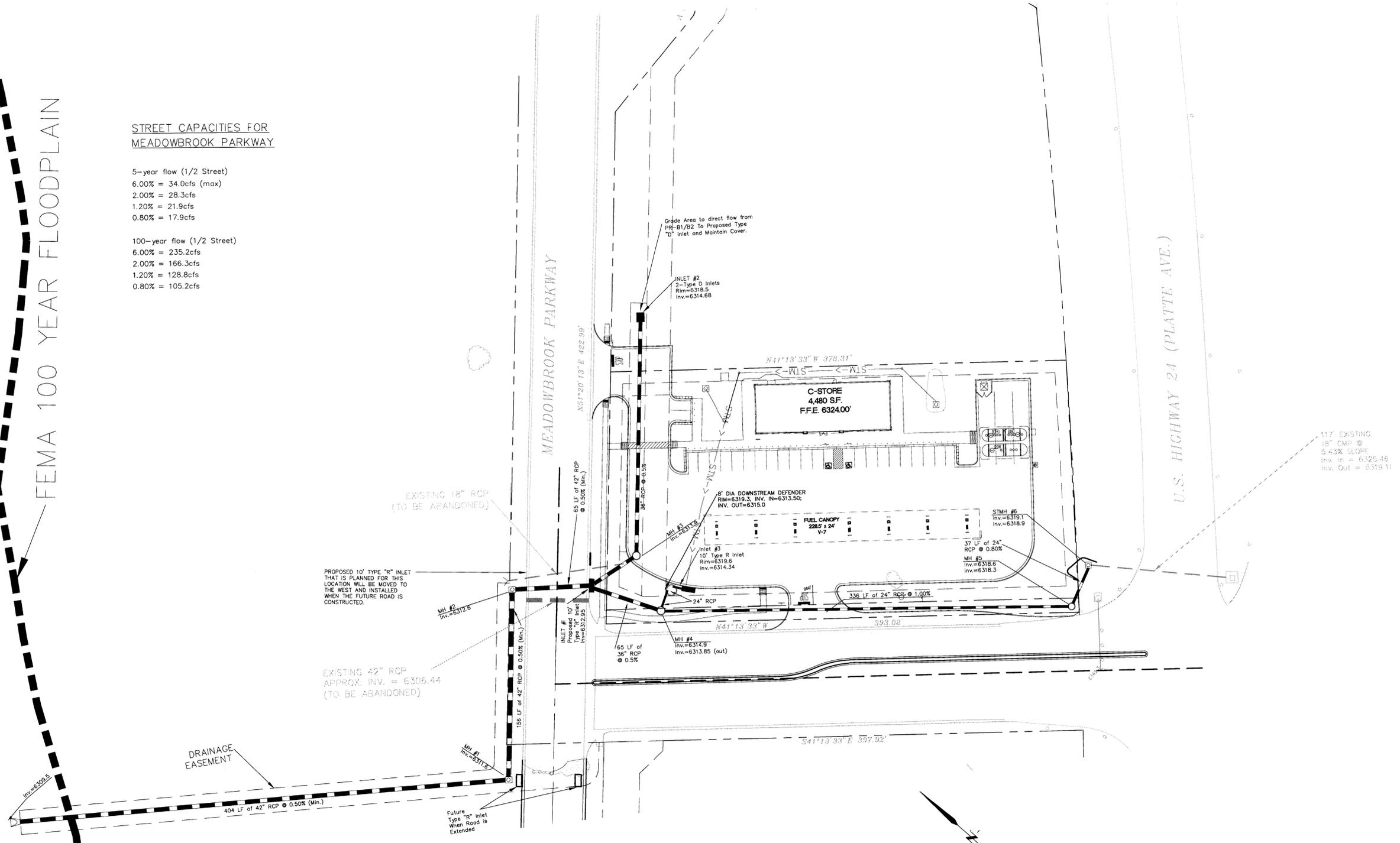
DATE: 04/18/18
SCALE: 1" = 100'
SHEET NO. 2 OF 2 SHEETS

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	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

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

DATE: _____
 DESCRIPTION: _____
 NO. _____
 PREPARED FOR: Circle K Stores, Inc.
 1199 South Bellline Road, Suite 160
 COPPER HILLS, CO 80124
 (940) 453-0015
 CONTACT: Tim Peters

DRAWN: LAB, 9/9/15
 DESIGNED: LAB, 9/9/15
 CHECKED: RLS, 9/10/15

PROPOSED STORM SEWER PLAN
LOT 1 OF 24/94 BUSINESS PARK
 Meadowbrook Pkwy, EL PASO COUNTY, CO

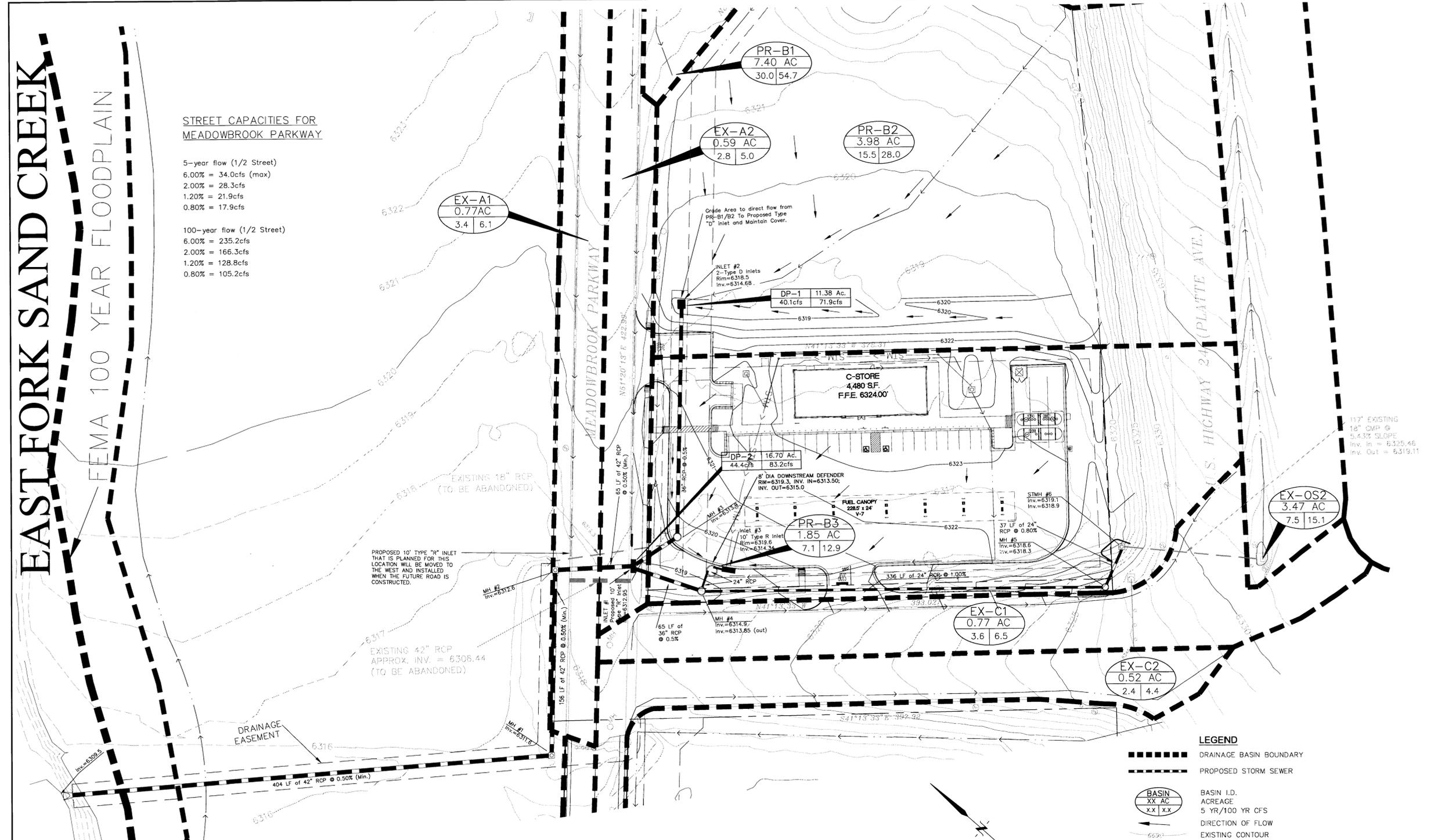
DATE: **JULY 2016**
 PROJECT NO: **319.001**
 SHEET NUMBER: **2**
 TOTAL SHEETS: **2**

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

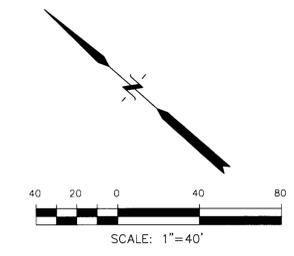


PROPOSED 10' TYPE 'R' INLET THAT IS PLANNED FOR THIS LOCATION WILL BE MOVED TO THE WEST AND INSTALLED WHEN THE FUTURE ROAD IS CONSTRUCTED.

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

DRAINAGE EASEMENT

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-OS2



- LEGEND**
- DRAINAGE BASIN BOUNDARY
 - - - - - PROPOSED STORM SEWER
 - (BASIN XX AC x.x | x.x)
 - HP HIGH POINT
 - LP LOW POINT
 - GB GRADE BREAK
 - TC TOP BACK OF CURB
 - FL FLOWLINE
 - TIME OF CONCENTRATION

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURKSVILLE, MN 55306
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@cegi.com

DATE: _____

DESCRIPTION: _____

NO. _____

PREPARED FOR: Circle K Stores, Inc.
1189 Business Parkway
Coppell, Texas 75019
(940) 453-0015
CONTACT: Tim Peters

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

DRAWN: LAB, 9/9/15
DESIGNED: LAB, 9/9/15
CHECKED: RLS, 9/10/15

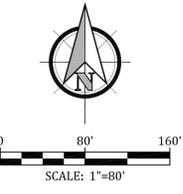
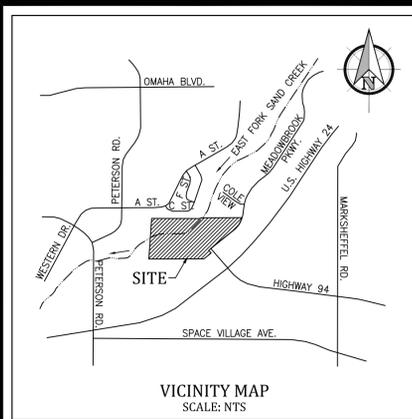
PROPOSED CONDITIONS DRAINAGE PLAN
LOT 1 OF 24/94 BUSINESS PARK
Meadowbrook Pkwy., EL PASO COUNTY, CO

DATE: **JULY, 2016**

PROJECT NO. **319.001**

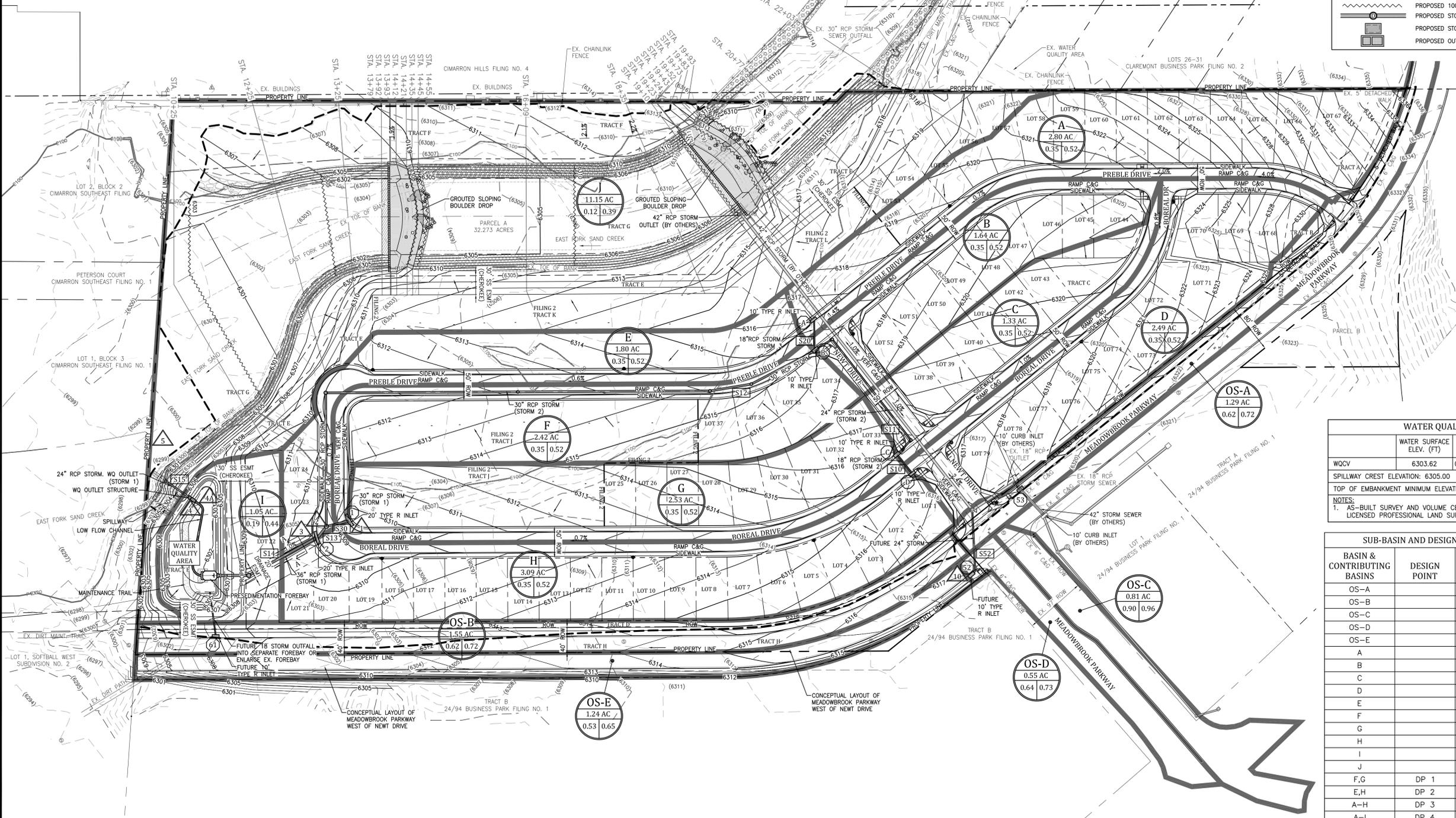
SHEET NUMBER **1**

TOTAL SHEETS: **2**



LEGEND

A	PROPOSED BASIN DESIGNATION
1.84 AC	DRAINAGE BASIN ACRES
C5 RUNOFF COEF 0.76 0.83	C100 RUNOFF COEFFICIENT
	DIRECTIONAL FLOW ARROW
	DRAINAGE BASIN BOUNDARY
	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:

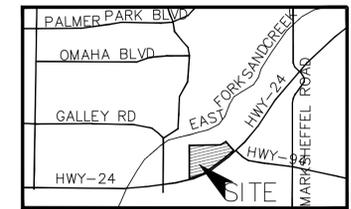
EXHIBIT
B

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.



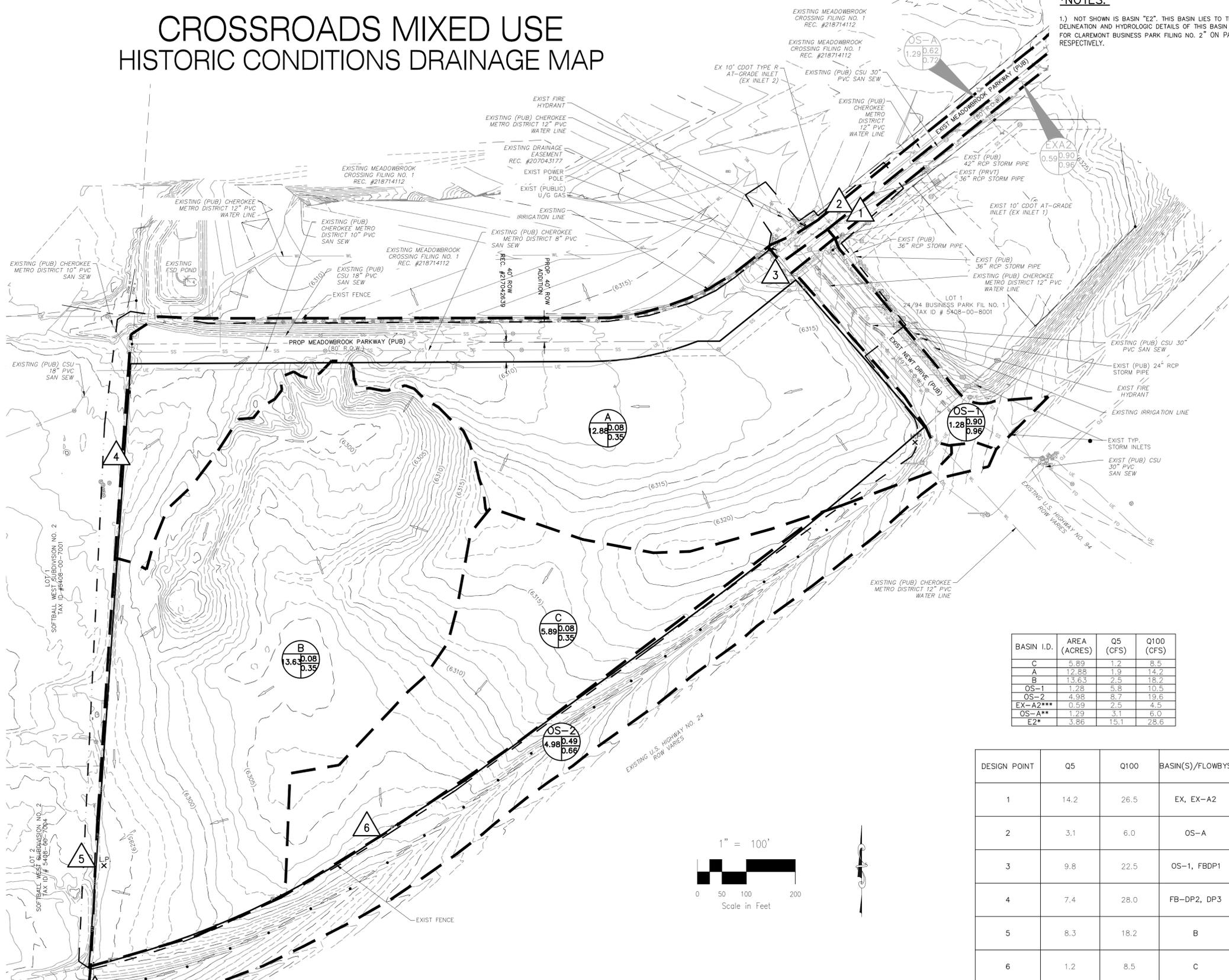
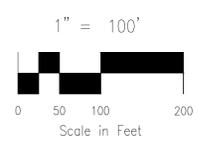
VICINITY MAP
N.T.S.

LEGEND

- BASIN DESIGNATION
- 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

BASIN I.D.	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
C	5.89	1.2	8.5
A	12.88	1.9	14.2
B	13.63	2.5	18.2
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	EX, 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	7.4	28.0	FB-DP2, DP3	DISCHARGE TO ADJACENT PARCEL (LOT 1)
5	8.3	18.2	B	DISCHARGE TO ADJACENT PARCEL (LOT2)
6	1.2	8.5	C	DISCHARGE TO CDOT ROW
7	10.4	31.9	OS2, DP6	CDOT BARROW DITCH



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

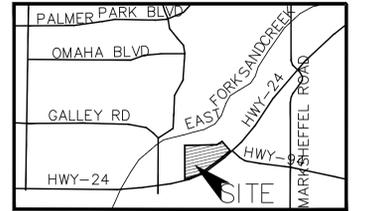


212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

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.

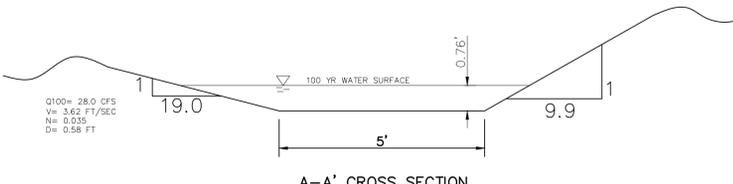
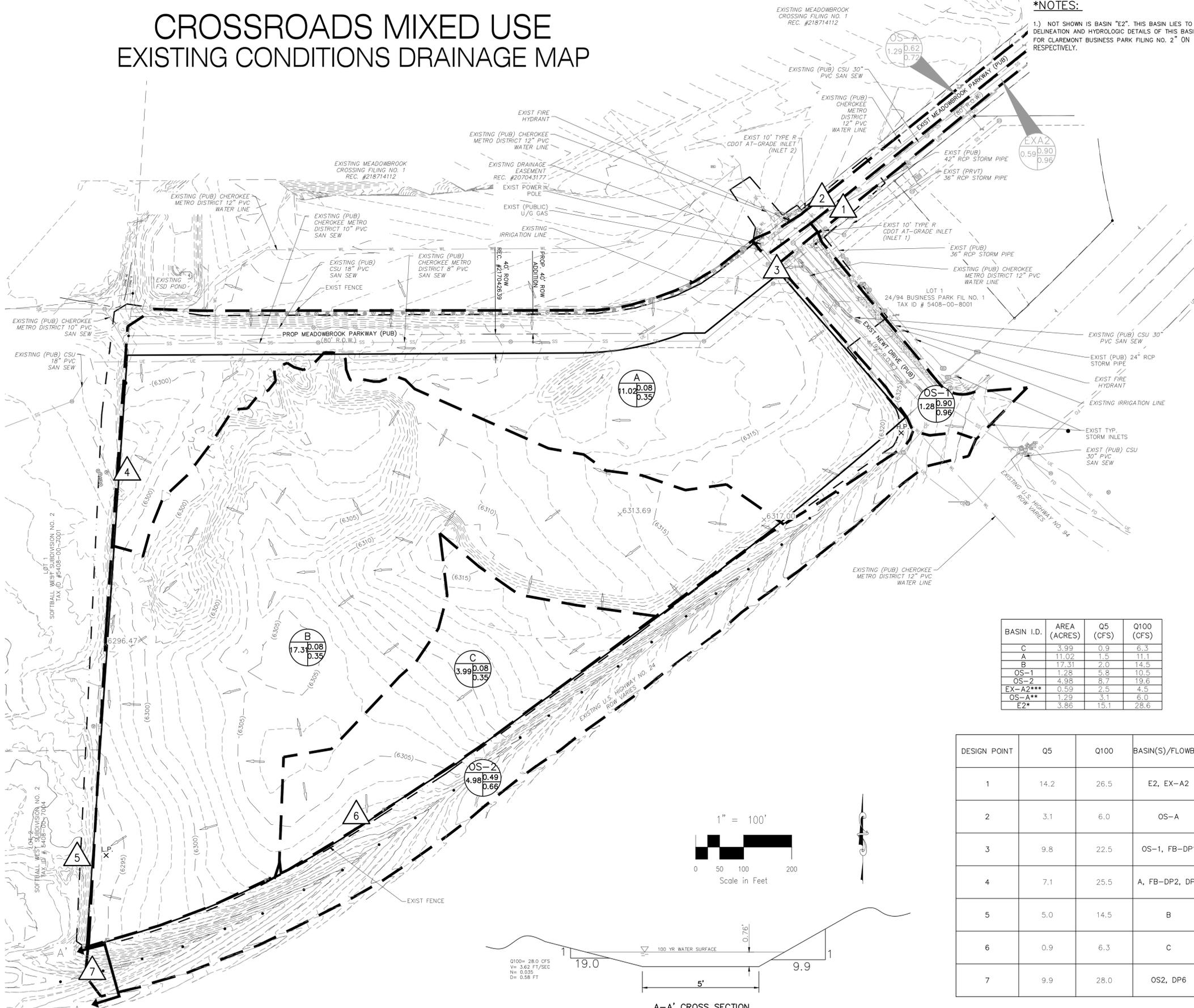
LEGEND

- BASIN DESIGNATION
- ACRES
- 1 SURFACE DESIGN POINT
- BASIN BOUNDARY
- (T070) EXIST MAJ CONT
- (T072) EXIST MIN CONT
- EXISTING FLOW DIRECTION ARROW
- H.P. X HIGH POINT
- L.P. X LOW POINT
- 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
- (V) EX. IRRIGATION VALVE
- (S) EX. STORM INLET
- (G) EX. GAS TEST NODE
- (T) EX. TELEPHONE PEDESTAL
- (E) EX. ELECTRIC VAULT
- (M) EX. SANITARY MANHOLE
- (W) EX. WATER VALVE

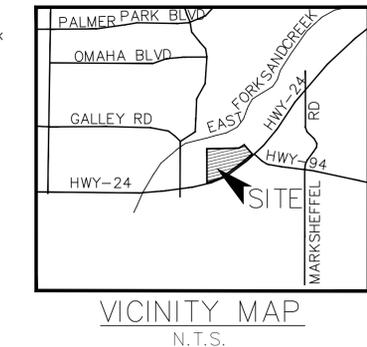
BASIN I.D.	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
C	3.99	0.9	6.3
A	11.02	1.5	11.1
B	17.31	2.0	14.5
OS-1	1.28	5.8	10.5
OS-2	4.98	8.7	19.6
EX-A2**	0.59	2.5	4.5
OS-A**	1.29	3.1	6.0
E2*	3.86	15.1	28.6

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

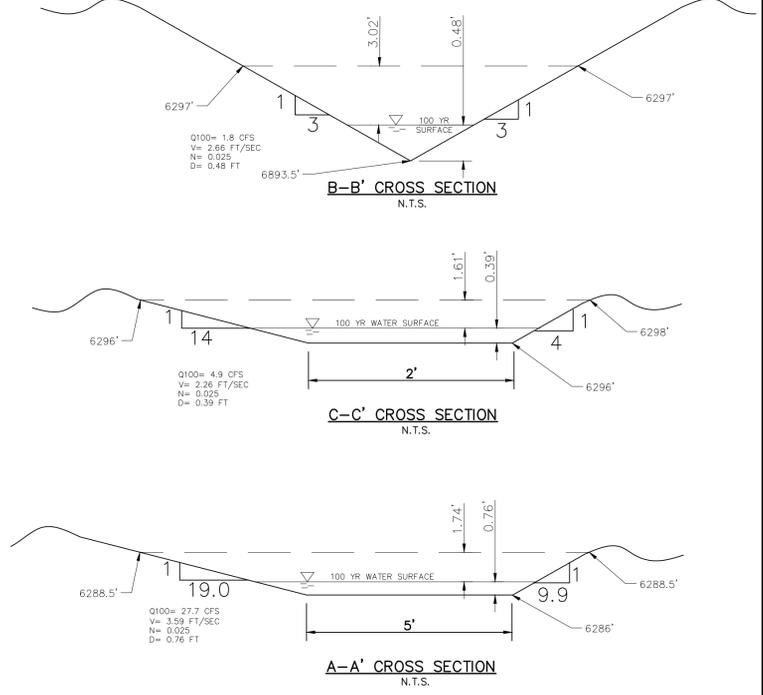
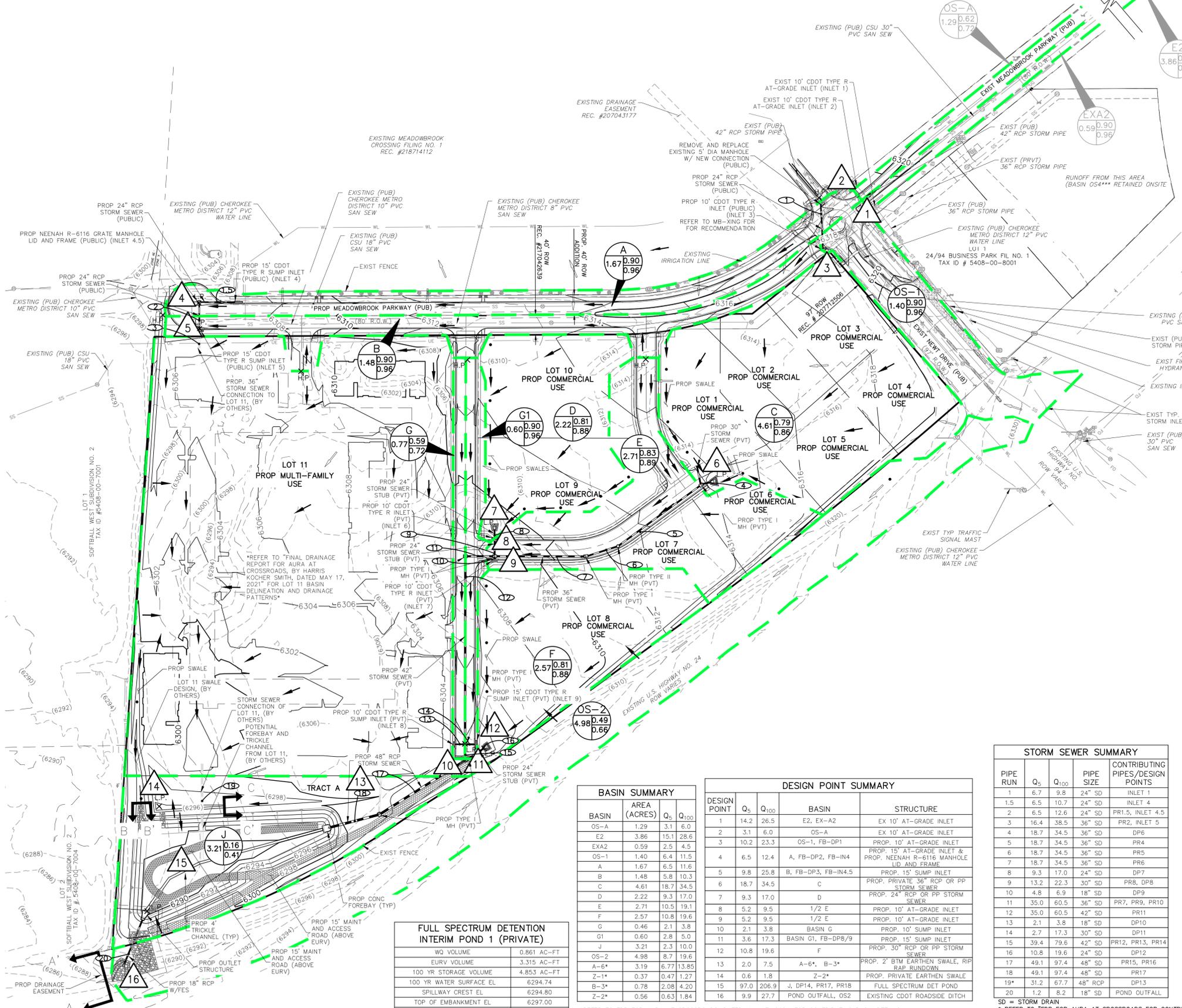
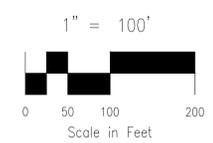
EXISTING DRAINAGE MAP
CROSSROADS MIXED USE
JOB NO. 18-003
DATE PREPARED: FEBRUARY 23, 2021
DATE REVISED:



CROSSROADS MIXED USE PROPOSED CONDITIONS DRAINAGE MAP



- ### LEGEND
- BASIN DESIGNATION: Z, 25, .25, .35, C5
 - ACRES: 1
 - SURFACE DESIGN POINT: 1
 - BASIN BOUNDARY: ---
 - PROP MAJ CONT: ---
 - PROP MIN CONT: ---
 - EXIST MAJ CONT: ---
 - EXIST MIN CONT: ---
 - PROPOSED STORM SEWER PIPE: ---
 - EXISTING FLOW DIRECTION ARROW: ---
 - HIGH POINT: H.P. X
 - LOW POINT: L.P. X
 - PROPOSED SWALE: ---
 - EXISTING SWALE: ---
 - SITE BOUNDARY: ---
 - R.O.W./EASEMENT: ---
 - LOT LINE: ---
 - STORM SEWER LINE: ST
 - EX. UNDERGROUND ELECTRIC LINE: UE
 - EX. SANITARY SEWER LINE: SS
 - EX. WATER LINE: WL
 - EX. STORM SEWER LINE: ST
 - LOT NUMBER: 9
 - EX. IRRIGATION VALVE: ---
 - EX. STORM INLET: ---
 - EX. GAS TEST NODE: ---
 - EX. TELEPHONE PEDESTAL: ---
 - EX. ELECTRIC VAULT: ---
 - EX. SANITARY MANHOLE: ---
 - EX. WATER VALVE: ---
 - PROPOSED RIPRAP: ---
 - EMERGENCY OVERTFLOW DIRECTION: ---



BASIN SUMMARY

BASIN	AREA (ACRES)	Q ₅	Q ₁₀₀
OS-A	1.29	3.1	6.0
E2	3.86	15.1	28.6
EXA2	0.59	2.5	4.5
OS-1	1.40	6.4	11.5
A	1.67	6.5	11.6
B	1.48	5.8	10.3
C	4.61	18.7	34.5
D	2.22	9.3	17.0
E	2.71	10.5	19.1
F	2.57	10.8	19.6
G	0.46	2.1	3.8
G1	0.60	2.8	5.0
J	3.21	2.3	10.0
OS-2	4.98	8.7	19.6
A-6*	3.19	6.77	13.85
Z-1*	0.37	0.47	1.27
B-3*	0.78	2.08	4.20
Z-2*	0.56	0.83	1.84

DESIGN POINT SUMMARY

DESIGN POINT	Q ₅	Q ₁₀₀	BASIN	STRUCTURE
1	14.2	26.5	E2, EX-A2	EX 10" AT-GRADE INLET
2	3.1	6.0	OS-A	EX 10" AT-GRADE INLET
3	10.2	23.3	OS-1, FB-DP1	PROP. 10" AT-GRADE INLET
4	6.5	12.4	A, FB-DP2, FB-IN4	PROP. 15" AT-GRADE INLET & PROP. NEENAH R-6116 MANHOLE LID AND FRAME
5	9.8	25.8	B, FB-DP3, FB-IN4.5	PROP. 15" SUMP INLET
6	18.7	34.5	C	PROP. PRIVATE 36" RCP OR PP STORM SEWER
7	9.3	17.0	D	PROP. 24" RCP OR PP STORM SEWER
8	5.2	9.5	1/2 E	PROP. 10" AT-GRADE INLET
9	5.2	9.5	1/2 E	PROP. 10" AT-GRADE INLET
10	2.1	3.8	BASIN G	PROP. 10" SUMP INLET
11	3.6	17.3	BASIN G1, FB-DP8/9	PROP. 15" SUMP INLET
12	10.8	19.6	F	PROP. 30" RCP OR PP STORM SEWER
13	2.0	7.5	A-6*, B-3*	PROP. 2" BTM EARTHEN SWALE, RIP RAP RUNDOWN
14	0.6	1.8	Z-2*	PROP. PRIVATE EARTHEN SWALE
15	37.0	206.9	J, DP14, PR17, PR18	FULL SPECTRUM DET POND
16	9.9	27.7	POND OUTFALL, OS2	EXISTING CDDT ROADSIDE DITCH

STORM SEWER SUMMARY

PIPE RUN	Q ₅	Q ₁₀₀	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
1	6.7	9.8	24" SD	INLET 1
1.5	6.5	10.7	24" SD	INLET 4
2	6.5	12.6	24" SD	PR1.5, INLET 4.5
3	16.4	38.5	36" SD	PR2, INLET 5
4	18.7	34.5	36" SD	DP6
5	18.7	34.5	36" SD	PR4
6	18.7	34.5	36" SD	PR5
7	18.7	34.5	36" SD	PR6
8	9.3	17.0	24" SD	DP7
9	13.2	22.3	30" SD	PR8, DP8
10	4.8	6.9	18" SD	DP9
11	35.0	60.5	36" SD	PR7, PR9, PR10
12	35.0	60.5	42" SD	PR11
13	2.1	3.8	18" SD	DP10
14	2.7	17.3	30" SD	DP11
15	39.4	79.6	42" SD	PR12, PR13, PR14
16	10.8	19.6	24" SD	DP12
17	49.1	97.4	48" SD	PR15, PR16
18	49.1	97.4	48" SD	PR17
19*	31.2	67.7	48" RCP	DP13
20	1.2	8.2	18" SD	POND OUTFALL

FULL SPECTRUM DETENTION INTERIM POND 1 (PRIVATE)

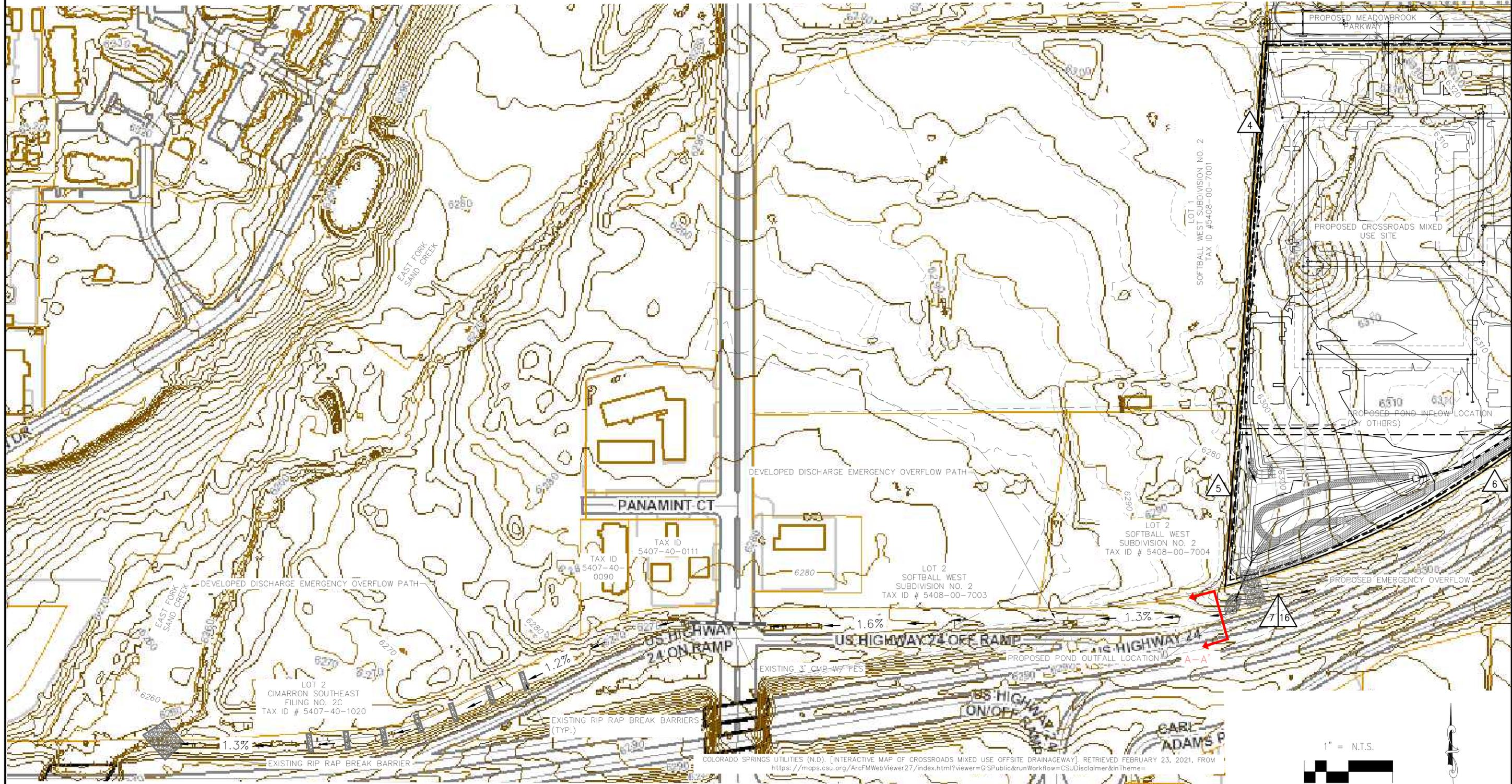
WQ VOLUME	0.861 AC-FT
EURV VOLUME	3.315 AC-FT
100 YR STORAGE VOLUME	4.853 AC-FT
100 YR WATER SURFACE EL	6294.74
SPILLWAY CREST EL	6294.80
TOP OF EMBANKMENT EL	6297.00
SPILLWAY DESIGN FLOW DEPTH	1.0 FT

PROPOSED DRAINAGE MAP
CROSSROADS MIXED USE
JOB NO. 18-003
DATE PREPARED: JUNE 18 2021
DATE REVISED:

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

CROSSROADS MIXED USE

DRAINAGEWAY EXHIBIT
FEBRUARY 2021



LEGEND

- SURFACE DESIGN POINT
- SITE BOUNDARY
- EXISTING RIP RAP BARRIERS
- PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED WATER FITTING
- 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

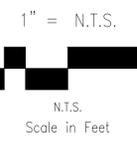
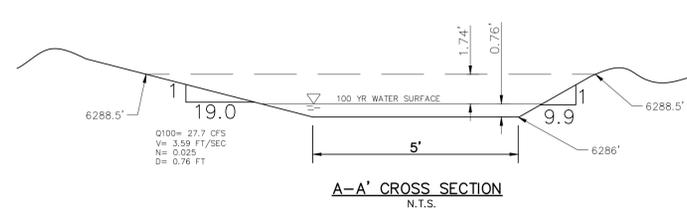
DESIGN POINT	Q5 (CFS)	Q100 (CFS)
4	7.4	27.7
5	8.3	18.2
6	1.2	8.5
7	10.4	31.9

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



PCD FILING NO: SP-20-011

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