



Soleana Subdivision

Phase II Drainage Report

IMEG #20002764.00

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Soleana Subdivision Phase II Drainage Report

GENERAL LOCATION AND DESCRIPTION

A. Site Location

The project is located in the north half of Section 26 T7S R67W 6th PM and is currently unplatted land. The property is bounded on the east by the Diamond Ridge subdivision, on the south by the Cooper Hook subdivision and on the west by the Silver Heights subdivision. The property ownership is divided into two parcels submitted as a single project with the north half owned by Tierra Investors LLC and the southern portion owned by 455 Alexander LLC. The owners are the developers for the property. IMEG is the consulting engineer providing civil engineering services.

The proposed Soleana Subdivision is in the north half of Section 26, Township 7 South, Range 67 west of the 6th Principal Meridian in Douglas County, Colorado. The property is centrally located and includes portions of the NE $\frac{1}{4}$ and the NW $\frac{1}{4}$ of Section 26. The overall project boundary encompasses approximately 77.96 acres.

B. Description of Property and Land Use

The property encompasses approximately 77.96 acres that is generally sloped from east to west at grades ranging from 2% to 20% in the buildable areas, and some areas of significant slope along Diamond Ridge. The proposed development plan calls for a low density, low impact neighborhood with approximate $\frac{1}{2}$ acre single family residential lots proposed.

Ground cover for the property includes scrub oaks, native grasses, and rock outcroppings. Site development will include over lot grading activities to optimize the use of available space and views from the subdivision. Open space areas will remain undisturbed to preserve the natural character of the community.

Soils on site are a combination of Kutch Sandy Loams (49.1%) and Stony steep land (50.9%). These soils are generally consistent with hydrologic soil group D.

The project area is historically tributary to East Plum Creek through two tributaries located at the north and south sides of the site. The north tributary drains through an established drainage system including a combination of open channels and storm sewer to the confluence with East Plum Creek located approximately 1.5 miles west of the development. The south outfall drains through the Cooper Hook development through a 72" storm sewer that is part of the Tributary C to Plum Creek as modeled in the Flood Hazard Area Delineation and Master plan prepared for the Town of Castle Rock.

The site is in zone X as noted on FIRM Panel 08035C0186G Revised March 16, 2016. There are no irrigation ditches or canals adjacent to or impacted by this project. There is a designated FEMA floodplain that begins approximately 2500 feet west of the project boundary. The FHAD for Tributary C identifies flood limits along the southern boundary of the Cooper Hook property.

Development of the project includes 55 single-family detached lots ranging from half-acre to one acre in size. Additionally, there are 22 duplex units proposed to be built in the southwest corner of the site with access to Flamecrest Trail (AKA Brewer Court). These sites may be modified depending on market conditions and become single family residential lots at the time of final design. For this analysis, we have assumed impervious coverage with the development based on relative use.

Secondary emergency access will be provided from an extension of Alexander Place that will serve this development together with Lot 4 of the Cooper Hook development being planned in coordination with this project. This emergency access will serve also be secondary water service serving the development. The final configuration of this access may be coordinated with the adjacent development to optimize the benefit for both projects.

DRAINAGE BASIN AND SUB-BASINS

A. Major Drainage Basins

The project area spans two basins in the Plumb creek watershed. The northern region does not have a masterplan associated with the region but includes a small portion of the Diamond Ridge rear lot drainage and the northern region of alexander way which is currently tributary to the Silver Heights subdivision by way of sheet flow to the adjacent neighbors and concentrated flow beginning at the corner of the Douglas County park property. This area has a documented history of creating localized flooding in the Silver Heights subdivision. As part of this project, the Soleana Subdivision grading plan will direct an additional 11.5 acres south to the tributary C and D outfall which will serve to mitigate potential impacts to the existing Silver heights development.

The project area is described in the Tributary C and D Watershed Masterplan prepared by Respec Dated October 2014. The property itself is a part of sub-Basin 106. This basin was estimated with approximately 97.5 acres total including portions of the proposed alexander way subdivision. Sub Basin 106 receives stormwater runoff from Sub basin 107 which includes 53.7 acres of offsite tributary area.

The historic drainage basin was also reviewed using the USGS Streamstats application. This was done for comparison purposes to evaluate relative runoff flow rates establishing a range of major event flow rates to accommodate the naturalized condition of the offsite tributary areas.



The combined tributary area to the proposed combined pond at Design point 27 as planned in the masterplan report is 162.7 acres including the intercepted flows from the northern portion of the development.

The watershed considered in this report includes the project area and surrounding regions that extends from the Silver Heights neighborhood on the west to the ridgeline with Diamond Ridge Estates to the east. The southern boundary of the site is generally located along Alexander Place, off East Allen Street. The southern limit of the watershed is the existing ridgeline located between 800 and 1300 feet south of the property. The north boundary is the approximate project property line. The watershed generally discharges along two flow paths going either north or south.

Basins A generally drains along its historic flow path to the north draining through the existing channel system that is part of the Silver Heights subdivision. This basin historically includes tributary areas to the east and proposed rear lot drainage along the western project boundary. Tributary runoff from this basin will be attenuated and treated for water quality and discharged directly into the existing drainage channel directly north of the project in its historic flow path.

Basins B, C, D, E and F generally drain south through the storm sewer constructed with the Cooper Hook development also identified as Tributary C. Historically a portion of the flow from Basin B would cross the western boundary as a sheet flow or surface concentrated flow over the adjacent lots in Silver Heights. This condition represented a drainage challenge for the downstream area as documented in the Silver Heights Drainage Study alternative solutions to Local Drainage Problems (Reference 4). The improvements associated with this development will concentrate the tributary flow areas identified with Reference 4 and direct them through a controlled flow path to a proposed pond and ultimately back into Plum Creek. This approach will significantly alleviate the impacts of stormwater to the downstream community.

There are no surface irrigation features that are impacted by the local drainage patterns described in this analysis. Stormwater runoff from this area drains west to Tributary "C" to Plum Creek located approximately 1 mile west of the project area.

The design of the major drainage features is based on assumptions related to specific detention requirements for the tributary areas. Volume requirements for basin A is established in Pond 1, Volume requirements for Basins B, C, D and E are identified in the proposed Pond 2. These basins are located within Sub Basin 106 as described in the Town FHAD and Master Plan Studies for Tributary C Basin F is a historic hill side that will not be modified with this development and is part of sub-Basin 107 in the Tributary C FHAD and Masterplan. In addition, offsite flows from the Diamond Ridge subdivision are treated as pass through flows.



The final design of the watershed impervious coverage will be refined with the Phase 3 reports prepared through the Town of Castle Rock entitlement process. For this Phase II report, we have assumed a composite impervious coverage that includes the following.

- Open Space 2%
- Front Lot Drainage 30%
- Rear Lot Drainage 30%
- Duplex Areas 50%

Silver Heights Mitigation

The existing outfall path for this area includes a combination of retention and overflow through the Silver Heights subdivision. The historic Basin A includes a total of 11.1 acres of tributary area including rear lot drainage from Diamond Ridge, and undeveloped areas. Additional flows tributary to the Silver Heights subdivision includes direct flow from the historic Basin B area including a total of 12.5 acres that is tributary to the rear lots along the eastern boundary of the Silver Heights development.

The proposed improvements are designed to minimize existing drainage impacts to the Silver Heights subdivision in as much as possible. This is accomplished by re-directing the historic Basin B area to the south intercepting flows that are historically tributary to Silver Heights in the Flamecrest Trail extension and directing those flows to the south through a defined storm sewer system. This takes existing drainage pressure off of the central area of the Silver Heights subdivision. In addition, the historic area tributary from combined Basin A and B is reduced from 19.72 acres to 8.25 acres. The percent impervious is increased from 2% native to 15.2% representing the rear lot drainage from the lots fronting Brewer Court that could not be re-directed. These flows are further mitigated in a proposed extended dry basin addressing water quality, EURV and 100-year detention before releasing into the historic flow path being an existing channel section adjacent to the site.

Basin A Total Runoff Volume Comparison

Event	Historic	Developed
WQCV	0	0.065
EURV	0	0.108
2 Year	0.079	0.134
5 Year	0.315	0.328
100 Year	1.485	1.196

The table above indicates that there is an increase in the 2-year event runoff volume. The frequent event increase is mitigated by providing water quality treatment and EURV release that stages stormwater release to the retention facility over a 72 hour period giving time for



evaporation and infiltration to occur in the existing facility. It is also noteworthy that major event runoff total volume is significantly reduced. The combination of these improvements represents a net improvement to the overall impact to the Silver heights neighborhood.

The outfall path for historic waters from Basin A through Silver Heights includes a combination of retention, overflow direct flow and local conveyance. The pond discharge from the Soleana development will discharge into the existing retention area on the Douglas County Park property as described above. The historic drainage pattern includes an emergency overflow and local drainage path that drains along the rear lot lines of the residential lots between Evalena Road and Bulkey Street. The combined basin drains to the existing detention facility located near Harvey Street and Interstate 25. The combination of the detention facility in Basin A and the diversion of Basin B dramatically improves the existing drainage condition of historic flows entering the Silver Heights subdivision.

B. Minor Drainage Basins

Basin A

The Basin A watershed represents the north region of the study area. Basin A is divided into three sub basins with Basin A1 representing the offsite tributary area and Basin A2 representing the onsite undeveloped area and Basin A3 representing rear lot drainage along the Flamecrest Trail extension. The basin historically drains directly to the existing channel in the Silver Heights subdivision. Developed areas will be directed to Pond 1. Basin A includes a total of approximately 8.25 acres with 0.97 acres being tributary from offsite areas.

Basin B

The Basin B watershed represents the north central area of the study limits. This Basin includes 22.74 acres that is bounded by Basin A on the north and Basin C on the south. The eastern boundary of the basin is Diamond Ridge Estates. Basin B includes approximately 0.97 acres being tributary from offsite areas. Sub Basins B1, B2 and B3 are directed south as additional areas tributary as an extension of Sub Basin 106 and represent approximately 11.47 acres of additional area tributary to proposed Pond 2. As previously mentioned, these areas are directed away from the Silver Heights surface flow path to a more clearly defined outfall where flow rates can more easily be attenuated before releasing downstream. Runoff from Basin B is attenuated in proposed Pond 2.

Basin C

The Basin C watershed is in the central region of the study area and includes approximately 43.66 acres. The watershed is bounded by the ridgeline with Diamond Ridge Estates to the northeast. Basin B forms the northern boundary of Basin C. The southern boundary roughly follows Basin D to the South and the extension of Flamecrest Trail to the west. Basin C



includes approximately 13.03 acres being tributary from offsite areas. Runoff from Basin C is attenuated in proposed Pond 2.

Basin D

The Basin D watershed is in the south-central region of the study area and includes approximately 21.56 acres. The watershed is bounded by the ridgeline with Diamond Ridge Estates to the northeast. Basin C forms the northern boundary of Basin D. The southern boundary roughly follows property line with 382 Alexander Place. The southeastern boundary is Basin E. Basin D includes approximately 2.14 acres being tributary from offsite areas both upstream and downstream of the project development limit. Runoff from Basin D is attenuated in proposed Pond 2.

Basin E

The Basin E watershed is in the southeastern region of the study area and includes approximately 8.27 acres. The watershed is bounded by the ridgeline with Diamond Ridge Estates to the northeast. Basin D forms the northern boundary of Basin E. The southern boundary roughly follows the property line with 382 Alexander Place. Basin E includes approximately 4.07 acres being tributary from offsite areas. Runoff from Basin E is attenuated in proposed Pond 2.

It is noteworthy that there is no development activity proposed in Basin E

Basin F

The Basin F watershed is in the southwestern region of the study area and includes approximately 1.29 acres. The watershed includes the approximate limits of lot 9.

DRAINAGE DESIGN CRITERIA

A. Regulations

This analysis is prepared in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual and The Town of Castle Rock Temporary Erosion and Sediment Control Manual. Supplemental data is developed using the Mile High Flood District Criteria Manuals Volumes 1 2 and 3 together with published worksheets for stormwater detention and inlet capacity sizing.

B. Drainage Studies, Master Plans, Site Constraints

Design for this site also takes into consideration the Regional Basin Tributary C and D Masterplan and the Tributary C & D Flood Hazard area delineation reports addressing the regional flows crossing the Cooperhook subdivision.

This analysis builds on the Phase 1 Drainage report for the Alexander Way subdivision.



Previous reports in the area include the the Design Report for Home Street/Evalena Road Interim Drainage improvements in the Silver Heights subdivision, THE Silver Heights Drainage Study alternative solution to local Drainage problems by Kirkham Michael from 1993, and the Phase III Drainage report for Silver Heights Collings Street, Harvey Street and Evalena Road by HKS dated September 2011.

C. Hydrology

Hydrology for the site is evaluated using several methods to establish a reliable comparison of runoff and impact on the drainage system accounting for different types of terrain, offsite basin impacts and routing design flow through the development. For the development area, the rational method is used to street, inlet and storm sewer capacity. Given the relative size of the overall basin, the validity of the rational method was compared to a CUHP evaluation for the full watershed. This analysis was use to evaluate a major event time of concentration routing for evaluation of major event street capacity and inlet sizing. The CUHP analysis demonstrated a peak flow of 146 cfs at a time to peak of 40 minutes. A similar watershed includes basins B and C that routs for a 45 minute time of concentration and generates a composite 100 year flow of 130.0 cfs. These total values are comparable and considered sufficient to justify the modeling methodology.

D. Hydraulics

Hydraulics for the storm sewer system was evaluated for the 5 year and 100 year rainfall events using the Bently StormCAD software. Inlet Capacity was evaluated using the MHFD inlet worksheet. Stormwater routing for the major event basin was accomplished by taking the incremental increase in watershed size with the incremental increase in travel time to approximate total runoff in the system. Inlet capacity from upstream basins was subtracted for the composite flow in order to determine an appropriate street flow at each design point.

E. Water Quality Enhancement

Water quality mitigation for volume is managed through recommendations for impervious coverage that minimize directly connected impervious areas, suggest alternatives for impervious paving, and support drought tolerant green spaces that optimize water usage for the site. In addition to source control, water quality enhancements can occur as part of the area detention proposed for the site and adjoining developments. This approach has the benefit of mitigating various particulate as sedimentation at fore bay structures and at the micro pool for the pond outlet.

The slope areas receiving stormwater runoff from the Diamond Ridge development may include isolated improvements for channelized areas where runoff is currently conveyed. This may include grass buffers, rock check structures, or formal channelization in localized areas for runoff management that control offsite tributary runoff prior to conveyance across the site using surface and piped conveyance solutions.



Water quality mitigation can be addressed through a series of techniques that may include minimizing directly connected impervious areas, identifying areas where grass buffers and infiltration can be encouraged, and source controls including community education for strategies as presented in the Water Efficiency Plan. This plan does not propose structural elements for source control.

STORMWATER MANAGEMENT FACILITY DESIGN

A. Regulations:

This project is proposed in conformance with the Adams County Storm Drainage Design and Stormwater Quality Regulations and supporting information from the Mile High Flood District Drainage Criteria Manuals Volumes 1, 2 and 3.

B. Stormwater Conveyance Facilities

Stormwater conveyance is accommodated through a combination of curb and gutter flow together with inlets and storm sewer directed to local detention facilities. Inlet and storm sewer spacing is positioned to collect minor event runoff for pipe conveyance. Major event runoff is allowed to bypass a percentage of stormwater runoff in the street to the next downstream facility.

C. Stormwater Storage Facilities

Stormwater detention for the Phase 2 evaluation was accomplished by evaluating the full regional basins tributary to each pond. This includes the assumed development for the Cooperhook property and the Martinez properties at an assumed development rate together with the offsite tributary watershed described as Basni 107 in the Tributary C FHAD.

D. Water Quality Enhancement Best Management Practices

This analysis includes six primary watersheds as part of the analysis identified as Basins A, B, C, D, E and F.

Basin A drains through Pond 1 and is attenuated for Peak Flow and water quality. The historic flow path for Basin A is to the north through the Silver Heights subdivision.

Basins B, C, D, E and F drain through proposed Pond 2 and are attenuated for Peak Flow and water quality. The historic flow path for Basins B through F are a combination of the southerly outfall path as formalized with the development and an easterly sheet flow through the Silver

Heights subdivision that is being corrected with the development of this project.

To mitigate flow through these systems, we are proposing that these flows be directed south to combine with release flow from proposed Pond 2. This approach is intended to minimize impact to the existing open channel system. Ultimate design release may be adjusted to minimize the peak condition tributary to the Cooper Hook storm sewer system.



The water quality facilities for the development are sized in accordance with Town of Castle Rock Criteria.

There are no wetlands associated with the Alexander Way Development.

D. Floodplain Modification

Development along the Cooper Hook improvements is beyond the scope of this analysis, however a proposal is in development with this report to aggregate the stormwater improvements from the Master Planned basins 106 and 107 for a combined detention at the upper end of the existing 72" outfall pipe. This solution will include a detention and stormwater quality facility. This plan does not propose modifications to Tributary C to Plum Creek.

E. Additional Permitting Requirements

The project is not located on or adjacent to a FEMA designated Floodplain. The project does not impact designated wetlands or waters of the US. Therefore, there are no State or Federal permitting requirements related to storm water that are required for this project. The site will be subject to Stormwater discharge permits for construction activities together with compliance with the Town of Castle Rock requirements for sediment control and stormwater discharge. The project will also be subject to review through Douglas County for the unincorporated properties to the north and west of the development.

CONCLUSIONS

A. Compliance with Standards

This analysis was developed in compliance with the Town of Castle Rock Stormwater criteria and includes site specific revisions proposed for the improvement of offsite drainage conditions. The approach for stormwater detention is to regionalize the improvements to optimize the use of space in the overall watershed and to make the expenditure of resources as efficient as possible.

B. Variances

This report includes a recommendation that we redirect 11.5 acres from Basin B to the south through the Cooper Hook storm sewer system. This recommendation alleviates some pressure from the existing Silver Heights Drainage system. A degree of over detention may be necessary to mitigate this proposed diversion. It is noteworthy that these follows are still tributary to Tributary "C" to Plum Creek and does not represent an inter-basin transfer for the larger watershed.

In addition, as part of the subsequent analysis for this site and the proposals for development on the adjacent areas, we may negotiate a combined drainage facility serving the local developments along Alexander Place. This determination will be



complete with the presentation of the Phase 3 drainage study subsequent to this report. Pond Criteria and design flows in this report reflect the shared uses approach.



REFERENCES

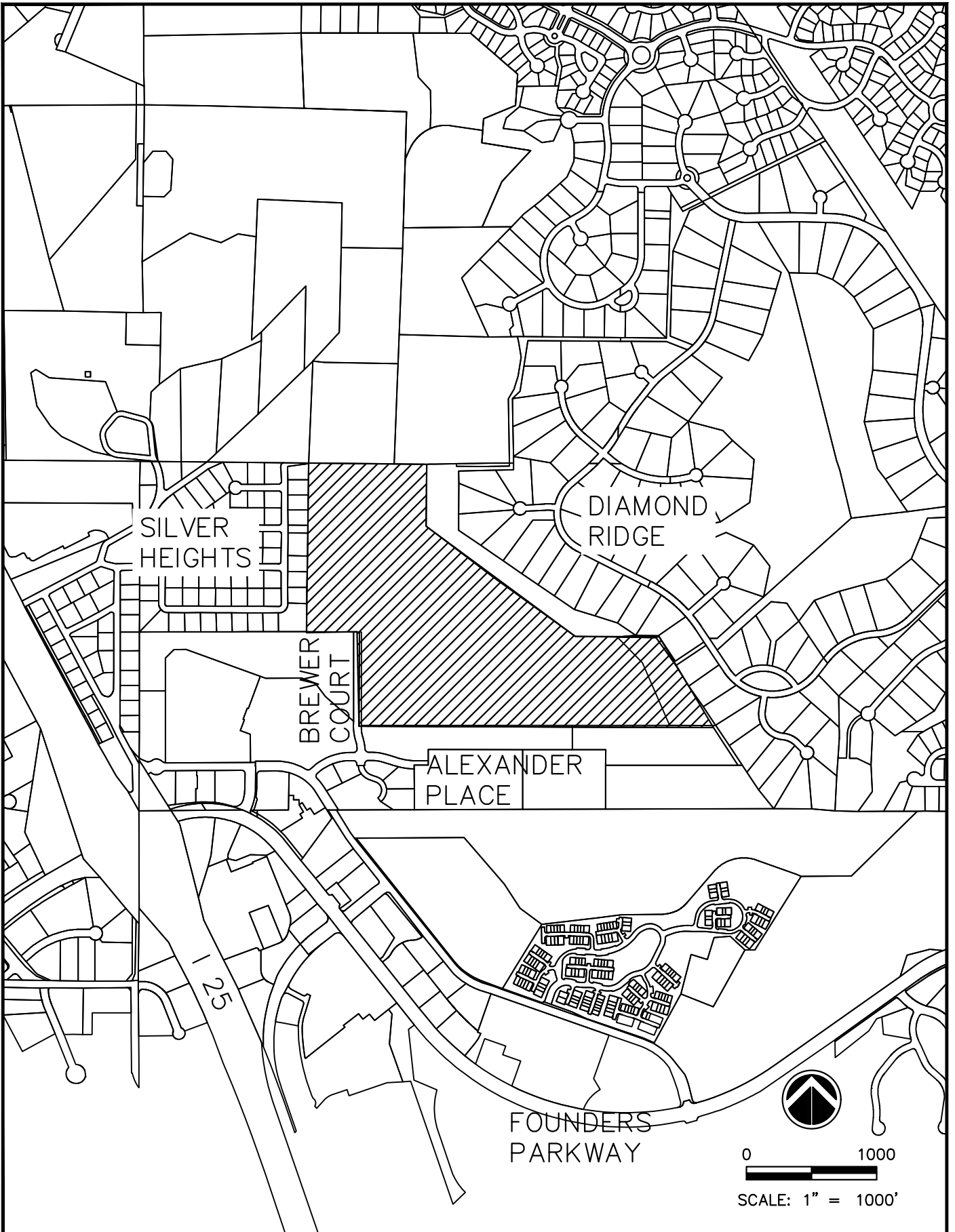
1. Storm Drainage Design and Technical Criteria Manual, Town of Castle Rock, June 2019
2. Mile High Flood District Urban Storm Drainage Criteria Manual Volumes 1, 2 and 3
3. Phase III Drainage Report for Cooper Hook/Main Place Filing No. 1, Galloway Romero & Associates, August 2001
4. Silver Heights Drainage Study Alternative Solutions to Local Drainage Problems. Kirkham Michael and Associates, January 1994
5. Phase III Drainage Report for Silver Heights – Collins Street, Harvey Street and Evalena Road Drainage Improvements, Harris Kocher Smith September 8, 2011
6. Design Report for Home Street/Evalena Road Interim Drainage Improvements, Muller Engineering Company, July 2015
7. FIRM Panel number 08035C0186G Douglas County Colorado Dated March 16, 2016.
8. Flood Hazard Area Delineation Tributary C and D Watersheds – Respec, October 2014



Appendix A



11/19/21 G:\2020\20002764.00\DESIGN\CIVIL\C3D\EXHIBITCONCEPT\20002764 VIC MAP.DWG



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ALEXANDER WAY

CASTLE ROCK, CO

VICINITY MAP

EXHIBIT

NOTES TO USERS

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

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum across jurisdiction, projection or UTM zone used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services
NGA, NINGS12
National Geodetic Survey
OSAC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

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

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

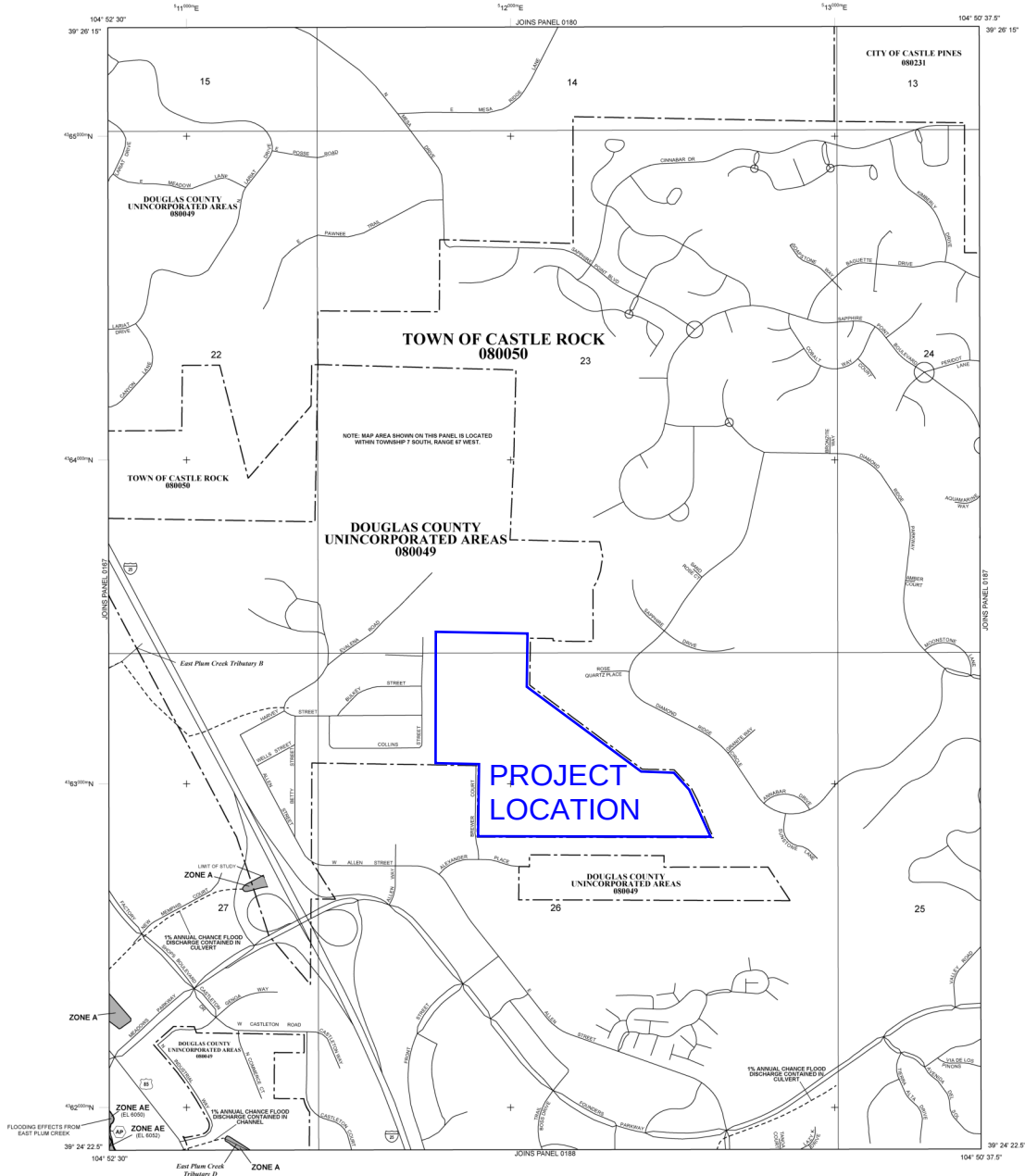
Based on updated topographic information, this map reflects more detailed and up-to-date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report which contain authoritative hydraulic data may reflect stream channel distances that differ from what is shown on the map. Also, the relationship to floodplain relationships for unincorporated streams may differ from what is shown on previous maps.

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

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

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://map.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information xChange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627), or visit the FEMA website at <http://www.fema.gov/business/fmif>.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHA) SUBJECT TO FLOODING 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 equaled 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, VE, X, Z, D, O, S, P, T, U, V, W, Y, Z, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z.

ZONE A No base flood elevation determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain). Base Flood Elevations determined.
ZONE AR Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. Zone AR includes areas that were flood control system being retained to provide protection from the 1% annual chance or greater flood.
ZONE AV Areas to be protected from the 1% annual chance flood by a flood control 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 (OPA)
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and 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
Base Flood Elevation value where uniform within zone, elevation in feet
Referenced to the North American Vertical Datum of 1988

Cross section line
40° 02' 58" N 87° 02' 12" W
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
100-meter Universal Transverse Mercator grid values, zone 13

Map Repository
Refer to Map Repository list on Map Index
EFFECTIVE DATE OF COUNTRYWIDE FLOOD INSURANCE MAP
SEPTEMBER 30, 2009
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add names and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

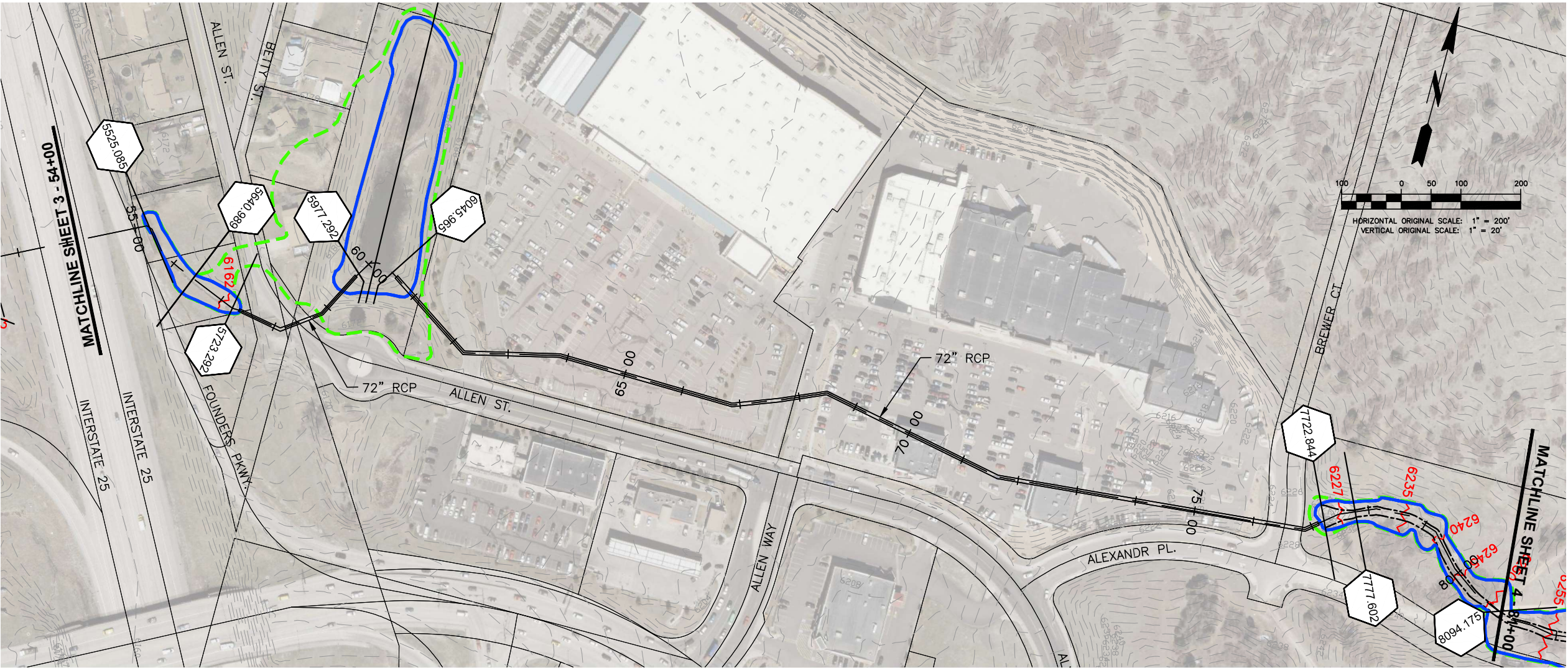
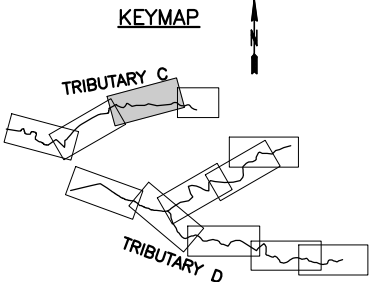
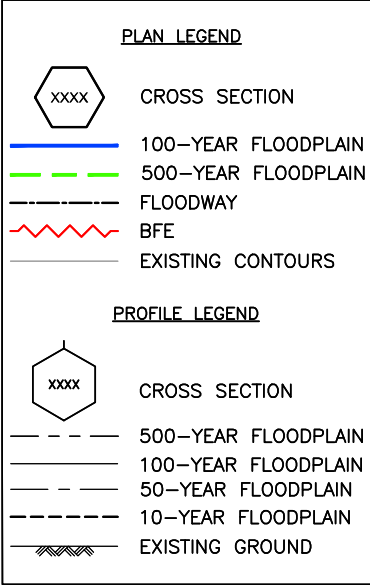
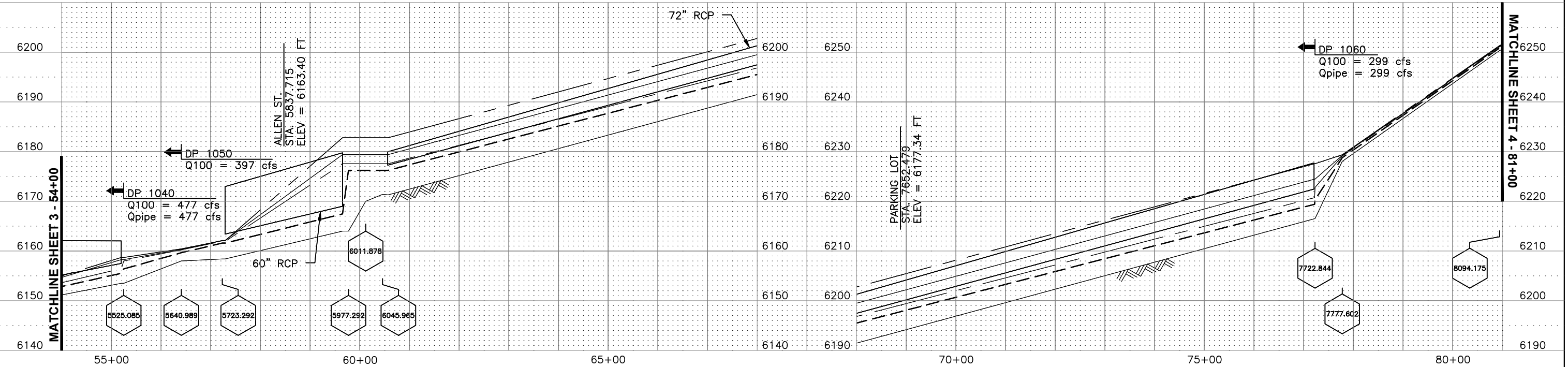
For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.
To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6623.

MAP SCALE 1" = 500'
250 0 250 500
150 0 150 300
FEET METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0186G
FIRM
FLOOD INSURANCE RATE MAP
DOUGLAS COUNTY,
COLORADO
AND INCORPORATED AREAS
PANEL 186 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
COMMUNITY
CASTLE ROCK, TOWN OF
DOUGLAS COUNTY
CASTLE PINES, CITY OF
NUMBER
080050
080049
080231
PANEL
0186
0186
0186
SUFFIX
D
D
D
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
08035C0186G
MAP REVISED
MARCH 16, 2016
Federal Emergency Management Agency

NAME: Z:\Castle Rock\TCR Planning Studies\CAD\Draw-Flood\Tributary C FHAD P & P.dwg
PLOT DATE: Jul 25, 2014 9:26am

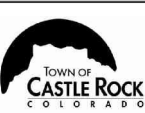


NO.	DATE	DESCRIPTION	BY

DESIGNED	WPF	DATE	7/8/13
DRAWN	ACT	DATE	7/8/13
CHECKED	RCO	DATE	7/8/13

RESPEC WATER & NATURAL RESOURCES
720 S. COLORADO BLVD. SUITE 4105
DENVER, CO 80246
PH: (303) 757-3655

PROJECT NO. _____

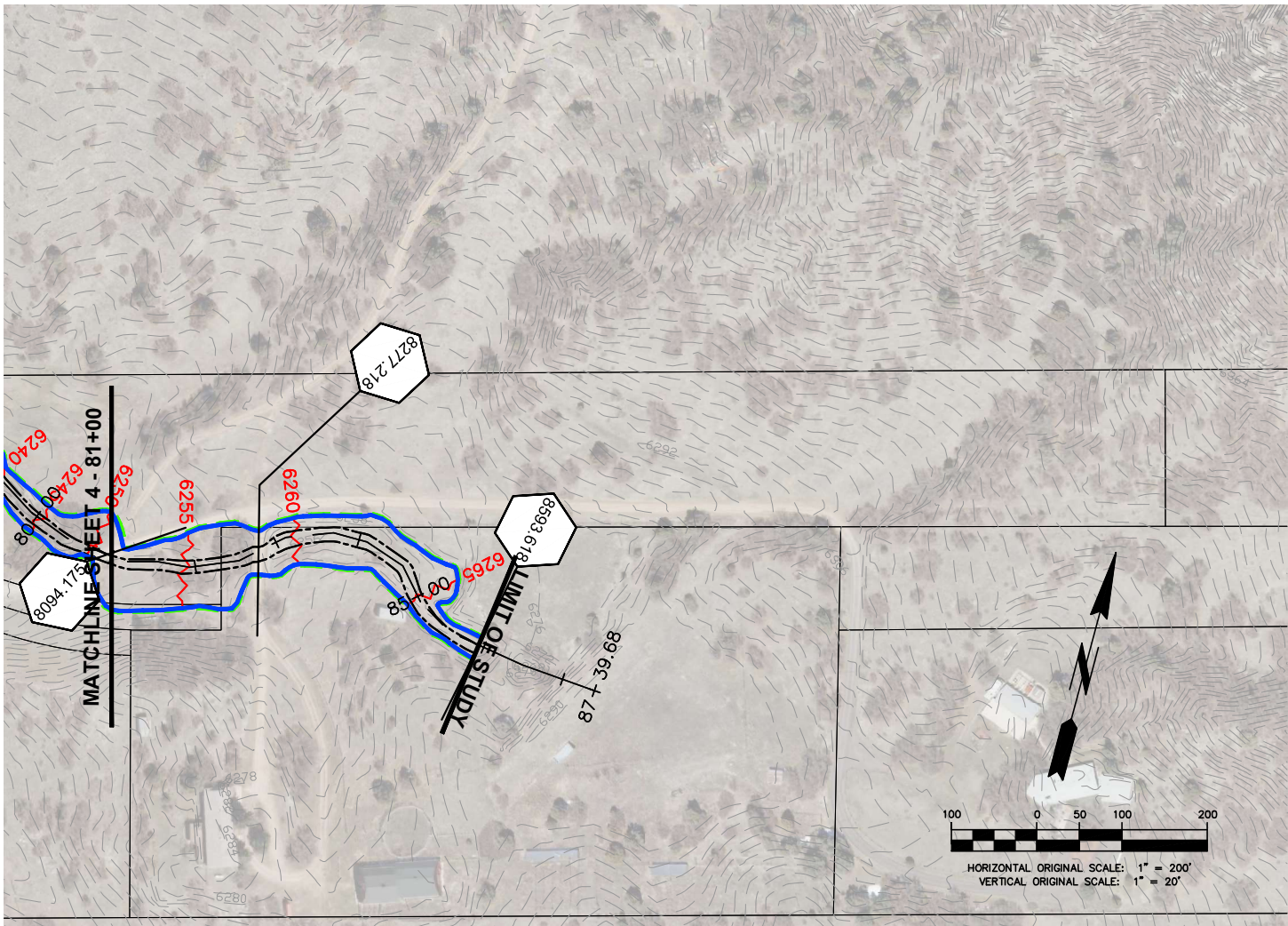
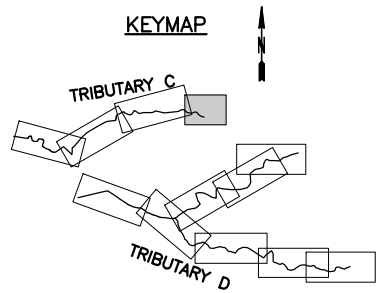
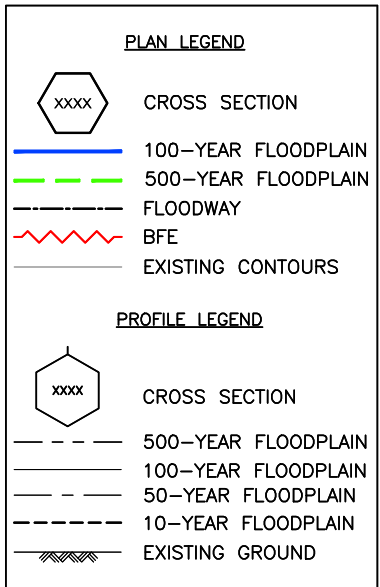
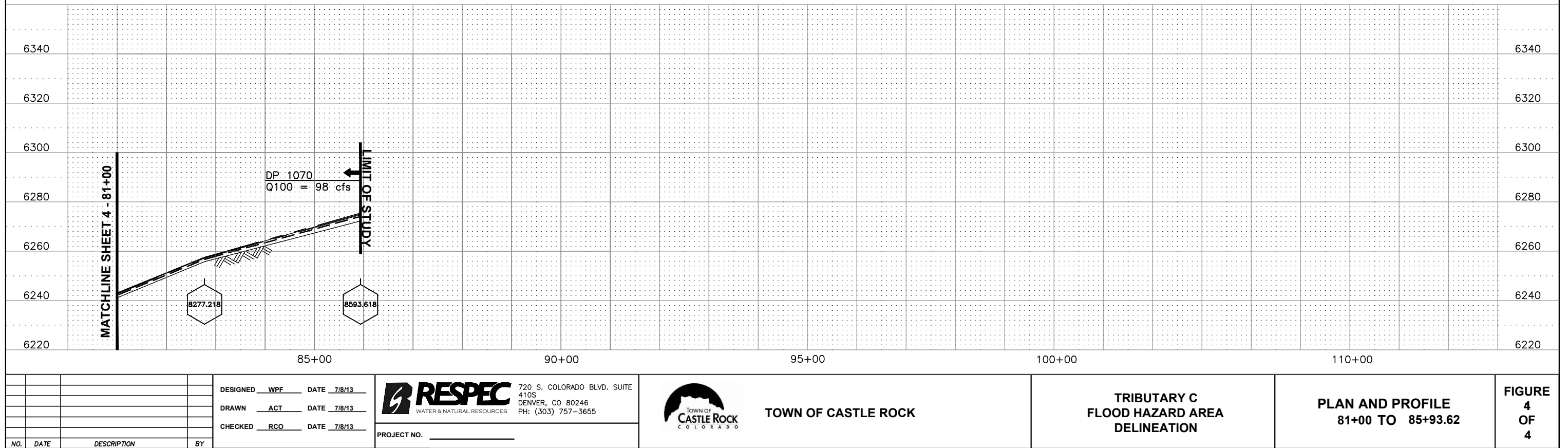


TOWN OF CASTLE ROCK

TRIBUTARY C
FLOOD HAZARD AREA
DELINEATION

PLAN AND PROFILE
54+00 TO 81+00

FIGURE
3
OF
4



Soil Map—Castle Rock Area, Colorado



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

12/15/2020
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Castle Rock Area, Colorado

Survey Area Data: Version 13, Jun 5, 2020

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

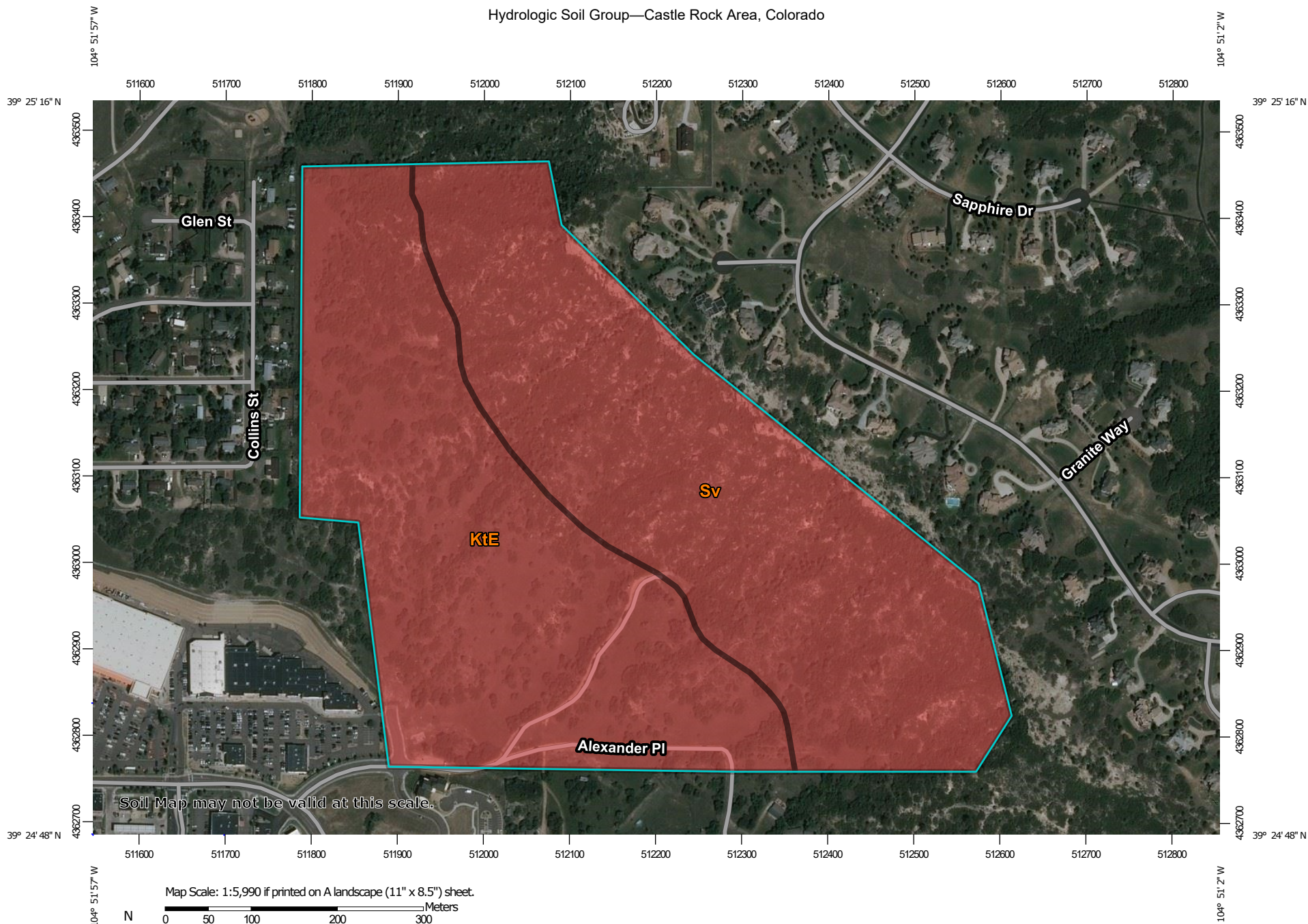
Date(s) aerial images were photographed: Jul 24, 2018—Nov 19, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
KtE	Kutch sandy loam, 5 to 20 percent slopes	47.8	49.1%
Sv	Stony steep land	49.5	50.9%
Totals for Area of Interest		97.3	100.0%

Hydrologic Soil Group—Castle Rock Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:5,990 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 250 500 1000 1500 Feet

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



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

12/15/2020
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Castle Rock Area, Colorado
 Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Jul 24, 2018—Nov 19, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
KtE	Kutch sandy loam, 5 to 20 percent slopes	D	47.8	49.1%
Sv	Stony steep land	D	49.5	50.9%
Totals for Area of Interest			97.3	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Appendix B



Alexander Way
Phase 1 Drainage Report
Historic Basins A and B

**STANDARD FORM SF-2**

REFERENCE MHFD TABLE 6-2

Watercourse Coefficient

Runoff Calculations

Heavy Meadow 2.5

Short Grass Pasture & Lawns 7.0

Grassed Waterway 15.0

Time of Concentration

Tillage/field 5.0

Nearly Bare Ground 10.0

Paved Area & Shallow Gutter 20.0

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA ac.	% I	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	EQ 6-5	min.
1	HA	11.06	2.0%	0.05	70	2.0	12.8	240	10.0	2.5	0.8	5.1	17.9	310	25.8	17.9
2	HB	12.42	2.0%	0.05	200	10.0	12.6	400	10.0	2.5	0.8	8.4	21.0	600	26.0	21.0
3	DA	8.15	15.2%	0.16	70	2.0	11.4	240	10.0	2.5	0.8	5.1	16.5	310	23.6	16.5

Alexander Way
Phase 1 Drainage Report
Historic Basins A and B

**STANDARD FORM SF-3**REFERENCE: MHFD Volume 1**Runoff Calculations**

Rainfall Depth-Duration-Frequency (1-hr) = 1.43

(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATION				DIRECT RUNOFF				TOTAL RUNOFF				REMARKS
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	
1	HA	11.06	0.05	17.9	0.57	2.98	1.7					HA HB
2	HB	12.42	0.05	21.0	0.64	2.74	1.7	21.0	1.21	2.74	3.3	
3	DA	8.15	0.16	16.5	1.30	3.10	4.0					

Alexander Way
Phase 1 Drainage Report
Historic Basins A and B

**STANDARD FORM SF-3**REFERENCE: MHFD Volume 1**Runoff Calculations**

Rainfall Depth-Duration-Frequency (1-hr) = 2.60

(Rational Method Procedure)

Design Storm 100 Year

BASIN INFORMATION				DIRECT RUNOFF				TOTAL RUNOFF				REMARKS
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	
1	HA	11.06	0.49	17.9	5.44	5.42	29.5					HA HB
2	HB	12.42	0.49	21.0	6.11	4.98	30.4	21.0	11.56	4.98	57.6	
3	DA	8.15	0.55	16.5	4.45	5.65	25.1					

Soleana
Phase 2 Drainage Report

**STANDARD FORM SF-2**

REFERENCE MHFD TABLE 6-2

Watercourse Coefficient

Runoff Calculations

Heavy Meadow 2.5

Short Grass Pasture & Lawns 7.0

Grassed Waterway 15.0

Time of Concentration

Tillage/field 5.0

Nearly Bare Ground 10.0

Paved Area & Shallow Gutter 20.0

DESIGN POINT	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)				T(t) min.	T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
	DRAIN BASIN	AREA ac.	% I	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps		COMP. T(c)	TOTAL LENGTH	EQ 6-5	min.
1	A1	0.97	4.9%	0.07	70	2.0	12.5	240	10.0	2.5	0.8	5.1	17.6	310	25.3	17.6
2	A2	2.29	2.0%	0.05	200	10.0	12.6	400	10.0	2.5	0.8	8.4	21.0	600	26.0	21.0
3	A3	4.99	5.1%	0.08	70	2.0	12.4	250	10.0	7.0	2.2	1.9	14.3	320	25.3	14.3
4	B1	0.97	4.3%	0.07	200	10.0	12.4	400	10.0	10.0	3.2	2.1	14.5	600	25.6	14.5
5	B2	8.16	18.3%	0.18	300	10.0	13.5	800	1.0	20.0	2.0	6.7	20.2	1100	24.5	20.2
6	B3	4.31	30.0%	0.28	250	5.0	13.9	400	5.0	20.0	4.5	1.5	15.4	650	21.3	15.4
7	B4	1.07	30.0%	0.28	100	2.0	11.9	550	5.0	20.0	4.5	2.0	13.9	650	21.3	13.9
8	B5	3.72	41.8%	0.38	200	10.0	8.7	800	8.0	20.0	5.7	2.4	11.1	1000	19.3	11.1
9	B6	1.03	49.9%	0.44	50	2.0	6.7	600	5.0	20.0	4.5	2.2	8.9	650	17.8	8.9
10	B7	2.02	29.8%	0.28	50	2.0	8.4	650	8.0	20.0	5.7	1.9	10.3	700	21.2	10.3
11	B8	2.34	30.0%	0.28	50	2.0	8.4	650	8.0	20.0	5.7	1.9	10.3	700	21.2	10.3
12	B9	1.14	30.0%	0.28	200	10.0	9.9	800	8.0	20.0	5.7	2.4	12.3	1000	21.4	12.3
13	C1.1	5.68	5.3%	0.08	200	5.0	15.5	700	6.0	7.0	1.7	6.8	22.3	900	25.7	22.3
14	C1.2	7.73	10.5%	0.12	100	10.0	8.3	900	6.0	7.0	1.7	8.7	17.0	1000	24.9	17.0
15	C2.1	3.68	5.2%	0.08	250	5.0	17.3	250	8.0	7.0	2.0	2.1	19.4	500	25.4	19.4
16	C2.2	4.52	5.0%	0.08	150	5.0	13.4	400	5.0	7.0	1.6	4.3	17.7	550	25.6	17.7
17	C2.3	3.67	4.4%	0.07	250	5.0	17.4	150	8.0	7.0	2.0	1.3	18.7	400	25.5	18.7

Soleana
Phase 2 Drainage Report



REFERENCE MHFD TABLE 6-2

Watercourse Coefficient

Runoff Calculations

Heavy Meadow 2.5

Short Grass Pasture & Lawns 7.0

Grassed Waterway 15.0

Time of Concentration

Tillage/field 5.0

Nearly Bare Ground 10.0

Paved Area & Shallow Gutter 20.0

DESIGN POINT	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)				T(t) min.	T(c) CHECK (URBANIZED BASINS)			FINAL T(c) min.
	DRAIN BASIN	AREA ac.	% I	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps		COMP. T(c)	TOTAL LENGTH	EQ 6-5	
18	C2.4	6.20	11.3%	0.13	250	10.0	13.1	550	5.0	7.0	1.6	5.9	19.0	800	24.6	19.0
19	C3	2.58	30.0%	0.28	200	10.0	9.8	550	5.0	20.0	4.5	2.0	11.8	750	21.3	11.8
20	C4	1.31	30.0%	0.28	200	10.0	9.9	550	5.0	20.0	4.5	2.0	11.9	750	21.3	11.9
21	C5	2.76	24.3%	0.23	200	10.0	10.4	550	5.0	20.0	4.5	2.0	12.4	750	22.3	12.4
22	C6	4.76	30.0%	0.28	100	2.0	11.9	1550	8.0	20.0	5.7	4.6	16.5	1650	21.6	16.5
23	C7	0.77	34.3%	0.32	30	2.0	6.2	150	8.0	20.0	5.7	0.4	6.6	180	20.2	6.6
24	D1	4.16	5.6%	0.08	200	2.0	20.9	200	10.0	10.0	3.2	1.1	22.0	400	25.3	22.0
25	D2	6.64	10.3%	0.12	200	10.0	11.8	700	2.0	20.0	2.8	4.1	15.9	900	25.3	15.9
26	D3	1.13	26.2%	0.25	50	2.0	8.7	700	2.0	20.0	2.8	4.1	12.8	750	22.2	12.8
27	D4	3.78	50.0%	0.45	30	2.0	5.2	500	4.0	20.0	4.0	2.1	7.3	530	17.8	7.3
28	D5	3.83	23.5%	0.23	150	10.0	9.1	350	10.0	10.0	3.2	1.8	10.9	500	22.2	10.9
29	E1	4.20	7.4%	0.10	150	10.0	10.5	650	10.0	10.0	3.2	3.4	13.9	800	25.2	13.9
30	E2	4.07	2.0%	0.05	150	10.0	10.9	450	10.0	10.0	3.2	2.4	13.3	600	26.0	13.3
31	F1	1.29	29.9%	0.28	150	10.0	8.5	450	10.0	10.0	3.2	2.4	10.9	600	21.2	10.9

Soleana
Phase 2 Drainage Report

**STANDARD FORM SF-3**REFERENCE: MHFD Volume 1**Runoff Calculations**

Rainfall Depth-Duration-Frequency (1-hr) = 1.43

(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATION				DIRECT RUNOFF				Travel Time			TOTAL RUNOFF				REMARKS
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	Length ft	Velocity fps	Tt Min.	T(c) min	SUM C x A	I in/hr	Q cfs	
1	A1	0.97	0.07	17.6	0.07	3.01	0.2								
2	A2	2.29	0.05	21.0	0.12	2.74	0.3				21.0	0.19	2.74	0.5	A1, A2
3	A3	4.99	0.08	14.3	0.38	3.32	1.3				21.0	0.57	2.74	1.6	A1 thru A3
4	B1	0.97	0.07	14.5	0.07	3.30	0.2								
5	B2	8.16	0.18	20.2	1.51	2.80	4.2	1100.0	2.0	9.2	29.3	1.58	2.27	3.6	B1, B2
6	B3	4.31	0.28	15.4	1.21	3.21	3.9	650.0	4.5	2.4	31.8	2.79	2.17	6.0	B1 thru B3
7	B4	1.07	0.28	13.9	0.30	3.36	1.0				31.8	3.09	2.17	6.7	B1 thru B4
8	B5	3.72	0.38	11.1	1.40	3.72	5.2	1000.0	5.7	2.9	34.7	4.49	2.06	9.2	B1 thru B5
9	B6	1.03	0.44	8.9	0.46	4.04	1.8				34.7	3.55	2.06	7.3	B1 thru B6
10	B7	2.02	0.28	10.3	0.56	3.82	2.2				34.7	4.11	2.06	8.4	B1 thru B7
11	B8	2.34	0.28	10.3	0.66	3.82	2.5								
12	B9	1.14	0.28	12.3	0.32	3.56	1.1	1000.0	2.4	7.1	17.4	0.98	3.02	3.0	B8, B9
13	C1.1	5.68	0.08	22.3	0.45	2.65	1.2								
14	C1.2	7.73	0.12	17.0	0.93	3.05	2.8	1000.0	1.7	9.7	32.0	1.38	2.16	3.0	C1.1, C1.2
15	C2.1	3.68	0.08	19.4	0.29	2.86	0.8								
16	C2.2	4.52	0.08	17.7	0.34	3.00	1.0	550.0	1.6	5.9	25.3	0.63	2.48	1.6	C2.1,2.2
17	C2.3	3.67	0.07	18.7	0.26	2.92	0.8								

Soleana
Phase 2 Drainage Report



REFERENCE: MHFD Volume 1

Runoff Calculations

Rainfall Depth-Duration-Frequency (1-hr) = 1.43

(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATON				DIRECT RUNOFF				Travel Time			TOTAL RUNOFF				REMARKS
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	Length ft	Velocity fps	Tt Min.	T(c) min	SUM C x A	I in/hr	Q cfs	
18	C2.4	6.20	0.13	19.0	0.79	2.89	2.3	800.0	1.6	8.5	33.8	3.06	2.09	6.4	C1 thru C2
19	C3	2.58	0.28	11.8	0.73	3.61	2.6				33.8	3.78	2.09	7.9	
20	C4	1.31	0.28	11.9	0.37	3.60	1.3	750.0	4.5	2.8	36.6	4.15	1.99	8.3	C1 thru C4
21	C5	2.76	0.23	12.4	0.65	3.53	2.3	750.0	4.5	2.8	39.4	4.80	1.90	9.1	C1 thru C5
22	C6	4.76	0.28	16.5	1.34	3.10	4.2	1650.0	5.7	4.9	44.2	6.14	1.77	10.8	C1 thru C6
23	C7	0.77	0.32	6.6	0.24	4.47	1.1				36.6	6.4	1.99	12.7	C1 thru C6
24	D1	4.16	0.08	22.0	0.34	2.68	0.9								
25	D2	6.64	0.12	15.9	0.79	3.16	2.5	900.0	2.8	5.3	27.3	1.13	2.37	2.7	D1,D2
26	D3	1.13	0.25	12.8	0.28	3.49	1.0	750.0	2.8	4.4	31.7	1.41	2.17	3.1	D1 thru D3
27	D4	3.78	0.45	7.3	1.68	4.34	7.3	530.0	4.0	2.2	33.9	3.10	2.09	6.5	D1 thru D4
28	D5	3.83	0.23	10.9	0.87	3.73	3.3	500.0	3.2	2.6	36.5	3.97	1.99	7.9	D1 thru D6
29	E1	4.20	0.10	13.9	0.40	3.36	1.3								
30	E2	4.07	0.05	13.3	0.21	3.43	0.7	600.0	3.2	3.2	17.1	0.61	3.05	1.9	E1,E2
31	F1	1.29	0.28	10.9	0.36	3.74	1.4								
		68.4									44.2	12.87	1.77	22.7	Sum B & C

Soleana
Phase 2 Drainage Report

**STANDARD FORM SF-3**REFERENCE: MHFD Volume 1**Runoff Calculations**

Rainfall Depth-Duration-Frequency (1-hr) = 2.60

(Rational Method Procedure)

Design Storm 100 Year

BASIN INFORMATION				DIRECT RUNOFF				TOTAL RUNOFF				REMARKS
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	
1	A1	0.97	0.50	17.6	0.49	5.47	2.7					
2	A2	2.29	0.49	21.0	1.13	4.98	5.6	21.0	1.62	4.98	8.0	A1, A2
3	A3	4.99	0.50	14.3	2.52	6.04	15.2	21.0	4.14	4.98	20.6	A1 thru A3
4	B1	0.97	0.50	14.5	2.62	6.00	15.7					
5	B2	8.16	0.56	20.2	4.56	5.09	23.2	29.3	7.18	4.13	29.7	B1, B2
6	B3	4.31	0.61	15.4	2.62	5.83	15.3	31.8	9.79	3.94	38.6	B1 thru B3
7	B4	1.07	0.61	13.9	0.65	6.11	4.0	31.8	10.44	3.94	41.2	B1 thru B4
8	B5	3.72	0.66	11.1	2.44	6.76	16.5	34.7	12.88	3.74	48.1	B1 thru B5
9	B6	1.03	0.69	8.9	0.71	7.34	5.2	34.7	11.15	3.74	41.7	B1 thru B6
10	B7	2.02	0.61	10.3	1.22	6.95	8.5	34.7	12.38	3.74	46.3	B1 thru B7
11	B8	2.34	0.61	10.3	1.42	6.95	9.9					
12	B9	1.14	0.61	12.3	0.69	6.47	4.5	17.4	2.11	5.49	11.6	B8, B9
13	C1.1	5.68	0.51	22.3	2.87	4.83	13.9					
14	C1.2	7.73	0.53	17.0	4.07	5.55	22.6	32.0	6.95	3.92	27.3	C1.1, C1.2
15	C2.1	3.68	0.51	19.4	1.86	5.20	9.7					
16	C2.2	4.52	0.50	17.7	2.28	5.45	12.4	25.3	4.14	4.50	18.6	C2.1,2.2
17	C2.3	3.67	0.50	18.7	1.84	5.30	9.8					

Soleana
Phase 2 Drainage Report



REFERENCE: MHFD Volume 1

Runoff Calculations

Rainfall Depth-Duration-Frequency (1-hr) = 2.60

(Rational Method Procedure)

Design Storm 100 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				REMARKS
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	
18	C2.4	6.20	0.53	19.0	3.29	5.26	17.3	33.8	16.21	3.80	61.6	C1 thru C2
19	C3	2.58	0.61	11.8	1.57	6.56	10.3	33.8	17.78	3.80	67.6	
20	C4	1.31	0.61	11.9	0.79	6.54	5.2	36.6	18.58	3.62	67.2	C1 thru C4
21	C5	2.76	0.58	12.4	1.61	6.42	10.3	39.4	20.19	3.46	69.8	C1 thru C5
22	C6	4.76	0.61	16.5	2.89	5.64	16.3	44.2	23.08	3.21	74.1	C1 thru C6
23	C7	0.77	0.62	6.6	0.48	8.13	3.9	36.6	23.6	3.62	85.3	C1 thru C6
24	D1	4.16	0.51	22.0	2.11	4.87	10.3					
25	D2	6.64	0.53	15.9	3.49	5.74	20.0	27.3	5.60	4.31	24.2	D1,D2
26	D3	1.13	0.59	12.8	0.67	6.34	4.2	31.7	6.27	3.95	24.8	D1 thru D3
27	D4	3.78	0.69	7.3	2.61	7.89	20.6	33.9	8.88	3.79	33.7	D1 thru D4
28	D5	3.83	0.58	10.9	2.22	6.78	15.1	36.5	11.10	3.62	40.2	D1 thru D6
29	E1	4.20	0.51	13.9	2.16	6.11	13.2					
30	E2	4.07	0.49	13.3	2.00	6.24	12.5	17.1	4.16	5.54	23.1	E1,E2
31	F1	1.29	0.61	10.9	0.78	6.80	5.3					
								44.2	40.48	3.21	130.0	Sum B & C

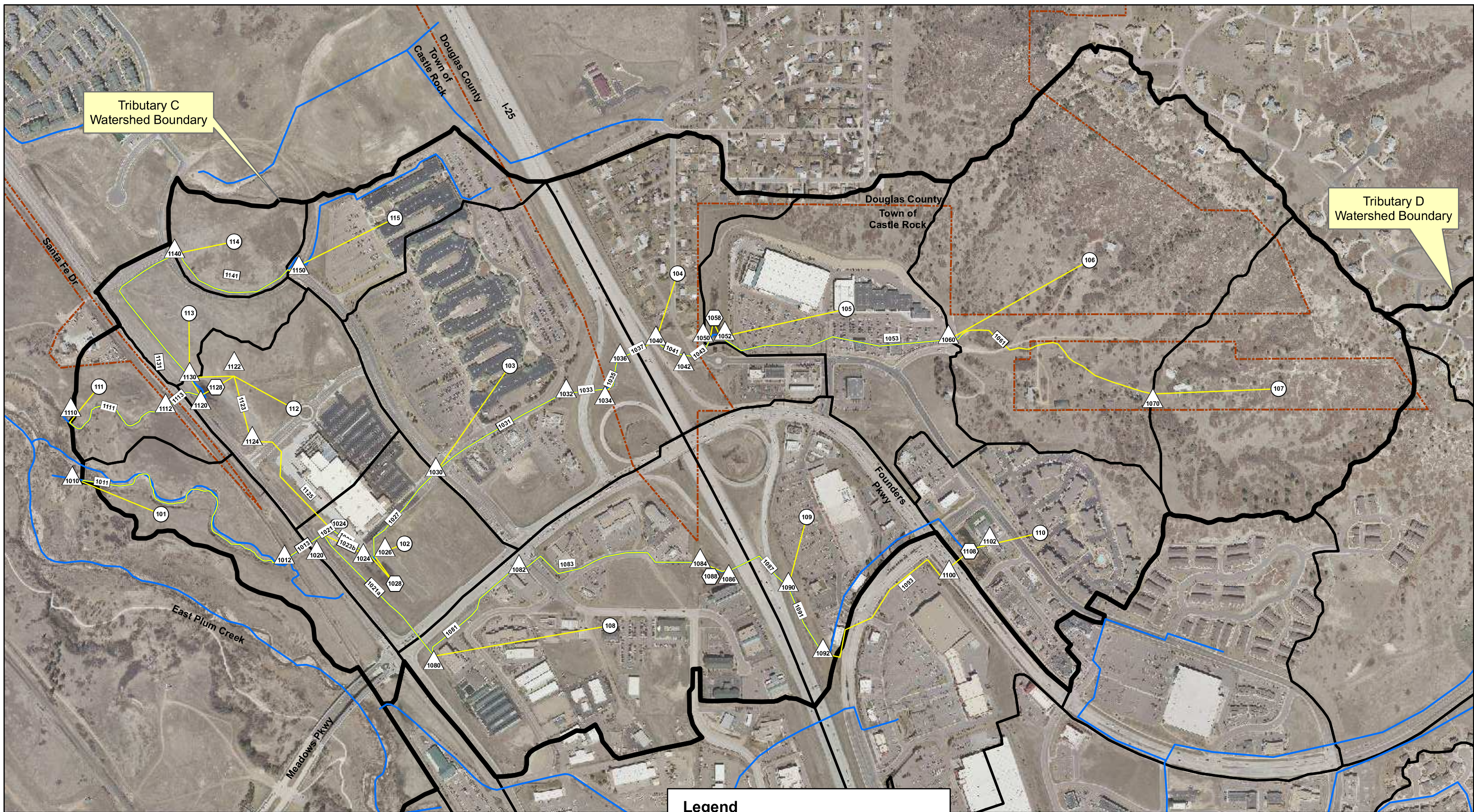
Table B-4 - Land Use by Subwatershed - Tributary C

Future

Subwatershed ID	Subwatershed Area (Acres)	Subwatershed Imperviousness (%)	Subwatershed Land Use Breakdown (Acres)						
			Open Space / Agricultural / Vacant (2%)	Single Family Large Lot (20%)	Multi-Family Residential (60%)	General Commercial (70%)	General / Restricted Commercial (85%)	General Commercial (95%)	Roads (100%)
101	25.5	39.8	15.5	0.0	0.0	0.0	1.2	0.0	8.8
102	24.0	63.3	7.9	0.0	0.0	0.0	5.0	5.7	5.4
103	72.0	89.3	4.5	0.0	0.0	0.0	9.5	37.4	20.6
104	37.7	51.7	3.2	18.1	0.0	0.0	3.9	0.0	12.5
105	48.1	61.3	13.1	1.3	0.4	0.0	30.5	0.0	2.9
106	97.5	14.9	73.5	11.5	0.5	0.0	10.4	0.0	1.6
107	53.7	2.9	51.5	2.1	0.0	0.0	0.1	0.0	0.0
108	76.3	88.7	0.9	0.0	0.0	0.0	51.8	0.0	23.6
109	37.0	84.0	3.1	0.0	0.0	0.0	19.0	0.0	14.9
110	37.2	64.3	4.4	0.0	17.9	0.0	11.9	0.0	3.0
111	12.4	74.2	2.1	0.0	0.0	0.0	7.7	0.0	2.7
112	28.4	78.7	1.2	0.0	0.0	14.8	0.0	9.3	3.1
113	13.7	70.0	0.0	0.0	0.0	11.5	0.0	0.0	0.0
114	11.5	70.0	0.0	0.0	0.0	13.7	0.0	0.0	0.0
115	19.5	95.5	0.0	0.0	0.0	0.0	0.2	16.9	2.3
Total	594.6	58.1	181.0	33.0	18.7	40.0	151.3	69.3	101.2

Existing

Subwatershed ID	Subwatershed Area (Acres)	Subwatershed Imperviousness (%)	Subwatershed Land Use Breakdown (Acres)					
			Open Space / Agricultural / Vacant (2%)	Single Family Large Lot (20%)	Multi-Family Residential (60%)	General / Restricted Commercial (85%)	General Commercial (95%)	Roads (100%)
101	25.5	35.7	16.7	0.0	0.0	0.0	0.0	8.8
102	24.0	46.0	13.0	0.0	0.0	0.0	5.7	5.4
103	72.0	84.8	8.4	0.0	0.0	5.6	37.4	20.6
104	37.7	51.7	3.2	18.1	0.0	3.9	0.0	12.5
105	48.1	57.4	15.4	1.3	0.4	28.2	0.0	2.9
106	97.5	6.0	83.9	11.5	0.5	0.0	0.0	1.6
107	53.7	2.7	51.6	2.1	0.0	0.0	0.0	0.0
108	76.3	82.6	6.5	0.0	0.0	46.2	0.0	23.6
109	37.0	84.0	3.1	0.0	0.0	19.0	0.0	14.9
110	37.2	64.3	4.4	0.0	17.9	11.9	0.0	3.0
111	12.4	29.6	8.8	0.0	0.0	1.0	0.0	2.7
112	28.4	43.3	16.0	0.0	0.0	0.0	9.3	3.1
113	13.7	20.9	11.0	0.0	0.0	0.0	0.0	2.6
114	11.5	7.8	10.9	0.0	0.0	0.0	0.0	0.7
115	19.5	94.6	0.2	0.0	0.0	0.0	16.9	2.3
Total	594.6	49.1	253.2	33.0	18.7	115.8	69.3	104.5



0 187.5 375 750 1,125 1,500 Feet



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Legend

- | | |
|-----------------------|--------------|
| Watershed Boundary | Basin ID |
| Subwatershed Boundary | Design Point |
| Castle Rock | Detention |
| Streams | Conveyance |
| Conveyance Link | Diversion |

Tributary C - EPA SWMM Connectivity
Figure A-7
Tributary C and Tributary D
Tributary Watersheds Master Plan

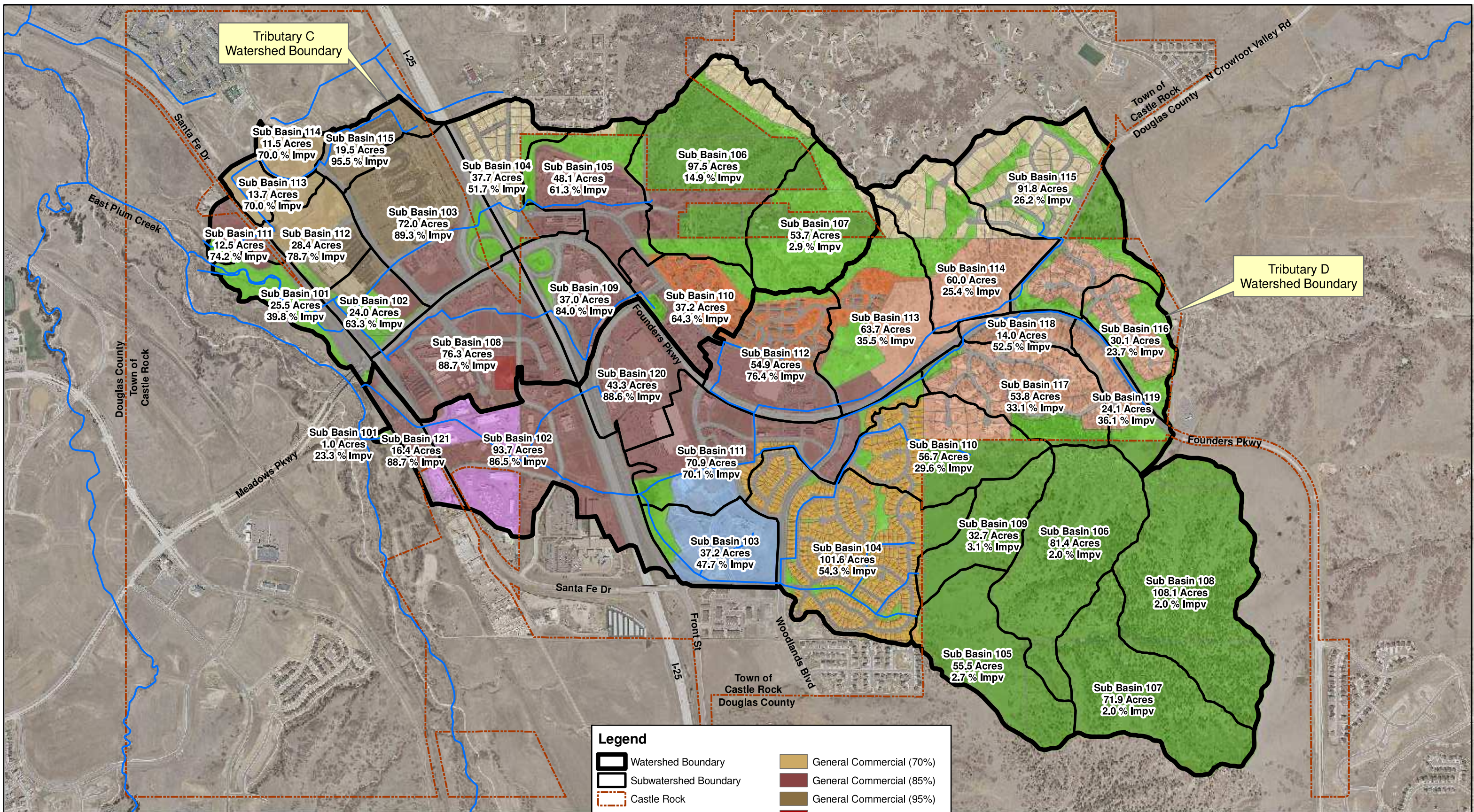


Table B-9 CUHP Subwatershed Peak Flows - Tributary C

Catchment Name/ID	2-Yr				5-Yr				10-Yr				25-Yr				50-Yr				100-Yr				500-Yr			
	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)	Exist. (cfs)	Vol (cf)	Fut. (cfs)	Vol (cf)
101	9	36,095	11	40,225	16	64,901	19	69,475	20	85,091	24	89,784	124,095	32	128,599	37	38	145,900	43	150,502	47	182,948	53	187,414	60	235,271	67	240,145
102	14	40,382	23	56,422	24	67,123	35	85,686	30	85,066	42	104,793	122,609	46	141,299	59	53	142,938	68	161,874	65	177,192	82	195,280	83	226,575	101	245,057
103	124	219,476	131	231,416	172	309,631	180	324,592	202	367,912	210	383,921	469,416	261	484,663	267	295	530,288	300	545,730	348	624,651	353	639,052	425	768,957	429	783,824
104	36	71,360	36	71,350	60	114,488	60	114,476	75	143,315	75	143,302	200,682	107	200,670	107	124	232,413	124	232,402	151	285,150	151	285,140	190	362,454	190	362,445
105	56	105,639	60	111,341	91	164,355	95	170,706	110	203,165	114	209,704	272,757	151	278,923	155	173	313,576	177	319,832	209	379,139	213	384,989	259	475,910	264	481,952
106	16	41,532	25	68,541	49	136,050	62	169,804	68	207,733	82	244,047	359,687	118	394,958	137	142	439,992	163	476,405	181	587,036	206	621,642	237	781,352	267	818,072
107	7	17,892	7	18,140	25	68,372	25	68,704	35	107,288	35	107,652	191,324	63	191,675	63	76	235,292	76	235,658	98	316,798	98	317,141	128	423,429	128	423,796
108	127	238,972	139	257,089	181	342,905	194	363,725	214	409,079	227	431,006	521,305	278	542,547	290	314	589,090	326	610,700	366	693,031	378	713,844	447	853,655	460	874,770
109	48	121,389	48	121,389	68	173,763	68	173,763	79	207,003	79	207,003	262,250	104	262,250	104	117	295,983	117	295,983	138	347,356	138	347,356	169	426,840	169	426,840
110	49	90,132	49	90,132	75	136,540	75	136,540	89	166,857	89	166,857	220,170	121	220,170	121	137	251,812	137	251,812	165	301,893	165	301,893	203	376,801	203	376,801
111	5	15,129	18	34,937	10	29,197	27	51,265	12	39,108	31	61,770	58,219	19	79,712	41	23	68,841	46	90,517	28	87,067	55	107,284	36	112,535	68	132,799
112	16	42,813	42	82,520	26	67,751	59	117,686	34	86,324	71	140,715	129,840	53	182,394	94	63	152,775	106	206,912	78	193,609	126	245,643	100	249,428	155	303,918
113	2	9,061	14	35,637	4	21,687	21	52,781	6	30,409	25	63,794	52,747	11	84,481	34	13	63,792	39	96,298	17	83,807	47	115,184	22	110,896	58	143,630
114	1	2,139	16	30,263	3	8,548	24	44,019	4	14,059	28	53,184	32,757	10	70,737	38	12	41,424	43	80,773	16	58,719	53	97,059	22	80,534	66	121,036
115	35	69,947	35	70,718	47	97,377	48	98,301	55	114,599	55	115,588	142,979	69	143,934	70	78	160,452	78	161,427	90	186,672	91	187,609	110	227,863	110	228,818

Table B-11 Peak Flow Summary Table - Tributary C

Station	Design Point	Location	Drainage Area		100-Year	2-Year		5-Year		10-Year		25-Year		50-Year		100-Year		500-Year	
			Runoff Volume		Existing FuLU (ac-ft)	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future
			(acres)	(sq.mi.)		(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	113		14	0.021	2.6	2	14	4	21	6	25	11	34	13	39	17	47	22	58
	114		12	0.018	2.2	1	16	3	24	4	28	10	38	12	43	16	53	22	66
	115		19	0.030	4.3	35	35	47	48	55	55	69	70	78	78	90	91	110	110
	104		38	0.059	6.5	36	36	60	60	75	75	107	107	124	124	151	151	190	190
	105		48	0.075	8.8	56	60	91	95	110	114	151	155	173	177	209	213	259	264
	112		28	0.044	5.6	16	42	26	59	34	71	53	94	63	106	78	126	100	155
	102		24	0.038	4.5	14	23	24	35	30	42	46	59	53	68	65	82	83	101
	111		12	0.019	2.5	5	18	10	27	12	31	19	41	23	46	28	55	36	68
	101		26	0.040	4.3	9	11	16	19	20	24	32	37	38	43	47	53	60	67
	110		37	0.058	6.9	49	49	75	75	89	89	121	121	137	137	165	165	203	203
	103		72	0.113	14.7	124	131	172	180	202	210	261	267	295	300	348	353	425	429
	107		54	0.084	7.3	7	7	25	25	35	35	63	63	76	76	98	98	128	128
	106		97	0.152	14.3	16	25	49	62	68	82	118	137	142	163	181	206	237	267
	109		37	0.058	8.0	48	48	68	68	79	79	104	104	117	117	138	138	169	169
	108		76	0.119	16.4	127	139	181	194	214	227	278	290	314	326	366	378	447	460
	1130		45	0.070	9.2	34	61	51	87	60	102	84	136	96	154	116	183	144	225
	1140		31	0.048	6.5	34	49	48	68	57	80	76	104	86	117	102	139	126	170
	1150		19	0.030	4.3	35	35	47	48	55	55	69	70	78	78	90	91	110	110
	1110	North Outfall to East Plum Creek D/S Study Limits	86	0.134	15.5	9	22	14	31	17	36	29	59	40	78	72	115	113	239
	1010	South Outfall to East Plum Creek D/S Study Limits	509	0.795	82.0	173	189	250	269	293	310	426	467	563	614	793	860	1,135	1,209
	1100		37	0.058	5.5	4	4	7	7	9	9	20	20	27	27	32	32	35	35
	1060	Brewer Court and Alexander Place	151	0.236	21.5	22	30	73	84	101	114	180	196	216	235	278	299	364	390
	1086		74	0.116	13.3	48	48	68	68	79	79	104	104	117	117	139	139	182	182
	1030	Factory Shops Blvd	309	0.483	49.1	156	164	227	235	272	279	390	410	469	505	628	662	866	934
	1070		54	0.084	7.3	7	7	25	25	35	35	63	63	76	76	98	98	128	128
	1020		333	0.520	51.3	68	74	96	100	139	157	311	343	410	453	577	641	835	892
	1012		484	0.756	77.7	171	185	240	256	281	298	402	439	534	582	753	817	1,084	1,154
	1026		333	0.520	53.6	168	185	248	268	298	319	434	467	515	562	689	738	938	1,019
	1084		74	0.116	10.2	2	2	15	15	22	22	26	26	28	28	30	30	32	32
	1082	Castleton Road	74	0.116	10.2	2	2	15	15	22	22	26	26	28	28	30	30	32	32
	1092		37	0.058	5.4	4	4	7	7	9	9	20	20	27	27	32	32	35	35
	1052		199	0.311	30.3	63	76	141	156	183	201	296	317	351	374	442	470	570	603
	1036		237	0.370	34.7	35	36	106	123	141	147	270	292	337	361	435	498	654	701
	1102		37	0.058	6.9	49	49	75	75	89	89	121	121	137	137	165	165	203	203
	1042		199	0.311	28.0	13	22	86	99	104	116	222	240	276	289	359	395	528	567
	1124		-	0.000	2.3	8	9	12	12	12	12	12	12	12	12	12	12	12	12
	1112		73	0.114	13.1	7	9	9	22	12	30	27	53	35	70	62	102	95	216
	1122		73	0.114	17.1	50	99	78	141	96	167	143	225	165	256	202	306	253	377
	1014	U/S of US 85 (South)	484	0.756	77.7	171	185	240	256	281	298	402	439	534	582	753	817	1,084	1,154
	1022	Lot 3 Detention	333	0.520	22.0	76	83	108	112	112	112	112	112	112	112	112	112	112	143
	1024		333	0.520	53.6	76	83	108	112	151	169	323	355	422	463	582	644	843	904
	1120	U/S of US 85 (North)	73	0.114	13.1	7	9	9	22	12	30	27	53	35	70	62	102	95	207
	1080	Meadows Pkwy and US 85	151	0.235	26.5	128	140	182	195	215	228	280	292	315	327	367	380	449	462
	1040	I-25	237	0.370	34.5	36	36	106	123	141	147	270	292	337	361	435	477	655	701
	1090		74	0.116	13.4	48	48	68	68	79	79	104	104	117	117	139	139	174	174
	1050	U/S of US 85	199	0.311	28.0	13	22	86	99	104	116	222	240	276	289	360	397	529	567
	1034		237	0.370	34.4	35	36	106	123	141	147	270	292	337	361	435	498	654	701
	1032		237	0.370	34.4	35	36	106	123	141	147	270	292	337	361	435	496	654	701
	1028	South Lowe's Pond	333	0.520	53.6	168	185	248	268	298	319	434	467	515	562	689	738	938	1,019
	1108	Pond H	37	0.058	6.9	49	49	75	75	89	89	121	121	137	137	165	165	203	203
	1058	Home Depot Pond	199	0.311	30.3	63	76	141	156	183	201	296	317	351	374	442	470	570	603
	1088	Douglas County Justice Center Filing No. 3 Pond	74	0.116	13.3	48	48	68	68	79	79	104	104	117	117	139	139	182	182
	1128	North Lowe's Pond	73	0.114	17.1	50	99	78	141	96	167	143	225	165	256	202	306	253	377

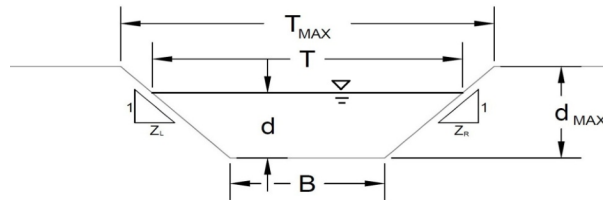
Appendix C



AREA INLET IN A SWALE

Solena Subdivision

A2



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

A, B, C, D, or E =

E	
n =	see details below
S_0 =	0.0400 ft/ft
B =	2.00 ft
Z_L =	4.00 ft/ft
Z_R =	4.00 ft/ft

Choose One:

- ☒ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm

Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	10.00	10.00	ft
d_{MAX} =	1.00	1.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	47.9	47.9	cfs
d_{allow} =	1.00	1.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

Q_o =	0.5	8.0	cfs
d =	0.17	0.49	ft

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'**

AREA INLET IN A SWALE

Solena Subdivision

A2

Inlet Design Information (Input)

Type of Inlet

CDOT Type C (Depressed)

Inlet Type =

CDOT Type C (Depressed)

Angle of Inclined Grate (must be ≤ 30 degrees)

Width of Grate

Length of Grate

Open Area Ratio

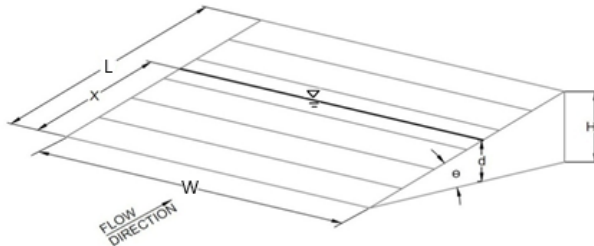
Height of Inclined Grate

Clogging Factor

Grate Discharge Coefficient

Orifice Coefficient

Weir Coefficient

 $\theta = 0.00$ degrees

W = 3.00 ft

L = 3.00 ft

 $A_{\text{RATIO}} = 0.70$ $H_B = 0.00$ ft $C_f = 0.50$ $C_d = 0.84$ $C_o = 0.56$ $C_w = 1.81$

Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)

Total Inlet Interception Capacity (assumes clogged condition)

Bypassed Flow

Capture Percentage = Q_a/Q_o

	MINOR	MAJOR	
d =	1.17	1.49	
$Q_a =$	15.4	17.4	cfs
$Q_b =$	0.0	0.0	cfs
$C\% =$	100	100	%

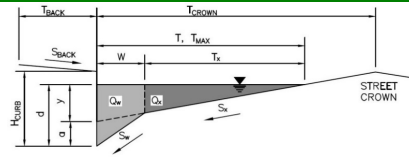
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

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

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

Project: Solena Subdivision

Inlet ID: B2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	15.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.010	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.9	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

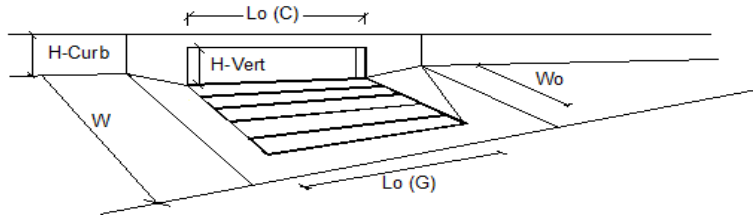
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow}	11.5	26.2	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.60 cfs on sheet 'Inlet Management'**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 29.70 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



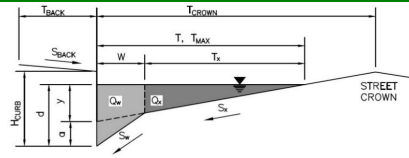
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _u =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _u =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM					
Total Inlet Interception Capacity		Q =	3.6	15.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	13.9	cfs
Capture Percentage = Q _i /Q _a		C% =	100	53	%

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

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

Project: Solena Subdivision

Inlet ID: B3

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

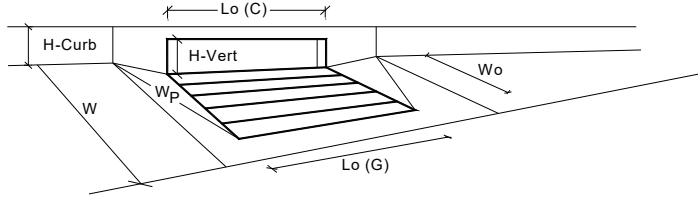
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



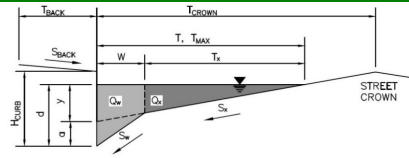
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.28	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.74	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q_s =	7.1	9.7	cfs
		$Q_{PEAK REQUIRED}$ =	3.9	22.8	cfs

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

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

Project: Solena Subdivision

Inlet ID: B4

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

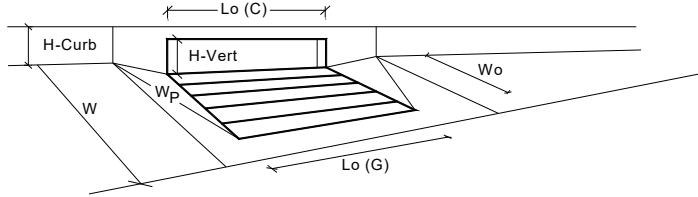
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



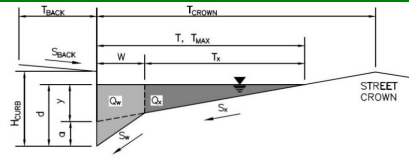
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.28	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.74	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q _s =	7.1	9.7	cfs
		Q _{PEAK REQUIRED} =	1.0	31.5	cfs

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

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

Project: Solena Subdivision

Inlet ID: B5

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$$\begin{aligned} T_{\text{BACK}} &= 12.0 \text{ ft} \\ S_{\text{BACK}} &= 0.020 \text{ ft/ft} \\ n_{\text{BACK}} &= 0.020 \end{aligned}$$

$$\begin{aligned} H_{\text{CURB}} &= 6.00 \text{ inches} \\ T_{\text{CROWN}} &= 16.0 \text{ ft} \\ W &= 2.00 \text{ ft} \\ S_X &= 0.020 \text{ ft/ft} \\ S_W &= 0.083 \text{ ft/ft} \\ S_O &= 0.000 \text{ ft/ft} \\ n_{\text{STREET}} &= 0.013 \end{aligned}$$

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

$$\begin{aligned} T_{\text{MAX}} &= \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 16.0 & 16.0 \end{matrix} \text{ ft} \\ d_{\text{MAX}} &= \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 6.0 & 6.0 \end{matrix} \text{ inches} \end{aligned}$$

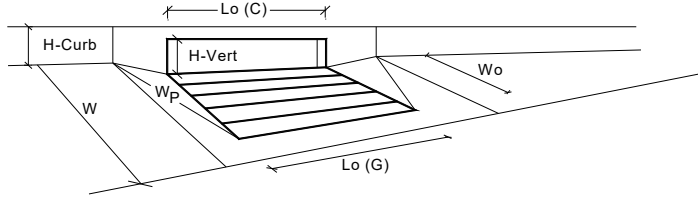
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$$Q_{\text{allow}} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ \text{SUMP} & \text{SUMP} \end{matrix} \text{ cfs}$$

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



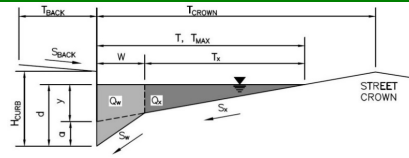
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.28	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.74	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q_s =	7.1	9.7	cfs
		$Q_{PEAK REQUIRED}$ =	5.2	38.4	cfs

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

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

Project: Solena Subdivision

Inlet ID: B6

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.060	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

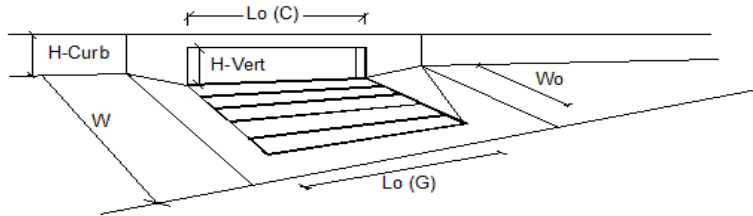
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow}	17.7	17.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.80 cfs on sheet 'Inlet Management'**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 32.00 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



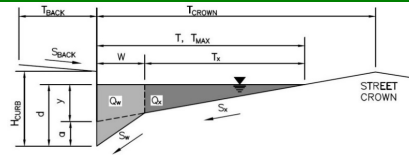
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _u =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _u =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM					
Total Inlet Interception Capacity		Q =	1.8	16.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	15.4	cfs
Capture Percentage = Q _i /Q _a		C% =	100	52	%

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

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

Project: Solena Subdivision

Inlet ID: B7

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.010	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

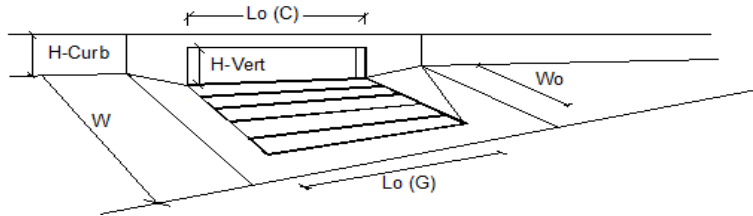
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	11.5	11.5	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.20 cfs on sheet 'Inlet Management'**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 29.70 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



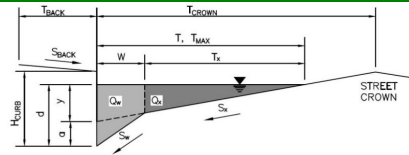
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	4	4	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _u =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _u =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM					
Total Inlet Interception Capacity		Q =	2.2	20.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	9.7	cfs
Capture Percentage = Q _i /Q _a		C% =	100	67	%

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

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

Project: Solena Subdivision

Inlet ID: B8

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.060	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

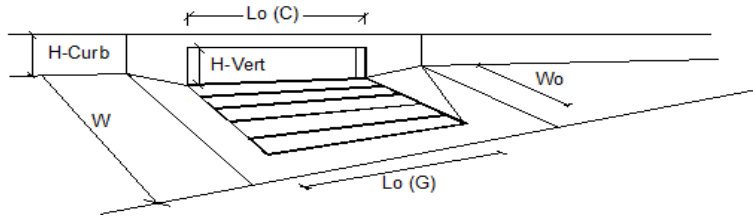
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow}	17.7	17.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.60 cfs on sheet 'Inlet Management'**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 27.30 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



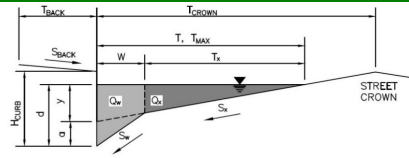
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_u =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_u =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_u =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM					
Total Inlet Interception Capacity		Q =	2.6	15.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o =	0.0	11.9	cfs
Capture Percentage = Q_i/Q_o		C% =	100	57	%

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

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

Project: Solena Subdivision

Inlet ID: B9

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.060	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

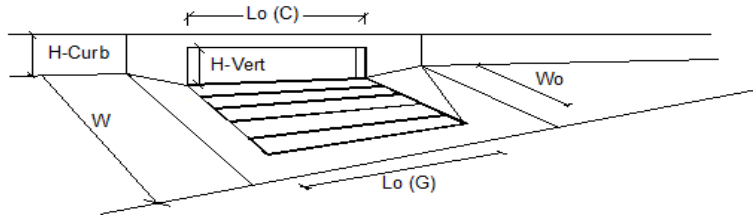
	Minor Storm	Major Storm	
Q_{allow}	17.7	17.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.00 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.00 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



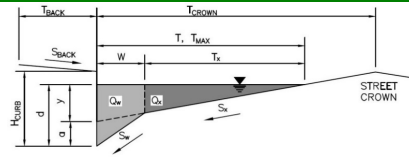
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity					
Total Inlet Interception Capacity		Q =	3.0	8.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	0.6	cfs
Capture Percentage = Q _i /Q _a		C% =	100	93	%

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

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

Project: Solena Subdivision

Inlet ID: C1

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	15.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.012	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	14.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.010	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	14.0	14.0	ft
d_{MAX}	6.0	8.0	inches
	☐	☒	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

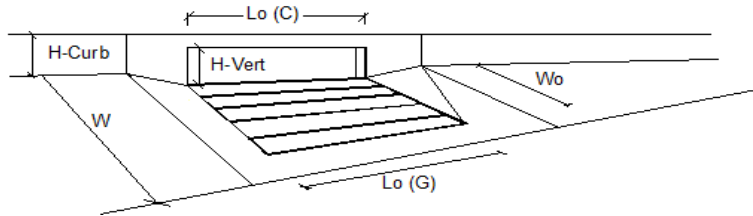
	Minor Storm	Major Storm	
Q_{allow}	8.3	39.4	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.00 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 27.30 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



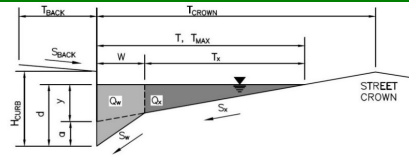
Design Information (Input)		MINOR		MAJOR
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0 inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	4	4
Length of a Single Unit Inlet (Grate or Curb Opening)		L _u =	5.00	5.00 ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _u =	N/A	N/A ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10
Street Hydraulics: OK - Q < Allowable Street Capacity			MINOR	MAJOR
Total Inlet Interception Capacity		Q =	3.0	19.2 cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	8.1 cfs
Capture Percentage = Q _i /Q _a		C% =	100	70 %

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

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

Project: Solena Subdivision

Inlet ID: C2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	8.0	inches
	☐	☐	

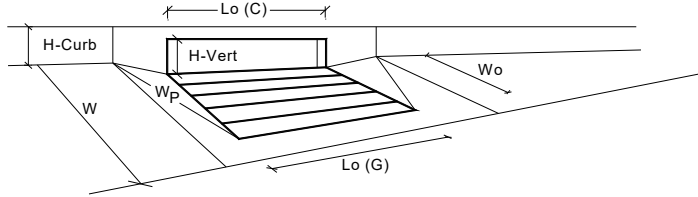
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



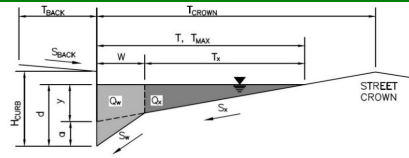
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	4	4	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.28	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.74	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q_s =	9.1	12.5	cfs
		$Q_{PEAK REQUIRED}$ =	6.4	42.4	cfs

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

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

Project: Solena Subdivision

Inlet ID: C3

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches

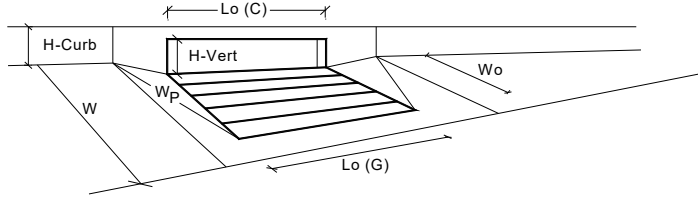
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



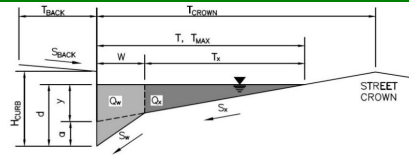
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	4	4	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.28	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.74	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q _s =	9.1	12.5	cfs
		Q _{PEAK REQUIRED} =	2.6	35.9	cfs

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

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

Project: Solena Subdivision

Inlet ID: C4

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	14.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.020	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	14.0	14.0	ft
d_{MAX}	6.0	10.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

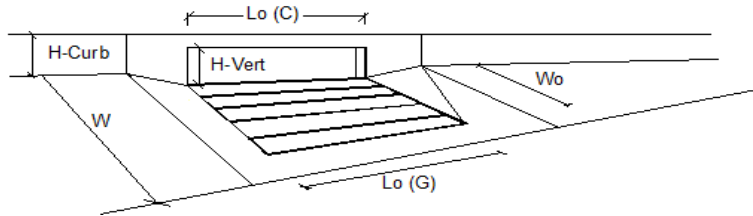
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	11.8	11.8	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.30 cfs on sheet 'Inlet Management'**WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 23.00 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



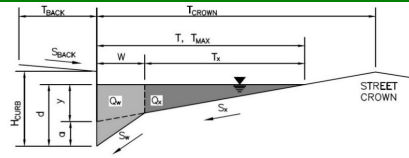
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L _u =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W _u =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C _f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _f (C) =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM					
Total Inlet Interception Capacity		Q =	1.3	14.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _s =	0.0	8.9	cfs
Capture Percentage = Q _i /Q _a		C% =	100	61	%

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

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

Project: Solena Subdivision

Inlet ID: CS

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.020	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

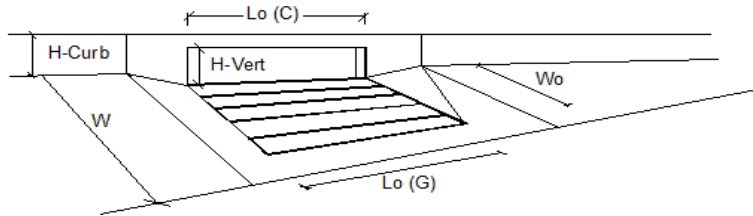
	Minor Storm	Major Storm	
Q_{allow}	16.3	16.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 15.80 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



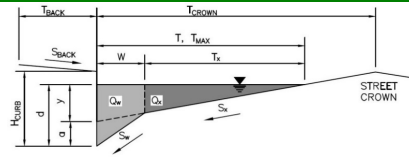
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o =	4	4	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q =	2.3	14.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o =	0.0	1.8	cfs
Capture Percentage = Q_i/Q_o		$C\%$ =	100	89	%

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

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

Project: Solena Subdivision

Inlet ID: C6

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$$\begin{aligned} T_{\text{BACK}} &= 12.0 \text{ ft} \\ S_{\text{BACK}} &= 0.020 \text{ ft/ft} \\ n_{\text{BACK}} &= 0.020 \end{aligned}$$

$$\begin{aligned} H_{\text{CURB}} &= 6.00 \text{ inches} \\ T_{\text{CROWN}} &= 16.0 \text{ ft} \\ W &= 2.00 \text{ ft} \\ S_x &= 0.020 \text{ ft/ft} \\ S_w &= 0.083 \text{ ft/ft} \\ S_o &= 0.000 \text{ ft/ft} \\ n_{\text{STREET}} &= 0.013 \end{aligned}$$

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

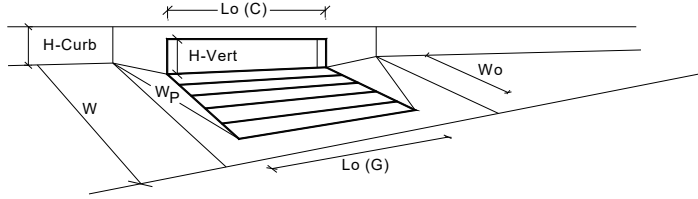
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$$Q_{\text{allow}} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ \text{SUMP} & \text{SUMP} \end{matrix} \text{ cfs}$$

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



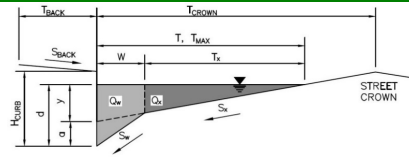
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	4	4	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.28	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.74	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q _s =	9.1	12.5	cfs
		Q _{PEAK REQUIRED} =	4.2	16.3	cfs

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

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

Project: Solena Subdivision

Inlet ID: C7

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	14.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	14.0	14.0	ft
d_{MAX}	6.0	6.0	inches
	☐	☐	

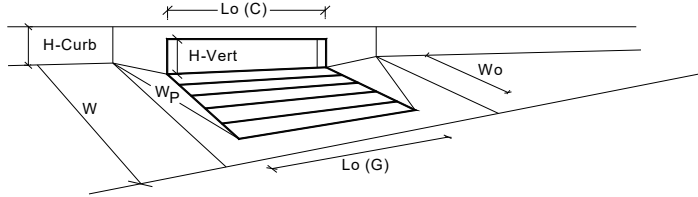
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



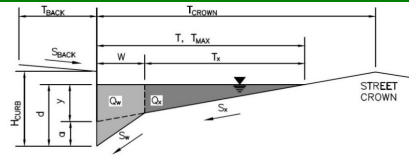
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.9	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.24	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.71	0.79	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	5.3	9.7	cfs
		Q _{PEAK REQUIRED} =	1.1	7.7	cfs

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

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

Project: Alexander Way

Inlet ID: C8

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	12.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.020	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	16.0	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_y	=	0.083	ft/ft
S_o	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	16.0	16.0	ft
d_{MAX}	6.0	6.0	inches

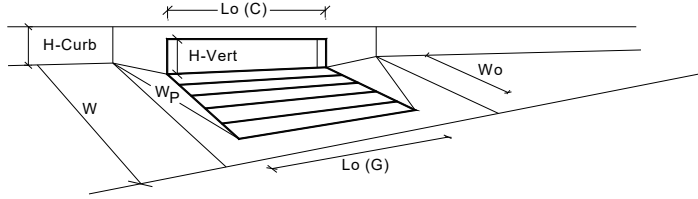
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

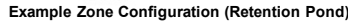
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.4	8.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.28	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.74	0.89	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
WARNING: Inlet Capacity < Q Peak for Major Storm		Q _s =	7.1	20.3	cfs
		Q _{PEAK REQUIRED} =	2.9	35.9	cfs

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Pond 1 Basins A

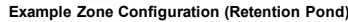


Zone 1 Volume (WQCV) =	0.065	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.043	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.309	acre-feet
Total Detention Basin Volume =	0.416	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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 ($R_{\text{L/W}}$) =	user	

8/15/2022, 9:56 AM

MHFD-Detention, Version 4.04 (February 2021)

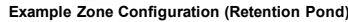
Basin ID: Pond 2 Sub Basins 106 and 107 Masterplan



8/15/2022, 10:09 AM

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Pond 2 Sub Basins 106 Modified and 107



	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
	inches
2.26	inches
2.60	inches
	inches

[illegible]

Appendix D



**Phase II Drainage Report Checklist**

The Phase II Drainage Report must be in conformance with the latest Town of Castle Rock Storm Drainage Design and Technical Criteria Manual available on the Town's website.

The Phase II Drainage Report must be signed and sealed by a Professional Engineer licensed in the State of Colorado. The purpose of the Phase II Drainage Report is to identify and refine conceptual storm-water management solutions to the challenges that may be present or occur on-site and off-site.

The preparer should contact and work with the Town Stormwater Engineering Staff regarding any design, master planning and existing system questions (720-733-6000). The following outline sets forth the **required minimum** content to be provided in the Phase II Drainage Report that shall be submitted with the Planned Development Plan or Straight Zoning documents. A copy of this checklist must be submitted with the Phase II Drainage Report.

Please see Chapter 4 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual for additional details and information. Please check off the following items to assure your report is complete. Appropriate notations shall be provided with the checklist. For example, if a specific item is not addressed or not applicable, an explanation needs to be provided.

Included	N/A	
X		I. COVER SHEET
X		A. Name of Project, including legal name of development
X		B. Address
X		C. Owner
	X	D. Developer
X		E. Engineer
X		F. Submittal date and revision dates as applicable
		II. GENERAL LOCATION AND DESCRIPTION
X		A. Site Location
X		B. Description of Property and Land Use
		III. DRAINAGE BASIN AND SUB-BASINS
X		A. Major Drainage Basins
X		B. Minor Drainage Basins
		IV. DRAINAGE DESIGN CRITERIA
X		A. Regulations
X		B. Drainage Studies, Master Plans, Site Constraints
X		C. Hydrology
X		D. Hydraulics
X		E. Water Quality Enhancement

Phase II Drainage Report Checklist

Included	N/A	
		V. STORMWATER MANAGEMENT FACILITY DESIGN
X		A. Stormwater Conveyance Facilities
X		B. Stormwater Storage Facilities
X		C. Water Quality Enhancement Best Management Practices
X		D. Floodplain Modification
X		E. Additional Permitting Requirements
X		F. General
		VI. CONCLUSIONS
X		A. Compliance with Standards
X		B. Variances
X		C. Drainage Concept
		VII. REFERENCES
		VIII. APPENDICES
X		A. Hydrologic Computations
X		B. Hydraulic Computations (If known at this time—not required)
X		C. Water Quality Enhancement Best Management Practices
X		D. Referenced Information
X		OVERALL DRAINAGE PLAN (IN POCKET)
	X	DETAILED DRAINAGE PLANS (IN POCKET)

Notes/Comments:

Drainage plans pending final coordination with metropolitan district inclusion areas.



Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock's MS4 permit with regard to permanent water quality on land disturbance projects.

Project Name Soleana Subdivision

Project Owner Tierra Investments LLC

Project Location North 1/2 Section 26 T7S R67W

ToCR Project Number _____

Total Site Area 77.96 _____ **acres**

Total Size of Common Plan of Development _____ **acres**

Check all that apply:

☒ **Project within Plum Creek Basin**

☐ **Project within Cherry Creek Basin**

Estimated construction completion date Spring 2025

1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

☒ WQCV standard

☒ Pollutant removal standard

☒ Runoff reduction standard

☒ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)

☒ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)

☐ Constrained redevelopment sites standard

• Imperviousness of existing site _____/_____ (Imp. Ac/Site Ac) = ____%

• Variance required TCV No. _____

☐ Existing control measure with WQCV per previous criteria standards

• Reference Construction Permit No. _____

☐ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☐ Tier 3

☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5? ☐ Yes ☒ No

i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. _____

- ☐ Pavement management site
Excluded impervious area: _____ acres
- ☐ Excluded roadway redevelopment
Excluded impervious area: _____ acres
- ☐ Excluded existing roadway areas
Excluded impervious area: _____ acres
- ☐ Above ground and below ground utilities
- ☐ Large lot single family home
- ☐ Non-residential and non-commercial infiltration
Excluded impervious area: _____ acres
- ☐ Land disturbance for land to remain undeveloped
Excluded impervious area: _____ acres
- ☐ Stream Stabilization Sites
Excluded impervious area: _____ acres
- ☐ Trails
Excluded impervious area: _____ acres
- ☐ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? ☐ Yes ☒ No

If yes, complete the following:

Excluded area: _____ acres
Total Site area: _____ acres, _____ % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area? ☐ Yes ☒ No

If yes, complete the following:

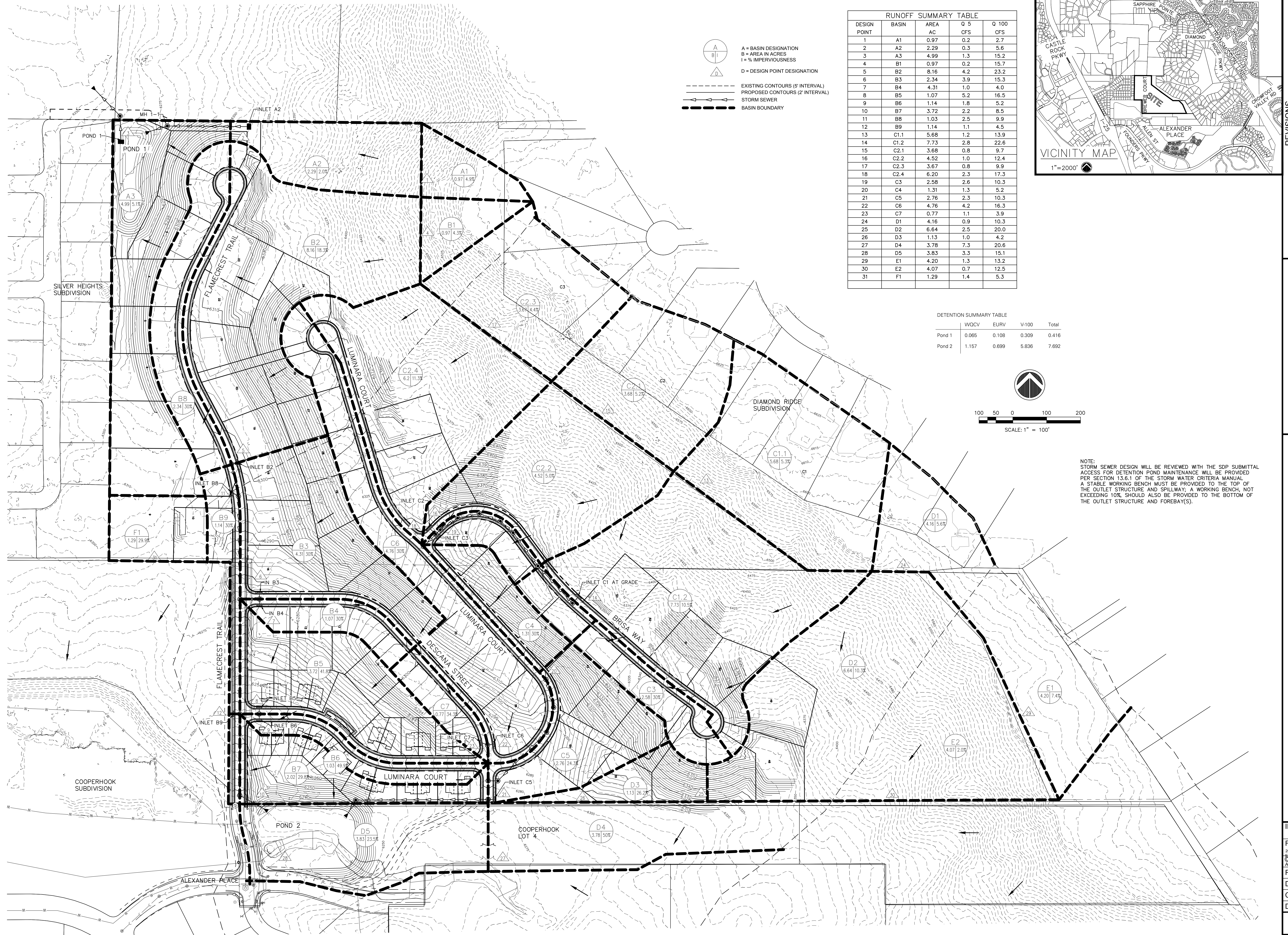
Excluded area: _____ acres
Excluded impervious area: _____ acres
Total Site area: _____ acres, _____ % site excluded
Total Impervious area: _____ acres, _____ % impervious excluded

Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5)

Project:		Project#		Applicant:
Section	Questions	Response	Check those that apply	Instructions
1	Non-applicable Sites			
1.1	Will the project result in a temporary disturbance of greater than one acre?	No Yes	☐ ☒	Proceed to section 1.2. Proceed to section 2.
1.2	Is the project part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related and are within 1/4 mile of each other? (A common plan of development will generally be documented on a site development plan, master plan, or equivalent, for the property/project)	No Yes	☐ ☐	Proceed to section 1.3. Proceed to section 2.
1.3	Is the project within the Cherry Creek Watershed?	Yes No	☐ ☐	Permanent water quality control measures may be required. Refer to Water Quality Control Regulation 72.7 for details and allowable exclusions. Permanent water quality control measures are not required.
2	Applicable Site Types and Exclusions by Variance			
2.1	Does the project have more than 35% impervious area on the existing site?	No Yes	☒ ☐	Project is an applicable Development Site. Proceed to section 3. Proceed to 2.2.
2.2	Does the project have greater than 75% impervious area on the existing site?	No Yes	☐ ☐	Project is an applicable Redevelopment Site. Proceed to section 3. Project is an applicable Constrained Redevelopment Site. Proceed to 2.3.
2.3	Will 100% of the runoff from the existing and proposed site be captured and treated using one or more of the allowable design standards for permanent water quality?	Yes No	☐ ☐	No further action required. Proceed to 2.4.
2.4	Do any other water quality exclusions apply to the site?	No Yes	☐ ☐	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> . Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> .
3	Applicable Sites with Other Exclusions by Variance			
3.1	Category 1: Roadways, bridges and trails only			
3.1.1	Is the project a bike or pedestrian trail?	Yes No	☐ ☒	Proceed to next line. Proceed to 3.1.2.
	Is the trail for a roadway?	Yes No	☐ ☐	Proceed to 3.1.2. Project is excluded. Submit variance for <u>Trails Excluded from Permanent Water Quality Requirements</u> .
3.1.2	Is the project primarily used for parking or access to parking?	Yes No	☐ ☒	This exclusion does not apply. Permanent water quality is required. Proceed to 3.1.3.
3.1.3	Does the project add impervious area?	No Yes	☐ ☒	Project is excluded. Submit variance for <u>Pavement Management Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.1.4.

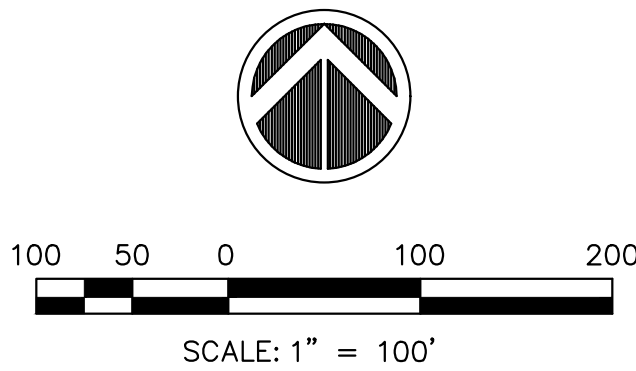
Section	Questions	Response	Check those that apply	Instructions
3.1.4	Does the project add more than 8.25 feet of paved width at any location to the existing roadway?	No	☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
		Yes	☒	
	Does the project add more than one acre of paved area per mile to an existing roadway?	No	☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
		Yes	☒	
	Does the project increase the width by two times or more, on average, of the original roadway area?	No	☐	Existing areas of site are excluded only. Submit variance for <u>Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements</u> .
		Yes	☒	This exclusion does not apply. Permanent water quality is required.
3.2	Category 2: Non-residential and non-commercial projects only			
3.2.1	Is the project associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities, including activities necessary to prepare a site for drilling and the movement and placement of drilling equipment?	Yes	☐	Project is excluded. Submit variance for <u>Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements</u> .
		No	☐	Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	Yes	☐	Project is excluded. Submit variance for <u>Stream Stabilization Sites Excluded from Permanent Water Quality Requirements</u> .
		No	☐	Proceed to 3.2.3.
3.2.3	Is the project for installation or maintenance of aboveground or underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity including activities to install, replace or maintain utilities under roadways or other paved areas that return the surface to the same condition?	Yes	☐	Project is excluded. Submit variance for <u>Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements</u> .
		No	☐	Proceed to 3.2.4.
3.2.4	Is the project on undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the project?	Yes	☐	Project is excluded. Submit variance for <u>Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> .
		No	☐	Proceed to 3.2.5.
3.2.5	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No	☐	Project is excluded. Submit study along with variance for <u>Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements</u> .
		Yes	☐	This exclusion does not apply. Permanent water quality is required.
3.3	Category 3: Residential, Agricultural and Commercial projects			
3.3.1	Is the project a single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling unit?	Yes	☐	Proceed to next line.
		No	☒	Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	No	☐	Project is excluded. Submit variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> .
		Yes	☐	Proceed to next line.
	Is the project site greater than 20% impervious?	Yes	☐	This exclusion does not apply. Permanent water quality is required.
		No	☐	Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No	☐	Project is excluded. Submit study along with variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> .
		Yes	☐	This exclusion does not apply. Permanent water quality is required.

Section	Questions	Response	Check those that apply	Instructions
3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	Yes No	☐ ☒	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	Yes No	☒ ☐	This portion of the project is excluded. Submit variance for <u>Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to next line. Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	Yes No	☒ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	Yes No	☒ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	No Yes	☒ ☐	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the drainage report . No further action is needed. This exclusion does not apply. Permanent water quality is required.



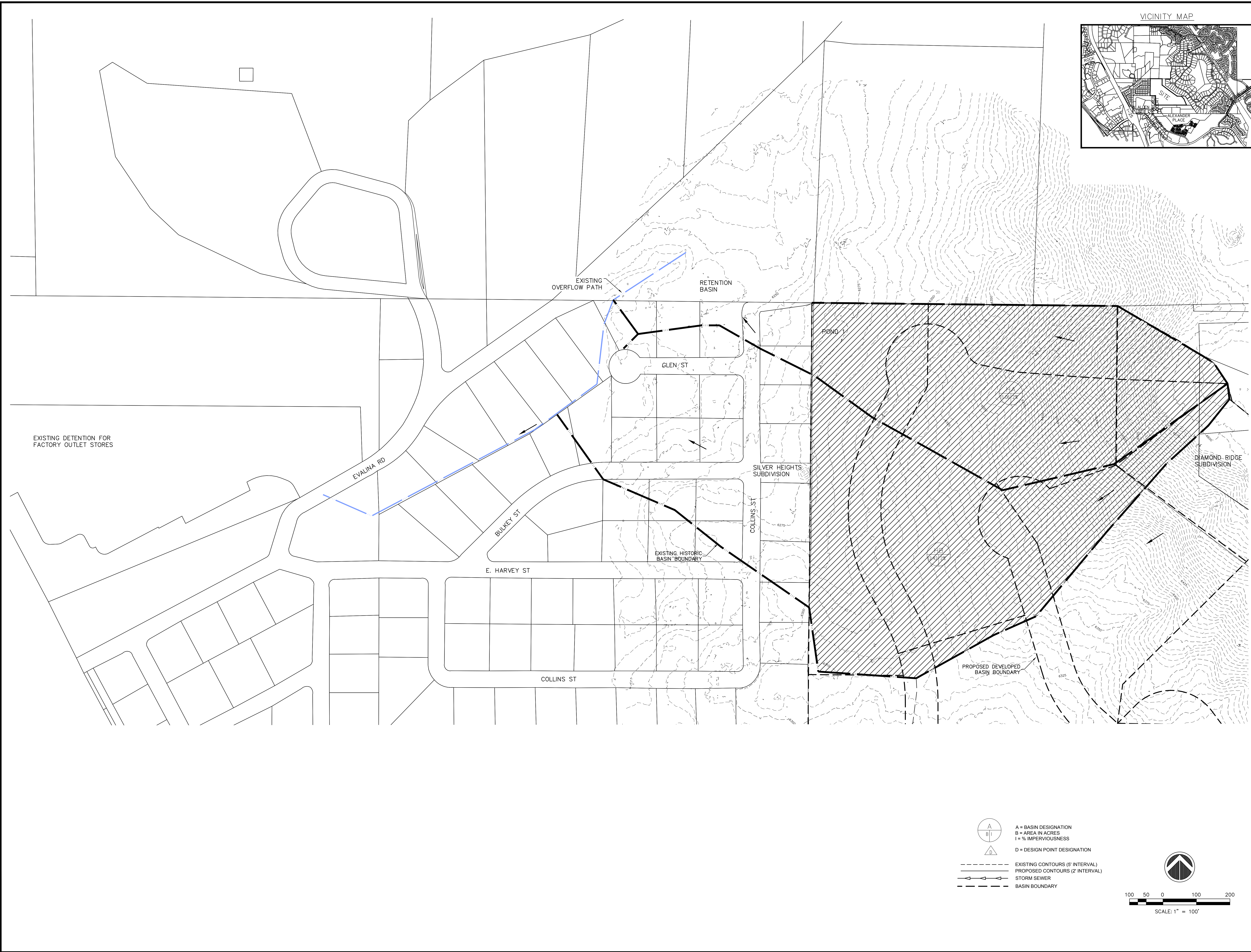
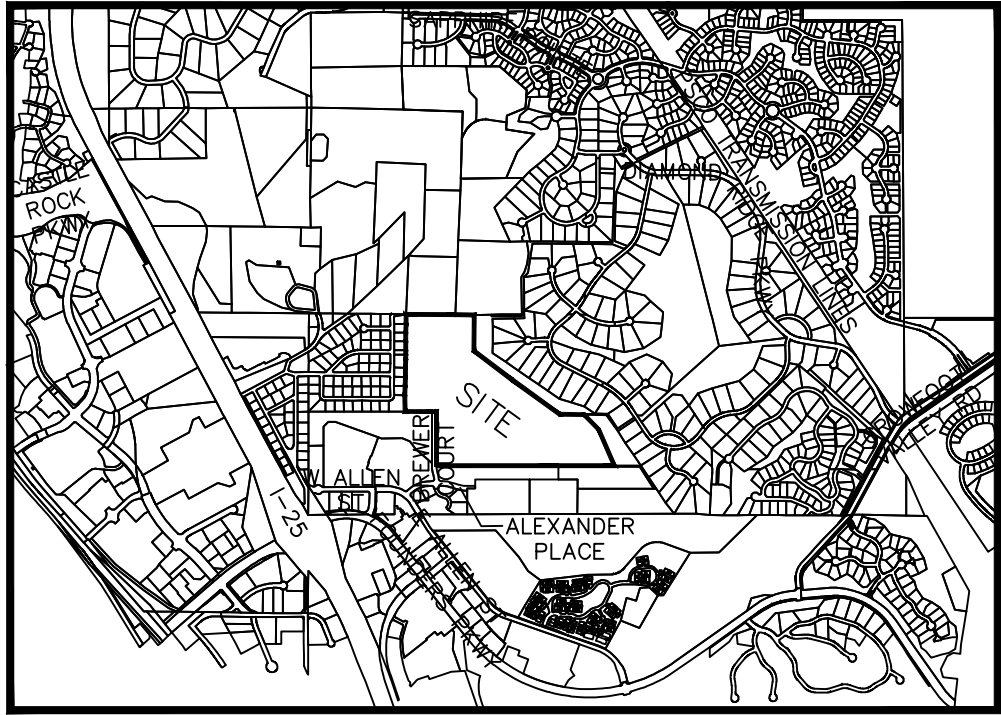
RUNOFF SUMMARY TABLE				
DESIGN POINT	BASIN	AREA AC	Q 5 CFS	Q 100 CFS
1	A1	0.97	0.2	2.7
2	A2	2.29	0.3	5.6
3	A3	4.99	1.3	15.2
4	B1	0.97	0.2	15.7
5	B2	8.16	4.2	23.2
6	B3	2.34	3.9	15.3
7	B4	4.31	1.0	4.0
8	B5	1.07	5.2	16.5
9	B6	1.14	1.8	5.2
10	B7	3.72	2.2	8.5
11	B8	1.03	2.5	9.9
12	B9	1.14	1.1	4.5
13	C1.1	5.68	1.2	13.9
14	C1.2	7.73	2.8	22.6
15	C2.1	3.68	0.8	9.7
16	C2.2	4.52	1.0	12.4
17	C2.3	3.67	0.8	9.9
18	C2.4	6.20	2.3	17.3
19	C3	2.58	2.6	10.3
20	C4	1.31	1.3	5.2
21	C5	2.76	2.3	10.3
22	C6	4.76	4.2	16.3
23	C7	0.77	1.1	3.9
24	D1	4.16	0.9	10.3
25	D2	6.64	2.5	20.0
26	D3	1.13	1.0	4.2
27	D4	3.78	7.3	20.6
28	D5	3.83	3.3	15.1
29	E1	4.20	1.3	13.2
30	E2	4.07	0.7	12.5
31	F1	1.29	1.4	5.3

	WQCV	EURV	V-100	Total
Pond 1	0.065	0.108	0.309	0.416
Pond 2	1.157	0.699	5.836	7.692



NOTE:
STORM SEWER DESIGN WILL BE REVIEWED WITH THE SDP SUBMITTAL
ACCESS FOR DETENTION POND MAINTENANCE WILL BE PROVIDED
PER SECTION 13.6.1 OF THE STORM WATER CRITERIA MANUAL.
A STABLE WORKING BENCH MUST BE PROVIDED TO THE TOP OF
THE OUTLET STRUCTURE AND SPILLWAY; A WORKING BENCH, NOT
EXCEEDING 10%, SHOULD ALSO BE PROVIDED TO THE BOTTOM OF
THE OUTLET STRUCTURE AND FOREBAY(S).

Monday, August 15, 2022 1:38:57 PM
C:\2020\2002764-00\DESIGN\DWG\1500\EXHIBIT\CONCEPT\2002764-00 PHASE 1 HISTORIC DRAINAGE EXHIBIT.DWG



REVISIONS		DATE
No.	DESCRIPTION	

323 N. LEROUX STREET
SUITE 201
FLACASPAR, AZ 86001
PH: 520.325.5410
www.imegcorp.com

ALEXANDER WAY
CASTLE ROCK, CO

PHASE 1 HISTORIC DRAINAGE MAP

IMEG Project No:
2002764.00

File Name:
2002764.00 Phase 1 Historic
Drainage Exhibit.dwg
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Field Book No:

Drawn By: RAR

Checked By: TCG

Date: 8/12/2022

1

Sheet 1 of 1