MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT

For

BRADLEY HEIGHTS

Prepared for:

BRADLEY HEIGHTS METROPOLITAN DISTRICT
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Project No. 21.1213.001

STM-REV22-0046

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Engineer's Statement:

This report and plan for the drainage design of Bradley Heights was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Jesse Sullivan — Date
Registered Professional Engineer
State of Colorado
No. 55600



Developer's Statement:

Bradley Heights Metro District hereby certifies that the drainage facilities for Bradley Heights shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the City of Colorado Springs reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of Bradley Heights, guarantee that final drainage design review will absolve Bradley Heights Metro District and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Bradley Heights Metropolitan District
Business Name

DocuSigned by:
By: Randle Case II, President — 4/19/2022
293CF22537AE478...
Randle Case, II President — Date

Title: Board President

Address: 614 North Tejon Street
Colorado Springs, CO 80903

City of Colorado Springs:

Filed in accordance with section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

Heidi M. McMacken — 05/06/22
For the City Engineer Heidi McMacken — Date

Conditions:
Building permits will not be released until assurances for channel improvements have been posted or channel improvements have been installed and accepted.

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I. INTRODUCTION

Bradley Heights is comprised of approximately 529.5 acres of mostly unplatted and undeveloped land. There are a few different developments which are currently in process at the time of writing this report. In the fully developed conditions, this site will involve mixed uses which include residential, commercial, industrial, and educational.

A. PURPOSE AND SCOPE OF STUDY

The purpose of this Master Development Drainage Plan Amendment is to evaluate the specific drainage infrastructure requirements which will enable the development of Bradley Heights, located to the southwest of the intersection of South Marksheffel Road and Bradley Road and extending south approximately 6,300 feet along Marksheffel Road to the north side of Peaceful Ridge at Fountain Valley Subdivision and west along Bradley Road to the east side of the Trails at Aspen Ridge (Waterview II) development. This study will identify off-site, and on-site drainage patterns associated with respective land uses, provide hydrologic and hydraulic analysis of tributary basins and conveyance structures to multiple detention ponds, and identify effective, safe routing to the downstream outfall. This study also serves as an update to the original 2015 MDDP to address changes to made to the DCM in the intervening years.

B. DBPS-RELATED INVESTIGATIONS & PREVIOUS STUDIES

The site is covered by two different DBPS reports:

i. ***Jimmy Camp Creek Drainage Basin Planning Study,*** *By Kiowa, Dated March 2015* (DBPS-2015)
ii. ***West Fork Jimmy Camp Creek Drainage Basin Planning Study (DBPS-WFJCC),*** by Kiowa Engineering Corp. October 2003.

There are a few drainage reports completed for parcels adjacent to or interior to the site:

1. ***Master Development Drainage Plan for Bradley Heights***, *prepared by Classic Consulting, dated January 2015 (MDDP-2015).* This is the previous MDDP for this site and will be amended by this report.
2. ***Final Drainage Report for Marksheffel Road South,*** *prepared by HDR, Inc., dated April 2015* (HDR-2015) pertaining to the improvements that were constructed in 2017 along a large section of the Marksheffel Road corridor, including the portion that runs alongside this site.
3. ***Bradley Heights East Preliminary Drainage Report****, by HR Green, Approved October 2021.* Filing No. 1 and 2 of this development are located between Bliss Road and Bradly Landing at the north boundary of the Bradley Heights area. ***(BHE-F1&2-PDR)*** (STM-REV22-0091)
4. ***Final Drainage Report for Redemption Hill Church,*** *by Terra Nova Engineering, Inc., In process* (***FDR-RHC)***. This development is located between Bliss Road and the Marksheffel Tributary to Jimmy Camp Creek at the north boundary of the Bradley Heights area.
5. ***Phase I Detention for Colorado Centre,*** *by JR Developers, LTD., Dated October 1985.* ***(Pond 1985)*** This report documents the detention pond design for Colorado Centre. The pond was originally designed to provide detention approximately 832 acres of industrial and business

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development and 122 acres of residential development. This area has been modified by MDDP-2015.

The southern portion of the project is located within the West Fork Jimmy Camp Creek Drainage Basin:

iii. ***West Fork Jimmy Camp Creek Drainage Basin Planning Study*** by Kiowa Engineering, revised October 2003 (DBPS-WFJCC)

C. STAKEHOLDER PROCESS

As no amendments to the Drainage Basin Planning Studies (DBPS-WFJCC & DBPS-JCC) are being proposed, there is no required stakeholder process. There is ongoing coordination between the various ongoing developments and the Metro District.

D. AGENCY JURISDICTIONS

This project is located within the City of Colorado Springs and is subject to the design criteria set forth in the ***City of Colorado Springs Drainage Criteria Manual, Volumes I and II, dated May 2014 and revised January 2021 and December 2020, respectively (DCM).***

E. GENERAL PROJECT DESCRIPTION

Bradley Heights is located at the intersection of South Marksheffel Road and Bradley Road. More specifically, the site is located as follows:

1. General Location: West ½ of Section 10 and the North ½ of Section 15, Township 15 South, Range 65 West of the 6th P.M. in the City of Colorado Springs, County of El Paso, State of Colorado.
2. Surrounding Streets: Marksheffel Road is the site's east border. Bradley Road borders the site to the north of the site. Big Johnson Drive is the nearest road found west of the site, just inside the Trails at Aspen Ridge development. The nearest road bounding the development to the south is future Peaceful Ridge Drive just inside the Peaceful Ridge at Fountain Valley Subdivision.
3. Drainageway: Bradley Heights is located on the western edge of the south portion of the Marksheffel Tributary to Jimmy Camp Creek Drainage Basin which is south of Bradley Road. Much of the site flows from west to east into the channel of the Marksheffel Tributary to Jimmy Camp Creek flowing into the existing Colorado Centre Detention Pond just upstream of Marksheffel Road. The stream eventually discharges into the existing double 9-ft x 12-ft concrete box culverts conveying storm water across Marksheffel Road and into the main channel of Jimmy Camp Creek to the east. The south portion of the site is within the West Fork Jimmy Camp Creek basin.
4. Surrounding Developments: The site is bound by the aforementioned streets to the north and west, and by mostly unplatted, vacant land to the south. There are no known plans for much of the vacant land to be developed at this time, but one section is platted as Peaceful Ridge at Fountain Valley Subdivision. Colorado Centre is located across Bradley Road to the north and has a detention pond between Bradley Heights and Marksheffel Road towards the southeast corner of the Bradley Heights area.

Refer to Appendix D for the Vicinity Map.

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F. DATA SOURCES

Topographical information for the site was found using a combination of ***United States Geological Survey*** (USGS) mapping as well as field surveying. The ***Web Soil Survey,*** created by the ***Natural Resources Conservation Service,*** was utilized to investigate the existing general soil types within the site. Offsite contours are taken from the ***2018 El Paso County LIDAR*** survey and/or USGS Quad Sheets.

G. APPLICABLE CRITERIA AND STANDARDS

This report has been prepared in accordance with the criteria set forth in the DCM. In addition to the DCM, the ***Urban Storm Drainage Criteria Manuals, Volumes 1 through 3***, dated 2016 have been used to supplement the City Criteria Manual.

II. Project Characteristics

A. BASIN LOCATION AND FLOWS

The Bradley Heights Metro District is found on the western border of the Marksheffel Tributary to Jimmy Camp Creek Drainage Basin which runs through the northeast corner of the Metro District. In addition to the proposed 529.5-acre site, there are off-site basins on the Marksheffel Tributary to the north of the proposed development that contribute a total tributary area of 2919 acres. Of this area approximately 418 acres are allowed to develop and use the Colorado Centre Detention Pond without onsite detention. Modifications to the DCM in the interim have added a requirement for onsite detention, so future development to these areas will require onsite water quality. Analysis of that detention is not considered in this report.

Because the Marksheffel Tributary to Jimmy Camp Creek runs through a portion of the district and the district has taken on the responsibility for stabilizing the stretch of the stream that is located within the district, the streamside zone will be affected by channel improvements required by the DCM. No portion of the proposed road improvements are adjacent to the stream.

Per the Jimmy Camp Creek DBPS, the predevelopment discharges to the Jimmy Camp Creek basin at Marksheffel Road are Q5: 42 cfs, and Q100: 1916 cfs. These values reflected the existing conditions at the time of the DBPS, proposed values are: Q5: 338.4 cfs, Q100: 1003.8 cfs. This study considers the whole of the basin in predevelopment conditions and thus has different values than those indicated by the HDR report.

B. COMPLIANCE WITH DBPS

The most recent DBPS study for Jimmy Camp Creek (DBPS-JCC) was completed in 2015 and, as noted above, indicates 1916 cfs for the 100-year discharge across Marksheffel Road at the downstream end of the development. The value indicated by the HEC-HMS model of Bradley Heights and its upstream tributary areas; including Colorado Centre, portions of the Colorado Springs Airport, and other undeveloped areas completed as part of this report is Q100: 1024 cfs and Q5: 84 cfs based on completely undeveloped upstream conditions. Subsequent additions to City of Colorado Springs Storm Water Runoff Policy require Water Quality and EURV treatment of stormwater runoff and detention of the minor storm event. Considering these items, Q100 detention is already provided offsite, but detention to provide the WQCV and EURV Treatment must be provided on-site.

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The downstream receiving structure across Marksheffel Road was upgraded after completion of the DBPS to a Double 12-foot by 9-foot Concrete Box Culvert. This size was based on a design flow of approximately 2540 cfs for the Q100 event. We believe this flow to be based on fully developed conditions and a drainage basin area of 905 acres which does not match the area indicated in the Colorado Centre or Bradley Heights MDDPs (3,315 acres). This MDDP further refines the areas described in those two reports to get a total drainage area tributary to the Marksheffel Crossing of 3302 acres. The difference is because there is a portion of drainage area included by those two reports towards the west end of the tributary basin which is near the intersection of Bradley Road and Powers Boulevard which was diverted by the CDOT construction of Powers Boulevard and Bradley Road which diverted an area from the Big Johnson Reservoir basin to the West Fork Jimmy Camp Creek Basin (See the El Paso County, Trails at Aspen Ridge MDDP and/or Trails at Aspen Ridge Filing No. 1 FDR for further information) rather than to the Marksheffel Tributary to Jimmy Camp Creek as assumed by JCC-DBPS and MDDP-2015.

Compliance with the most recent DBPS study for the Jimmy Camp Creek Basin (DBPS-JCC) will be provided by sub-regional Water Quality and EURV detention for the various developments in the Bradley Heights area. These detention ponds will be sized to enable the existing regional Colorado Centre detention pond at the southeast corner of the area to reduce the Major storm to be at or below the historic value indicated in the HEC-HMS model provided with this report. The EURV and Water Quality ponds will provide compliance with the current DCM and State requirements for discharge times

C. GEOLOGY

The majority of the site is currently undeveloped and consists of sparse, natural vegetative land cover.

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group "A" is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group "D" typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. See Soils Map, Appendix A. The following soil types are present in the Bradley Heights development area.

Table 1.1 – NRCS Soil Survey for El Paso County - Bradley Heights

Soil ID Number	*Soil*	*Hydrologic Classification*	*Drainage Class*	*Percent of Site*
2	Ascalon sandy loam, 1 to 3 percent slopes	B	Well Drained	5.2%
30	Fort Collins loam, 0 to 3 percent slopes	B	Well Drained	4.5%
31	Fort Collins loam, 3 to 8 percent slopes	B	Well Drained	0.2%
43	Kim loam, 1 to 8 percent slopes	B	Well Drained	0.9%
52	Manzanst clay loam, 0 to 3 percent slopes	C	Well Drained	8.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 pct slopes	B	Well Drained	12.9%
75	Razor-Midway complex	D	Well Drained	65.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	Well Drained	3.0%

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Much of the north portion of the Marksheffel Tributary to Jimmy Camp Creek is in Soil Group A. The table below lists the soil types for the whole tributary area, inclusive of the Bradley Heights area:

Table 1.2 - NRCS Soil Survey for El Paso County
Marksheffel Tributary to Jimmy Camp Creek

Soil ID Number	***Soil***	***Hydrologic Classification***
2	Ascalon sandy loam, 1 to 3 percent slopes	B
3	Ascalon sandy loam, 3 to 9 percent slopes	B
8	Blakeland loamy sand, 1 to 9 percent slopes	A
10	Blendon sandy loam, 0 to 3 percent slopes	B
11	Bresser sandy loam, cool, 0 to 3 percent slopes	B
12	Bresser sandy loam, cool, 3 to 5 percent slopes	B
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A
30	Fort Collins loam, 0 to 3 percent slopes	B
31	Fort Collins loam, 3 to 8 percent slopes	B
33	Heldt clay loam, 0 to 3 percent slopes	C
43	Kim loam, 1 to 8 percent slopes	B
47	Limon clay, 0 to 3 percent slopes	C
52	Manzanst clay loam, 0 to 3 percent slopes	C
54	Midway clay loam, 3 to 25 percent slopes	D
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B
59	Nunn clay loam, 0 to 3 percent slopes	C
75	Razor-Midway complex	D
86	Stoneham sandy loam, 3 to 8 percent slopes	B
89	Tassel fine sandy loam, 3 to 18 percent slopes	D
90	Terry sandy loam, 1 to 8 percent slopes	B
94	Travessilla-Rock outcrop complex, 8 to 90 percent slopes	D
95	Truckton loamy sand, 1 to 9 percent slopes	A
96	Truckton sandy loam, 0 to 3 percent slopes	A
97	Truckton sandy loam, 3 to 9 percent slopes	A
101	Ustic Torrifluvents, loamy	B
104	Vona sandy loam, warm, 0 to 3 percent slopes	A
106	Wigton loamy sand, 1 to 8 percent slopes	A
108	Wiley silt loam, 3 to 9 percent slopes	B

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D. MAJOR DRAINAGEWAYS

1. Marksheffel Tributary to Jimmy Camp Creek

Most of the site is within this drainageway. Approximately 3302 total acres sheet flow off of the basin's rolling sparsely vegetated hills at slopes ranging from 0.2% to 10%. The flows are eventually channelized in the Marksheffel Tributary to Jimmy Camp Creek which conveys the flows into the existing Colorado Centre Detention Pond, eventually discharging across Marksheffel Road to a confluence with the main branch of Jimmy Camp Creek via an existing public double 9-foot x 12-foot CBC.

2. West Fork – Jimmy Camp Creek

This basin makes up the portion of the basin south of the ridge running through the site. Flows in this drainage way sheet flow off of the sloped hills at slopes ranging from 3% to 10%. The slopes of this basin within the Bradley Heights area mostly continue through or terminate in the vicinity of the area's boundaries. Channelized flows will continue south via the West Fork Tributary to Jimmy Camp Creek drainage way eventually reaching the main branch of Jimmy Camp Creek several miles to the south.

3. Jimmy Camp Creek

A small portion of the Bradley Heights area drains to this basin. Approximately, 47.9 acres at the southeast corner of the area drain to an existing 7-foot by 4-foot CBC across Marksheffel Road. This area is considered as part of the main branch of Jimmy Camp Creek in DPBS-JC. Under existing conditions flows in this basin sheet flow down slopes varying from 1% to 10%. Channelized flows in the Marksheffel Road ditch are conveyed across Marksheffel Road via an existing 7-foot by 4-foot CBC. From this point flows shortly arrive in the main branch of Jimmy Camp Creek.

E. LAND USES

Presently, the site is unplatted and consists mostly of undeveloped land. The 529.5-acre area is entirely designated as PUD type use. More specific uses will be determined as development of the area progresses.

III. Hydrologic Analysis

A. MAJOR BASINS AND SUBBASINS

The majority of Bradley Heights is located within the Marksheffel Tributary to Jimmy Camp Creek Drainage Basin with a small portion of the site tributary to the main branch of Jimmy Camp Creek and roughly a third of the area located in the West Fork Jimmy Camp Creek Drainage Basin. Runoff presently flows overland until reaching an existing natural drainage swale on the site. This drainage swale directs the site's flows internally in an arcing pattern, commencing at the northwestern corner and traveling in a south and east direction until reaching an approximate longitudinal midpoint of the site. At this point, the flows turn and begin to flow south and west to existing box culverts south of the site boundary. Drainage from the fully developed conditions will be directed to multiple on-site detention ponds, where the runoff will be treated for water quality and detained to maintain the historic major event discharge rate from the site.

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B. METHODOLOGY

i. UD Methods

The hydrology for this project uses the **Rational Method** as recommended by the Drainage Criteria Manual (DCM) for the minor and major storms. The Rational Method is used for drainage basins less than 100-acres in size. The Rational Method uses the following equation:

$Q=C*i*A$

Where:

Q	=	Maximum runoff rate in cubic feet per second (cfs)
C	=	Runoff coefficient
i	=	Average rainfall intensity (inches per hour)
A	=	Area of drainage sub-basin (acres)

Rational Method coefficients from 6-6 of the Drainage Criteria Manual for developed land were utilized in the Rational Method calculations. This method will be used primarily for sizing of storm sewer infrastructure. See Appendix B for more information.

Time of Concentration

The time of concentration consists of the initial time of overland flow and the travel time in a channel to the inlet or point of interest. A minimum time of concentrations of 5 minutes is utilized for urban areas. The Rational Calculation spreadsheet included in Appendix A shows an initial overland flow length, a channel or street flow length for each sub-basin, and, also demonstrates the time of concentration calculations for initial (overland) and channel (or street) conditions. A maximum "True Initial" Flow Length of 300 feet will be used for pre-developed sub-basins and a maximum length of 100 feet will be used for Developed sub-basins for time of concentration calculations in compliance with the DCM.

Rainfall Intensity

The hypothetical rainfall depths for the 1-hour storm duration were derived using Table 6-2 of the Colorado Springs DCM (shown below). See Appendix B.

Table 2.1 – Project Area 1-Hour Rainfall Depth

Storm Recurrence Interval	Rainfall Depth (inches)
5-year	1.50
100-year	2.52

The rainfall intensity equation for the Rational Method was taken from Drainage Criteria Manual Volume 1 Figure 6-5.

C-Factors

C-factors for the Rational Method are based on anticipated land use and are taken from Table 6-6. Proposed single family residential is considered as the "1/8th Acre or Less" category. Anticipated multi-family areas are considered under the Business-Neighborhood Areas category and commercial areas under the Business-Commercial Areas category. Areas which will be future open spaces or

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detention facilities are modeled under the Parks and Cemeteries category. Undeveloped or predevelopment areas are model under Undeveloped Areas-Historic Flow Analysis—Greenbelts, Agriculture category.

ii. HEC-HMS Methods

The DCM requires the use of a modeling program to design and analyze detention for the site when the ponds treating and detaining water for the project are in series to route the various hydrographs involved and more accurately reflect the actual function of the proposed conditions. This report uses HEC-HMS for the routing and analysis of the various detention and site conditions. The base HEC-HMS model was acquired from FEMA and the previous LOMR for this stream Effective in June 2009.

SCS Lag

The SCS lag calculations are completed as part of this report. However, the values indicated in the effective HMS model acquired from FEMA were more conservative and were therefore used where possible. Proposed development areas within the Bradley Heights area are calculated based on the methodology indicated in the DCM Equations:

The Time of Concentration is the sum of overland flow time and the t_t values for the various consecutive flow segments:

$$t_c = t_i + t_{t1} + t_{t2} + t_{t3} \ldots t_{tm} \qquad \text{(Eq. 6-14)}$$

Where:

t_c = time of concentration (hr)

t_i = overland (initial) flow time (hr)

t_{tm} = travel time for each flow segment (hr)

m = number of flow segments

Overland Flow:

$$T_i = 0.007(n \cdot L)^{0.8} / (P_2)^{0.5} S^{0.4} \qquad \text{(Eq. 6-15)}$$

Where:

T_i = overland flow time (hr)

n = Manning's roughness coefficient L

= flow length (ft)

P_2 = 2-year, 24-hour rainfall (in)

S = slope of hydraulic grade line (ft/ft)

Concentrated Flow:

$$T_t = L / (3600 \cdot V) \qquad \text{(Eq. 6-16)}$$

Where:

T_t = travel time (hr)

L = flow length (ft)

V = velocity (ft/s)

3,600 = conversion factor from seconds to hours

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Runoff Analysis

The Marksheffel Tributary to Jimmy Camp Creek basin is analyzed using HEC-HMS and the NRCS SCS method. **FEMA Effective Model**: Jimmy_Camp. **Predevelopment Model**: MK_JCC_UNDEV (Simulates completely undeveloped conditions for the basin). **Post-development models**: **JCC_DEV** (This version includes no onsite or sub-regional detention, only the Colorado Centre detention pond to demonstrate whether it is adequate on its own for 100-year runoff. The model indicates approximately 200 cfs increase for Q100 event post development of the Bradley Heights and Colorado Centre areas.) **JCC_DEV_2, JCC_DEV_5, JCC_DEV_10, and JCC_DEV_100** (These models look at the 2-, 5-, 10-, and 100-year events for onsite/sub-regional detention within the Bradley Heights region and demonstrate a slight reduction for the 100-year event.) Print outs from each model can be found in Appendix A.

Hydrographs for proposed sub-regional detention are taken from MHFD-Detention, where appropriate, and input to the model to represent the various detention required within the development to maintain the historic flow discharge to the downstream of the regional Colorado Centre Detention Pond and provide water quality for the development in accordance with the DCM.

NRCS SCS curve numbers (CN) are taken from Table 6-10 of the DCM and weighted for each basin based on the soil and development types. As recommended in the DCM storms of 2-hour duration are used for the 5 and 2-year events. A 24-hour storm is used for the 10- and 100-year events. Lag times are calculated for the basins using the formulas from the DCM shown above. (Note: When more conservative, lag numbers from FEMA's Effective Hydrological model are used instead of the calculated values.)

iii. HGL Profile Methods

Preliminary sizing of storm sewer has been completed using the Manning's channel flow calculation.

Each future phase of development will be required to analyze the storm sewer to confirm DCM compliant capacity and velocity values. These future FDRs will provide HGL profiles modeled in Storm CAD using the Standard head loss method and head loss values taken from Table 9-4 of the Colorado Springs DCM or via other methodology allowed by the DCM. HGL profiles may alternately be submitted with construction drawings as addenda to the appropriate Final Drainage Report as the project area is developed.

Table 9-4. STORMCAD Standard Method Coefficients

Bend Loss		
Bend Angle	**K Coefficient**	
0°	0.05	
22.5°	0.10	
45°	0.40	
60°	0.64	
90°	1.32	
LATERAL LOSS		
One Lateral K Coefficient		
Bend Angle	Non-surcharged	Surcharged
45°	0.27	0.47
60°	0.52	0.90
90°	1.02	1.77
Two Laterals K Coefficient		
45°	0.96	
60°	1.16	
90°	1.52	

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C. BASIN HYDROLOGY

a. The ***Pre-development conditions*** for the site have been analyzed and are presented by design points and are described as follows:

As much as possible, sub-basin lines are delineated based on property lines to ease quantification of each property owner's share of the infrastructure required to convey storm water from the property, as well as detention for future development of said property.

Predevelopment conditions have been analyzed using both rational routed flow and HEC-HMS calculations. The existing conditions will discuss the entry of runoff from off-site basins as it relates to the respective design point. Runoff generated, either on-site or off-site, drains overland towards the middle of the site where it is captured by the existing natural swale that runs south and southeast, exiting the site and releasing flows to be conveyed through the existing culvert system in an easterly direction, underneath Marksheffel Road. Generally, all undeveloped basins are considered to be vegetated with sparse grasses. A delineation of the basin boundaries can be found in Appendix D in drawings DR-01 and DR-02. Runoff calculations can be found in Appendix A. The existing runoff design points are described below:

Marksheffel Tributary to Jimmy Camp Creek

Design Points M4 through M11 are identical to those indicated in DBPS-JCC. The SCS CN's have been recalculated to reflect undeveloped upstream conditions to allow for appropriate modeling of the predevelopment conditions for the area tributary to the Colorado Centre Detention Pond. SCS Lag times from the original model are used in this report's model, as they are more conservative. A map of the offsite basins can be found in Appendix D.

DESIGN POINT	Area (acres)	Slopes (%)	Q2 (cfs)	Q5 (cfs)	Q10 (cfs)	Q100 (cfs)
DP-M4	2919.097	3.8 to 10	38.2	62	291.3	804.4
DP-M5	250.2276	3.6 to 10	6	7.6	32	122.8
DP-M6	2102.016	3.7 to 10	21.2	27	122.3	371.6
DP-M7	451.584	4.9 to 10	6.3	8	19.8	70.4
DP-M8	1561.6	2.2 to 10	13.9	17.7	98.7	284.3
DP-M9	875.584	1.2 to 10	10.2	12.9	25.1	67.8
DP-M10	368.896	1.3 to 10	7.2	9.1	16.3	23.2
DP-M11	239.168	3.3 to 10	3.2	4	6.9	9.7

Design Point M3 (HMS) (Q_5 = 69 cfs, Q_{100} = 897.5 cfs) (Area: 3064.9 Ac.) (Slopes: 0.8 to 10 %) represents the confluence of sub-basin M3 with the flows coming across Bradley Road from the Marksheffel tributary area to the north.

Design Point M2 (HMS) (Q_5 = 79.2 cfs, Q_{100} = 990.9 cfs) (Area: 3213.1 Ac.) (Slopes: 0.8 to 10 %) represents the combination of flows from Design Point M3 with flows from Sub-basin M2 in the Marksheffel Tributary to Jimmy Camp Creek.

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Design Point M1 (HMS) (Q_5 = 82 cfs, Q_{100} = 1029.9 cfs) (Area: 3310.8 Ac.) (Slopes: 0.2 to 10 %) represent the confluence of flows from Design Point M2 with runoff from Sub-basin M1

Design Point M0 (HMS) (Q_5 = 82 cfs, Q_{100} = 1029.9 cfs) (Area: 3310.8 Ac.) (Slopes: 0.2 to 25%) This point represents the final discharge from the Bradley Heights at the 9-foot by 12-foot concrete box culvert across Marksheffel Road.

Jimmy Camp Creek Drainage Fee Basin

Design Point JC (Q_5 = 15.0 cfs, Q_{100} = 80.3 cfs) (Area: 46.62 Ac.) (Slopes: 2 to 10 %) represents the site discharge at the southeast corner of the site to the Marksheffel Road ditch. Runoff from the sub-basin sheet flows to the east until being channelized in the Marksheffel Road ditch.

West Fork - Jimmy Camp Creek Drainage Fee Basin

Design Point WF1 (Q_5 = 35.6 cfs, Q_{100} = 298.9 cfs) (Sub-basin: TAR-EP, W1; Area: 258.80 Ac.) (Slopes: 5 to 25 %) represents the site discharge at the southwest corner of the site. Flows from the Trails at Aspen Ridge East Pond are combined with flows from the Future City of Colorado Springs electric substation and the portion of Bradley Heights draining to this point. Flows sheet flow offsite until eventually being channelized in the tributary.

Design Point WF2 (Q_5 = 29.4 cfs, Q_{100} = 157.4 cfs) (sub-basin: W2, W3; Area: 88.88 Ac.) (Slopes: 5 to 25 %) represents the combination of two Bradley Heights areas which drain into the West Fork Jimmy Camp Creek Tributary. Flows in these sub-basins sheet flow offsite where they are eventually channelized in the tributary.

b. The ***fully developed conditions*** for the site are as follows:

At this Master Development stage of design for the drainage, general locations of Design Points have been defined in order to size the trunk mains of the proposed storm system (see Appendix D for Storm Exhibit). Many of the proposed sub-basins will have their own internal storm systems that convey the flows to the Design Points mentioned in this report and will be outlined in each parcel's respective Preliminary/Final Drainage Report. (Bradley Heights East and Redemption Hill Church are two such concurrent Preliminary/Final Drainage Reports being submitted.) Infrastructure may need to be modified in the future depending on design of future developments and future drainage criteria. Please note that, for the Marksheffel Tributary to Jimmy Camp Creek design points and sub-basins within the Bradley Heights area, there may be differences between predevelopment and post development areas because development of the Bradley Heights Metro District area will change break lines between basins and thus alter the tributary areas. The ultimate 100-year discharge from the Metro District will remain at or below the modeled predevelopment value. Drawings DR-04 and DR-05 in Appendix D illustrate the proposed drainage conditions for this report.

Marksheffel Tributary to Jimmy Camp Creek

Note: These design points are also addressed in the FDR for the Bradley Heights Phase I Road Improvements.

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Design Point TAR-NEP (Q_5 = 0.2 cfs, Q_{100} = 7.9 cfs) (Sub-basin TAR-NE (Slopes 1 to 25%); Area: 9.15 Ac.) represents the discharge from the existing private Trails at Aspen Ridge Filing No. 4 Northeast Detention Pond. In accordance with the El Paso County DCM, this full spectrum detention pond discharges flows at predevelopment rates calculated by the UDFCD/MHFD Detention model into the proposed Bradley Road ditch. Capacity calculations completed in the FDR for Bradley Heights Phase I Road Improvements for the Bradley Road ditch at the worst-case flow location of Design Point B & C indicate that the ditch has adequate capacity at velocities within the DCM criteria for erosive soils (DCM Table 12-3). (Please note that this is an existing FSD detention facility in a separate development outside of the Bradley Heights Metro District and was not constructed as part of the Bradley Heights development.)

Design Point A (Q_5 = 1.3 cfs, Q_{100} = 11.6 cfs) (Sub-basins: TAR-NE (Slopes 1 to 25%), BR1 (Slopes 1 to 5%), BH1 (Slopes 3 to 5%); Area: 13.53 Ac.) represents the combination of flows at the proposed 24-inch public crossroad culvert (Bradley Heights Phase I Road Improvements) at the future access for the Bradley Heights East Filings 3 & 4 development. Flows in Sub-basin BR1 will sheet flow off Bradley Road and adjacent undeveloped areas to the Bradley Road ditch where channelized flows will be conveyed eastward to this design point. Capacity calculations for the road ditch at the worst-case flow location of Design Point B & C indicate that the ditch has adequate capacity at velocities within the DCM criteria for erosive soils (DCM Table 12-3).

Design Points B and C (Q_5 = 5.7 cfs, Q_{100} = 28.3 cfs) (Sub-basins: TAR-NE (Slopes 1 to 25%), BR1 (Slopes 1 to 5%), BH1(Slopes 3 to 5%), BHE2 (Slopes 3 to 5%), BHC (Slopes 3 to 5%); Area: 36.36 Ac.) represents the combination of flows from the referenced sub-basins. The developed sub-basins tributary to this design point will meter flows out via full spectrum detention ponds. Flows in the from the two future filing FSD detention ponds (Private) in Sub-basins BHE2 (Future Private FSD by others; Not part of this project) and BHC (Future Private FSD by others; Not part of this project) will discharge in a safe and stabilized manner to the Bradley Road ditch where they will be combined with flows from Design Point A and conveyed across the proposed access road for the Bradley Heights commercial parcel via a proposed public 24-inch public crossroad pipe (Bradley Heights Phase I Road Improvements) and thence further eastwards via the Bradley Road ditch to the proposed 24-inch public culvert crossing Bradley Landing Boulevard (Bradley Heights Phase I Road Improvements Improvements) at Design Point C. To be conservative, these design points are looked at as the same area to allow for variance in discharge location from the commercial parcel when it develops in the future. The road ditch was analyzed using Hydraflow hydrographs which determined that the ditch has capacity for the design storms at velocities in compliance with those indicated in Table 12-3 of the DCM (less than 5 ft/s for Q100). A report of this model/calculation can be found in Appendix A of the FDR for Bradley Heights Phase I Road Improvements.

Design Point D (Q_5 = 6.7 cfs, Q_{100} = 37.3 cfs) (Sub-basins: TAR-NE (Slopes 1 to 25%), BR1 (Slopes 1 to 5%), BH1(Slopes 3 to 5%), BHE2 (Slopes 3 to 5%), BHC (Slopes 3 to 5%), BH2 (Slopes 2 to 33%); Area: 38.44 Ac.) represents the combination of flows from Design Point C with flows sheet flowing off of the vegetated sub-basin BH2 and into the Bradley Heights Road Ditch. The channelized flows will continue east to this design point, located at a proposed 24-inch public storm sewer (Bradley Heights Phase I Road Improvements) just west of Bliss Road. The captured flows will be conveyed under Bliss Road and then to the south along Bliss Road via proposed public 24-inch, proposed public 30-inch, and proposed public 36-inch public storm sewer (Bradley Heights Phase I Road Improvements) to Design Point E.

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Design Point BL-1 (Q_5 = 10.7 cfs, Q_{100} = 19.6 cfs) (Sub-basins: BL1 (slopes 1 to 5%); Area: 2.98 Ac.) represents the proposed public 10-foot sump inlet (Bradley Heights Phase I Road Improvements) capturing flows in sub-basin BL1. Runoff in this sub-basin sheet flows off of areas of Bradley Road and Bradley Landing Boulevard towards the curb and gutter. The channelized flows are conveyed downstream to the proposed 10-foot public sump inlet (Bradley Heights Phase I Road Improvements) located just south of Bradley Road and on the west side of Bradley Landing. (Note: The sub-basin and design point have the same name at this location.)

Design Point BL-2 (Q_5 = 15.7 cfs, Q_{100} = 28.7 cfs) (Sub-basins: BL1 (slopes 1 to 5%) & BL2 (slopes 1 to 5%); Area: 4.37 Ac.) represents the proposed public 10-foot sump inlet capturing flows in sub-basin BL2 (Q_5 = 5.3 cfs, Q_{100} = 9.6 cfs) and the combination of these flows with those from Design Point BL-1 in the discharge from the inlet. Runoff in sub-basin BL2 sheet flows off areas of Bradley Landing Boulevard towards the curb and gutter. The channelized flows are conveyed downstream via curb and gutter flow to the proposed public 10-foot sump inlet (Bradley Heights Phase I Road Improvements) located just south of Bradley Road and on the east side of Bradley Landing. The flows combined in this proposed public inlet will be conveyed eastward via a proposed 24-inch public storm sewer (Bradley Heights Phase I Road Improvements) to the edge of the Bradley Landing Boulevard Right of Way. From this point the Bradley Heights East Filing No. 1 & 2 storm sewer by others (STM-REV22-0091) will convey the captured flows to the filing's Full Spectrum Detention Basin (FSD by others, see STM-REV22-0092). This detention facility is anticipated to be constructed on roughly the same time frame as the Bradley Height Phase I Road Improvements. (Note: The sub-basin and design point have the same name at this location.)

Design Point E (Q_5 = 15.5, Q_{100} = 123.7 cfs) (Sub-basins: TAR-NE (Slopes 1 to 25%), BR1 (Slopes 1 to 5%), BH1(Slopes 3 to 5%), BHE2 (Slopes 3 to 5%), BHC (Slopes 3 to 5%), BH2 (Slopes 2 to 33%) BHE (Slopes 1 to 33%); Area: 79.67 Ac.) represents the combination of flows from Design Point D with the discharge from the Bradley Heights East Filings No. 1 & 2 full spectrum detention pond being constructed by others in parallel to these improvements at a proposed public storm manhole. The combined flows will be directed downstream via proposed public 42-inch storm pipe to the Marksheffel Tributary to Jimmy Camp Creek. This FDR addresses the storm sewer between the manholes on either side of Bliss Road. Please refer to the ***BHE-F1&2-PDR*** (STM-REV22-0091) and/or the future FDR associated with that development to find the storm sewer and associated easements on either side of the road right of way and for the capacity and stability calculations for the existing private receiving swale. Marksheffel Tributary calculations will be included in the forthcoming channel design report and MDDP Amendment. Please note that this discharge correlates to existing Design Point M3 and shows a slight reduction in anticipated flows. Thus, the receiving swale should remain stable as the flows will be within the calculated historic value.

Design Point F (Q_5 = 7.6 cfs, Q_{100} = 15.0 cfs) (Sub-basins: BS1 (slopes 1.8 to 5%); Area: 3.16 Ac.) represents the proposed public 15-foot at-grade inlet on Bliss Road capturing and directing flows from Bliss Road to the ***BHE-F1&2-PDR*** (STM-REV22-0091) full spectrum detention pond (BY OTHERS-STM-REV22-0092). Flows will be conveyed downstream to DP H via proposed 18-inch public storm sewer. 2.8 cfs of bypass for the 100-year event will round the corner to the northwest into Bradley Heights East Filings No. 1&2 and be captured by the proposed sump inlet located just west of its access off Bliss Road.

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Design Point G (Q_5 = 3.1 cfs, Q_{100} = 5.6 cfs) (Sub-basin: BS2 (slopes 1.8 to 5%); Area: 0.83 Ac.) represents the proposed public 15-foot at-grade inlet on Bliss Road capturing and directing flows from Bliss Road to the ***BHE-F1&2-PDR*** (STM-REV22-0091) full spectrum detention pond (STM-REV22-0092). Flows will be conveyed downstream to DP H via proposed 18-inch public storm sewer.

Design Point H (Q_5 =10.4 cfs, Q_{100} = 20.2 cfs) (Sub-basins: BS1 (slopes 1.8 to 5%), BS2 (slopes 1.8 to 5%); Area: 3.99 Ac.) represents the proposed public manhole combining flows captured by the at-grade inlets on Bliss Road capturing and directing flows from Bliss Road to the ***BHE-F1&2-PDR*** (STM-REV22-0091) full spectrum detention pond (STM-REV22-0092). From this design point the runoff will be conveyed to the storm sewer described in ***BHE-F1&2-PDR*** (STM-REV22-0091) via proposed 24-inch public storm pipe.

Design Point RH1 (Q_5 = 7.7 cfs, Q_{100} = 14.0 cfs) (Sub-basin: RHC1; Area: 2.48 Ac.) represents the proposed public 10-foot sump inlet on the west side of Bliss Road just south of its intersection with Bradley Road capturing and directing flows from Bliss Road to the Redemption Hill Church full spectrum detention pond. From here captured flows will be conveyed east to the sump inlet at Design Point RH2 via proposed 24-inch public storm pipe.

Design Point RH2 (Q_5 = 9.5 cfs, Q_{100} = 17.4 cfs) (Sub-basin: RHC1-2; Area: 3.06 Ac.) represents the proposed public 10-foot public sump inlet on the east side of Bliss Road just south of its intersection with Bradley Road capturing and directing flows from Sub-basin RHC2 (Q_5 = 2.3 cfs, Q_{100} = 4.2 cfs; Area: 0.59 Ac.) Bliss Road to the Redemption Hill Church full spectrum detention pond. From here captured flows will be conveyed south and east to the Redemption Hill Church storm sewer system via proposed 24-inch public storm pipe (Bradley Heights Phase I Road Improvements) which will become private after exiting the Bliss Road Right of Way. For analysis in the Redemption Hill Church parcel please see the Redemption Hill Church PDR/FDR (Reference number not available). Construction within the Redemption Hill Church parcel is not a part of the Bradley Heights Phase I Road Improvements project. The Church construction is anticipated to take place along roughly the same time frame as the Bradley Heights Phase I Road Improvements.

Notes: The above design points were also covered in the FDR for the Bradley Heights Phase I Road Improvements. See the FDR for further information. Please also note that none of the detention facilities mentioned above are constructed as part of the proposed Bradley Heights Phase I Road Improvements. These will be separately constructed by the individual developers. The BHE F1&2 and RHC Detention Ponds are anticipated to be constructed at the same time as the Bradley Heights Phase I Road Improvements.

Design Point M3 (HEC-HMS) (Q_5 = 284.6 cfs, Q_{100} = 1209.3 cfs) (Sub-basin: M4-M27 (see slopes in the Existing design points descriptions), BHE, BH1, BH2, RHC1-3, BS1-2, BHC, BHE2, TAR-NE; Area: 3018.2 Ac.) represents the cumulative flows to the Marksheffel Tributary to Jimmy Camp Creek at a point on the stream just southeast of the proposed private Redemption Hill Church full spectrum detention pond (MKJCC Pond #8, Construction not included in the proposed Bradley Heights Phase I or II Road Improvements). Flows at this design point are determined via HEC-HMS modeling due to the size of the tributary area and the means of modeling the upstream flows. From this point flows will be conveyed in the proposed channel section indicated in the Channel Improvements section.

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Design Point I (Q_5 = 7.6 cfs, Q_{100} = 13.8 cfs) (Sub-basins: BS3, BS5; Area: 1.97 Ac.) represents the west proposed public 10-foot Type R sump inlet on Bliss Road adjacent to Bradley Heights East Filings No. 5 & 6 that will capture flows from the west half of Bliss Road as represented by Sub-basins BS3 and BS5. Flows will be conveyed downstream via a proposed 24-inch public storm pipe to Design Point K.

Design Point J (Q_5 = 5.0 cfs, Q_{100} = 9.1 cfs) (Sub-basins: BS4, BS6; Area: 1.20 Ac.) represents the east proposed public 10-foot Type R sump inlet on Bliss Road adjacent to Bradley Heights East Filings No. 5 & 6 that will capture flows from the east half of Bliss Road as represented by Sub-basins BS4 and BS6. Flows will be conveyed downstream via a proposed 18-inch public storm pipe to Design Point K.

Design Point K (Q_5 = 12.2 cfs, Q_{100} = 22.2 cfs) (Sub-basins: BS3- BS6; Area: 3.17 Ac.) represents the combination of flows from the two sump inlets described in Design Points I and J on Bliss Road adjacent to Bradley Heights East Filings No. 5 & 6 in a proposed public manhole. Flows will be conveyed downstream via a proposed 24-inch public storm pipe to Design Point L.

Design Point L (Q_5 = 48.5 cfs, Q_{100} = 104.1 cfs) (Sub-basins: BHE3, BS3- BS6; Area: 24.77 Ac.) represents the combination of flows from the two sump inlets on Bliss Road adjacent to Bradley Heights East Filings No. 5 & 6 with flows from Bradley Heights East Filings No. 5&6. Flows will be conveyed downstream via a proposed 42-inch public storm pipe to discharge to a swale which will convey these flows to MKJCC Pond #7 adjacent to the Marksheffel Tributary Channel. *This swale will be sized in the forthcoming FDR for the Bradley Heights Metro District Road Phase II Road Improvements.*

Design Point M2 (HEC-HMS) (Q_5 = 305.9 cfs, Q_{100} = 1220.2 cfs) (Sub-basins: M4-M27, MK1, BHE, BHE3, BH1, BH2, RHC1-4, BS1-6, BHC, BHE2, TAR-NE; Area: 3140.0 Ac.) represents the cumulative flows to the Marksheffel Tributary to Jimmy Camp Creek at a point on the stream just southeast of MKJCC Pond #7. Flows at this design point are determined via HEC-HMS modeling due to the size of the tributary area and the means of modeling the upstream flows. From this point flows will be conveyed in the proposed channel section indicated in MDDP-2015

Design Point N (Q_5 = 5.1 cfs, Q_{100} = 9.3 cfs) (Sub-basin: MK3; Area: 1.64 Ac.) represents the west proposed public 5-foot Type R sump inlet on Bradley Landing that will capture flows from the west half of Bliss Road as represented by Sub-basins MK3. Flows will be conveyed downstream via a proposed 18-inch public storm pipe to Design Point Q.

Design Point O (Q_5 =2.4 cfs, Q_{100} = 4.4 cfs) (Sub-basin: MK5; Area: 0.60 Ac.) represents the proposed public 5-foot Type R sump inlet at the intersection of Bradley Landing and Bradley Ridge. Flows will be conveyed downstream via a proposed 18-inch public storm pipe to Design Point Q.

Design Point P (Q_5 = 5.9 cfs, Q_{100} = 10.8 cfs) (Sub-basin: MK4; Area: 1.63 Ac.) represents the east proposed public 5-foot Type R sump inlet on Bradley Landing that will capture flows from the west half of Bliss Road as represented by Sub-basins MK3. Flows will be conveyed downstream via a proposed 18-inch public storm pipe to Design Point Q.

Design Point Q (Q_5 = 12.0 cfs, Q_{100} = 21.8 cfs) (Sub-basins: MK3-MK5; Area: 3.87 Ac.) represents the proposed public manhole combining flows from the three sump inlets at Design Points N, O,

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and P. Flows will be conveyed downstream via a proposed 24-inch public storm pipe to Design Point R.

Design Point R (Q_5 =34.9 cfs, Q_{100} = 72.7 cfs) (Sub-basins: MK2-MK5; Area: 15.16 Ac.) represents the proposed public manhole combining flows from the three proposed public 5-foot Type R sump inlets at Design Points N, O, and P with flows from Sub-basin MK2. Flows will be conveyed downstream via a proposed 42-inch public storm pipe into an interim swale in Sub-basin MK6 which will eventually discharge into proposed private MKJCC Pond #5 (EURV&WQ Detention). Design of the pond and swale will be included in a future FDR for the development or for Bradley Heights Phase II Road Improvements depending on the relative timing of future development.

MKJCC Pond #6 (Inflow: Q_5 = 54.1 cfs, Q_{100} = 116.6 cfs, Outflow: Q_5 = 17.0 cfs, Q_{100} = 89.0 cfs) (Sub-basins: MK9; Area: 41.24 Ac.) represents the future detention pond for sub-basin MK9 which is the future development area between Marksheffel Tributary to Jimmy Camp Creek and Marksheffel Road. Runoff will be conveyed via future internal streets and storm sewer to the proposed detention pond just upstream of the Colorado Centre Detention Pond.

Construction of this pond will likely be by others as the area is developed. The interim conditions may require a temporary detention pond for the Bradley Heights Phase II Road Improvements. Design of this item will be completed as part of a future FDR for either the development containing the detention pond or for the Bradley Heights Phase II Road Improvements depending on relative timing of future improvements.

Design Point M1 (HEC-HMS) (Q_5 = 330.7 cfs, Q_{100} = 1217.9 cfs) (Sub-basins: M4-M27, MK1-MK6, MK9, BHE, BHE3, BH1, BH2, RHC1-4, BS1-6, BHC, BHE2, TAR-NE; Area: 3248.5 Ac.) represents the cumulative flows to the Marksheffel Tributary to Jimmy Camp Creek at a point on the stream just southeast of MKJCC Pond #5. Flows at this design point are determined via HEC-HMS modeling due to the size of the tributary area and the means of modeling the upstream flows. From this point flows will be conveyed in the proposed channel section, described in the channel improvement section of this report, directly into the existing Colorado Centre detention pond.

Design Point S (Q_5 =6.3 cfs, Q_{100} = 11.5 cfs) (Sub-basins: MK9; Area: 1.79 Ac,) represents the proposed public 5-foot Type R sump inlet on the west side of the first north/south collector west of Marksheffel Road off of Bradley Ridge (Bridgegate Place). Flows captured in the inlet will be conveyed downstream via proposed 24-inch public storm pipe to Design Point U.

Design Point T (Q_5 = 1.6 cfs, Q_{100} = 2.9 cfs) (Sub-basins: MK10; Area: 0.38 Ac.) represents the proposed public 5-foot Type R sump inlet on Bridgegate Place. Flows captured in the inlet will be conveyed downstream via proposed 18-inch public storm pipe to Design Point U.

Design Point U (Q_5 = 7.5 cfs, Q_{100} = 13.8 cfs) (Sub-basins: MK9, MK10; Area: 2.17 Ac.) represents the proposed public manhole combining flows from Design Points S and T. Flows will be conveyed downstream via proposed 24-inch public storm pipe to design point U2.

Design Point U2 (Q_5 = 38.2 cfs, Q_{100} = 82.3 cfs) (Sub-basins: MK9, MK10, MK11; Area: 18.46 Ac.) represents the proposed public manhole combining flows from Design Points U with flows

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captured in Sub-basin MK11. Flows will be conveyed downstream via proposed 42-inch public storm pipe to design point V.

Design Point V (Q_5 = 42.6 cfs, Q_{100} = 92.3 cfs) (Sub-basins: MK9, MK10, MK11, MK13; Area: 21.47 Ac.) represents the proposed public manhole combining flows from Design Points U2 with flows captured in Sub-basin MK13. Flows will be conveyed downstream via proposed 42-inch public storm pipe to design point Z.

Design Point W (Q_5 = 2.8 cfs, Q_{100} = 5.2 cfs) (Sub-basin: MK15; Area: 0.67 Ac.) represents a proposed public 10-foot Type R sump inlet on the southeast side of Bradley Ridge just west of its intersection with Marksheffel Road. Flows captured by the inlet will be conveyed to Design Point Y via proposed 18-inch public storm pipe.

Design Point X (Q_5 = 6.4 cfs, Q_{100} = 11.7 cfs) (Sub-basin: MK10; Area: 1.97 Ac.) represents a proposed public 15-foot Type R sump inlet on the northwest side of Bradley Ridge across Bradley Heights from Design Point W. Flows captured by this inlet will be conveyed to Design Point Y via proposed 24-inch public storm pipe.

Design Point Y (Q_5 =8.6 cfs, Q_{100} = 15.7 cfs) (Sub-basins: MK10, MK15; Area: 2.64 Ac.) represents the proposed public manhole combining the discharge from Design Points W and X. The combined flows will be conveyed downstream via proposed 24-inch public storm pipe to design point Z.

Design Point Z (Q_5 =49.8 cfs, Q_{100} = 105.1 cfs) (Sub-basins:MK10 to MK15; Area: 26.3 Ac.) represents the proposed public manhole combining flows from Design Points V and Y. The combined flows will be conveyed downstream via proposed 48-inch public storm sewer to the proposed MKJCC Pond #4 (Full Spectrum Detention)

Design Point M0 (HEC-HMS) (Q_5 = 338.4 cfs, Q_{100} = 1003.8 cfs) (Sub-basins: M4-M27, MK1-MK6, BHE, BHE3, BH1, BH2, RHC1-4, BS1-6, BHC, BHE2, TAR-NE; Area: 3305.6 Ac.) represents the cumulative flows to the Marksheffel Tributary to Jimmy Camp Creek at a point on the stream just upstream of the Marksheffel Road Culverts (Double 12-foot x 9-foot CBC) on the east side of Bradley Heights. Flows at this design point are determined via HEC-HMS modeling due to the size of the tributary area and the means of modeling the upstream flows. From this point flows will be conveyed onwards across Marksheffel Road to the main branch of Jimmy Camp Creek approximately 650 feet downstream.

<u>Jimmy Camp Creek</u>

Design Point AA (Q_5 = 3.0 cfs, Q_{100} = 5.4 cfs) (Sub-basin: JC1; Area: 0.74 Ac.) represents a proposed public 5-foot Type R sump inlet on the first north-south collector off of Bradley Ridge west of Marksheffel Road (Bridgegate Place). Captured flows will be directed downstream via proposed 18-inch public storm sewer to Design Point AC.

Design Point AB (Q_5 = 3.0 cfs, Q_{100} = 5.5 cfs) (Sub-basin: JC2; Area: 0.75 Ac.) represents a proposed public 5-foot Type R sump inlet on Bridgegate Place. Captured flows will be directed downstream via proposed 18-inch public storm sewer to Design Point AC.

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Design Point AC (Q_5 = 6.0 cfs, Q_{100} = 11.0 cfs) (Sub-basins: JC1-JC2; Area: 1.48 Ac.) represents a proposed public manhole combining flows from Design Points AB and AA. Flows will be conveyed downstream to Design Point AD via proposed 24-inch public storm sewer.

Design Point AD (Q_5 = 41.6 cfs, Q_{100} = 90.9 cfs) (Sub-basins: JC1-JC3; Area: 21.33 Ac.) represents the proposed public manhole combining flows from Design Point AC with flows from Sub-basin JC3. The combined flows will be conveyed downstream via proposed 42-inch public storm sewer to Design Point AE at the Full Spectrum Detention JCC Pond #3.

Design Point AE (Q_5 = 69.7 cfs, Q_{100} = 153.5 cfs) (Sub-basins: JC1-JC4; Area: 38.07 Ac.) represents the combination of flows from Design Point AD with flows from Sub-basin JC4 at FSD JCC Pond #3.

Design Point JC (Q_5 = 18.2 cfs, Q_{100} = 83.3 cfs) (Sub-basins: JC1-JC5; Area: 45.58 Acres) represents the ultimate discharge from Bradley Heights to the Marksheffel Road ditch at the southeasternmost corner of the Bradley Heights Metro District. From this point flows will be conveyed onwards via the existing ditch and downstream storm facilities eventually reaching the main channel of Jimmy Camp Creek approximately 1500 feet downstream. Swale capacity calculations indicate that the road ditch has adequate capacity for the runoff and that velocities comply with the DCM criteria for Q100 channel flows in erosive soils. The report indicating this calculation can be found in Appendix A.

West Fork - Jimmy Camp Creek

Design Point AF (Q_5 = 6.0 cfs, Q_{100} = 10.9 cfs) (Sub-basins: WF10; Area: 1.56 Ac.) represents a sump inlet on the north side of Bradley Ridge Road west of its intersection with the second north/south collector west of Marksheffel Road. Flows captured in this sump inlet will be conveyed downstream via proposed 18-inch public storm pipe to Design Point AH.

Design Point AG (Q_5 = 4.2 cfs, Q_{100} = 7.6 cfs) (Sub-basins:WF11; Area: 1.08 Ac.) represents a sump inlet on the south side of Bradley Ridge Road west of its intersection with the second north/south collector west of Marksheffel Road. Flows captured in this sump inlet will be conveyed downstream via proposed 18-inch public storm pipe to Design Point AH.

Design Point AH (Q_5 = 10.1 cfs, Q_{100} = 18.5 cfs) (Sub-basins:WF10-WF11; Area: 2.64 Ac.) represents the storm proposed public manhole combining flows from Design Points AF and AG. Flows will be conveyed east to the second north/south collector west of Marksheffel off of Bradley Ridge Road and then southwest to Design Point AI via proposed 24-inch public storm pipe.

Design Point AI (Q_5 = 43.1 cfs, Q_{100} = 106.8 cfs) (Sub-basins:WF12-WF13; Area: 32.34 Ac.) represents a pair of sump inlets on a residential side road teeing into Collector 2 from the west. The sump inlets will be sized by a future FDR for the development and will capture flows from the west half of Collector 2. Captured flows will be conveyed downstream via proposed 48-inch public storm pipe.

Design Point AJ (Q_5 = 59.7 cfs, Q_{100} = 131.4 cfs) (Sub-basins: WF14-WF15; Area: 31.99 Ac.) represents a pair of sump inlets on a residential side road across Collector 2 from DP AI. The sump inlets will be sized by a future FDR for the development and will capture flows from the east half of

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Collector 2. Captured flows from the development will be conveyed downstream via proposed 48-inch public storm pipe.

Design Point AK (Q_5 = 92.0 cfs, Q_{100} = 210.9 cfs) (Sub-basins: WF10-WF15; Area: 66.97 Ac.) represents a proposed public manhole combining flows from Design Points AH, AI, and AJ. The combined flows will be conveyed downstream via proposed 48-inch public storm pipe.

Design Point AL (Q_5 = 0.4 cfs, Q_{100} = 0.7 cfs) (Sub-basins: WF16; Area: 0.09 Ac.) represents an at grade inlet on the south boundary of Bradley Heights capturing flows from the west portion of Collector 2. Captured flows will be conveyed downstream via 18-inch public storm pipe.

Design Point AM (Q_5 = 0.4 cfs, Q_{100} = 0.7 cfs) (Sub-basins: WF17; Area: 0.09 Ac.) represents an at grade inlet on the south boundary of Bradley Heights capturing flows from the east portion of Collector 2. Captured flows will be conveyed downstream via 18-inch public storm pipe.

Design Point AN (Q_5 = 0.8 cfs, Q_{100} = 1.4 cfs) (Sub-basins:WF16-WF17; Area: 0.18 Ac.) represents the proposed public manhole combining flows from Design Points AM and AL. The combined flows will be conveyed north to Design Point AO by 18-inch public storm sewer.

Design Point AO (Q_5 = 92.5 cfs, Q_{100} = 212.2 cfs) (Sub-basins:WF10-WF17 (Excluding WF12a); Area: 67.33 Ac.) represents the combination of flows from Design Points AN and AK. Flows will be conveyed downstream via proposed 48-inch public storm pipe. Please note that the flows to this point are conservative as it is likely that flows to this point may be somewhat less than accounted for here. (Future design consideration: The pipe calculations indicate pressure flows here as well, so it may be beneficial for the future development to consider a larger pipe size if HGLs exceed DCM criteria)

Design Point AP (Q_5 = 128.7 cfs, Q_{100} = 293.0 cfs) (Sub-basins:WF10-WF17 (Including WF12a); Area: 93.01 Ac.) represents the total flows into WFJCC Pond #2 in the Bradley Ridge development.

Design Point WF2 (Q_5 = 22.60 cfs, Q_{100} = 153.50 cfs) (Sub-basins: WF10-WF17; Area: 93.01 Ac.) represents the site discharge to the south boundary of Bradley Heights. The proposed development will discharge at or below historic rates. A future FDR for the site will provide more detailed information on the discharge. The DBPS indicates an anticipated Q100 discharge of 380 cfs near this point, therefore the proposed conditions are in compliance with DBPS-WFJCC.

Design Point AQ (Q_5 = 0.75 cfs, Q_{100} = 1.38 cfs) (Sub-basins: LH1; Area: 0.18 Ac.) represents a 10-foot at grade inlet capturing all the flows off of the portion of the north half of Legacy Hill Drive draining westwards towards the Trails at Aspen Ridge Development. The inlet will fully capture all flows and direct them to Design Point AS via proposed 18-inch public storm sewer.

Design Point AR (Q_5 = 0.75 cfs, Q_{100} = 1.38 cfs) (Sub-basins: LH2; Area: 0.18 Ac.) represents a 10-foot at grade inlet capturing all the flows off of the portion of the south half of Legacy Hill Drive draining westwards towards the Trails at Aspen Ridge Development. The inlet will fully capture all flows and direct them to Design Point AS via proposed 18-inch public storm sewer.

Design Point AS (Q_5 = 1.51 cfs, Q_{100} = 2.75 cfs) (Sub-basins: LH1 & LH2; Area: 0.36 Ac.) represents the proposed public manhole combining runoff from Design Points AR and AQ. The

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combined flows will be conveyed eastwards to Design Point AV via proposed 18-inch public storm sewer.

Design Point AT (Q_5 = 2.90 cfs, Q_{100} = 5.28 cfs) (Sub-basins: WF3; Area: 0.75 Ac.) represents a sump inlet on the south half of Legacy Hill Drive. Captured flows will be directed via proposed 18-inch public storm sewer towards Design Point AV.

Design Point AU (Q_5 = 2.78 cfs, Q_{100} = 12.36 cfs) (Sub-basins:WF2; Area: 4.63 Ac.) represents a sump inlet on the north half of Legacy Hill Drive capturing flows from Sub-basin WF2 which includes a portion of Bradley Landing Boulevard. Captured flows will be directed to Design Point AV via proposed 24-inch public storm sewer.

Design Point AV (Q_5 = 6.53 cfs, Q_{100} = 19.46 cfs) (Sub-basins: LH1-LH2, WF2-WF3; Area: 5.74 Ac.) represents the proposed public manhole combining flows from Design Points AS, AT, and AU. Combined flows will be conveyed to Design Point AW via proposed 24-inch public storm sewer.

Design Point AW (Q_5 = 37.02 cfs, Q_{100} = 86.80 cfs) (Sub-basins: LH1-LH2, WF1-WF3; Area: 21.73 Ac.) represents the proposed public manhole combining flows from Design Point AV with anticipated flows from Sub-basin WF1. The combined flows will be conveyed to Design Point BA by proposed 42-inch public storm sewer.

Design Point AX (Q_5 = 10.07 cfs, Q_{100} = 22.45 cfs) (Sub-basins: WF5; Area: 6.44 Ac.) represents four proposed public 10-foot at grade inlets fully capturing runoff from Sub-basin WF5. Captured flows will be conveyed to Design Point AZ via proposed 24-inch public storm sewer.

Design Point AY (Q_5 = 3.6 cfs, Q_{100} = 6.6 cfs) (Sub-basins: WF5; Area: 1.06 Ac.) represents two proposed public 10-foot at grade inlets fully capturing runoff from Sub-basin WF5. Captured flows will be conveyed to Design Point AZ via proposed 24-inch public storm sewer.

Design Point AZ (Q_5 = 13.03 cfs, Q_{100} = 27.89 cfs) (Sub-basins: WF5-WF6; Area: 7.5 Ac.) represents the proposed public manhole where flows from Design Points AX and AY are combined. The combined flows will be conveyed downstream via proposed 24-inch public storm pipe.

Design Point BA (Q_5 = 43.77 cfs, Q_{100} = 101.53 cfs) (Sub-basins: WF1-WF3, WF5-WF6, LH1-LH2; Area: 29.23 Ac.) represents the proposed public manhole combining flows from Design Points AZ and AW. The combined flows will be conveyed downstream via proposed 48-inch public storm pipe

Design Point BB (Q_5 = 72.74 cfs, Q_{100} = 170.87 cfs) (Sub-basins: WF1-WF6, LH1-LH2; Area: 49.51 Ac.) represents the proposed public manhole combining flows from Design Point BA and Sub-basin WF4. The combined flows will be conveyed downstream via proposed 48-inch public storm sewer.

Design Point BC (Q_5 = 89.73 cfs, Q_{100} = 226.69 cfs) (Sub-basins: WF1-WF8, LH1-LH2; Area: 76.22 Ac.) represents the total discharge into the proposed private detention pond WFJCC Pond #1. The pond will detain and treat flows from the tributary areas.

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WFJCC Pond #1 (Q_5 = 10.70 cfs, Q_{100} = 106.70 cfs) (Sub-basins: WF1-WF8, LH1-LH2; Area: 76.22 Ac.) represents the discharge from the proposed private detention pond WFJCC Pond #1. This pond will provide detention and water quality treatment for the tributary areas in the Bradley Heights Metro District.

Design Point WF1 (Q_5 = 22.1 cfs, Q_{100} = 276.3 cfs) (Sub-basins: TAR-EP, WF9, WFJCC Pond #1 Discharge; Area: 249.7 Ac.) represents the overall site discharge. DBPS-WFJCC indicates an anticipated flow near this discharge point of 585 cfs for the Q100 event, therefore the anticipated flows are in compliance with DBPS-WFJCC.

Notes:

- **Analysis of the Proposed Basin areas is conceptual in nature except where proposed Bradley Heights Metro District infrastructure improvements/construction plans are covered by the FDR for the Bradley Heights Phase I Road Improvements. Greater detail than typical (including some preliminary storm sewer design) is provided in this MDDP in order to accommodate various concurrent developments by other entities within the study area. Proposed Bradley Heights Metro District improvements include Bradley Landing along the north frontage of the Bradley Heights East Filings 1&2, Bliss Road from Bradley Road to the south entrance to Bradley Heights East Filings 1&2, and the Bradley Road improvements from the east bound of Trails at Aspen Ridge (El Paso County jurisdiction) to the termination of these improvements east of Bliss Road.**

- **For sub-basins within the single-family residential areas, runoff will sheet flow towards the adjacent streets. Once reaching the street these flows will be channelized into gutter flow for conveyance to downstream inlets or, if otherwise, as indicated in each development's FDR.**

- **In multi-family residential, commercial, and school sub-basins, internal storm sewer be designed and described within an FDR for the development.**

- **Storm sewer within proposed public streets will be publicly owned by the City of Colorado Springs. Ponds and pond outlet structures will be private and will be owned and maintained by the Bradley Heights Metropolitan District (The RHC pond may be maintained by Redemption Hill Church, or they may contract with the metro district for maintenance). Storm sewer located on private property will be private.**

- **Each individual development within Bradley Heights will be required to provide either full spectrum detention or WQ and EURV detention, as indicated in this report. According to HDR-2015 Marksheffel runoff is already treated in several smaller water quality facilities within the Marksheffel Road right of way.**

- **Tables summarizing inlet sizes and street capacities for the Bradley Heights Development can be found in Appendix A or in the following section.**

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IV. Hydraulic Analysis

A. MAJOR DRAINAGEWAYS

In the Marksheffel Tributary to Jimmy Camp Creek basin, runoff from is currently conveyed through multiple existing naturally vegetated lowland drainage swales of varying widths and depths, draining eastwards to the Marksheffel Tributary to Jimmy Camp Creek which directs the flows southeast to the Colorado Centre Regional Detention Pond and then, ultimately, to the existing public dual 12-foot x 9-foot culverts at the southeastern edge of Bradley Heights. From here, the runoff is directed east across South Marksheffel Road, and into Jimmy Camp Creek.

In the Jimmy Camp Creek Basin, runoff sheet flows off of sparsely vegetated slopes to the existing road ditch along Marksheffel Road. Flows are then directed south to an offsite culvert across Marksheffel Road.

In the West Fork Jimmy Camp Creek basin runoff sheet flows off the sparsely vegetated slopes to low points near the boundary of the Bradley Heights area. Once leaving the Bradley Heights area flows are conveyed via several small unnamed tributaries to the West Fork of Jimmy Camp Creek and ultimately combining with the Main Branch of Jimmy Camp Creek several miles to the south.

Under fully developed conditions, the Jimmy Camp and West Fork Jimmy Camp Creek basins will require full spectrum development for all development. This report currently demonstrates several sub-regional full spectrum detention facilities (two for West Fork Jimmy Camp Creek, and one for Jimmy Camp Creek), but sizing, quantity, and location for the full spectrum detention facilities may change as design of the various developments is refined.

Full development of the Marksheffel Tributary to Jimmy Camp Creek will be more complicated because the regional facility provides some detention for 100-year flows (Pond 1985), though initial analysis of the facility in HEC-HMS indicates that the facility does not fully meter flows down to predevelopment conditions. To address this a HEC-HMS model of the Marksheffel Tributary to Jimmy Camp Creek has been completed. The base model was requested from FEMA and is modified to account for predevelopment conditions and development conditions for the areas in Bradley Heights and Colorado Centre which are allowed by MDDP-2015 to use the Colorado Centre pond for detention

B. STRUCTURE IMPROVEMENTS

a. Existing Structures

The downstream culverts that convey the flows across Marksheffel Road were analyzed in the DBPS and determined to be capable of conveying the developed DBPS flows from its tributary area, since the proposed conditions indicated in this MDDP for both Marksheffel Culverts are less than or equal to those of the DBPS, the culverts remain viable for the proposed conditions.

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b. Proposed Detention Facilities

Initial design of the proposed detention facilities has been completed using the Mile High Flood District MHFD-Detention program. The results of these calculations are summarized in the table below.

Proposed Pond Summary BRADLEY HEIGHTS MDDP									
Pond	Trib. Area	% Imp.	Pre-Development Peak		Pond Outflow		Pre vs. Post Ratio		NOTES
			Q5	Q100	Q5	Q100	Q5	Q100	
1	76.22	49.06%	33.5	124.8	10.7	106.7	0.3	0.9	FSD: SEE FUTURE FDR
2	90.75	77.79%	56.3	179.6	22.6	153.5	0.4	0.9	FSD: SEE FUTURE FDR
3	38.07	66.17%	19.9	65.7	7.4	59.8	0.4	0.9	FSD: SEE FUTURE FDR
4	49.03	67.94%	23.7	77.0	10.0	70.3	0.4	0.9	FSD: SEE FUTURE FDR
5	67.29	66.73%	37.6	119.8	24.2	203.5	0.6	1.7	WQCV & EURV: SEE FUTURE FDR
6	41.24	70.00%	12.7	43.8	17.0	89.0	1.3	2.0	WQCV & EURV: SEE FUTURE FDR
7	69.95	75.34%	33.4	110.1	23.5	177.2	0.7	1.6	WQCV & EURV: SEE FUTURE FDR
8	12.97	75.92%	3.4	12.4	3.6	11.3	1.1	0.9	FSD: SEE RHC FDR
9	51.93	60.00%	28.5	103.5	12.2	103.1	0.4	1.0	FSD: SEE BRADLEY HEIGHTS EAST F1&2 FDR
10	13.98	95.00%	4.4	18.6	0.4	16.7	0.1	0.9	FSD: SEE FUTURE FDR
11	8.00	65.00%	2.8	11.7	1.4	10.6	0.5	0.9	FSD: SEE BRADLEY HEIGHTS EAST F3&4 FDR
TAR-NEP OFFSITE	9.09	59.05%	0.2	11.2	0.2	7.9	1.0	0.7	FSD: SEE TAR F4 DRAINAGE REPORTS
TAR-EP OFFSITE	160.87	44.95%	5.3	191.8	5.8	139.5	1.1	0.7	FSD: SEE TAR MDDPA

NOTE: *Pond information is preliminary in nature. Please see the final drainage reports of each development for final pond information*

The Colorado Centre Detention Pond was originally analyzed in the Detention Report titled ***Phase I Detention for Colorado Centre***, by JR Developers, LTD and dated October 1985. This report indicated that the detention facility would provide detention for approximately 832 acres of industrial and business development and 122 acres of residential development. This area was modified by ***MDDP-2015*** to approximately 779 acres of developed tributary area. Please see the drawing in Appendix C demonstrating that Bradley Heights is within this tributary area. The remainder of the tributary area was (and will continue to be) required to provide onsite detention. Please see excerpts of both reports included in Appendix C.

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This MDDPA has further evaluated the existing Colorado Centre Detention Pond using HEC-HMS to confirm conformance with the DCM, the previous MDDP and the Detention Report. The modeling was based on the HMS model used for the effective FEMA hydrology which appears to also match the HMS model referenced in MDDP-2015 and shown in DBPS-2015. SCS numbers for undeveloped conditions are calculated based on the soil type and proposed development type. This MDDPA indicates whether developments within the Bradley Heights area will need full spectrum or just EURV & WQCV detention. The HEC-HMS model does not model areas within the Colorado Centre Metro District, but it is likely that future development within the area indicated as "Detention Provided by Colorado Centre Detention Pond" in drawing DR-02 (Appendix D) will require EURV&WQCV detention in order to comply with the DCM.

Emergency Overflows

For emergency overflow paths see each development's FDR. The Colorado Centre overflow is described in MDDP-2015 and the Colorado Centre MDDP. This Emergency overflow continues along the tributary and into Jimmy Camp Creek.

Generally, emergency overflows should follow adjacent streets, road ditches, or existing drainage swales downstream until reaching historic drainage paths where they will continue downstream ultimately reaching Fountain Creek. Detention ponds along the Marksheffel Tributary to Jimmy Camp Creek will discharge directly to the creek and follow historic paths.

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c. Proposed Inlets

INLET SUMMARY											
BRADLEY HEIGHTS MDDP											
DESIGN POINT or SUB-BASIN	***SUB-BASINS/ DESCRIPTION***	***TOTAL AREA (AC)***	***INLET***			***Q(5) TOTAL INFLOW***	***Q5 INLET CAPACTIY***	***Q(100) BYPASS FLOWS (cfs)***	***Q(100) TOTAL INFLOW (cfs)***	***MAX INLET CAPACITY***	***NOTES:***
			SIZE (Ft.)	***TYPE***	***CONDITION***						
RHC1	**RHC1**	2.48	10	R	**SUMP**	7.7	**7.7**	**0.0**	14.0	**19.3**	***FDR***
RHC2	**RHC2**	0.59	10	R	**SUMP**	2.3	**2.3**	**0.0**	4.2	**19.3**	***FDR***
BL1	**WEST HALF OF BRADLEY LANDING DRAINING TO NORTH. PORTION OF BRADLEY ROAD DRAINING EAST**	2.88	10	R	**SUMP**	10.3	**10.3**	**0.0**	18.9	**19.3**	***FDR***
BL2	**EAST HALF OF BRADLEY LANDING**	1.39	10	R	**SUMP**	5.3	**5.3**	**0.0**	9.6	**19.3**	***FDR***
G	**BS2**	0.83	15	R	**AT-GRADE**	3.1	**3.1**	**0.0**	5.6	**5.6**	***FDR***
F	**BS1**	3.16	15	R	**AT-GRADE**	7.6	**7.6**	**2.8**	12.2	**12.2**	***FDR Bypass to BRADLEY HEIGHTS EAST 1&2 Sump inlet***
I	**10a**	1.97	10	R	**SUMP**	7.6	**7.6**	**0.0**	13.8	**19.3**	
J	**10b**	1.20	10	R	**SUMP**	5.0	**5.0**	**0.0**	9.1	**19.3**	
N	**N**	1.64	5	R	**SUMP**	5.1	**5.1**	**0.0**	9.2	**11.0**	
P	**P**	1.63	5	R	**SUMP**	5.9	**5.9**	**0.0**	10.8	**11.0**	
S	**MK11**	1.79	5	R	**SUMP**	6.3	**6.3**	**0.0**	11.5	**11.5**	***FLOWS EQUALIZE ACROSS CROWN IN MAJOR EVENT***
T	**MK12**	0.38	5	R	**SUMP**	1.6	**1.6**	**0.0**	2.9	**11.0**	
X	**MK10**	1.97	15	R	**SUMP**	6.4	**6.4**	**0.0**	11.7	**27.0**	
W	**MK15**	0.67	10	R	**SUMP**	2.8	**2.8**	**0.0**	5.1	**19.3**	
AA	**JC1**	0.74	5	R	**SUMP**	3.0	**3.0**	**0.0**	5.5	**11.0**	
AB	**JC2**	0.75	5	R	**SUMP**	3.0	**3.0**	**0.0**	5.6	**11.0**	
AG	**WF11**	1.08	5	R	**SUMP**	4.2	**4.2**	**0.0**	7.6	**11.0**	
AF	**WF10**	1.56	5	R	**SUMP**	6.0	**6.0**	**0.0**	10.9	**11.0**	

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INLET SUMMARY

BRADLEY HEIGHTS MDDP

DESIGN POINT or SUB-BASIN	*SUB-BASINS/ DESCRIPTION*	*TOTAL AREA (AC)*	*INLET*			*Q(5) TOTAL INFLOW*	*Q5 INLET CAPACTIY*	*Q(100) BYPASS FLOWS (cfs)*	*Q(100) TOTAL INFLOW (cfs)*	*MAX INLET CAPACITY*	*NOTES:*
			SIZE (Ft.)	*TYPE*	*CONDITION*						
WF13	**WEST HALF OF COLLECTOR 2**	1.03	15	R	**SUMP**	4.1	**4.1**	**0.0**	7.5	**27.0**	***INLETS ARE OVER SIZED TO ACCOUNT FOR ADDITIONAL FLOWS IN THE DEVELOPMENT ADJACENT***
WF14	**EAST HALF OF COLLECTOR 2**	1.17	15	R	**SUMP**	4.7	**4.7**	**0.0**	8.5	**27.0**	
AL	**WF16**	0.09	5	R	**AT-GRADE**	0.4	**0.4**	**0.0**	0.7	**0.7**	
AM	**WF17**	0.09	5	R	**AT-GRADE**	0.4	**0.4**	**0.0**	0.7	**0.7**	
AQ	**LH1 - AT GRADE AT BORDER WITH TRAILS AT ASPEN RIDGE**	0.18	10	R	**AT-GRADE**	0.8	**0.8**	**0.0**	1.4	**1.4**	
AR	**LH2 - AT GRADE AT BORDER WITH TRAILS AT ASPEN RIDGE**	0.18	10	R	**AT-GRADE**	0.8	**0.8**	**0.0**	1.4	**1.4**	
AU	**WF2**	4.63	10	R	**SUMP**	2.8	**2.8**	**0.0**	12.4	**19.3**	
AT	**WF3**	0.75	5	R	**SUMP**	2.9	**2.9**	**0.0**	5.3	**11.0**	
AX	**WF5**	6.44	10	R	**AT-GRADE**	10.1	**10.1**	**0.0**	22.4	**22.4**	***4 INLETS FOR FULL CAPTURE***
AY	**WF6**	1.06	10	R	**AT-GRADE**	3.6	**3.6**	**0.0**	6.6	**6.6**	***2 INLETS FOR FULL CAPTURE***
AQ	**LH1 - AT GRADE AT BORDER WITH TRAILS AT ASPEN RIDGE**	0.18	10	R	**AT-GRADE**	0.8	**0.8**	**0.0**	1.4	**1.4**	
AS	**LH1-LH2**	0.36	10	R	**AT-GRADE**	1.5	**1.5**	**0.0**	2.8	**2.8**	

Note: Inlet sizes indicated are minimums. Larger sizes may be used in the construction plans for conservative design.

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Overflow Routing	
Inlet	***Overflow Routing Under Sump Inlet Blockage Conditions***
RHC1	In case of blockage of the inlet, flows will surcharge the crown of the road and go into the opposite inlet if both are clogged, flows will surcharge the inlets and continue through the church parking lot to MKJCC Pond #8 (RH Church Pond) where the inlets are currently directing the flows.
RHC2	In case of blockage of the inlet, flows will surcharge the crown of the road and go into the opposite inlet if both are clogged, flows will surcharge the inlets and continue through the church parking lot to MKJCC Pond #8 (RH Church FSD) where the inlets are currently directing the flows.
BL1	In case of blockage of the inlet, flows will surcharge the crown of the road and go into the opposite inlet if both are clogged, flows will surcharge the inlets and continue through the Bradley Heights East residential roads to MKJCC Pond #9 (Bradley Heights East FSD) where the inlets are currently directing the flows.
BL2	In case of blockage of the inlet, flows will surcharge the crown of the road and go into the opposite inlet if both are clogged, flows will surcharge the inlets and continue through the Bradley Heights East residential roads to MKJCC Pond #9 (Bradley Heights East FSD) where the inlets are currently directing the flows.
Future	Future sump inlets will have paths described in FDRs associated with the related development.

d. Marksheffel Tributary - Channel Improvements

The Marksheffel tributary is a tributary to Jimmy Camp Creek within the Jimmy Camp Creek drainage basin and flows north to south. Off-site flows on Marksheffel tributary are routed through a triple reinforced concrete box culvert under Bradley Road. The project area begins downstream of the culvert at Bradley Road and ends upstream of the culvert at Marksheffel Road. Within the project area flows in Marksheffel tributary are routed through the existing Colorado Centre Regional Detention Facility and then through the double box culvert at Marksheffel Road before its confluence with the main stem of Jimmy Camp Creek.

The proposed development within the drainage area for Marksheffel tributary includes single home residential, multi-family residential, parks, an elementary school site, and commercial use. Hydrology in the watershed is expected to change significantly due to increased impervious cover. According to DBPS-2015 the existing 100-yr flow at DP M1 is 1,916 cfs and the developed 100-yr flow is estimated to be 6,254 cfs.

To convey the increased flow channel modifications are proposed to widen and deepen the existing channel. A multi-staged channel is proposed and includes four stages: base flow, bankfull, low flow, and 100-yr flow. Table 1 summarizes the design flow for each stage. Multi-staged channels are effective at reducing erosive forces and engaging floodplains more frequently than single staged channels. The base flow stage is designed to convey routine flows that occur from post-development, anthropogenic sources (irrigation, washing cars, etc.). The bankfull stage is based on existing 1.5-yr flows and will be engaged during frequent storm events. This stage will be useful for engaging floodplain while the contributing watershed is still under development and flows have not risen to developed levels. The

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low flow is based on the developed 2-yr storm event and will engage a wider portion of the channel semi-regularly, dissipating flood energy and maintaining vegetation. Lastly, the 100-yr has capacity to convey developed 100-yr flows while maintaining one foot of freeboard. During the 100-yr event the average velocity is calculated to be 4.88 ft/s and the average shear stress is estimated to be 0.59 psf. The Bentley Flowmaster hydraulic summary for the typical cross section is attached in Appendix A. Both the average velocity and average shear stress meet city criteria listed in Table 12.3 in the City's DCM.

Table 1: DBPS-2015 - Discharge by Channel Stage

	Base	Bankfull	Low Flow	100-yr
Discharge (ft^3/s)	25	200	1,037	6,254

A wide 100-yr floodplain enables energy to be dissipated, reducing erosive forces within the channel. Channel side slopes will be at a 4:1 (horizontal:vertical) slope to further reduce channel velocities and enable ease of access to the channel. The proposed channel section is 8.4 feet deep from the limits of the freeboard to the channel invert; the 100-yr water surface is 7.4 feet above the channel bottom and one foot of freeboard is added in accordance with City criteria. The total channel top width is 321 feet, including one foot of freeboard. The typical channel cross section and supporting calculations are shown in Appendix A

The proposed channel alignment will have an average stable slope of 0.2%, generally following the existing low point in the valley. Within the multi-stage channel, the bankfull channel will meander within the main channel's cross section following natural planform patterns found in other comparable systems. Four drop structures, six feet high each, are proposed upstream of the pond to make up vertical grade and dissipate energy. Also, one 2.5-foot drop structure is proposed downstream of the pond before the double box culvert at Marksheffel Road. The drop structures will span the full width of the channel and include a stilling basin, end sill, sheet pile cutoff wall, and buried soil riprap to protect against scour. Drops will be grouted boulder or sculpted concrete depending on the hydraulic results of future design iterations. If needed, additional bank stabilization will be provided throughout the project reach where shear stresses exceed the limits allotted in the City's criteria manual. All disturbed areas outside of the baseflow channel will receive a robust revegetation plan including – erosion control fabric, seeding, and native plantings. The zoning of each revegetation item will be dependent on final grading and channel hydraulics. Long-term sustainability and stabilization will be managed through an operations and maintenance plan that will be facilitated by the Bradley Heights Metro District and overseen by the City. Operations and maintenance plans will be finalized and approved through the design process and channel report.

A Letter of Map Revision (LOMR) was completed in 2018 to partially define the floodplain of the Tributary between Bradley Road and Marksheffel Road. This was approved by FEMA to properly define the existing 100-year floodplain and make property within the studied reach developable. The entire project reach is within a 100-year floodplain as shown on Flood Insurance Rate Map (FIRM) Panels 08041C0768G, dated December 7, 2018 (see appendix). Part of the reach is located approximately between cross-sections A and C and has 100-year Base Flood Elevations and a regulatory floodway. Areas outside this reach are Zoned A and are currently unmapped. The

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floodplain datum is North American Vertical Datum 1988 (NAVD88). Due to the realignment and reshaping of the channel, it is anticipated that this project will require a CLOMR/LOMR to revise the 100-year floodplain limits to the new channel corridor. Permitting with the U.S. Army Corps of Engineers (USACE) will also be required.

The opinion of probable construction cost (OPCC) was calculated based on the preliminary design of the proposed improvement to the Marksheffel tributary. Preliminary grading was created based on the proposed typical cross-section and tie-in grading. Due to the nature of the site, the earthwork is not balanced, and it was assumed that net cut would be exported from the site. The drop structure dimensions were estimated using the criterion in the City's DCM described above and compared to previously approved designs for similar channels. It was assumed that the drop structures would be constructed with grouted boulders or sculpted concrete and included a stilling basin, end sill, upstream sheet pile cutoff wall, and upstream and downstream riprap. Additionally, it was assumed that all disturbed areas outside the baseflow channel would be re-seeded and protected with erosion control fabric. Unit costs were estimated based on previous, local projects of similar magnitude and scale. It was assumed that the channel improvements will be constructed as a stand-alone project and not in tandem with any other adjacent development work. Because the OPCC was based on preliminary plans, the estimate was classified as an AACE International Class 4 estimate which has tolerances of -30% and +50%. These tolerances were adjusted to -20% and +30% because the preliminary design was more than 10% complete. The probable construction cost was calculated to be $8,726,366 with the low and high-end estimates of $6,981,093 and $11,344,276 respectively. The OPCC is included in Appendix A along with the channel section and the supporting hydraulic calculations.

C. FLOODPLAINS

Per the ***Flood Insurance Rate Map (FIRM) 08041CO768 G***, effective date December 7, 2018, published by the Federal Emergency Management Agency (FEMA), an unnamed (DBPS names Marksheffel) Tributary to Jimmy Camp Creek runs along the eastern bound of the Bradley heights area and has designated 100-year floodplain. Refer to the map in Appendix C.

V. Environmental Evaluations

A. WETLAND IMPACTS

According to MDDP-2015 there are no designated wetland or riparian areas on site, and no anticipated impacts. A wetland delineation will be performed as part of the stream improvements.

B. STORMWATER QUALITY

All on-site detention facilities shall be designed to accommodate water quality requirements. As the various developments within Bradley Heights progress, the detention guidelines will require water quality and EURV detention for some regions tributary to the Colorado Centre detention pond. The church and Bradley Heights east areas are already designed to have full spectrum detention. General locations are given for several sub-regional water quality and EURV detention pond, however, since the developments are still being or yet to be designed the locations may shift. Areas not tributary to the Colorado Centre detention pond will be required to provide full spectrum detention.

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Per the DCM Chapter 1, Section 4, the City of Colorado Springs requires the MHFD Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls. The implementation of these four steps will need to be outlined for each phase/region included in the Bradley Heights development in the respective Final Drainage Reports. The four-step process has been completed below.

All on-site detention facilities shall be designed to accommodate water quality requirements. As the development of each parcel progresses, the detention guidelines outlined in this report are to be upheld.

Per Chapter 1, Section 4, of the city of Colorado Springs DCM, the DCM requires the MHFD Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

Step 1: **Reduce runoff by disconnecting impervious area, eliminating "unnecessary" impervious area and encouraging infiltration into soils that are suitable.**

- Site specific landscaping will be done as possible to minimize directly connected impervious areas. The layout for many of the proposed buildings allows for runoff conveyance via a grassed green space between the buildings. An IRF sheet will be required for the various FDRs to go along with the proposed detention pond design.

Step 2: **Treat and slowly release the WQCV.**

- The proposed detention ponds must meet the DCM standards for the release rates of Full Spectrum Detention Ponds for Water Quality Capture Volumes.

Step 3: **Stabilize stream channels.**

- Developers in the Bradley Heights Metro District will be required to pay in an equivalent to Jimmy Camp Creek Drainage Basin Fee to the Bradley Heights Metro District which will aid in future channel improvements to the Marksheffel Tributary to Jimmy Camp Creek within the Metro District.

- A subsequent channel design report will address required improvements to the portion of Marksheffel Tributary to Jimmy Camp Creek running though the Bradley Heights area from Marksheffel Road at the southeast border of Bradley Heights to Bradley Road at the north bound of the Metro District. Improvements are anticipated to include four 6-foot and one 2.5-foot drop structures and forming the channel to comply with the City DCM.

Step 4: **Implement source controls.**

- Dumping of waste materials in the proposed storm system is not permitted.

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- During construction, the contractor will have designated concrete washout areas and will implement sediment control logs and inlet protection in order to control pollutants at their source.
- There are no plans for outdoor stockpiling of materials onsite after construction has been completed, therefore, no other source control BMPs are anticipated at this time.
- If long term storage of materials is needed, storage must be stabilized according to City criteria.

VI. PERMITTING REQUIREMENTS

A USACE 404 permit may be necessary. MDDP-2015 indicated that the USACE determined that they did not want jurisdiction, however this must be reconsidered as the time limit in that notice of determination has expired.

VII. Erosion Control Plan

A grading and erosion control plan (GEC) for each proposed development will be submitted for review as separate submittals by the various developments. These will incorporate straw wattles, straw bale check dams, silt fence, vehicle tracking control, inlet & outlet control, sedimentation basins and other best management practices (CMs) identified in the DCM Volume 2.

VIII. Selected Plan (Implementation of DBPS)

A. PLAN HYDROLOGY

The hydrology for the site has been provided above and is in compliance with the latest studies (DPBS-2015 & DBPS-WFJCC).

B. SYSTEM IMPROVEMENTS

The channel was previously studied in MDDP-2015. A future channel design report will be submitted for the portion of Marksheffel Tributary to Jimmy Camp Creek which is within the Bradley Heights area. This report will provide design of drop structures and improvements to bring the channel into compliance with the current DCM.

C. SYSTEM PRIORITIES/PHASING

The Metro district is providing road construction improvements as the developments in the area progress. The first portion of this is the portions of Bradley Landing and Bliss Road necessary to provide access to the Bradley Heights East Filings No. 1&2 and the Redemption Hill Church developments. Bradley Road will also have some improvements in this initial phase.

D. GOVERNMENTAL AGENCY REQUIREMENTS

Outside of the standard City of Colorado Springs standard entitlement processing, there are no governmental agency requirements for the proposed development at this time. Avigation easement and restrictions must be adhered to upon approval and recordation.

E. MAINTENANCE REQUIREMENTS

Maintenance requirements for all stormwater quality and erosion control procedures will be outlined in each filing's individual Erosion Control and Storm Water Management Plans. The full spectrum

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detention ponds will be owned and maintained by the Bradley Heights Metro District and the Colorado Centre Detention Pond receiving flows from Bradley Heights is owned and maintained by the Colorado Centre Metro District. The City has indicated that maintenance of the improved channel is likely to be the responsibility of the Bradley Heights Metro District.

F. RECOMMENDATION FOR IMPLEMENTATION

It is recommended that any development of the site initiates the implementation of the detention and water quality procedures that have been detailed in this report. In doing so, the developed conditions will produce runoff comparable to that of the existing conditions, which will allow the site continued adherence to the DPBS and protect downstream owners and facilities.

IX. Fee Development

A. UNDEVELOPED PLATTABLE LAND

Bradley Heights has not been previously platted but is currently zoned as PUD and will incorporate multiple uses. Private agreements between the developers and the Bradley Heights Metro District will provide the district with an equivalent dollar amount to the Drainage Fees. The developers are therefore likely to provide that agreement to the City as a justification for deferral of drainage fees. All other fees will be due at the time of plat recordation.

B. REIMBURSABLE COSTS AND FEES

Bradley Heights is located within two different Drainage Fee Basins. The large majority being the Jimmy Camp Creek Drainage Fee Basin and the smaller minority being the West Fork Jimmy Camp Creek Drainage Fee Basin. Fees will be paid by the entities platting the various developments within the area.

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a. Cost Estimate

Engineer's Estimate of Probable Construction Costs				
JIMMY CAMP CREEK				
BRADLEY HEIGHTS ROAD AND STORM IMPROVEMENTS BRADLEY HEIGHTS PHASE I ROAD IMPROVEMENTS				
Public Non-Reimbursable				
Item	Unit	Quantity	Unit Cost	Extension
18" RCP/HP	LF	58	$67.00	$3,859.87
24" RCP/HP	LF	704	$81.00	$57,062.07
30" RCP/HP	LF	37	$100.00	$3,709.00
36" RCP/HP	LF	440	$125.00	$54,962.50
42" RCP/HP	LF	102	$166.00	$16,900.46
48" RCP/HP	LF	514	$202.00	$103,801.74
4' STM MH	EA	5	$6,600.00	$33,000.00
6' STM MH	EA	1	$6,600.00	$6,600.00
8' STM MH	EA	2	$12,000.00	$24,000.00
10-FT TYPE R	EA	8	$8,136.00	$65,088.00
15-FT TYPE R	EA	2	$12,034.00	$24,068.00
24" FES	EA	8	$486.00	$3,888.00
48" FES	EA	1	$1,212.00	$1,212.00
			Sub Total	$398,151.64
			10% Contingency	$39,815.16
			TOTAL:	**$437,966.80**

Engineer's Estimate of Probable Construction Costs				
JIMMY CAMP CREEK				
BRADLEY HEIGHTS ROAD AND STORM IMPROVEMENTS				
Permanent Control Measures(PCM): Private Non-reimbursable				
Item	Unit	Quantity	Unit Cost	Extension
DETENTION	EA	11	$300,000.00	$3,300,000.00
			Sub Total	$ 3,300,000.00
			10% Contingency	$330,000.00
			TOTAL:	**$3,630,000.00**

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Engineer's Estimate of Probable Construction Costs				
JIMMY CAMP CREEK				
BRADLEY HEIGHTS ROAD AND STORM IMPROVEMENTS - FUTURE PHASES				
Public - Non-reimbursable				
Item	Unit	Quantity	Unit Cost	Extension
18" RCP/HP	LF	1382	$67.00	$92,573.90
24" RCP/HP	LF	2840	$81.00	$230,070.78
30" RCP/HP	LF	149	$100.00	$14,935.00
36" RCP/HP	LF	176	$125.00	$21,976.25
42" RCP/HP	LF	1591	$166.00	$264,023.00
48" RCP/HP	LF	1902	$202.00	$384,179.76
4' STM MH	EA	19	$6,600.00	$125,400.00
6' STM MH	EA	11	$6,600.00	$72,600.00
8' STM MH	EA	7	$12,000.00	$84,000.00
10-FT TYPE R	EA	29	$8,136.00	$235,944.00
42" FES	EA	2	$996.00	$1,992.00
			Sub Total	$1,528,906.69
		10% Contingency		$152,890.67
			TOTAL:	**$1,681,797.36**

Overall Total	**$5,749,764.16**

Since the engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the contractor's method of determining prices, or over the competitive bidding or market conditions, the opinion of probable construction costs provided herein are made on the basis of the engineer's experience and qualifications and represents the best judgment as an experienced and qualified professional familiar with the construction industry. The engineer cannot, and does not guarantee that proposals, bid or actual construction costs will not vary from the opinion of probable costs.

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X. Summary

This study has shown that the proposed development of Bradley Heights will release flows downstream at or below values indicated in the relevant DBPS

	Q100 DBPS/EX	Q100 MDDP	Ratio
Jimmy Camp Creek (DP JC)	80.3 cfs	83.3 cfs	1.0
Marksheffel Tributary to Jimmy Camp Creek (DP M0)	1029.9 cfs	1003.8 cfs	1.0
West Fork Jimmy Camp Creek (DP-WF1)	298.9 cfs	276.3 cfs	0.9
West Fork Jimmy Camp Creek (DP-WF2)	157.4 cfs	153.5	1.0

Notes:

- Where correlating DBPS design points are not available, the comparison of existing to proposed rational method calculations shows no increase in flows discharged offsite.

This report also demonstrates that the proposed associated developments will not negatively affect downstream infrastructure or surrounding developments. This study is in conformance with DBPS-2015 and adjacent/internal Final Drainage Reports.

XI. References

1. ***City of Colorado Springs Drainage Criteria Manual***, City of Colorado Springs, January 2021
2. ***Web Soil Survey of El Paso County Area, Colorado. Unites States Department of Agriculture Soil Conservation Service***, November 2021.
3. ***Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas, Panel 768 of 1300, Federal Emergency Management Agency***, Effective Date December 7, 2018.
4. ***West Fork Jimmy Camp Creek Drainage Basin Planning Study,*** by Kiowa Engineering Corp., dated October 2003.
5. ***Jimmy Camp Creek Drainage Basin Planning Study,*** by Kiowa Engineering, dated March 2015. (DBPS-2015)
6. ***Bradley Heights Master Development Drainage Plan,*** by Classic Engineering, dated January 2015. (MDDP-2015)
7. ***Final Drainage Report "Marksheffel Road South" Link Road to US-2***4 by HDR, dated April 2015

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XII. Appendices

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APPENDIX A

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Rational Method - Existing Conditions

Project Name:	BRADLEY HEIGHTS MDDP
Project Location:	COLORADO SPRINGS, EL PASO COUNTY, CO
Designer	JTS
Notes:	

Channel Flow Type Key

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

Average Channel Velocity 4 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)

		Area		Rational 'C' Values											Flow Lengths				Initial Flow		Channel Flow				Tc	Rainfall Intensity & Rational Flow Rate				
				Surface Type 1 (Neighborhoods)			Surface Type 2 (Impervious)			Surface Type 3 (Undeveloped)			Composite																		
Major Basin / Sub-basin	**Comments**	sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Initial ft	True Initial Length ft	Channel ft	rue Channe Length ft	Average Slope	Initial Tc (min)	Average (%) Slope	Channel Flow Type (See Key above) Ground Type	Velocity (ft/s)	Channel Tc (min)	Total (min)	i5 in/hr	Q5 cfs	i100 in/hr	Q100 cfs	
M-1	***Marksheffel Tributary-SCS***	4,255,918.0	97.70	0.65	0.80		0.90	0.96		0.16	0.51	4255918.00	0.16	0.51	300	300	2248	2248	0.050	17.14	0.5	4	0.5	75.7	92.8	1.2	**18.8**	2.0	**167.7**	HEC HMS
M-2	***Marksheffel Tributary-SCS***	6,457,173.0	148.24	0.65	0.80		0.90	0.96		0.16	0.51	6457173.00	0.16	0.51	300	300	4513	4513	0.050	17.14	0.5	4	0.5	152.0	169.1	0.8	**26.2**	1.3	**228.8**	
M-3	***Marksheffel Tributary-SCS***	6,350,933.0	145.80	0.65	0.80		0.90	0.96		0.16	0.51	6350933.00	0.16	0.51	300	300	6127	6127	0.050	17.14	0.5	4	0.5	206.3	223.4	0.6	**9.4**	1.1	**150.7**	
W1	***To WFJCC***	4,265,912.0	97.93	0.65	0.80		0.90	0.96		0.16	0.51	4265912.00	0.16	0.51	300	300	2680	2680	0.050	17.14	5.0	4	1.6	28.5	45.7	1.9	**29.8**	3.2	**159.4**	
W2	***To WFJCC***	47,721.0	1.10	0.65	0.80		0.90	0.96		0.16	0.51	47721.00	0.16	0.51	50	50	378	378	0.050	7.00	5.0	4	1.6	4.0	11.0	3.9	**0.7**	6.6	**3.7**	
W3	***To WFJCC***	3,823,833.0	87.78	0.65	0.80		0.90	0.96		0.16	0.51	3823833.00	0.16	0.51	300	300	2130	2130	0.050	17.14	5.0	4	1.6	22.7	39.8	2.1	**29.0**	3.4	**155.4**	
J1	***Southeast corner of Bradley Heights***	2,030,559.0	46.62	0.65	0.80		0.90	0.96		0.16	0.51	2030559.00	0.16	0.51	300	300	2300	2300	0.050	17.14	5.0	4	1.6	24.5	41.6	2.0	**15.0**	3.4	**80.3**	
TAR-EP	***Trails at Aspen Ridge East Pond Discharge***	7,007,497.2	160.87	0.65	0.80		0.90	0.96		0.16	0.51	7007497.20	0.16	0.51													**5.8**		**139.5**	
EXISTING CONDITIONS - DESIGN POINTS	***INCLUDED SUB-BASINS***																													
WF1	***W1, TAR-EP***	11,273,409.2	258.80	0.65	0.80	0.0	0.90	0.96	0.0	0.16	0.51	11,273,409.2	0.16	0.51	300	300	2680	2680	0.05	17.14	5.0	4	1.6	28.5	45.7	1.9	**35.6**	3.2	**298.9**	
WF2	***W2,W3***	3,871,554.0	88.88			0.0	0.90	0.96	0.0	0.16	0.51	3,871,554.0	0.16	0.51	300	300	2130	2130	0.05	17.14	5.0	4	1.6	22.7	39.8	2.1	**29.4**	3.4	**157.4**	
JC	***J1***	2,030,559.0	46.62	0.65	0.80	0.0	0.90	0.96	0.0	0.16	0.51	2,030,559.0	0.16	0.51	300	300	2300	2300	0.05	17.14	5.0	4	1.6	24.5	41.6	2.0	**15.0**	3.4	**80.3**	
See SCS table for Marksheffel Tributary Design Points																														

Rational Method - Proposed Conditions

Project Name: BRADLEY HEIGHTS MDDP
Project Location: COLORADO SPRINGS, EL PASO COUNTY, CO
Designer JTS
Notes: Proposed Condition

Average Channel Velocity 4.00 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)
SOIL TYPE CHOSEN BASED ON WORST CASE FOR TRIBUTARY AREA

Channel Flow Type Key
Heavy Meadow 2
Tillage/Field 3
Short Pasture and Lawns 4
Nearly Bare Ground 5
Grassed Waterway 6
Paved Areas 7

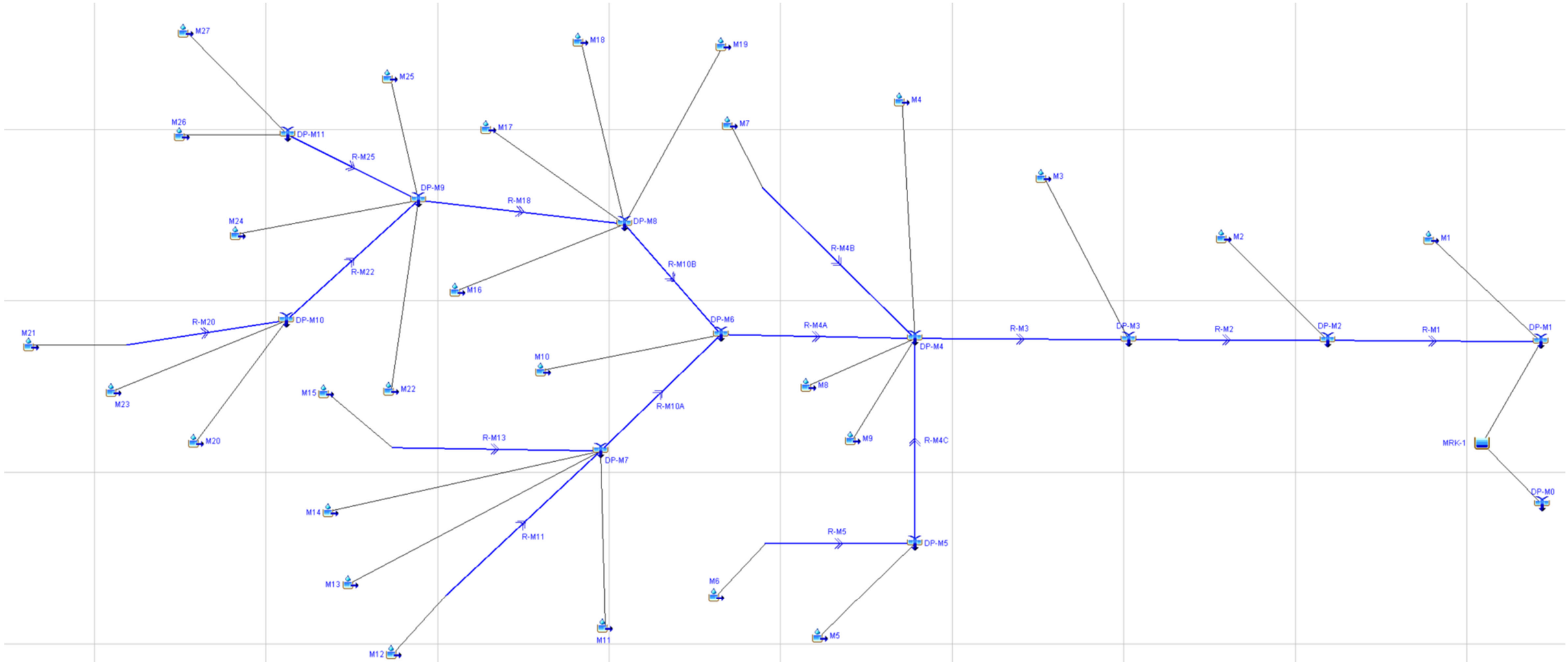
PCT Impervious 95% 65% 100% 70% 30% 2%

Sub-basin	Comments	Area			Soil Group	Rational 'C' Values																		Percent Impervious	Flow Lengths				Tc						Rainfall Intensity & Rational Flow Rate					Sub-basin
						Commercial Areas (95% Impervious)			Residential (1/8 or less) (65% Impervious)			Pavement (100% Impervious)			Neighborhoods/Multi-Family (70% Impervious)			Residential (1/3 Acre) (30% Impervious)			Undeveloped/Pervious Areas (2% Impervious)			Composite		Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	
		sf	acres	Sq. Mi.		C5	C100	Area	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	
BR1	*NORTH OF TRAILS AT ASPEN RIDGE*	1215922	2.80	0.0044	B	0.81	0.88	42600	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36	79392	0.34	0.54	34.48	100	100	1268	1268	0.02	10.84	3.0	4	1.21	17.43	28.26	2.51	**2.4**	4.21	**6.4**	*BR1*
BH1	*NE CORNER OF TRAILS, NW CORNER OF BRADLEY HEIGHTS*	69052	1.59	0.0025	B	0.81	0.88		0.45	0.59		0.90	0.96	11729	0.49	0.62		0.25	0.47		0.09	0.36	57323	0.23	0.46	18.65	100	100	549	549	0.02	12.46	3.0	4	1.21	7.55	20.01	3.01	**1.1**	5.06	**3.7**	*BH1*
BH2	*DITCH BETWEEN BRADLEY ROAD & BRADLEY HEIGHTS EAST*	130927	3.01	0.0047	B	0.81	0.88		0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36	130927	0.09	0.36	2.00	20	20	1233	1233	0.05	4.75	2.0	4	0.99	20.76	25.51	2.65	**0.7**	4.45	**4.9**	*BH2*
BHE	*BRADLEY HEIGHTS EAST F 1&2 UNDEVELOPED/DISCHARGE FROM MKJCC Pond #*	1755694	40.31	0.0630	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	1755694	0.16	0.51	2.00	100	100	2332	2332	0.05	9.89	2.0	7	2.83	13.74	23.63	2.76	**8.8**	4.64	**86.4**	*BHE*
BHE2	*BRADLEY HEIGHTS EAST F 3&4 UNDEVELOPED/DISCHARGE FROM MKJCC POND #11*	382000	8.77	0.0137	B	0.81	0.88		0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36	382000	0.09	0.36	2.00	100	100	898	898	0.05	10.63	3.0	4	1.21	12.34	22.97	2.81	**0.9**	4.71	**18.9**	*BHE2*
BHE3	*BRADLEY HEIGHTS EAST F 5&6 - DEVELOPED FLOWS*	941040	21.60	0.0338	D	0.82	0.89		0.49	0.65	941040	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.63	65.00	100	100	1100	1100	0.05	6.42	3.0	7	3.46	5.29	11.71	3.85	**41.1**	6.47	**91.6**	*BHE3*
BHC	*BRADLEY HEIGHTS COMMERCIAL UNDEVELOPED/DISCHARGE FROM MKJCC POND #10*	612207	14.05	0.0220	B	0.81	0.88		0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36	612207	0.09	0.36	2.00	100	100	1166	1166	0.05	10.63	2.0	4	0.99	19.63	30.26	2.41	**3.1**	4.05	**20.7**	*BHC*
TAR-NE	*NORTHEAST TRAILS AT ASPEN RIDGE (PART OF TAR F4) UNDEVELOPED/DISCHARGE FROM FSD*	398439	9.15	0.0143	B	0.81	0.88		0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36	398439	0.09	0.36	2.00	100	100	1750	1750	0.05	10.63	2.0	7	2.83	10.31	20.94	2.94	**0.2**	4.95	**7.9**	*TAR-NE*
BL1	*WEST HALF OF BRADLEY LANDING DRAINING TO NORTH. PORTION OF BRADLEY ROAD DRAINING EAST*	130000	2.98	0.0047	B	0.81	0.88	130000	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	20	20	1372	1372	0.03	1.62	3.0	7	3.46	6.60	8.21	4.41	**10.7**	7.40	**19.6**	*BL1*
BL2	*EAST HALF OF BRADLEY LANDING*	60354	1.39	0.0022	B	0.81	0.88	60354	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	20	20	1212	1212	0.05	1.37	3.3	7	3.63	5.56	6.92	4.66	**5.3**	7.83	**9.6**	*BL2*
RHC1	*SOUTH HALF OF BRADLEY ROAD BETWEEN BLISS AND BRADLEY LANDING*	107935	2.48	0.0039	B	0.81	0.88	107935	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	92	92	1343	1343	0.02	3.97	1.9	7	2.76	8.12	12.09	3.80	**7.7**	6.39	**14.0**	*RHC1*
RHC2	*EAST HALF OF BLISS ROAD ADJACENT TO REDEMPTION HILL CHURCH*	25483	0.59	0.0009	B	0.81	0.88	25483	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	20	20	546	546	0.02	1.85	1.0	7	2.00	4.55	6.40	4.77	**2.3**	8.01	**4.2**	*RHC2*
RHC3	*REDEMPTION HILL CHURCH*	431154	9.90	0.0155	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68	431154	0.30	0.57		0.16	0.51		0.53	0.68	70.00	100	100	1110	1110	0.02	8.14	2.0	7	2.83	6.54	14.68	3.50	**18.5**	5.87	**39.9**	*RHC3*
RHC4	*RHC ADJACENT PROPERTY OWNED BY THE CHURCH*	1055503	24.23	0.0379	D	0.82	0.89		0.49	0.65	1055503	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	1035	1035	0.05	6.42	3.0	7	3.46	4.98	11.40	3.90	**46.6**	6.55	**103.9**	*RHC4*
BS1	*BLISS ROAD*	137852	3.16	0.0049	B	0.81	0.88	60390	0.45	0.59	77462	0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.61	0.72	58.14	100	100	980	980	0.05	5.18	1.8	7	2.68	6.09	11.26	3.92	**7.6**	6.58	**15.0**	*BS1*
BS2	*BLISS ROAD*	35937	0.83	0.0013	B	0.81	0.88	35937	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	20	20	980	980	0.05	1.37	1.8	7	2.68	6.09	7.45	4.55	**3.1**	7.64	**5.6**	*BS2*
BS3	*BLISS ROAD*	33528	0.77	0.0012	D	0.82	0.89	33528	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	100	100	737	737	0.05	2.95	2.3	7	3.03	4.05	6.99	4.64	**3.0**	7.80	**5.4**	*BS3*
BS4	*BLISS ROAD*	30562	0.70	0.0011	D	0.82	0.89	30562	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	737	737	0.05	2.08	2.3	7	3.03	4.05	6.13	4.83	**2.8**	8.12	**5.1**	*BS4*
BS5	*BLISS ROAD*	52249	1.20	0.0019	D	0.82	0.89	52249	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	1147	1147	0.05	2.08	1.8	7	2.68	7.12	9.20	4.23	**4.2**	7.11	**7.6**	*BS5*
BS6	*BLISS ROAD*	21806	0.50	0.0008	D	0.82	0.89	21806	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	555	555	0.05	2.08	1.8	7	2.68	3.45	5.53	4.97	**2.1**	8.35	**3.8**	*BS6*
MK1	*SCHOOL & PUD*	912529	20.95	0.1388	D	0.82	0.89	912529	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	100	100	1170	1170	0.05	2.95	3.0	7	3.46	5.63	8.57	4.34	**75.1**	7.29	**137.0**	*MK1*
MK2	*PUD-MARKSHEFFEL-WOODMEN INVESTMENTS, LLC*	491552	11.28	0.1079	D	0.82	0.89		0.49	0.65	491552	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	1056	1056	0.05	6.42	3.0	7	3.46	5.08	11.50	3.88	**21.6**	6.52	**48.2**	*MK2*
MK3	*BRADLEY LANDING BOULEVARD*	71539	1.64	0.1660	D	0.82	0.89	71539	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	1303	1303	0.05	2.08	1.2	7	2.19	9.91	11.99	3.82	**5.2**	6.41	**9.4**	*MK3*
MK4	*BRADLEY LANDING BOULEVARD*	71100	1.63	0.2257	D	0.82	0.89	71100	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	830	830	0.05	2.08	1.2	7	2.19	6.31	8.39	4.37	**5.9**	7.35	**10.8**	*MK4*
MK5	*BRADLEY RIDGE ROAD*	26108	0.60	0.1136	D	0.82	0.89	26108	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	157	157	0.05	2.08	1.0	7	2.00	1.31	3.00	5.10	**2.5**	8.58	**4.6**	*MK5*
MK6	*PUD-MARKSHEFFEL-WOODMEN INVESTMENTS, LLC*	2270661	52.13	0.0924	D	0.82	0.89		0.49	0.65	2270661	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	1500	1500	0.05	6.42	3.0	7	3.46	7.22	13.63	3.61	**93.0**	6.07	**207.3**	*MK6*
MK7	*PUD-MARKSHEFFEL-WOODMEN INVESTMENTS, LLC*	1085533	24.92	0.2321	D	0.82	0.89		0.49	0.65	1085533	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	1650	1650	0.05	6.42	3.0	7	3.46	7.94	14.35	3.53	**43.5**	5.93	**96.9**	*MK7*
MK8	*MARKSHEFFEL ROAD/MARKSHEFFEL TRIB. DOWNSTREAM OF CC POND.*	351015	8.06	0.2844	D	0.82	0.89	98617	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	252398	0.35	0.62	28.13	50	50	1200	1200	0.02	7.62	1.8	4	0.94	21.30	28.91	2.47	**6.9**	4.16	**20.8**	*MK8*
MK9	*PUD-PIKES PEAK COUNCIL BOYS MULTI-FAMILY IN MDDP-2015*	1796376	41.24	0.2554	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68	1796376	0.30	0.57		0.16	0.51		0.53	0.68	70.00	100	100	2500	2500	0.05	6.00	0.8	7	1.79	23.29	29.29	2.46	**54.1**	4.13	**116.6**	*MK9*
MK10	*BRADLEY RIDGE ROAD*	85832	1.97	0.3000	D	0.82	0.89	85832	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	2150	2150	0.05	2.08	4.0	7	4.00	8.96	11.04	3.95	**6.4**	6.63	**11.7**	*MK10*
CC	*COLORADO CENTRE POND/MARKSHEFFEL TRIBUTARY FUTURE FLOW PATH*	2259954	51.88	0.1399	D	0.82	0.89	207592	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	2052362	0.22	0.54	10.54	300	100	6000	6200	0.05	16.03	0.5	4	0.49	208.76	224.79	0.63	**7.3**	1.06	**30.2**	*CC*
MK11	*BRADLEY RIDGE ROAD*	195555	4.49	0.2290	D	0.82	0.89	77886	0.49	0.65		0.90	0.96		0.53	0.68	72375	0.30	0.57		0.16	0.51	45294	0.56	0.72	64.21	50	50	1673	1673	0.05	4.02	4.0	7	4.00	6.97	10.99	3.95	**10.0**	6.64	**21.8**	*MK11*
MK12	*1ST COLLECTOR WEST OF MARKSHEFFEL*	16546	0.38	0.1033	D	0.82	0.89	16546	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	400	400	0.05	2.08	3.7	7	3.85	1.73	5.00	5.10	**1.6**	8.58	**2.9**	*MK12*
MK13	*BRADLEY RIDGE DEVELOPMENT*	685860	15.75	0.2075	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68	685860	0.30	0.57		0.16	0.51		0.53	0.68	70.00	100	100	1425	1425	0.05	6.00	3.0	7	3.46	6.86	12.85	3.71	**31.2**	6.23	**67.2**	*MK13*
MK14	*BRADLEY RIDGE DEVELOPMENT*	131504	3.02	0.0047	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68	131504	0.30	0.57		0.16	0.51		0.53	0.68	70.00	100	100	610	610	0.05	6.00	3.0	7	3.46	2.93	8.93	4.28	**6.9**	7.19	**14.9**	*MK14*
MK15	*BRADLEY RIDGE ROAD*	29148	0.67	0.0010	D	0.82	0.89	29148	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	550	550	0.05	2.08	4.0	7	4.00	2.29	5.00	5.10	**2.8**	8.58	**5.1**	*MK15*
MK16	*MARKSHEFFEL ROAD & UNDEVELOPED CITY PROPERTY*	293102	6.73	0.0105	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	293102	0.16	0.51	2.00	50	50	760	760	0.05	7.00	4.8	4	1.53	8.26	15.25	3.44	**3.7**	5.77	**20.0**	*MK16*
JC1	*1ST COLLECTOR WEST OF MARKSHEFFEL-WEST SIDE*	80679	1.85	0.1556	D	0.82	0.89	35729	0.49	0.65		0.90	0.96		0.53	0.68	30402	0.30	0.57		0.16	0.51	14548	0.59	0.74	68.81	20	20	795	795	0.05	2.39	2.3	7	3.03	4.37	6.76	4.69	**5.2**	7.88	**10.9**	*JC1*
JC2	*1ST COLLECTOR WEST OF MARKSHEFFEL-EAST SIDE*	32553	0.75	0.1591	D	0.82	0.89	32553	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	20	20	795	795	0.05	1.32	2.3	7	3.03	4.37	5.68	4.94	**3.0**	8.29	**5.6**	*JC2*
JC3	*BRADLEY RIDGE DEVELOPMENT 70% impervious used to provide more conservative flow*	788205	18.09	0.1786	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68	788205	0.30	0.57		0.16	0.51		0.53	0.68	70.00	100	100	1150	1150	0.05	6.00	4.0	7	4.00	4.79	10.79	3.98	**38.5**	6.69	**83.0**	*JC3*
JC4	*BRADLEY RIDGE DEVELOPMENT*	729417	16.75	0.1951	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68	729417	0.30	0.57		0.16	0.51		0.53	0.68	70.00	100	100	1181	1181	0.05	6.00	2.3	7	3.03	6.49	12.48	3.75	**33.6**	6.31	**72.4**	*JC4*
JC5	*MARKSHEFFEL ROAD & UNDEVELOPED CITY PROPERTY*	326813	7.50	0.0117	D	0.82	0.89	207805	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	119008	0.58	0.75	61.13	100	100	1692	1692	0.05	5.48	2.9	4	1.19	23.66	29.13	2.46	**10.8**	4.14	**23.5**	*JC5*
WF1	*BRADLEY HEIGHTS EAST FILINGS 3&4*	696679	15.99	0.0250	B	0.81	0.88		0.45	0.59	696679	0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.45	0.59	65.00	100	100	1466	1466	0.05	6.84	2.0	7	2.83	8.64	15.48	3.41	**24.8**	5.73	**54.5**	*WF1*
WF2	*BRADLEY LANDING (WEST SIDE) & LEGACY HILL DR (NORTH SIDE)*	201537	4.63	0.0072	B	0.81	0.88	17670	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36	183867	0.15	0.41	10.15	50	50	1070	1070	0.05	7.05	4.1	7	4.05	4.40	11.45	3.89	**2.8**	6.53	**12.4**	*WF2*
WF3	*SOUTH HALF OF LEGACY HILL DRIVE*	32652	0.75	0.0012	B	0.81	0.88	32652	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	30	30	589	589	0.05	1.67	1.0	7	2.00	4.91	6.58	4.73	**2.9**	7.95	**5.3**	*WF3*
LH1	*LEGACY HILL NORTHSIDE DRAINING WEST*	7884	0.18	0.0003	B	0.81	0.88	7884	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	20	20	180	180	0.05	1.37	2.0	7	2.83	1.06	5.00	5.10	**0.8**	8.58	**1.4**	*LH1*
LH2	*LEGACY HILL NORTHSIDE DRAINING EAST*	7884	0.18	0.0003	B	0.81	0.88	7884	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	20	20	180	180	0.05	1.37	2.0	7	2.83	1.06	5.00	5.10	**0.8**	8.58	**1.4**	*LH2*
WF4	*BRADLEY HEIGHTS MULTI-FAMILY*	883225	20.28	0.0317	B	0.81	0.88		0.45	0.59		0.90	0.96		0.49	0.62	697669	0.25	0.47		0.09	0.36	185556	0.41	0.57	55.71	100	100	1484	1484	0.05	7.31	1.0	7	2.00	12.37	19.67	3.04	**25.2**	5.11	**59.0**	*WF4*
WF5	*BRADLEY HEIGHTS EAST FILINGS 3&4*	280402	6.44	0.0101	D	0.82	0.89		0.49	0.65	280402	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	1471	1471	0.05	6.42	1.1	7	2.10	11.69	18.10	3.17	**10.1**	5.32	**22.4**	*WF5*
WF6	*BRADLEY LANDING (WEST SIDE)*	46250	1.06	0.0017	D	0.82	0.89	46250	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	961	961	0.05	2.08	1.1	7	2.10	7.64	9.71	4.15	**3.6**	6.97	**6.6**	*WF6*
WF7	*BRADLEY RIDGE DEVELOPMENT SOUTHWEST OF BRADLEY RIDGE ROAD*	584103	13.41	0.0210	D	0.82	0.89		0.49	0.65	584103	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	823	823	0.05	6.42	3.0	7	3.46	3.96	10.38	4.04	**26.8**	6.79	**59.7**	*WF7*
WF8	*WF/CC POND #1*	579521	13.30	0.0208	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	579521	0.16	0.51	2.00	100	100	1025	1025	0.05	9.89	2.0	4	0.99	17.26	27.15	2.56	**5.5**	4.30	**29.4**	*WF8*
WF9	*OFFSITE AREAS: CSU FUTURE SUBSTATION*	550374	12.63	0.0197	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	550374	0.16	0.51	2.00	100	100	819	819	0.05	9.89	2.0	4	0.99	13.79	23.68	2.76	**5.6**	4.64	**30.1**	*WF9*
WF10	*NORTH SIDE OF BRADLEY RIDGE ROAD*	67865	1.56	0.0024	B	0.81	0.88	67865	0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.81	0.88	95.00	50	50	765	765	0.05	2.16	1.7	7	2.61	4.89	7.04	4.63	**5.9**	7.78	**10.8**	*WF10*
WF11	*SOUTH SIDE OF BRADLEY RIDGE ROAD*	47120	1.08	0.0017	D	0.82	0.89	47120	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	765	765	0.05	2.08	1.7	7	2.61	4.89	6.97	4.65	**4.2**	7.81	**7.6**	*WF11*
WF12a	*BRADLEY RIDGE DEVELOPMENT SOUTWEST OF BRADLEY RIDGE AND COLLECTOR 2*	1364268	31.32	0.0489	D	0.82	0.89		0.49	0.65	1037630	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51	326638	0.41	0.62	49.92	100	100	2777	2777	0.05	7.25	4.0	7	4.00	11.57	18.82	3.11	**40.3**	5.22	**101.6**	*WF12a*
WF12b	*BRADLEY RIDGE DEVELOPMENT SOUTWEST OF BRADLEY RIDGE AND COLLECTOR 2*	1118584	25.68	0.0401	D	0.82	0.89		0.49	0.65	1118584	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	2777	2777	0.05	6.42	4.0	7	4.00	11.57	17.99	3.18	**40.3**	5.34	**89.8**	*WF12b*
WF13	*WEST HALF OF COLLECTOR 2*	44672	1.03	0.0016	D	0.82	0.89	44672	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	50	50	1050	1050	0.05	2.08	4.6	7	4.29	4.08	6.16	4.82	**4.1**	8.10	**7.5**	*WF13*
WF14	*EAST HALF OF COLLECTOR 2*	137679	3.16	0.0049	D	0.82	0.89	48793	0.49	0.65		0.90	0.96		0.53	0.68	88886	0.30	0.57		0.16	0.51		0.63	0.75	78.86	50	50	1050	1050	0.05	3.48	4.6	7	4.29	4.08	7.55	4.53	**9.1**	7.61	**18.3**	*WF14*
WF15	*BRADLEY RIDGE DEVELOPMENT SOUTH OF BRADLEY RIDGE AND EAST OF COLLECTOR 2*	1255752	28.83	0.0450	D	0.82	0.89		0.49	0.65	1255752	0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.49	0.65	65.00	100	100	1645	1645	0.05	6.42	4.0	7	4.00	6.85	13.27	3.66	**52.1**	6.14	**116.0**	*WF15*
WF16	*WEST HALF OF COLLECTOR 2 NEAR SOUTH BOUND OF BRADLEY HEIGHTS*	3901	0.09	0.0001	D	0.82	0.89	3901	0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.82	0.89	95.00	20	20	118	118	0.05	1.32	1.0

Rational Method - Proposed Conditions

DESIGN POINTS	Sub-basins/Comments	Area			Soil Group	Rational 'C' Values																		Composite		Percent Impervious	Flow Lengths								Tc	Rainfall Intensity & Rational Flow Rate				DESIGN POINTS
						Commercial Areas (95% Impervious)			Residential (1/8 or less) (65% Impervious)			Pavement (100% Impervious)			Neighborhoods/Multi-Family (70% Impervious)			Residential (1/3 Acre) (30% Impervious)			Undeveloped/Pervious Areas (2% Impervious)						Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	
						C5	C100	Area	C5	C100	Area	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	
TAR-NEP	*TRAILS AT ASPEN RIDGE NORTHEAST POND*	398439	9.15	0.0143	B	0.81	0.88		0.45	0.59	0	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	398439	0.09	0.36	2.00	100	100	1150	1150	0.05	10.63	2.9	4	1.19	16.08	26.71		**0.2**		**7.9**	*TAR-NEP*
A	*1ST ENTRANCE EAST OF TAR*	589483	13.53	0.0211	B	0.81	0.88	42600	0.45	0.59	0	0.90	0.96	11729	0.49	0.62	0	0.25	0.47	0	0.09	0.36	535154	0.16	0.41	10.67	100	100	1882	1882	0.05	9.91	3.0	4	1.21	25.87	35.78	2.19	**1.3**	3.67	**11.6**	*A*
B	*2ND ENTRANCE EAST OF TAR*	1585690	36.36	0.0568	B	0.81	0.88	42600	0.45	0.59	0	0.90	0.96	11729	0.49	0.62	0	0.25	0.47	0	0.09	0.36	917154	0.08	0.24	4.45	100	100	2432	2432	0.05	10.73	3.0	4	1.21	33.43	44.16	1.92	**5.7**	3.23	**28.3**	*B*
C	*BRADLEY LANDING BLVD CROSSING*	1585690	36.36	0.0568	B	0.81	0.88	42600	0.45	0.59	0	0.90	0.96	11729	0.49	0.62	0	0.25	0.47	0	0.09	0.36	1529361	0.12	0.38	5.23	100	100	2830	2830	0.05	10.56	3.0	4	1.21	38.90	49.26	1.80	**5.7**	3.02	**28.3**	*C*
D	*BLISS ROAD BYPASS STORM*	1714617	39.36	0.0615	B	0.81	0.88	42600	0.45	0.59	0	0.90	0.96	11729	0.49	0.62	0	0.25	0.47	0	0.09	0.36	1660288	0.11	0.38	4.98	100	100	4063	4063	0.05	10.59	3.0	4	1.21	55.85	66.23	1.48	**6.7**	2.49	**37.3**	*D*
E	*MKJCC POND #9 DISCHARGE & DP D*	3470311	79.67	0.1245	B	0.81	0.88	42600	0.45	0.59	0	0.90	0.96	11729	0.49	0.62	0	0.25	0.47	0	0.09	0.36	3415982	0.10	0.37	3.47	100	100	4063	4063	0.05	10.51	3.0	4	1.21	55.85	66.36	1.48	**15.5**	2.49	**123.7**	*E*
BL-1	*INLET BL-1*	130000	2.98	0.0047	B	0.81	0.88	130000	0.45	0.59	0	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.81	0.88	95.00	20	20	1372	1372	0.03	1.62	3.0	7	3.46	6.60	8.21	4.41	**10.7**	7.40	**19.6**	*BL-1*
BL-2	*INLET BL-2 OUTFLOW*	190354	4.37	0.0068	B	0.81	0.88	190354	0.45	0.59	0	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.81	0.88	95.00	20	20	1372	1372	0.03	1.62	3.0	7	3.46	6.60	8.21	4.41	**15.7**	7.40	**28.7**	*BL-2*
F	*BS1*	137852	3.16	0.0049	B	0.81	0.88	60390	0.45	0.59	77462	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.61	0.72	78.14	100	100	980	980	0.05	5.18	1.8	7	2.68	6.09	11.26	3.92	**7.6**	6.58	**15.0**	*F*
G	*BS2*	35937	0.83	0.0013	B	0.81	0.88	35937	0.45	0.59	0	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.81	0.88	95.00	20	20	980	980	0.05	1.37	1.8	7	2.68	6.09	7.45	4.53	**3.1**	7.64	**5.6**	*G*
H	*BS3-2*	173789	3.99	0.0062	B	0.81	0.88	96327	0.45	0.59	77462	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.65	0.75	81.63	100	100	980	980	0.05	4.74	1.8	7	2.68	6.09	10.82	3.98	**10.4**	6.68	**20.2**	*H*
RH1	*RHC1*	107935	2.48	0.0039	B	0.81	0.88	107935	0.45	0.59	0	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.81	0.88	95.00	92	92	1343	1343	0.02	3.97	1.9	7	2.76	8.12	12.09	3.80	**7.7**	6.39	**14.0**	*RH1*
RH2	*RHC1-RHC2*	133418	3.06	0.0048	B	0.81	0.88	133418	0.45	0.59	0	0.90	0.96	0	0.49	0.62	0	0.25	0.47	0	0.09	0.36	0	0.81	0.88	95.00	92	92	1343	1343	0.02	3.97	1.9	7	2.76	8.12	12.09	3.80	**9.5**	6.39	**17.4**	*RH2*
MKJCC POND #8	*RHC1-RHC3 (SEE PDR/FDR FOR MORE DETAILED ANALYSIS OF THE REDEMPTION HILL CHURCH SITE*	564572	12.96	0.0203	D	0.82	0.89	133418	0.49	0.65	0	0.90	0.96	0	0.53	0.68	431154	0.30	0.57	0	0.16	0.51	0	0.60	0.73	75.91	100	100	2443	2443	0.02	7.16	1.9	7	2.76	14.77	21.93	2.87	**22.5**	4.83	**46.0**	*MKJCC POND #8*
MKJCC POND #8	*OUTFLOW*	564572	12.96	0.0203	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.00	0.00	0.00		0		0		#DIV/0!							**3.6**		**11.3**	*MKJCC POND #8*
DP-M3	*HEC-HMS CALCS CUMULATIVE OF OFFSITE FLOWS, MKJCC POND #8-MKJCC POND#11*	133507044	3064.90	4.7889	B	0.81	0.88		0.45	0.59		0.90	0.96		0.49	0.62		0.25	0.47		0.09	0.36		0.00	0.00	0.00													**284.6**		**1209.3**	*DP-M3*
I	*BS3, BS5*	85777	1.97	0.0031	D	0.82	0.89	85777	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	100	100	737	737	0.05	2.95	2.3	7	3.03	4.05	6.99	4.64	**7.6**	7.80	**13.8**	*I*
J	*BS4, BS6*	52368	1.20	0.0019	D	0.82	0.89	52368	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	20	20	737	737	0.05	1.32	2.3	7	3.03	4.05	5.36	5.01	**5.0**	8.42	**9.1**	*J*
K	*BS3-BS6*	138145	3.17	0.0050	D	0.82	0.89	138145	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	100	100	737	737	0.05	2.95	2.3	7	3.03	4.05	6.99	4.64	**12.2**	7.80	**22.2**	*K*
L	*BS3-BS6, BHE3*	1079185	24.77	0.0387	D	0.82	0.89	138145	0.49	0.65	941040	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.53	0.68	68.84	100	100	1400	1400	0.05	5.98	2.5	7	3.16	7.38	13.35	3.65	**48.5**	6.13	**104.1**	*L*
MKJCC POND #7	*BS3-BS6, BHE3, MK1, RHC4*	3047217	69.95	0.1093	D	0.82	0.89	1050674	0.49	0.65	1996543	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.60	0.73	75.34	100	100	2435	2435	0.05	5.22	2.5	7	3.16	12.83	18.05	3.17	**135.1**	5.33	**275.4**	*MKJCC POND #7*
MKJCC POND #7	*OUTFLOW*	3047217	69.95	0.1093	D	0.82	0.89	1050674	0.49	0.65	1996543	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.60	0.73	75.34	100	100	2435	2435	0.05	5.22	2.5	7					**23.5**		**177.2**	*MKJCC POND #7*
DP-M2	*HEC-HMS CALCS CUMULATIVE OF OFFSITE FLOWS, MKJCC PONDS #6, #7, & #8*	139962636	3213.10	5.0205	D	0.82	0.89		0.49	0.65		0.90	0.96		0.53	0.68		0.30	0.57		0.16	0.51		0.00	0.00	0.00													**305.9**		**1220.2**	*DP-M2*
N	*MK3*	71539	1.64	0.0026	D	0.82	0.89	71539	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	1384	1384	0.05	2.08	1.2	7	2.19	10.53	12.61	3.74	**5.1**	6.28	**9.2**	*N*
O	*MK5*	26108	0.60	0.0009	D	0.82	0.89	26108	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	541	541	0.05	2.08	1.2	7	2.19	4.12	6.19	4.82	**2.4**	8.09	**4.4**	*O*
P	*MK4*	71100	1.63	0.0026	D	0.82	0.89	71100	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	830	830	0.05	2.08	1.2	7	2.19	6.31	8.39	4.37	**5.9**	7.35	**10.8**	*P*
Q	*MK3-MK5*	168747	3.87	0.0061	D	0.82	0.89	168747	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	1384	1384	0.05	2.08	1.2	7	2.19	10.53	12.61	3.74	**12.0**	6.28	**21.8**	*Q*
R	*MK3-5*	660299	15.16	0.0237	D	0.82	0.89	168747	0.49	0.65	491552	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.57	0.71	72.67	100	100	1100	1100	0.05	5.53	3.0	7	3.46	5.29	10.82	3.98	**34.9**	6.68	**72.7**	*R*
MKJCC POND #5	*MK2-MK6*	2930960	67.29	0.1051	D	0.82	0.89	168747	0.49	0.65	2762213	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.51	0.66	66.73	100	100	2050	2050	0.05	6.22	4.0	7	4.00	8.54	14.76	3.49	**120.4**	5.86	**263.8**	*MKJCC POND #5*
MKJCC POND #5	*OUTFLOW*	2930960	67.29	0.1051	D	0.82	0.89	168747	0.49	0.65	2762213	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.51	0.66	66.73	100	100	2050	2050	0.05	6.22	4.0	7					**24.2**		**203.5**	*MKJCC POND #5*
DP-M1	*HEC-HMS CALCS CUMULATIVE OF OFFSITE FLOWS AND MKJCC PONDS #5-#8*	141505972	3248.53	5.0758				168747			2762213			0			0			0				0.00	0.00	1.38													**330.7**		**1217.9**	*DP-M1*
COLORADO CENTRE DETENTION POND	*HEC-HMS CALCS CUMULATIVE OF OFFSITE FLOWS AND MKJCC PONDS #5-#8, AND MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK CHANNEL FLOWS SOUTH OF BRADLEY ROAD*	141505972	3248.53	5.0758				376339			2762213			0			0			0			2052562	0.00	0.00	1.55													**327.1**		**1001.2**	*COLORADO CENTRE DETENTION POND*
S	*MK11*	195555	4.49	0.0070	D	0.82	0.89	77886	0.49	0.65	0	0.90	0.96	0	0.53	0.68	72375	0.30	0.57	0	0.16	0.51	45294	0.56	0.72	64.21	50	50	1673	1673	0.05	4.02	4.0	7	4.00	6.97	10.99	3.95	**10.0**	6.64	**21.8**	*S*
T	*MK12*	16546	0.38	0.0006	D	0.82	0.89	16546	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	400	400	0.05	2.08	3.7	7	3.85	1.73	5.00	5.10	**1.6**	8.58	**2.9**	*T*
U	*MK11-MK12*	212101	4.87	0.0076	D	0.82	0.89	94432	0.49	0.65	0	0.90	0.96	0	0.53	0.68	72375	0.30	0.57	0	0.16	0.51	45294	0.58	0.74	66.61	50	50	1673	1673	0.05	3.87	3.7	7	3.85	7.25	11.11	3.94	**11.2**	6.61	**23.9**	*U*
U2	*MK13-MK13*	897961	20.61	0.0322	D	0.82	0.89	94432	0.49	0.65	0	0.90	0.96	0	0.53	0.68	758235	0.30	0.57	0	0.16	0.51	45294	0.54	0.69	69.20	50	50	1673	1673	0.05	4.15	3.7	7	3.85	7.25	11.40	3.90	**43.9**	6.55	**94.3**	*U2*
V	*MK13-MK14*	3029465	23.63	0.0369	D	0.82	0.89	94432	0.49	0.65	0	0.90	0.96	0	0.53	0.68	889739	0.30	0.57	0	0.16	0.51	45294	0.54	0.69	69.30	50	50	1873	1873	0.05	4.17	3.7	7	3.85	8.11	12.28	3.78	**48.6**	6.35	**104.6**	*V*
W	*MK15*	29148	0.67	0.0010	D	0.82	0.89	29148	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	550	550	0.05	2.08	4.0	7	4.00	2.29	5.00	5.10	**2.8**	8.58	**5.1**	*W*
X	*MK10*	85832	1.97	0.0031	D	0.82	0.89	85832	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	2150	2150	0.05	2.08	4.0	7	4.00	8.96	11.04	3.95	**6.4**	6.63	**11.7**	*X*
Y	*MK10, MK15*	114980	2.64	0.0041	D	0.82	0.89	114980	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	2150	2150	0.05	2.08	4.0	7	4.00	8.96	11.04	3.95	**8.6**	6.63	**15.7**	*Y*
Z	*MK10-MK15*	1144445	26.27	0.0411	D	0.82	0.89	209412	0.49	0.65	0	0.90	0.96	0	0.53	0.68	889739	0.30	0.57	0	0.16	0.51	45294	0.57	0.71	71.88	50	50	2150	2150	0.05	3.96	4.0	7	4.00	8.96	12.91	3.70	**55.7**	6.22	**117.1**	*Z*
MKJCC POND #4	*MK7, MK10-MK16-INFLOW*	2229978	51.19	0.0800	D	0.82	0.89	209412	0.49	0.65	1085533	0.90	0.96	0	0.53	0.68	889739	0.30	0.57	0	0.16	0.51	45294	0.53	0.68	68.53	100	100	2050	2050	0.05	6.00	4.0	7	4.00	8.54	14.53	3.51	**96.1**	5.90	**207.6**	*MKJCC POND #4*
MKJCC POND #4	*MK7, MK10-MK16-OUTFLOW*	2229978	51.19	0.0800	D	0.82	0.89	209412	0.49	0.65	1085533	0.90	0.96	0	0.53	0.68	889739	0.30	0.57	0	0.16	0.51	45294	0.53	0.68	68.53													**10.0**		**70.3**	*MKJCC POND #4*
MKJCC POND #6	*MK9*	1796376	41.24	0.0644	D	0.82	0.89	0	0.49	0.65	0	0.90	0.96	0	0.53	0.68	1796376	0.30	0.57	0	0.16	0.51	0	0.53	0.68	70.00	100		2500		0.05		0.8	7					**17.0**		**89.0**	*MKJCC POND #6*
DP-M0	*HEC-HMS CALCS CUMULATIVE OF OFFSITE FLOWS, COLORADO CENTRE REGIONAL POND DISCHARGE, POND MKJCC #4 DISCHARGE, AND MK-8*	143993179	3305.63	5.1650	D	0.82	0.89	684368	0.49	0.65	3847746	0.90	0.96	0	0.53	0.68	889739	0.30	0.57	0	0.16	0.51	2350054	0.02	0.03	2.65													**338.4**		**1003.8**	*DP-M0*
AA	*JC1*	80679	1.85	0.0029	D	0.82	0.89	35729	0.49	0.65	0	0.90	0.96	0	0.53	0.68	30402	0.30	0.57	0	0.16	0.51	14548	0.59	0.74	68.81	20	20	795	795	0.05	2.39	2.3	7	3.03	4.37	6.76	4.69	**5.2**	7.88	**10.9**	*AA*
AB	*JC2*	32553	0.75	0.0012	D	0.82	0.89	32553	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	20	20	795	795	0.05	1.32	2.3	7	3.03	4.37	5.68	4.94	**3.0**	8.29	**5.6**	*AB*
AC	*JC1-JC2*	113232	2.60	0.0041	D	0.82	0.89	68282	0.49	0.65	0	0.90	0.96	0	0.53	0.68	30402	0.30	0.57	0	0.16	0.51	14548	0.66	0.78	76.34	20	20	795	795	0.05	2.08	2.3	7	3.03	4.37	6.45	4.76	**8.2**	7.99	**16.4**	*AC*
AD	*JC1-JC3*	501437	20.69	0.0323	D	0.82	0.89	68282	0.49	0.65	0	0.90	0.96	0	0.53	0.68	818607	0.30	0.57	0	0.16	0.51	14548	0.55	0.69	70.80	100	100	1150	1150	0.05	5.83	4.0	7	4.00	4.79	10.62	4.01	**45.6**	6.73	**97.4**	*AD*
AE	*JC1-JC4*	1630854	37.44	0.0585	D	0.82	0.89	68282	0.49	0.65	0	0.90	0.96	0	0.53	0.68	1548024	0.30	0.57	0	0.16	0.51	14548	0.54	0.69	70.44	100	100	1450	1450	0.05	5.91	4.0	7	4.00	6.04	11.94	3.82	**77.7**	6.42	**166.6**	*AE*
JCC POND #3	*JC1-JC4*	1630854	37.44	0.0585	D	0.82	0.89	68282	0.49	0.65	0	0.90	0.96	0	0.53	0.68	1548024	0.30	0.57	0	0.16	0.51	14548	0.54	0.69	70.44	100	100	1450	1450	0.05	5.91	4.0	7	4.00	6.04	11.94	3.82	**7.4**	6.42	**59.8**	*JCC POND #3*
JC	*JC1-JC5*	1937667	44.94	0.0702	D	0.82	0.89	276087	0.49	0.65	0	0.90	0.96	0	0.53	0.68	1548024	0.30	0.57	0	0.16	0.51	133556	0.55	0.70	68.89	100	100	1450	1450	0.05	5.84	4.0	7	4.00	6.04	11.87	3.83	**18.2**	6.44	**83.3**	*JC*
AF	*WF10*	67865	1.56	0.0024	D	0.82	0.89	67865	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	765	765	0.05	2.08	1.7	7	2.61	4.89	6.97	4.65	**6.0**	7.81	**10.9**	*AF*
AG	*WF11*	47120	1.08	0.0017	D	0.82	0.89	47120	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	765	765	0.05	2.08	1.7	7	2.61	4.89	6.97	4.65	**4.2**	7.81	**7.6**	*AG*
AH	*WF10-WF11*	114985	2.64	0.0041	D	0.82	0.89	114985	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	50	50	765	765	0.05	2.08	1.7	7	2.61	4.89	6.97	4.65	**10.1**	7.81	**18.5**	*AH*
AI	*WF12b & WF13*	1408940	32.34	0.0505	D	0.82	0.89	44672	0.49	0.65	1037630	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	326638	0.42	0.63	51.35	100	100	2777	2777	0.05	7.12	4.0	7	4.00	11.57	18.68	3.12	**43.1**	5.24	**106.8**	*AI*
AJ	*WF14 & WF15*	1395431	31.99	0.0500	D	0.82	0.89	48793	0.49	0.65	1255752	0.90	0.96	0	0.53	0.68	88886	0.30	0.57	0	0.16	0.51	0	0.50	0.66	66.37	100	100	1645	1645	0.05	6.27	4.0	7	4.00	6.85	13.12	3.67	**59.7**	6.17	**131.4**	*AJ*
AK	*WF10-WF15 (Excluding WF12a)*	2917356	66.97	0.1046	D	0.82	0.89	2084560	0.49	0.65	2293382	0.90	0.96	0	0.53	0.68	88886	0.30	0.57	0	0.16	0.51	566338	0.48	0.65	62.24	100	100	3777	3777	0.05	6.55	4.0	7	4.00	15.74	22.28	2.85	**92.0**	4.79	**210.9**	*AK*
AL	*WF16*	3901	0.09	0.0001	D	0.82	0.89	3901	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	0	0.82	0.89	95.00	20	20	118	118	0.05	1.32	1.0	7	2.00	0.98	5.00	5.10	**0.4**	8.58	**0.7**	*AL*
AM	*WF17*	11725	0.27	0.0004	D	0.82	0.89	4177	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	7548	0.40	0.65	35.13	20	20	118	118	0.05	3.32	1.0	7	2.00	0.98	5.00	5.10	**0.5**	8.58	**1.5**	*AM*
AN	*WF16-WF17*	15626	0.36	0.0006	D	0.82	0.89	8078	0.49	0.65	0	0.90	0.96	0	0.53	0.68	0	0.30	0.57	0	0.16	0.51	7548	0.50	0.71	50.08	20	20	118	118	0.05	2.82	1.0	7	2.00	0.98	5.00	5.10	**0.9**	8.58	**2.2**	*AN*
AO	*WF16-WF17 (Excluding WF12a)*	2932982	67.33	0.1052	D	0.82	0.89	216528	0.49	0.65	2293382	0.90	0.96	0	0.53	0.68	88886	0.30	0.57	0	0.16	0.51	334186	0.48	0.65	60.19	100	100	3777	3777	0.05	6.55	4.0	7	4.00	15.74	22.28	2.85	**92.5**	4.79	**212.2**	*AO*
WFJCC POND #2-INFLOW	*DP AO and Sub-basin WF12a DESIGN POINT AP: POND INFLOWS*	4051566	93.01	0.1453	D	0.82	0.89	216528	0.49	0.65	3411966	0.90	0.96	0	0.53	0.68	88886	0.30	0.57	0	0.16	0.51	334186	0.48	0.65	61.52	100	100	3777	3777	0.05	6.51	4.0	7	4.00	15.74	22.25	2.85	**128.7**	4.79	**293.0**	*WFJCC POND #2-INFLOW*
WFJCC POND #2-OUTFLOW	*DP AO and Sub-basin WF12a DESIGN POINT AP: POND DISCHARGE*	4051566	93.01	0.1453	D	0.82	0.89	216528	0.49	0.65	3411966	0.90	0.96	0	0.53	0.68	88886	0.30	0.57

FEMA Effective Model: HMS Model Name: ***Jimmy Camp***



Global Summary Results for Run "100yr"

Project: Final Ex100 Simulation Run: 100yr

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 25Mar2022, 15:03:10

Basin Model: Jimmy Cam
Meteorologic Model: 100yr
Control Specifications: 100yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1816	1241.7	01Jan2000, 07:31	1.32
DP-M1	5.1816	1838.5	01Jan2000, 06:56	1.32
DP-M10	0.5764	188.6	01Jan2000, 06:30	0.90
DP-M11	0.3737	29.9	01Jan2000, 07:06	0.48
DP-M2	5.0230	1791.0	01Jan2000, 06:51	1.30
DP-M3	4.8017	1694.9	01Jan2000, 06:46	1.26
DP-M4	4.5721	1569.2	01Jan2000, 06:44	1.22
DP-M5	0.4034	178.9	01Jan2000, 06:19	0.97
DP-M6	3.2844	1065.0	01Jan2000, 06:42	1.11
DP-M7	0.7056	297.7	01Jan2000, 06:28	1.17
DP-M8	2.4400	709.1	01Jan2000, 06:35	1.07
DP-M9	1.3681	274.5	01Jan2000, 06:36	0.76
M1	0.1586	171.5	01Jan2000, 06:19	2.08
M10	0.1388	71.1	01Jan2000, 06:40	1.60
M11	0.1079	92.8	01Jan2000, 06:19	1.70
M12	0.1660	76.6	01Jan2000, 06:22	1.08
M13	0.2257	77.4	01Jan2000, 06:29	0.97
M14	0.1136	75.4	01Jan2000, 06:23	1.51
M15	0.0924	37.4	01Jan2000, 06:12	0.77
M16	0.2321	98.2	01Jan2000, 06:29	1.15
M17	0.2844	253.1	01Jan2000, 06:22	1.90
M18	0.2554	167.8	01Jan2000, 06:26	1.58
M19	0.3000	127.5	01Jan2000, 06:30	1.18
M2	0.2213	215.1	01Jan2000, 06:23	2.08
M20	0.1399	49.0	01Jan2000, 06:35	1.09
M21	0.2290	121.2	01Jan2000, 06:17	1.09
M22	0.1033	13.3	01Jan2000, 06:20	0.42
M23	0.2075	26.0	01Jan2000, 06:46	0.56
M24	0.1556	87.5	01Jan2000, 06:18	1.17
M25	0.1591	50.9	01Jan2000, 06:19	0.76
M26	0.1786	18.9	01Jan2000, 07:03	0.58
M27	0.1951	11.2	01Jan2000, 07:12	0.40
M3	0.2296	213.8	01Jan2000, 06:24	2.04
M4	0.2316	195.0	01Jan2000, 06:23	1.85
M5	0.1798	126.1	01Jan2000, 06:16	1.35
M6	0.2236	58.7	01Jan2000, 06:19	0.67
M7	0.1696	136.6	01Jan2000, 06:12	1.36
M8	0.2477	185.6	01Jan2000, 06:37	2.13
M9	0.2354	92.5	01Jan2000, 07:04	1.65
MRK-1	5.1816	1241.7	01Jan2000, 07:31	1.32
R-M1	5.0230	1788.1	01Jan2000, 06:57	1.29
R-M10A	0.7056	297.1	01Jan2000, 06:38	1.16
R-M10B	2.4400	707.3	01Jan2000, 06:46	1.06
R-M11	0.1660	76.5	01Jan2000, 06:35	1.08
R-M13	0.0924	37.4	01Jan2000, 06:41	0.76
R-M18	1.3681	274.1	01Jan2000, 06:54	0.76
R-M2	4.8017	1691.3	01Jan2000, 06:52	1.26
R-M20	0.2290	120.1	01Jan2000, 06:28	1.09
R-M22	0.5764	188.4	01Jan2000, 06:40	0.90
R-M25	0.3737	29.9	01Jan2000, 07:31	0.48
R-M3	4.5721	1568.2	01Jan2000, 06:48	1.22
R-M4A	3.2844	1061.4	01Jan2000, 06:49	1.10
R-M4B	0.1696	136.1	01Jan2000, 06:19	1.36
R-M4C	0.4034	178.6	01Jan2000, 06:23	0.97
R-M5	0.2236	58.7	01Jan2000, 06:24	0.67

Project: Final Ex100 Simulation Run: 10yr

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 25Mar2022, 15:27:38

Basin Model: Jimmy Camp
Meteorologic Model: 10yr
Control Specifications: 10yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1816	689.1	01Jan2000, 07:18	0.63
DP-M1	5.1816	764.0	01Jan2000, 07:05	0.63
DP-M10	0.5764	60.7	01Jan2000, 06:36	0.35
DP-M11	0.3737	4.2	01Jan2000, 07:26	0.13
DP-M2	5.0230	745.3	01Jan2000, 06:57	0.61
DP-M3	4.8017	703.6	01Jan2000, 06:49	0.59
DP-M4	4.5721	643.4	01Jan2000, 06:46	0.56
DP-M5	0.4034	57.4	01Jan2000, 06:21	0.40
DP-M6	3.2844	404.7	01Jan2000, 06:43	0.49
DP-M7	0.7056	104.1	01Jan2000, 06:34	0.52
DP-M8	2.4400	274.0	01Jan2000, 06:27	0.47
DP-M9	1.3681	81.3	01Jan2000, 06:48	0.28
M1	0.1586	87.8	01Jan2000, 06:20	1.14
M10	0.1388	31.6	01Jan2000, 06:43	0.80
M11	0.1079	42.8	01Jan2000, 06:20	0.86
M12	0.1660	25.8	01Jan2000, 06:24	0.46
M13	0.2257	23.9	01Jan2000, 06:32	0.39
M14	0.1136	32.3	01Jan2000, 06:25	0.73
M15	0.0924	8.7	01Jan2000, 06:15	0.27
M16	0.2321	35.0	01Jan2000, 06:32	0.50
M17	0.2844	123.3	01Jan2000, 06:24	1.01
M18	0.2554	74.0	01Jan2000, 06:28	0.78
M19	0.3000	46.3	01Jan2000, 06:33	0.52
M2	0.2213	109.6	01Jan2000, 06:24	1.14
M20	0.1399	16.8	01Jan2000, 06:38	0.46
M21	0.2290	41.3	01Jan2000, 06:19	0.46
M22	0.1033	0.8	01Jan2000, 06:49	0.10
M23	0.2075	4.1	01Jan2000, 06:59	0.17
M24	0.1556	31.5	01Jan2000, 06:20	0.51
M25	0.1591	11.6	01Jan2000, 06:22	0.27
M26	0.1786	3.4	01Jan2000, 07:20	0.17
M27	0.1951	1.1	01Jan2000, 08:24	0.09
M3	0.2296	108.0	01Jan2000, 06:25	1.11
M4	0.2316	93.7	01Jan2000, 06:25	0.97
M5	0.1798	50.7	01Jan2000, 06:18	0.63
M6	0.2236	10.9	01Jan2000, 06:24	0.22
M7	0.1696	55.7	01Jan2000, 06:14	0.63
M8	0.2477	95.5	01Jan2000, 06:39	1.17
M9	0.2354	42.2	01Jan2000, 07:06	0.83
MRK-1	5.1816	689.1	01Jan2000, 07:18	0.63
R-M1	5.0230	742.2	01Jan2000, 07:05	0.61
R-M10A	0.7056	103.8	01Jan2000, 06:49	0.51
R-M10B	2.4400	273.6	01Jan2000, 06:42	0.46
R-M11	0.1660	25.8	01Jan2000, 06:43	0.45
R-M13	0.0924	10.0	01Jan2000, 07:00	0.27
R-M18	1.3681	87.2	01Jan2000, 07:14	0.28
R-M2	4.8017	700.4	01Jan2000, 06:58	0.59
R-M20	0.2290	41.0	01Jan2000, 06:35	0.46
R-M22	0.5764	60.7	01Jan2000, 06:50	0.35
R-M25	0.3737	4.2	01Jan2000, 08:10	0.13
R-M3	4.5721	642.7	01Jan2000, 06:51	0.56
R-M4A	3.2844	403.4	01Jan2000, 06:50	0.49
R-M4B	0.1696	55.5	01Jan2000, 06:23	0.63
R-M4C	0.4034	57.3	01Jan2000, 06:27	0.40
R-M5	0.2236	10.9	01Jan2000, 06:31	0.22

Project: Final Ex100 Simulation Run: 5yr

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 25Mar2022, 15:29:52

Basin Model: Jimmy Camp
Meteorologic Model: 5yr
Control Specifications: 5yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1816	107.4	01Jan2000, 02:44	0.07
DP-M1	5.1816	107.4	01Jan2000, 02:44	0.07
DP-M10	0.5764	2.4	01Jan2000, 02:43	0.01
DP-M11	0.3737	0.0	01Jan2000, 00:00	0.00
DP-M2	5.0230	106.0	01Jan2000, 02:31	0.06
DP-M3	4.8017	99.2	01Jan2000, 02:18	0.06
DP-M4	4.5721	88.1	01Jan2000, 02:11	0.05
DP-M5	0.4034	3.7	01Jan2000, 01:32	0.02
DP-M6	3.2844	47.0	01Jan2000, 02:01	0.03
DP-M7	0.7056	9.3	01Jan2000, 01:28	0.03
DP-M8	2.4400	33.0	01Jan2000, 01:31	0.03
DP-M9	1.3681	2.4	01Jan2000, 03:18	0.01
M1	0.1586	17.8	01Jan2000, 01:19	0.20
M10	0.1388	4.7	01Jan2000, 01:56	0.08
M11	0.1079	5.9	01Jan2000, 01:24	0.10
M12	0.1660	1.2	01Jan2000, 02:11	0.01
M13	0.2257	0.7	01Jan2000, 02:19	0.00
M14	0.1136	3.6	01Jan2000, 01:35	0.07
M15	0.0924	0.0	01Jan2000, 00:00	0.00
M16	0.2321	2.2	01Jan2000, 02:13	0.02
M17	0.2844	21.9	01Jan2000, 01:25	0.15
M18	0.2554	9.5	01Jan2000, 01:37	0.08
M19	0.3000	3.2	01Jan2000, 02:13	0.02
M2	0.2213	22.8	01Jan2000, 01:25	0.19
M20	0.1399	0.9	01Jan2000, 02:19	0.01
M21	0.2290	1.8	01Jan2000, 02:08	0.01
M22	0.1033	0.0	01Jan2000, 00:00	0.00
M23	0.2075	0.0	01Jan2000, 00:00	0.00
M24	0.1556	1.7	01Jan2000, 02:07	0.02
M25	0.1591	0.0	01Jan2000, 00:00	0.00
M26	0.1786	0.0	01Jan2000, 00:00	0.00
M27	0.1951	0.0	01Jan2000, 00:00	0.00
M3	0.2296	22.0	01Jan2000, 01:26	0.19
M4	0.2316	16.1	01Jan2000, 01:27	0.14
M5	0.1798	3.7	01Jan2000, 01:32	0.04
M6	0.2236	0.0	01Jan2000, 00:00	0.00
M7	0.1696	3.8	01Jan2000, 01:23	0.04
M8	0.2477	22.4	01Jan2000, 01:43	0.21
M9	0.2354	7.6	01Jan2000, 02:22	0.09
MRK-1	5.1816	107.4	01Jan2000, 02:44	0.07
R-M1	5.0230	105.4	01Jan2000, 02:44	0.06
R-M10A	0.7056	9.3	01Jan2000, 02:01	0.03
R-M10B	2.4400	33.0	01Jan2000, 02:02	0.03
R-M11	0.1660	1.2	01Jan2000, 02:53	0.01
R-M13	0.0924	0.0	01Jan2000, 00:00	0.00
R-M18	1.3681	2.4	01Jan2000, 04:37	0.01
R-M2	4.8017	98.8	01Jan2000, 02:32	0.06
R-M20	0.2290	1.8	01Jan2000, 02:48	0.01
R-M22	0.5764	2.4	01Jan2000, 03:19	0.01
R-M25	0.3737	0.0	01Jan2000, 00:00	0.00
R-M3	4.5721	88.0	01Jan2000, 02:19	0.05
R-M4A	3.2844	46.8	01Jan2000, 02:16	0.03
R-M4B	0.1696	3.8	01Jan2000, 01:44	0.04
R-M4C	0.4034	3.7	01Jan2000, 01:45	0.02
R-M5	0.2236	0.0	01Jan2000, 00:00	0.00

Project: Final Ex100 Simulation Run: 2yr

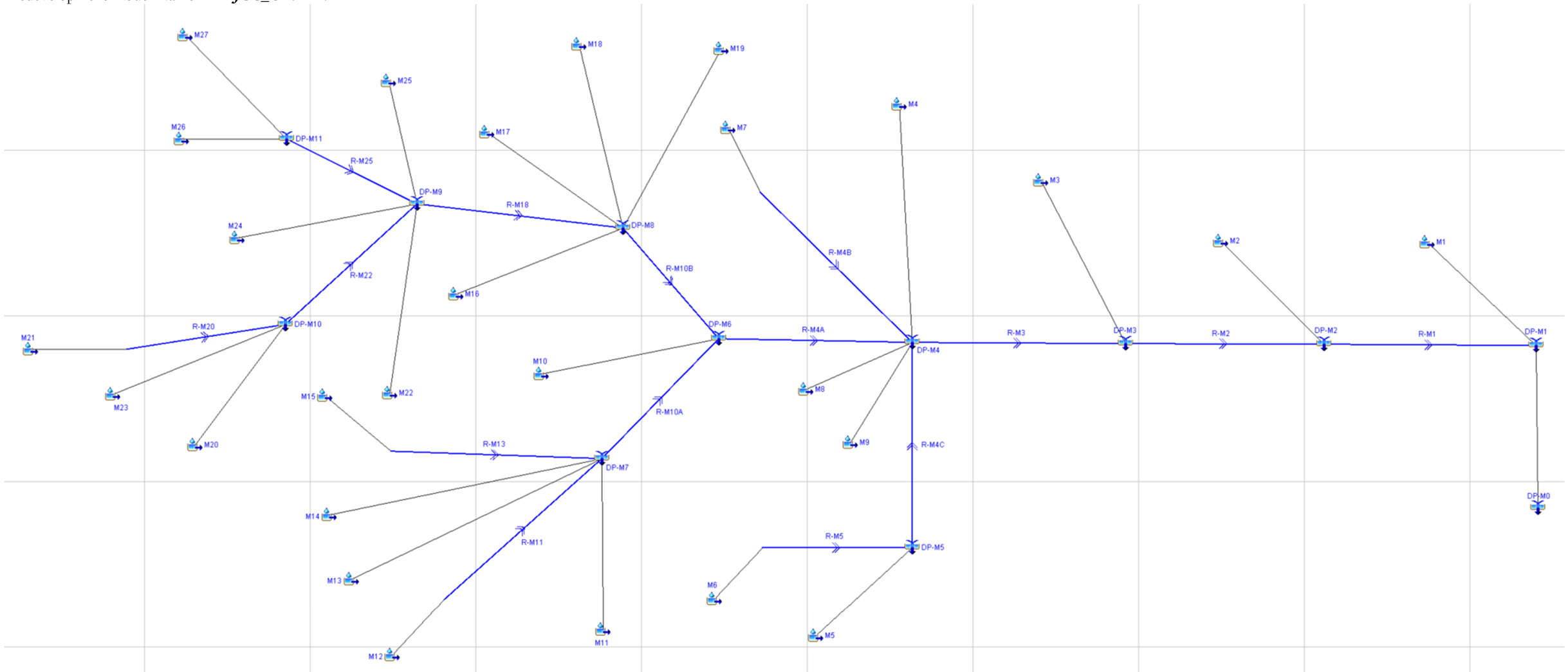
Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 25Mar2022, 15:32:54

Basin Model: Jimmy Camp
Meteorologic Model: 2yr
Control Specifications: 2yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1816	35.6	01Jan2000, 02:21	0.03
DP-M1	5.1816	35.5	01Jan2000, 02:21	0.03
DP-M10	0.5764	0.0	01Jan2000, 00:00	0.00
DP-M11	0.3737	0.0	01Jan2000, 00:00	0.00
DP-M2	5.0230	32.1	01Jan2000, 02:09	0.02
DP-M3	4.8017	29.8	01Jan2000, 02:44	0.02
DP-M4	4.5721	27.4	01Jan2000, 02:34	0.02
DP-M5	0.4034	0.8	01Jan2000, 02:10	0.00
DP-M6	3.2844	14.6	01Jan2000, 02:24	0.01
DP-M7	0.7056	2.7	01Jan2000, 02:05	0.01
DP-M8	2.4400	10.6	01Jan2000, 01:38	0.01
DP-M9	1.3681	0.1	01Jan2000, 02:19	0.00
M1	0.1586	7.8	01Jan2000, 01:24	0.09
M10	0.1388	1.5	01Jan2000, 02:16	0.02
M11	0.1079	1.8	01Jan2000, 01:36	0.03
M12	0.1660	0.0	01Jan2000, 00:00	0.00
M13	0.2257	0.0	01Jan2000, 00:00	0.00
M14	0.1136	1.0	01Jan2000, 02:10	0.02
M15	0.0924	0.0	01Jan2000, 00:00	0.00
M16	0.2321	0.0	01Jan2000, 02:30	0.00
M17	0.2844	8.4	01Jan2000, 01:32	0.06
M18	0.2554	2.9	01Jan2000, 02:09	0.02
M19	0.3000	0.1	01Jan2000, 02:28	0.00
M2	0.2213	10.0	01Jan2000, 01:29	0.09
M20	0.1399	0.0	01Jan2000, 00:00	0.00
M21	0.2290	0.0	01Jan2000, 00:00	0.00
M22	0.1033	0.0	01Jan2000, 00:00	0.00
M23	0.2075	0.0	01Jan2000, 00:00	0.00
M24	0.1556	0.1	01Jan2000, 02:19	0.00
M25	0.1591	0.0	01Jan2000, 00:00	0.00
M26	0.1786	0.0	01Jan2000, 00:00	0.00
M27	0.1951	0.0	01Jan2000, 00:00	0.00
M3	0.2296	9.5	01Jan2000, 01:31	0.08
M4	0.2316	6.0	01Jan2000, 01:36	0.05
M5	0.1798	0.8	01Jan2000, 02:10	0.01
M6	0.2236	0.0	01Jan2000, 00:00	0.00
M7	0.1696	0.9	01Jan2000, 02:07	0.01
M8	0.2477	10.4	01Jan2000, 01:48	0.10
M9	0.2354	2.6	01Jan2000, 02:33	0.03
MRK-1	5.1816	35.6	01Jan2000, 02:21	0.03
R-M1	5.0230	32.1	01Jan2000, 02:26	0.02
R-M10A	0.7056	2.7	01Jan2000, 02:51	0.01
R-M10B	2.4400	10.6	01Jan2000, 02:22	0.01
R-M11	0.1660	0.0	01Jan2000, 00:00	0.00
R-M13	0.0924	0.0	01Jan2000, 00:00	0.00
R-M18	1.3681	0.0	01Jan2000, 04:28	0.00
R-M2	4.8017	29.3	01Jan2000, 03:04	0.02
R-M20	0.2290	0.0	01Jan2000, 00:00	0.00
R-M22	0.5764	0.0	01Jan2000, 00:00	0.00
R-M25	0.3737	0.0	01Jan2000, 00:00	0.00
R-M3	4.5721	27.4	01Jan2000, 02:45	0.02
R-M4A	3.2844	14.6	01Jan2000, 02:43	0.01
R-M4B	0.1696	0.9	01Jan2000, 02:40	0.01
R-M4C	0.4034	0.8	01Jan2000, 02:31	0.00
R-M5	0.2236	0.0	01Jan2000, 00:00	0.00

Predevelopment Model Name: ***MK-JCC_UNDEV***



Project: Final Ex100 Simulation Run: 100-YR-EX

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 28Mar2022, 07:55:37

Basin Model: MK-JCC-UNDEV
Meteorologic Model: 100yr
Control Specifications: 100yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1732	1029.9	01Jan2000, 07:00	0.84
DP-M1	5.1732	1029.9	01Jan2000, 07:00	0.84
DP-M10	0.5764	23.2	01Jan2000, 06:33	0.16
DP-M11	0.3737	9.7	01Jan2000, 06:47	0.15
DP-M2	5.0206	990.9	01Jan2000, 06:53	0.80
DP-M3	4.7890	897.5	01Jan2000, 06:46	0.74
DP-M4	4.5612	804.4	01Jan2000, 06:43	0.70
DP-M5	0.3910	122.8	01Jan2000, 06:21	0.76
DP-M6	3.2844	371.6	01Jan2000, 06:43	0.46
DP-M7	0.7056	70.4	01Jan2000, 06:27	0.42
DP-M8	2.4400	284.3	01Jan2000, 06:28	0.47
DP-M9	1.3681	67.8	01Jan2000, 06:20	0.24
M1	0.1526	167.7	01Jan2000, 06:18	2.12
M10	0.1388	17.5	01Jan2000, 06:45	0.57
M11	0.1079	31.0	01Jan2000, 06:21	0.76
M12	0.1660	12.8	01Jan2000, 06:22	0.33
M13	0.2257	25.6	01Jan2000, 06:30	0.46
M14	0.1136	10.6	01Jan2000, 06:27	0.39
M15	0.0924	5.3	01Jan2000, 06:06	0.16
M16	0.2321	18.3	01Jan2000, 06:31	0.37
M17	0.2844	121.9	01Jan2000, 06:24	1.09
M18	0.2554	107.7	01Jan2000, 06:28	1.14
M19	0.3000	32.5	01Jan2000, 06:33	0.46
M2	0.2316	228.8	01Jan2000, 06:23	2.11
M20	0.1399	5.1	01Jan2000, 06:26	0.16
M21	0.2290	11.6	01Jan2000, 06:11	0.16
M22	0.1033	5.3	01Jan2000, 06:10	0.17
M23	0.2075	6.9	01Jan2000, 06:31	0.16
M24	0.1556	22.3	01Jan2000, 06:20	0.46
M25	0.1591	37.1	01Jan2000, 06:19	0.62
M26	0.1786	4.7	01Jan2000, 06:46	0.15
M27	0.1951	5.0	01Jan2000, 06:49	0.15
M3	0.2278	150.7	01Jan2000, 06:25	1.57
M4	0.2334	162.9	01Jan2000, 06:24	1.60
M5	0.1654	48.5	01Jan2000, 06:18	0.72
M6	0.2256	75.3	01Jan2000, 06:18	0.79
M7	0.1692	115.3	01Jan2000, 06:13	1.20
M8	0.2475	183.2	01Jan2000, 06:37	2.11
M9	0.2357	60.0	01Jan2000, 07:06	1.18
R-M1	5.0206	986.5	01Jan2000, 07:01	0.80
R-M10A	0.7056	70.4	01Jan2000, 06:44	0.42
R-M10B	2.4400	284.0	01Jan2000, 06:43	0.47
R-M11	0.1660	12.7	01Jan2000, 06:45	0.33
R-M13	0.0924	5.3	01Jan2000, 06:57	0.15
R-M18	1.3681	67.7	01Jan2000, 06:49	0.24
R-M2	4.7890	892.8	01Jan2000, 06:54	0.74
R-M20	0.2290	11.5	01Jan2000, 06:34	0.16
R-M22	0.5764	23.2	01Jan2000, 06:52	0.15
R-M25	0.3737	9.7	01Jan2000, 07:23	0.15
R-M3	4.5612	803.4	01Jan2000, 06:48	0.70
R-M4A	3.2844	370.4	01Jan2000, 06:50	0.46
R-M4B	0.1692	114.9	01Jan2000, 06:20	1.20
R-M4C	0.3910	122.6	01Jan2000, 06:25	0.76
R-M5	0.2256	75.3	01Jan2000, 06:22	0.79

Project: Final Ex100 Simulation Run: 10-YR-EX

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 28Mar2022, 07:53:29

Basin Model: MK-JCC-UNDEV
Meteorologic Model: 10yr
Control Specifications: 100yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1732	417.9	01Jan2000, 06:50	0.38
DP-M1	5.1732	417.9	01Jan2000, 06:50	0.38
DP-M10	0.5764	16.3	01Jan2000, 06:35	0.06
DP-M11	0.3737	6.9	01Jan2000, 06:47	0.06
DP-M2	5.0206	386.5	01Jan2000, 06:42	0.36
DP-M3	4.7890	322.3	01Jan2000, 06:58	0.32
DP-M4	4.5612	291.3	01Jan2000, 06:53	0.30
DP-M5	0.3910	32.0	01Jan2000, 06:24	0.29
DP-M6	3.2844	122.3	01Jan2000, 06:48	0.17
DP-M7	0.7056	19.8	01Jan2000, 06:32	0.14
DP-M8	2.4400	98.7	01Jan2000, 06:27	0.18
DP-M9	1.3681	25.1	01Jan2000, 07:03	0.09
M1	0.1526	87.0	01Jan2000, 06:20	1.17
M10	0.1388	4.3	01Jan2000, 06:41	0.19
M11	0.1079	8.2	01Jan2000, 06:22	0.29
M12	0.1660	5.5	01Jan2000, 06:14	0.09
M13	0.2257	6.7	01Jan2000, 06:21	0.14
M14	0.1136	3.5	01Jan2000, 06:17	0.11
M15	0.0924	3.8	01Jan2000, 06:06	0.06
M16	0.2321	6.6	01Jan2000, 06:21	0.10
M17	0.2844	43.3	01Jan2000, 06:26	0.47
M18	0.2554	39.5	01Jan2000, 06:29	0.50
M19	0.3000	8.6	01Jan2000, 06:23	0.14
M2	0.2316	118.1	01Jan2000, 06:24	1.17
M20	0.1399	3.6	01Jan2000, 06:26	0.06
M21	0.2290	8.2	01Jan2000, 06:11	0.06
M22	0.1033	3.8	01Jan2000, 06:10	0.06
M23	0.2075	4.9	01Jan2000, 06:31	0.06
M24	0.1556	5.5	01Jan2000, 06:12	0.14
M25	0.1591	8.3	01Jan2000, 06:18	0.21
M26	0.1786	3.4	01Jan2000, 06:46	0.06
M27	0.1951	3.5	01Jan2000, 06:49	0.06
M3	0.2278	67.0	01Jan2000, 06:27	0.78
M4	0.2334	73.3	01Jan2000, 06:25	0.81
M5	0.1654	12.2	01Jan2000, 06:19	0.27
M6	0.2256	20.4	01Jan2000, 06:19	0.30
M7	0.1692	43.9	01Jan2000, 06:14	0.54
M8	0.2475	94.5	01Jan2000, 06:39	1.17
M9	0.2357	23.3	01Jan2000, 07:09	0.53
R-M1	5.0206	384.7	01Jan2000, 06:51	0.36
R-M10A	0.7056	19.8	01Jan2000, 06:58	0.13
R-M10B	2.4400	98.6	01Jan2000, 06:48	0.18
R-M11	0.1660	5.5	01Jan2000, 06:44	0.09
R-M13	0.0924	3.7	01Jan2000, 07:02	0.06
R-M18	1.3681	25.0	01Jan2000, 07:39	0.09
R-M2	4.7890	320.0	01Jan2000, 07:09	0.32
R-M20	0.2290	8.2	01Jan2000, 06:37	0.06
R-M22	0.5764	16.3	01Jan2000, 06:56	0.06
R-M25	0.3737	6.9	01Jan2000, 07:26	0.06
R-M3	4.5612	290.9	01Jan2000, 06:59	0.30
R-M4A	3.2844	121.6	01Jan2000, 06:59	0.17
R-M4B	0.1692	43.7	01Jan2000, 06:24	0.54
R-M4C	0.3910	32.0	01Jan2000, 06:30	0.29
R-M5	0.2256	20.4	01Jan2000, 06:25	0.30

Project: Final Ex100 Simulation Run: 5-YR-EX

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 28Mar2022, 07:56:33

Basin Model: MK-JCC-UNDEV
Meteorologic Model: 5yr
Control Specifications: 5yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1732	82.0	01Jan2000, 02:35	0.06
DP-M1	5.1732	82.0	01Jan2000, 02:35	0.06
DP-M10	0.5764	9.1	01Jan2000, 01:29	0.03
DP-M11	0.3737	4.0	01Jan2000, 01:41	0.03
DP-M2	5.0206	79.2	01Jan2000, 02:22	0.05
DP-M3	4.7890	69.0	01Jan2000, 02:07	0.05
DP-M4	4.5612	62.0	01Jan2000, 01:59	0.04
DP-M5	0.3910	7.6	01Jan2000, 01:07	0.03
DP-M6	3.2844	27.0	01Jan2000, 01:48	0.03
DP-M7	0.7056	8.0	01Jan2000, 01:11	0.03
DP-M8	2.4400	17.7	01Jan2000, 01:12	0.03
DP-M9	1.3681	12.9	01Jan2000, 02:01	0.03
M1	0.1526	18.8	01Jan2000, 01:18	0.22
M10	0.1388	1.8	01Jan2000, 01:25	0.03
M11	0.1079	2.0	01Jan2000, 01:04	0.03
M12	0.1660	3.1	01Jan2000, 01:05	0.03
M13	0.2257	3.7	01Jan2000, 01:11	0.03
M14	0.1136	2.0	01Jan2000, 01:08	0.03
M15	0.0924	2.2	01Jan2000, 00:54	0.03
M16	0.2321	3.7	01Jan2000, 01:12	0.03
M17	0.2844	4.9	01Jan2000, 01:08	0.04
M18	0.2554	4.2	01Jan2000, 01:12	0.04
M19	0.3000	4.7	01Jan2000, 01:13	0.03
M2	0.2316	26.2	01Jan2000, 01:23	0.22
M20	0.1399	2.1	01Jan2000, 01:18	0.03
M21	0.2290	4.6	01Jan2000, 01:01	0.03
M22	0.1033	2.1	01Jan2000, 01:00	0.03
M23	0.2075	2.8	01Jan2000, 01:23	0.03
M24	0.1556	3.1	01Jan2000, 01:02	0.03
M25	0.1591	3.2	01Jan2000, 01:01	0.03
M26	0.1786	2.0	01Jan2000, 01:39	0.03
M27	0.1951	2.1	01Jan2000, 01:42	0.03
M3	0.2278	9.4	01Jan2000, 01:30	0.09
M4	0.2334	10.6	01Jan2000, 01:28	0.10
M5	0.1654	3.3	01Jan2000, 01:01	0.03
M6	0.2256	4.5	01Jan2000, 01:01	0.03
M7	0.1692	3.8	01Jan2000, 00:57	0.04
M8	0.2475	22.8	01Jan2000, 01:41	0.22
M9	0.2357	2.9	01Jan2000, 02:10	0.04
R-M1	5.0206	78.7	01Jan2000, 02:36	0.05
R-M10A	0.7056	8.0	01Jan2000, 01:46	0.03
R-M10B	2.4400	17.6	01Jan2000, 01:49	0.03
R-M11	0.1660	3.1	01Jan2000, 01:39	0.03
R-M13	0.0924	2.2	01Jan2000, 01:58	0.03
R-M18	1.3681	12.9	01Jan2000, 02:51	0.03
R-M2	4.7890	68.6	01Jan2000, 02:24	0.05
R-M20	0.2290	4.6	01Jan2000, 01:32	0.03
R-M22	0.5764	9.1	01Jan2000, 01:55	0.03
R-M25	0.3737	4.0	01Jan2000, 02:26	0.03
R-M3	4.5612	61.9	01Jan2000, 02:08	0.04
R-M4A	3.2844	26.9	01Jan2000, 02:04	0.03
R-M4B	0.1692	3.7	01Jan2000, 01:17	0.04
R-M4C	0.3910	7.6	01Jan2000, 01:17	0.03
R-M5	0.2256	4.5	01Jan2000, 01:10	0.03

Project: Final Ex100 Simulation Run: 2-YR-EX

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 28Mar2022, 07:57:23

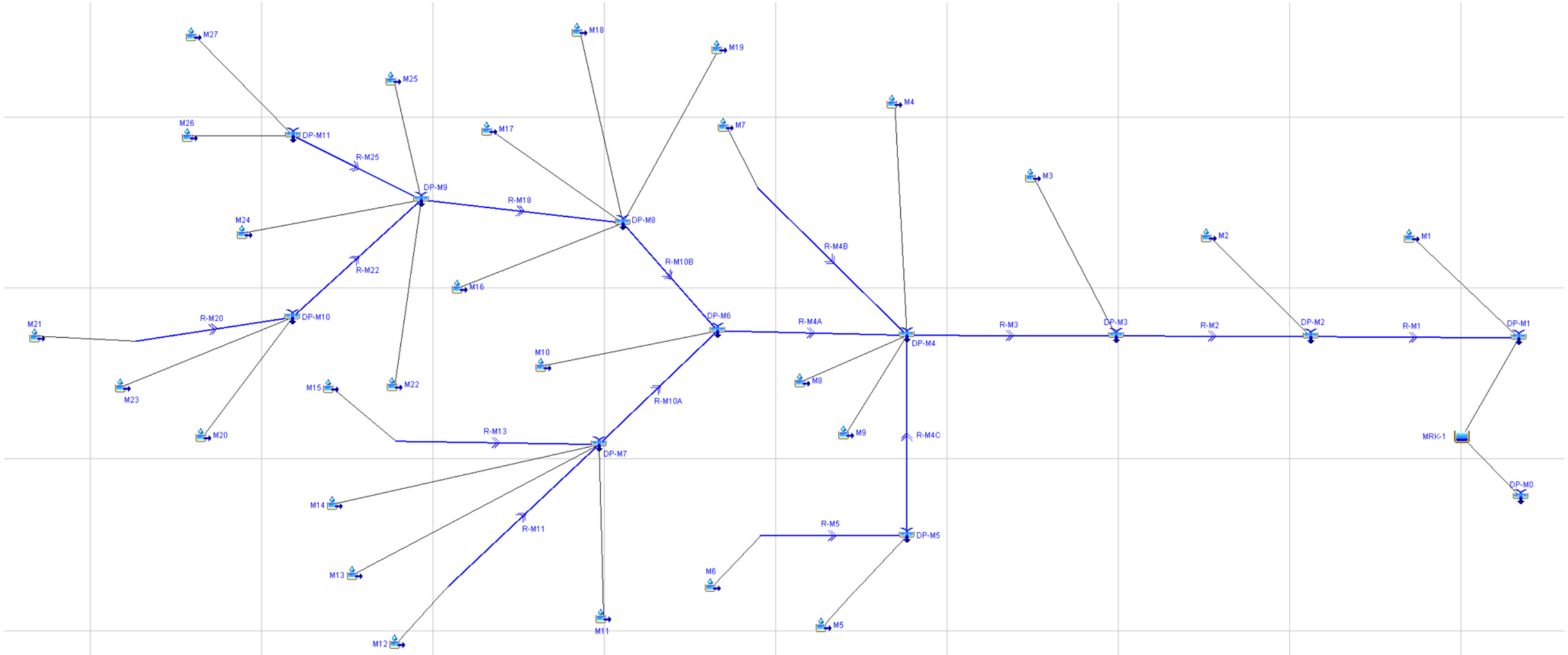
Basin Model: MK-JCC-UNDEV
Meteorologic Model: 2yr
Control Specifications: 2yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1732	45.6	01Jan2000, 02:47	0.03
DP-M1	5.1732	45.6	01Jan2000, 02:47	0.03
DP-M10	0.5764	7.2	01Jan2000, 01:31	0.02
DP-M11	0.3737	3.2	01Jan2000, 01:41	0.02
DP-M2	5.0206	45.0	01Jan2000, 02:31	0.03
DP-M3	4.7890	40.8	01Jan2000, 02:14	0.03
DP-M4	4.5612	38.2	01Jan2000, 02:04	0.03
DP-M5	0.3910	6.0	01Jan2000, 01:08	0.02
DP-M6	3.2844	21.2	01Jan2000, 01:50	0.02
DP-M7	0.7056	6.3	01Jan2000, 01:10	0.02
DP-M8	2.4400	13.9	01Jan2000, 01:11	0.02
DP-M9	1.3681	10.2	01Jan2000, 02:04	0.02
M1	0.1526	8.8	01Jan2000, 01:21	0.11
M10	0.1388	1.5	01Jan2000, 01:25	0.02
M11	0.1079	1.6	01Jan2000, 01:04	0.02
M12	0.1660	2.4	01Jan2000, 01:05	0.02
M13	0.2257	2.9	01Jan2000, 01:11	0.02
M14	0.1136	1.6	01Jan2000, 01:08	0.02
M15	0.0924	1.7	01Jan2000, 00:54	0.02
M16	0.2321	3.0	01Jan2000, 01:12	0.02
M17	0.2844	3.9	01Jan2000, 01:08	0.02
M18	0.2554	3.3	01Jan2000, 01:11	0.02
M19	0.3000	3.8	01Jan2000, 01:13	0.02
M2	0.2316	12.3	01Jan2000, 01:26	0.11
M20	0.1399	1.6	01Jan2000, 01:18	0.02
M21	0.2290	3.7	01Jan2000, 01:01	0.02
M22	0.1033	1.7	01Jan2000, 01:00	0.02
M23	0.2075	2.2	01Jan2000, 01:23	0.02
M24	0.1556	2.4	01Jan2000, 01:02	0.02
M25	0.1591	2.5	01Jan2000, 01:01	0.02
M26	0.1786	1.6	01Jan2000, 01:39	0.02
M27	0.1951	1.6	01Jan2000, 01:42	0.02
M3	0.2278	3.3	01Jan2000, 01:20	0.04
M4	0.2334	3.7	01Jan2000, 01:23	0.04
M5	0.1654	2.6	01Jan2000, 01:01	0.02
M6	0.2256	3.6	01Jan2000, 01:01	0.02
M7	0.1692	3.0	01Jan2000, 00:57	0.02
M8	0.2475	11.0	01Jan2000, 01:45	0.11
M9	0.2357	1.9	01Jan2000, 01:48	0.02
R-M1	5.0206	44.6	01Jan2000, 02:47	0.03
R-M10A	0.7056	6.3	01Jan2000, 01:47	0.02
R-M10B	2.4400	13.9	01Jan2000, 01:51	0.02
R-M11	0.1660	2.4	01Jan2000, 01:41	0.02
R-M13	0.0924	1.7	01Jan2000, 02:02	0.02
R-M18	1.3681	10.2	01Jan2000, 02:58	0.02
R-M2	4.7890	40.5	01Jan2000, 02:32	0.03
R-M20	0.2290	3.6	01Jan2000, 01:34	0.02
R-M22	0.5764	7.2	01Jan2000, 01:59	0.02
R-M25	0.3737	3.2	01Jan2000, 02:28	0.02
R-M3	4.5612	38.1	01Jan2000, 02:14	0.03
R-M4A	3.2844	21.1	01Jan2000, 02:08	0.02
R-M4B	0.1692	3.0	01Jan2000, 01:19	0.02
R-M4C	0.3910	6.0	01Jan2000, 01:19	0.02
R-M5	0.2256	3.6	01Jan2000, 01:11	0.02

Predevelopment Model Name: ***JCC_DEV***

Note: This model demonstrates the need for some level of onsite detention in the Bradley Heights Metro District. This has been accommodated by the inclusion of Onsite Full Spectrum Detention in the areas of the Bradley Heights Phase I Road Improvements (Bradley Heights East Filing No. 1&2 and Redemption Hill Church).



Project: Final Ex100 Simulation Run: 100YR-PR

Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV
End of Run: 02Jan2000, 00:00 Meteorologic Model: 100yr
Compute Time: 28Mar2022, 08:04:06 Control Specifications: 100yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1596	1267.3	01Jan2000, 07:14	1.28
DP-M1	5.1596	1970.8	01Jan2000, 06:36	1.28
DP-M10	0.5764	23.2	01Jan2000, 06:33	0.16
DP-M11	0.3737	9.7	01Jan2000, 06:47	0.15
DP-M2	5.0153	1829.5	01Jan2000, 06:31	1.22
DP-M3	4.7898	1523.9	01Jan2000, 06:26	1.11
DP-M4	4.5612	1206.8	01Jan2000, 06:39	0.99
DP-M5	0.3910	311.3	01Jan2000, 06:16	1.56
DP-M6	3.2844	371.6	01Jan2000, 06:43	0.46
DP-M7	0.7056	70.4	01Jan2000, 06:27	0.42
DP-M8	2.4400	284.3	01Jan2000, 06:28	0.47
DP-M9	1.3681	67.6	01Jan2000, 06:20	0.24
M1	0.1443	269.8	01Jan2000, 06:15	3.48
M10	0.1388	17.5	01Jan2000, 06:45	0.57
M11	0.1079	31.0	01Jan2000, 06:21	0.76
M12	0.1660	12.8	01Jan2000, 06:22	0.33
M13	0.2257	25.6	01Jan2000, 06:30	0.46
M14	0.1136	10.6	01Jan2000, 06:27	0.39
M15	0.0924	5.3	01Jan2000, 06:06	0.16
M16	0.2321	18.3	01Jan2000, 06:31	0.37
M17	0.2844	121.9	01Jan2000, 06:24	1.09
M18	0.2554	107.7	01Jan2000, 06:28	1.14
M19	0.3000	32.5	01Jan2000, 06:33	0.46
M2	0.2255	386.8	01Jan2000, 06:19	3.48
M20	0.1399	5.1	01Jan2000, 06:26	0.16
M21	0.2290	11.6	01Jan2000, 06:11	0.16
M22	0.1033	5.3	01Jan2000, 06:10	0.17
M23	0.2075	6.9	01Jan2000, 06:31	0.16
M24	0.1556	22.3	01Jan2000, 06:20	0.46
M25	0.1591	37.0	01Jan2000, 06:19	0.62
M26	0.1786	4.7	01Jan2000, 06:46	0.15
M27	0.1951	5.0	01Jan2000, 06:49	0.15
M3	0.2286	396.3	01Jan2000, 06:20	3.57
M4	0.2334	328.1	01Jan2000, 06:20	2.91
M5	0.1654	248.4	01Jan2000, 06:13	2.60
M6	0.2256	76.0	01Jan2000, 06:18	0.79
M7	0.1692	119.7	01Jan2000, 06:13	1.24
M8	0.2475	317.2	01Jan2000, 06:34	3.37
M9	0.2357	178.4	01Jan2000, 06:57	2.84
MRK-1	5.1596	1267.3	01Jan2000, 07:14	1.28
R-M1	5.0153	1822.2	01Jan2000, 06:38	1.21
R-M10A	0.7056	70.4	01Jan2000, 06:44	0.42
R-M10B	2.4400	283.9	01Jan2000, 06:43	0.47
R-M11	0.1660	12.7	01Jan2000, 06:45	0.33
R-M13	0.0924	5.3	01Jan2000, 06:57	0.15
R-M18	1.3681	67.5	01Jan2000, 06:49	0.24
R-M2	4.7898	1517.2	01Jan2000, 06:33	1.11
R-M20	0.2290	11.5	01Jan2000, 06:34	0.16
R-M22	0.5764	23.2	01Jan2000, 06:52	0.15
R-M25	0.3737	9.7	01Jan2000, 07:23	0.15
R-M3	4.5612	1205.3	01Jan2000, 06:43	0.99
R-M4A	3.2844	370.3	01Jan2000, 06:50	0.46
R-M4B	0.1692	119.3	01Jan2000, 06:20	1.24
R-M4C	0.3910	311.0	01Jan2000, 06:19	1.56
R-M5	0.2256	75.9	01Jan2000, 06:22	0.79

Project: Final Ex100 Simulation Run: 10-PR

Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV
End of Run: 02Jan2000, 00:00 Meteorologic Model: 10yr
Compute Time: 28Mar2022, 08:05:32 Control Specifications: 10yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1596	937.6	01Jan2000, 06:56	0.74
DP-M1	5.1596	1186.1	01Jan2000, 06:38	0.74
DP-M10	0.5764	16.3	01Jan2000, 06:35	0.06
DP-M11	0.3737	6.9	01Jan2000, 06:47	0.06
DP-M2	5.0153	1100.8	01Jan2000, 06:33	0.69
DP-M3	4.7898	906.2	01Jan2000, 06:27	0.62
DP-M4	4.5612	661.8	01Jan2000, 06:25	0.53
DP-M5	0.3910	161.2	01Jan2000, 06:15	0.85
DP-M6	3.2844	122.3	01Jan2000, 06:48	0.17
DP-M7	0.7056	19.8	01Jan2000, 06:32	0.14
DP-M8	2.4400	98.7	01Jan2000, 06:27	0.18
DP-M9	1.3681	25.1	01Jan2000, 07:03	0.09
M1	0.1443	180.6	01Jan2000, 06:15	2.35
M10	0.1388	4.3	01Jan2000, 06:41	0.19
M11	0.1079	8.2	01Jan2000, 06:22	0.29
M12	0.1660	5.5	01Jan2000, 06:14	0.09
M13	0.2257	6.7	01Jan2000, 06:21	0.14
M14	0.1136	3.5	01Jan2000, 06:17	0.11
M15	0.0924	3.8	01Jan2000, 06:06	0.06
M16	0.2321	6.6	01Jan2000, 06:21	0.10
M17	0.2844	43.3	01Jan2000, 06:26	0.47
M18	0.2554	39.5	01Jan2000, 06:29	0.50
M19	0.3000	8.6	01Jan2000, 06:23	0.14
M2	0.2255	259.0	01Jan2000, 06:19	2.35
M20	0.1399	3.6	01Jan2000, 06:26	0.06
M21	0.2290	8.2	01Jan2000, 06:11	0.06
M22	0.1033	3.8	01Jan2000, 06:10	0.06
M23	0.2075	4.9	01Jan2000, 06:31	0.06
M24	0.1556	5.5	01Jan2000, 06:12	0.14
M25	0.1591	8.3	01Jan2000, 06:18	0.21
M26	0.1786	3.4	01Jan2000, 06:46	0.06
M27	0.1951	3.5	01Jan2000, 06:49	0.06
M3	0.2286	266.0	01Jan2000, 06:20	2.42
M4	0.2334	204.6	01Jan2000, 06:20	1.86
M5	0.1654	147.2	01Jan2000, 06:14	1.60
M6	0.2256	20.7	01Jan2000, 06:19	0.30
M7	0.1692	47.2	01Jan2000, 06:14	0.58
M8	0.2475	205.8	01Jan2000, 06:34	2.23
M9	0.2357	111.3	01Jan2000, 06:57	1.80
MRK-1	5.1596	937.6	01Jan2000, 06:56	0.74
R-M1	5.0153	1096.6	01Jan2000, 06:40	0.69
R-M10A	0.7056	19.8	01Jan2000, 06:58	0.13
R-M10B	2.4400	98.6	01Jan2000, 06:48	0.18
R-M11	0.1660	5.5	01Jan2000, 06:44	0.09
R-M13	0.0924	3.7	01Jan2000, 07:02	0.06
R-M18	1.3681	25.0	01Jan2000, 07:43	0.09
R-M2	4.7898	901.6	01Jan2000, 06:35	0.61
R-M20	0.2290	8.2	01Jan2000, 06:37	0.06
R-M22	0.5764	16.3	01Jan2000, 06:56	0.06
R-M25	0.3737	6.9	01Jan2000, 07:26	0.06
R-M3	4.5612	661.2	01Jan2000, 06:29	0.53
R-M4A	3.2844	121.6	01Jan2000, 06:59	0.17
R-M4B	0.1692	47.0	01Jan2000, 06:23	0.57
R-M4C	0.3910	161.1	01Jan2000, 06:19	0.85
R-M5	0.2256	20.7	01Jan2000, 06:25	0.30

Project: Final Ex100 Simulation Run: 5-PR

Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV
End of Run: 02Jan2000, 00:00 Meteorologic Model: 5yr
Compute Time: 28Mar2022, 08:09:15 Control Specifications: 5yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1596	523.7	01Jan2000, 01:38	0.25
DP-M1	5.1596	532.6	01Jan2000, 01:33	0.25
DP-M10	0.5764	9.1	01Jan2000, 01:29	0.03
DP-M11	0.3737	4.0	01Jan2000, 01:41	0.03
DP-M2	5.0153	487.5	01Jan2000, 01:26	0.23
DP-M3	4.7898	390.2	01Jan2000, 01:20	0.20
DP-M4	4.5612	269.7	01Jan2000, 01:19	0.16
DP-M5	0.3910	58.1	01Jan2000, 01:05	0.23
DP-M6	3.2844	27.0	01Jan2000, 01:48	0.03
DP-M7	0.7056	8.0	01Jan2000, 01:11	0.03
DP-M8	2.4400	17.7	01Jan2000, 01:12	0.03
DP-M9	1.3681	12.9	01Jan2000, 02:01	0.03
M1	0.1443	90.4	01Jan2000, 01:06	0.98
M10	0.1388	1.8	01Jan2000, 01:25	0.03
M11	0.1079	2.0	01Jan2000, 01:04	0.03
M12	0.1660	3.1	01Jan2000, 01:05	0.03
M13	0.2257	3.7	01Jan2000, 01:11	0.03
M14	0.1136	2.0	01Jan2000, 01:08	0.03
M15	0.0924	2.2	01Jan2000, 00:54	0.03
M16	0.2321	3.7	01Jan2000, 01:12	0.03
M17	0.2844	4.9	01Jan2000, 01:08	0.04
M18	0.2554	4.2	01Jan2000, 01:12	0.04
M19	0.3000	4.7	01Jan2000, 01:13	0.03
M2	0.2255	130.6	01Jan2000, 01:10	0.98
M20	0.1399	2.1	01Jan2000, 01:18	0.03
M21	0.2290	4.6	01Jan2000, 01:01	0.03
M22	0.1033	2.1	01Jan2000, 01:00	0.03
M23	0.2075	2.8	01Jan2000, 01:23	0.03
M24	0.1556	3.1	01Jan2000, 01:02	0.03
M25	0.1591	3.2	01Jan2000, 01:01	0.03
M26	0.1786	2.0	01Jan2000, 01:39	0.03
M27	0.1951	2.1	01Jan2000, 01:42	0.03
M3	0.2286	133.6	01Jan2000, 01:11	1.01
M4	0.2334	88.3	01Jan2000, 01:12	0.66
M5	0.1654	53.9	01Jan2000, 01:04	0.51
M6	0.2256	4.5	01Jan2000, 01:01	0.03
M7	0.1692	5.6	01Jan2000, 00:57	0.06
M8	0.2475	96.2	01Jan2000, 01:27	0.84
M9	0.2357	52.3	01Jan2000, 01:51	0.64
MRK-1	5.1596	523.7	01Jan2000, 01:38	0.25
R-M1	5.0153	486.1	01Jan2000, 01:35	0.23
R-M10A	0.7056	8.0	01Jan2000, 01:46	0.03
R-M10B	2.4400	17.6	01Jan2000, 01:49	0.03
R-M11	0.1660	3.1	01Jan2000, 01:39	0.03
R-M13	0.0924	2.2	01Jan2000, 01:58	0.03
R-M18	1.3681	12.9	01Jan2000, 02:51	0.03
R-M2	4.7898	389.0	01Jan2000, 01:30	0.20
R-M20	0.2290	4.6	01Jan2000, 01:32	0.03
R-M22	0.5764	9.1	01Jan2000, 01:55	0.03
R-M25	0.3737	4.0	01Jan2000, 02:26	0.03
R-M3	4.5612	269.5	01Jan2000, 01:24	0.16
R-M4A	3.2844	26.9	01Jan2000, 02:04	0.03
R-M4B	0.1692	5.6	01Jan2000, 01:14	0.06
R-M4C	0.3910	58.1	01Jan2000, 01:10	0.23
R-M5	0.2256	4.5	01Jan2000, 01:10	0.03

Project: Final Ex100 Simulation Run: 2-PR

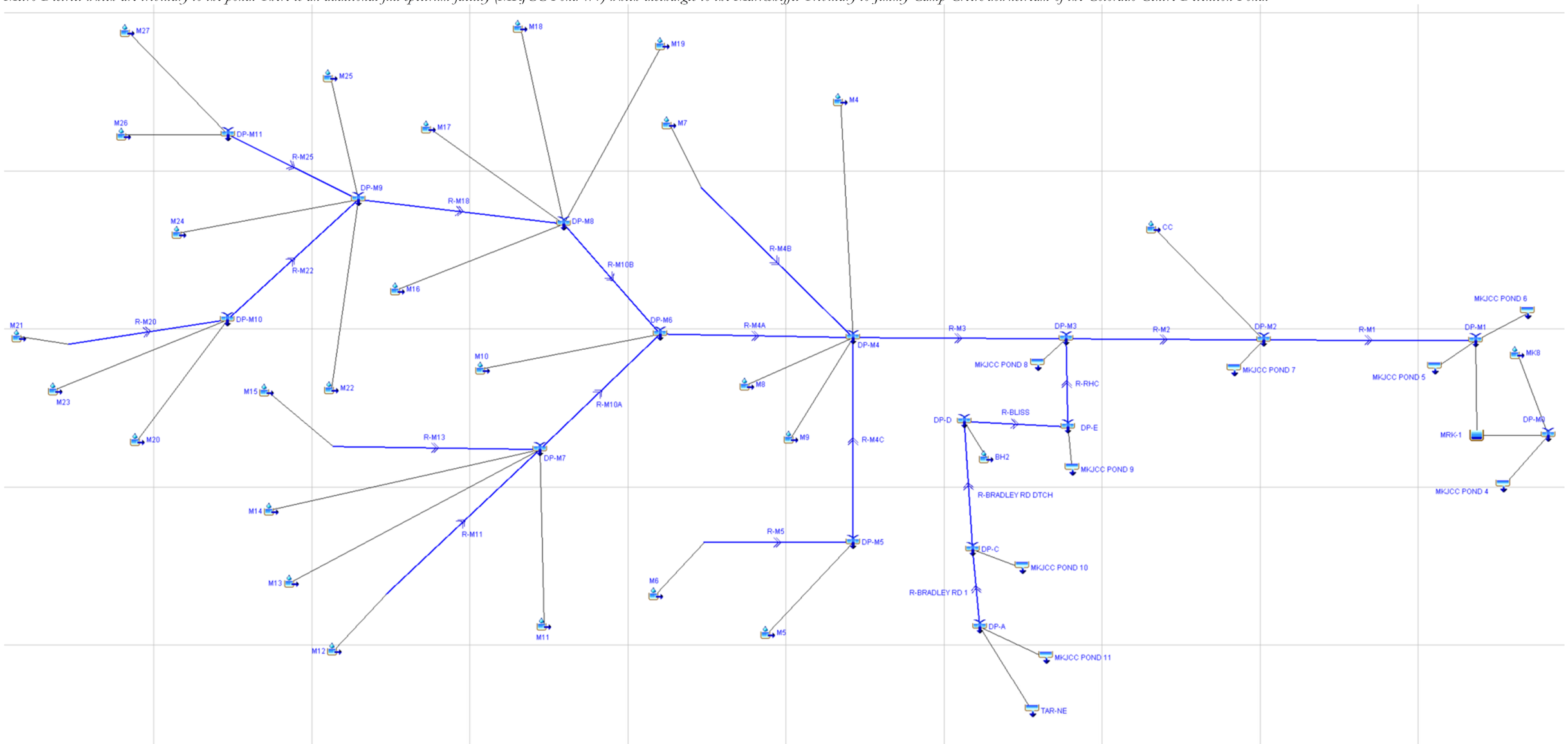
Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV
End of Run: 02Jan2000, 00:00 Meteorologic Model: 2yr
Compute Time: 28Mar2022, 08:10:12 Control Specifications: 2yr

Volume Units: (●) IN ( ) AC-FT

Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
DP-M0	5.1596	388.9	01Jan2000, 01:39	0.19
DP-M1	5.1596	395.8	01Jan2000, 01:34	0.19
DP-M10	0.5764	7.2	01Jan2000, 01:31	0.02
DP-M11	0.3737	3.2	01Jan2000, 01:41	0.02
DP-M2	5.0153	362.7	01Jan2000, 01:26	0.17
DP-M3	4.7898	289.6	01Jan2000, 01:20	0.15
DP-M4	4.5612	197.3	01Jan2000, 01:18	0.11
DP-M5	0.3910	41.3	01Jan2000, 01:04	0.16
DP-M6	3.2844	21.2	01Jan2000, 01:50	0.02
DP-M7	0.7056	6.3	01Jan2000, 01:10	0.02
DP-M8	2.4400	13.9	01Jan2000, 01:11	0.02
DP-M9	1.3681	10.2	01Jan2000, 02:04	0.02
M1	0.1443	69.8	01Jan2000, 01:05	0.76
M10	0.1388	1.5	01Jan2000, 01:25	0.02
M11	0.1079	1.6	01Jan2000, 01:04	0.02
M12	0.1660	2.4	01Jan2000, 01:05	0.02
M13	0.2257	2.9	01Jan2000, 01:11	0.02
M14	0.1136	1.6	01Jan2000, 01:08	0.02
M15	0.0924	1.7	01Jan2000, 00:54	0.02
M16	0.2321	3.0	01Jan2000, 01:12	0.02
M17	0.2844	3.9	01Jan2000, 01:08	0.02
M18	0.2554	3.3	01Jan2000, 01:11	0.02
M19	0.3000	3.8	01Jan2000, 01:13	0.02
M2	0.2255	101.0	01Jan2000, 01:10	0.76
M20	0.1399	1.6	01Jan2000, 01:18	0.02
M21	0.2290	3.7	01Jan2000, 01:01	0.02
M22	0.1033	1.7	01Jan2000, 01:00	0.02
M23	0.2075	2.2	01Jan2000, 01:23	0.02
M24	0.1556	2.4	01Jan2000, 01:02	0.02
M25	0.1591	2.5	01Jan2000, 01:01	0.02
M26	0.1786	1.6	01Jan2000, 01:39	0.02
M27	0.1951	1.6	01Jan2000, 01:42	0.02
M3	0.2286	102.6	01Jan2000, 01:11	0.77
M4	0.2334	65.2	01Jan2000, 01:11	0.49
M5	0.1654	38.2	01Jan2000, 01:03	0.36
M6	0.2256	3.6	01Jan2000, 01:01	0.02
M7	0.1692	4.5	01Jan2000, 00:57	0.03
M8	0.2475	70.5	01Jan2000, 01:27	0.62
M9	0.2357	38.6	01Jan2000, 01:50	0.47
MRK-1	5.1596	388.9	01Jan2000, 01:39	0.19
R-M1	5.0153	361.7	01Jan2000, 01:36	0.17
R-M10A	0.7056	6.3	01Jan2000, 01:47	0.02
R-M10B	2.4400	13.9	01Jan2000, 01:51	0.02
R-M11	0.1660	2.4	01Jan2000, 01:41	0.02
R-M13	0.0924	1.7	01Jan2000, 02:02	0.02
R-M18	1.3681	10.2	01Jan2000, 02:58	0.02
R-M2	4.7898	288.5	01Jan2000, 01:31	0.15
R-M20	0.2290	3.6	01Jan2000, 01:34	0.02
R-M22	0.5764	7.2	01Jan2000, 01:59	0.02
R-M25	0.3737	3.2	01Jan2000, 02:28	0.02
R-M3	4.5612	197.2	01Jan2000, 01:25	0.11
R-M4A	3.2844	21.1	01Jan2000, 02:08	0.02
R-M4B	0.1692	4.5	01Jan2000, 01:16	0.03
R-M4C	0.3910	41.2	01Jan2000, 01:10	0.16
R-M5	0.2256	3.6	01Jan2000, 01:11	0.02

Predevelopment Model Name: **JCC_DEV_2, JCC_DEV_5, JCC_DEV_10, and JCC_DEV_100**

These models reflect full development of the areas indicated as fully developed in MDDP-2015, but with full spectrum detention in the areas covered by the Bradley Heights Phase I Road Improvements and WQCV and EURV Detention for the remainder of the areas in Bradley Heights Metro District which are tributary to the pond. There is an additional full spectrum facility (MKJCC Pond #4) which discharges to the Marksheffel Tributary to Jimmy Camp Creek downstream of the Colorado Centre Detention Pond.

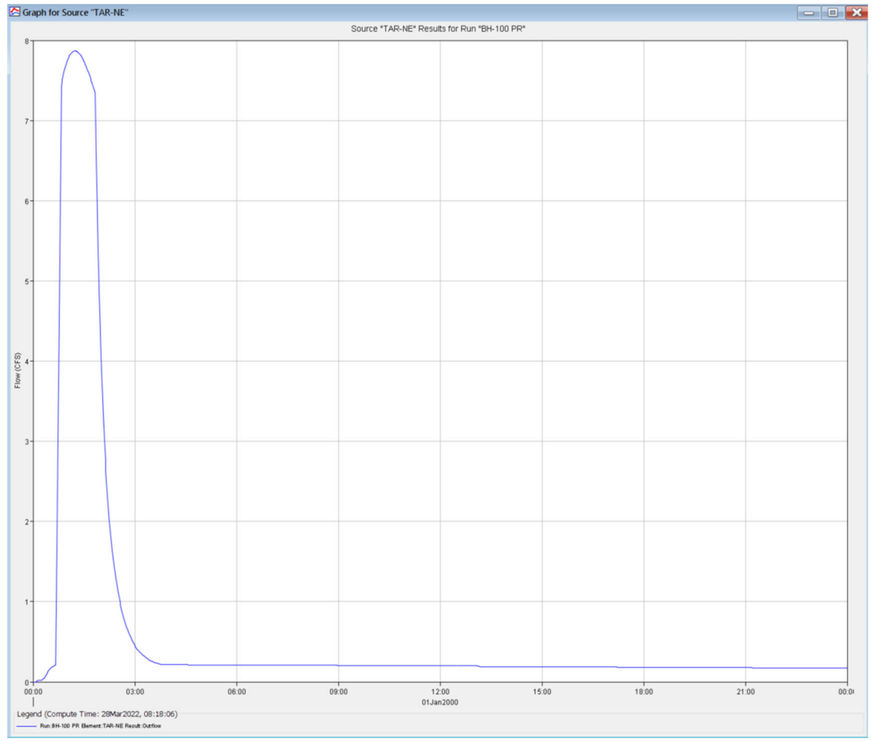


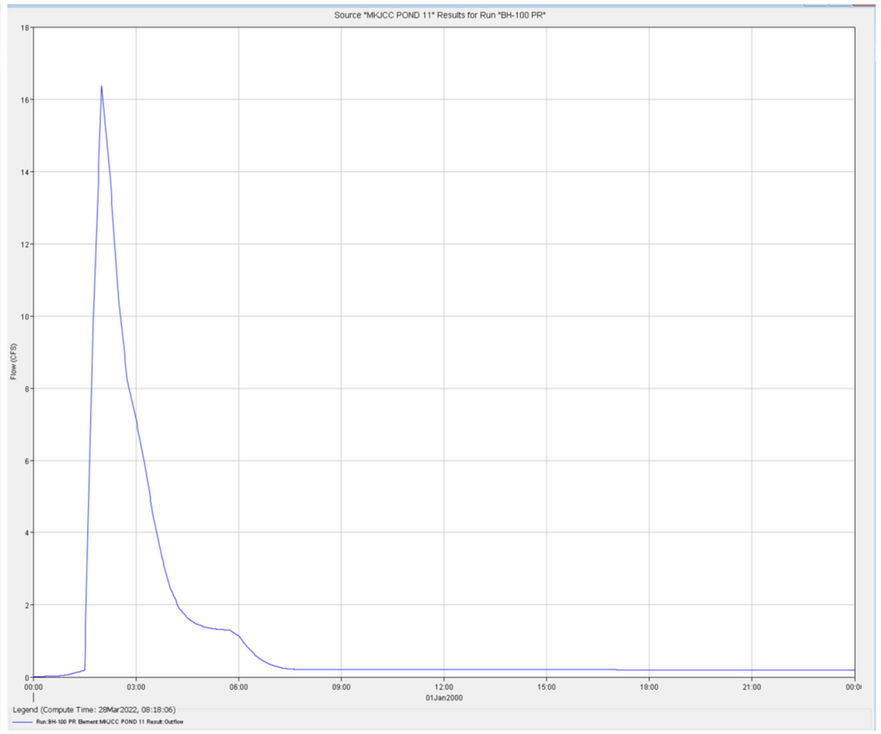
Project: Final Ex100 Simulation Run: BH-100 PR

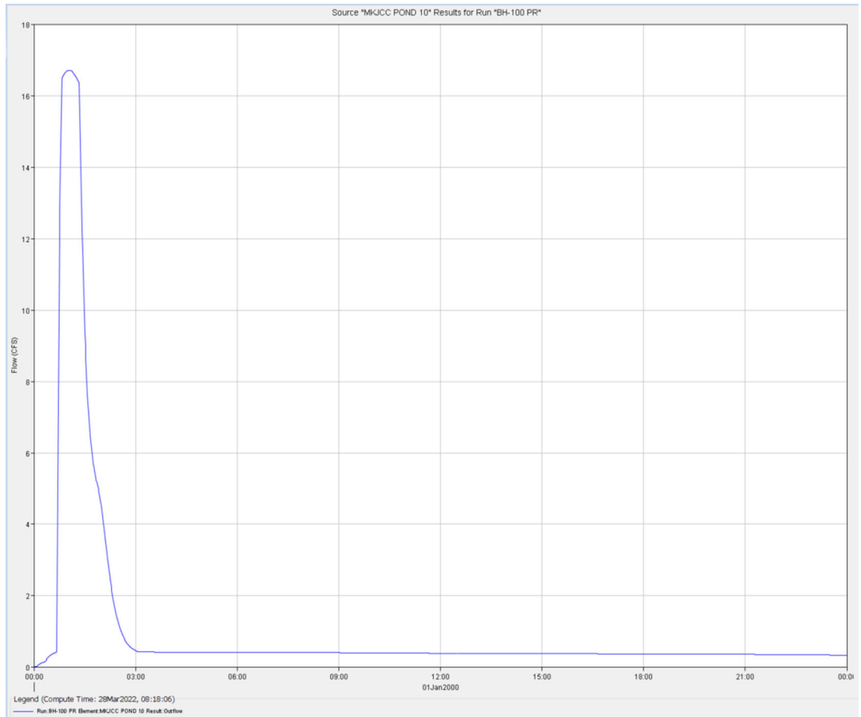
Start of Run: 01Jan2000, 00:00 Basin Model: JCC DEV-100
End of Run: 02Jan2000, 00:00 Meteorologic Model: 100yr
Compute Time: 28Mar2022, 08:18:06 Control Specifications: 100yr

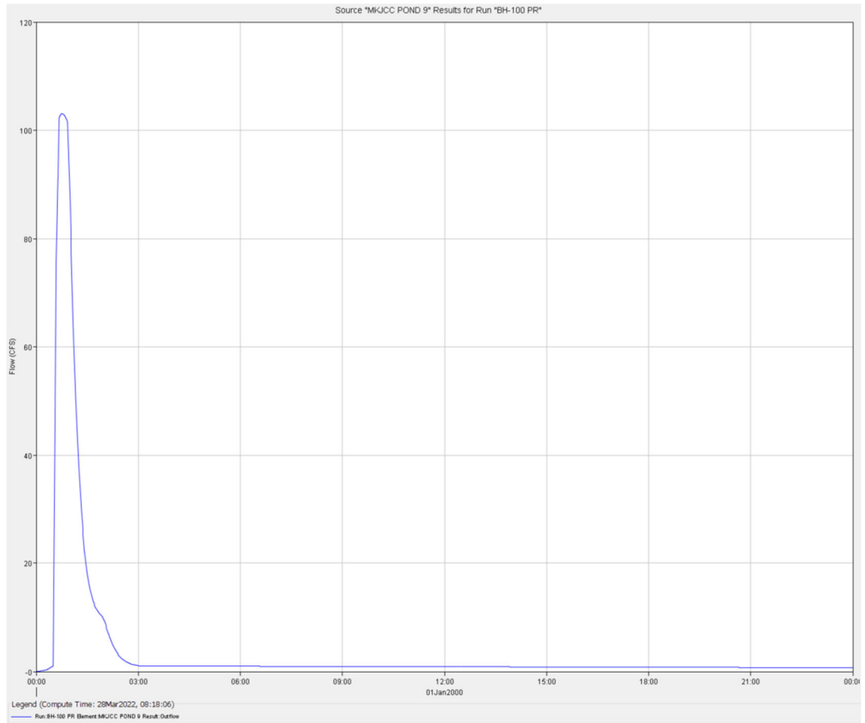
Volume Units: (●) IN ( ) AC-FT

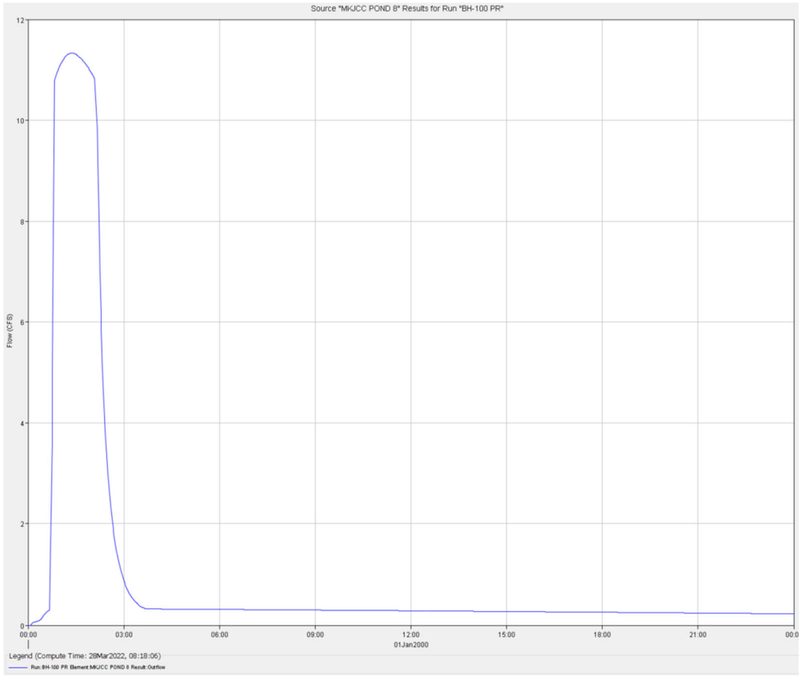
Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
BH2	0.0047000	7.4	01Jan2000, 06:09	2.28
CC	0.0811000	33.2	01Jan2000, 08:03	2.62
DP-A	0.0267169	20.4	01Jan2000, 02:00	2.45
DP-C	0.0485560	24.6	01Jan2000, 01:08	2.14
DP-D	0.0532560	24.6	01Jan2000, 01:12	2.15
DP-E	0.1343966	123.3	01Jan2000, 00:55	1.93
DP-M0	5.1650446	1003.8	01Jan2000, 07:18	1.10
DP-M1	5.0758283	1217.9	01Jan2000, 06:58	1.09
DP-M10	0.5764000	23.2	01Jan2000, 06:33	0.16
DP-M11	0.3737000	9.7	01Jan2000, 06:47	0.15
DP-M2	4.9062622	1220.2	01Jan2000, 06:51	1.06
DP-M3	4.7158622	1209.3	01Jan2000, 06:43	1.02
DP-M4	4.5612000	1206.8	01Jan2000, 06:39	0.99
DP-M5	0.3910000	311.3	01Jan2000, 06:16	1.56
DP-M6	3.2844000	371.6	01Jan2000, 06:43	0.46
DP-M7	0.7056000	70.4	01Jan2000, 06:27	0.42
DP-M8	2.4400000	284.3	01Jan2000, 06:28	0.47
DP-M9	1.3681000	67.6	01Jan2000, 06:20	0.24
M10	0.1388000	17.5	01Jan2000, 06:45	0.57
M11	0.1079000	31.0	01Jan2000, 06:21	0.76
M12	0.1660000	12.8	01Jan2000, 06:22	0.33
M13	0.2257000	25.6	01Jan2000, 06:30	0.46
M14	0.1136000	10.6	01Jan2000, 06:27	0.39
M15	0.0924000	5.3	01Jan2000, 06:06	0.16
M16	0.2321000	18.3	01Jan2000, 06:31	0.37
M17	0.2844000	121.9	01Jan2000, 06:24	1.09
M18	0.2554000	107.7	01Jan2000, 06:28	1.14
M19	0.3000000	32.5	01Jan2000, 06:33	0.46
M20	0.1399000	5.1	01Jan2000, 06:26	0.16
M21	0.2290000	11.6	01Jan2000, 06:11	0.16
M22	0.1033000	5.3	01Jan2000, 06:10	0.17
M23	0.2075000	6.9	01Jan2000, 06:31	0.16
M24	0.1556000	22.3	01Jan2000, 06:20	0.46
M25	0.1591000	37.0	01Jan2000, 06:19	0.62
M26	0.1786000	4.7	01Jan2000, 06:46	0.15
M27	0.1951000	5.0	01Jan2000, 06:49	0.15
M4	0.2334000	328.1	01Jan2000, 06:20	2.91
M5	0.1654000	248.4	01Jan2000, 06:13	2.60
M6	0.2256000	76.0	01Jan2000, 06:18	0.79
M7	0.1692000	119.7	01Jan2000, 06:13	1.24
M8	0.2475000	317.2	01Jan2000, 06:34	3.37
M9	0.2357000	178.4	01Jan2000, 06:57	2.84
MK8	0.0126000	29.7	01Jan2000, 06:06	3.34
MKJCC POND 10	0.0218391	16.7	01Jan2000, 01:00	1.76
MKJCC POND 11	0.0125061	16.4	01Jan2000, 02:00	3.39
MKJCC POND 4	0.0766163	70.3	01Jan2000, 01:00	1.79
MKJCC POND 5	0.1051300	203.5	01Jan2000, 00:40	1.82
MKJCC POND 6	0.0644361	89.0	01Jan2000, 00:50	1.84
MKJCC POND 7	0.1093000	177.2	01Jan2000, 00:45	1.82
MKJCC POND 8	0.0202656	11.3	01Jan2000, 01:20	1.85
MKJCC POND 9	0.0811406	103.1	01Jan2000, 00:45	1.79
MRK-1	5.0758283	1001.2	01Jan2000, 07:18	1.09
R-BLISS	0.0532560	24.6	01Jan2000, 01:13	2.15
R-BRADLEY RD 1	0.0267169	20.4	01Jan2000, 02:02	2.45
R-BRADLEY RD DTCH	0.0485560	24.6	01Jan2000, 01:12	2.14
R-M1	4.9062622	1215.9	01Jan2000, 06:58	1.06
R-M10A	0.7056000	70.4	01Jan2000, 06:44	0.42
R-M10B	2.4400000	283.9	01Jan2000, 06:43	0.47
R-M11	0.1660000	12.7	01Jan2000, 06:45	0.33
R-M13	0.0924000	5.3	01Jan2000, 06:57	0.15
R-M18	1.3681000	67.5	01Jan2000, 06:49	0.24
R-M2	4.7158622	1203.6	01Jan2000, 06:51	1.02
R-M20	0.2290000	11.5	01Jan2000, 06:34	0.16
R-M22	0.5764000	23.2	01Jan2000, 06:52	0.15
R-M25	0.3737000	9.7	01Jan2000, 07:23	0.15
R-M3	4.5612000	1205.3	01Jan2000, 06:43	0.99
R-M4A	3.2844000	370.3	01Jan2000, 06:50	0.46
R-M4B	0.1692000	119.3	01Jan2000, 06:20	1.24
R-M4C	0.3910000	311.0	01Jan2000, 06:19	1.56
R-M5	0.2256000	75.9	01Jan2000, 06:22	0.79
R-RHC	0.1343966	122.6	01Jan2000, 00:55	1.93
TAR-NE	0.0142108	7.9	01Jan2000, 01:15	1.63

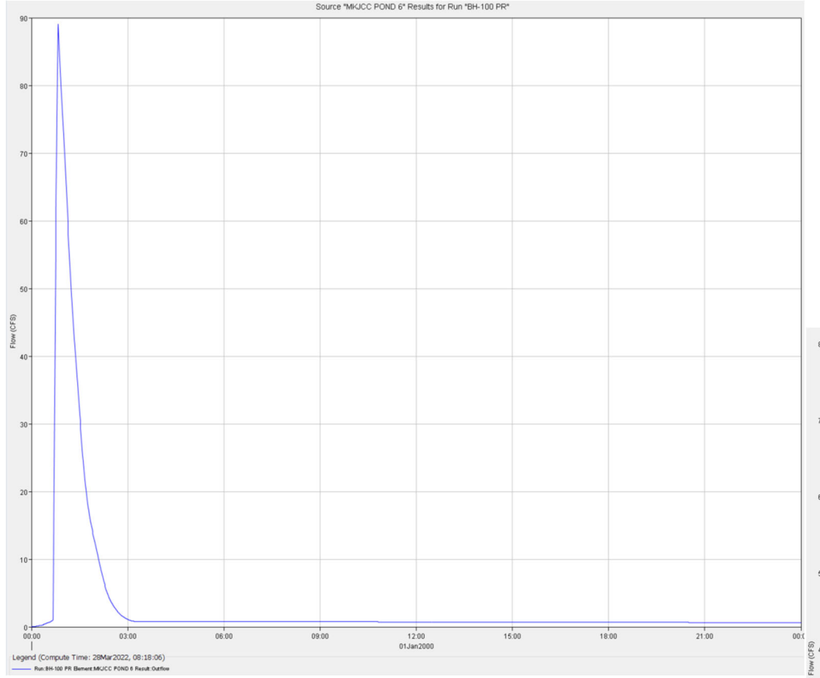


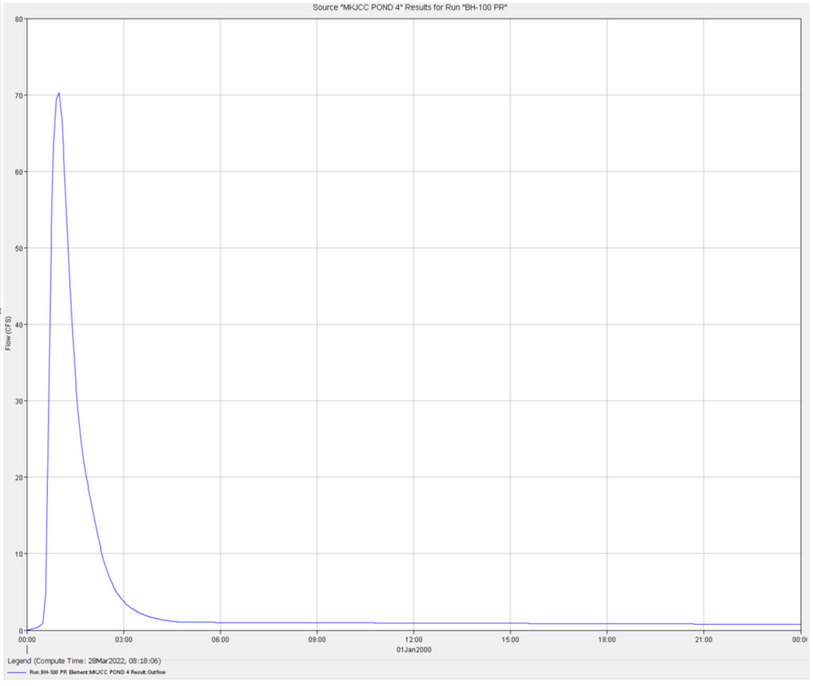


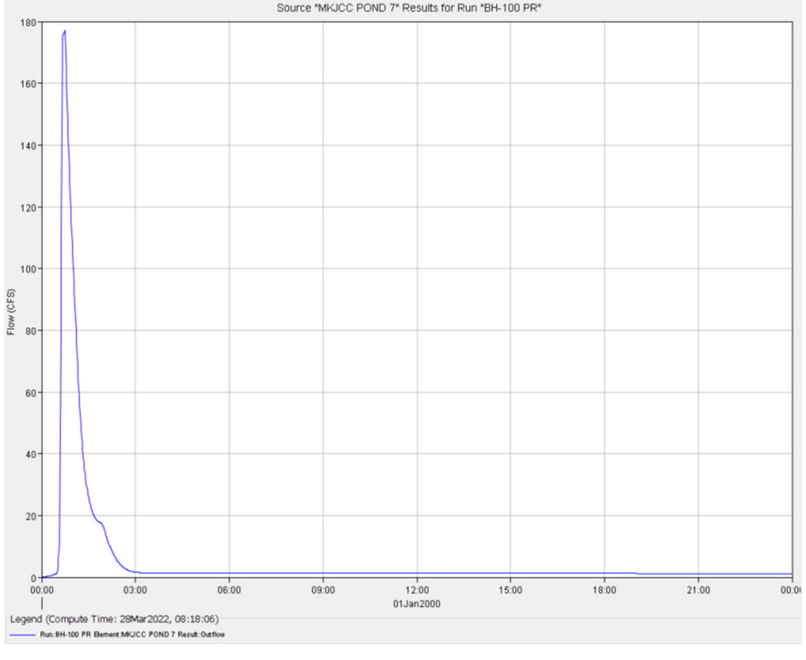


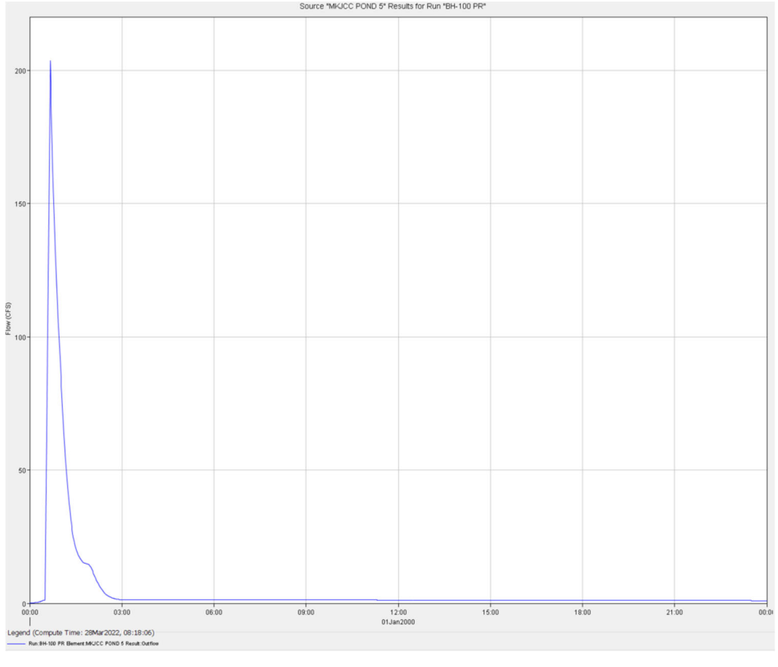



Source "MKJCC POND 8" Results for Run "BH-100 PR"
Flow (CFS)
0
2
4
6
8
10
12
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 28Mar2022, 08:18:06)
Run:BH-100 PR Element:MKJCC POND 8 Result:Outflow


Source "MKJCC POND 6" Results for Run "BH-100 PR"
Flow (CFS)
0
10
20
30
40
50
60
70
80
90
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 28Mar2022, 08:18:06)
Run:BH-100 PR Element:MKJCC POND 6 Result:Outflow


Source "MKJCC POND 4" Results for Run "BH-100 PR"
Flow (CFS)
0
10
20
30
40
50
60
70
80
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 28Mar2022, 08:18:06)
Run:BH-100 PR Element:MKJCC POND 4 Result:Outflow


Source "MKJCC POND 7" Results for Run "BH-100 PR"
Flow (CFS)
0
20
40
60
80
100
120
140
160
180
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 28Mar2022, 08:18:06)
Run:BH-100 PR Element:MKJCC POND 7 Result:Outflow

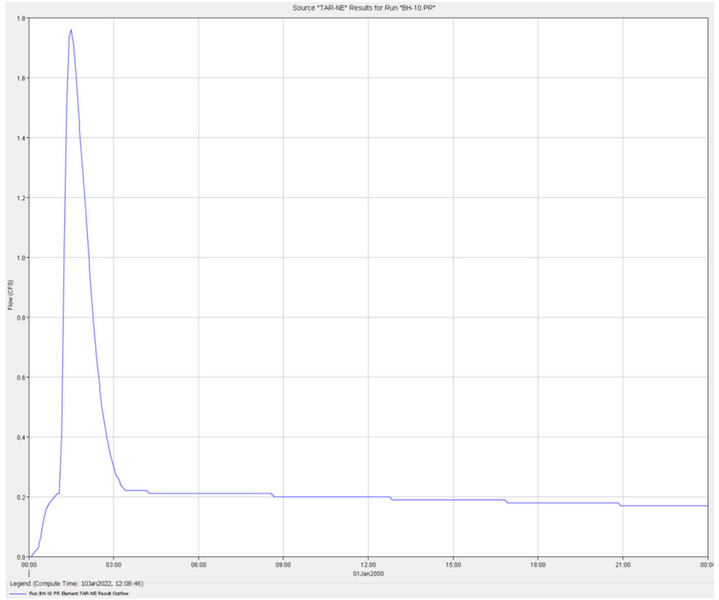

Source "MKJCC POND 5" Results for Run "BH-100 PR"
Flow (CFS)
0
50
100
150
200
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 28Mar2022, 08:18:06)
Run:BH-100 PR Element:MKJCC POND 5 Result:Outflow

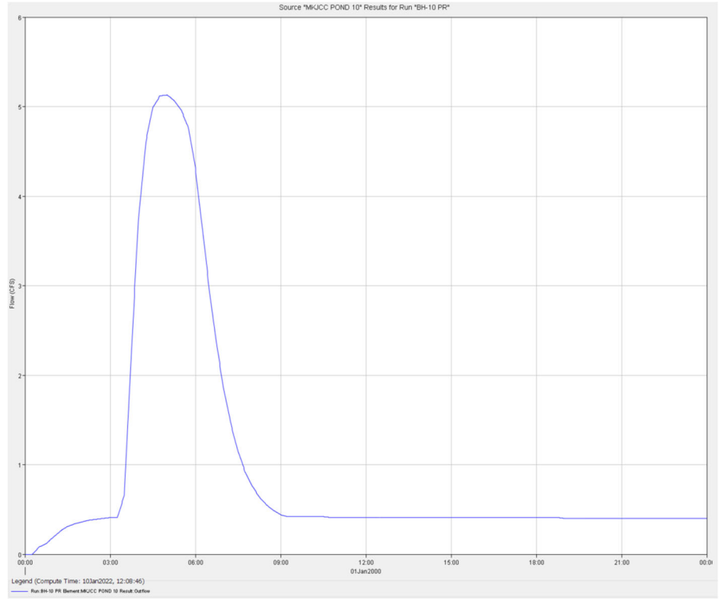
Project: Final Ex100 Simulation Run: BH-10 PR

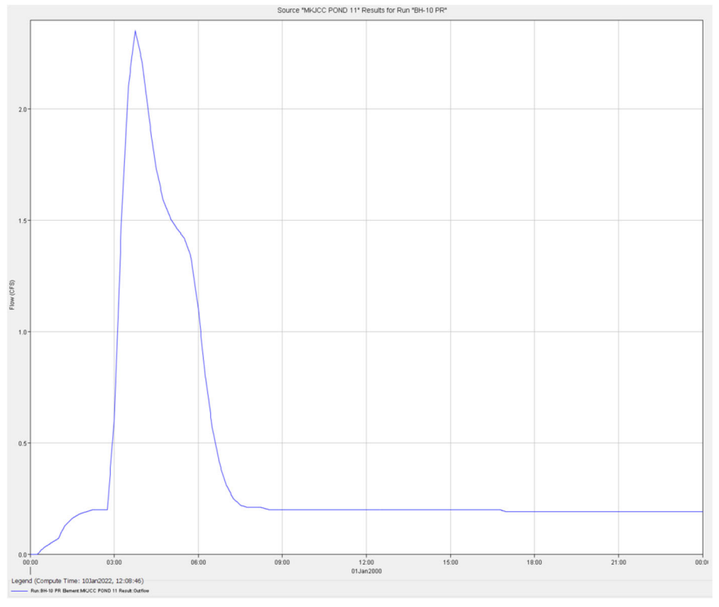
Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV-10
End of Run: 02Jan2000, 00:00 Meteorologic Model: 10yr
Compute Time: 10Jan2022, 12:08:46 Control Specifications: 10yr

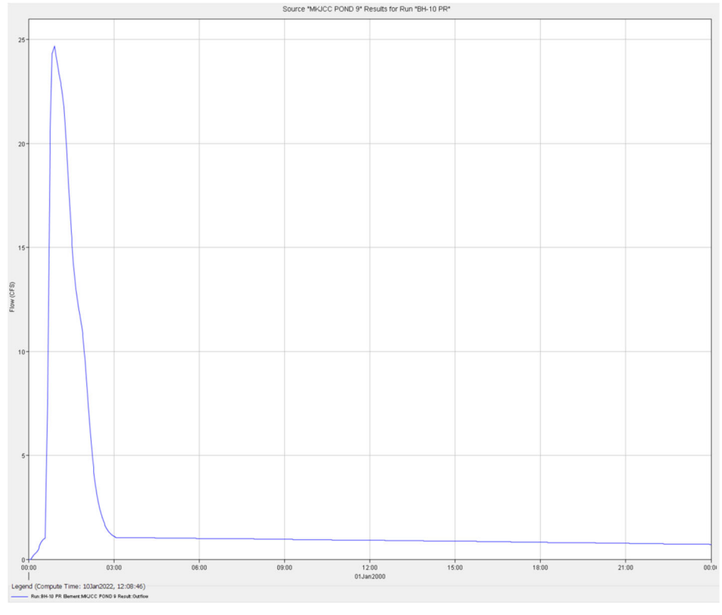
Volume Units: (•) IN ( ) AC-FT

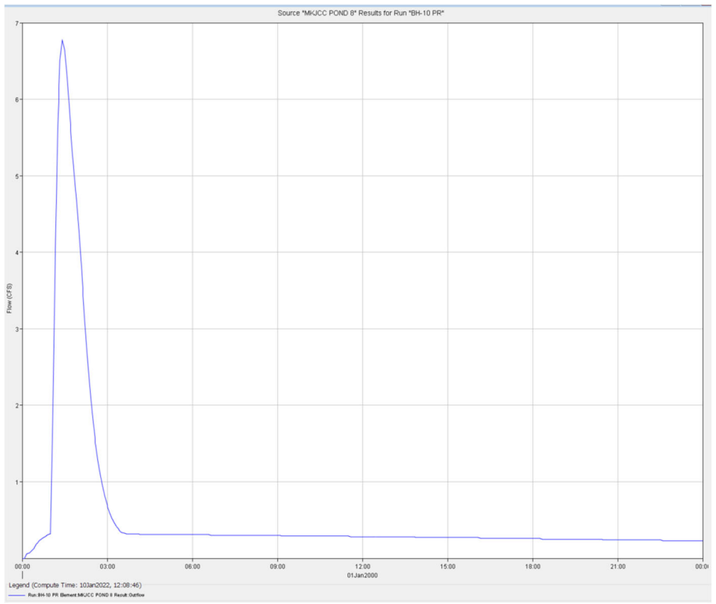
Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
BH2	0.0047000	4.0	01Jan2000, 06:10	1.30
CC	0.0811000	19.6	01Jan2000, 08:05	1.59
DP-A	0.0267169	2.6	01Jan2000, 03:45	0.90
DP-C	0.0485560	7.0	01Jan2000, 04:30	1.22
DP-D	0.0532560	9.5	01Jan2000, 06:08	1.22
DP-E	0.1343966	25.0	01Jan2000, 00:55	1.02
DP-M0	5.1650446	624.5	01Jan2000, 06:57	0.59
DP-M1	5.0758283	672.8	01Jan2000, 06:46	0.58
DP-M10	0.5764000	16.3	01Jan2000, 06:35	0.06
DP-M11	0.3737000	6.9	01Jan2000, 06:47	0.06
DP-M2	4.9062622	673.2	01Jan2000, 06:38	0.57
DP-M3	4.7158622	668.7	01Jan2000, 06:29	0.54
DP-M4	4.5612000	661.8	01Jan2000, 06:25	0.53
DP-M5	0.3910000	161.2	01Jan2000, 06:15	0.85
DP-M6	3.2844000	122.3	01Jan2000, 06:48	0.17
DP-M7	0.7056000	19.8	01Jan2000, 06:32	0.14
DP-M8	2.4400000	98.7	01Jan2000, 06:27	0.18
DP-M9	1.3681000	25.1	01Jan2000, 07:03	0.09
M10	0.1388000	4.3	01Jan2000, 06:41	0.19
M11	0.1079000	8.2	01Jan2000, 06:22	0.29
M12	0.1660000	5.5	01Jan2000, 06:14	0.09
M13	0.2257000	6.7	01Jan2000, 06:21	0.14
M14	0.1136000	3.5	01Jan2000, 06:17	0.11
M15	0.0924000	3.8	01Jan2000, 06:06	0.06
M16	0.2321000	6.6	01Jan2000, 06:21	0.10
M17	0.2844000	43.3	01Jan2000, 06:26	0.47
M18	0.2554000	39.5	01Jan2000, 06:29	0.50
M19	0.3000000	8.6	01Jan2000, 06:23	0.14
M20	0.1399000	3.6	01Jan2000, 06:26	0.06
M21	0.2290000	8.2	01Jan2000, 06:11	0.06
M22	0.1033000	3.8	01Jan2000, 06:10	0.06
M23	0.2075000	4.9	01Jan2000, 06:31	0.06
M24	0.1556000	5.5	01Jan2000, 06:12	0.14
M25	0.1591000	8.3	01Jan2000, 06:18	0.21
M26	0.1786000	3.4	01Jan2000, 06:46	0.06
M27	0.1951000	3.5	01Jan2000, 06:49	0.06
M4	0.2334000	204.6	01Jan2000, 06:20	1.86
M5	0.1654000	147.2	01Jan2000, 06:14	1.60
M6	0.2256000	20.7	01Jan2000, 06:19	0.30
M7	0.1692000	47.2	01Jan2000, 06:14	0.58
M8	0.2475000	205.8	01Jan2000, 06:34	2.23
M9	0.2357000	111.3	01Jan2000, 06:57	1.80
MK8	0.0126000	19.4	01Jan2000, 06:07	2.21
MKJCC PO...	0.0218391	5.1	01Jan2000, 05:00	1.61
MKJCC PO...	0.0125061	2.4	01Jan2000, 03:45	1.17
MKJCC PO...	0.0766163	18.7	01Jan2000, 01:20	0.95
MKJCC PO...	0.1051300	50.2	01Jan2000, 00:50	0.97
MKJCC PO...	0.0644361	28.3	01Jan2000, 01:10	0.99
MKJCC PO...	0.1093000	44.6	01Jan2000, 00:55	0.99
MKJCC PO...	0.0202656	6.8	01Jan2000, 01:25	1.01
MKJCC PO...	0.0811406	24.7	01Jan2000, 00:55	0.88
MRK-1	5.0758283	621.8	01Jan2000, 06:57	0.58
R-BLISS	0.0532560	9.5	01Jan2000, 06:09	1.22
R-BRADLE...	0.0267169	2.6	01Jan2000, 03:49	0.89
R-BRADLE...	0.0485560	7.0	01Jan2000, 04:35	1.21
R-M1	4.9062622	670.7	01Jan2000, 06:46	0.57
R-M10A	0.7056000	19.8	01Jan2000, 06:58	0.13
R-M10B	2.4400000	98.6	01Jan2000, 06:48	0.18
R-M11	0.1660000	5.5	01Jan2000, 06:44	0.09
R-M13	0.0924000	3.7	01Jan2000, 07:02	0.06
R-M18	1.3681000	25.0	01Jan2000, 07:43	0.09
R-M2	4.7158622	665.8	01Jan2000, 06:38	0.54
R-M20	0.2290000	8.2	01Jan2000, 06:37	0.06
R-M22	0.5764000	16.3	01Jan2000, 06:56	0.06
R-M25	0.3737000	6.9	01Jan2000, 07:26	0.06
R-M3	4.5612000	661.2	01Jan2000, 06:29	0.53
R-M4A	3.2844000	121.6	01Jan2000, 06:59	0.17
R-M4B	0.1692000	47.0	01Jan2000, 06:23	0.57
R-M4C	0.3910000	161.1	01Jan2000, 06:19	0.85
R-M5	0.2256000	20.7	01Jan2000, 06:25	0.30
R-RHC	0.1343966	25.0	01Jan2000, 00:56	1.02
TAR-NE	0.0142108	1.8	01Jan2000, 01:30	0.66

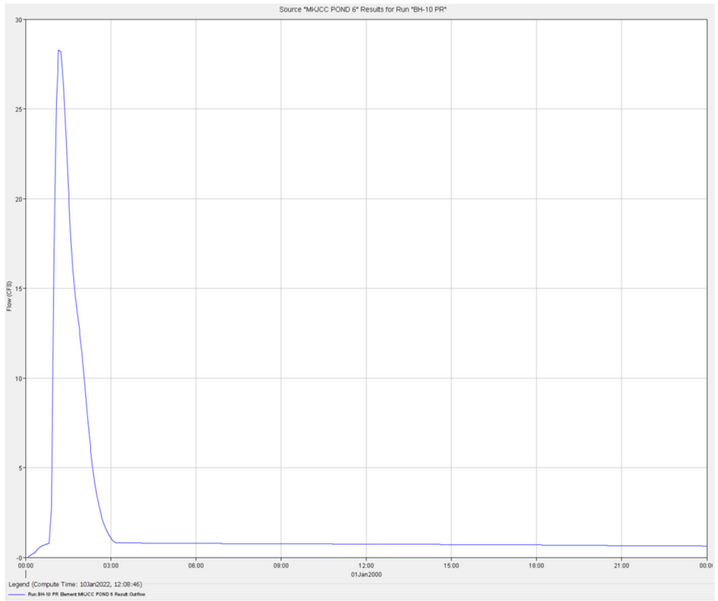


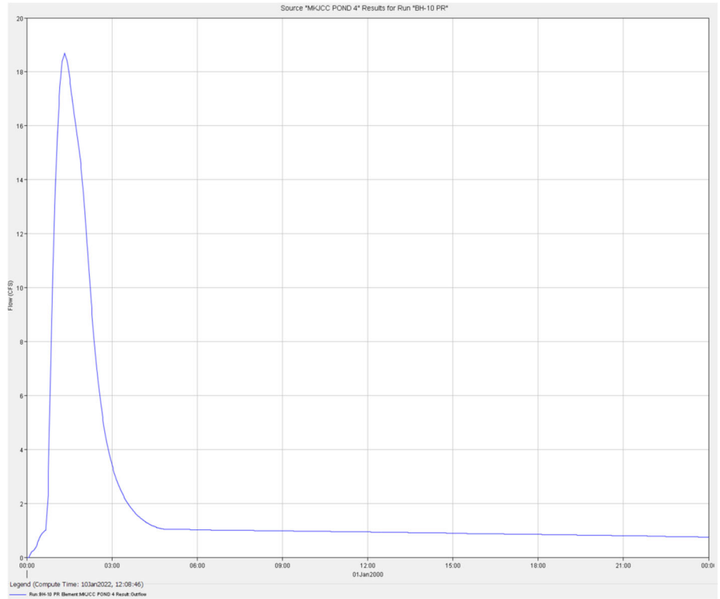







Source "MKJCC POND 8" Results for Run "BH-10 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:08:46)
Run BH-10 PR Element MKJCC POND 8 Result Outflow


Source "MKJCC POND 6" Results for Run "BH-10 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:08:46)
Run BH-10 PR Element MKJCC POND 6 Result Outflow


Source "MKJCC POND 4" Results for Run "BH-10 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:08:46)
Run BH-10 PR Element MKJCC POND 4 Result Outflow

Source "MKJCC POND 7" Results for Run "BH-10 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:08:46)
Run BH-10 PR Element MKJCC POND 7 Result Outflow

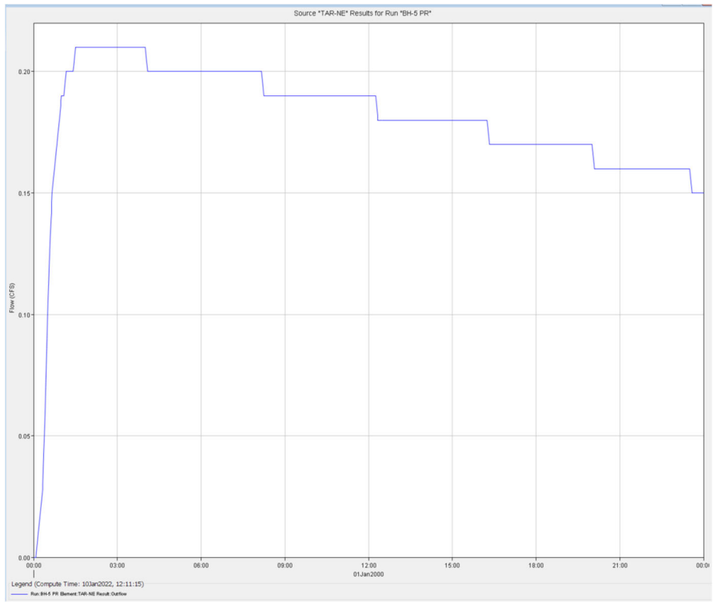
Source "MKJCC POND 5" Results for Run "BH-10 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:08:46)
Run BH-10 PR Element MKJCC POND 5 Result Outflow

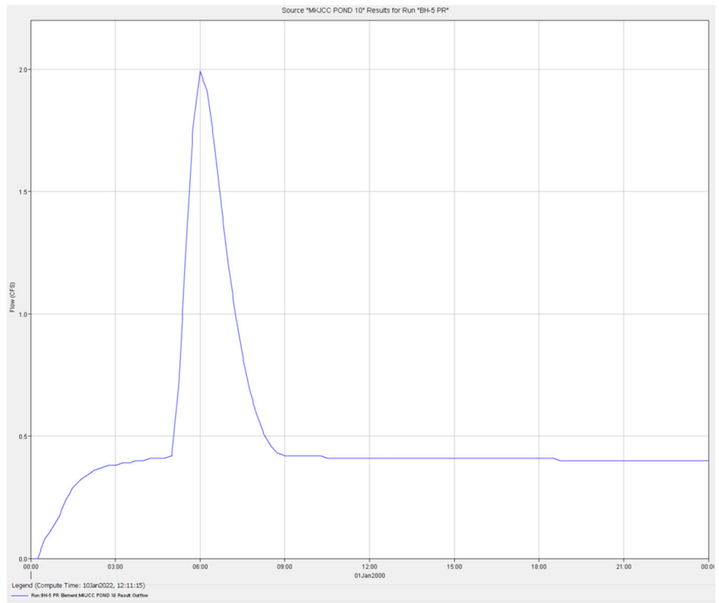
Project: Final Ex100 Simulation Run: BH-5 PR

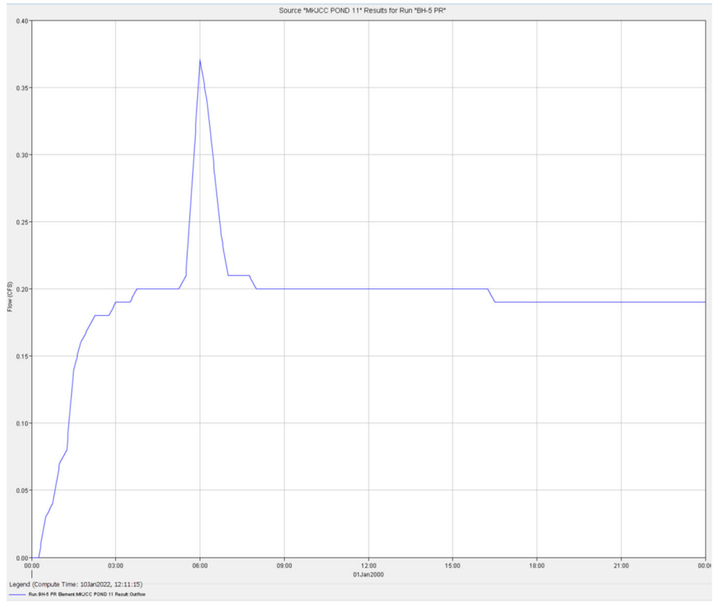
Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV-5
End of Run: 02Jan2000, 00:00 Meteorologic Model: 5yr
Compute Time: 10Jan2022, 12:11:15 Control Specifications: 5yr

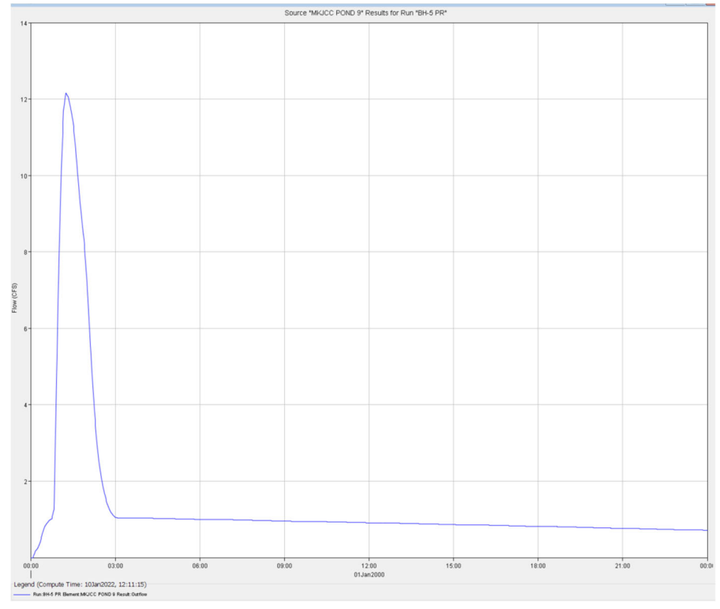
Volume Units: (•) IN ( ) AC-FT

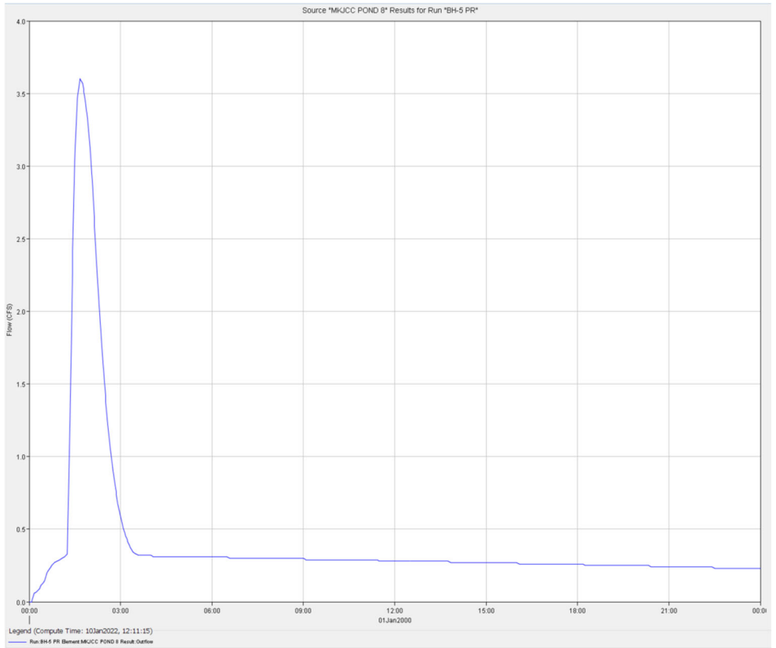
Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
BH2	0.0047000	0.9	01Jan2000, 01:04	0.26
CC	0.0811000	8.0	01Jan2000, 03:01	0.47
DP-A	0.0267170	0.6	01Jan2000, 06:00	0.52
DP-C	0.0485560	2.5	01Jan2000, 06:04	0.66
DP-D	0.0532560	2.5	01Jan2000, 06:08	0.62
DP-E	0.1343966	13.4	01Jan2000, 01:15	0.63
DP-M0	5.1650446	338.4	01Jan2000, 01:48	0.22
DP-M1	5.0758283	330.7	01Jan2000, 01:44	0.21
DP-M10	0.5764000	9.1	01Jan2000, 01:29	0.03
DP-M11	0.3737000	4.0	01Jan2000, 01:41	0.03
DP-M2	4.9062622	305.9	01Jan2000, 01:35	0.19
DP-M3	4.7158622	284.6	01Jan2000, 01:25	0.17
DP-M4	4.5612000	269.7	01Jan2000, 01:19	0.16
DP-M5	0.3910000	58.1	01Jan2000, 01:05	0.23
DP-M6	3.2844000	27.0	01Jan2000, 01:48	0.03
DP-M7	0.7056000	8.0	01Jan2000, 01:11	0.03
DP-M8	2.4400000	17.7	01Jan2000, 01:12	0.03
DP-M9	1.3681000	12.9	01Jan2000, 02:01	0.03
M10	0.1388000	1.8	01Jan2000, 01:25	0.03
M11	0.1079000	2.0	01Jan2000, 01:04	0.03
M12	0.1660000	3.1	01Jan2000, 01:05	0.03
M13	0.2257000	3.7	01Jan2000, 01:11	0.03
M14	0.1136000	2.0	01Jan2000, 01:08	0.03
M15	0.0924000	2.2	01Jan2000, 00:54	0.03
M16	0.2321000	3.7	01Jan2000, 01:12	0.03
M17	0.2844000	4.9	01Jan2000, 01:08	0.04
M18	0.2554000	4.2	01Jan2000, 01:12	0.04
M19	0.3000000	4.7	01Jan2000, 01:13	0.03
M20	0.1399000	2.1	01Jan2000, 01:18	0.03
M21	0.2290000	4.6	01Jan2000, 01:01	0.03
M22	0.1033000	2.1	01Jan2000, 01:00	0.03
M23	0.2075000	2.8	01Jan2000, 01:23	0.03
M24	0.1556000	3.1	01Jan2000, 01:02	0.03
M25	0.1591000	3.2	01Jan2000, 01:01	0.03
M26	0.1786000	2.0	01Jan2000, 01:39	0.03
M27	0.1951000	2.1	01Jan2000, 01:42	0.03
M4	0.2334000	88.3	01Jan2000, 01:12	0.66
M5	0.1654000	53.9	01Jan2000, 01:04	0.51
M6	0.2256000	4.5	01Jan2000, 01:01	0.03
M7	0.1692000	5.6	01Jan2000, 00:57	0.06
M8	0.2475000	96.2	01Jan2000, 01:27	0.84
M9	0.2357000	52.3	01Jan2000, 01:51	0.64
MK8	0.0126000	8.8	01Jan2000, 00:55	0.85
MKJCC PO...	0.0218390	2.0	01Jan2000, 06:00	0.84
MKJCC PO...	0.0125060	0.4	01Jan2000, 06:00	0.57
MKJCC PO...	0.0766163	10.0	01Jan2000, 01:40	0.70
MKJCC PO...	0.1051300	24.2	01Jan2000, 01:05	0.72
MKJCC PO...	0.0644361	17.0	01Jan2000, 01:25	0.73
MKJCC PO...	0.1093000	23.5	01Jan2000, 01:15	0.73
MKJCC PO...	0.0202656	3.6	01Jan2000, 01:40	0.75
MKJCC PO...	0.0811406	12.2	01Jan2000, 01:15	0.63
MRK-1	5.0758283	327.1	01Jan2000, 01:48	0.21
R-BLISS	0.0532560	2.5	01Jan2000, 06:10	0.62
R-BRADLE...	0.0267170	0.6	01Jan2000, 06:06	0.51
R-BRADLE...	0.0485560	2.5	01Jan2000, 06:08	0.66
R-M1	4.9062622	305.2	01Jan2000, 01:45	0.19
R-M10A	0.7056000	8.0	01Jan2000, 01:46	0.03
R-M10B	2.4400000	17.6	01Jan2000, 01:49	0.03
R-M11	0.1660000	3.1	01Jan2000, 01:39	0.03
R-M13	0.0924000	2.2	01Jan2000, 01:58	0.03
R-M18	1.3681000	12.9	01Jan2000, 02:51	0.03
R-M2	4.7158622	283.8	01Jan2000, 01:36	0.17
R-M20	0.2290000	4.6	01Jan2000, 01:32	0.03
R-M22	0.5764000	9.1	01Jan2000, 01:55	0.03
R-M25	0.3737000	4.0	01Jan2000, 02:26	0.03
R-M3	4.5612000	269.5	01Jan2000, 01:24	0.16
R-M4A	3.2844000	26.9	01Jan2000, 02:04	0.03
R-M4B	0.1692000	5.6	01Jan2000, 01:14	0.06
R-M4C	0.3910000	58.1	01Jan2000, 01:10	0.23
R-M5	0.2256000	4.5	01Jan2000, 01:10	0.03
R-RHC	0.1343966	13.4	01Jan2000, 01:16	0.63
TAR-NE	0.0142110	0.2	01Jan2000, 01:30	0.47

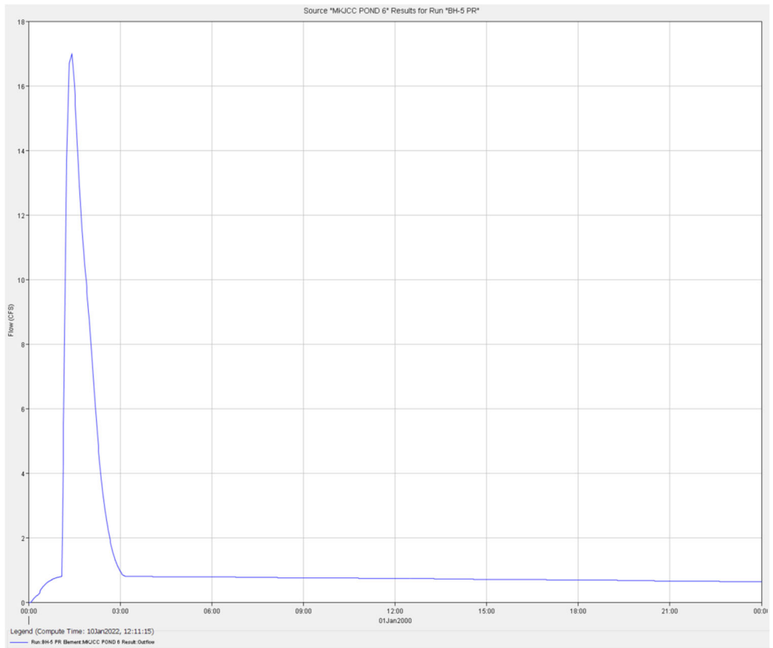


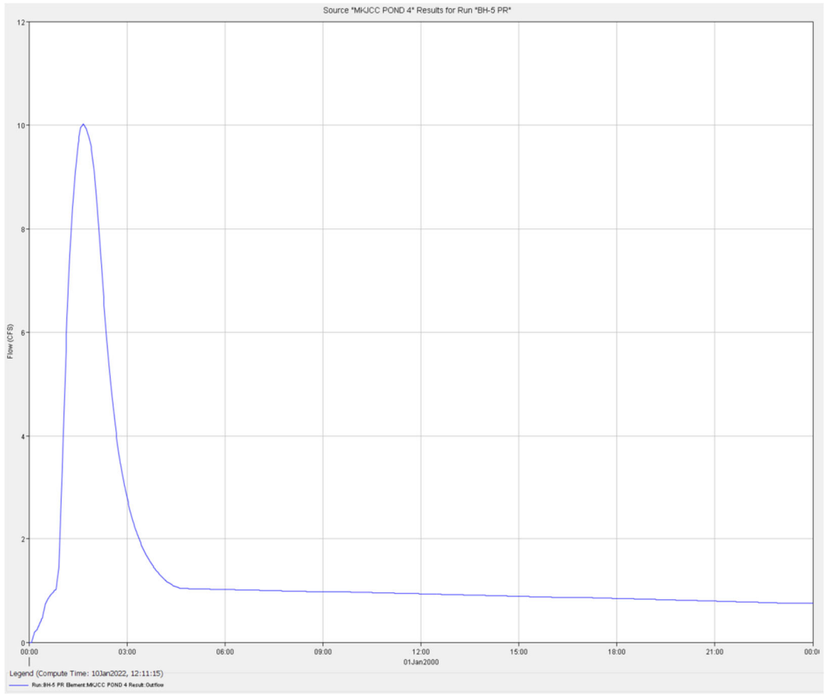


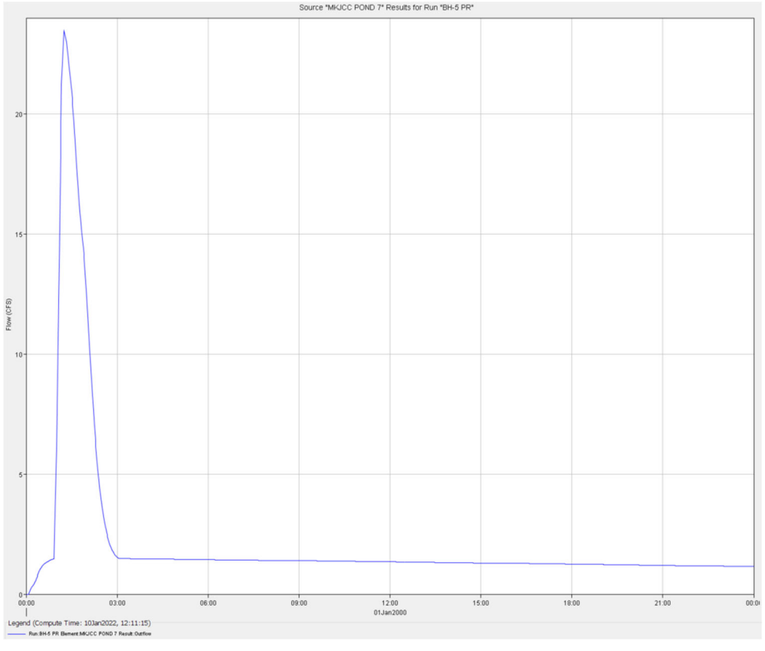


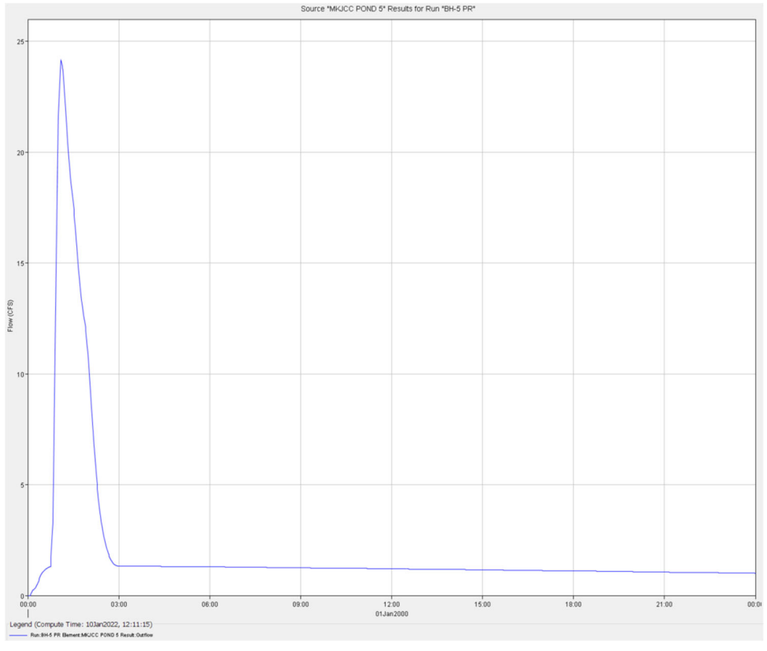



Source "MKJCC POND 8" Results for Run "BH-5 PR"
Flow (CFS)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 10Jan2022, 12:11:15)
Run BH-5 PR Element MKJCC POND 8 Result Outflow


Source "MKJCC POND 6" Results for Run "BH-5 PR"
Flow (CFS)
18
16
14
12
10
8
6
4
2
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 10Jan2022, 12:11:15)
Run BH-5 PR Element MKJCC POND 6 Result Outflow


Source "MKJCC POND 4" Results for Run "BH-5 PR"
Flow (CFS)
12
10
8
6
4
2
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 10Jan2022, 12:11:15)
Run BH-5 PR Element MKJCC POND 4 Result Outflow


Source "MKJCC POND 7" Results for Run "BH-5 PR"
Flow (CFS)
20
15
10
5
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 10Jan2022, 12:11:15)
Run BH-5 PR Element MKJCC POND 7 Result Outflow

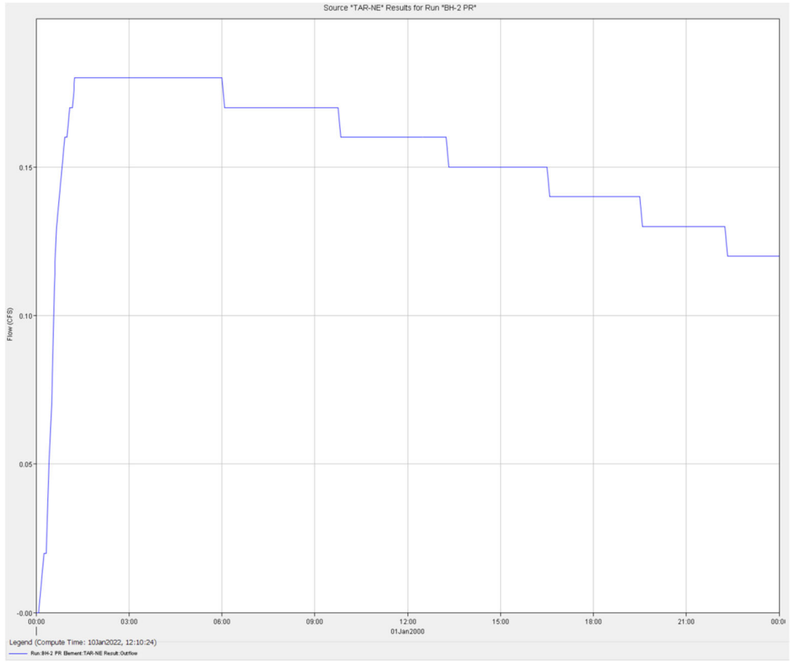

Source "MKJCC POND 5" Results for Run "BH-5 PR"
Flow (CFS)
25
20
15
10
5
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
01Jan2000
Legend (Compute Time: 10Jan2022, 12:11:15)
Run BH-5 PR Element MKJCC POND 5 Result Outflow

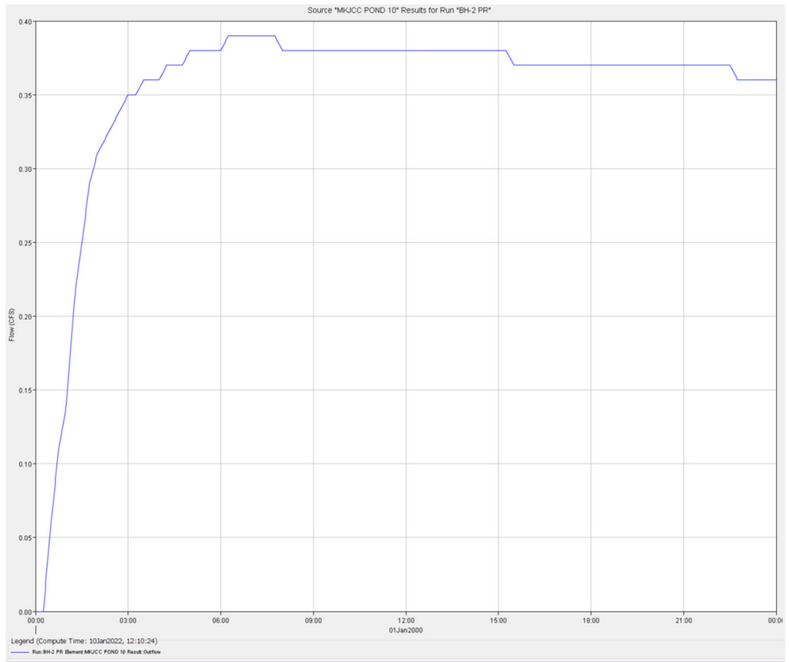
Project: Final Ex100 Simulation Run: BH-2 PR

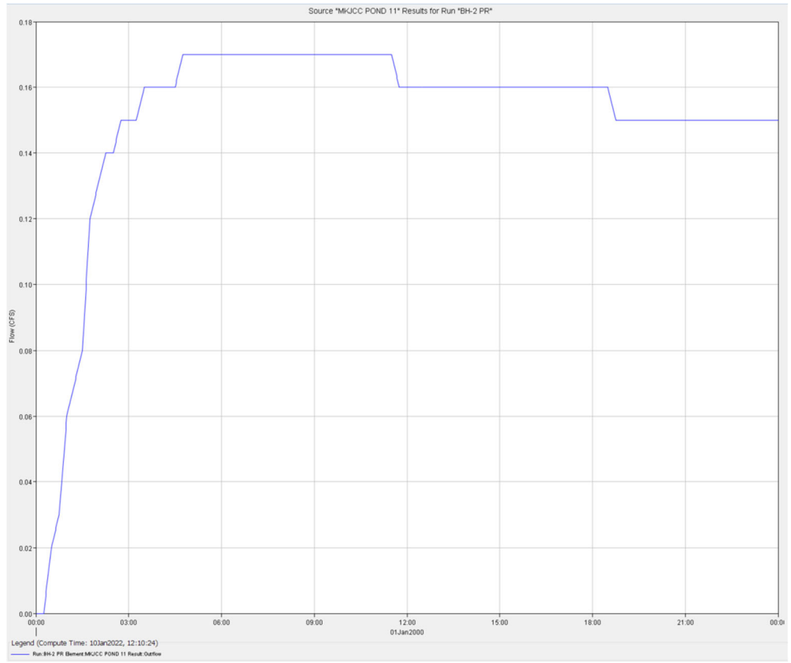
Start of Run: 01Jan2000, 00:00 Basin Model: JCC-DEV-2
End of Run: 02Jan2000, 00:00 Meteorologic Model: 2yr
Compute Time: 10Jan2022, 12:10:24 Control Specifications: 2yr

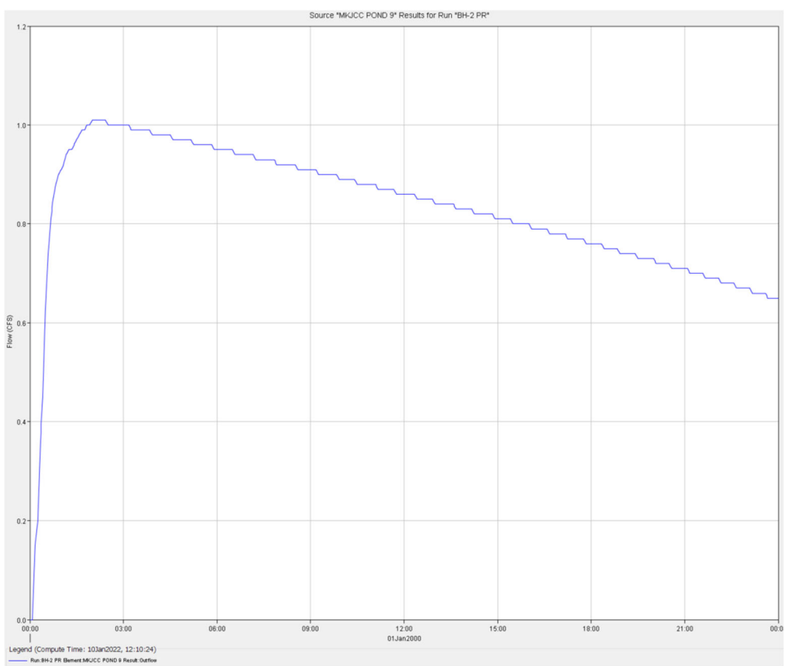
Volume Units: (●) IN ( ) AC-FT

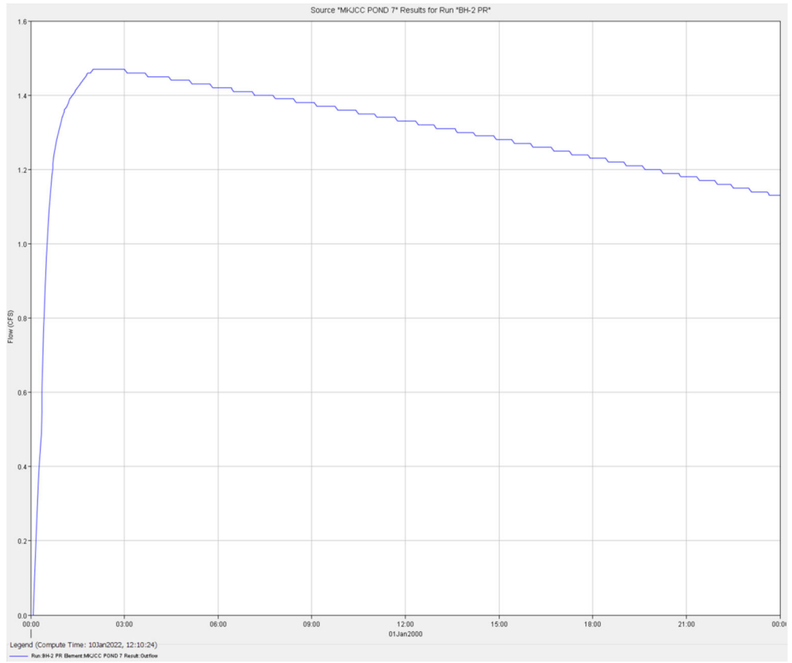
Hydrologic Element	Drainage A... (MI2)	Peak Disch... (CFS)	Time of Peak	Volume (IN)
BH2	0.0047000	0.4	01Jan2000, 01:07	0.14
CC	0.0811000	5.3	01Jan2000, 03:01	0.31
DP-A	0.0267169	0.4	01Jan2000, 04:45	0.42
DP-C	0.0485560	0.7	01Jan2000, 06:06	0.50
DP-D	0.0532560	0.8	01Jan2000, 01:15	0.47
DP-E	0.1343966	1.8	01Jan2000, 02:07	0.42
DP-M0	5.1650446	205.5	01Jan2000, 01:48	0.15
DP-M1	5.0758283	203.6	01Jan2000, 01:48	0.14
DP-M10	0.5764000	7.2	01Jan2000, 01:31	0.02
DP-M11	0.3737000	3.2	01Jan2000, 01:41	0.02
DP-M2	4.9062622	201.9	01Jan2000, 01:37	0.13
DP-M3	4.7158622	199.2	01Jan2000, 01:25	0.12
DP-M4	4.5612000	197.3	01Jan2000, 01:18	0.11
DP-M5	0.3910000	41.3	01Jan2000, 01:04	0.16
DP-M6	3.2844000	21.2	01Jan2000, 01:50	0.02
DP-M7	0.7056000	6.3	01Jan2000, 01:10	0.02
DP-M8	2.4400000	13.9	01Jan2000, 01:11	0.02
DP-M9	1.3681000	10.2	01Jan2000, 02:04	0.02
M10	0.1388000	1.5	01Jan2000, 01:25	0.02
M11	0.1079000	1.6	01Jan2000, 01:04	0.02
M12	0.1660000	2.4	01Jan2000, 01:05	0.02
M13	0.2257000	2.9	01Jan2000, 01:11	0.02
M14	0.1136000	1.6	01Jan2000, 01:08	0.02
M15	0.0924000	1.7	01Jan2000, 00:54	0.02
M16	0.2321000	3.0	01Jan2000, 01:12	0.02
M17	0.2844000	3.9	01Jan2000, 01:08	0.02
M18	0.2554000	3.3	01Jan2000, 01:11	0.02
M19	0.3000000	3.8	01Jan2000, 01:13	0.02
M20	0.1399000	1.6	01Jan2000, 01:18	0.02
M21	0.2290000	3.7	01Jan2000, 01:01	0.02
M22	0.1033000	1.7	01Jan2000, 01:00	0.02
M23	0.2075000	2.2	01Jan2000, 01:23	0.02
M24	0.1556000	2.4	01Jan2000, 01:02	0.02
M25	0.1591000	2.5	01Jan2000, 01:01	0.02
M26	0.1786000	1.6	01Jan2000, 01:39	0.02
M27	0.1951000	1.6	01Jan2000, 01:42	0.02
M4	0.2334000	65.2	01Jan2000, 01:11	0.49
M5	0.1654000	38.2	01Jan2000, 01:03	0.36
M6	0.2256000	3.6	01Jan2000, 01:01	0.02
M7	0.1692000	4.5	01Jan2000, 00:57	0.03
M8	0.2475000	70.5	01Jan2000, 01:27	0.62
M9	0.2357000	38.6	01Jan2000, 01:50	0.47
MK8	0.0126000	6.4	01Jan2000, 00:55	0.63
MKJCC PO...	0.0218391	0.4	01Jan2000, 06:15	0.60
MKJCC PO...	0.0125061	0.2	01Jan2000, 04:45	0.45
MKJCC PO...	0.0766163	1.1	01Jan2000, 02:15	0.42
MKJCC PO...	0.1051300	2.9	01Jan2000, 02:05	0.42
MKJCC PO...	0.0644361	1.7	01Jan2000, 02:20	0.42
MKJCC PO...	0.1093000	1.5	01Jan2000, 02:00	0.44
MKJCC PO...	0.0202656	0.3	01Jan2000, 02:00	0.48
MKJCC PO...	0.0811406	1.0	01Jan2000, 02:00	0.38
MRK-1	5.0758283	203.4	01Jan2000, 01:48	0.14
R-BLISS	0.0532560	0.8	01Jan2000, 01:17	0.47
R-BRADLE...	0.0267169	0.3	01Jan2000, 05:16	0.42
R-BRADLE...	0.0485560	0.7	01Jan2000, 06:15	0.50
R-M1	4.9062622	201.4	01Jan2000, 01:48	0.13
R-M10A	0.7056000	6.3	01Jan2000, 01:47	0.02
R-M10B	2.4400000	13.9	01Jan2000, 01:51	0.02
R-M11	0.1660000	2.4	01Jan2000, 01:41	0.02
R-M13	0.0924000	1.7	01Jan2000, 02:02	0.02
R-M18	1.3681000	10.2	01Jan2000, 02:58	0.02
R-M2	4.7158622	198.6	01Jan2000, 01:36	0.12
R-M20	0.2290000	3.6	01Jan2000, 01:34	0.02
R-M22	0.5764000	7.2	01Jan2000, 01:59	0.02
R-M25	0.3737000	3.2	01Jan2000, 02:28	0.02
R-M3	4.5612000	197.2	01Jan2000, 01:25	0.11
R-M4A	3.2844000	21.1	01Jan2000, 02:08	0.02
R-M4B	0.1692000	4.5	01Jan2000, 01:16	0.03
R-M4C	0.3910000	41.2	01Jan2000, 01:10	0.16
R-M5	0.2256000	3.6	01Jan2000, 01:11	0.02
R-RHC	0.1343966	1.8	01Jan2000, 02:08	0.42
TAR-NE	0.0142108	0.2	01Jan2000, 01:15	0.40

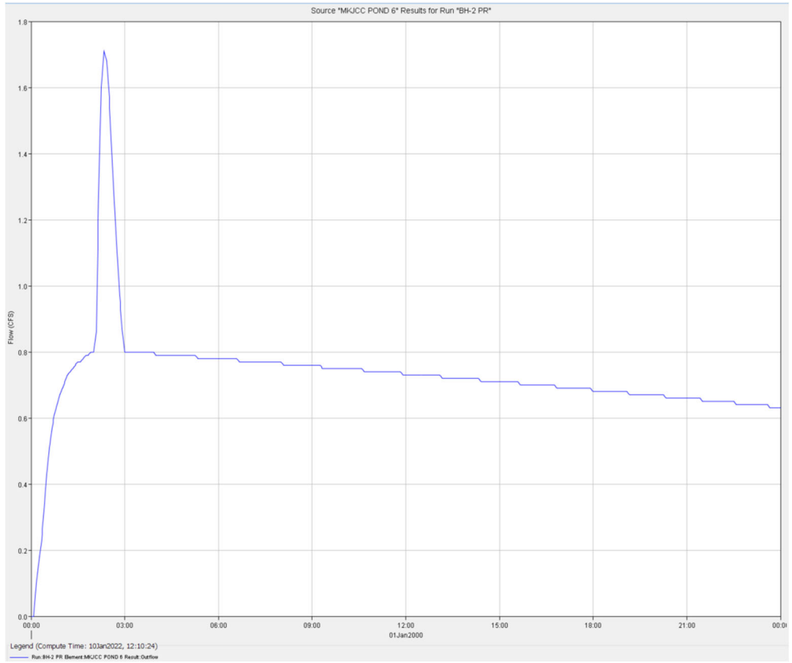


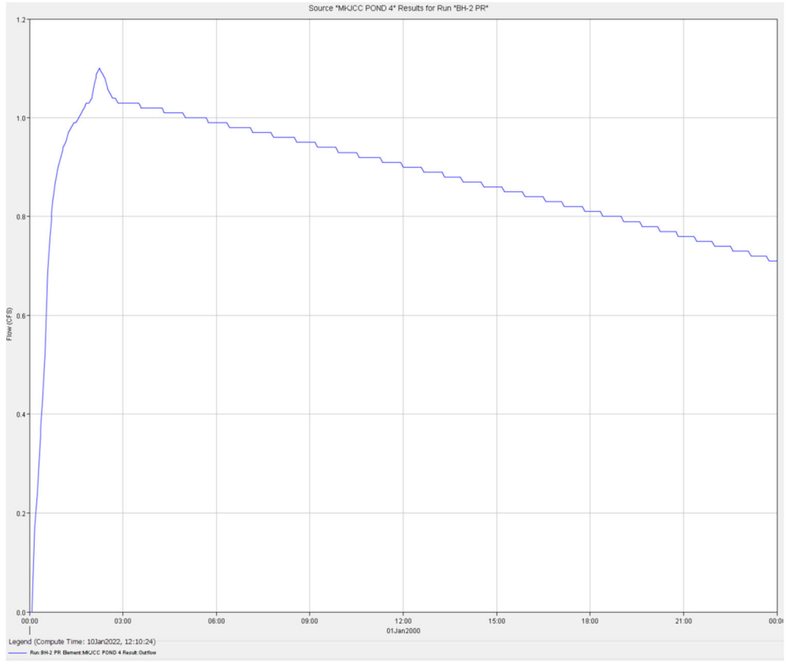


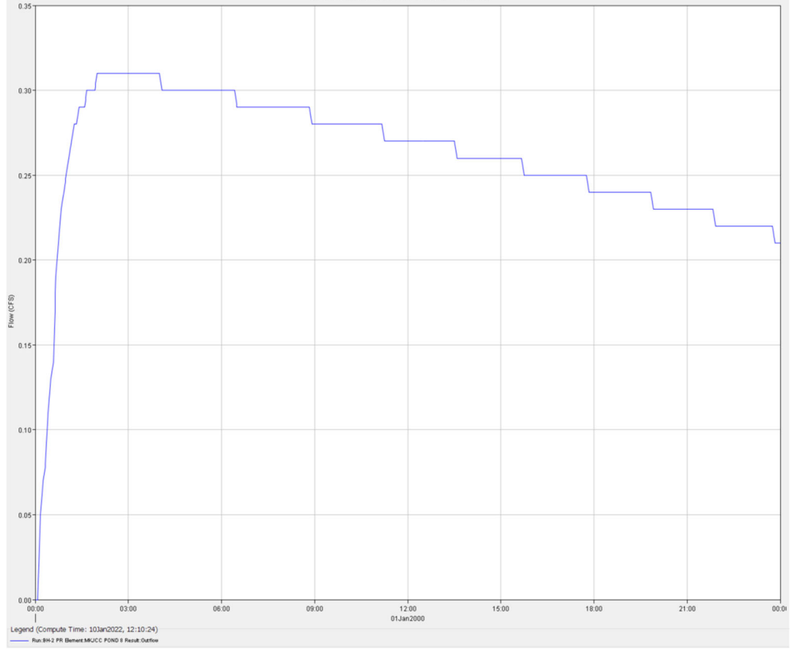


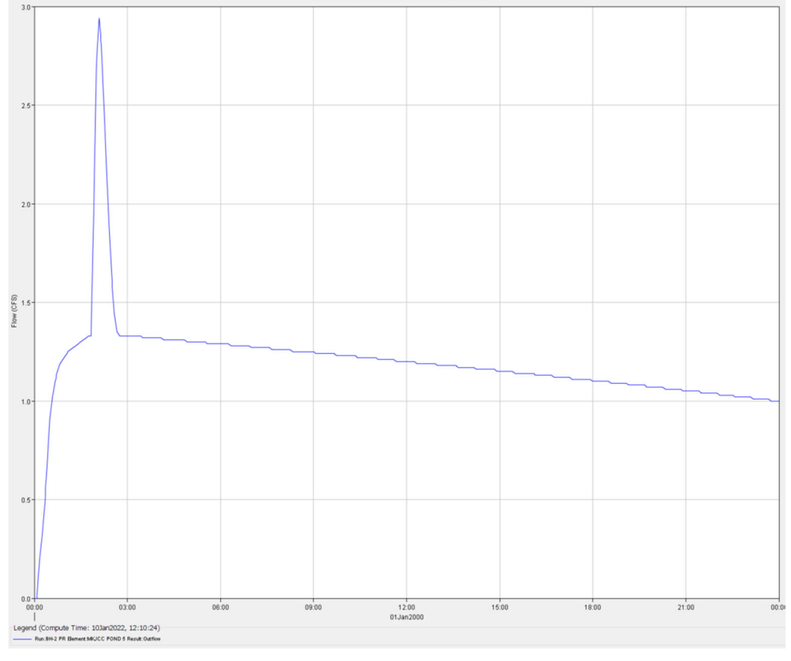



Source "MKJCC POND 7" Results for Run "BH-2 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:10:24)
Run BH-2 PR Element MKJCC POND 7 Result Outflow


Source "MKJCC POND 6" Results for Run "BH-2 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:10:24)
Run BH-2 PR Element MKJCC POND 6 Result Outflow


Source "MKJCC POND 4" Results for Run "BH-2 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:10:24)
Run BH-2 PR Element MKJCC POND 4 Result Outflow


Source "MKJCC POND 8" Results for Run "BH-2 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:10:24)
Run BH-2 PR Element MKJCC POND 8 Result Outflow


Source "MKJCC POND 5" Results for Run "BH-2 PR"
Flow (CFS)
01Jan2000
Legend (Compute Time: 10Jan2022, 12:10:24)
Run BH-2 PR Element MKJCC POND 5 Result Outflow

Rational Method - Existing Conditions

Project Name: BRADLEY HEIGHTS MDDP
Project Location: COLORADO SPRINGS, EL PASO COUNTY, CO
Designer JTS
Notes: UNDEVELOPED CONDITIONS-HEC-HMS: SCS METHOD

Average Channel Velocity 4.00 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)

Channel Flow Type Key
Heavy Meadow 2
Tillage/Field 3
Short Pasture and Lawns 4
Nearly Bare Ground 5
Grassed Waterway 6
Paved Areas 7

		Area			SOIL GROUP ONE			SOIL GROUP TWO			SOIL GROUP THREE						Flow Lengths										Tc	HEC-HMS SCS VALUES				
					PCT Impervious	2%		PCT Impervious	2%		PCT Impervious	2%																				
Sub-basin	Comments	sf	acres	Sq. Mi.	Soil Group	SCS CURVE NUMBERS (CN) Undeveloped/Pervious Areas (2% Impervious) C5	Area	Soil Group	SCS CURVE NUMBERS (CN) Undeveloped/Pervious Areas (2% Impervious) C5	Area	Soil Group	SCS CURVE NUMBERS (CN) Undeveloped/Pervious Areas (2% Impervious) C5	Area	Manning's n	Percent Impervious	SCS Curve Number	Initial ft	True Initial Length ft	Channel ft	True Channel Length ft	Average (decimal) Slope	Initial Tc (min)	Average (%) Slope	Channel Flow Type (See Key above) Ground Type	Velocity (ft/s)	Channel Tc (min)	Total (min)	SCS LAG (min)	INITIAL ABSTRACTION (NOT USED)	Q2 cfs	Q5 cfs	Q10 cfs	Q100 cfs
DP-M0	***UNDEVELOPED DESIGN POINT AT COLORADO CENTRE DETENTION POND***	144217002	3310.77	5.1731																										**45.6**	**82.0**	**417.9**	**1029.9**
M1		4253029	97.64	0.1526	D	80.00	3597020	B	61.00	656009	A	39.00		0.15	2.00	77.07	1245	300	1005	1950	0.05	21.9	0.5	4	0.49	65.7	87.54	52.52	0.30	**8.8**	**18.8**	**87.0**	**167.7**
M2		6457173	148.24	0.2316	D	80.00	5582357	B	61.00	874816	A	39.00		0.15	2.00	77.43	1897	300	2616	4213	0.05	21.2	0.8	4	0.63	112.1	133.31	79.99	0.29	**12.3**	**26.2**	**118.1**	**228.8**
M3		6350932	145.80	0.2278	D	80.00	3147459	B	61.00	3225052	A	39.00		0.15	2.00	70.62	300	300	5827	5827	0.05	21.2	0.8	4	0.63	155.1	176.28	105.77	0.42	**3.3**	**9.4**	**67.0**	**150.7**
M4		6505968	149.36	0.2334	D	80.00	3394201	B	61.00	3111767	A	39.00		0.15	2.00	70.91	300	300	4898	4898	0.05	21.2	3.8	4	1.35	60.6	81.79	49.07	0.41	**3.7**	**10.6**	**73.3**	**162.9**
M5		4610932	105.85	0.1654	D	80.00		B	61.00	3460448	A	39.00	1150484	0.15	2.00	55.51	300	300	4570	4570	0.05	21.2	3.6	4	1.31	58.2	79.33	47.60	0.80	**2.6**	**3.3**	**12.2**	**48.5**
M6		6288981	144.38	0.2256	D	80.00		B	61.00	5115661	A	39.00	1173319	0.15	2.00	56.90	300	300	4353	4353	0.05	21.2	3.7	4	1.33	54.6	75.79	45.47	0.76	**3.6**	**4.5**	**20.4**	**75.3**
M7		4716280	108.27	0.1692	D	80.00	2708522	B	61.00	422109	A	39.00	1585649	0.15	2.00	64.51	300	300	3556	3556	0.05	21.2	4.9	4	1.55	38.2	59.41	35.65	0.55	**3.0**	**3.8**	**43.9**	**115.3**
M8		6898894	158.38	0.2475	D	80.00	6152975	B	61.00	745919	A	39.00		0.15	2.00	77.95	300	300	5445	5445	0.05	21.2	2.2	4	1.04	87.4	108.57	65.14	0.28	**11.0**	**22.8**	**94.5**	**183.2**
M9		6570996	150.85	0.2357	D	80.00	1125239	B	61.00	5445757	A	39.00		0.15	2.00	64.25	300	300	7092	7092	0.05	21.2	1.2	4	0.73	161.0	182.16	109.30	0.56	**1.9**	**2.9**	**23.3**	**60.0**
M10		3869522	88.83	0.1388	D	80.00	390327	B	61.00	1589224	A	39.00	1889971	0.15	2.00	52.17	300	300	3854	3854	0.05	21.2	1.3	4	0.77	83.8	104.93	62.96	0.92	**1.5**	**1.8**	**4.3**	**17.5**
M11		3008079	69.06	0.1079	D	80.00	926605	B	61.00	633244	A	39.00	1448230	0.15	2.00	56.26	300	300	3446	3446	0.05	21.2	3.3	4	1.27	45.2	66.33	39.80	0.78	**1.6**	**2.0**	**8.2**	**31.0**
M12		4627814	106.24	0.1660	D	80.00	0	B	61.00	1396164	A	39.00	3231650	0.15	2.00	45.64	300	300	5312	5312	0.05	21.2	3.5	4	1.29	68.6	89.76	53.86	1.19	**2.4**	**3.1**	**5.5**	**12.8**
M13		6292155	144.45	0.2257	D	80.00	0	B	61.00	2951997	A	39.00	3340157	0.15	2.00	49.32	300	300	6047	6047	0.05	21.2	4.0	4	1.38	72.9	94.07	56.44	1.03	**2.9**	**3.7**	**6.7**	**25.6**
M14		3166986	72.70	0.1136	D	80.00	0	B	61.00	1205966	A	39.00	1961020	0.15	2.00	47.38	300	300	5033	5033	0.05	21.2	1.9	4	0.94	89.3	110.48	66.29	1.11	**1.6**	**2.0**	**3.5**	**10.6**
M15		2575964	59.14	0.0924	D	80.00	0	B	61.00		A	39.00	2575964	0.15	2.00	39.00	300	300	2018	2018	0.05	21.2	5.9	4	1.70	19.8	40.95	24.57	1.56	**1.7**	**2.2**	**3.8**	**5.3**
M16		6470577	148.54	0.2321	D	80.00	0	B	61.00	2288423	A	39.00	4182154	0.15	2.00	46.78	300	300	6172	6172	0.05	21.2	3.7	4	1.35	76.4	97.56	58.54	1.14	**3.0**	**3.7**	**6.6**	**18.3**
M17		7928617	182.02	0.2844	D	80.00	1666234	B	61.00	5397796	A	39.00	864587	0.15	2.00	62.59	300	300	7727	7727	0.05	21.2	3.4	4	1.29	99.8	120.94	72.56	0.60	**3.9**	**4.9**	**43.3**	**121.9**
M18		7120143	163.46	0.2554	D	80.00	1488952	B	61.00	5125329	A	39.00	505863	0.15	2.00	63.41	300	300	6815	6815	0.05	21.2	3.9	4	1.36	83.2	104.40	62.64	0.58	**3.3**	**4.2**	**39.5**	**107.7**
M19		8363520	192.00	0.3000	D	80.00		B	61.00	3902453	A	39.00	4461067	0.15	2.00	49.27	300	300	7330	7330	0.05	21.2	3.8	4	1.35	90.7	111.90	67.14	1.03	**3.8**	**4.7**	**8.6**	**32.5**
M20		3900188	89.54	0.1399	D	80.00		B	61.00		A	39.00	3900188	0.15	2.00	39.00	300	300	3174	3174	0.01	40.3	1.4	4	0.83	63.9	104.16	62.50	1.56	**1.6**	**2.1**	**3.6**	**5.1**
M21		6384154	146.56	0.2290	D	80.00		B	61.00		A	39.00	6384154	0.15	2.00	39.00	300	300	1965	1965	0.01	40.3	1.0	4	0.70	46.8	87.08	52.25	1.56	**3.7**	**4.6**	**8.2**	**11.6**
M22		2879839	66.11	0.1033	D	80.00		B	61.00	93877	A	39.00	2785962	0.15	2.00	39.72	300	300	3298	3298	0.01	40.3	4.1	4	1.40	39.3	79.56	47.74	1.52	**1.7**	**2.1**	**3.8**	**5.3**
M23		5784768	132.80	0.2075	D	80.00		B	61.00		A	39.00	5784768	0.15	2.00	39.00	300	300	5342	5342	0.01	40.3	0.5	4	0.49	179.9	220.17	132.10	1.56	**2.2**	**2.8**	**4.9**	**6.9**
M24		4337879	99.58	0.1556	D	80.00	1079399	B	61.00	50712	A	39.00	3207768	0.15	2.00	49.46	1310	300	4177	5187	0.05	21.2	4.3	4	1.45	59.6	80.72	48.43	1.02	**2.4**	**3.1**	**5.5**	**22.3**
M25		4435453	101.82	0.1591	D	80.00	1520543	B	61.00	42924	A	39.00	2871987	0.15	2.00	53.27	300	300	4305	4305	0.05	21.2	4.2	4	1.42	50.6	71.79	43.07	0.88	**2.5**	**3.2**	**8.3**	**37.1**
M26		4979082	114.30	0.1786	D	80.00		B	61.00		A	39.00	4979082	0.15	2.00	39.00	300	300	4668	4668	0.01	40.3	0.9	4	0.63	124.3	164.56	98.74	1.56	**1.6**	**2.0**	**3.4**	**4.7**
M27		5439076	124.86	0.1951	D	80.00		B	61.00		A	39.00	5439076	0.15	2.00	39.00	300	300	4560	4560	0.01	40.3	0.9	4	0.63	121.4	161.68	97.01	1.56	**1.6**	**2.1**	**3.5**	**5.0**

DESIGN POINTS		Area sf	acres	Sq. Mi.																													
DP-M0		144217002	3310.77	5.1731	N/A																									**45.6**	**82.0**	**417.9**	**1029.9**
DP-M1		144217002	3310.77	5.1731	N/A																									**45.6**	**82.0**	**417.9**	**1029.9**
DP-M2		139963973	3213.13	5.0205	N/A																									**45.0**	**79.2**	**386.5**	**990.9**
DP-M3		133506800	3064.89	4.7889	N/A																									**40.8**	**69.0**	**322.3**	**897.5**
DP-M4		127155868	2919.10	4.5611	N/A																									**38.2**	**62.0**	**291.3**	**804.4**
DP-M5		10899913	250.23	0.3910	N/A																									**6.0**	**7.6**	**32.0**	**122.8**
DP-M6		91563817	2102.02	3.2844	N/A																									**21.2**	**27.0**	**122.3**	**371.6**
DP-M7		19670999	451.58	0.7056	N/A																									**6.3**	**8.0**	**19.8**	**70.4**
DP-M8		68023296	1561.60	2.4400	N/A																									**13.9**	**17.7**	**98.7**	**284.3**
DP-M9		38140439	875.58	1.3681	N/A																									**10.2**	**12.9**	**25.1**	**67.8**
DP-M10		16069110	368.90	0.5764	N/A																									**7.2**	**9.1**	**16.3**	**23.2**
DP-M11		10418158	239.17	0.3737	N/A																									**3.2**	**4.0**	**6.9**	**9.7**

Rational Method - Proposed Conditions

Project Name:	BRADLEY HEIGHTS MDDP
Project Location:	COLORADO SPRINGS, EL PASO COUNTY, CO
Designer	JTS
Notes:	DEVELOPED CONDITIONS-HEC-HMS: SCS METHOD

Average Channel Velocity: 4.00 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow: 0.04 ft/ft (If Elevations are used, this will be ignored)

Channel Flow Type Key
Heavy Meadow 2
Tillage/Field 3
Short Pasture and Lawns 4
Nearly Bare Ground 5
Grassed Waterway 6
Paved Areas 7

SOIL GROUP ONE: PCT Impervious 90% 72% 38% 2%
SOIL GROUP TWO: PCT Impervious 85% 90% 72% 38% 2%
SOIL GROUP THREE: PCT Impervious 2%

		Area				SCS CURVE NUMBERS (CN)																		Flow Lengths								Tc	HEC-HMS SCS VALUES				
Sub-basin	Comments	sf	acres	Sq. Mi.	Soil Group	High Density Industrial (100% Impervious)		Industrial (72% Impervious)		Residential (1/4 Acre) (38% Impervious)		Undeveloped/Pervious Areas (2% Impervious)		Soil Group	Commercial Areas		High Density Industrial (100% Impervious)		Industrial (72% Impervious)		Residential (1/4 Acre) (38% Impervious)		Undeveloped/Pervious Areas (2% Impervious)		Soil Group	Undeveloped/Pervious Areas (2% Impervious)		Manning's n	Percent Impervious	SCS Curve Number	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	SCS LAG	INITIAL ABSTRACTION (NOT USED)	Q2	Q5	Q10	Q100	Sub-basin
						CS	Area (SF)	CS	Area	CS	Area	CS	Area		CN	Area	CS	Area (SF)	CS	Area	CS	Area	CS	Area		CS	Area				ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	(min)		cfs	cfs	cfs	cfs	
CC	*POND AND CHANNEL AREAS.*	2260580	51.90	0.0811	D	93.00	207592	93.00		87.00		80.00	2052988	B	92.00		89.00		88.00		75.00		61.00		D	80.00		0.15	17%	81.19	100	100	6000	6000	0.05	9.1	0.5	4	0.49	202.0	211.11	126.67	0.23	**5.3**	**8.0**	**19.6**	**33.2**	*CC*
MK8	*UNDEVELOPED AREA DOWNSTREAM OF POND*	351268	8.06	0.0126	D	93.00	98617	93.00		87.00		80.00	252651	B	92.00		89.00		88.00		75.00		61.00		D	80.00		0.15	47%	83.65	50	50	1201	1201	0.05	5.0	1.8	4	0.94	21.3	26.36	15.82	0.20	**6.4**	**8.8**	**19.4**	**29.7**	*MK8*
BH2	*BRADLEY ROAD DITCH*	131028	3.01	0.0047	D	93.00		93.00		87.00		80.00	131028	B	92.00		89.00		88.00		75.00		61.00		D	80.00		0.15	2%	80.00	100	100	1233	1233	0.05	8.8	2.1	4	1.01	20.3	29.04	17.42	0.25	**0.4**	**0.9**	**4.0**	**7.4**	*BH2*
M4	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6506819	149.38	0.2334	D	93.00		93.00	3403345	87.00		80.00		B	92.00		89.00		88.00		75.00		61.00	3103473	A	39.00		0.15	39%	77.74	300	100	4898	5098	0.05	8.8	3.8	4	1.35	63.1	71.89	43.13	0.29	**65.2**	**88.3**	**204.6**	**328.1**	*M4*
M5	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	4611087	105.86	0.1654	D	93.00		93.00		87.00		80.00		B	92.00	301392	89.00	1006535	88.00		75.00		61.00	3159212	A	39.00	1150484	0.15	27%	76.96	300	100	4570	4770	0.05	8.8	3.6	4	1.31	60.7	69.49	41.69	0.30	**38.2**	**53.9**	**147.2**	**248.4**	*M5*
M6	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6289367	144.38	0.2256	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00	21988	75.00		61.00	5093673	A	39.00	1173706	0.15	2%	56.99	300	100	4353	4553	0.05	8.8	3.7	4	1.33	57.1	65.92	39.55	0.75	**3.6**	**4.5**	**20.7**	**76.0**	*M6*
M7	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	4717025	108.29	0.1692	D	93.00		93.00	56806	87.00		80.00	2651716	B	92.00		89.00		88.00		75.00		61.00	422854	A	39.00	1585649	0.15	3%	64.67	300	100	3556	3756	0.05	8.8	4.9	4	1.55	40.4	49.19	29.51	0.55	**4.5**	**5.6**	**47.2**	**119.7**	*M7*
M8	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6899904	158.40	0.2475	D	93.00		93.00	4055874	87.00		80.00	2097101	B	92.00		89.00		88.00		75.00		61.00	746929	A	39.00		0.15	43%	85.58	300	100	5445	5645	0.05	8.8	2.2	4	1.04	90.6	99.40	59.64	0.17	**70.5**	**96.2**	**205.8**	**317.2**	*M8*
M9	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6570939	150.85	0.2357	D	93.00		93.00		87.00	1125239	80.00		B	92.00		89.00		88.00		75.00	5445700	61.00		A	39.00		0.15	38%	77.05	300	100	7092	7292	0.05	8.8	1.2	4	0.73	165.5	174.32	104.59	0.30	**38.6**	**52.3**	**111.3**	**178.4**	*M9*
M10	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	3869522	88.83	0.1388	D	93.00		93.00		87.00		80.00	390327	B	92.00		89.00		88.00		75.00		61.00	1589224	A	39.00	1889971	0.15	2%	52.17	300	100	3854	4054	0.05	8.8	1.3	4	0.77	88.1	96.90	58.14	0.92	**1.5**	**1.8**	**4.3**	**17.5**	*M10*
M11	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	3008079	69.06	0.1079	D	93.00		93.00		87.00		80.00	926605	B	92.00		89.00		88.00		75.00		61.00	633244	A	39.00	1448230	0.15	2%	56.26	300	100	3446	3646	0.05	8.8	3.3	4	1.27	47.8	56.57	33.94	0.78	**1.6**	**2.0**	**8.2**	**31.0**	*M11*
M12	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	4627814	106.24	0.1660	D	93.00		93.00		87.00		80.00	0	B	92.00		89.00		88.00		75.00		61.00	1396164	A	39.00	3231650	0.15	2%	45.64	300	100	5312	5512	0.05	8.8	3.5	4	1.29	71.2	79.96	47.98	1.19	**2.4**	**3.1**	**5.5**	**12.8**	*M12*
M13	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6292155	144.45	0.2257	D	93.00		93.00		87.00		80.00	0	B	92.00		89.00		88.00		75.00		61.00	2931997	A	39.00	3340157	0.15	2%	49.32	300	100	6047	6247	0.05	8.8	4.0	4	1.38	75.3	84.10	50.46	1.03	**2.9**	**3.7**	**6.7**	**25.6**	*M13*
M14	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	3166986	72.70	0.1136	D	93.00		93.00		87.00		80.00	0	B	92.00		89.00		88.00		75.00		61.00	1205966	A	39.00	1961020	0.15	2%	47.38	300	100	5033	5233	0.05	8.8	1.9	4	0.94	92.9	101.65	60.99	1.11	**1.6**	**2.0**	**3.5**	**10.6**	*M14*
M15	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	2575964	59.14	0.0924	D	93.00		93.00		87.00		80.00	0	B	92.00		89.00		88.00		75.00		61.00		A	39.00	2575964	0.15	2%	39.00	300	100	2018	2218	0.05	8.8	5.9	4	1.70	21.7	30.53	18.32	1.56	**1.7**	**2.2**	**3.8**	**5.3**	*M15*
M16	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6470577	148.54	0.2321	D	93.00		93.00		87.00		80.00	0	B	92.00		89.00		88.00		75.00		61.00	2288423	A	39.00	4182154	0.15	2%	46.78	300	100	6172	6372	0.05	8.8	3.7	4	1.35	78.9	87.66	52.60	1.14	**3.0**	**3.7**	**6.6**	**18.3**	*M16*
M17	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	7928617	182.02	0.2844	D	93.00		93.00		87.00		80.00	1666234	B	92.00		89.00		88.00		75.00		61.00	5397796	A	39.00	864587	0.15	2%	62.59	300	100	7727	7927	0.05	8.8	3.4	4	1.29	102.4	111.14	66.68	0.60	**3.9**	**4.9**	**43.3**	**121.9**	*M17*
M18	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	7120143	163.46	0.2554	D	93.00		93.00		87.00		80.00	1488952	B	92.00		89.00		88.00		75.00		61.00	5125329	A	39.00	505863	0.15	2%	63.41	300	100	6815	7015	0.05	8.8	3.9	4	1.36	85.7	94.47	56.68	0.58	**3.3**	**4.2**	**39.5**	**107.7**	*M18*
M19	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	8363520	192.00	0.3000	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00	3902453	A	39.00	4461067	0.15	2%	49.27	300	100	7330	7530	0.05	8.8	3.8	4	1.35	93.2	101.99	61.19	1.03	**3.8**	**4.7**	**8.6**	**32.5**	*M19*
M20	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	3900188	89.54	0.1399	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00		A	39.00	3900188	0.15	2%	39.00	300	100	3174	3374	0.01	16.7	1.4	4	0.83	67.9	84.62	50.77	1.56	**1.6**	**2.1**	**3.6**	**5.1**	*M20*
M21	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	6384154	146.56	0.2290	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00		A	39.00	6384154	0.15	2%	39.00	300	100	1965	2165	0.01	16.7	1.0	4	0.70	51.5	68.28	40.97	1.56	**3.7**	**4.6**	**8.2**	**11.6**	*M21*
M22	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	2879839	66.11	0.1033	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00	93877	A	39.00	2785962	0.15	2%	39.72	300	100	3298	3498	0.01	16.7	4.1	4	1.40	41.6	58.37	35.02	1.52	**1.7**	**2.1**	**3.8**	**5.3**	*M22*
M23	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	5784768	132.80	0.2075	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00		A	39.00	5784768	0.15	2%	39.00	300	100	5342	5542	0.01	16.7	0.5	4	0.49	186.6	203.34	122.00	1.56	**2.2**	**2.8**	**4.9**	**6.9**	*M23*
M24	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	4337879	99.58	0.1556	D	93.00		93.00		87.00		80.00	1079399	B	92.00		89.00		88.00		75.00		61.00	507?12	A	39.00	3207768	0.15	2%	49.46	1310	100	4177	5387	0.05	8.8	4.3	4	1.45	61.9	70.64	42.38	1.02	**2.4**	**3.1**	**5.5**	**22.3**	*M24*
M25	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	4435453	101.82	0.1591	D	93.00		93.00		87.00		80.00	1520543	B	92.00		89.00		88.00		75.00		61.00	42924	A	39.00	2871987	0.15	2%	53.27	300	100	4305	4505	0.05	8.8	4.2	4	1.42	53.0	61.76	37.06	0.88	**2.5**	**3.2**	**8.3**	**37.0**	*M25*
M26	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	4979082	114.30	0.1786	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00		A	39.00	4979082	0.15	2%	39.00	300	100	4668	4868	0.01	16.7	0.9	4	0.63	129.6	146.31	87.79	1.56	**1.6**	**2.0**	**3.4**	**4.7**	*M26*
M27	*DBPS SUB-BASIN NORTH OF BRADLEY ROAD*	5439076	124.86	0.1951	D	93.00		93.00		87.00		80.00		B	92.00		89.00		88.00		75.00		61.00		A	39.00	5439076	0.15	2%	39.00	300	100	4560	4760	0.01	16.7	0.9	4	0.63	126.7	143.44	86.06	1.56	**1.6**	**2.1**	**3.5**	**5.0**	*M27*
DESIGN POINTS	*COMMENTS*	AREAS				High Density Industrial (100% Impervious)		Industrial (72% Impervious)		Residential (1/4 Acre) (38% Impervious)		Undeveloped/Pervious Areas (2% Impervious)		Soil Group	Commercial Areas		High Density Industrial (100% Impervious)		Industrial (72% Impervious)		Residential (1/4 Acre) (38% Impervious)		Undeveloped/Pervious Areas (2% Impervious)		Soil Group	Undeveloped/Pervious Areas (2% Impervious)		Manning's n	Percent Impervious	SCS Curve Number																			*DESIGN POINTS*
		Sq. Ft.	acres	Sq. Mi.		CS	Area (SF)	CS	Area	CS	Area	CS	Area		CN	Area	CS	Area (SF)	CS	Area	CS	Area	CS	Area		CS	Area																Q2 cfs	Q5 cfs	Q10 cfs	Q100 cfs	
DP-M0	*DBPS DESIGN POINT AT MARKSHEFFEL ROAD*	143993179	3305.63	5.1650	D	93.00	306209	93.00	7516025	87.00	1125239	80.00	14257545	B	92.00	301392	89.00	1006535	88.00	21988	75.00	5445700	61.00	37204250	A	39.00	63723486	0.15	8%	50.34	N/A												**205.5**	**338.4**	**624.5**	**1003.8**	*DP-M0*
DP-M1	*DBPS DESIGN POINT BETWEEN COLORADO CENTRE DETENTION POND AND BRADLEY ROAD*	141505972	3248.53	5.0758	D	93.00	306209	93.00	7516025	87.00	1125239	80.00	14257545	B	92.00	301392	89.00	1006535	88.00	21988	75.00	5445700	61.00	37204250	A	39.00	63723486	0.15	8%	51.22	N/A												**203.6**	**330.7**	**672.8**	**1217.9**	*DP-M1*
DP-M2	*DBPS DESIGN POINT BETWEEN COLORADO CENTRE DETENTION POND AND BRADLEY ROAD*	136778740	3140.01	4.9063	D	93.00	98617	93.00	7516025	87.00	1125239	80.00	12204557	B	92.00	301392	89.00	1006535	88.00	21988	75.00	5445700	61.00	37204250	A	39.00	63723486	0.15	8%	51.65	N/A												**201.9**	**305.9**	**673.2**	**1220.2**	*DP-M2*
DP-M3	*DBPS DESIGN POINT BETWEEN COLORADO CENTRE DETENTION POND AND BRADLEY ROAD*	131470693	3018.15	4.7159	D	93.00	0	93.00	7516025	87.00	1125239	80.00	11951906	B	92.00	301392	89.00	1006535	88.00	21988	75.00	5445700	61.00	37204250	A	39.00	63723486	0.15	9%	53.51	N/A												**199.2**	**284.6**	**668.7**	**1209.3**	*DP-M3*
DP-M4	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	127158958	2919.17	4.5612	D	93.00	0	93.00	7516025	87.00	1125239	80.00	11820878	B	92.00	301392	89.00	1006535	88.00	21988	75.00	5445700	61.00	37204250	A	39.00	63723486	0.15	9%	55.25	N/A												**197.3**	**269.7**	**661.8**	**1206.8**	*DP-M4*
DP-M5	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	10900454	250.24	0.3910	D	93.00	0	93.00	0	87.00	0	80.00	0	B	92.00	301392	89.00	1006535	88.00	21988	75.00	0	61.00	8252885	A	39.00	2324189	0.15	13%	65.44	N/A												**41.3**	**58.1**	**161.2**	**311.5**	*DP-M5*
DP-M6	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	91563817	2102.02	3.2844	D	93.00	0	93.00	0	87.00	0	80.00	7072060	B	92.00	0	89.00	0	88.00	0	75.00	0	61.00	24678109	A	39.00	59813648	0.15	2%	48.10	N/A												**21.2**	**27.0**	**122.3**	**371.6**	*DP-M6*
DP-M7	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	19670999	451.58	0.7056	D	93.00	0	93.00	0	87.00	0	80.00	926605	B	92.00	0	89.00	0	88.00	0	75.00	0	61.00	6187372	A	39.00	12557021	0.15	2%	47.85	N/A												**6.3**	**8.0**	**19.8**	**70.4**	*DP-M7*
DP-M8	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	68025296	1561.60	2.4400	D	93.00	0	93.00	0	87.00	0	80.00	5755128	B	92.00	0	89.00	0	88.00	0	75.00	0	61.00	16901513	A	39.00	45366656	0.15	2%	47.94	N/A												**13.9**	**17.7**	**98.7**	**284.3**	*DP-M8*
DP-M9	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	38140439	875.58	1.3681	D	93.00	0	93.00	0	87.00	0	80.00	2599941	B	92.00	0	89.00	0	88.00	0	75.00	0	61.00	187513	A	39.00	35352985	0.15	2%	41.90	N/A												**10.2**	**12.9**	**25.1**	**67.6**	*DP-M9*
DP-M10	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	16069110	368.90	0.5764	D	93.00	0	93.00	0	87.00	0	80.00	0	B	92.00	0	89.00	0	88.00	0	75.00	0	61.00	0	A	39.00	16069110	0.15	2%	39.00	N/A												**7.2**	**9.1**	**16.3**	**23.2**	*DP-M10*
DP-M11	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	10418158	239.17	0.3737	D	93.00	0	93.00	0	87.00	0	80.00	0	B	92.00	0	89.00	0	88.00	0	75.00	0	61.00	0	A	39.00	10418158	0.15	2%	39.00	N/A												**3.2**	**4.0**	**6.9**	**9.7**	*DP-M11*
MKJCC POND 4	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	2135940	49.03	0.0766	D	POND OUTFLOW HYDROGRAPH																																				**1.1**	**10.0**	**18.7**	**70.3**	*MKJCC POND 4*
MKJCC POND 5	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	2930856	67.28	0.1051	D	POND OUTFLOW HYDROGRAPH																																				**2.9**	**24.2**	**50.2**	**203.5**	*MKJCC POND 5*
MKJCC POND 6	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	1796375	41.24	0.0644	D	POND OUTFLOW HYDROGRAPH																																				**1.7**	**17.0**	**28.3**	**89.0**	*MKJCC POND 6*
MKJCC POND 7	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	3047109	69.95	0.1093	D	POND OUTFLOW HYDROGRAPH																																				**1.5**	**23.5**	**44.6**	**177.2**	*MKJCC POND 7*
MKJCC POND 8	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	564973	12.97	0.0203	D	POND OUTFLOW HYDROGRAPH																																				**0.3**	**3.6**	**6.8**	**11.3**	*MKJCC POND 8*
MKJCC POND 9	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	2262070	51.93	0.0811	D	POND OUTFLOW HYDROGRAPH																																				**1.0**	**12.2**	**24.7**	**103.1**	*MKJCC POND 9*
MKJCC POND 10	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	608839	13.98	0.0218	D	POND OUTFLOW HYDROGRAPH																																				**0.4**	**2.0**	**5.1**	**16.7**	*MKJCC POND 10*
MKJCC POND 11	*DBPS DESIGN POINT NORTH OF BRADLEY ROAD*	348650	8.00	0.0125	D	POND OUTFLOW HYDROGRAPH																																				**0.2**	**0.4**	**2.4**	**16.4**	*MKJCC POND 11*
TAR-NE	*TRAILS AT ASPEN RIDGE FILING NO. 4 NORTHEAST DETENTION POND*	396174	9.09	0.0142	D	POND OUTFLOW HYDROGRAPH																																				**0.2**	**0.2**	**1.8**	**7.9**	*TAR-NE*
MRK-1	*COLRADO CENTRE DETENTION POND*	141505972	3248.53	5.0758	D	POND OUTFLOW HYDROGRAPH																																				**203.4**	**327.1**	**621.8**	**1001.2**	*MRK-1*

BRADLEY HEIGHTS
COMPARISON OF PREDEVELOPMENT AND POST-DEVELOPMENT CONDITIONS

Sub-basin	Area		Q2		DELTA	Q5		DELTA	Q10		DELTA	Q100		DELTA
	Acres	Sq. Mi.	EX	PR	Q	EX	PR	Q	EX	PR	Q	EX	PR	Q
DP-M0	3310.8	5.17307	45.6	205.5	159.9	82	338.4	256.4	417.9	624.5	206.6	1029.9	1003.8	-26.1
M1	97.6	0.15256	8.8	-	-	18.8	-	-	87	-	-	167.7	-	-
M2	148.2	0.23162	12.3	-	-	26.2	-	-	118.1	-	-	228.8	-	-
M3	145.8	0.22781	3.3	-	-	9.4	-	-	67	-	-	150.7	-	-
BH2	3.0	0.00470	-	0.4	-	-	0.9	-	-	4	-	-	7.4	-
CC	51.9	0.08109	-	5.3	-	-	8	-	-	19.6	-	-	33.2	-
MK8	8.1	0.01260	-	6.4	-	-	8.8	-	-	19.4	-	-	29.7	-
M4	149.4	0.23337	3.7	65.2	61.5	10.6	88.3	77.7	73.3	204.6	131.3	162.9	328.1	165.2
M5	105.9	0.16539	2.6	38.2	35.6	3.3	53.9	50.6	12.2	147.2	135	48.5	248.4	199.9
M6	144.4	0.22559	3.6	3.6	0	4.5	4.5	0	20.4	20.7	0.3	75.3	76	0.7
M7	108.3	0.16917	3	4.5	1.5	3.8	5.6	1.8	43.9	47.2	3.3	115.3	119.7	4.4
M8	158.4	0.24746	11	70.5	59.5	22.8	96.2	73.4	94.5	205.8	111.3	183.2	317.2	134
M9	150.8	0.23570	1.9	38.6	36.7	2.9	52.3	49.4	23.3	111.3	88	60	178.4	118.4
M10	88.8	0.13880	1.5	1.5	0	1.8	1.8	0	4.3	4.3	0	17.5	17.5	0
M11	69.1	0.10790	1.6	1.6	0	2	2	0	8.2	8.2	0	31	31	0
M12	106.2	0.16600	2.4	2.4	0	3.1	3.1	0	5.5	5.5	0	12.8	12.8	0
M13	144.4	0.22570	2.9	2.9	0	3.7	3.7	0	6.7	6.7	0	25.6	25.6	0
M14	72.7	0.11360	1.6	1.6	0	2	2	0	3.5	3.5	0	10.6	10.6	0
M15	59.1	0.09240	1.7	1.7	0	2.2	2.2	0	3.8	3.8	0	5.3	5.3	0
M16	148.5	0.23210	3	3	0	3.7	3.7	0	6.6	6.6	0	18.3	18.3	0
M17	182.0	0.28440	3.9	3.9	0	4.9	4.9	0	43.3	43.3	0	121.9	121.9	0
M18	163.5	0.25540	3.3	3.3	0	4.2	4.2	0	39.5	39.5	0	107.7	107.7	0
M19	192.0	0.30000	3.8	3.8	0	4.7	4.7	0	8.6	8.6	0	32.5	32.5	0
M20	89.5	0.13990	1.6	1.6	0	2.1	2.1	0	3.6	3.6	0	5.1	5.1	0
M21	146.6	0.22900	3.7	3.7	0	4.6	4.6	0	8.2	8.2	0	11.6	11.6	0
M22	66.1	0.10330	1.7	1.7	0	2.1	2.1	0	3.8	3.8	0	5.3	5.3	0
DESIGN POINTS														
DP-M0	3310.8	5.17307	45.6	205.5	159.9	82	338.4	256.4	417.9	624.5	206.6	1029.9	1003.8	-26.1
DP-M1	3310.8	5.17307	45.6	203.6	158	82	330.7	248.7	417.9	672.8	254.9	1029.9	1217.9	188
DP-M2	3213.1	5.02052	45	201.9	156.9	79.2	305.9	226.7	386.5	673.2	286.7	990.9	1220.2	229.3
DP-M3	3064.9	4.78890	40.8	199.2	158.4	69	284.6	215.6	322.3	668.7	346.4	897.5	1209.3	311.8
DP-M4	2919.1	4.56109	38.2	197.3	159.1	62	269.7	207.7	291.3	661.8	370.5	804.4	1206.8	402.4
DP-M5	250.2	0.39098	6	41.3	35.3	7.6	58.1	50.5	32	161.2	129.2	122.8	311.3	188.5
DP-M6	2102.0	3.28440	21.2	21.2	0	27	27	0	122.3	122.3	0	371.6	371.6	0
DP-M7	451.6	0.70560	6.3	6.3	0	8	8	0	19.8	19.8	0	70.4	70.4	0
DP-M8	1561.6	2.44000	13.9	13.9	0	17.7	17.7	0	98.7	98.7	0	284.3	284.3	0
DP-M9	875.6	1.36810	10.2	10.2	0	12.9	12.9	0	25.1	25.1	0	67.8	67.6	0
DP-M10	368.9	0.57640	7.2	7.2	0	9.1	9.1	0	16.3	16.3	0	23.2	23.2	0
DP-M11	239.2	0.37370	3.2	3.2	0	4	4	0	6.9	6.9	0	9.7	9.7	0
MKJCC POND 4	49.0	0.07662	-	1.1	-	-	10	-	-	18.7	-	-	70.3	-
MKJCC POND 5	67.3	0.10513	-	2.9	-	-	24.2	-	-	50.2	-	-	203.5	-
MKJCC POND 6	41.2	0.06444	-	1.7	-	-	17	-	-	28.3	-	-	89	-
MKJCC POND 7	70.0	0.10930	-	1.5	-	-	23.5	-	-	44.6	-	-	177.2	-
MKJCC POND 8	13.0	0.02027	-	0.3	-	-	3.6	-	-	6.8	-	-	11.3	-
MKJCC POND 9	51.9	0.08114	-	1	-	-	12.2	-	-	24.7	-	-	103.1	-
MKJCC POND 10	14.0	0.02184	-	0.4	-	-	2	-	-	5.1	-	-	16.7	-
MKJCC POND 11	8.0	0.01251	-	0.2	-	-	0.4	-	-	2.4	-	-	16.4	-
TAR-NE	9.1	0.01421	-	0.2	-	-	0.2	-	-	1.8	-	-	7.9	-
MRK-1	3248.5	5.07583	-	203.4	-	-	327.1	-	-	621.8	-	-	1001.2	-

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Mar 23 2022

Design Point JC

Triangular

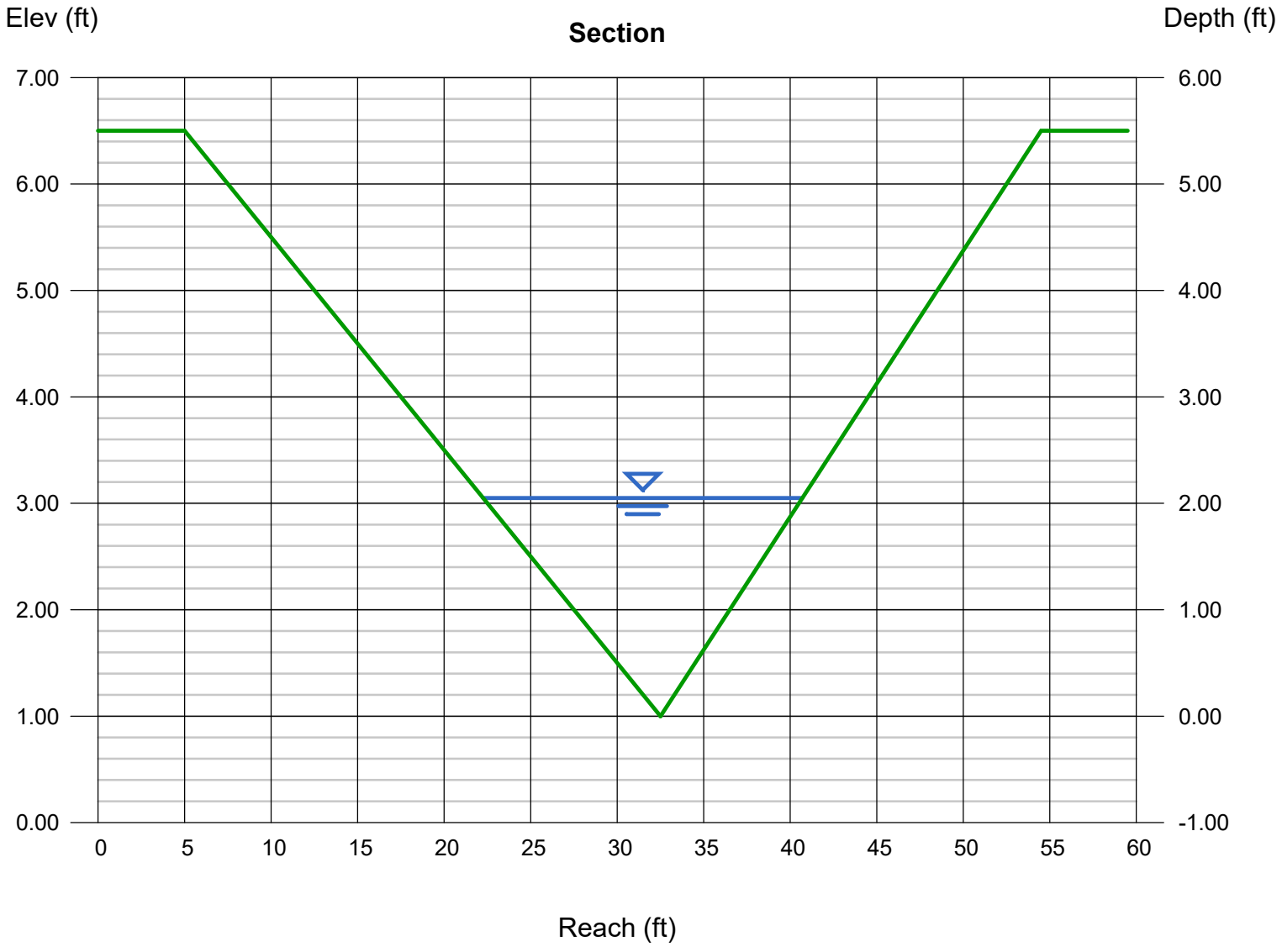
Side Slopes (z:1)	= 5.00, 4.00
Total Depth (ft)	= 5.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 83.30

Highlighted

Depth (ft)	= 2.05
Q (cfs)	= 83.30
Area (sqft)	= 18.91
Velocity (ft/s)	= 4.40
Wetted Perim (ft)	= 18.91
Crit Depth, Yc (ft)	= 1.85
Top Width (ft)	= 18.45
EGL (ft)	= 2.35



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 4 2022

BRADLEY ROAD-DRAINAGE FLUME

Rectangular

Bottom Width (ft)	= 3.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.00
N-Value	= 0.013

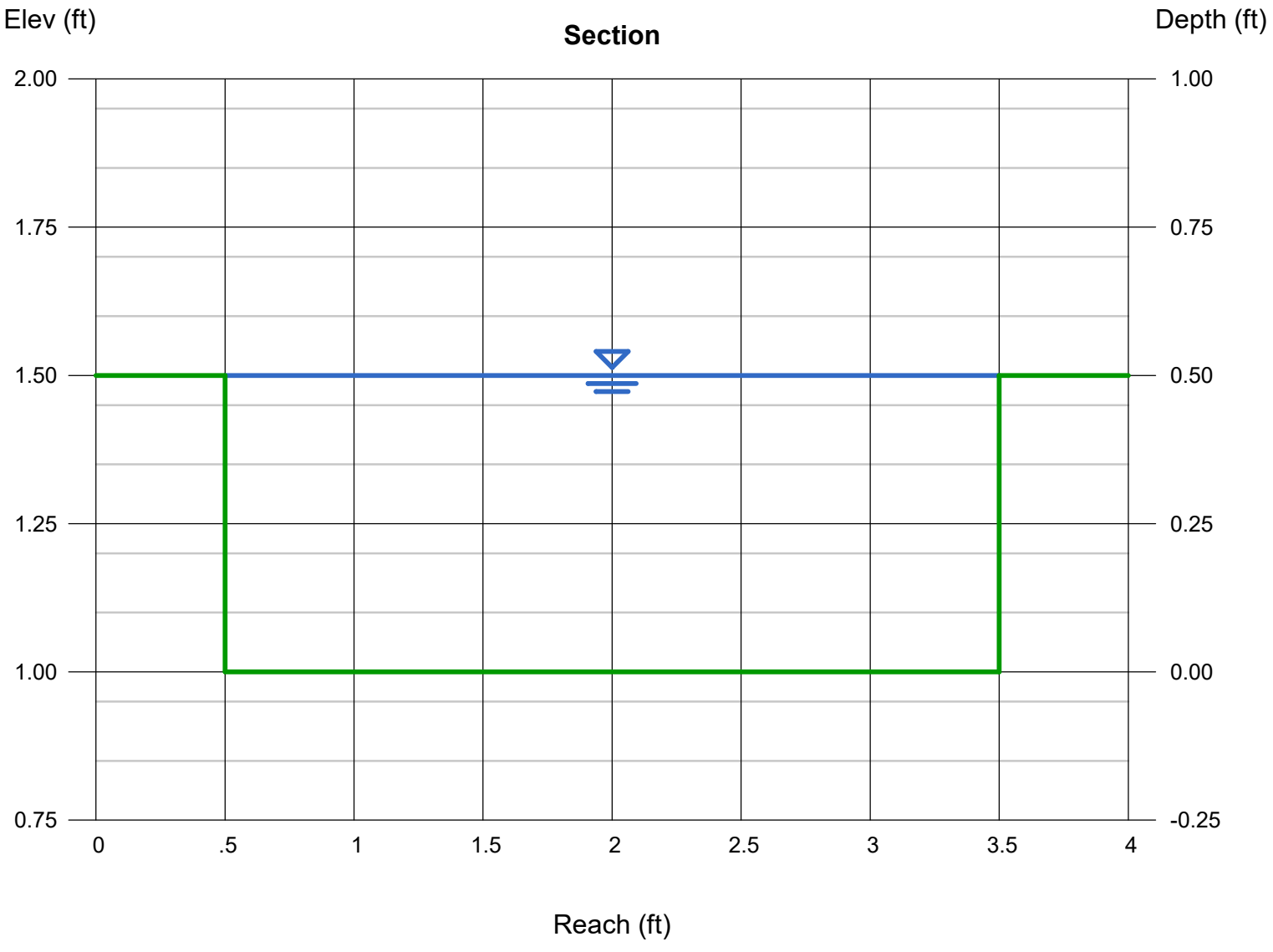
Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 17.83
Area (sqft)	= 1.50
Velocity (ft/s)	= 11.88
Wetted Perim (ft)	= 4.00
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 3.00
EGL (ft)	= 2.70

Note: Tributary to this flume is less than 1% of overall basin containing the area (Sub-basin CC, Q100: 30.2 cfs), therefore, this flume has more than adequate capacity to convey runoff into the Bradley Road ditch.



Channel Report

BRADLEY ROAD-DITCH - DESIGN POINT D

Triangular

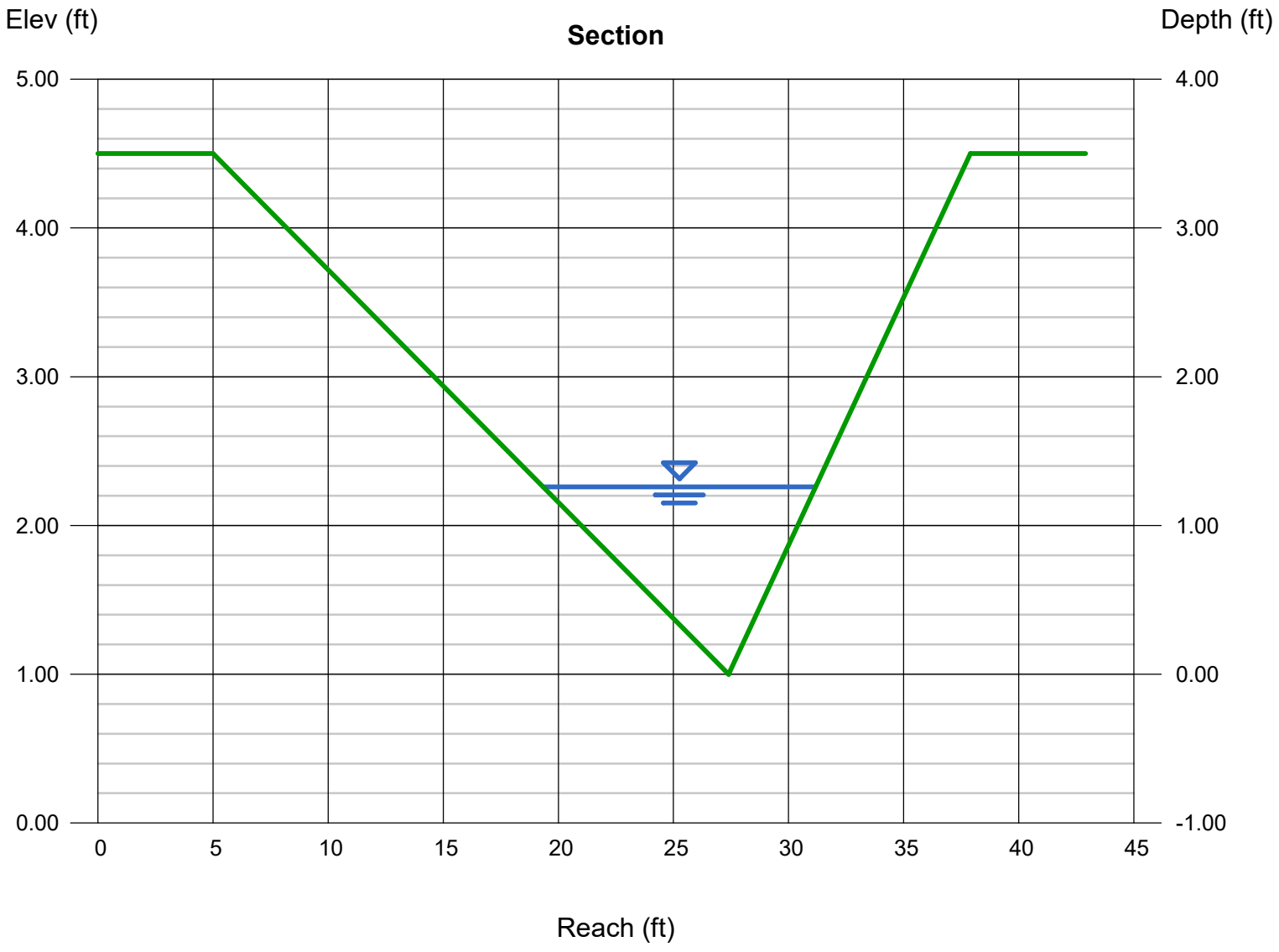
Side Slopes (z:1)	= 6.40, 3.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.60

Highlighted

Depth (ft)	= 1.26
Q (cfs)	= 32.60
Area (sqft)	= 7.46
Velocity (ft/s)	= 4.37
Wetted Perim (ft)	= 12.15
Crit Depth, Yc (ft)	= 1.25
Top Width (ft)	= 11.84
EGL (ft)	= 1.56



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 17 2022

BRADLEY ROAD DITCH AT DP B AND C Q100

Triangular

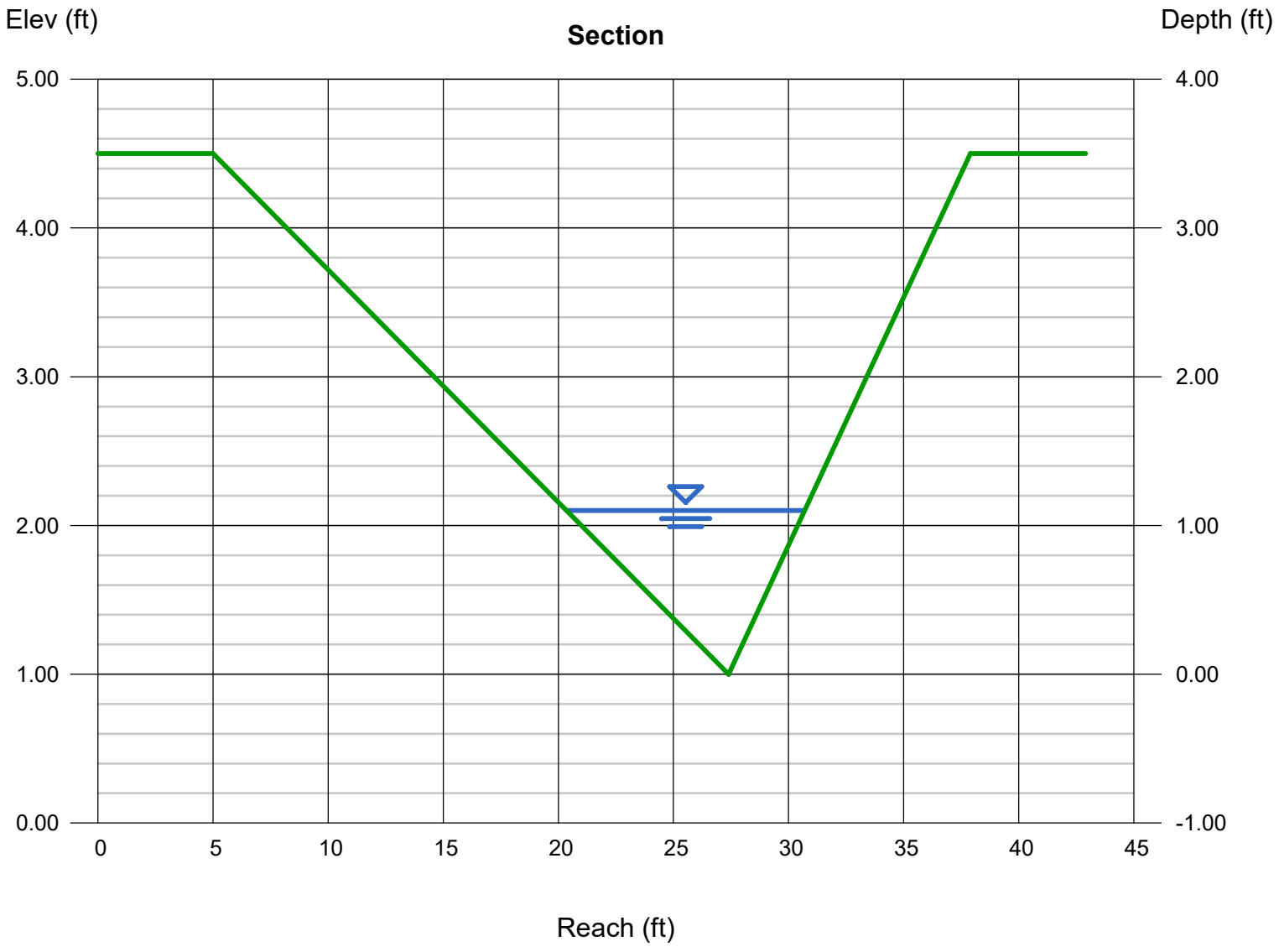
Side Slopes (z:1)	= 6.40, 3.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 3.20
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 28.30

Highlighted

Depth (ft)	= 1.10
Q (cfs)	= 28.30
Area (sqft)	= 5.69
Velocity (ft/s)	= 4.98
Wetted Perim (ft)	= 10.60
Crit Depth, Yc (ft)	= 1.18
Top Width (ft)	= 10.34
EGL (ft)	= 1.49



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Feb 18 2022

DP A

Invert Elev Dn (ft)	=	5868.88
Pipe Length (ft)	=	87.38
Slope (%)	=	1.00
Invert Elev Up (ft)	=	5869.75
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

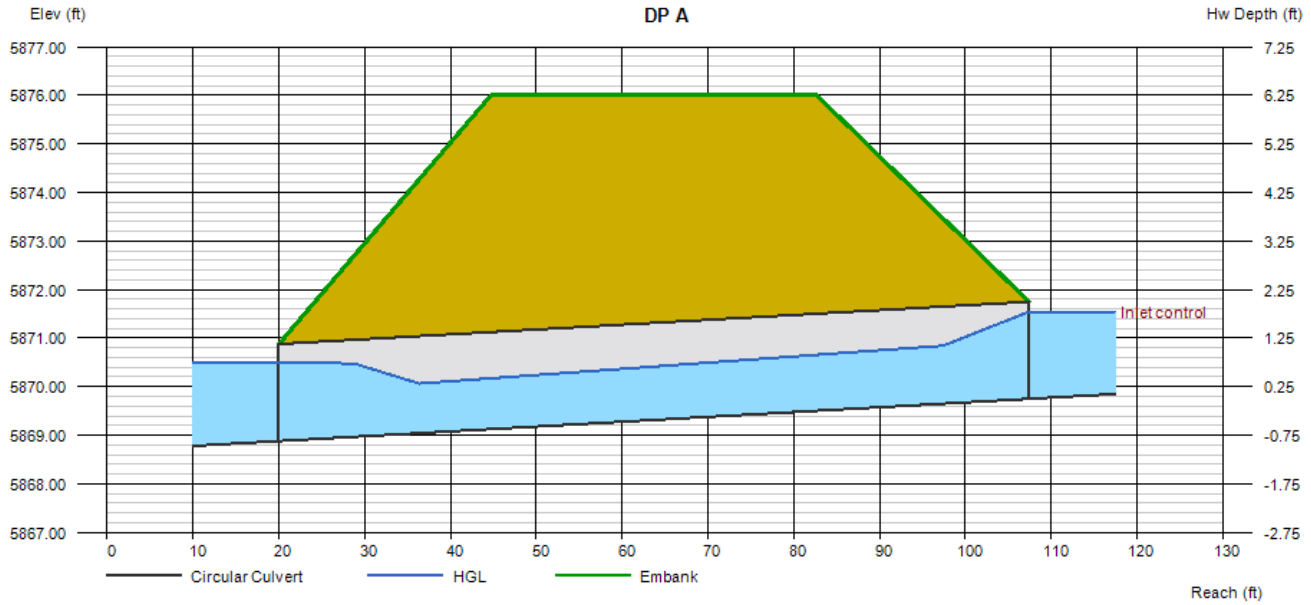
Top Elevation (ft)	=	5876.00
Top Width (ft)	=	38.00
Crest Width (ft)	=	30.00

Calculations

Qmin (cfs)	=	11.60
Qmax (cfs)	=	11.60
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	11.60
Qpipe (cfs)	=	11.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.28
Veloc Up (ft/s)	=	5.77
HGL Dn (ft)	=	5870.49
HGL Up (ft)	=	5870.97
Hw Elev (ft)	=	5871.54
Hw/D (ft)	=	0.90
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Feb 18 2022

DP B

Invert Elev Dn (ft)	=	5851.80
Pipe Length (ft)	=	73.70
Slope (%)	=	4.44
Invert Elev Up (ft)	=	5855.07
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

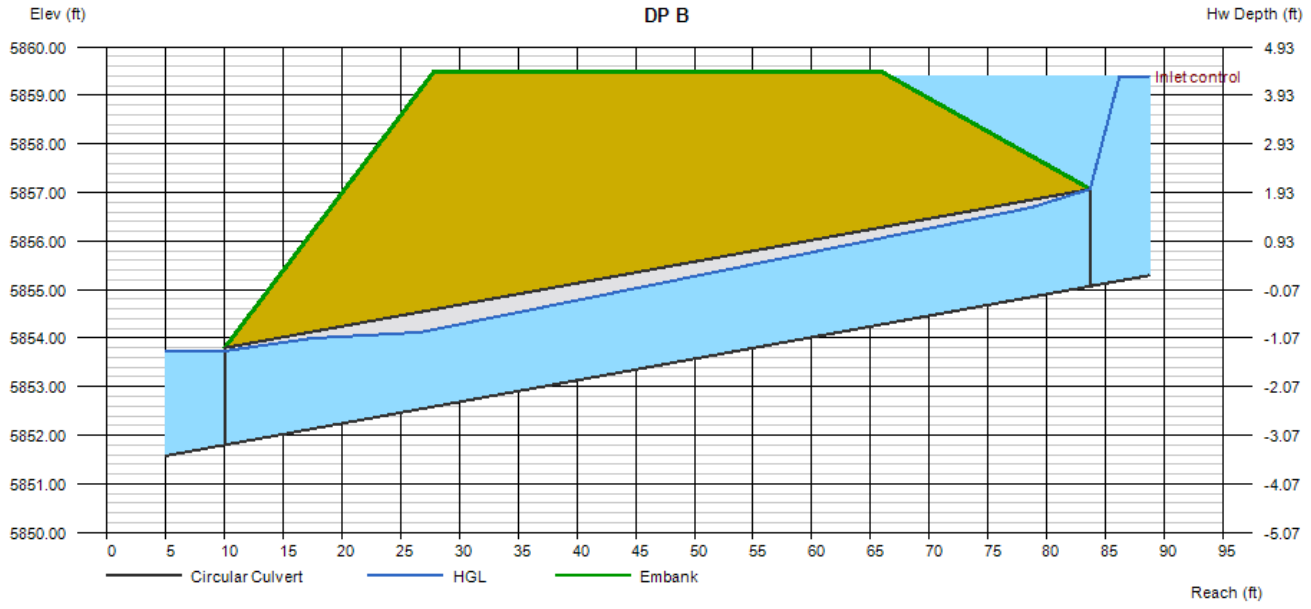
Top Elevation (ft)	=	5859.50
Top Width (ft)	=	38.00
Crest Width (ft)	=	30.00

Calculations

Qmin (cfs)	=	30.50
Qmax (cfs)	=	30.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	30.50
Qpipe (cfs)	=	30.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.81
Veloc Up (ft/s)	=	9.99
HGL Dn (ft)	=	5853.73
HGL Up (ft)	=	5856.94
Hw Elev (ft)	=	5859.39
Hw/D (ft)	=	2.16
Flow Regime	=	Inlet Control

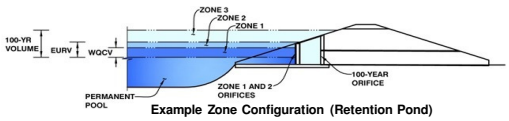


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADELY HEIGHTS - WFJCC POND #1

Basin ID: WEST FORK JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	76.22	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	1,000	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	54.21%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	61.1%	percent
Percentage Hydrologic Soil Groups C/D =	38.9%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.385	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	4.247	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.249	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.977	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.495	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	9.354	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	10.954	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.920	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.55 in.) =	19.729	acre-feet	3.55 inches
Approximate 2-yr Detention Volume =	3.424	acre-feet	
Approximate 5-yr Detention Volume =	4.803	acre-feet	
Approximate 10-yr Detention Volume =	5.948	acre-feet	
Approximate 25-yr Detention Volume =	6.447	acre-feet	
Approximate 50-yr Detention Volume =	6.706	acre-feet	
Approximate 100-yr Detention Volume =	7.459	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.385	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.862	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.212	acre-feet
Total Detention Basin Volume =	7.459	acre-feet
Initial Surcharge Volume (ISV) =	181	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	7.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

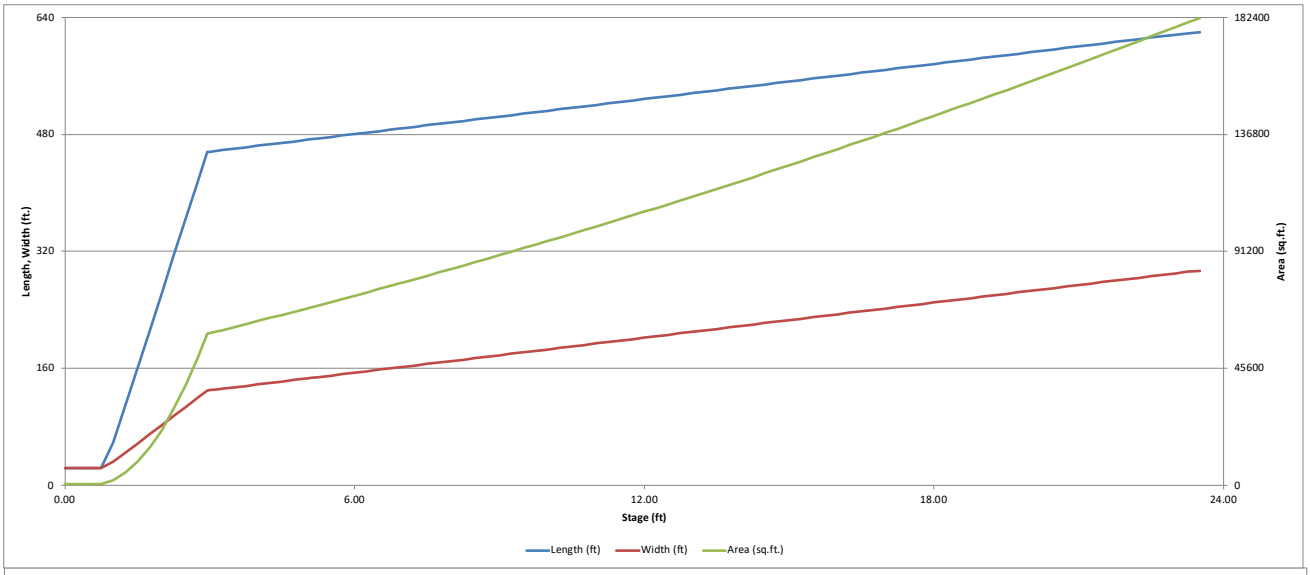
Initial Surcharge Area (A_{ISV}) =	549	ft^2
Surcharge Volume Length (L_{ISV}) =	23.4	ft
Surcharge Volume Width (W_{ISV}) =	23.4	ft
Depth of Basin Floor (H_{FLOOR}) =	2.12	ft
Length of Basin Floor (L_{FLOOR}) =	455.9	ft
Width of Basin Floor (W_{FLOOR}) =	129.4	ft
Area of Basin Floor (A_{FLOOR}) =	59,004	ft^2
Volume of Basin Floor (V_{FLOOR}) =	46,104	ft^3
Depth of Main Basin (H_{MAIN}) =	4.05	ft
Length of Main Basin (L_{MAIN}) =	488.3	ft
Width of Main Basin (W_{MAIN}) =	161.8	ft
Area of Main Basin (A_{MAIN}) =	79,018	ft^2
Volume of Main Basin (V_{MAIN}) =	278,509	ft^3
Calculated Total Basin Volume (V_{total}) =	**7.463**	acre-feet

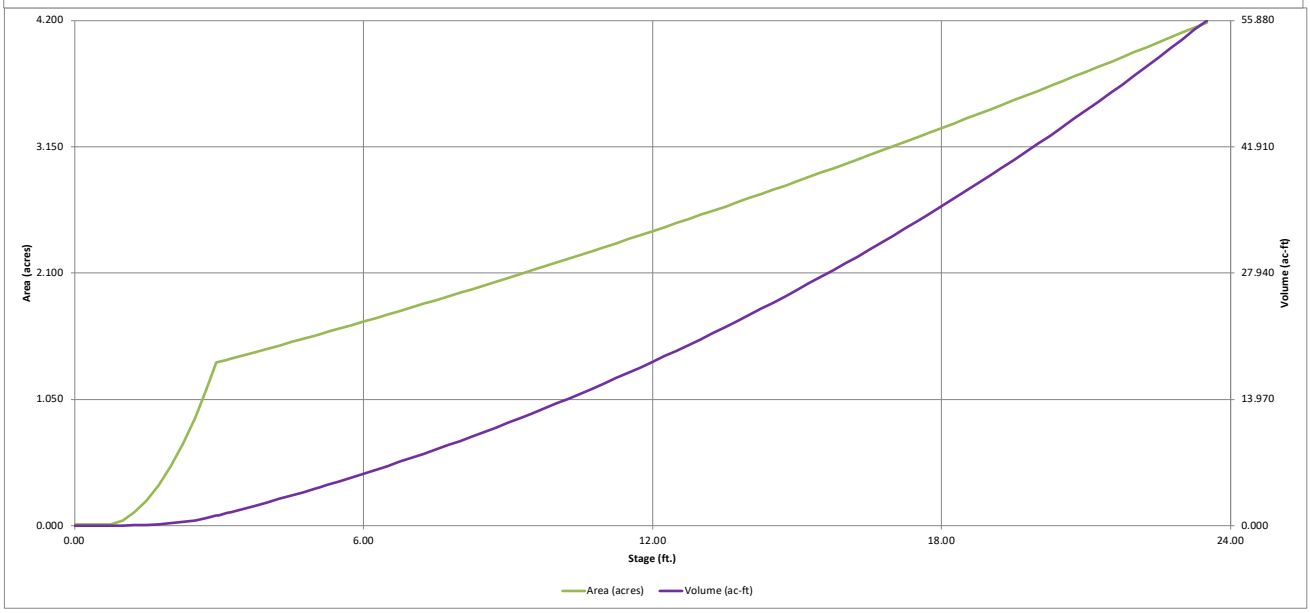
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		23.4	23.4	549		0.013		
ISV	0.33		23.4	23.4	549		0.013	181	0.004
	0.50		23.4	23.4	549		0.013	274	0.006
	0.75		23.4	23.4	549		0.013	411	0.009
	1.00		58.1	31.9	1,855		0.043	651	0.015
	1.25		109.1	44.4	4,846		0.111	1,462	0.034
	1.50		160.1	56.9	9,113		0.209	3,181	0.073
	1.75		211.1	69.4	14,655		0.336	6,125	0.141
	2.00		262.1	81.9	21,472		0.493	10,615	0.244
	2.25		313.1	94.4	29,564		0.679	16,967	0.390
	2.50		364.1	106.9	38,930		0.894	25,503	0.585
	2.75		415.1	119.4	49,572		1.138	36,539	0.839
Floor	2.95		455.9	129.4	59,004		1.355	47,383	1.088
	3.00		456.3	129.8	59,238		1.360	50,339	1.156
Zone 1 (WQCV)	3.17		457.7	131.2	60,037		1.378	60,477	1.388
	3.25		458.3	131.8	60,414		1.387	65,295	1.499
	3.50		460.3	133.8	61,598		1.414	80,547	1.849
	3.75		462.3	135.8	62,791		1.441	96,095	2.206
	4.00		464.3	137.8	63,991		1.469	111,943	2.570
	4.25		466.3	139.8	65,199		1.497	128,091	2.941
	4.50		468.3	141.8	66,415		1.525	144,543	3.318
	4.75		470.3	143.8	67,640		1.553	161,300	3.703
	5.00		472.3	145.8	68,872		1.581	178,363	4.095
Zone 2 (EURV)	5.10		473.1	146.6	69,367		1.592	185,275	4.253
	5.25		474.3	147.8	70,112		1.610	195,736	4.493
	5.50		476.3	149.8	71,360		1.638	213,420	4.899
	5.75		478.3	151.8	72,617		1.667	231,417	5.313
	6.00		480.3	153.8	73,881		1.696	249,729	5.733
	6.25		482.3	155.8	75,153		1.725	268,358	6.161
	6.50		484.3	157.8	76,433		1.755	287,306	6.596
	6.75		486.3	159.8	77,722		1.784	306,575	7.038
Zone 3 (100-year)	6.99		488.2	161.7	78,966		1.813	325,378	7.470
	7.00		488.3	161.8	79,018		1.814	326,168	7.488
	7.25		490.3	163.8	80,322		1.844	346,085	7.945
	7.50		492.3	165.8	81,634		1.874	366,329	8.410
	7.75		494.3	167.8	82,955		1.904	386,903	8.882
	8.00		496.3	169.8	84,283		1.935	407,807	9.362
	8.25		498.3	171.8	85,619		1.966	429,045	9.850
	8.50		500.3	173.8	86,963		1.996	450,618	10.345
	8.75		502.3	175.8	88,316		2.027	472,527	10.848
	9.00		504.3	177.8	89,676		2.059	494,776	11.358
	9.25		506.3	179.8	91,044		2.090	517,366	11.877
	9.50		508.3	181.8	92,420		2.122	540,299	12.404
	9.75		510.3	183.8	93,805		2.153	563,577	12.938
	10.00		512.3	185.8	95,197		2.185	587,202	13.480
	10.25		514.3	187.8	96,597		2.218	611,176	14.031
	10.50		516.3	189.8	98,005		2.250	635,501	14.589
	10.75		518.3	191.8	99,422		2.282	660,179	15.156
	11.00		520.3	193.8	100,846		2.315	685,212	15.730
	11.25		522.3	195.8	102,278		2.348	710,603	16.313
	11.50		524.3	197.8	103,718		2.381	736,352	16.904
	11.75		526.3	199.8	105,167		2.414	762,462	17.504
	12.00		528.3	201.8	106,623		2.448	788,936	18.111
	12.25		530.3	203.8	108,087		2.481	815,775	18.728
	12.50		532.3	205.8	109,559		2.515	842,980	19.352
	12.75		534.3	207.8	111,040		2.549	870,555	19.985
	13.00		536.3	209.8	112,528		2.583	898,501	20.627
	13.25		538.3	211.8	114,024		2.618	926,819	21.277
	13.50		540.3	213.8	115,528		2.652	955,513	21.936
	13.75		542.3	215.8	117,041		2.687	984,584	22.603
	14.00		544.3	217.8	118,561		2.722	1,014,034	23.279
	14.25		546.3	219.8	120,089		2.757	1,043,865	23.964
	14.50		548.3	221.8	121,625		2.792	1,074,079	24.657
	14.75		550.3	223.8	123,170		2.828	1,104,679	25.360
	15.00		552.3	225.8	124,722		2.863	1,135,665	26.071
	15.25		554.3	227.8	126,282		2.899	1,167,040	26.792
	15.50		556.3	229.8	127,850		2.935	1,198,806	27.521
	15.75		558.3	231.8	129,426		2.971	1,230,966	28.259
	16.00		560.3	233.8	131,011		3.008	1,263,520	29.006
	16.25		562.3	235.8	132,603		3.044	1,296,472	29.763
	16.50		564.3	237.8	134,203		3.081	1,329,823	30.529
	16.75		566.3	239.8	135,811		3.118	1,363,574	31.303
	17.00		568.3	241.8	137,428		3.155	1,397,729	32.087
	17.25		570.3	243.8	139,052		3.192	1,432,289	32.881
	17.50		572.3	245.8	140,684		3.230	1,467,256	33.684
	17.75		574.3	247.8	142,324		3.267	1,502,632	34.496
	18.00		576.3	249.8	143,973		3.305	1,538,419	35.317
	18.25		578.3	251.8	145,629		3.343	1,574,619	36.148
	18.50		580.3	253.8	147,293		3.381	1,611,234	36.989
	18.75		582.3	255.8	148,965		3.420	1,648,266	37.839
	19.00		584.3	257.8	150,646		3.458	1,685,717	38.699
	19.25		586.3	259.8	152,334		3.497	1,723,589	39.568
	19.50		588.3	261.8	154,030		3.536	1,761,885	40.447
	19.75		590.3	263.8	155,734		3.575	1,800,605	41.336
	20.00		592.3	265.8	157,447		3.614	1,839,753	42.235
	20.25		594.3	267.8	159,167		3.654	1,879,329	43.143
	20.50		596.3	269.8	160,895		3.694	1,919,337	44.062
	20.75		598.3	271.8	162,631		3.734	1,959,777	44.990
	21.00		600.3	273.8	164,376		3.774	2,000,653	45.929
	21.25		602.3	275.8	166,128		3.814	2,041,966	46.877
	21.50		604.3	277.8	167,888		3.854	2,083,718	47.836
	21.75		606.3	279.8	169,656		3.895	2,125,911	48.804
	22.00		608.3	281.8	171,433		3.936	2,168,547	49.783
	22.25		610.3	283.8	173,217		3.977	2,211,628	50.772
	22.50		612.3	285.8	175,009		4.018	2,255,156	51.771
	22.75		614.3	287.8	176,809		4.059	2,299,133	52.781
	23.00		616.3	289.8	178,618		4.100	2,343,561	53.801
	23.25		618.3	291.8	180,434		4.142	2,388,442	54.831
	23.50		620.3	293.8	182,258		4.184	2,433,779	55.872

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



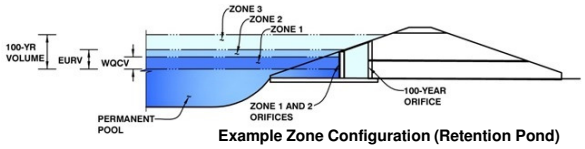


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADELY HEIGHTS - WFJCC POND #1

Basin ID: WEST FORK JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.17	1.385	Orifice Plate
Zone 2 (EURV)	5.10	2.862	Circular Orifice
Zone 3 (100-year)	6.99	3.212	Weir&Pipe (Restrict)
Total (all zones)		7.459	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.764E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.17	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.70	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.98	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.06	2.11					
Orifice Area (sq. inches)	3.98	3.98	3.98					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.17	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.10	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	5.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.18	N/A	feet
Vertical Orifice Diameter =	4.31	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.10	N/A	feet
Overflow Weir Front Edge Length =	10.00	N/A	feet	Overflow Weir Slope Length =	8.06	N/A	feet
Overflow Weir Grate Slope =	8.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.75	N/A	
Horiz. Length of Weir Sides =	8.00	N/A	feet	Overflow Grate Open Area w/o Debris =	56.44	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	28.22	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	9.82	N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	1.62	N/A	feet
Restrictor Plate Height Above Pipe Invert =	35.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.05	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
Spillway Crest Length =	85.00	feet	Stage at Top of Freeboard =	9.47	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.12	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	12.34	acre-ft

Calculated Parameters for Spillway

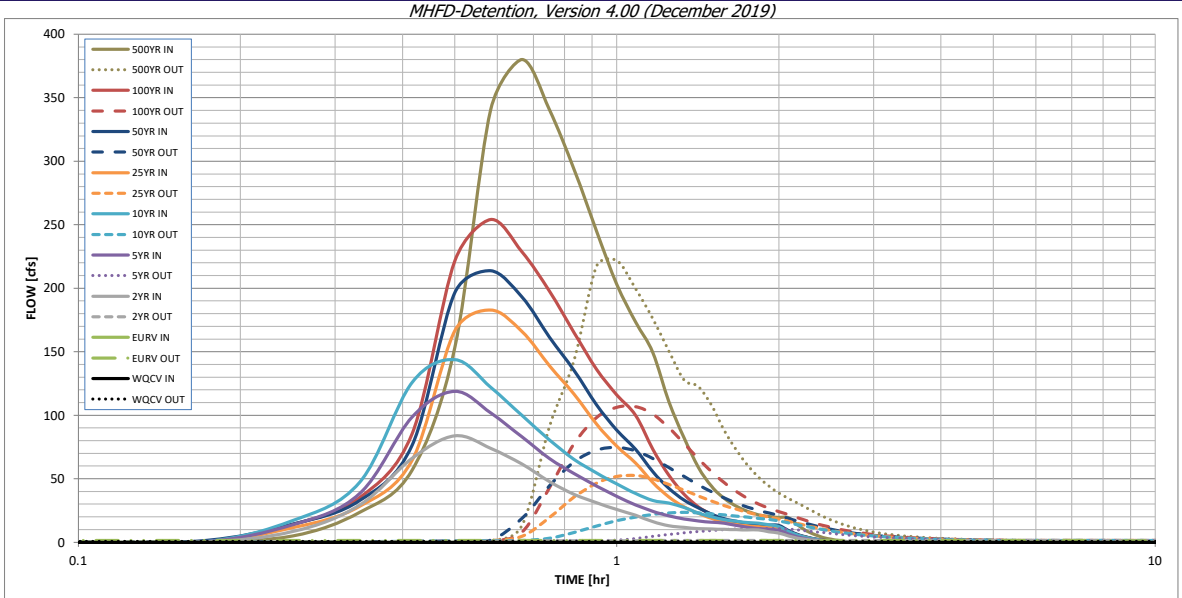
Routed Hydrograph Results

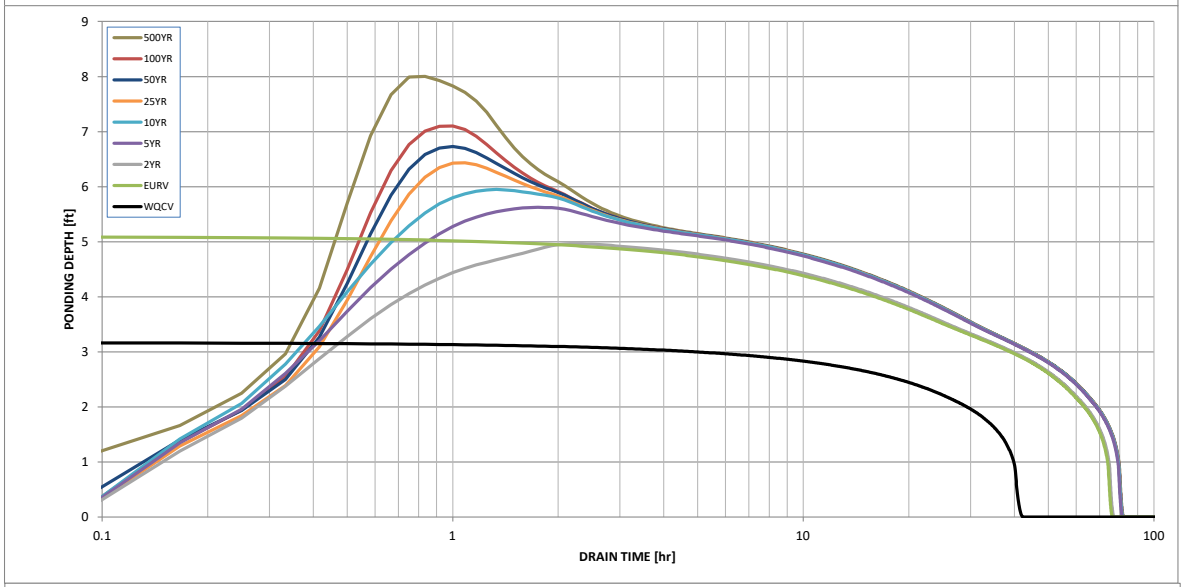
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

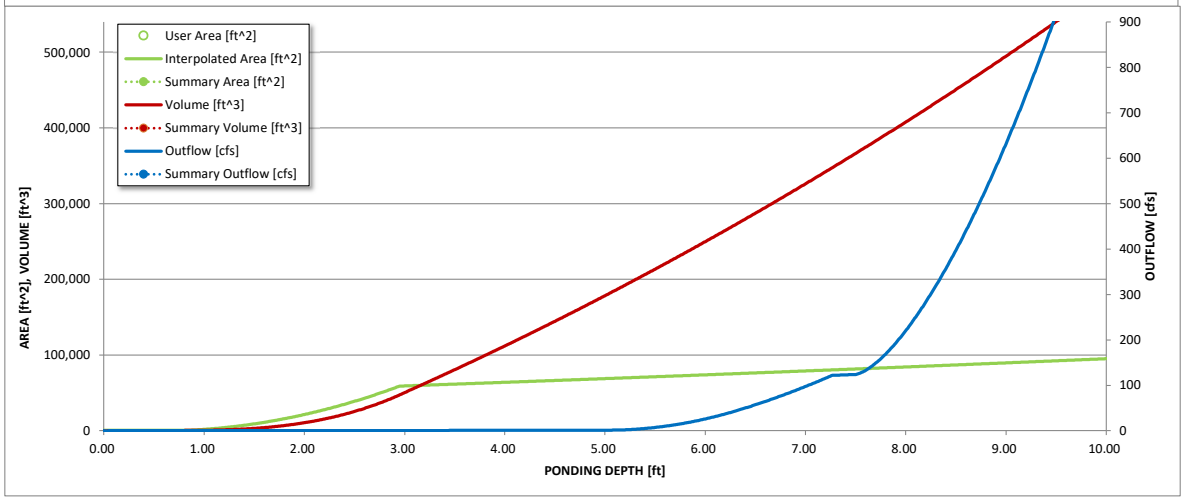
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	1.385	4.247	4.249	5.977	7.495	9.354	10.954	12.920	19.729
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.249	5.977	7.495	9.354	10.954	12.920	19.729
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	14.1	33.5	49.2	80.8	100.6	124.8	206.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.18	0.44	0.65	1.06	1.32	1.64	2.71
Peak Inflow Q (cfs) =	N/A	N/A	83.8	118.8	143.9	182.9	213.7	254.0	380.1
Peak Outflow Q (cfs) =	0.6	1.4	1.4	10.7	23.5	52.6	74.7	106.7	221.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.5	0.7	0.7	0.9	1.1
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	0.9	1.3	1.9	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	69	71	70	68	66	64	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	73	76	76	75	74	74	71
Maximum Ponding Depth (ft) =	3.17	5.10	4.97	5.62	5.95	6.44	6.73	7.10	8.01
Area at Maximum Ponding Depth (acres) =	1.38	1.59	1.58	1.65	1.69	1.75	1.78	1.83	1.93
Maximum Volume Stored (acre-ft) =	1.388	4.253	4.032	5.097	5.631	6.473	6.985	7.670	9.362

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





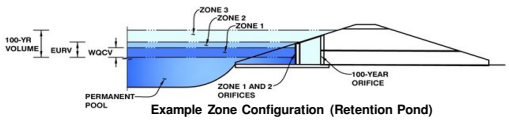


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS MDDP - WFJCC POND #2

Basin ID: WEST FORK JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	90.86	acres
Watershed Length =	2,000	ft
Watershed Length to Centroid =	1,000	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	77.77%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	5.0%	percent
Percentage Hydrologic Soil Groups C/D =	95.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	2.384	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	6.970	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	7.285	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	9.711	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	11.712	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	13.835	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	15.875	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	18.193	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.55 in.) =	26.646	acre-feet	3.55 inches
Approximate 2-yr Detention Volume =	6.256	acre-feet	
Approximate 5-yr Detention Volume =	8.548	acre-feet	
Approximate 10-yr Detention Volume =	9.874	acre-feet	
Approximate 25-yr Detention Volume =	10.477	acre-feet	
Approximate 50-yr Detention Volume =	10.742	acre-feet	
Approximate 100-yr Detention Volume =	11.404	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.384	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.586	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.433	acre-feet
Total Detention Basin Volume =	11.404	acre-feet
Initial Surcharge Volume (ISV) =	312	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	7.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

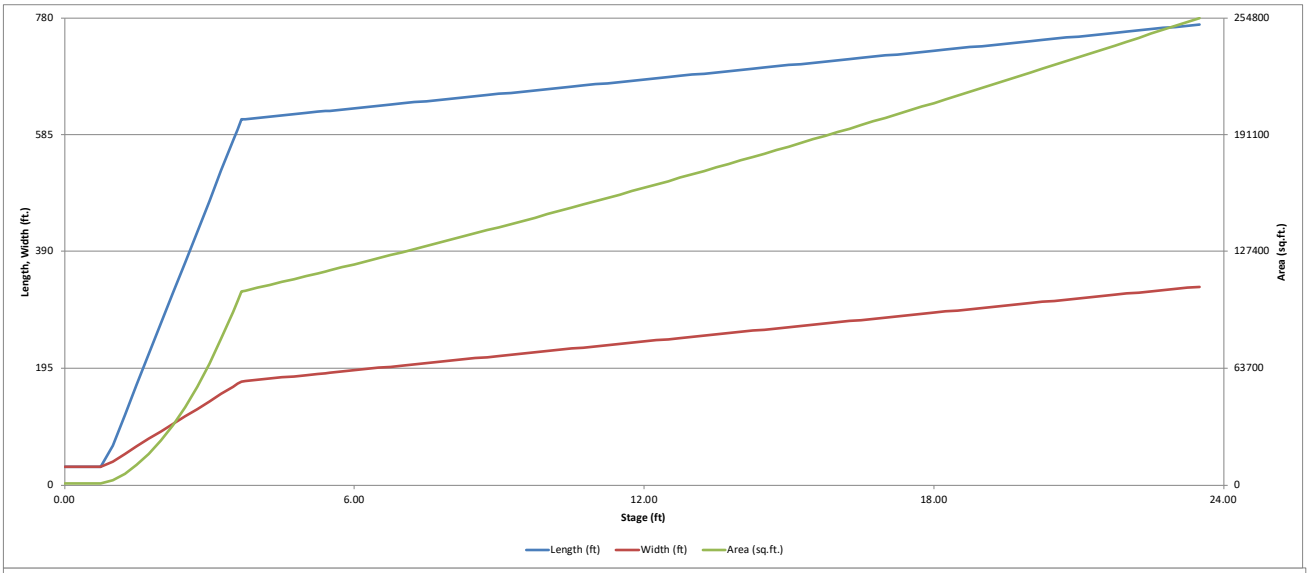
Initial Surcharge Area (A_{ISV}) =	944	ft^2
Surcharge Volume Length (L_{ISV}) =	30.7	ft
Surcharge Volume Width (W_{ISV}) =	30.7	ft
Depth of Basin Floor (H_{FLOOR}) =	2.84	ft
Length of Basin Floor (L_{FLOOR}) =	610.1	ft
Width of Basin Floor (W_{FLOOR}) =	172.7	ft
Area of Basin Floor (A_{FLOOR}) =	105,379	ft^2
Volume of Basin Floor (V_{FLOOR}) =	110,096	ft^3
Depth of Main Basin (H_{MAIN}) =	3.33	ft
Length of Main Basin (L_{MAIN}) =	636.7	ft
Width of Main Basin (W_{MAIN}) =	199.4	ft
Area of Main Basin (A_{MAIN}) =	126,943	ft^2
Volume of Main Basin (V_{MAIN}) =	386,260	ft^3
Calculated Total Basin Volume (V_{total}) =	**11.413**	acre-feet

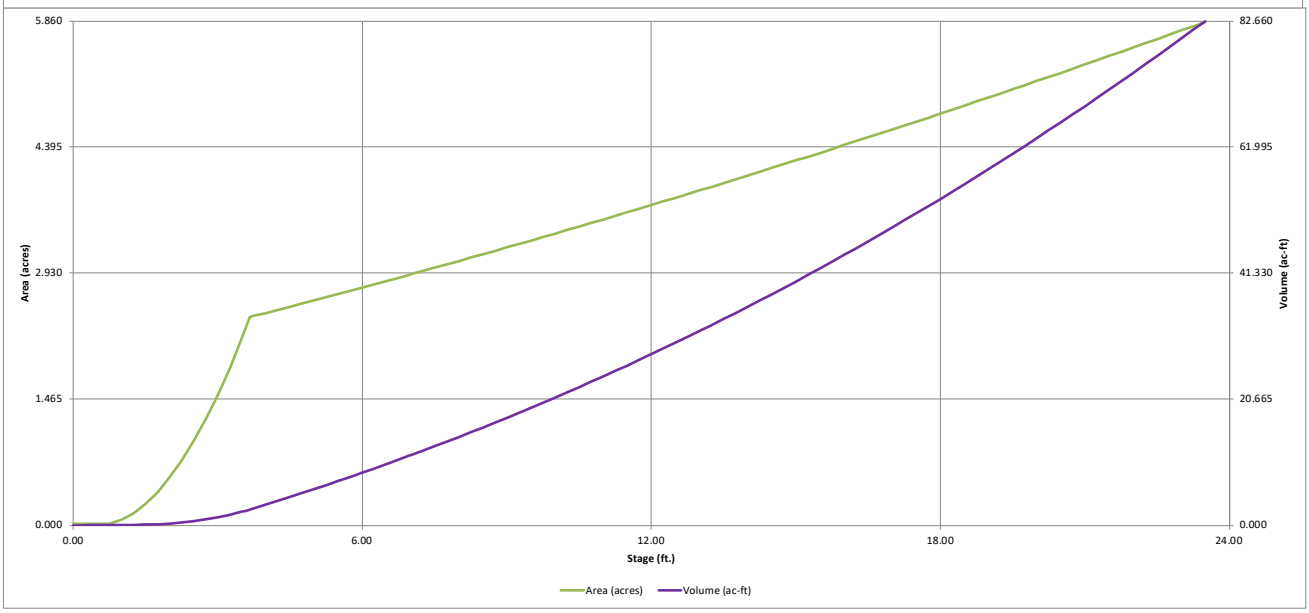
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		30.7	30.7	944		0.022		
ISV	0.33		30.7	30.7	944		0.022	312	0.007
	0.50		30.7	30.7	944		0.022	472	0.011
	0.75		30.7	30.7	944		0.022	708	0.016
	1.00		65.4	39.2	2,566		0.059	1,074	0.025
	1.25		116.4	51.7	6,022		0.138	2,121	0.049
	1.50		167.4	64.2	10,752		0.247	4,191	0.096
	1.75		218.4	76.7	16,758		0.385	7,603	0.175
	2.00		269.4	89.2	24,039		0.552	12,676	0.291
	2.25		320.4	101.7	32,594		0.748	19,729	0.453
	2.50		371.4	114.2	42,425		0.974	29,079	0.668
	2.75		422.4	126.7	53,531		1.229	41,047	0.942
	3.00		473.4	139.2	65,912		1.513	55,951	1.284
	3.25		524.4	151.7	79,567		1.827	74,109	1.701
	3.50		575.4	164.2	94,498		2.169	95,841	2.200
Zone 1 (WQCV)	3.59		593.8	168.7	100,185		2.300	104,601	2.401
Floor	3.67		610.1	172.7	105,379		2.419	112,822	2.590
	3.75		610.7	173.4	105,881		2.431	121,273	2.784
	4.00		612.7	175.4	107,453		2.467	147,939	3.396
	4.25		614.7	177.4	109,033		2.503	175,000	4.017
	4.50		616.7	179.4	110,621		2.540	202,456	4.648
	4.75		618.7	181.4	112,217		2.576	230,311	5.287
	5.00		620.7	183.4	113,822		2.613	258,566	5.936
	5.25		622.7	185.4	115,434		2.650	287,223	6.594
Zone 2 (EURV)	5.40		623.9	186.6	116,405		2.672	304,610	6.993
	5.50		624.7	187.4	117,054		2.687	316,283	7.261
	5.75		626.7	189.4	118,682		2.725	345,750	7.937
	6.00		628.7	191.4	120,318		2.762	375,625	8.623
	6.25		630.7	193.4	121,963		2.800	405,910	9.318
	6.50		632.7	195.4	123,615		2.838	436,607	10.023
	6.75		634.7	197.4	125,275		2.876	467,718	10.737
Zone 3 (100-year)	6.99		636.6	199.3	126,876		2.913	497,976	11.432
	7.00		636.7	199.4	126,943		2.914	499,245	11.461
	7.25		638.7	201.4	128,619		2.953	531,191	12.194
	7.50		640.7	203.4	130,304		2.991	563,556	12.937
	7.75		642.7	205.4	131,996		3.030	596,343	13.690
	8.00		644.7	207.4	133,696		3.069	629,554	14.453
	8.25		646.7	209.4	135,404		3.108	663,192	15.225
	8.50		648.7	211.4	137,120		3.148	697,257	16.007
	8.75		650.7	213.4	138,845		3.187	731,752	16.799
	9.00		652.7	215.4	140,577		3.227	766,680	17.601
	9.25		654.7	217.4	142,317		3.267	802,041	18.412
	9.50		656.7	219.4	144,065		3.307	837,839	19.234
	9.75		658.7	221.4	145,821		3.348	874,075	20.066
	10.00		660.7	223.4	147,585		3.388	910,750	20.908
	10.25		662.7	225.4	149,358		3.429	947,868	21.760
	10.50		664.7	227.4	151,138		3.470	985,430	22.622
	10.75		666.7	229.4	152,926		3.511	1,023,438	23.495
	11.00		668.7	231.4	154,722		3.552	1,061,894	24.378
	11.25		670.7	233.4	156,526		3.593	1,100,800	25.271
	11.50		672.7	235.4	158,339		3.635	1,140,158	26.174
	11.75		674.7	237.4	160,159		3.677	1,179,970	27.088
	12.00		676.7	239.4	161,987		3.719	1,220,238	28.013
	12.25		678.7	241.4	163,823		3.761	1,260,964	28.948
	12.50		680.7	243.4	165,667		3.803	1,302,150	29.893
	12.75		682.7	245.4	167,520		3.846	1,343,798	30.849
	13.00		684.7	247.4	169,380		3.888	1,385,910	31.816
	13.25		686.7	249.4	171,248		3.931	1,428,489	32.794
	13.50		688.7	251.4	173,124		3.974	1,471,535	33.782
	13.75		690.7	253.4	175,008		4.018	1,515,051	34.781
	14.00		692.7	255.4	176,901		4.061	1,559,040	35.791
	14.25		694.7	257.4	178,801		4.105	1,603,502	36.811
	14.50		696.7	259.4	180,709		4.149	1,648,441	37.843
	14.75		698.7	261.4	182,625		4.192	1,693,858	38.886
	15.00		700.7	263.4	184,549		4.237	1,739,754	39.939
	15.25		702.7	265.4	186,482		4.281	1,786,133	41.004
	15.50		704.7	267.4	188,422		4.326	1,832,996	42.080
	15.75		706.7	269.4	190,370		4.370	1,880,344	43.167
	16.00		708.7	271.4	192,326		4.415	1,928,181	44.265
	16.25		710.7	273.4	194,290		4.460	1,976,508	45.374
	16.50		712.7	275.4	196,262		4.506	2,025,327	46.495
	16.75		714.7	277.4	198,243		4.551	2,074,640	47.627
	17.00		716.7	279.4	200,231		4.597	2,124,449	48.771
	17.25		718.7	281.4	202,227		4.642	2,174,756	49.926
	17.50		720.7	283.4	204,231		4.689	2,225,563	51.092
	17.75		722.7	285.4	206,243		4.735	2,276,872	52.270
	18.00		724.7	287.4	208,264		4.781	2,328,686	53.459
	18.25		726.7	289.4	210,292		4.828	2,381,005	54.660
	18.50		728.7	291.4	212,328		4.874	2,433,832	55.873
	18.75		730.7	293.4	214,372		4.921	2,487,170	57.098
	19.00		732.7	295.4	216,424		4.968	2,541,019	58.334
	19.25		734.7	297.4	218,485		5.016	2,595,382	59.582
	19.50		736.7	299.4	220,553		5.063	2,650,262	60.842
	19.75		738.7	301.4	222,629		5.111	2,705,660	62.113
	20.00		740.7	303.4	224,713		5.159	2,761,577	63.397
	20.25		742.7	305.4	226,805		5.207	2,818,017	64.693
	20.50		744.7	307.4	228,906		5.255	2,874,980	66.000
	20.75		746.7	309.4	231,014		5.303	2,932,470	67.320
	21.00		748.7	311.4	233,130		5.352	2,990,488	68.652
	21.25		750.7	313.4	235,254		5.401	3,049,036	69.996
	21.50		752.7	315.4	237,386		5.450	3,108,116	71.353
	21.75		754.7	317.4	239,527		5.499	3,167,730	72.721
	22.00		756.7	319.4	241,675		5.548	3,227,880	74.102
	22.25		758.7	321.4	243,831		5.598	3,288,568	75.495
	22.50		760.7	323.4	245,995		5.647	3,349,796	76.901
	22.75		762.7	325.4	248,167		5.697	3,411,566	78.319
	23.00		764.7	327.4	250,347		5.747	3,473,880	79.749
	23.25		766.7	329.4	252,536		5.797	3,536,740	81.192
	23.50		768.7	331.4	254,732		5.848	3,600,149	82.648

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



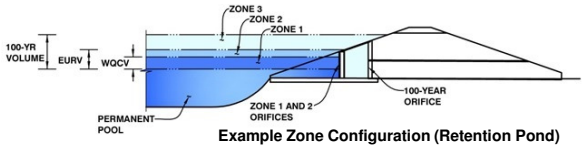


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS MDDP - WFJCC POND #2

Basin ID: WEST FORK JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.59	2.384	Orifice Plate
Zone 2 (EURV)	5.40	4.586	Circular Orifice
Zone 3 (100-year)	6.99	4.433	Weir&Pipe (Restrict)
Total (all zones)		11.404	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.549E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.59	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	6.55	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.39					
Orifice Area (sq. inches)	6.55	6.55	6.55					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.59	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.15	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	5.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.22	N/A	feet
Vertical Orifice Diameter =	5.24	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.40	N/A	feet
Overflow Weir Front Edge Length =	44.00	N/A	feet	Overflow Weir Slope Length =	8.06	N/A	feet
Overflow Weir Grate Slope =	8.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	17.32	N/A	
Horiz. Length of Weir Sides =	8.00	N/A	feet	Overflow Grate Open Area w/o Debris =	248.32	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	124.16	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	14.33	N/A	ft^2
Outlet Pipe Diameter =	60.00	N/A	inches	Outlet Orifice Centroid =	1.92	N/A	feet
Restrictor Plate Height Above Pipe Invert =	41.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.95	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.98	feet
Spillway Crest Length =	137.00	feet	Stage at Top of Freeboard =	9.48	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	3.30	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	19.17	acre-ft

Calculated Parameters for Spillway

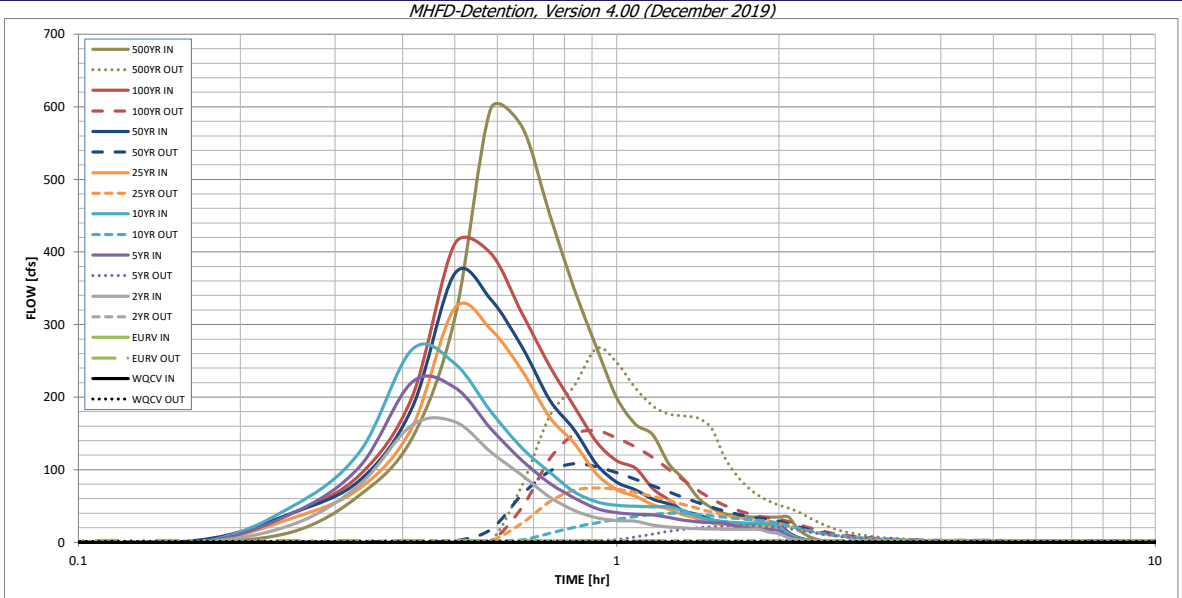
Routed Hydrograph Results

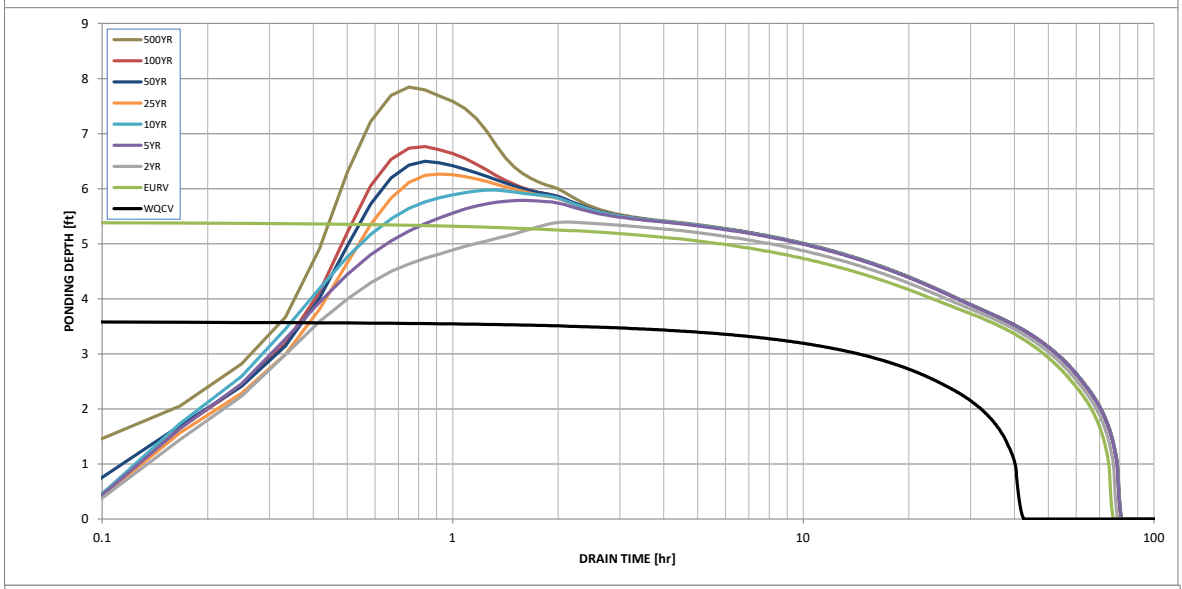
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

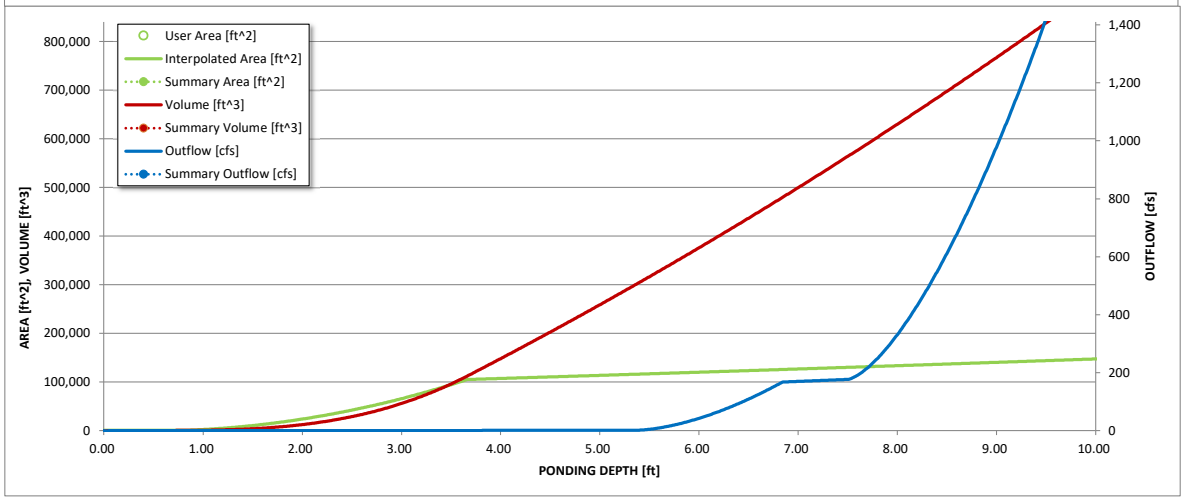
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	2.384	6.970	7.285	9.711	11.712	13.835	15.875	18.193	26.646
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.285	9.711	11.712	13.835	15.875	18.193	26.646
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	26.6	56.3	77.5	118.5	146.0	179.6	291.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.29	0.62	0.85	1.30	1.61	1.98	3.21
Peak Inflow Q (cfs) =	N/A	N/A	166.2	220.6	265.5	322.5	370.0	411.1	596.8
Peak Outflow Q (cfs) =	1.0	2.2	2.2	22.6	40.0	74.9	108.2	153.5	267.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.5	0.6	0.7	0.9	0.9
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.1	0.3	0.4	0.6	0.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	70	71	69	68	66	65	60
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	75	76	75	75	74	73	71
Maximum Ponding Depth (ft) =	3.59	5.40	5.39	5.79	5.97	6.27	6.50	6.76	7.85
Area at Maximum Ponding Depth (acres) =	2.30	2.67	2.67	2.73	2.76	2.80	2.84	2.88	3.04
Maximum Volume Stored (acre-ft) =	2.401	6.993	6.966	8.019	8.540	9.346	9.995	10.766	13.964

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





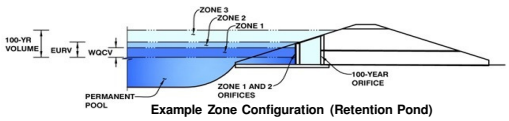


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - JCC POND #3

Basin ID: JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	38.07	acres
Watershed Length =	1,771	ft
Watershed Length to Centroid =	700	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	66.17%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	16.1%	percent
Percentage Hydrologic Soil Groups C/D =	83.9%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.821	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	2.488	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.574	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.516	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.309	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	5.191	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	6.011	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.973	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.55 in.) =	10.393	acre-feet	3.55 inches
Approximate 2-yr Detention Volume =	2.177	acre-feet	
Approximate 5-yr Detention Volume =	3.045	acre-feet	
Approximate 10-yr Detention Volume =	3.542	acre-feet	
Approximate 25-yr Detention Volume =	3.783	acre-feet	
Approximate 50-yr Detention Volume =	3.899	acre-feet	
Approximate 100-yr Detention Volume =	4.241	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.821	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.667	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.753	acre-feet
Total Detention Basin Volume =	4.241	acre-feet
Initial Surcharge Volume (ISV) =	107	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	7.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

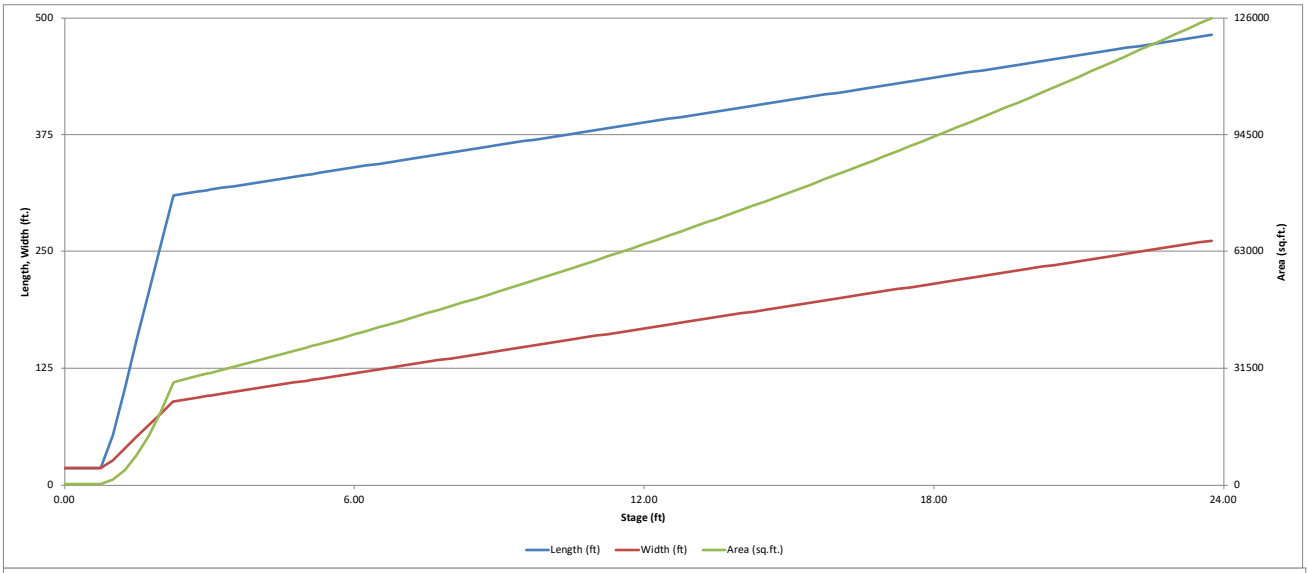
Initial Surcharge Area (A_{ISV}) =	325	ft^2
Surcharge Volume Length (L_{ISV}) =	18.0	ft
Surcharge Volume Width (W_{ISV}) =	18.0	ft
Depth of Basin Floor (H_{FLOOR}) =	1.43	ft
Length of Basin Floor (L_{FLOOR}) =	309.7	ft
Width of Basin Floor (W_{FLOOR}) =	89.5	ft
Area of Basin Floor (A_{FLOOR}) =	27,732	ft^2
Volume of Basin Floor (V_{FLOOR}) =	14,805	ft^3
Depth of Main Basin (H_{MAIN}) =	4.74	ft
Length of Main Basin (L_{MAIN}) =	347.7	ft
Width of Main Basin (W_{MAIN}) =	127.4	ft
Area of Main Basin (A_{MAIN}) =	44,310	ft^2
Volume of Main Basin (V_{MAIN}) =	169,212	ft^3
Calculated Total Basin Volume (V_{total}) =	**4.231**	acre-feet

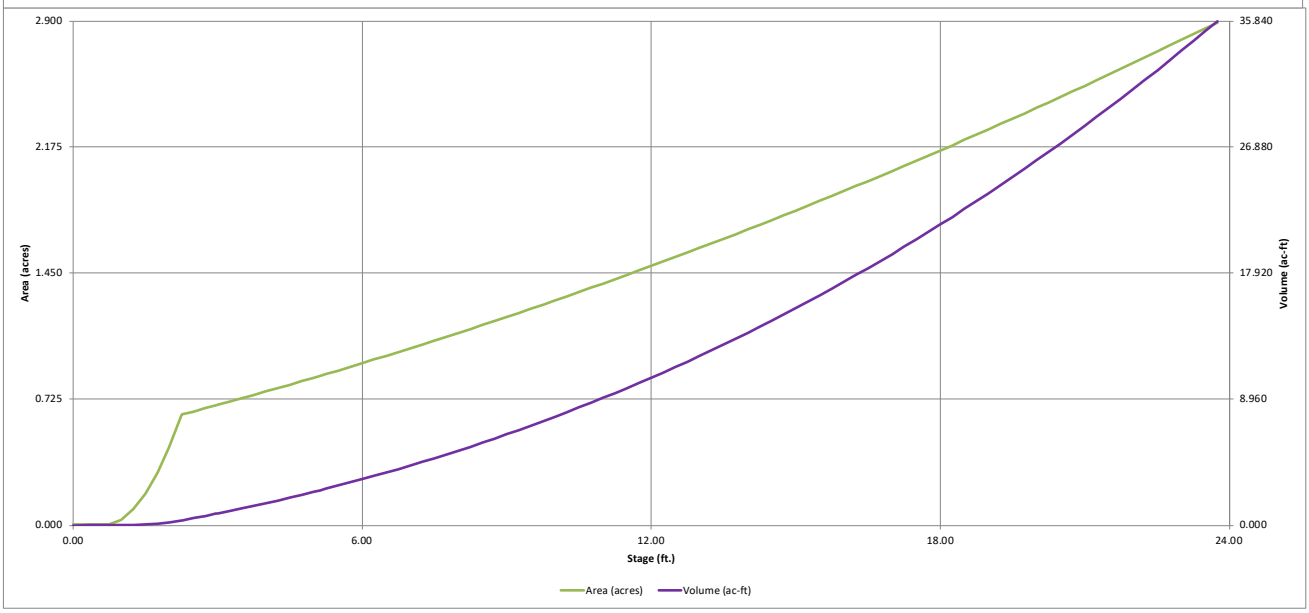
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		18.0	18.0	325		0.007		
ISV	0.33		18.0	18.0	325		0.007	107	0.002
	0.50		18.0	18.0	325		0.007	163	0.004
	0.75		18.0	18.0	325		0.007	244	0.006
	1.00		52.7	26.5	1,398		0.032	408	0.009
	1.25		103.7	39.0	4,048		0.093	1,062	0.024
	1.50		154.7	51.5	7,972		0.183	2,538	0.058
	1.75		205.7	64.0	13,171		0.302	5,154	0.118
	2.00		256.7	76.5	19,646		0.451	9,230	0.212
	2.25		307.7	89.0	27,395		0.629	15,084	0.346
Floor	2.26		309.7	89.5	27,732		0.637	15,359	0.353
	2.50		311.7	91.4	28,502		0.654	22,107	0.508
	2.75		313.7	93.4	29,312		0.673	29,334	0.673
Zone 1 (WQCV)	2.97		315.4	95.2	30,032		0.689	35,861	0.823
	3.00		315.7	95.4	30,130		0.692	36,764	0.844
	3.25		317.7	97.4	30,957		0.711	44,399	1.019
	3.50		319.7	99.4	31,791		0.730	52,243	1.199
	3.75		321.7	101.4	32,633		0.749	60,296	1.384
	4.00		323.7	103.4	33,483		0.769	68,560	1.574
	4.25		325.7	105.4	34,342		0.788	77,038	1.769
	4.50		327.7	107.4	35,208		0.808	85,731	1.968
	4.75		329.7	109.4	36,082		0.828	94,642	2.173
	5.00		331.7	111.4	36,964		0.849	103,773	2.382
Zone 2 (EURV)	5.13		332.7	112.5	37,426		0.859	108,608	2.493
	5.25		333.7	113.4	37,855		0.869	113,125	2.597
	5.50		335.7	115.4	38,753		0.890	122,701	2.817
	5.75		337.7	117.4	39,659		0.910	132,502	3.042
	6.00		339.7	119.4	40,573		0.931	142,531	3.272
	6.25		341.7	121.4	41,495		0.953	152,790	3.508
	6.50		343.7	123.4	42,426		0.974	163,280	3.748
	6.75		345.7	125.4	43,364		0.995	174,003	3.995
Zone 3 (100-year)	7.00		347.7	127.4	44,310		1.017	184,962	4.246
	7.25		349.7	129.4	45,264		1.039	196,159	4.503
	7.50		351.7	131.4	46,227		1.061	207,595	4.766
	7.75		353.7	133.4	47,197		1.083	219,273	5.034
	8.00		355.7	135.4	48,175		1.106	231,194	5.307
	8.25		357.7	137.4	49,161		1.129	243,361	5.587
	8.50		359.7	139.4	50,156		1.151	255,776	5.872
	8.75		361.7	141.4	51,158		1.174	268,440	6.163
	9.00		363.7	143.4	52,168		1.198	281,355	6.459
	9.25		365.7	145.4	53,186		1.221	294,524	6.761
	9.50		367.7	147.4	54,213		1.245	307,949	7.070
	9.75		369.7	149.4	55,247		1.268	321,631	7.384
	10.00		371.7	151.4	56,289		1.292	335,573	7.704
	10.25		373.7	153.4	57,339		1.316	349,776	8.030
	10.50		375.7	155.4	58,397		1.341	364,243	8.362
	10.75		377.7	157.4	59,464		1.365	378,976	8.700
	11.00		379.7	159.4	60,538		1.390	393,976	9.044
	11.25		381.7	161.4	61,620		1.415	409,245	9.395
	11.50		383.7	163.4	62,710		1.440	424,787	9.752
	11.75		385.7	165.4	63,809		1.465	440,601	10.115
	12.00		387.7	167.4	64,915		1.490	456,692	10.484
	12.25		389.7	169.4	66,029		1.516	473,059	10.860
	12.50		391.7	171.4	67,151		1.542	489,707	11.242
	12.75		393.7	173.4	68,282		1.568	506,636	11.631
	13.00		395.7	175.4	69,420		1.594	523,848	12.026
	13.25		397.7	177.4	70,566		1.620	541,346	12.428
	13.50		399.7	179.4	71,720		1.646	559,132	12.836
	13.75		401.7	181.4	72,883		1.673	577,207	13.251
	14.00		403.7	183.4	74,053		1.700	595,574	13.672
	14.25		405.7	185.4	75,231		1.727	614,234	14.101
	14.50		407.7	187.4	76,417		1.754	633,190	14.536
	14.75		409.7	189.4	77,612		1.782	652,444	14.978
	15.00		411.7	191.4	78,814		1.809	671,997	15.427
	15.25		413.7	193.4	80,024		1.837	691,851	15.883
	15.50		415.7	195.4	81,242		1.865	712,009	16.345
	15.75		417.7	197.4	82,468		1.893	732,473	16.815
	16.00		419.7	199.4	83,703		1.922	753,244	17.292
	16.25		421.7	201.4	84,945		1.950	774,325	17.776
	16.50		423.7	203.4	86,195		1.979	795,717	18.267
	16.75		425.7	205.4	87,453		2.008	817,423	18.765
	17.00		427.7	207.4	88,720		2.037	839,445	19.271
	17.25		429.7	209.4	89,994		2.066	861,784	19.784
	17.50		431.7	211.4	91,276		2.095	884,442	20.304
	17.75		433.7	213.4	92,566		2.125	907,422	20.832
	18.00		435.7	215.4	93,865		2.155	930,726	21.367
	18.25		437.7	217.4	95,171		2.185	954,355	21.909
	18.50		439.7	219.4	96,485		2.215	978,312	22.459
	18.75		441.7	221.4	97,807		2.245	1,002,599	23.016
	19.00		443.7	223.4	99,138		2.276	1,027,217	23.582
	19.25		445.7	225.4	100,476		2.307	1,052,168	24.154
	19.50		447.7	227.4	101,822		2.338	1,077,455	24.735
	19.75		449.7	229.4	103,176		2.369	1,103,080	25.323
	20.00		451.7	231.4	104,538		2.400	1,129,044	25.919
	20.25		453.7	233.4	105,909		2.431	1,155,350	26.523
	20.50		455.7	235.4	107,287		2.463	1,181,999	27.135
	20.75		457.7	237.4	108,673		2.495	1,208,994	27.755
	21.00		459.7	239.4	110,067		2.527	1,236,336	28.382
	21.25		461.7	241.4	111,470		2.559	1,264,028	29.018
	21.50		463.7	243.4	112,880		2.591	1,292,072	29.662
	21.75		465.7	245.4	114,298		2.624	1,320,469	30.314
	22.00		467.7	247.4	115,724		2.657	1,349,221	30.974
	22.25		469.7	249.4	117,159		2.690	1,378,332	31.642
	22.50		471.7	251.4	118,601		2.723	1,407,801	32.319
	22.75		473.7	253.4	120,051		2.756	1,437,633	33.004
	23.00		475.7	255.4	121,509		2.789	1,467,828	33.697
	23.25		477.7	257.4	122,976		2.823	1,498,388	34.398
	23.50		479.7	259.4	124,450		2.857	1,529,316	35.108
	23.75		481.7	261.4	125,932		2.891	1,560,614	35.827

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



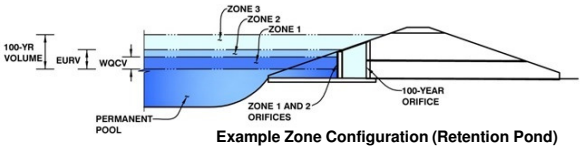


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - JCC POND #3

Basin ID: JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.97	0.821	Orifice Plate
Zone 2 (EURV)	5.13	1.667	Circular Orifice
Zone 3 (100-year)	7.00	1.753	Weir&Pipe (Restrict)
Total (all zones)		4.241	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.736E-02	ft²
Depth at top of Zone using Orifice Plate =	2.97	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	2.50	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.99	1.98					
Orifice Area (sq. inches)	2.50	2.50	2.50					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.97	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.04	N/A	ft²
Depth at top of Zone using Vertical Orifice =	5.13	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.12	N/A	feet
Vertical Orifice Diameter =	2.81	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.13	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.13	N/A	feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	6.08	N/A	feet
Overflow Weir Grate Slope =	6.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.00	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	34.06	N/A	ft²
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	17.03	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.87	N/A	ft²
Outlet Pipe Diameter =	42.00	N/A	inches	Outlet Orifice Centroid =	1.02	N/A	feet
Restrictor Plate Height Above Pipe Invert =	21.20		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.58	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.95	feet
Spillway Crest Length =	48.00	feet	Stage at Top of Freeboard =	8.95	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.19	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	6.40	acre-ft

Calculated Parameters for Spillway

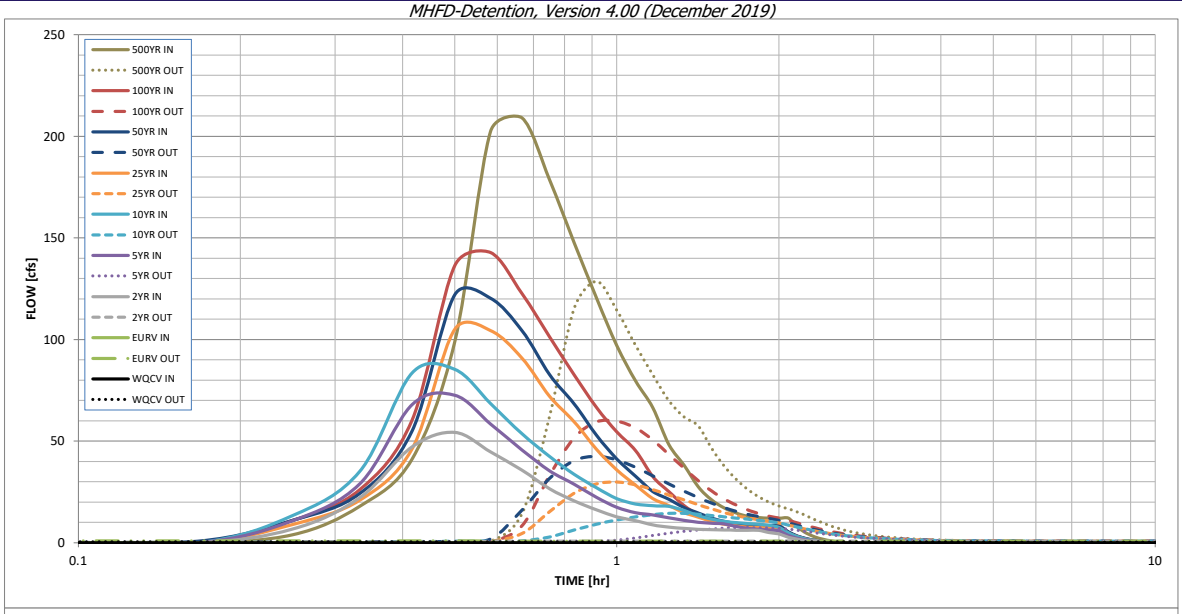
Routed Hydrograph Results

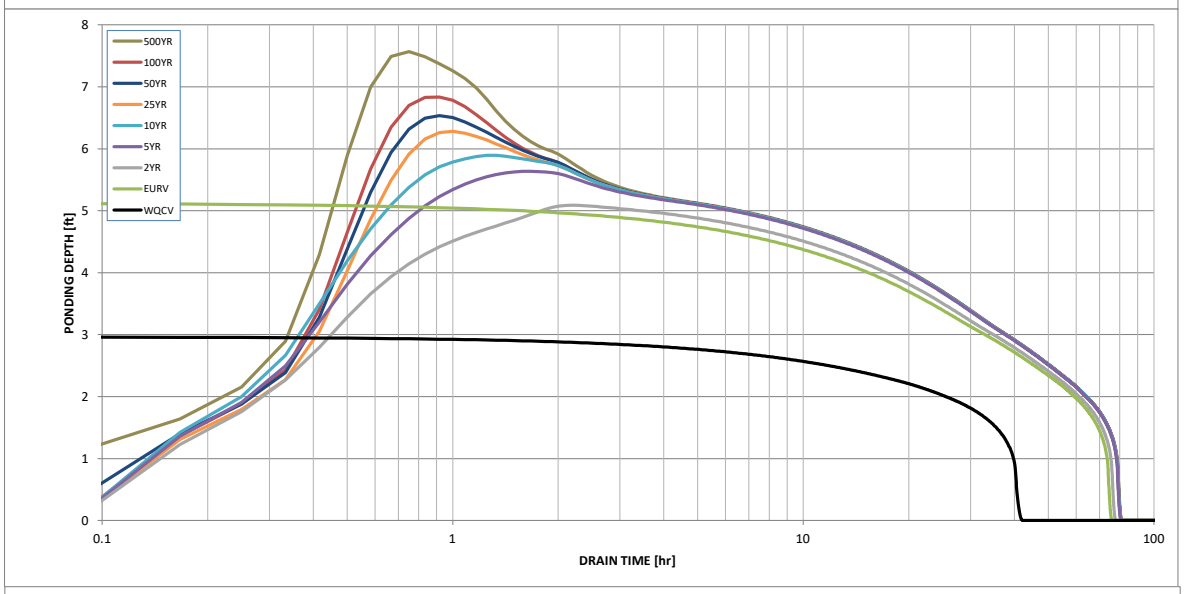
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

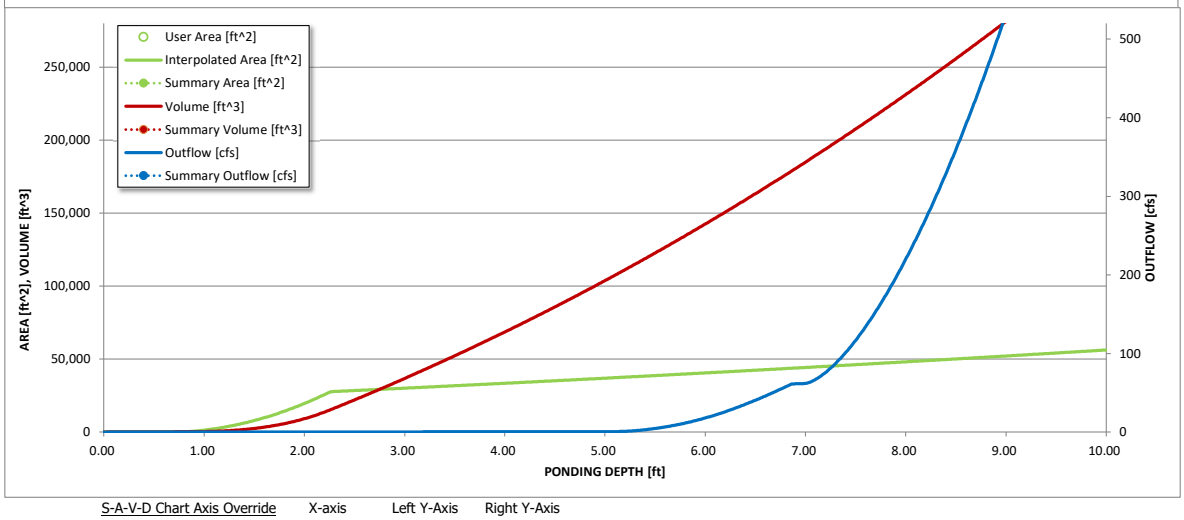
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	0.821	2.488	2.574	3.516	4.309	5.191	6.011	6.973	10.393
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.574	3.516	4.309	5.191	6.011	6.973	10.393
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	9.1	19.9	27.7	43.2	53.3	65.7	107.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.24	0.52	0.73	1.13	1.40	1.72	2.82
Peak Inflow Q (cfs) =	N/A	N/A	54.2	72.5	85.3	105.0	122.0	142.7	209.1
Peak Outflow Q (cfs) =	0.3	0.8	0.8	7.4	14.4	29.8	42.5	59.8	128.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.5	0.7	0.8	0.9	1.2
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	0.8	1.2	1.7	1.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	70	71	69	68	66	64	59
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	74	76	75	75	74	74	71
Maximum Ponding Depth (ft) =	2.97	5.13	5.09	5.64	5.89	6.28	6.54	6.84	7.57
Area at Maximum Ponding Depth (acres) =	0.69	0.86	0.86	0.90	0.92	0.96	0.98	1.00	1.07
Maximum Volume Stored (acre-ft) =	0.823	2.493	2.450	2.933	3.170	3.536	3.778	4.074	4.830

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







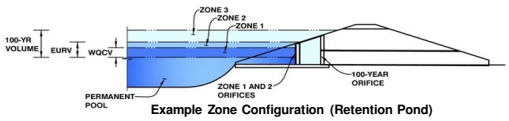
S-A-V-D Chart Axis Override X-axis Left Y-Axis Right Y-Axis

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS MKJCC POND #4

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	49.03	acres
Watershed Length =	2,150	ft
Watershed Length to Centroid =	1,000	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	67.94%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.087	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	3.230	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.421	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	4.659	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	5.691	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	6.821	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	7.885	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	9.123	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.55 in.) =	13.547	acre-feet	3.55 inches
Approximate 2-yr Detention Volume =	2.898	acre-feet	
Approximate 5-yr Detention Volume =	4.066	acre-feet	
Approximate 10-yr Detention Volume =	4.656	acre-feet	
Approximate 25-yr Detention Volume =	4.958	acre-feet	
Approximate 50-yr Detention Volume =	5.098	acre-feet	
Approximate 100-yr Detention Volume =	5.530	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.087	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.143	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.301	acre-feet
Total Detention Basin Volume =	5.530	acre-feet
Initial Surcharge Volume (ISV) =	142	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	7.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

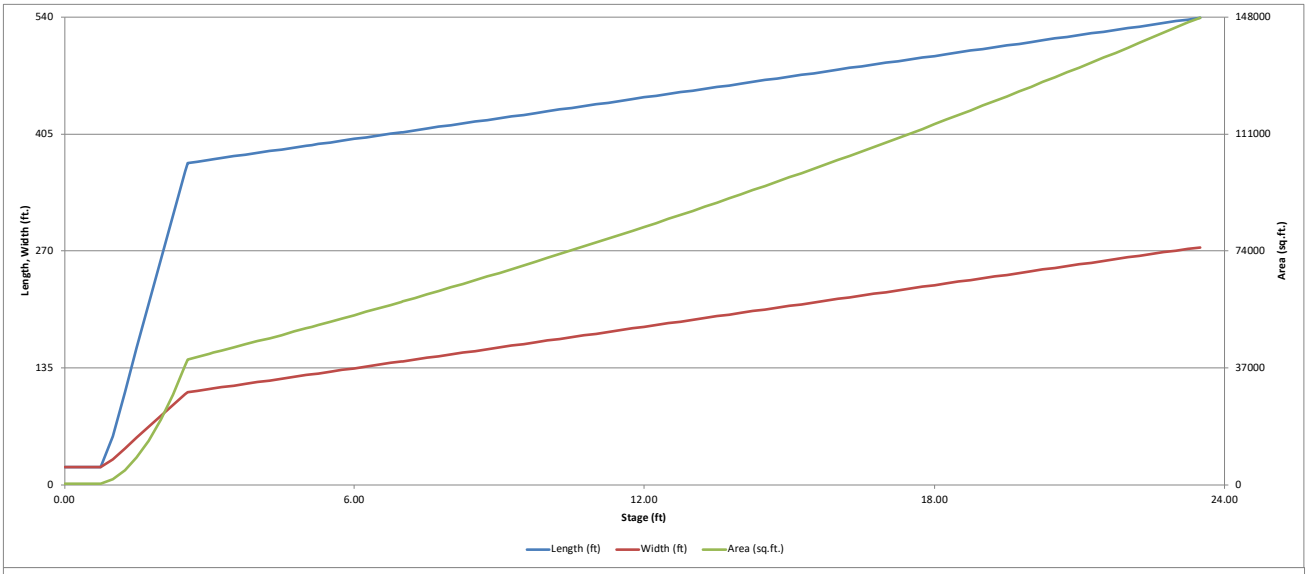
Initial Surcharge Area (A_{ISV}) =	430	ft^2
Surcharge Volume Length (L_{ISV}) =	20.7	ft
Surcharge Volume Width (W_{ISV}) =	20.7	ft
Depth of Basin Floor (H_{FLOOR}) =	1.72	ft
Length of Basin Floor (L_{FLOOR}) =	371.6	ft
Width of Basin Floor (W_{FLOOR}) =	106.7	ft
Area of Basin Floor (A_{FLOOR}) =	39,670	ft^2
Volume of Basin Floor (V_{FLOOR}) =	25,360	ft^3
Depth of Main Basin (H_{MAIN}) =	4.45	ft
Length of Main Basin (L_{MAIN}) =	407.2	ft
Width of Main Basin (W_{MAIN}) =	142.3	ft
Area of Main Basin (A_{MAIN}) =	57,967	ft^2
Volume of Main Basin (V_{MAIN}) =	215,960	ft^3
Calculated Total Basin Volume (V_{total}) =	**5.548**	acre-feet

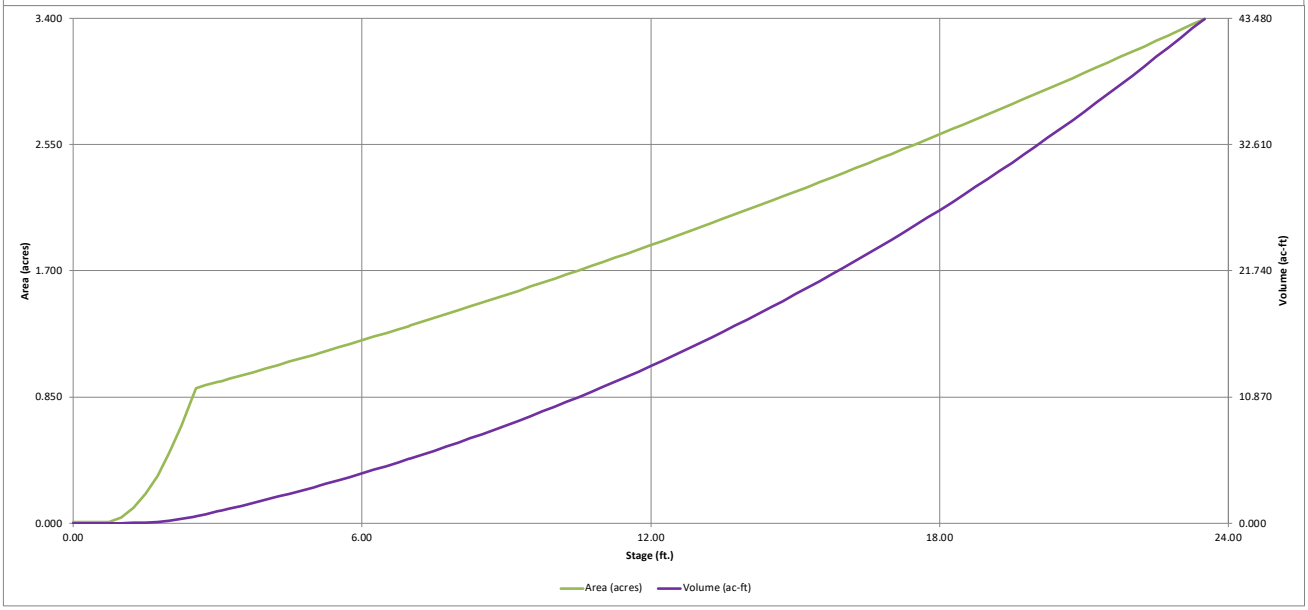
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		20.7	20.7	430		0.010		
ISV	0.33		20.7	20.7	430		0.010	142	0.003
	0.50		20.7	20.7	430		0.010	215	0.005
	0.75		20.7	20.7	430		0.010	323	0.007
	1.00		55.4	29.2	1,621		0.037	523	0.012
	1.25		106.4	41.7	4,443		0.102	1,255	0.029
	1.50		157.4	54.2	8,540		0.196	2,851	0.065
	1.75		208.4	66.7	13,912		0.319	5,631	0.129
	2.00		259.4	79.2	20,559		0.472	9,913	0.228
	2.25		310.4	91.7	28,481		0.654	16,016	0.368
	2.50		361.4	104.2	37,678		0.865	24,260	0.557
Floor	2.55		371.6	106.7	39,670		0.911	26,193	0.601
	2.75		373.2	108.3	40,438		0.928	34,204	0.785
	3.00		375.2	110.3	41,405		0.951	44,434	1.020
Zone 1 (WQCV)	3.08		375.9	111.0	41,716		0.958	47,759	1.096
	3.25		377.2	112.3	42,380		0.973	54,907	1.260
	3.50		379.2	114.3	43,363		0.995	65,625	1.507
	3.75		381.2	116.3	44,354		1.018	76,589	1.758
	4.00		383.2	118.3	45,354		1.041	87,803	2.016
	4.25		385.2	120.3	46,361		1.064	99,267	2.279
	4.50		387.2	122.3	47,376		1.088	110,984	2.548
	4.75		389.2	124.3	48,399		1.111	122,955	2.823
	5.00		391.2	126.3	49,430		1.135	135,184	3.103
Zone 2 (EURV)	5.12		392.2	127.3	49,928		1.146	141,145	3.240
	5.25		393.2	128.3	50,469		1.159	147,671	3.390
	5.50		395.2	130.3	51,516		1.183	160,419	3.683
	5.75		397.2	132.3	52,572		1.207	173,430	3.981
	6.00		399.2	134.3	53,635		1.231	186,706	4.286
	6.25		401.2	136.3	54,706		1.256	200,248	4.597
	6.50		403.2	138.3	55,785		1.281	214,059	4.914
	6.75		405.2	140.3	56,872		1.306	228,141	5.237
Zone 3 (100-year)	6.98		407.1	142.2	57,879		1.329	241,338	5.540
	7.00		407.2	142.3	57,967		1.331	242,496	5.567
	7.25		409.2	144.3	59,070		1.356	257,126	5.903
	7.50		411.2	146.3	60,182		1.382	272,032	6.245
	7.75		413.2	148.3	61,301		1.407	287,217	6.594
	8.00		415.2	150.3	62,428		1.433	302,683	6.949
	8.25		417.2	152.3	63,563		1.459	318,432	7.310
	8.50		419.2	154.3	64,706		1.485	334,465	7.678
	8.75		421.2	156.3	65,857		1.512	350,785	8.053
	9.00		423.2	158.3	67,017		1.538	367,395	8.434
	9.25		425.2	160.3	68,184		1.565	384,294	8.822
	9.50		427.2	162.3	69,359		1.592	401,487	9.217
	9.75		429.2	164.3	70,542		1.619	418,974	9.618
	10.00		431.2	166.3	71,733		1.647	436,759	10.027
	10.25		433.2	168.3	72,932		1.674	454,842	10.442
	10.50		435.2	170.3	74,139		1.702	473,225	10.864
	10.75		437.2	172.3	75,355		1.730	491,912	11.293
	11.00		439.2	174.3	76,578		1.758	510,903	11.729
	11.25		441.2	176.3	77,809		1.786	530,202	12.172
	11.50		443.2	178.3	79,048		1.815	549,808	12.622
	11.75		445.2	180.3	80,295		1.843	569,726	13.079
	12.00		447.2	182.3	81,550		1.872	589,957	13.544
	12.25		449.2	184.3	82,813		1.901	610,502	14.015
	12.50		451.2	186.3	84,085		1.930	631,364	14.494
	12.75		453.2	188.3	85,364		1.960	652,545	14.980
	13.00		455.2	190.3	86,651		1.989	674,047	15.474
	13.25		457.2	192.3	87,946		2.019	695,871	15.975
	13.50		459.2	194.3	89,249		2.049	718,020	16.483
	13.75		461.2	196.3	90,560		2.079	740,496	16.999
	14.00		463.2	198.3	91,879		2.109	763,301	17.523
	14.25		465.2	200.3	93,207		2.140	786,437	18.054
	14.50		467.2	202.3	94,542		2.170	809,905	18.593
	14.75		469.2	204.3	95,885		2.201	833,708	19.139
	15.00		471.2	206.3	97,236		2.232	857,848	19.693
	15.25		473.2	208.3	98,595		2.263	882,327	20.255
	15.50		475.2	210.3	99,962		2.295	907,146	20.825
	15.75		477.2	212.3	101,337		2.326	932,309	21.403
	16.00		479.2	214.3	102,721		2.358	957,816	21.988
	16.25		481.2	216.3	104,112		2.390	983,670	22.582
	16.50		483.2	218.3	105,511		2.422	1,009,872	23.183
	16.75		485.2	220.3	106,918		2.455	1,036,426	23.793
	17.00		487.2	222.3	108,333		2.487	1,063,332	24.411
	17.25		489.2	224.3	109,756		2.520	1,090,593	25.037
	17.50		491.2	226.3	111,187		2.553	1,118,211	25.671
	17.75		493.2	228.3	112,627		2.586	1,146,187	26.313
	18.00		495.2	230.3	114,074		2.619	1,174,525	26.963
	18.25		497.2	232.3	115,529		2.652	1,203,225	27.622
	18.50		499.2	234.3	116,992		2.686	1,232,290	28.289
	18.75		501.2	236.3	118,463		2.720	1,261,722	28.965
	19.00		503.2	238.3	119,942		2.753	1,291,522	29.649
	19.25		505.2	240.3	121,430		2.788	1,321,694	30.342
	19.50		507.2	242.3	122,925		2.822	1,352,238	31.043
	19.75		509.2	244.3	124,428		2.856	1,383,157	31.753
	20.00		511.2	246.3	125,939		2.891	1,414,452	32.471
	20.25		513.2	248.3	127,458		2.926	1,446,127	33.199
	20.50		515.2	250.3	128,985		2.961	1,478,182	33.934
	20.75		517.2	252.3	130,520		2.996	1,510,620	34.679
	21.00		519.2	254.3	132,064		3.032	1,543,443	35.433
	21.25		521.2	256.3	133,615		3.067	1,576,652	36.195
	21.50		523.2	258.3	135,174		3.103	1,610,251	36.966
	21.75		525.2	260.3	136,741		3.139	1,644,240	37.747
	22.00		527.2	262.3	138,316		3.175	1,678,622	38.536
	22.25		529.2	264.3	139,899		3.212	1,713,399	39.334
	22.50		531.2	266.3	141,490		3.248	1,748,572	40.142
	22.75		533.2	268.3	143,090		3.285	1,784,145	40.958
	23.00		535.2	270.3	144,697		3.322	1,820,118	41.784
	23.25		537.2	272.3	146,312		3.359	1,856,494	42.619
	23.50		539.2	274.3	147,935		3.396	1,893,274	43.464

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



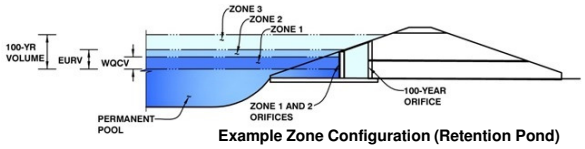


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS MKJCC POND #4

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.08	1.087	Orifice Plate
Zone 2 (EURV)	5.12	2.143	Circular Orifice
Zone 3 (100-year)	6.98	2.301	Weir&Pipe (Restrict)
Total (all zones)		5.530	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.236E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.08	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.22	sq. inches (diameter = 2 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.03	2.05					
Orifice Area (sq. inches)	3.22	3.22	3.22					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.08	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.06	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	5.12	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.14	N/A	feet
Vertical Orifice Diameter =	3.27	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.12	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.12	N/A	feet
Overflow Weir Front Edge Length =	12.00	N/A	feet	Overflow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.96	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	34.63	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	17.32	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	5.82	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.27	N/A	feet
Restrictor Plate Height Above Pipe Invert =	27.60		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.13	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.96	feet
Spillway Crest Length =	58.00	feet	Stage at Top of Freeboard =	9.46	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.59	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.15	acre-ft

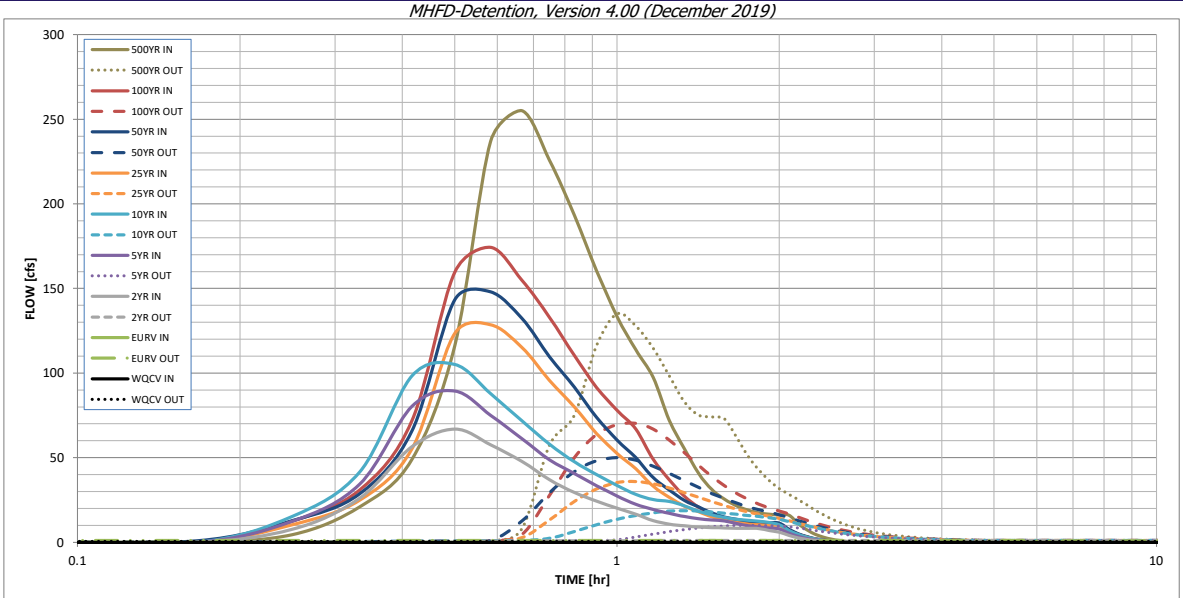
Calculated Parameters for Spillway

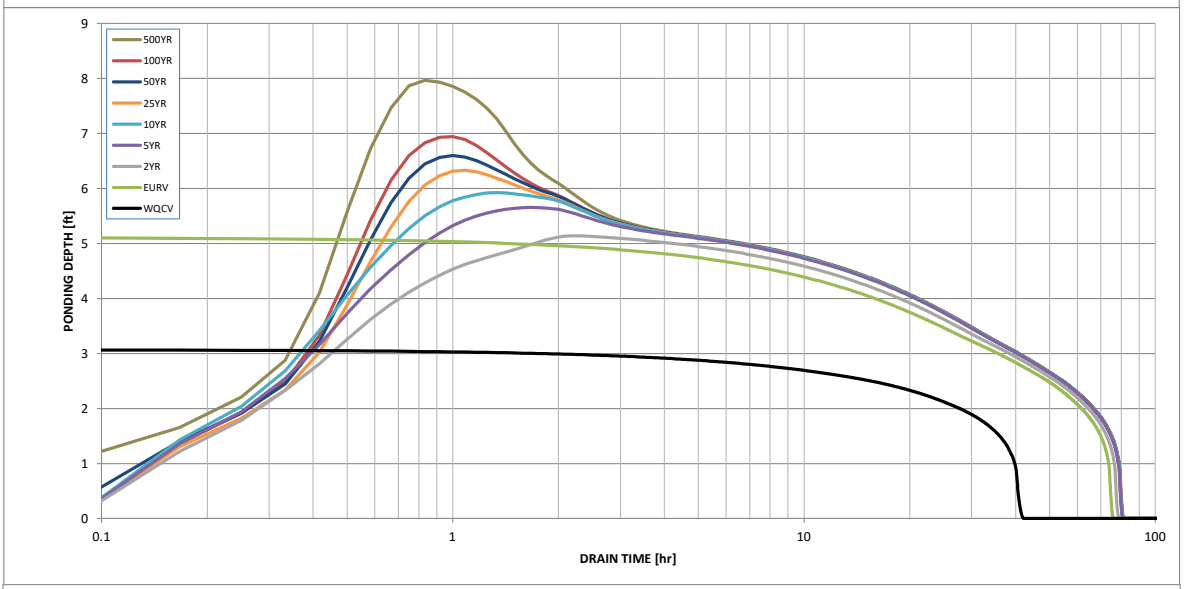
Routed Hydrograph Results *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

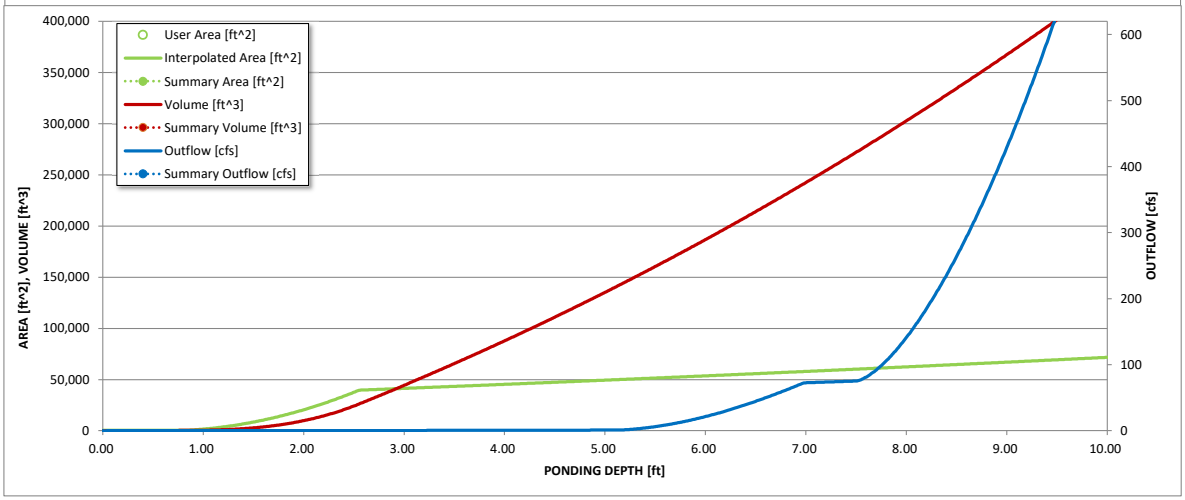
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	1.087	3.230	3.421	4.659	5.691	6.821	7.885	9.123	13.547
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.421	4.659	5.691	6.821	7.885	9.123	13.547
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	11.6	23.7	32.8	50.1	61.9	77.0	124.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.24	0.48	0.67	1.02	1.26	1.57	2.55
Peak Inflow Q (cfs) =	N/A	N/A	66.9	89.4	105.1	128.5	147.9	174.3	255.0
Peak Outflow Q (cfs) =	0.5	1.0	1.1	10.0	18.7	35.9	49.9	70.3	134.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.7	0.8	0.9	1.1
Structure Controlling Flow =	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.00	0.3	0.5	1.0	1.4	2.0	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	71	71	69	68	66	65	60
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	75	76	76	75	74	74	71
Maximum Ponding Depth (ft) =	3.08	5.12	5.14	5.65	5.93	6.33	6.60	6.94	7.97
Area at Maximum Ponding Depth (acres) =	0.96	1.15	1.15	1.20	1.22	1.26	1.29	1.32	1.43
Maximum Volume Stored (acre-ft) =	1.096	3.240	3.263	3.861	4.188	4.698	5.030	5.487	6.891

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





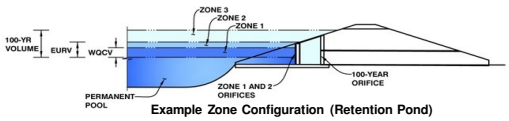


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - MKJCC POND #5

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	67.29	acres
Watershed Length =	2,050	ft
Watershed Length to Centroid =	1,000	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	66.73%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.464 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.347 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.653 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.354 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.775 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.338 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	10.805 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	12.517 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	18.671 acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	3.897 acre-feet		
Approximate 5-yr Detention Volume =	5.487 acre-feet		
Approximate 10-yr Detention Volume =	6.279 acre-feet		
Approximate 25-yr Detention Volume =	6.692 acre-feet		
Approximate 50-yr Detention Volume =	6.883 acre-feet		
Approximate 100-yr Detention Volume =	7.488 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.464	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.884	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	0.250	acre-feet
Total Detention Basin Volume =	4.597	acre-feet
Initial Surcharge Volume (ISV) =	191	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	7.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

Total detention volume is less than 100-year volume.

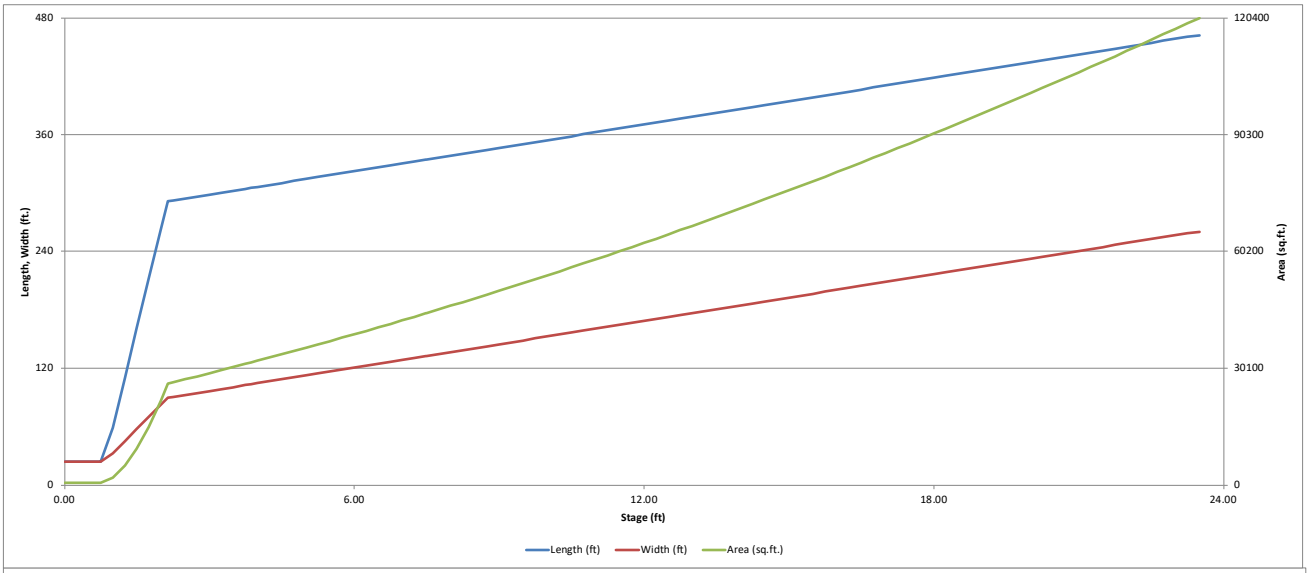
Initial Surcharge Area (A_{ISV}) =	580	ft^2
Surcharge Volume Length (L_{ISV}) =	24.1	ft
Surcharge Volume Width (W_{ISV}) =	24.1	ft
Depth of Basin Floor (H_{FLOOR}) =	1.31	ft
Length of Basin Floor (L_{FLOOR}) =	291.3	ft
Width of Basin Floor (W_{FLOOR}) =	89.6	ft
Area of Basin Floor (A_{FLOOR}) =	26,094	ft^2
Volume of Basin Floor (V_{FLOOR}) =	13,346	ft^3
Depth of Main Basin (H_{MAIN}) =	5.36	ft
Length of Main Basin (L_{MAIN}) =	334.2	ft
Width of Main Basin (W_{MAIN}) =	132.5	ft
Area of Main Basin (A_{MAIN}) =	44,265	ft^2
Volume of Main Basin (V_{MAIN}) =	186,431	ft^3
Calculated Total Basin Volume (V_{total}) =	**4.597**	acre-feet

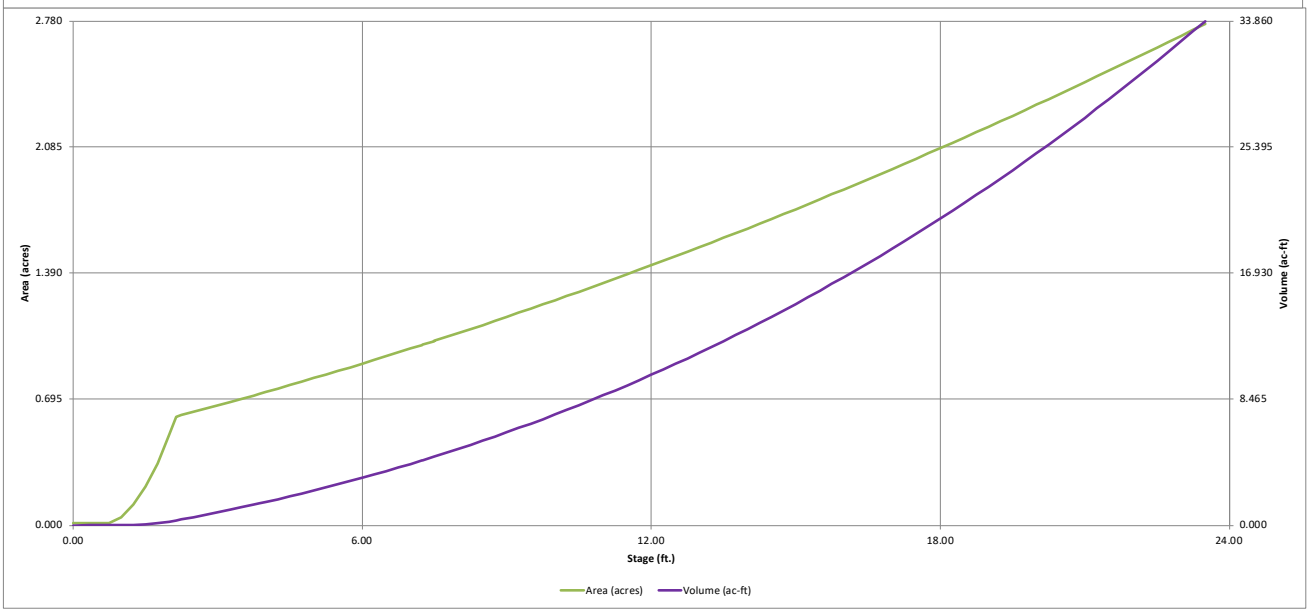
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		24.1	24.1	580		0.013		
ISV	0.33		24.1	24.1	580		0.013	191	0.004
	0.50		24.1	24.1	580		0.013	290	0.007
	0.75		24.1	24.1	580		0.013	435	0.010
	1.00		58.8	32.6	1,914		0.044	685	0.016
	1.25		109.8	45.1	4,947		0.114	1,516	0.035
	1.50		160.8	57.6	9,255		0.212	3,264	0.075
	1.75		211.8	70.1	14,838		0.341	6,250	0.143
	2.00		262.8	82.6	21,697		0.498	10,790	0.248
Floor	2.14		291.3	89.6	26,094		0.599	14,131	0.324
	2.25		292.2	90.5	26,430		0.607	17,019	0.391
	2.50		294.2	92.5	27,199		0.624	23,723	0.545
	2.75		296.2	94.5	27,977		0.642	30,620	0.703
	3.00		298.2	96.5	28,762		0.660	37,712	0.866
	3.25		300.2	98.5	29,555		0.678	45,002	1.033
	3.50		302.2	100.5	30,357		0.697	52,490	1.205
	3.75		304.2	102.5	31,166		0.715	60,181	1.382
Zone 1 (WQCV)	3.87		305.2	103.4	31,557		0.724	63,944	1.468
	4.00		306.2	104.5	31,983		0.734	68,074	1.563
	4.25		308.2	106.5	32,809		0.753	76,173	1.749
	4.50		310.2	108.5	33,642		0.772	84,479	1.939
	4.75		312.2	110.5	34,483		0.792	92,994	2.135
	5.00		314.2	112.5	35,332		0.811	101,721	2.335
	5.25		316.2	114.5	36,190		0.831	110,661	2.540
	5.50		318.2	116.5	37,055		0.851	119,817	2.751
	5.75		320.2	118.5	37,928		0.871	129,189	2.966
	6.00		322.2	120.5	38,810		0.891	138,782	3.186
	6.25		324.2	122.5	39,699		0.911	148,595	3.411
	6.50		326.2	124.5	40,596		0.932	158,632	3.642
	6.75		328.2	126.5	41,502		0.953	168,894	3.877
	7.00		330.2	128.5	42,415		0.974	179,383	4.118
Zone 2 (EURV)	7.24		332.1	130.4	43,299		0.994	189,669	4.354
	7.25		332.2	130.5	43,336		0.995	190,102	4.364
Zone 3 (User)	7.49		334.1	132.4	44,228		1.015	200,609	4.605
	7.50		334.2	132.5	44,265		1.016	201,052	4.616
	7.75		336.2	134.5	45,203		1.038	212,235	4.872
	8.00		338.2	136.5	46,148		1.059	223,654	5.134
	8.25		340.2	138.5	47,101		1.081	235,310	5.402
	8.50		342.2	140.5	48,063		1.103	247,205	5.675
	8.75		344.2	142.5	49,032		1.126	259,342	5.954
	9.00		346.2	144.5	50,009		1.148	271,722	6.238
	9.25		348.2	146.5	50,994		1.171	284,347	6.528
	9.50		350.2	148.5	51,988		1.193	297,220	6.823
	9.75		352.2	150.5	52,989		1.216	310,342	7.124
	10.00		354.2	152.5	53,998		1.240	323,715	7.431
	10.25		356.2	154.5	55,016		1.263	337,342	7.744
	10.50		358.2	156.5	56,041		1.287	351,223	8.063
	10.75		360.2	158.5	57,074		1.310	365,363	8.388
	11.00		362.2	160.5	58,116		1.334	379,761	8.718
	11.25		364.2	162.5	59,165		1.358	394,421	9.055
	11.50		366.2	164.5	60,222		1.383	409,344	9.397
	11.75		368.2	166.5	61,287		1.407	424,533	9.746
	12.00		370.2	168.5	62,361		1.432	439,989	10.101
	12.25		372.2	170.5	63,442		1.456	455,714	10.462
	12.50		374.2	172.5	64,531		1.481	471,710	10.829
	12.75		376.2	174.5	65,629		1.507	487,980	11.202
	13.00		378.2	176.5	66,734		1.532	504,525	11.582
	13.25		380.2	178.5	67,847		1.558	521,348	11.969
	13.50		382.2	180.5	68,969		1.583	538,450	12.361
	13.75		384.2	182.5	70,098		1.609	555,833	12.760
	14.00		386.2	184.5	71,235		1.635	573,499	13.166
	14.25		388.2	186.5	72,380		1.662	591,451	13.578
	14.50		390.2	188.5	73,534		1.688	609,690	13.997
	14.75		392.2	190.5	74,695		1.715	628,219	14.422
	15.00		394.2	192.5	75,864		1.742	647,038	14.854
	15.25		396.2	194.5	77,042		1.769	666,151	15.293
	15.50		398.2	196.5	78,227		1.796	685,560	15.738
	15.75		400.2	198.5	79,420		1.823	705,265	16.191
	16.00		402.2	200.5	80,621		1.851	725,271	16.650
	16.25		404.2	202.5	81,831		1.879	745,577	17.116
	16.50		406.2	204.5	83,048		1.907	766,187	17.589
	16.75		408.2	206.5	84,273		1.935	787,102	18.069
	17.00		410.2	208.5	85,507		1.963	808,324	18.557
	17.25		412.2	210.5	86,748		1.991	829,856	19.051
	17.50		414.2	212.5	87,997		2.020	851,699	19.552
	17.75		416.2	214.5	89,255		2.049	873,855	20.061
	18.00		418.2	216.5	90,520		2.078	896,327	20.577
	18.25		420.2	218.5	91,793		2.107	919,116	21.100
	18.50		422.2	220.5	93,074		2.137	942,224	21.630
	18.75		424.2	222.5	94,364		2.166	965,653	22.168
	19.00		426.2	224.5	95,661		2.196	989,406	22.714
	19.25		428.2	226.5	96,966		2.226	1,013,485	23.266
	19.50		430.2	228.5	98,280		2.256	1,037,890	23.827
	19.75		432.2	230.5	99,601		2.287	1,062,625	24.395
	20.00		434.2	232.5	100,930		2.317	1,087,691	24.970
	20.25		436.2	234.5	102,268		2.348	1,113,091	25.553
	20.50		438.2	236.5	103,613		2.379	1,138,826	26.144
	20.75		440.2	238.5	104,966		2.410	1,164,898	26.742
	21.00		442.2	240.5	106,327		2.441	1,191,310	27.349
	21.25		444.2	242.5	107,697		2.472	1,218,062	27.963
	21.50		446.2	244.5	109,074		2.504	1,245,159	28.585
	21.75		448.2	246.5	110,459		2.536	1,272,600	29.215
	22.00		450.2	248.5	111,853		2.568	1,300,389	29.853
	22.25		452.2	250.5	113,254		2.600	1,328,527	30.499
	22.50		454.2	252.5	114,663		2.632	1,357,017	31.153
	22.75		456.2	254.5	116,081		2.665	1,385,859	31.815
	23.00		458.2	256.5	117,506		2.698	1,415,057	32.485
	23.25		460.2	258.5	118,939		2.730	1,444,613	33.164
	23.50		462.2	260.5	120,380		2.764	1,474,528	33.850

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



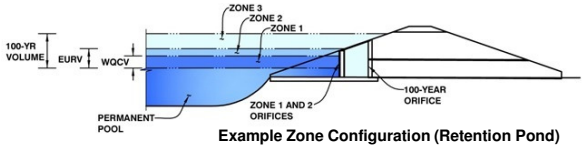


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - MKJCC POND #5

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.87	1.464	Orifice Plate
Zone 2 (EURV)	7.24	2.884	Circular Orifice
Zone 3 (User)	7.49	0.250	Weir&Pipe (Restrict)
Total (all zones)		4.597	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.979E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.77	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	15.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.29	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.26	2.51					
Orifice Area (sq. inches)	4.29	4.29	4.29					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.77	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.03	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	7.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.09	N/A	feet
Vertical Orifice Diameter =	2.18	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.72	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.72	N/A	feet
Overflow Weir Front Edge Length =	9.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =		N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	56.70	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	28.35	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =		N/A	feet
Restrictor Plate Height Above Pipe Invert =			inches	Half-Central Angle of Restrictor Plate on Pipe =		N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.36	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	10.36	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.27	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	7.88	acre-ft

Calculated Parameters for Spillway

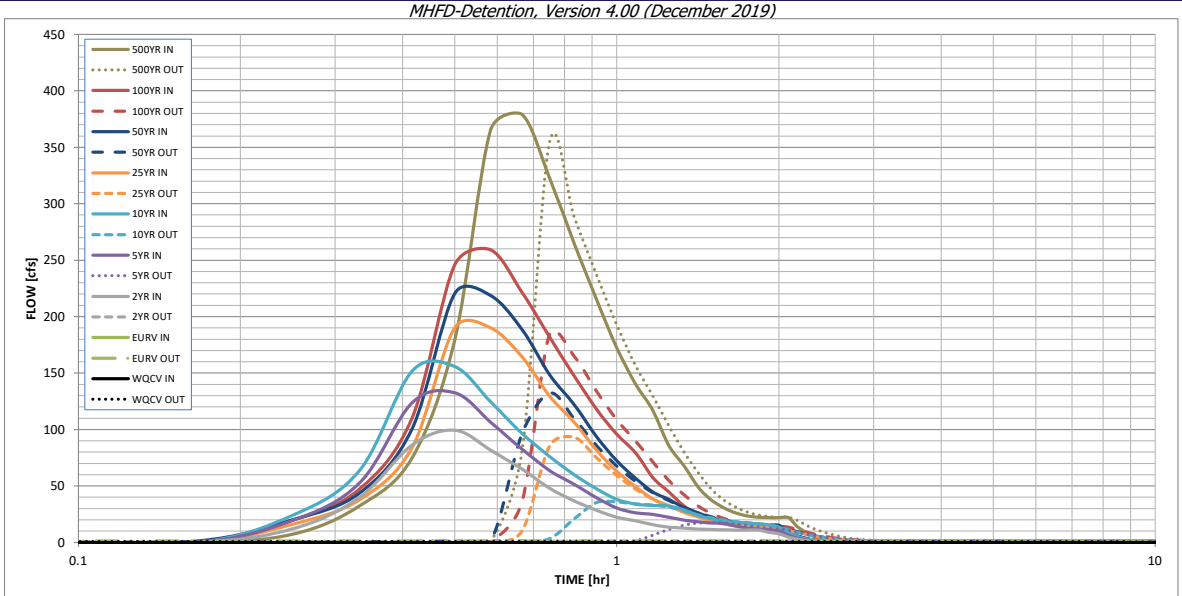
Routed Hydrograph Results

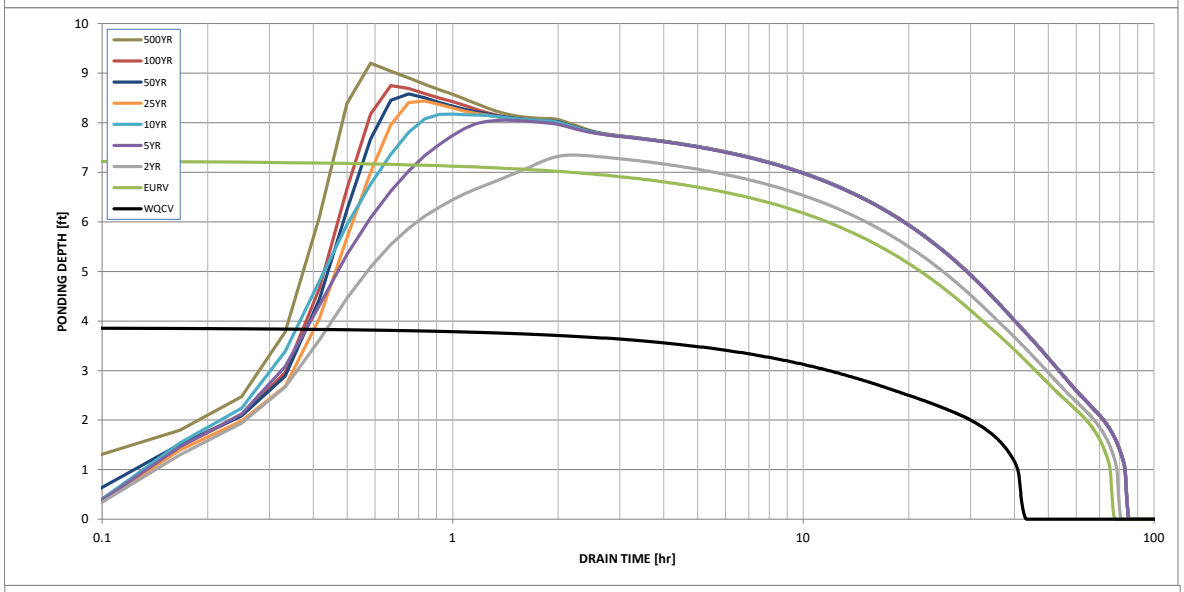
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

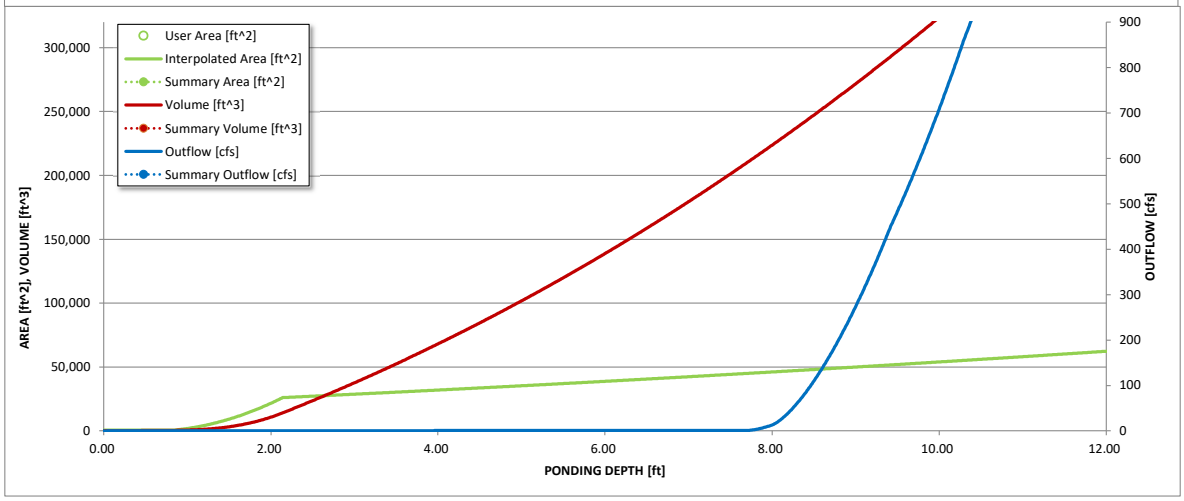
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	1.464	4.347	4.653	6.354	7.775	9.338	10.805	12.517	18.671
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.653	6.354	7.775	9.338	10.805	12.517	18.671
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	18.1	37.6	51.9	79.2	97.5	119.8	194.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.27	0.56	0.77	1.18	1.45	1.78	2.89
Peak Inflow Q (cfs) =	N/A	N/A	99.4	132.6	155.7	190.1	220.5	259.1	379.1
Peak Outflow Q (cfs) =	0.7	1.3	1.3	17.5	35.8	93.0	132.2	184.0	354.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	1.2	1.4	1.5	1.8
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	69	72	74	73	71	69	67	62
Time to Drain 99% of Inflow Volume (hours) =	**41**	73	76	80	79	78	78	77	74
Maximum Ponding Depth (ft) =	3.87	7.24	7.35	8.05	8.17	8.44	8.58	8.75	9.20
Area at Maximum Ponding Depth (acres) =	0.72	0.99	1.00	1.06	1.07	1.10	1.11	1.12	1.17
Maximum Volume Stored (acre-ft) =	1.468	4.354	4.454	5.177	5.316	5.598	5.764	5.942	6.469

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ..\MODELING\HYDROGRAPHS\POND 5 Outflow Hydrographs.xlsx

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	1.35	0.13	7.10
	0:15:00	0.00	0.00	11.94	19.46	24.07	16.15	19.86	19.62	32.46
	0:20:00	0.00	0.00	40.06	52.80	63.79	37.96	43.84	47.37	75.01
	0:25:00	0.00	0.00	86.29	123.69	151.85	84.17	100.82	110.42	179.42
	0:30:00	0.00	0.00	99.42	132.59	155.71	190.08	220.47	245.99	365.36
	0:35:00	0.00	0.00	81.69	106.53	124.50	190.06	218.74	259.14	379.13
	0:40:00	0.00	0.00	64.92	82.58	96.63	164.52	188.74	221.60	322.89
	0:45:00	0.00	0.00	48.02	63.72	76.20	129.66	148.62	182.05	265.03
	0:50:00	0.00	0.00	36.74	51.38	59.90	106.47	122.06	147.50	215.23
	0:55:00	0.00	0.00	28.48	39.54	47.51	81.65	93.75	118.03	172.54
	1:00:00	0.00	0.00	22.33	30.55	38.06	63.00	72.37	95.83	140.30
	1:05:00	0.00	0.00	19.15	26.23	34.01	49.35	56.86	79.29	116.81
	1:10:00	0.00	0.00	15.63	24.68	32.75	38.49	44.66	57.44	85.78
	1:15:00	0.00	0.00	13.60	22.25	32.27	32.60	38.04	44.65	67.67
	1:20:00	0.00	0.00	12.51	19.78	28.68	26.42	30.74	32.21	48.97
	1:25:00	0.00	0.00	11.86	18.19	23.96	22.57	26.16	24.58	37.42
	1:30:00	0.00	0.00	11.45	17.27	20.85	18.75	21.71	20.00	30.47
	1:35:00	0.00	0.00	11.17	16.70	18.87	16.26	18.81	17.05	25.99
	1:40:00	0.00	0.00	11.02	14.29	17.64	14.74	17.04	15.37	23.42
	1:45:00	0.00	0.00	11.00	12.66	16.84	13.91	16.07	14.73	22.38
	1:50:00	0.00	0.00	11.00	11.70	16.36	13.44	15.52	14.44	21.90
	1:55:00	0.00	0.00	9.01	11.13	15.45	13.23	15.28	14.42	21.86
	2:00:00	0.00	0.00	7.64	10.28	13.61	13.12	15.16	14.42	21.86
	2:05:00	0.00	0.00	4.78	6.42	8.56	8.34	9.63	9.16	13.88
	2:10:00	0.00	0.00	2.86	3.83	5.16	5.08	5.86	5.57	8.45
	2:15:00	0.00	0.00	1.64	2.24	3.00	2.99	3.44	3.27	4.97
	2:20:00	0.00	0.00	0.86	1.26	1.65	1.68	1.94	1.84	2.80
	2:25:00	0.00	0.00	0.39	0.64	0.79	0.87	1.00	0.95	1.45
	2:30:00	0.00	0.00	0.14	0.23	0.26	0.32	0.36	0.34	0.53
	2:35:00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.04
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

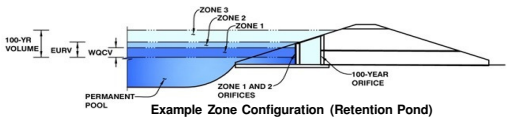
Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - MKJCC POND #6

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	41.24	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	1,000	ft
Watershed Slope =	0.008	ft/ft
Watershed Imperviousness =	70.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.945 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.806 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.008 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	4.077 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.966 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.933 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	6.847 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.905 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	11.703 acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	2.522 acre-feet		
Approximate 5-yr Detention Volume =	3.519 acre-feet		
Approximate 10-yr Detention Volume =	4.032 acre-feet		
Approximate 25-yr Detention Volume =	4.290 acre-feet		
Approximate 50-yr Detention Volume =	4.407 acre-feet		
Approximate 100-yr Detention Volume =	4.758 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.945	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.860	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	0.250	acre-feet
Total Detention Basin Volume =	3.056	acre-feet
Initial Surcharge Volume (ISV) =	124	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	7.50	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

Total detention volume is less than 100-year volume.

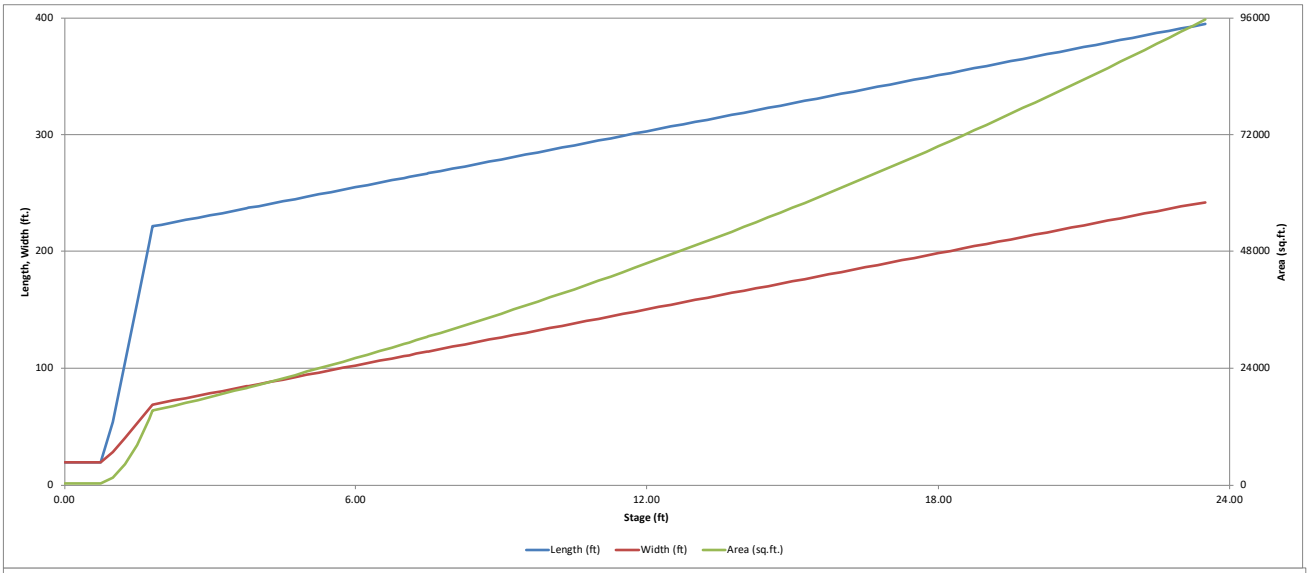
Initial Surcharge Area (A_{ISV}) =	374	ft^2
Surcharge Volume Length (L_{ISV}) =	19.3	ft
Surcharge Volume Width (W_{ISV}) =	19.3	ft
Depth of Basin Floor (H_{FLOOR}) =	0.99	ft
Length of Basin Floor (L_{FLOOR}) =	221.3	ft
Width of Basin Floor (W_{FLOOR}) =	68.8	ft
Area of Basin Floor (A_{FLOOR}) =	15,236	ft^2
Volume of Basin Floor (V_{FLOOR}) =	5,940	ft^3
Depth of Main Basin (H_{MAIN}) =	5.68	ft
Length of Main Basin (L_{MAIN}) =	266.7	ft
Width of Main Basin (W_{MAIN}) =	114.3	ft
Area of Main Basin (A_{MAIN}) =	30,486	ft^2
Volume of Main Basin (V_{MAIN}) =	127,372	ft^3
Calculated Total Basin Volume (V_{total}) =	**3.068**	acre-feet

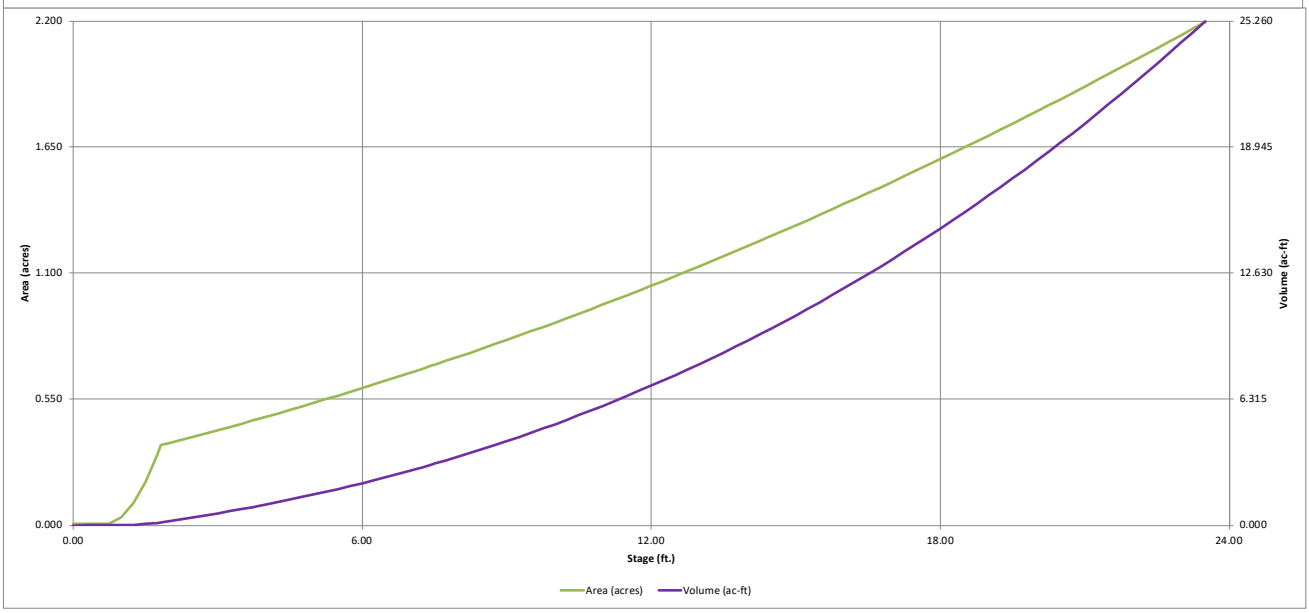
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		19.3	19.3	374		0.009		
ISV	0.33		19.3	19.3	374		0.009	124	0.003
	0.50		19.3	19.3	374		0.009	187	0.004
	0.75		19.3	19.3	374		0.009	281	0.006
	1.00		54.0	27.8	1,504		0.035	462	0.011
	1.25		105.0	40.3	4,237		0.097	1,153	0.026
	1.50		156.0	52.8	8,245		0.189	2,687	0.062
	1.75		207.0	65.3	13,529		0.311	5,382	0.124
Floor	1.82		221.3	68.8	15,236		0.350	6,388	0.147
	2.00		222.7	70.3	15,656		0.359	9,169	0.210
	2.25		224.7	72.3	16,246		0.373	13,156	0.302
	2.50		226.7	74.3	16,844		0.387	17,292	0.397
	2.75		228.7	76.3	17,450		0.401	21,579	0.495
	3.00		230.7	78.3	18,064		0.415	26,018	0.597
	3.25		232.7	80.3	18,686		0.429	30,612	0.703
	3.50		234.7	82.3	19,317		0.443	35,362	0.812
	3.75		236.7	84.3	19,955		0.458	40,271	0.924
Zone 1 (WQCV)	3.80		237.1	84.7	20,083		0.461	41,272	0.947
	4.00		238.7	86.3	20,601		0.473	45,340	1.041
	4.25		240.7	88.3	21,255		0.488	50,572	1.161
	4.50		242.7	90.3	21,917		0.503	55,968	1.285
	4.75		244.7	92.3	22,587		0.519	61,531	1.413
	5.00		246.7	94.3	23,265		0.534	67,262	1.544
	5.25		248.7	96.3	23,951		0.550	73,164	1.680
	5.50		250.7	98.3	24,645		0.566	79,238	1.819
	5.75		252.7	100.3	25,347		0.582	85,487	1.963
	6.00		254.7	102.3	26,057		0.598	91,913	2.110
	6.25		256.7	104.3	26,775		0.615	98,516	2.262
	6.50		258.7	106.3	27,501		0.631	105,301	2.417
	6.75		260.7	108.3	28,235		0.648	112,268	2.577
	7.00		262.7	110.3	28,977		0.665	119,419	2.741
Zone 2 (EURV)	7.10		263.5	111.1	29,277		0.672	122,332	2.808
	7.25		264.7	112.3	29,728		0.682	126,757	2.910
Zone 3 (User)	7.47		266.5	114.0	30,394		0.698	133,370	3.062
	7.50		266.7	114.3	30,486		0.700	134,284	3.083
	7.75		268.7	116.3	31,252		0.717	142,001	3.260
	8.00		270.7	118.3	32,026		0.735	149,910	3.441
	8.25		272.7	120.3	32,808		0.753	158,014	3.628
	8.50		274.7	122.3	33,598		0.771	166,315	3.818
	8.75		276.7	124.3	34,396		0.790	174,814	4.013
	9.00		278.7	126.3	35,202		0.808	183,513	4.213
	9.25		280.7	128.3	36,016		0.827	192,415	4.417
	9.50		282.7	130.3	36,838		0.846	201,522	4.626
	9.75		284.7	132.3	37,668		0.865	210,835	4.840
	10.00		286.7	134.3	38,506		0.884	220,357	5.059
	10.25		288.7	136.3	39,352		0.903	230,089	5.282
	10.50		290.7	138.3	40,206		0.923	240,034	5.510
	10.75		292.7	140.3	41,068		0.943	250,193	5.744
	11.00		294.7	142.3	41,939		0.963	260,569	5.982
	11.25		296.7	144.3	42,817		0.983	271,163	6.225
	11.50		298.7	146.3	43,703		1.003	281,977	6.473
	11.75		300.7	148.3	44,597		1.024	293,015	6.727
	12.00		302.7	150.3	45,499		1.045	304,277	6.985
	12.25		304.7	152.3	46,409		1.065	315,765	7.249
	12.50		306.7	154.3	47,327		1.086	327,482	7.518
	12.75		308.7	156.3	48,253		1.108	339,429	7.792
	13.00		310.7	158.3	49,187		1.129	351,609	8.072
	13.25		312.7	160.3	50,129		1.151	364,023	8.357
	13.50		314.7	162.3	51,079		1.173	376,674	8.647
	13.75		316.7	164.3	52,037		1.195	389,563	8.943
	14.00		318.7	166.3	53,003		1.217	402,693	9.245
	14.25		320.7	168.3	53,977		1.239	416,066	9.552
	14.50		322.7	170.3	54,959		1.262	429,683	9.864
	14.75		324.7	172.3	55,950		1.284	443,546	10.182
	15.00		326.7	174.3	56,948		1.307	457,658	10.506
	15.25		328.7	176.3	57,954		1.330	472,021	10.836
	15.50		330.7	178.3	58,968		1.354	486,636	11.172
	15.75		332.7	180.3	59,990		1.377	501,505	11.513
	16.00		334.7	182.3	61,020		1.401	516,631	11.860
	16.25		336.7	184.3	62,058		1.425	532,016	12.213
	16.50		338.7	186.3	63,104		1.449	547,661	12.573
	16.75		340.7	188.3	64,158		1.473	563,568	12.938
	17.00		342.7	190.3	65,220		1.497	579,740	13.309
	17.25		344.7	192.3	66,290		1.522	596,179	13.686
	17.50		346.7	194.3	67,368		1.547	612,886	14.070
	17.75		348.7	196.3	68,454		1.571	629,864	14.460
	18.00		350.7	198.3	69,548		1.597	647,114	14.856
	18.25		352.7	200.3	70,650		1.622	664,639	15.258
	18.50		354.7	202.3	71,761		1.647	682,440	15.667
	18.75		356.7	204.3	72,879		1.673	700,520	16.082
	19.00		358.7	206.3	74,005		1.699	718,880	16.503
	19.25		360.7	208.3	75,139		1.725	737,523	16.931
	19.50		362.7	210.3	76,281		1.751	756,450	17.366
	19.75		364.7	212.3	77,431		1.778	775,664	17.807
	20.00		366.7	214.3	78,589		1.804	795,166	18.255
	20.25		368.7	216.3	79,755		1.831	814,959	18.709
	20.50		370.7	218.3	80,929		1.858	835,044	19.170
	20.75		372.7	220.3	82,111		1.885	855,424	19.638
	21.00		374.7	222.3	83,301		1.912	876,100	20.112
	21.25		376.7	224.3	84,499		1.940	897,075	20.594
	21.50		378.7	226.3	85,705		1.968	918,351	21.082
	21.75		380.7	228.3	86,919		1.995	939,929	21.578
	22.00		382.7	230.3	88,141		2.023	961,811	22.080
	22.25		384.7	232.3	89,372		2.052	984,000	22.590
	22.50		386.7	234.3	90,610		2.080	1,006,498	23.106
	22.75		388.7	236.3	91,856		2.109	1,029,306	23.630
	23.00		390.7	238.3	93,110		2.138	1,052,426	24.160
	23.25		392.7	240.3	94,372		2.166	1,075,861	24.698
	23.50		394.7	242.3	95,642		2.196	1,099,613	25.244

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



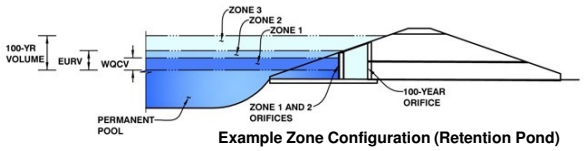


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - MKJCC POND #6

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.80	0.945	Orifice Plate
Zone 2 (EURV)	7.10	1.860	Circular Orifice
Zone 3 (User)	7.47	0.250	Weir&Pipe (Restrict)
Total (all zones)		3.056	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.097E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.04	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	16.20	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.02	sq. inches (diameter = 1-15/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.35	2.69					
Orifice Area (sq. inches)	3.02	3.02	3.02					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	4.04	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.01	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	7.58	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.04	N/A	feet
Vertical Orifice Diameter =	0.99	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.58	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.58	N/A	feet
Overflow Weir Front Edge Length =	9.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =		N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	56.70	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	28.35	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =		N/A	feet
Restrictor Plate Height Above Pipe Invert =			inches	Half-Central Angle of Restrictor Plate on Pipe =		N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.78	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	10.03	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.89	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.09	acre-ft

Calculated Parameters for Spillway

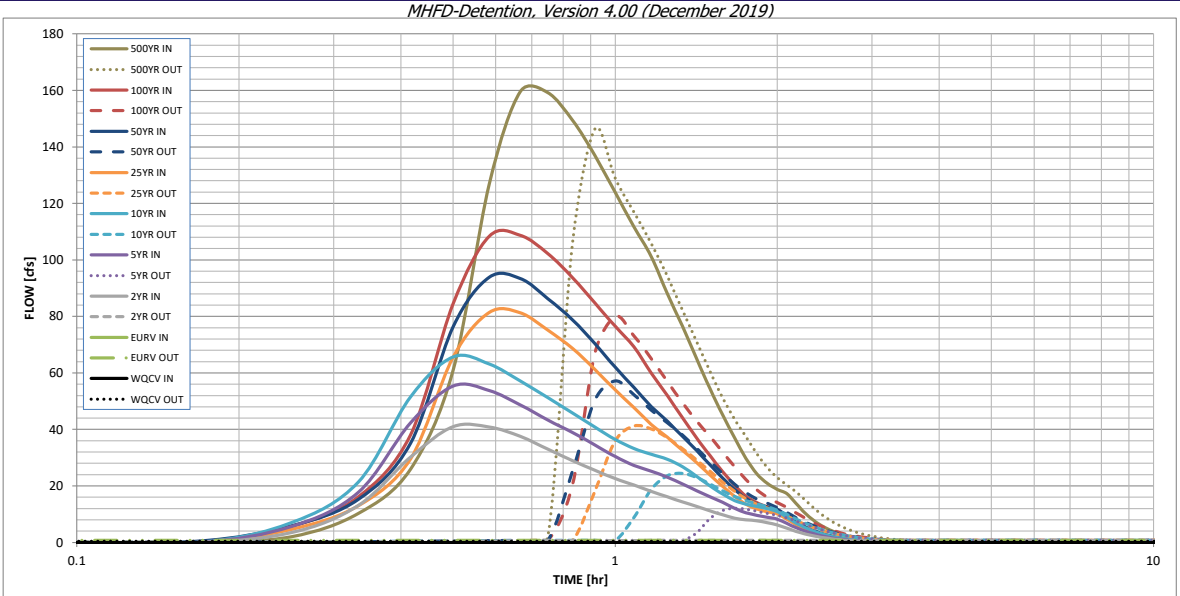
Routed Hydrograph Results

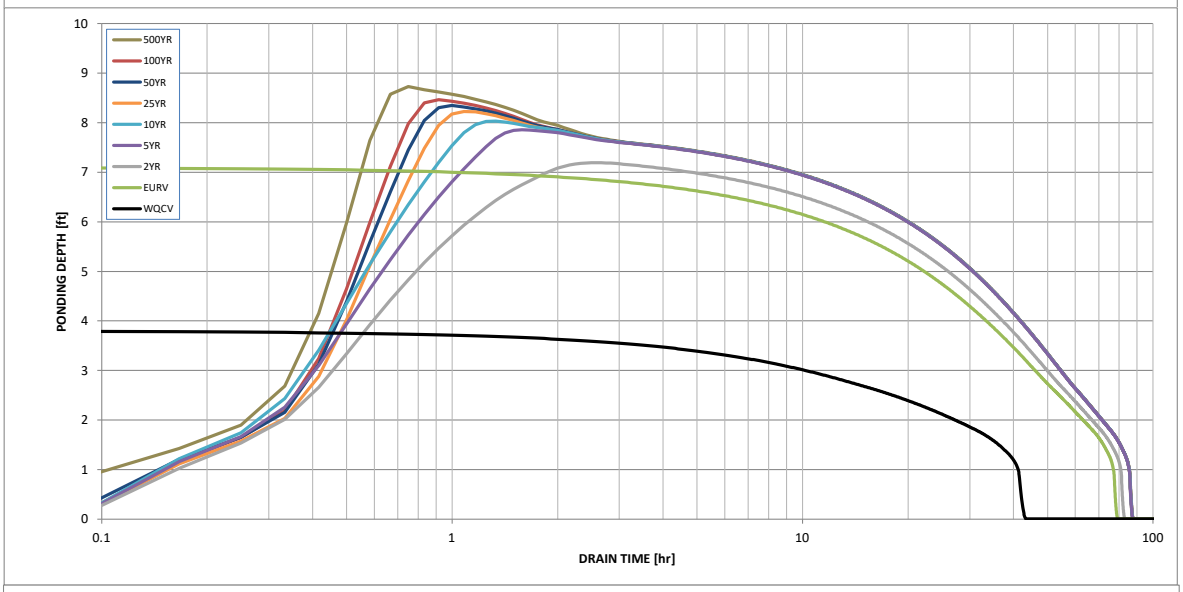
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

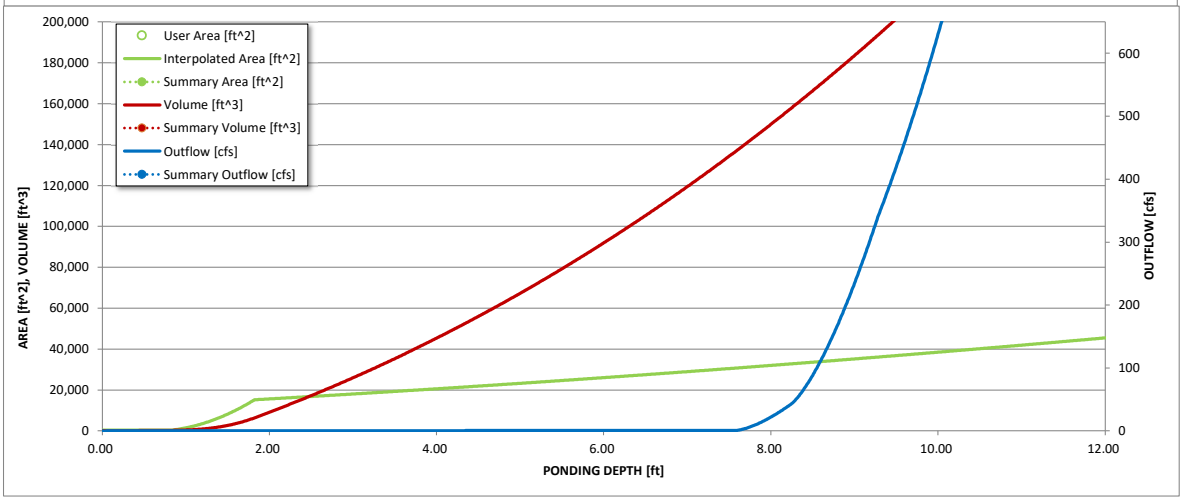
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	0.945	2.806	3.008	4.077	4.966	5.933	6.847	7.905	11.703
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.008	4.077	4.966	5.933	6.847	7.905	11.703
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	6.0	12.7	17.8	28.2	34.9	43.8	71.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.15	0.31	0.43	0.68	0.85	1.06	1.74
Peak Inflow Q (cfs) =	N/A	N/A	41.0	55.3	65.6	81.3	93.8	108.7	159.6
Peak Outflow Q (cfs) =	0.5	0.8	0.8	12.1	24.4	41.2	57.2	80.0	146.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.4	1.5	1.6	1.8	2.0
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	71	74	77	75	73	72	70	65
Time to Drain 99% of Inflow Volume (hours) =	**41**	75	79	82	82	81	80	80	77
Maximum Ponding Depth (ft) =	3.80	7.10	7.19	7.86	8.03	8.23	8.34	8.46	8.72
Area at Maximum Ponding Depth (acres) =	0.46	0.67	0.68	0.72	0.74	0.75	0.76	0.77	0.79
Maximum Volume Stored (acre-ft) =	0.947	2.808	2.869	3.332	3.464	3.605	3.696	3.787	3.990

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: ..\MODELING\HYDROGRAPHS\POND 6 Outflow Hydrographs.xlsx

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.04	2.04
	0:15:00	0.00	0.00	3.44	5.60	6.93	4.65	5.89	5.67	10.24
	0:20:00	0.00	0.00	13.06	17.71	21.40	13.00	15.22	16.16	25.91
	0:25:00	0.00	0.00	30.22	42.27	51.47	29.56	35.07	38.04	60.94
	0:30:00	0.00	0.00	41.00	55.30	65.61	65.57	76.27	84.43	126.82
	0:35:00	0.00	0.00	40.87	53.77	63.11	81.34	93.83	108.36	159.57
	0:40:00	0.00	0.00	37.53	48.66	57.12	81.24	93.42	108.66	159.16
	0:45:00	0.00	0.00	32.99	43.29	51.23	75.10	86.27	102.25	149.42
	0:50:00	0.00	0.00	28.94	38.93	45.80	68.66	78.84	93.74	136.97
	0:55:00	0.00	0.00	25.54	34.50	40.82	61.24	70.35	84.76	123.85
	1:00:00	0.00	0.00	22.56	30.38	36.45	53.94	61.97	76.47	111.71
	1:05:00	0.00	0.00	20.29	27.29	33.23	47.71	54.85	69.23	101.21
	1:10:00	0.00	0.00	18.07	25.23	31.16	41.80	48.13	59.97	88.00
	1:15:00	0.00	0.00	16.10	23.09	29.44	37.18	42.89	51.95	76.51
	1:20:00	0.00	0.00	14.38	20.67	26.82	32.57	37.55	44.15	65.04
	1:25:00	0.00	0.00	12.76	18.34	23.38	28.25	32.52	36.99	54.44
	1:30:00	0.00	0.00	11.20	16.13	20.03	23.89	27.49	30.74	45.23
	1:35:00	0.00	0.00	9.75	14.17	17.12	19.85	22.83	25.13	36.96
	1:40:00	0.00	0.00	8.61	12.03	14.84	16.31	18.75	20.22	29.78
	1:45:00	0.00	0.00	7.99	10.54	13.54	13.50	15.55	16.37	24.27
	1:50:00	0.00	0.00	7.71	9.61	12.73	11.89	13.70	14.07	20.95
	1:55:00	0.00	0.00	6.96	8.92	11.95	10.84	12.49	12.58	18.79
	2:00:00	0.00	0.00	6.21	8.26	10.93	10.13	11.68	11.52	17.24
	2:05:00	0.00	0.00	5.04	6.73	8.90	8.24	9.51	9.24	13.84
	2:10:00	0.00	0.00	3.92	5.22	6.91	6.35	7.32	6.98	10.45
	2:15:00	0.00	0.00	3.04	4.04	5.33	4.87	5.61	5.25	7.87
	2:20:00	0.00	0.00	2.34	3.11	4.07	3.71	4.27	3.95	5.92
	2:25:00	0.00	0.00	1.81	2.37	3.08	2.83	3.26	3.02	4.52
	2:30:00	0.00	0.00	1.37	1.78	2.30	2.12	2.44	2.28	3.40
	2:35:00	0.00	0.00	1.03	1.31	1.72	1.58	1.82	1.71	2.56
	2:40:00	0.00	0.00	0.77	0.96	1.29	1.18	1.36	1.29	1.93
	2:45:00	0.00	0.00	0.55	0.69	0.94	0.88	1.01	0.96	1.44
	2:50:00	0.00	0.00	0.37	0.48	0.66	0.63	0.72	0.69	1.02
	2:55:00	0.00	0.00	0.23	0.31	0.42	0.42	0.48	0.45	0.67
	3:00:00	0.00	0.00	0.12	0.18	0.24	0.25	0.28	0.27	0.40
	3:05:00	0.00	0.00	0.05	0.09	0.11	0.12	0.14	0.13	0.19
	3:10:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.06
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

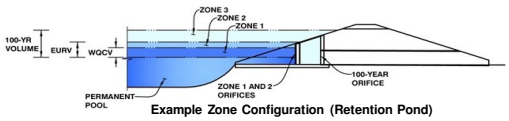
Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - MKJCC POND #7

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	69.95	acres
Watershed Length =	2,435	ft
Watershed Length to Centroid =	1,000	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	75.34%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.757 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	5.152 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	5.328 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	7.138 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.633 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	10.231 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.759 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	13.506 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	19.848 acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	4.649 acre-feet		
Approximate 5-yr Detention Volume =	6.400 acre-feet		
Approximate 10-yr Detention Volume =	7.354 acre-feet		
Approximate 25-yr Detention Volume =	7.805 acre-feet		
Approximate 50-yr Detention Volume =	8.003 acre-feet		
Approximate 100-yr Detention Volume =	8.541 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.757	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.395	acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	0.250	acre-feet
Total Detention Basin Volume =	5.402	acre-feet
Initial Surcharge Volume (ISV) =	230	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	8.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

Total detention volume is less than 100-year volume.

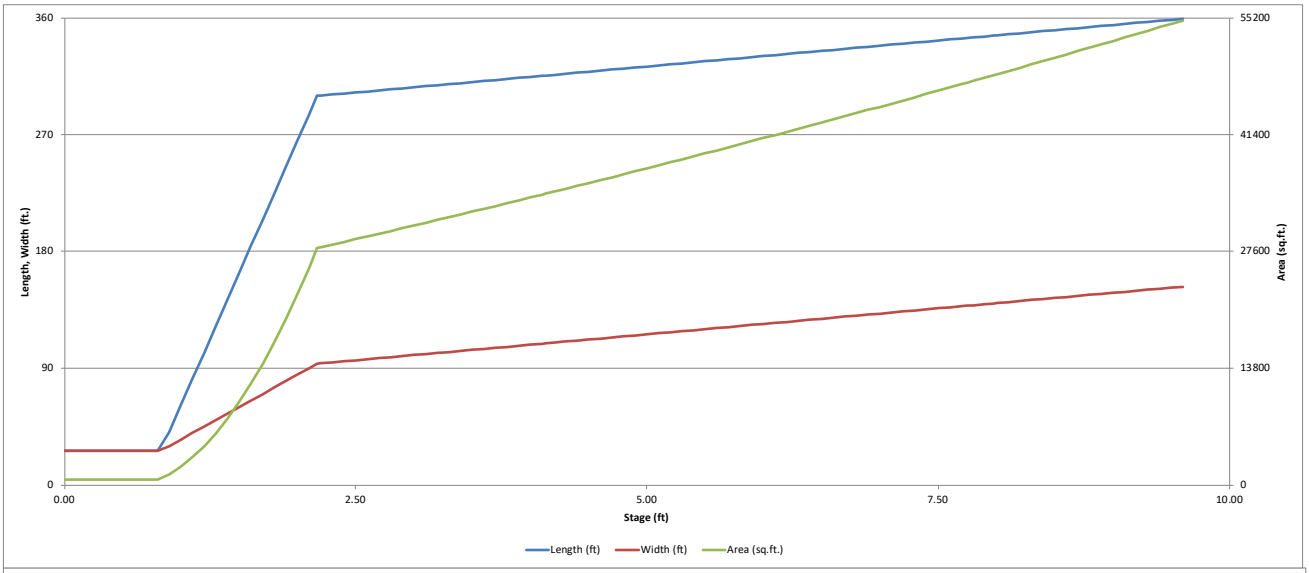
Initial Surcharge Area (A_{ISV}) =	696	ft^2
Surcharge Volume Length (L_{ISV}) =	26.4	ft
Surcharge Volume Width (W_{ISV}) =	26.4	ft
Depth of Basin Floor (H_{FLOOR}) =	1.34	ft
Length of Basin Floor (L_{FLOOR}) =	299.7	ft
Width of Basin Floor (W_{FLOOR}) =	93.4	ft
Area of Basin Floor (A_{FLOOR}) =	27,988	ft^2
Volume of Basin Floor (V_{FLOOR}) =	14,783	ft^3
Depth of Main Basin (H_{MAIN}) =	5.83	ft
Length of Main Basin (L_{MAIN}) =	346.4	ft
Width of Main Basin (W_{MAIN}) =	140.0	ft
Area of Main Basin (A_{MAIN}) =	48,497	ft^2
Volume of Main Basin (V_{MAIN}) =	220,232	ft^3
Calculated Total Basin Volume (V_{total}) =	**5.408**	acre-feet

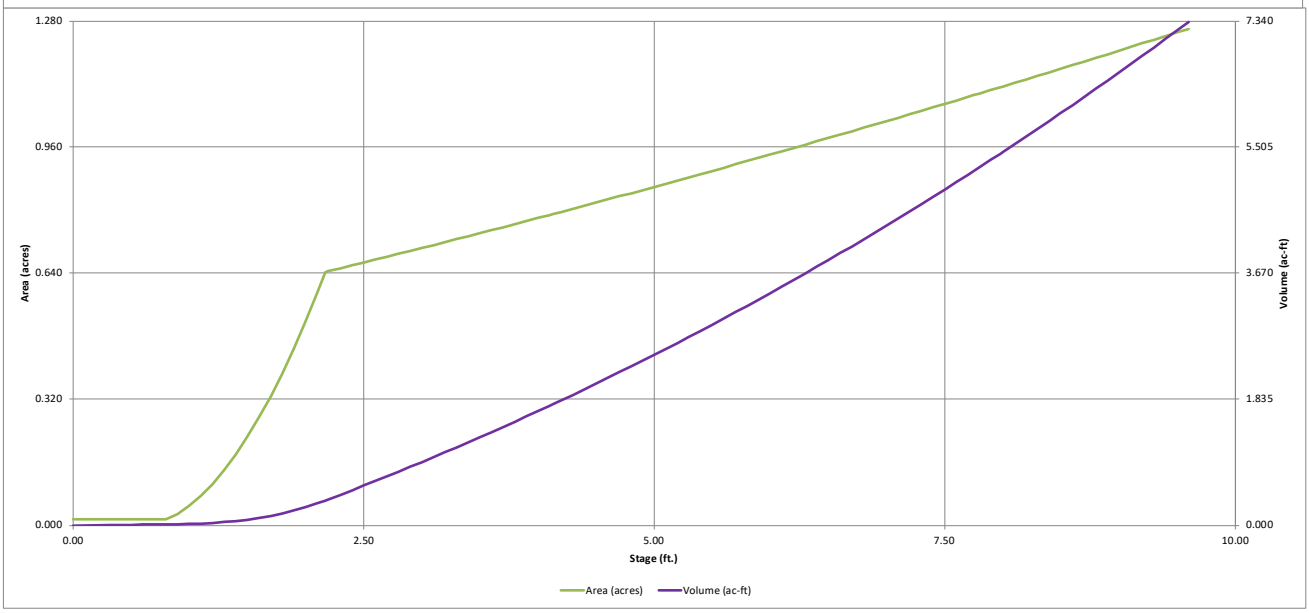
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		26.4	26.4	696		0.016		
ISV	0.33		26.4	26.4	696		0.016	230	0.005
	0.40		26.4	26.4	696		0.016	278	0.006
	0.50		26.4	26.4	696		0.016	348	0.008
	0.60		26.4	26.4	696		0.016	417	0.010
	0.70		26.4	26.4	696		0.016	487	0.011
	0.80		26.4	26.4	696		0.016	556	0.013
	0.90		40.7	29.9	1,215		0.028	644	0.015
	1.00		61.1	34.9	2,129		0.049	809	0.019
	1.10		81.5	39.9	3,248		0.075	1,076	0.025
	1.20		101.9	44.9	4,571		0.105	1,465	0.034
	1.30		122.3	49.9	6,097		0.140	1,997	0.046
	1.40		142.7	54.9	7,828		0.180	2,692	0.062
	1.50		163.1	59.9	9,763		0.224	3,570	0.082
	1.60		183.5	64.9	11,902		0.273	4,651	0.107
	1.70		203.9	69.9	14,244		0.327	5,957	0.137
	1.80		224.3	74.9	16,791		0.385	7,507	0.172
	1.90		244.7	79.9	19,542		0.449	9,322	0.214
	2.00		265.1	84.9	22,496		0.516	11,422	0.262
	2.10		285.5	89.9	25,655		0.589	13,828	0.317
Floor	2.17		299.7	93.4	27,988		0.643	15,705	0.361
	2.20		300.0	93.6	28,082		0.645	16,546	0.380
	2.30		300.8	94.4	28,397		0.652	19,370	0.445
	2.40		301.6	95.2	28,714		0.659	22,225	0.510
	2.50		302.4	96.0	29,032		0.666	25,113	0.577
	2.60		303.2	96.8	29,352		0.674	28,032	0.644
	2.70		304.0	97.6	29,672		0.681	30,983	0.711
	2.80		304.8	98.4	29,994		0.689	33,966	0.780
	2.90		305.6	99.2	30,317		0.696	36,982	0.849
	3.00		306.4	100.0	30,642		0.703	40,030	0.919
	3.10		307.2	100.8	30,968		0.711	43,110	0.990
	3.20		308.0	101.6	31,295		0.718	46,223	1.061
	3.30		308.8	102.4	31,623		0.726	49,369	1.133
	3.40		309.6	103.2	31,953		0.734	52,548	1.206
	3.50		310.4	104.0	32,283		0.741	55,760	1.280
	3.60		311.2	104.8	32,616		0.749	59,005	1.355
	3.70		312.0	105.6	32,949		0.756	62,283	1.430
	3.80		312.8	106.4	33,284		0.764	65,595	1.506
	3.90		313.6	107.2	33,620		0.772	68,940	1.583
	4.00		314.4	108.0	33,957		0.780	72,319	1.660
	4.10		315.2	108.8	34,296		0.787	75,731	1.739
Zone 1 (WQCV)	4.13		315.4	109.1	34,397		0.790	76,762	1.762
	4.20		316.0	109.6	34,635		0.795	79,178	1.818
	4.30		316.8	110.4	34,976		0.803	82,658	1.898
	4.40		317.6	111.2	35,319		0.811	86,173	1.978
	4.50		318.4	112.0	35,663		0.819	89,722	2.060
	4.60		319.2	112.8	36,007		0.827	93,306	2.142
	4.70		320.0	113.6	36,354		0.835	96,924	2.225
	4.80		320.8	114.4	36,701		0.843	100,576	2.309
	4.90		321.6	115.2	37,050		0.851	104,264	2.394
	5.00		322.4	116.0	37,400		0.859	107,986	2.479
	5.10		323.2	116.8	37,751		0.867	111,744	2.565
	5.20		324.0	117.6	38,104		0.875	115,537	2.652
	5.30		324.8	118.4	38,458		0.883	119,365	2.740
	5.40		325.6	119.2	38,813		0.891	123,228	2.829
	5.50		326.4	120.0	39,170		0.899	127,127	2.918
	5.60		327.2	120.8	39,527		0.907	131,062	3.009
	5.70		328.0	121.6	39,886		0.916	135,033	3.100
	5.80		328.8	122.4	40,247		0.924	139,040	3.192
	5.90		329.6	123.2	40,608		0.932	143,082	3.285
	6.00		330.4	124.0	40,971		0.941	147,161	3.378
	6.10		331.2	124.8	41,335		0.949	151,277	3.473
	6.20		332.0	125.6	41,701		0.957	155,428	3.568
	6.30		332.8	126.4	42,067		0.966	159,617	3.664
	6.40		333.6	127.2	42,435		0.974	163,842	3.761
	6.50		334.4	128.0	42,805		0.983	168,104	3.859
	6.60		335.2	128.8	43,175		0.991	172,403	3.958
	6.70		336.0	129.6	43,547		1.000	176,739	4.057
	6.80		336.8	130.4	43,920		1.008	181,112	4.158
	6.90		337.6	131.2	44,295		1.017	185,523	4.259
	7.00		338.4	132.0	44,670		1.025	189,971	4.361
	7.10		339.2	132.8	45,047		1.034	194,457	4.464
	7.20		340.0	133.6	45,425		1.043	198,981	4.568
	7.30		340.8	134.4	45,805		1.052	203,542	4.673
	7.40		341.6	135.2	46,186		1.060	208,142	4.778
	7.50		342.4	136.0	46,568		1.069	212,780	4.885
	7.60		343.2	136.8	46,951		1.078	217,456	4.992
	7.70		344.0	137.6	47,336		1.087	222,170	5.100
Zone 2 (EURV)	7.75		344.4	138.0	47,529		1.091	224,542	5.155
	7.80		344.8	138.4	47,722		1.096	226,923	5.209
	7.90		345.6	139.2	48,109		1.104	231,714	5.319
Zone 3 (User)	7.98		346.2	139.9	48,420		1.112	235,575	5.408
	8.00		346.4	140.0	48,497		1.113	236,545	5.430
	8.10		347.2	140.8	48,887		1.122	241,414	5.542
	8.20		348.0	141.6	49,278		1.131	246,322	5.655
	8.30		348.8	142.4	49,671		1.140	251,270	5.768
	8.40		349.6	143.2	50,064		1.149	256,256	5.883
	8.50		350.4	144.0	50,459		1.158	261,282	5.998
	8.60		351.2	144.8	50,855		1.167	266,348	6.115
	8.70		352.0	145.6	51,253		1.177	271,453	6.232
	8.80		352.8	146.4	51,651		1.186	276,599	6.350
	8.90		353.6	147.2	52,051		1.195	281,784	6.469
	9.00		354.4	148.0	52,453		1.204	287,009	6.589
	9.10		355.2	148.8	52,855		1.213	292,274	6.710
	9.20		356.0	149.6	53,259		1.223	297,580	6.831
	9.30		356.8	150.4	53,664		1.232	302,926	6.954
	9.40		357.6	151.2	54,070		1.241	308,313	7.078
	9.50		358.4	152.0	54,478		1.251	313,740	7.202
	9.60		359.2	152.8	54,887		1.260	319,209	7.328

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



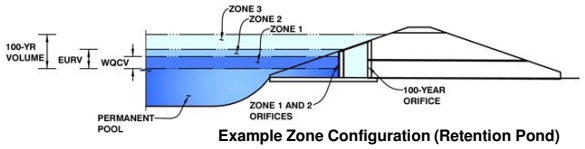


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS - MKJCC POND #7

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.13	1.757	Orifice Plate
Zone 2 (EURV)	7.75	3.395	Circular Orifice
Zone 3 (User)	7.98	0.250	Weir&Pipe (Restrict)
Total (all zones)		5.402	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.701E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.13	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	16.50	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	5.33	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.38	2.75					
Orifice Area (sq. inches)	5.33	5.33	5.33					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	4.13	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.02	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	7.75	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.07	N/A	feet
Vertical Orifice Diameter =	1.66	N/A	inches				

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

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.75	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.75	N/A	feet
Overflow Weir Front Edge Length =	9.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =		N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	56.70	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	28.35	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =		N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =		N/A	feet
Restrictor Plate Height Above Pipe Invert =			inches	Half-Central Angle of Restrictor Plate on Pipe =		N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

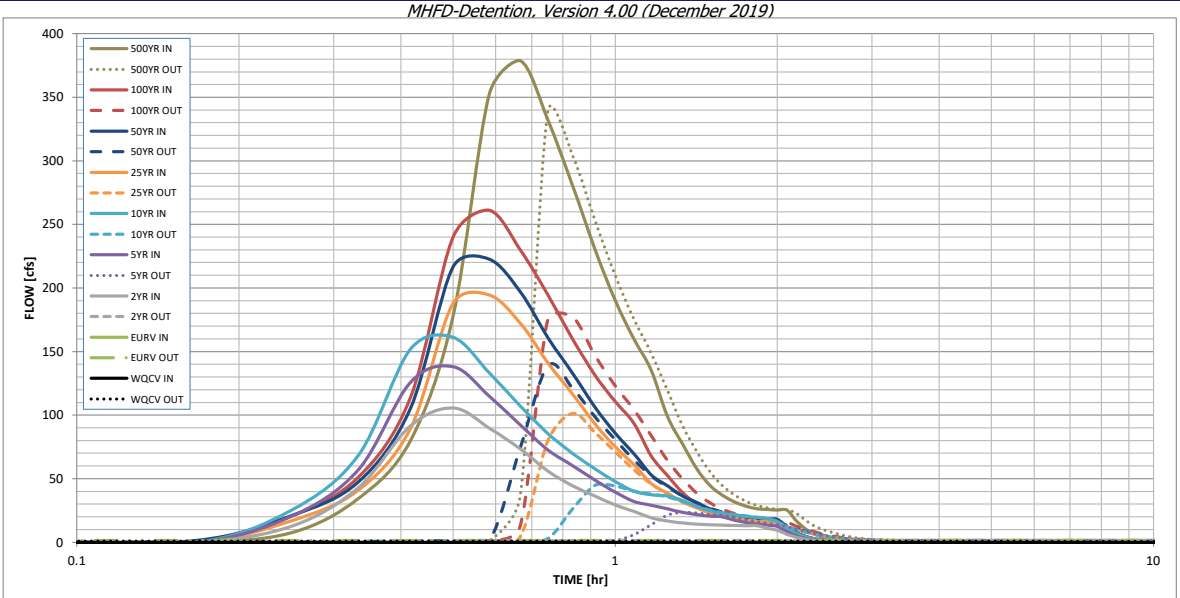
			Calculated Parameters for Spillway		
Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.36	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	10.36	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.33	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	8.31	acre-ft

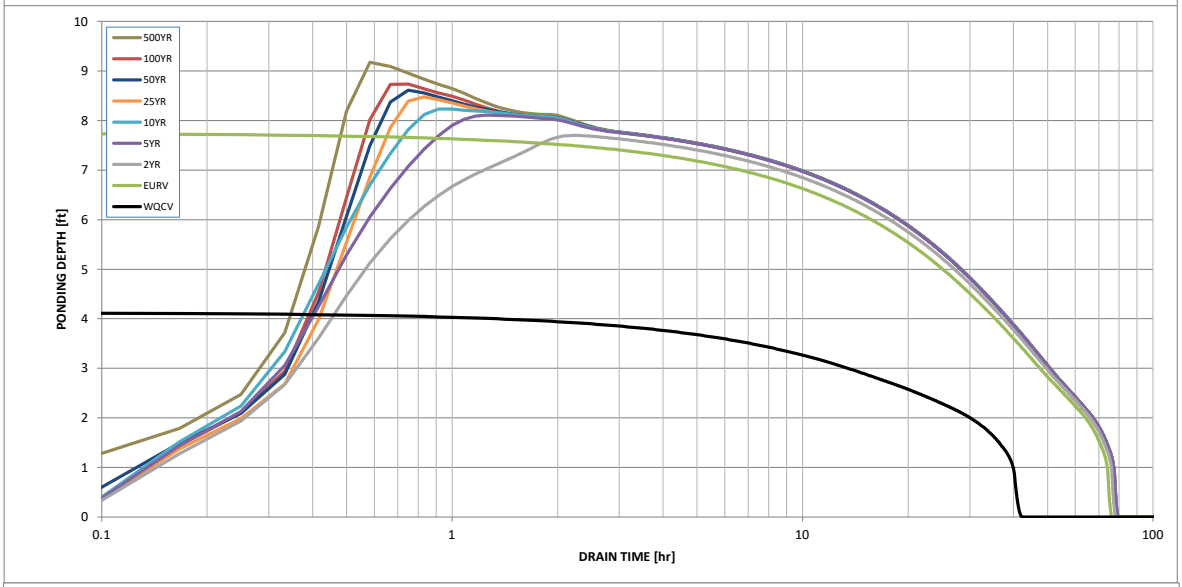
Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

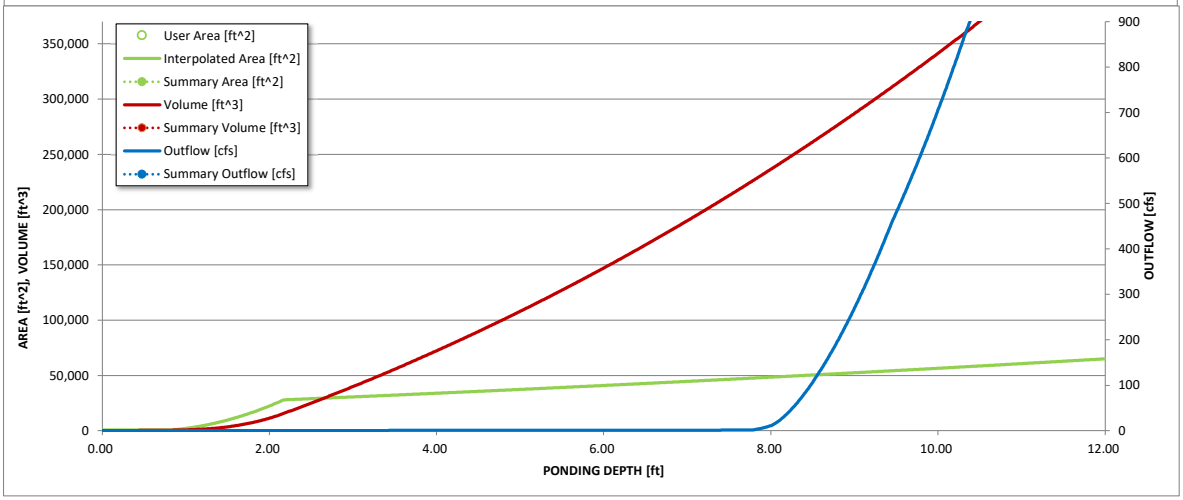
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	1.757	5.152	5.328	7.138	8.633	10.231	11.759	13.506	19.848
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.328	7.138	8.633	10.231	11.759	13.506	19.848
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	16.5	33.4	46.4	71.7	88.1	110.1	178.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.24	0.48	0.66	1.02	1.26	1.57	2.55
Peak Inflow Q (cfs) =	N/A	N/A	105.6	138.1	161.1	194.5	222.7	261.1	378.7
Peak Outflow Q (cfs) =	0.9	1.5	1.5	23.5	44.6	101.4	138.6	177.2	338.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.0	1.4	1.6	1.6	1.9
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	70	69	68	66	65	63	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	74	74	74	73	72	72	70
Maximum Ponding Depth (ft) =	4.13	7.75	7.70	8.11	8.23	8.48	8.61	8.74	9.17
Area at Maximum Ponding Depth (acres) =	0.79	1.09	1.09	1.12	1.13	1.16	1.17	1.18	1.22
Maximum Volume Stored (acre-ft) =	1.762	5.155	5.100	5.542	5.689	5.964	6.126	6.267	6.795

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





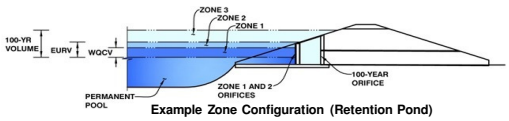


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: MKJCC POND #8 - REDEMPTION HILL CHURCH DETENTION POND FSD - SEE RHC FDR FOR UP TO DATE MODEL

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	12.97	acres
Watershed Length =	2,000	ft
Watershed Length to Centroid =	800	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	75.92%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	23.7%	percent
Percentage Hydrologic Soil Groups C/D =	76.3%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.329 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.993 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.005 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.342 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.623 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.925 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.213 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.541 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	3.736 acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	0.867 acre-feet		
Approximate 5-yr Detention Volume =	1.181 acre-feet		
Approximate 10-yr Detention Volume =	1.384 acre-feet		
Approximate 25-yr Detention Volume =	1.473 acre-feet		
Approximate 50-yr Detention Volume =	1.515 acre-feet		
Approximate 100-yr Detention Volume =	1.613 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.329	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.664	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.620	acre-feet
Total Detention Basin Volume =	1.613	acre-feet
Initial Surcharge Volume (ISV) =	43	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

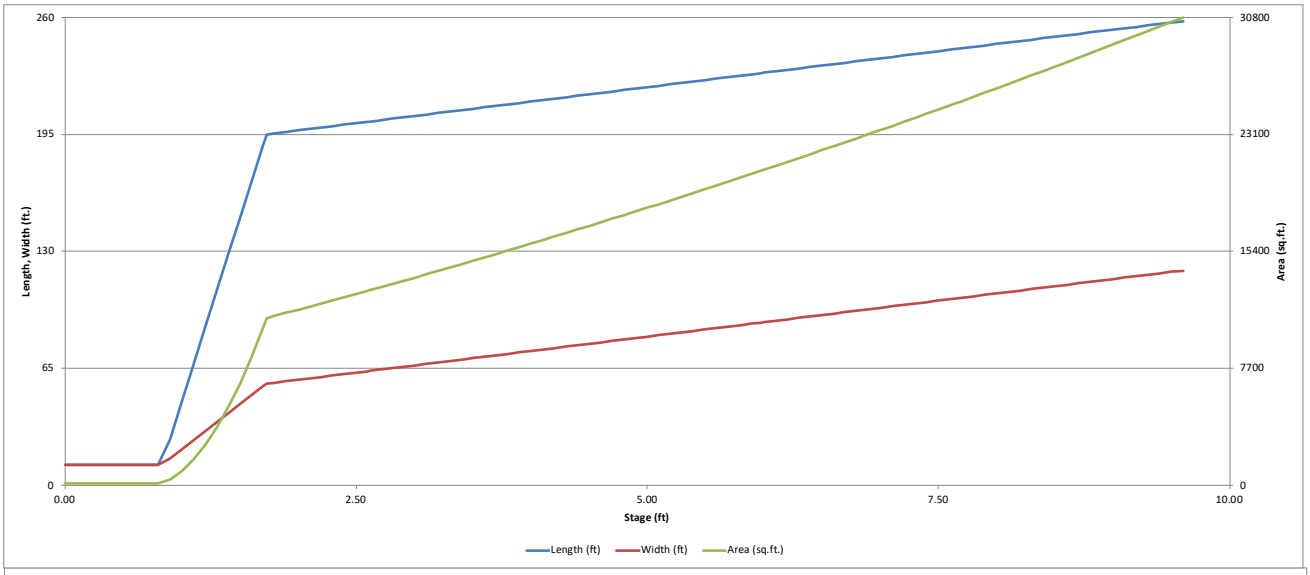
Initial Surcharge Area (A_{ISV}) =	130	ft^2
Surcharge Volume Length (L_{ISV}) =	11.4	ft
Surcharge Volume Width (W_{ISV}) =	11.4	ft
Depth of Basin Floor (H_{FLOOR}) =	0.90	ft
Length of Basin Floor (L_{FLOOR}) =	195.0	ft
Width of Basin Floor (W_{FLOOR}) =	56.4	ft
Area of Basin Floor (A_{FLOOR}) =	11,002	ft^2
Volume of Basin Floor (V_{FLOOR}) =	3,699	ft^3
Depth of Main Basin (H_{MAIN}) =	4.27	ft
Length of Main Basin (L_{MAIN}) =	229.2	ft
Width of Main Basin (W_{MAIN}) =	90.6	ft
Area of Main Basin (A_{MAIN}) =	20,758	ft^2
Volume of Main Basin (V_{MAIN}) =	66,714	ft^3
Calculated Total Basin Volume (V_{total}) =	**1.619**	acre-feet

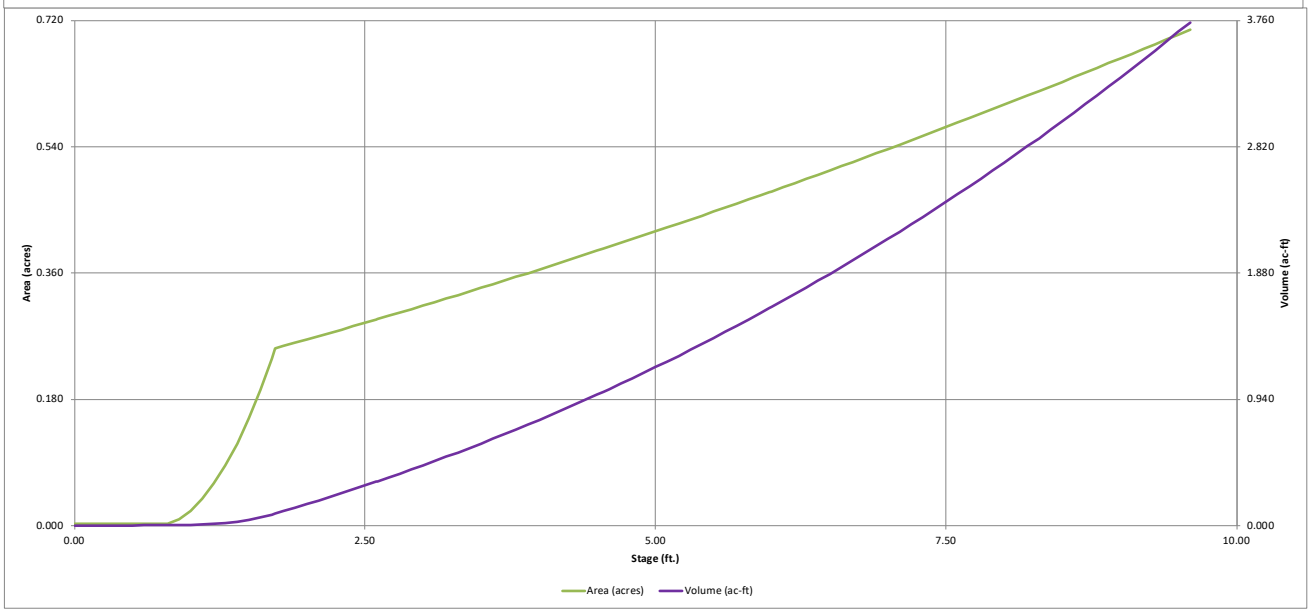
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		11.4	11.4	130		0.003		
ISV	0.33		11.4	11.4	130		0.003	43	0.001
	0.40		11.4	11.4	130		0.003	52	0.001
	0.50		11.4	11.4	130		0.003	65	0.001
	0.60		11.4	11.4	130		0.003	78	0.002
	0.70		11.4	11.4	130		0.003	91	0.002
	0.80		11.4	11.4	130		0.003	104	0.002
	0.90		25.7	14.9	383		0.009	126	0.003
	1.00		46.1	19.9	918		0.021	189	0.004
	1.10		66.5	24.9	1,657		0.038	316	0.007
	1.20		86.9	29.9	2,600		0.060	527	0.012
	1.30		107.3	34.9	3,746		0.086	843	0.019
	1.40		127.7	39.9	5,097		0.117	1,283	0.029
	1.50		148.1	44.9	6,652		0.153	1,869	0.043
	1.60		168.5	49.9	8,411		0.193	2,620	0.060
	1.70		188.9	54.9	10,373		0.238	3,558	0.082
Floor	1.73		195.0	56.4	11,002		0.253	3,878	0.089
	1.80		195.6	57.0	11,143		0.256	4,653	0.107
	1.90		196.4	57.8	11,346		0.260	5,778	0.133
	2.00		197.2	58.6	11,550		0.265	6,923	0.159
	2.10		198.0	59.4	11,755		0.270	8,088	0.186
	2.20		198.8	60.2	11,962		0.275	9,274	0.213
	2.30		199.6	61.0	12,169		0.279	10,480	0.241
	2.40		200.4	61.8	12,378		0.284	11,708	0.269
	2.50		201.2	62.6	12,589		0.289	12,956	0.297
	2.60		202.0	63.4	12,800		0.294	14,225	0.327
Zone 1 (WQCV)	2.61		202.1	63.5	12,822		0.294	14,354	0.330
	2.70		202.8	64.2	13,013		0.299	15,516	0.356
	2.80		203.6	65.0	13,228		0.304	16,828	0.386
	2.90		204.4	65.8	13,443		0.309	18,162	0.417
	3.00		205.2	66.6	13,660		0.314	19,517	0.448
	3.10		206.0	67.4	13,878		0.319	20,894	0.480
	3.20		206.8	68.2	14,097		0.324	22,292	0.512
	3.30		207.6	69.0	14,318		0.329	23,713	0.544
	3.40		208.4	69.8	14,540		0.334	25,156	0.578
	3.50		209.2	70.6	14,763		0.339	26,621	0.611
	3.60		210.0	71.4	14,987		0.344	28,109	0.645
	3.70		210.8	72.2	15,213		0.349	29,619	0.680
	3.80		211.6	73.0	15,440		0.354	31,151	0.715
	3.90		212.4	73.8	15,668		0.360	32,707	0.751
	4.00		213.2	74.6	15,898		0.365	34,285	0.787
	4.10		214.0	75.4	16,129		0.370	35,886	0.824
	4.20		214.8	76.2	16,361		0.376	37,511	0.861
	4.30		215.6	77.0	16,594		0.381	39,158	0.899
	4.40		216.4	77.8	16,829		0.386	40,830	0.937
	4.50		217.2	78.6	17,065		0.392	42,524	0.976
Zone 2 (EURV)	4.55		217.6	79.0	17,183		0.394	43,380	0.996
	4.60		218.0	79.4	17,302		0.397	44,243	1.016
	4.70		218.8	80.2	17,541		0.403	45,985	1.056
	4.80		219.6	81.0	17,780		0.408	47,751	1.096
	4.90		220.4	81.8	18,021		0.414	49,541	1.137
	5.00		221.2	82.6	18,264		0.419	51,355	1.179
	5.10		222.0	83.4	18,507		0.425	53,194	1.221
	5.20		222.8	84.2	18,752		0.430	55,057	1.264
	5.30		223.6	85.0	18,999		0.436	56,944	1.307
	5.40		224.4	85.8	19,246		0.442	58,856	1.351
	5.50		225.2	86.6	19,495		0.448	60,793	1.396
	5.60		226.0	87.4	19,745		0.453	62,755	1.441
	5.70		226.8	88.2	19,996		0.459	64,742	1.486
	5.80		227.6	89.0	20,249		0.465	66,755	1.532
	5.90		228.4	89.8	20,503		0.471	68,792	1.579
Zone 3 (100-year)	5.98		229.0	90.4	20,707		0.475	70,441	1.617
	6.00		229.2	90.6	20,758		0.477	70,855	1.627
	6.10		230.0	91.4	21,014		0.482	72,944	1.675
	6.20		230.8	92.2	21,272		0.488	75,058	1.723
	6.30		231.6	93.0	21,531		0.494	77,198	1.772
	6.40		232.4	93.8	21,791		0.500	79,364	1.822
	6.50		233.2	94.6	22,053		0.506	81,557	1.872
	6.60		234.0	95.4	22,316		0.512	83,775	1.923
	6.70		234.8	96.2	22,580		0.518	86,020	1.975
	6.80		235.6	97.0	22,845		0.524	88,291	2.027
	6.90		236.4	97.8	23,112		0.531	90,589	2.080
	7.00		237.2	98.6	23,380		0.537	92,913	2.133
	7.10		238.0	99.4	23,649		0.543	95,265	2.187
	7.20		238.8	100.2	23,920		0.549	97,643	2.242
	7.30		239.6	101.0	24,191		0.555	100,049	2.297
	7.40		240.4	101.8	24,464		0.562	102,482	2.353
	7.50		241.2	102.6	24,739		0.568	104,942	2.409
	7.60		242.0	103.4	25,014		0.574	107,429	2.466
	7.70		242.8	104.2	25,291		0.581	109,945	2.524
	7.80		243.6	105.0	25,570		0.587	112,488	2.582
	7.90		244.4	105.8	25,849		0.593	115,059	2.641
	8.00		245.2	106.6	26,130		0.600	117,658	2.701
	8.10		246.0	107.4	26,412		0.606	120,285	2.761
	8.20		246.8	108.2	26,695		0.613	122,940	2.822
	8.30		247.6	109.0	26,980		0.619	125,624	2.884
	8.40		248.4	109.8	27,266		0.626	128,336	2.946
	8.50		249.2	110.6	27,553		0.633	131,077	3.009
	8.60		250.0	111.4	27,841		0.639	133,847	3.073
	8.70		250.8	112.2	28,131		0.646	136,645	3.137
	8.80		251.6	113.0	28,422		0.652	139,473	3.202
	8.90		252.4	113.8	28,714		0.659	142,330	3.267
	9.00		253.2	114.6	29,008		0.666	145,216	3.334
	9.10		254.0	115.4	29,303		0.673	148,131	3.401
	9.20		254.8	116.2	29,599		0.679	151,076	3.468
	9.30		255.6	117.0	29,896		0.686	154,051	3.537
	9.40		256.4	117.8	30,195		0.693	157,056	3.605
	9.50		257.2	118.6	30,495		0.700	160,090	3.675
	9.60		258.0	119.4	30,796		0.707	163,155	3.746

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



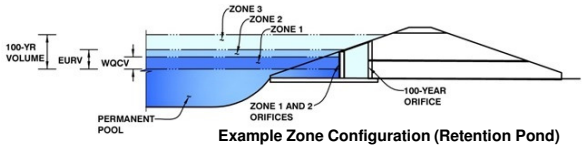


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: MKJCC POND #8 - REDEMPTION HILL CHURCH DETENTION POND FSD - SEE RHC FDR FOR UP TO DATE MODEL

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.61	0.329	Orifice Plate
Zone 2 (EURV)	4.55	0.664	Circular Orifice
Zone 3 (100-year)	5.98	0.620	Weir&Pipe (Restrict)
Total (all zones)		1.613	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	7.500E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.61	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	10.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.08	sq. inches (diameter = 1-3/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.87	1.74					
Orifice Area (sq. inches)	1.08	1.08	1.08					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.61	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.02	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.55	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.07	N/A	feet
Vertical Orifice Diameter =	1.75	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.55	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.55	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.56	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.30	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	3.15	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.83	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.41	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.60		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.53	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.87	feet
Spillway Crest Length =	11.00	feet	Stage at Top of Freeboard =	7.87	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.59	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.62	acre-ft

Calculated Parameters for Spillway

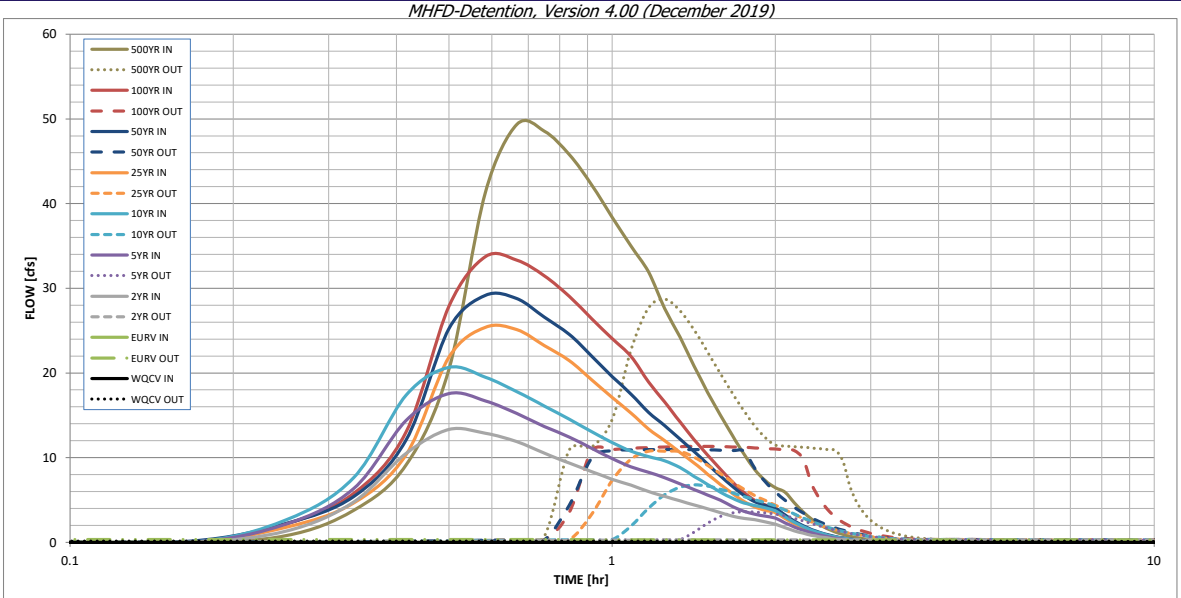
Routed Hydrograph Results

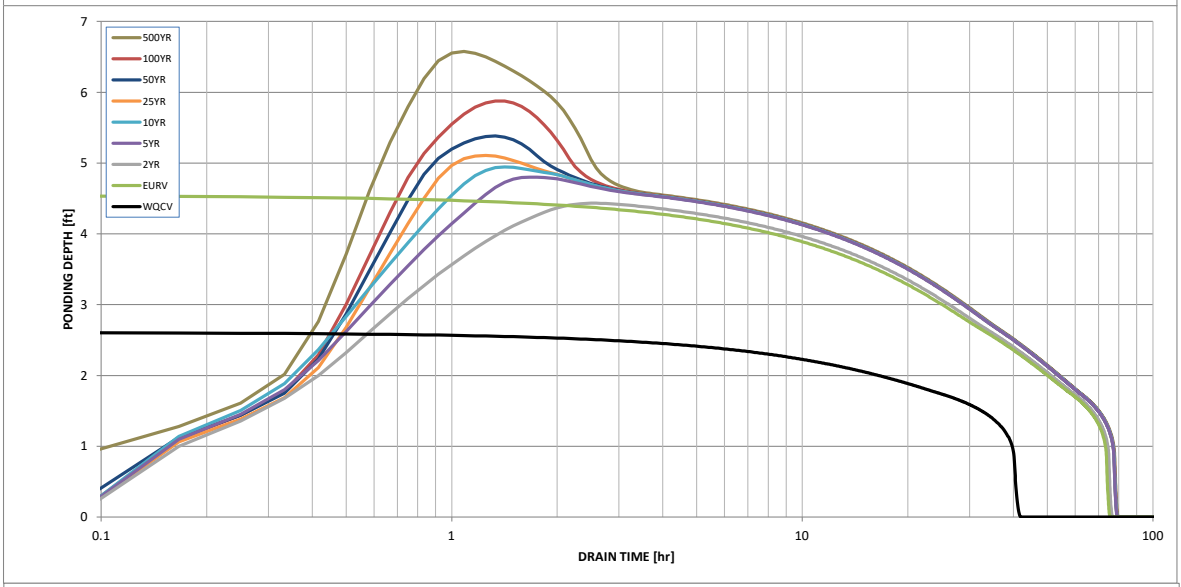
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

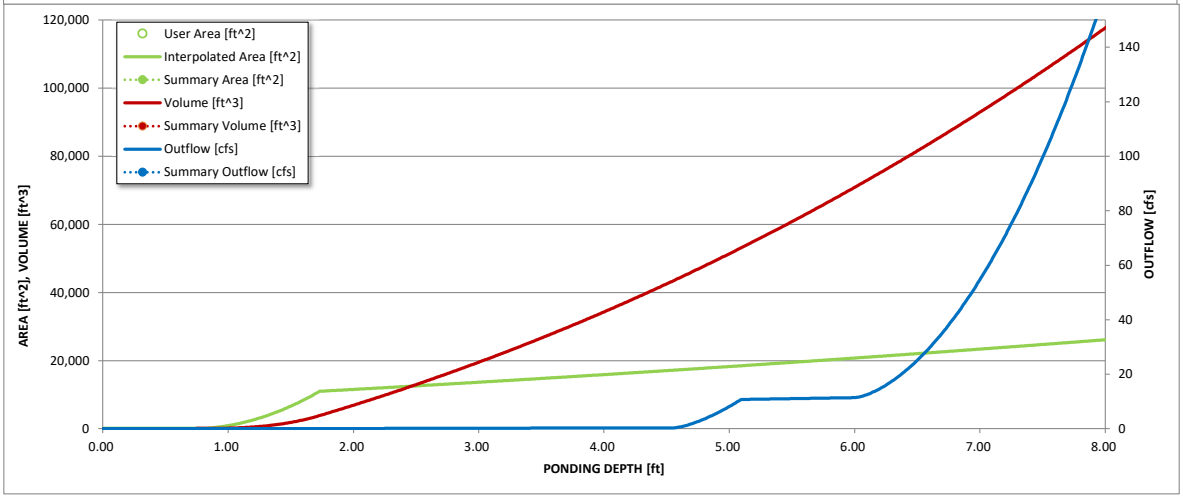
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	0.329	0.993	1.005	1.342	1.623	1.925	2.213	2.541	3.736
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.005	1.342	1.623	1.925	2.213	2.541	3.736
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.5	3.4	4.8	8.0	9.9	12.4	20.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.26	0.37	0.61	0.76	0.96	1.58
Peak Inflow Q (cfs) =	N/A	N/A	13.3	17.6	20.6	25.4	29.2	33.7	49.3
Peak Outflow Q (cfs) =	0.1	0.3	0.3	3.6	6.8	10.8	11.0	11.3	28.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	1.4	1.4	1.1	0.9	1.4
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.5	1.0	1.7	1.7	1.7	1.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	69	70	69	68	66	65	60
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	73	75	75	74	74	73	71
Maximum Ponding Depth (ft) =	2.61	4.55	4.43	4.80	4.95	5.11	5.38	5.88	6.58
Area at Maximum Ponding Depth (acres) =	0.29	0.39	0.39	0.41	0.42	0.43	0.44	0.47	0.51
Maximum Volume Stored (acre-ft) =	0.330	0.996	0.949	1.096	1.154	1.225	1.342	1.565	1.908

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





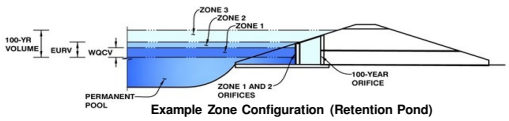


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: MKJCC POND #9 - BRADLEY HEIGHTS EAST 1&2 -SEE FDR FOR UP TO DATE MODEL

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	51.93	acres
Watershed Length =	2,533	ft
Watershed Length to Centroid =	380	ft
Watershed Slope =	0.043	ft/ft
Watershed Imperviousness =	60.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	60.0%	percent
Percentage Hydrologic Soil Groups C/D =	40.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.022	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	3.224	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.136	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	4.333	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	5.373	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	6.613	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	7.697	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	9.012	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.55 in.) =	13.627	acre-feet	3.55 inches
Approximate 2-yr Detention Volume =	2.626	acre-feet	
Approximate 5-yr Detention Volume =	3.637	acre-feet	
Approximate 10-yr Detention Volume =	4.462	acre-feet	
Approximate 25-yr Detention Volume =	4.807	acre-feet	
Approximate 50-yr Detention Volume =	4.990	acre-feet	
Approximate 100-yr Detention Volume =	5.476	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.022	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.202	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.252	acre-feet
Total Detention Basin Volume =	5.476	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

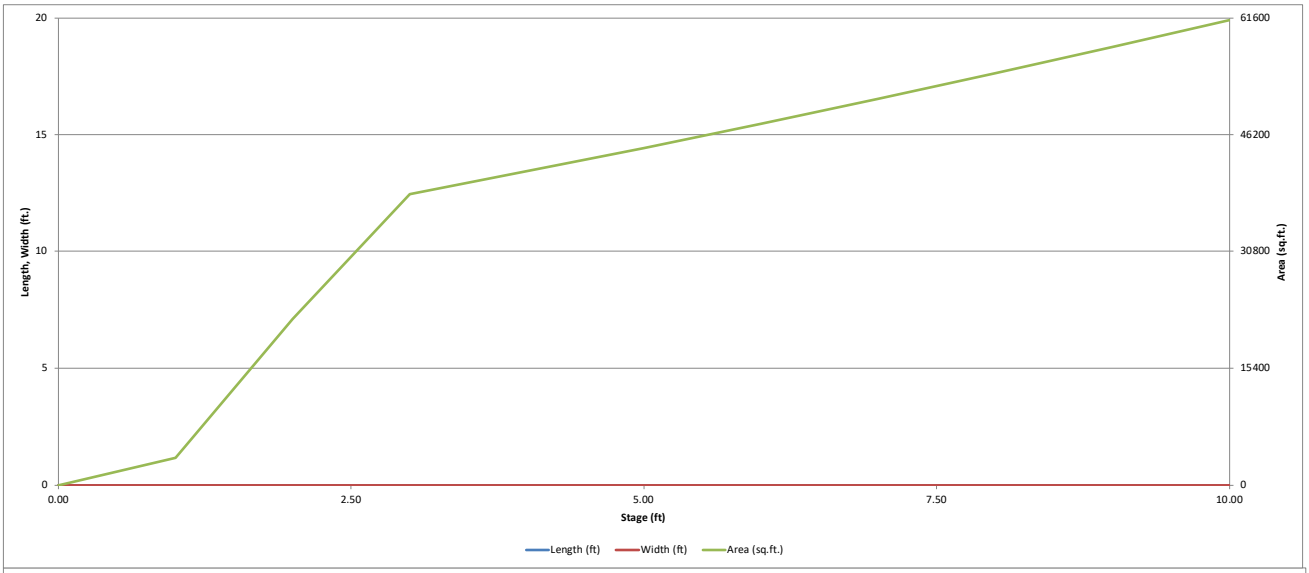
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

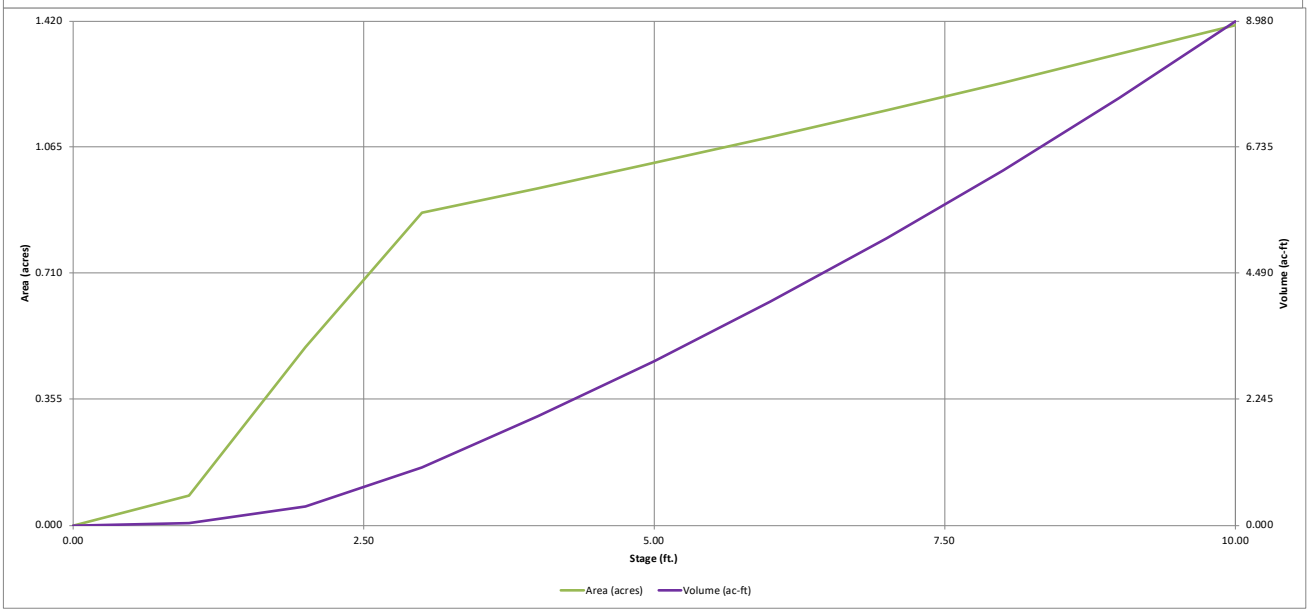
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
5808	--	1.00	--	--	--	3,610	0.083	1,805	0.041
5809	--	2.00	--	--	--	21,855	0.502	14,537	0.334
5810	--	3.00	--	--	--	38,321	0.880	44,625	1.024
5811	--	4.00	--	--	--	41,345	0.949	84,458	1.939
5812	--	5.00	--	--	--	44,437	1.020	127,349	2.924
5813	--	6.00	--	--	--	47,621	1.093	173,378	3.980
5814	--	7.00	--	--	--	50,904	1.169	222,641	5.111
5815	--	8.00	--	--	--	54,290	1.246	275,238	6.319
5816	--	9.00	--	--	--	57,774	1.326	331,270	7.605
5817	--	10.00	--	--	--	61,363	1.409	390,838	8.972

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



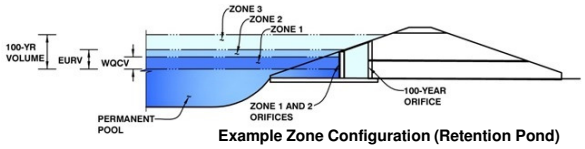


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: MKJCC POND #9 - BRADLEY HEIGHTS EAST 1&2 -SEE FDR FOR UP TO DATE MODEL

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.00	1.022	Orifice Plate
Zone 2 (EURV)	5.30	2.202	Orifice Plate
Zone 3 (100-year)	7.31	2.252	Weir&Pipe (Restrict)
Total (all zones)		5.476	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	5.30	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.77	3.53					
Orifice Area (sq. inches)	4.85	4.85	12.25					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.30	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.30	N/A	feet
Overflow Weir Front Edge Length =	9.00	N/A	feet	Overflow Weir Slope Length =	9.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.33	N/A	
Horiz. Length of Weir Sides =	9.00	N/A	feet	Overflow Grate Open Area w/o Debris =	56.70	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	28.35	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.74	N/A	ft^2
Outlet Pipe Diameter =	42.00	N/A	inches	Outlet Orifice Centroid =	1.45	N/A	feet
Restrictor Plate Height Above Pipe Invert =	31.48		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.96	feet
Spillway Crest Length =	70.00	feet	Stage at Top of Freeboard =	8.76	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.31	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	7.29	acre-ft

Calculated Parameters for Spillway

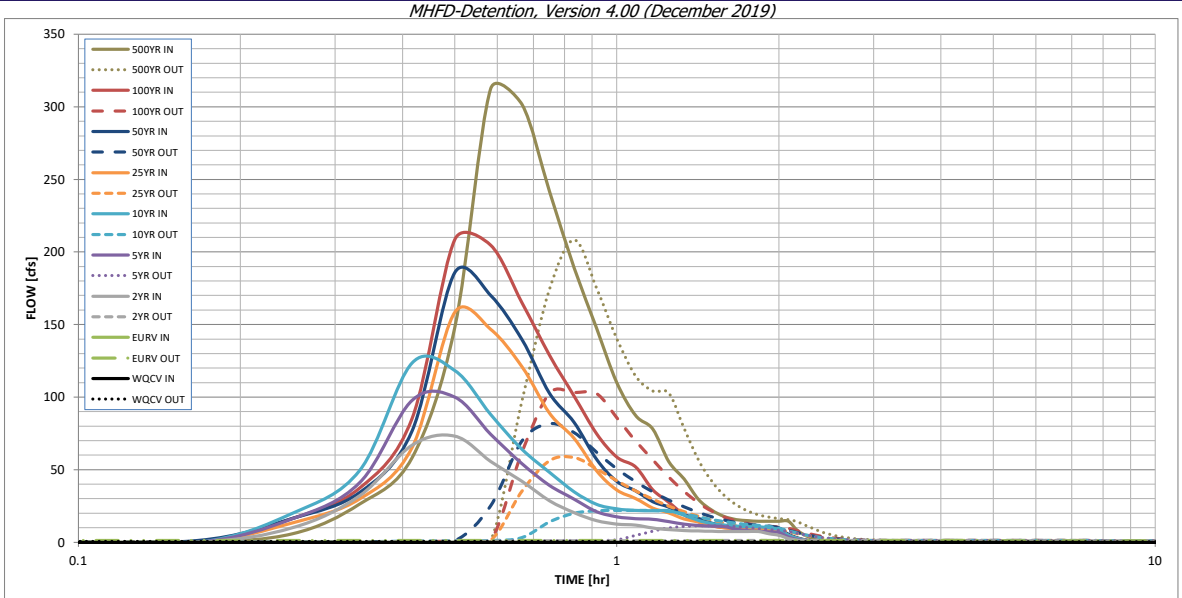
Routed Hydrograph Results

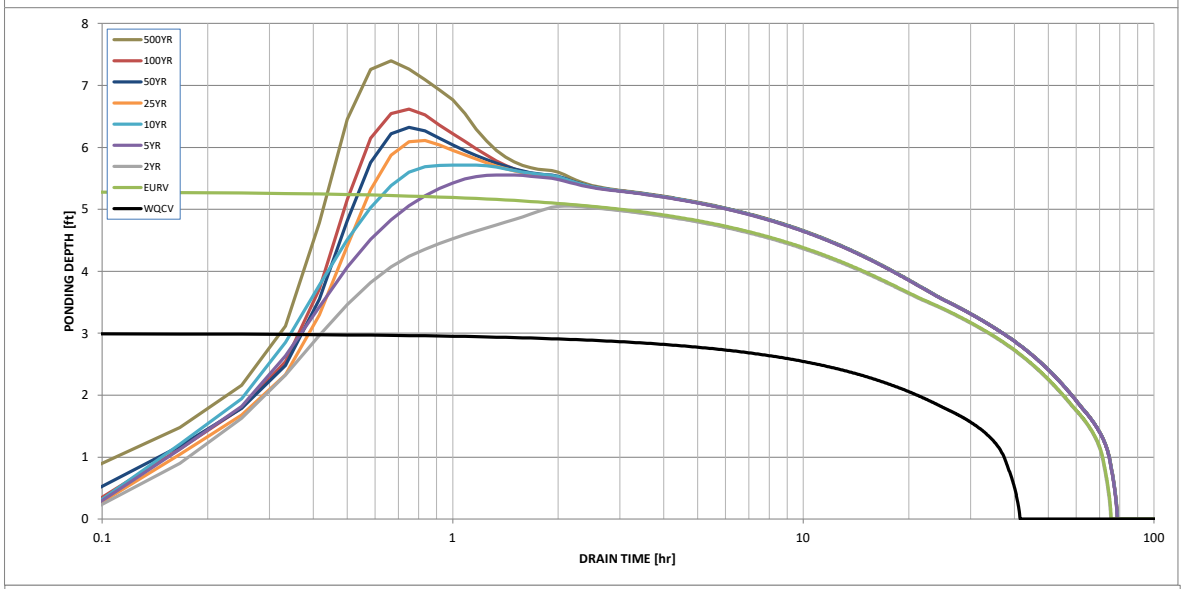
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

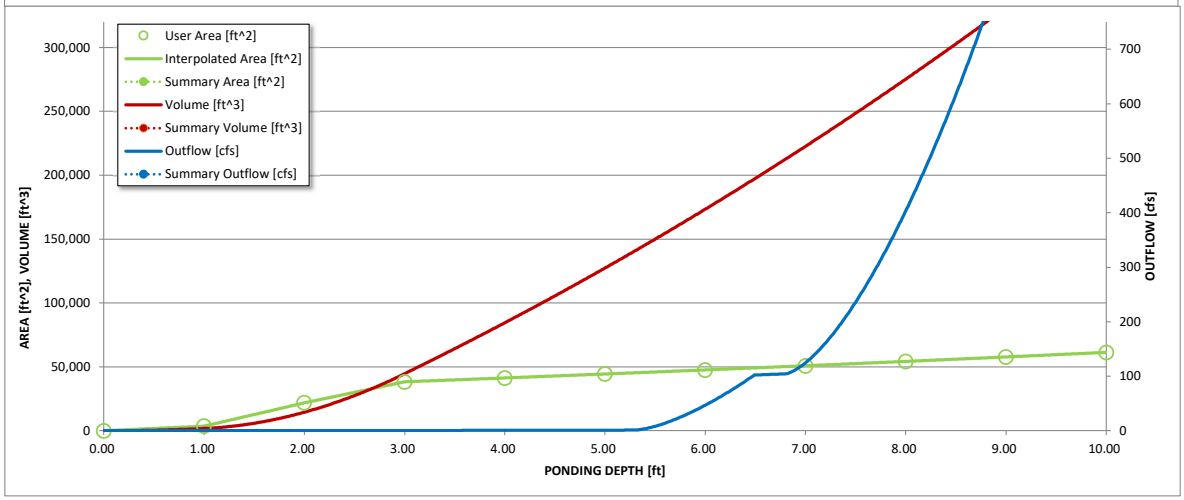
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	1.022	3.224	3.136	4.333	5.373	6.613	7.697	9.012	13.627
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.136	4.333	5.373	6.613	7.697	9.012	13.627
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	12.5	28.5	41.3	67.4	83.3	103.5	169.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.24	0.55	0.80	1.30	1.60	1.99	3.27
Peak Inflow Q (cfs) =	N/A	N/A	73.2	100.0	123.5	158.4	185.7	208.5	312.3
Peak Outflow Q (cfs) =	0.5	1.2	1.2	11.3	22.0	58.3	81.7	103.1	208.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.5	0.9	1.0	1.0	1.2
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	1.0	1.4	1.8	1.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	68	69	67	65	63	61	56
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	72	74	74	73	72	71	69
Maximum Ponding Depth (ft) =	3.00	5.30	5.05	5.56	5.71	6.11	6.32	6.62	7.40
Area at Maximum Ponding Depth (acres) =	0.88	1.04	1.02	1.06	1.07	1.10	1.12	1.14	1.20
Maximum Volume Stored (acre-ft) =	1.024	3.233	2.975	3.496	3.666	4.101	4.334	4.661	5.573

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





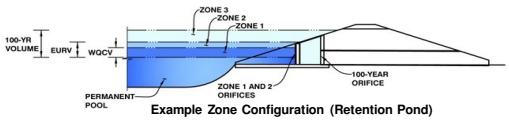


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS COMMERCIAL - MKJCC POND #10

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	13.98	acres
Watershed Length =	1,166	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	95.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.521 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.495 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.280 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.653 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.955 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.262 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.567 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.899 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	4.155 acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	1.206 acre-feet		
Approximate 5-yr Detention Volume =	1.566 acre-feet		
Approximate 10-yr Detention Volume =	1.906 acre-feet		
Approximate 25-yr Detention Volume =	2.044 acre-feet		
Approximate 50-yr Detention Volume =	2.121 acre-feet		
Approximate 100-yr Detention Volume =	2.188 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.521	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.974	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.693	acre-feet
Total Detention Basin Volume =	2.188	acre-feet
Initial Surcharge Volume (ISV) =	68	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	8.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	

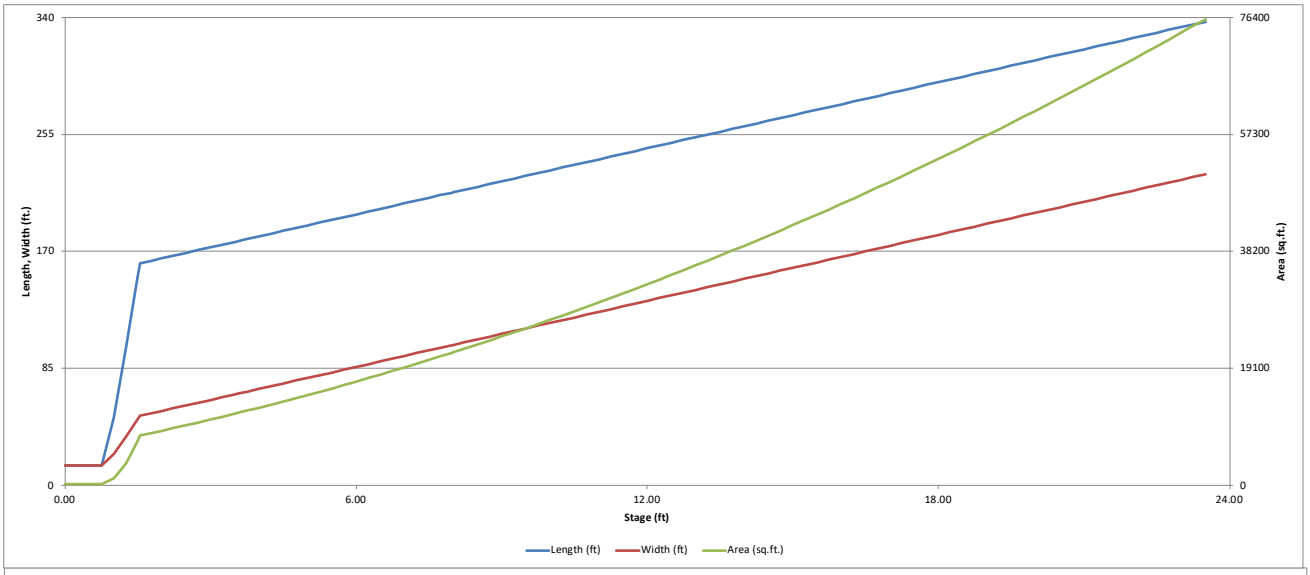
Initial Surcharge Area (A_{ISV}) =	206	ft^2
Surcharge Volume Length (L_{ISV}) =	14.4	ft
Surcharge Volume Width (W_{ISV}) =	14.4	ft
Depth of Basin Floor (H_{FLOOR}) =	0.72	ft
Length of Basin Floor (L_{FLOOR}) =	161.2	ft
Width of Basin Floor (W_{FLOOR}) =	50.4	ft
Area of Basin Floor (A_{FLOOR}) =	8,121	ft^2
Volume of Basin Floor (V_{FLOOR}) =	2,309	ft^3
Depth of Main Basin (H_{MAIN}) =	6.45	ft
Length of Main Basin (L_{MAIN}) =	212.8	ft
Width of Main Basin (W_{MAIN}) =	102.0	ft
Area of Main Basin (A_{MAIN}) =	21,702	ft^2
Volume of Main Basin (V_{MAIN}) =	92,663	ft^3
Calculated Total Basin Volume (V_{total}) =	**2.184**	acre-feet

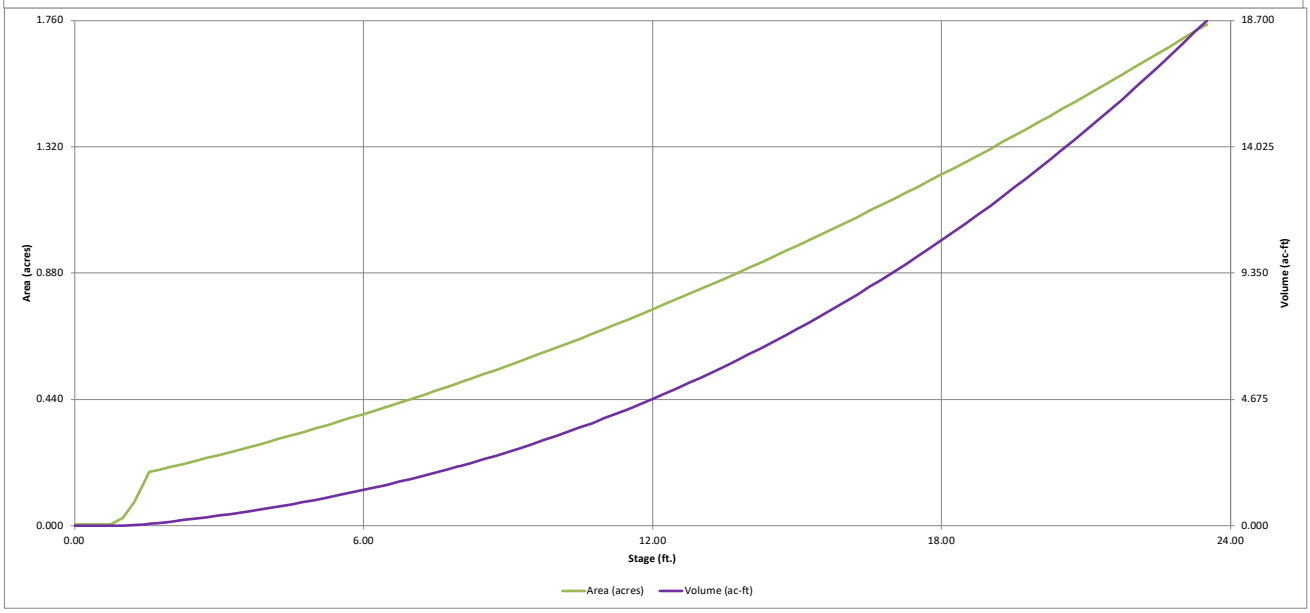
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		14.4	14.4	206		0.005		
ISV	0.33		14.4	14.4	206		0.005	68	0.002
	0.50		14.4	14.4	206		0.005	103	0.002
	0.75		14.4	14.4	206		0.005	155	0.004
	1.00		49.0	22.9	1,121		0.026	276	0.006
	1.25		100.0	35.4	3,538		0.081	832	0.019
	1.50		151.0	47.9	7,230		0.166	2,151	0.049
Floor	1.55		161.2	50.4	8,121		0.186	2,535	0.058
	1.75		162.8	52.0	8,462		0.194	4,193	0.096
	2.00		164.8	54.0	8,896		0.204	6,362	0.146
	2.25		166.8	56.0	9,337		0.214	8,641	0.198
	2.50		168.8	58.0	9,787		0.225	11,032	0.253
	2.75		170.8	60.0	10,245		0.235	13,535	0.311
	3.00		172.8	62.0	10,710		0.246	16,155	0.371
	3.25		174.8	64.0	11,184		0.257	18,891	0.434
	3.50		176.8	66.0	11,665		0.268	21,747	0.499
Zone 1 (WQCV)	3.59		177.6	66.7	11,841		0.272	22,805	0.524
	3.75		178.8	68.0	12,155		0.279	24,724	0.568
	4.00		180.8	70.0	12,653		0.290	27,825	0.639
	4.25		182.8	72.0	13,158		0.302	31,051	0.713
	4.50		184.8	74.0	13,672		0.314	34,405	0.790
	4.75		186.8	76.0	14,193		0.326	37,888	0.870
	5.00		188.8	78.0	14,723		0.338	41,502	0.953
	5.25		190.8	80.0	15,261		0.350	45,250	1.039
	5.50		192.8	82.0	15,806		0.363	49,133	1.128
	5.75		194.8	84.0	16,360		0.376	53,154	1.220
	6.00		196.8	86.0	16,922		0.388	57,314	1.316
	6.25		198.8	88.0	17,491		0.402	61,615	1.414
Zone 2 (EURV)	6.45		200.4	89.6	17,953		0.412	65,160	1.496
	6.50		200.8	90.0	18,069		0.415	66,060	1.517
	6.75		202.8	92.0	18,654		0.428	70,650	1.622
	7.00		204.8	94.0	19,248		0.442	75,388	1.731
	7.25		206.8	96.0	19,850		0.456	80,275	1.843
	7.50		208.8	98.0	20,459		0.470	85,314	1.959
	7.75		210.8	100.0	21,077		0.484	90,505	2.078
Zone 3 (100-year)	7.98		212.7	101.8	21,652		0.497	95,419	2.191
	8.00		212.8	102.0	21,702		0.498	95,853	2.200
	8.25		214.8	104.0	22,336		0.513	101,357	2.327
	8.50		216.8	106.0	22,978		0.527	107,021	2.457
	8.75		218.8	108.0	23,627		0.542	112,847	2.591
	9.00		220.8	110.0	24,285		0.558	118,836	2.728
	9.25		222.8	112.0	24,951		0.573	124,990	2.869
	9.50		224.8	114.0	25,624		0.588	131,312	3.015
	9.75		226.8	116.0	26,306		0.604	137,803	3.164
	10.00		228.8	118.0	26,995		0.620	144,465	3.316
	10.25		230.8	120.0	27,693		0.636	151,301	3.473
	10.50		232.8	122.0	28,399		0.652	158,312	3.634
	10.75		234.8	124.0	29,112		0.668	165,501	3.799
	11.00		236.8	126.0	29,834		0.685	172,869	3.969
	11.25		238.8	128.0	30,563		0.702	180,419	4.142
	11.50		240.8	130.0	31,301		0.719	188,152	4.319
	11.75		242.8	132.0	32,047		0.736	196,070	4.501
	12.00		244.8	134.0	32,800		0.753	204,176	4.687
	12.25		246.8	136.0	33,562		0.770	212,471	4.878
	12.50		248.8	138.0	34,332		0.788	220,957	5.072
	12.75		250.8	140.0	35,109		0.806	229,637	5.272
	13.00		252.8	142.0	35,895		0.824	238,512	5.475
	13.25		254.8	144.0	36,688		0.842	247,585	5.684
	13.50		256.8	146.0	37,490		0.861	256,857	5.897
	13.75		258.8	148.0	38,300		0.879	266,331	6.114
	14.00		260.8	150.0	39,117		0.898	276,008	6.336
	14.25		262.8	152.0	39,943		0.917	285,890	6.563
	14.50		264.8	154.0	40,776		0.936	295,980	6.795
	14.75		266.8	156.0	41,618		0.955	306,279	7.031
	15.00		268.8	158.0	42,468		0.975	316,790	7.272
	15.25		270.8	160.0	43,325		0.995	327,514	7.519
	15.50		272.8	162.0	44,191		1.014	338,453	7.770
	15.75		274.8	164.0	45,065		1.035	349,610	8.026
	16.00		276.8	166.0	45,946		1.055	360,986	8.287
	16.25		278.8	168.0	46,836		1.075	372,584	8.553
	16.50		280.8	170.0	47,733		1.096	384,405	8.825
	16.75		282.8	172.0	48,639		1.117	396,451	9.101
	17.00		284.8	174.0	49,553		1.138	408,725	9.383
	17.25		286.8	176.0	50,474		1.159	421,228	9.670
	17.50		288.8	178.0	51,404		1.180	433,963	9.962
	17.75		290.8	180.0	52,342		1.202	446,931	10.260
	18.00		292.8	182.0	53,287		1.223	460,134	10.563
	18.25		294.8	184.0	54,241		1.245	473,575	10.872
	18.50		296.8	186.0	55,202		1.267	487,255	11.186
	18.75		298.8	188.0	56,172		1.290	501,177	11.505
	19.00		300.8	190.0	57,150		1.312	515,342	11.831
	19.25		302.8	192.0	58,135		1.335	529,752	12.161
	19.50		304.8	194.0	59,129		1.357	544,410	12.498
	19.75		306.8	196.0	60,130		1.380	559,317	12.840
	20.00		308.8	198.0	61,140		1.404	574,476	13.188
	20.25		310.8	200.0	62,158		1.427	589,888	13.542
	20.50		312.8	202.0	63,183		1.450	605,555	13.902
	20.75		314.8	204.0	64,217		1.474	621,480	14.267
	21.00		316.8	206.0	65,259		1.498	637,664	14.639
	21.25		318.8	208.0	66,308		1.522	654,110	15.016
	21.50		320.8	210.0	67,366		1.547	670,819	15.400
	21.75		322.8	212.0	68,431		1.571	687,794	15.790
	22.00		324.8	214.0	69,505		1.596	705,036	16.185
	22.25		326.8	216.0	70,587		1.620	722,547	16.587
	22.50		328.8	218.0	71,676		1.645	740,329	16.996
	22.75		330.8	220.0	72,774		1.671	758,386	17.410
	23.00		332.8	222.0	73,879		1.696	776,717	17.831
	23.25		334.8	224.0	74,993		1.722	795,326	18.258
	23.50		336.8	226.0	76,115		1.747	814,214	18.692

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



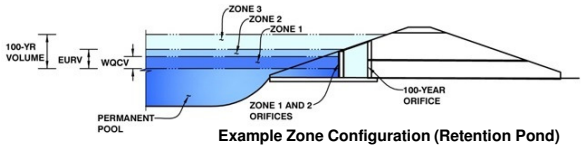


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS COMMERCIAL - MKJCC POND #10

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.59	0.521	Orifice Plate
Zone 2 (EURV)	6.45	0.974	Circular Orifice
Zone 3 (100-year)	7.98	0.693	Weir&Pipe (Restrict)
Total (all zones)		2.188	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.194E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.59	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.72	sq. inches (diameter = 1-7/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.39					
Orifice Area (sq. inches)	1.72	1.72	1.72					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.59	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.00	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	6.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.03	N/A	feet
Vertical Orifice Diameter =	0.72	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.45	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.55	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.60	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.31	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.58	N/A	feet
Restrictor Plate Height Above Pipe Invert =	12.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.97	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.49	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	9.49	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.59	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.01	acre-ft

Calculated Parameters for Spillway

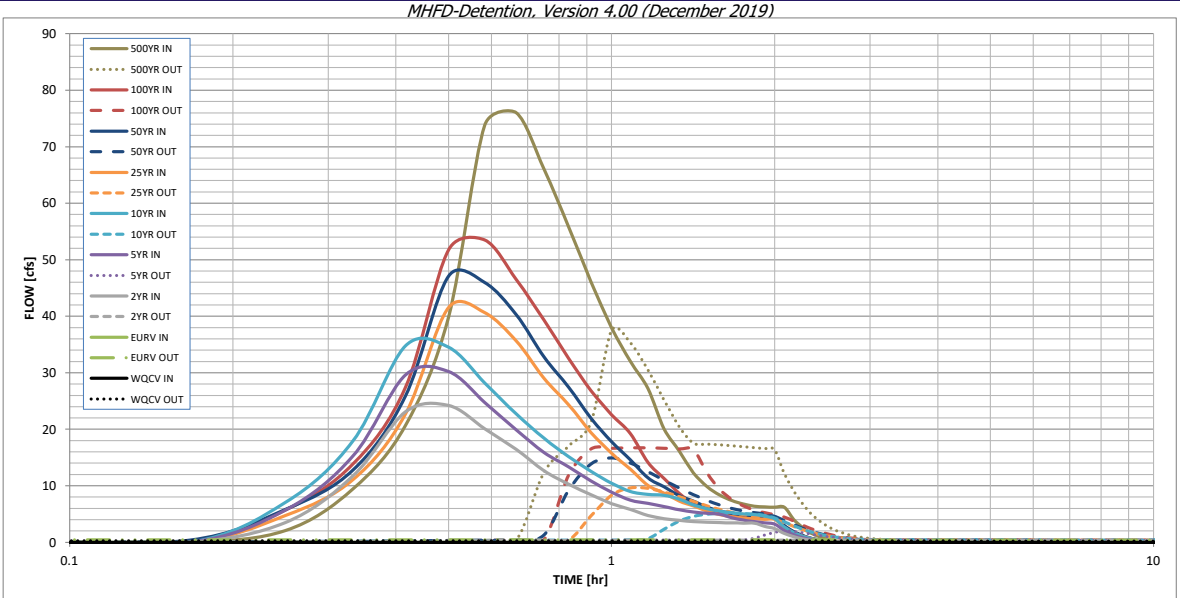
Routed Hydrograph Results

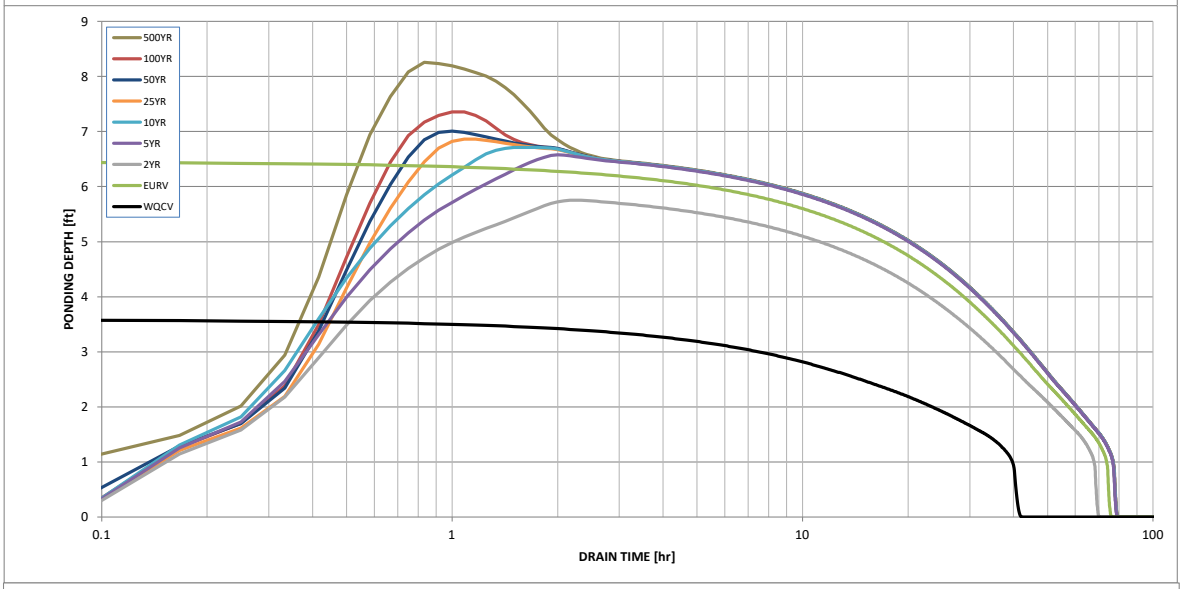
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

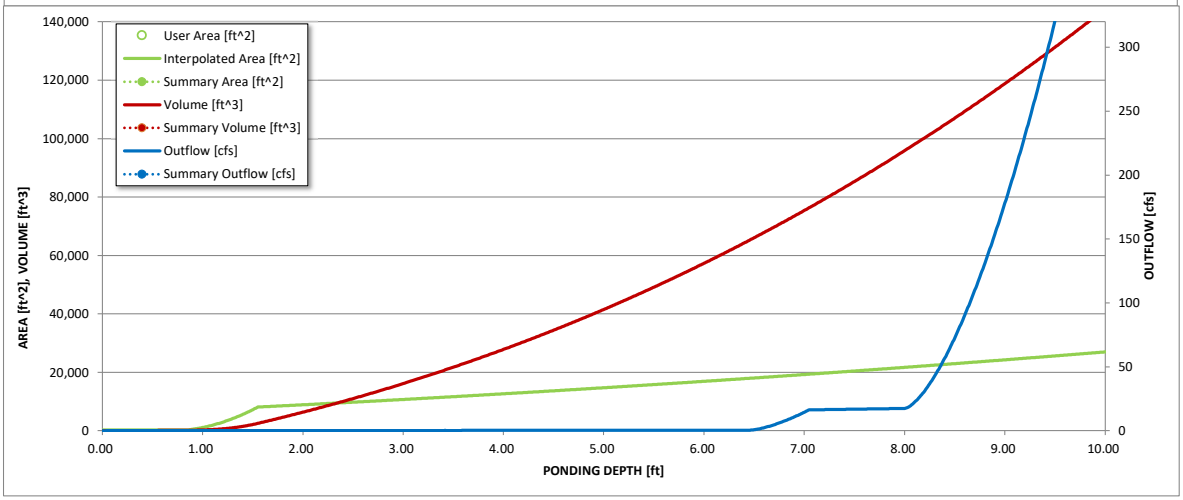
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	0.521	1.495	1.280	1.653	1.955	2.262	2.567	2.899	4.155
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.280	1.653	1.955	2.262	2.567	2.899	4.155
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.5	4.4	6.6	11.6	14.6	18.6	30.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.31	0.47	0.83	1.05	1.33	2.21
Peak Inflow Q (cfs) =	N/A	N/A	24.2	30.2	34.8	41.6	47.1	53.5	76.0
Peak Outflow Q (cfs) =	0.3	0.4	0.4	2.0	5.1	9.6	14.9	16.7	37.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.8	0.8	1.0	0.9	1.2
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.4	0.8	1.3	1.5	1.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	68	63	70	69	68	67	66	63
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	67	75	74	74	74	73	72
Maximum Ponding Depth (ft) =	3.59	6.45	5.75	6.58	6.71	6.86	7.01	7.36	8.26
Area at Maximum Ponding Depth (acres) =	0.27	0.41	0.38	0.42	0.43	0.43	0.44	0.46	0.51
Maximum Volume Stored (acre-ft) =	0.524	1.496	1.220	1.546	1.605	1.669	1.735	1.889	2.327

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





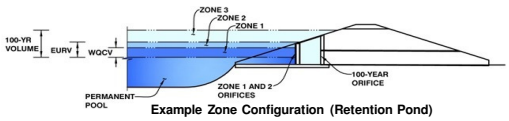


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **BRADLEY HEIGHTS: MKJCC POND 11 - SEE BRADLEY HEIGHTS EAST FDR FOR FILINGS 3&4 FOR UP TO DATE VERSION**

Basin ID: **MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	8.00	acres
Watershed Length =	900	ft
Watershed Length to Centroid =	450	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	65.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.169 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.568 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.497 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.678 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.832 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.020 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.183 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.380 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	2.072 acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	0.440 acre-feet		
Approximate 5-yr Detention Volume =	0.590 acre-feet		
Approximate 10-yr Detention Volume =	0.752 acre-feet		
Approximate 25-yr Detention Volume =	0.811 acre-feet		
Approximate 50-yr Detention Volume =	0.844 acre-feet		
Approximate 100-yr Detention Volume =	0.912 acre-feet		

Define Zones and Basin Geometry

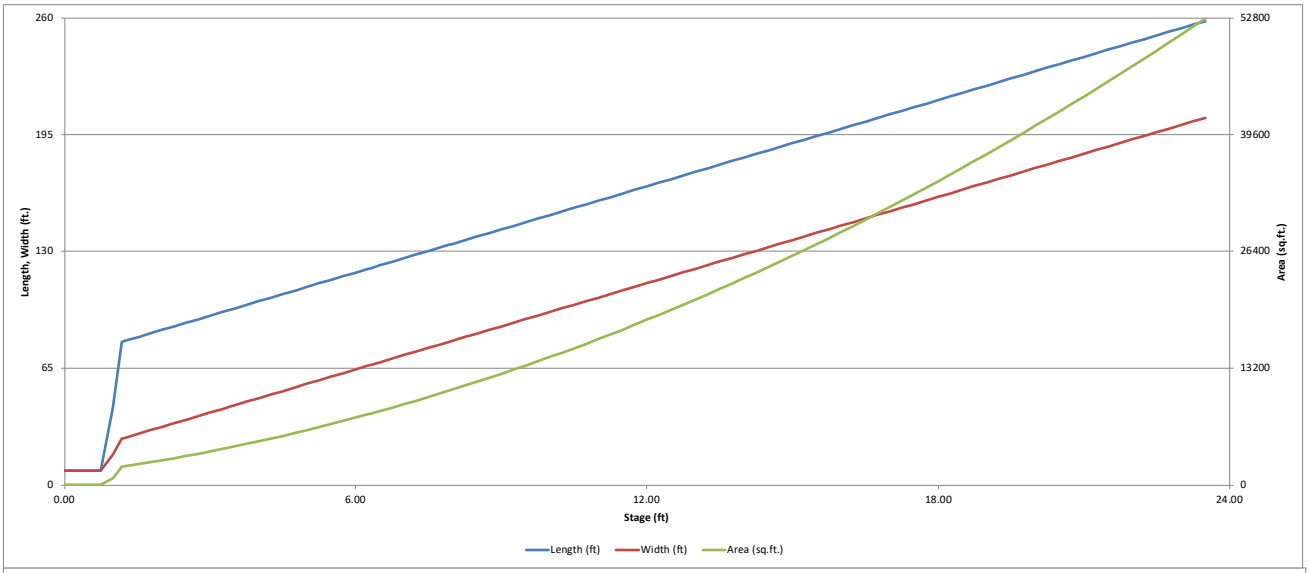
Zone 1 Volume (WQCV) =	0.169	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.398	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.345	acre-feet
Total Detention Basin Volume =	0.912	acre-feet
Initial Surcharge Volume (ISV) =	22	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	8.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	4	
Initial Surcharge Area (A_{ISV}) =	67	ft^2
Surcharge Volume Length (L_{ISV}) =	8.2	ft
Surcharge Volume Width (W_{ISV}) =	8.2	ft
Depth of Basin Floor (H_{FLOOR}) =	0.35	ft
Length of Basin Floor (L_{FLOOR}) =	79.6	ft
Width of Basin Floor (W_{FLOOR}) =	25.7	ft
Area of Basin Floor (A_{FLOOR}) =	2,045	ft^2
Volume of Basin Floor (V_{FLOOR}) =	290	ft^3
Depth of Main Basin (H_{MAIN}) =	6.82	ft
Length of Main Basin (L_{MAIN}) =	134.2	ft
Width of Main Basin (W_{MAIN}) =	80.3	ft
Area of Main Basin (A_{MAIN}) =	10,766	ft^2
Volume of Main Basin (V_{MAIN}) =	39,789	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.921**	acre-feet

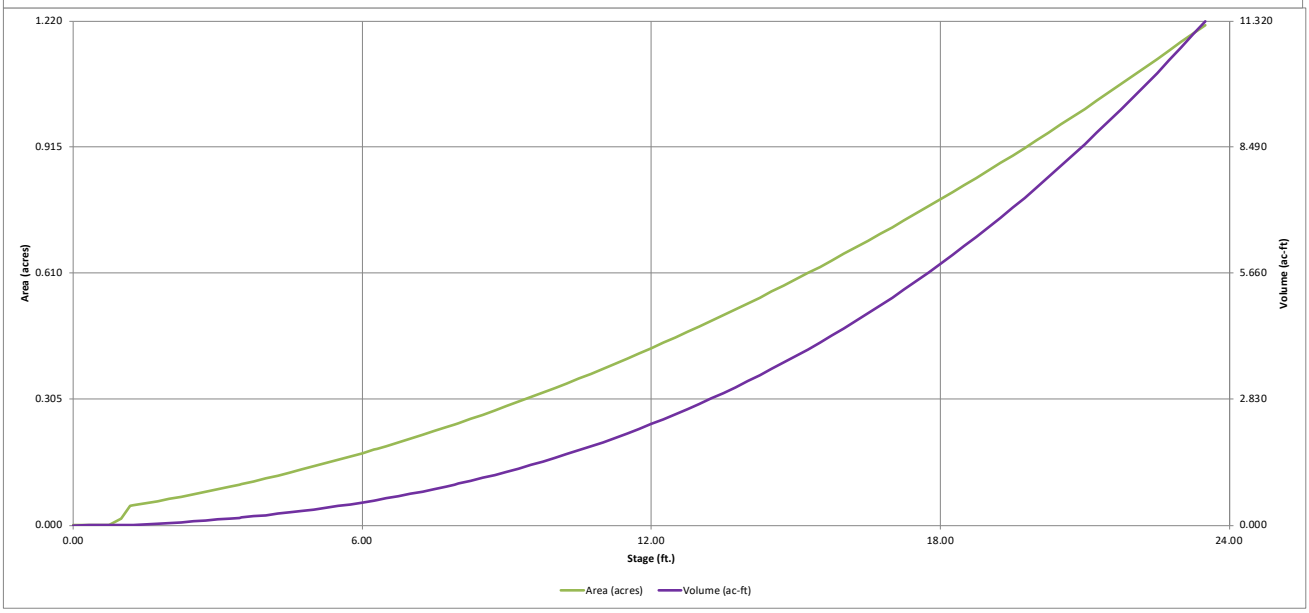
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		8.2	8.2	67		0.002		
ISV	0.33		8.2	8.2	67		0.002	22	0.001
	0.50		8.2	8.2	67		0.002	34	0.001
	0.75		8.2	8.2	67		0.002	50	0.001
	1.00		42.9	16.7	716		0.016	114	0.003
Floor	1.18		79.6	25.7	2,045		0.047	352	0.008
	1.25		80.2	26.3	2,104		0.048	498	0.011
	1.50		82.2	28.3	2,321		0.053	1,051	0.024
	1.75		84.2	30.3	2,546		0.058	1,659	0.038
	2.00		86.2	32.3	2,778		0.064	2,324	0.053
	2.25		88.2	34.3	3,019		0.069	3,049	0.070
	2.50		90.2	36.3	3,268		0.075	3,834	0.088
	2.75		92.2	38.3	3,525		0.081	4,683	0.108
	3.00		94.2	40.3	3,790		0.087	5,597	0.128
	3.25		96.2	42.3	4,062		0.093	6,579	0.151
Zone 1 (WQCV)	3.45		97.8	43.9	4,286		0.098	7,414	0.170
	3.50		98.2	44.3	4,343		0.100	7,629	0.175
	3.75		100.2	46.3	4,632		0.106	8,751	0.201
	4.00		102.2	48.3	4,929		0.113	9,946	0.228
	4.25		104.2	50.3	5,234		0.120	11,216	0.257
	4.50		106.2	52.3	5,546		0.127	12,564	0.288
	4.75		108.2	54.3	5,867		0.135	13,990	0.321
	5.00		110.2	56.3	6,196		0.142	15,498	0.356
	5.25		112.2	58.3	6,533		0.150	17,089	0.392
	5.50		114.2	60.3	6,878		0.158	18,765	0.431
	5.75		116.2	62.3	7,231		0.166	20,528	0.471
	6.00		118.2	64.3	7,591		0.174	22,381	0.514
	6.25		120.2	66.3	7,960		0.183	24,325	0.558
Zone 2 (EURV)	6.31		120.6	66.7	8,050		0.185	24,805	0.569
	6.50		122.2	68.3	8,337		0.191	26,362	0.605
	6.75		124.2	70.3	8,722		0.200	28,494	0.654
	7.00		126.2	72.3	9,115		0.209	30,723	0.705
	7.25		128.2	74.3	9,515		0.218	33,052	0.759
	7.50		130.2	76.3	9,924		0.228	35,481	0.815
	7.75		132.2	78.3	10,341		0.237	38,014	0.873
Zone 3 (100-year)	7.92		133.5	79.6	10,629		0.244	39,797	0.914
	8.00		134.2	80.3	10,766		0.247	40,653	0.933
	8.25		136.2	82.3	11,199		0.257	43,398	0.996
	8.50		138.2	84.3	11,639		0.267	46,252	1.062
	8.75		140.2	86.3	12,088		0.278	49,218	1.130
	9.00		142.2	88.3	12,545		0.288	52,297	1.201
	9.25		144.2	90.3	13,010		0.299	55,491	1.274
	9.50		146.2	92.3	13,483		0.310	58,803	1.350
	9.75		148.2	94.3	13,963		0.321	62,233	1.429
	10.00		150.2	96.3	14,452		0.332	65,785	1.510
	10.25		152.2	98.3	14,949		0.343	69,460	1.595
	10.50		154.2	100.3	15,454		0.355	73,260	1.682
	10.75		156.2	102.3	15,967		0.367	77,188	1.772
	11.00		158.2	104.3	16,487		0.378	81,244	1.865
	11.25		160.2	106.3	17,016		0.391	85,432	1.961
	11.50		162.2	108.3	17,553		0.403	89,753	2.060
	11.75		164.2	110.3	18,098		0.415	94,209	2.163
	12.00		166.2	112.3	18,651		0.428	98,803	2.268
	12.25		168.2	114.3	19,211		0.441	103,535	2.377
	12.50		170.2	116.3	19,780		0.454	108,409	2.489
	12.75		172.2	118.3	20,357		0.467	113,426	2.604
	13.00		174.2	120.3	20,942		0.481	118,588	2.722
	13.25		176.2	122.3	21,535		0.494	123,897	2.844
	13.50		178.2	124.3	22,135		0.508	129,356	2.970
	13.75		180.2	126.3	22,744		0.522	134,966	3.098
	14.00		182.2	128.3	23,361		0.536	140,729	3.231
	14.25		184.2	130.3	23,986		0.551	146,647	3.367
	14.50		186.2	132.3	24,619		0.565	152,722	3.506
	14.75		188.2	134.3	25,259		0.580	158,957	3.649
	15.00		190.2	136.3	25,908		0.595	165,353	3.796
	15.25		192.2	138.3	26,565		0.610	171,912	3.947
	15.50		194.2	140.3	27,230		0.625	178,636	4.101
	15.75		196.2	142.3	27,903		0.641	185,527	4.259
	16.00		198.2	144.3	28,583		0.656	192,588	4.421
	16.25		200.2	146.3	29,272		0.672	199,820	4.587
	16.50		202.2	148.3	29,969		0.688	207,225	4.757
	16.75		204.2	150.3	30,674		0.704	214,805	4.931
	17.00		206.2	152.3	31,387		0.721	222,562	5.109
	17.25		208.2	154.3	32,107		0.737	230,499	5.292
	17.50		210.2	156.3	32,836		0.754	238,617	5.478
	17.75		212.2	158.3	33,573		0.771	246,918	5.668
	18.00		214.2	160.3	34,318		0.788	255,404	5.863
	18.25		216.2	162.3	35,071		0.805	264,077	6.062
	18.50		218.2	164.3	35,831		0.823	272,940	6.266
	18.75		220.2	166.3	36,600		0.840	281,994	6.474
	19.00		222.2	168.3	37,377		0.858	291,241	6.686
	19.25		224.2	170.3	38,162		0.876	300,683	6.903
	19.50		226.2	172.3	38,955		0.894	310,322	7.124
	19.75		228.2	174.3	39,756		0.913	320,161	7.350
	20.00		230.2	176.3	40,564		0.931	330,201	7.580
	20.25		232.2	178.3	41,381		0.950	340,444	7.816
	20.50		234.2	180.3	42,206		0.969	350,892	8.055
	20.75		236.2	182.3	43,039		0.988	361,548	8.300
	21.00		238.2	184.3	43,880		1.007	372,412	8.549
	21.25		240.2	186.3	44,728		1.027	383,488	8.804
	21.50		242.2	188.3	45,585		1.046	394,777	9.063
	21.75		244.2	190.3	46,450		1.066	406,281	9.327
	22.00		246.2	192.3	47,323		1.086	418,003	9.596
	22.25		248.2	194.3	48,204		1.107	429,943	9.870
	22.50		250.2	196.3	49,092		1.127	442,105	10.149
	22.75		252.2	198.3	49,989		1.148	454,490	10.434
	23.00		254.2	200.3	50,894		1.168	467,100	10.723
	23.25		256.2	202.3	51,807		1.189	479,938	11.018
	23.50		258.2	204.3	52,728		1.210	493,004	11.318

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



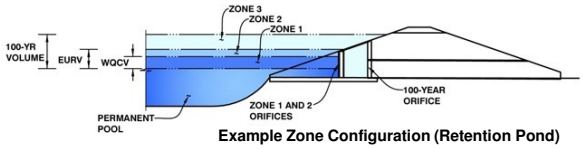


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: BRADLEY HEIGHTS: MKJCC POND 11 - SEE BRADLEY HEIGHTS EAST FDR FOR FILINGS 3&4 FOR UP TO DATE VERSION

Basin ID: MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.45	0.169	Orifice Plate
Zone 2 (EURV)	6.31	0.398	Circular Orifice
Zone 3 (100-year)	7.92	0.345	Weir&Pipe (Restrict)
Total (all zones)		0.912	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.028E-03	ft^2
Depth at top of Zone using Orifice Plate =	3.45	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.58	sq. inches (diameter = 7/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.15	2.30					
Orifice Area (sq. inches)	0.58	0.58	0.58					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.01	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	6.31	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.04	N/A	feet
Vertical Orifice Diameter =	1.02	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.31	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.31	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.67	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.30	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	3.15	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.82	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.41	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.52	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.83 feet
Spillway Crest Length =	9.00	feet	Stage at Top of Freeboard =	9.33 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.30 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.30 acre-ft

Calculated Parameters for Spillway

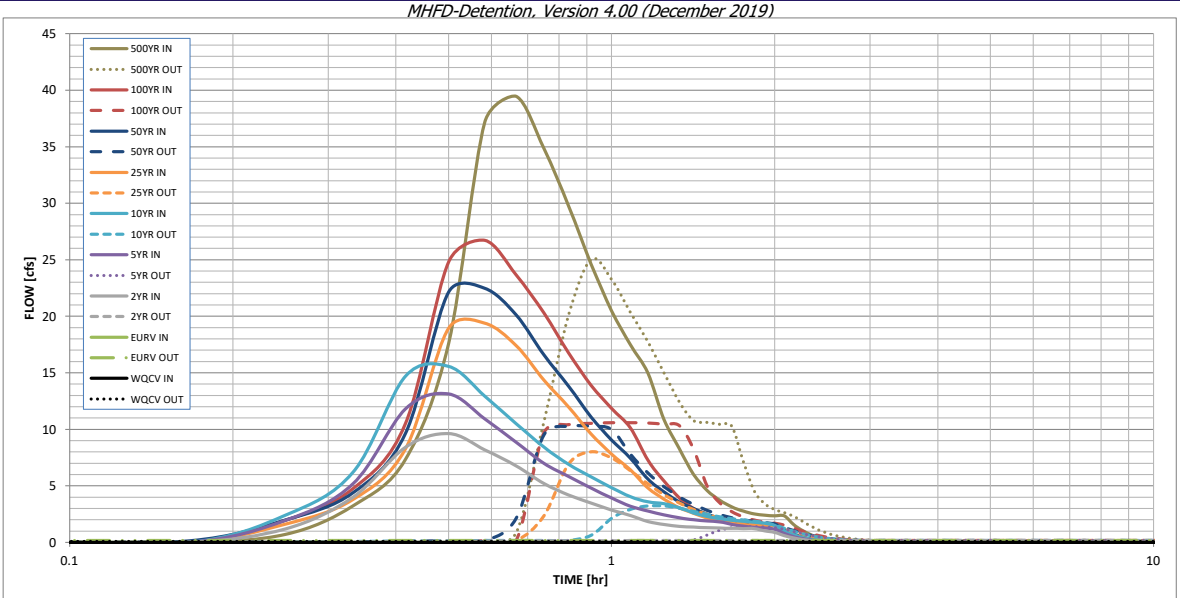
Routed Hydrograph Results

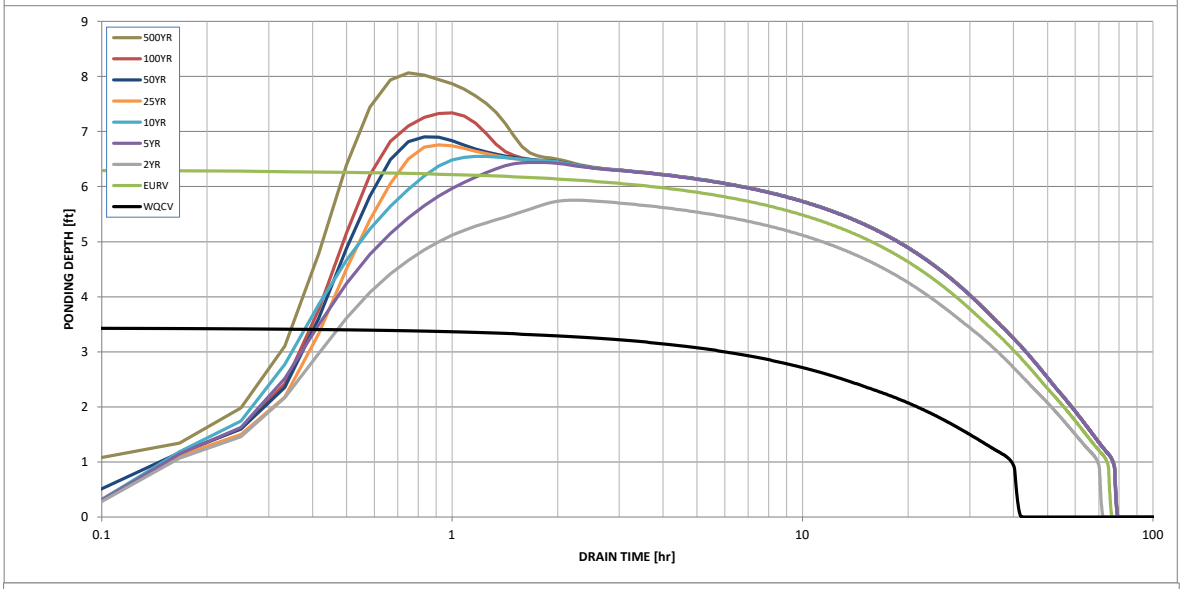
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

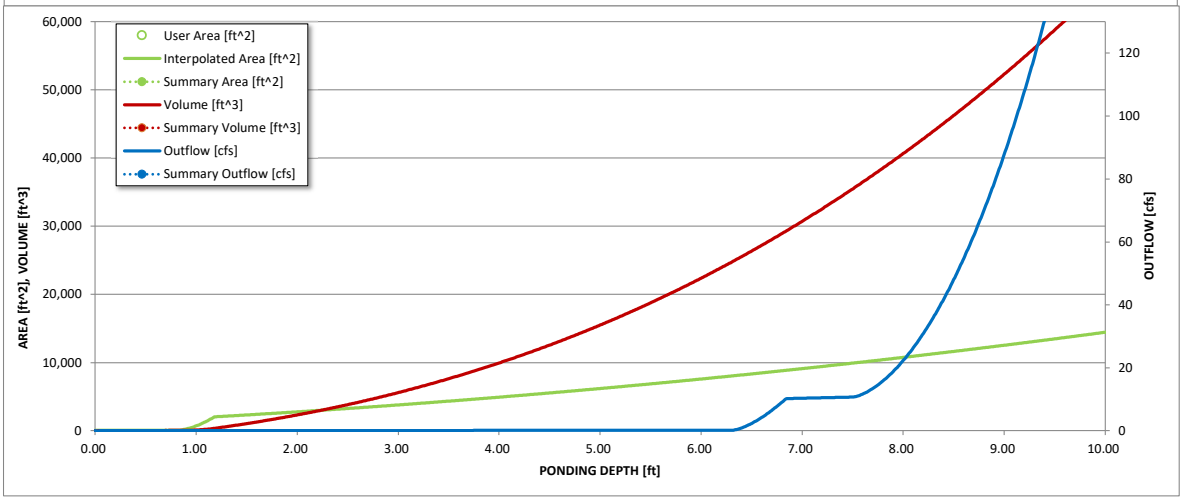
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.55
CUHP Runoff Volume (acre-ft) =	0.169	0.568	0.497	0.678	0.832	1.020	1.183	1.380	2.072
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.497	0.678	0.832	1.020	1.183	1.380	2.072
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.0	2.8	4.2	7.5	9.3	11.7	19.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.13	0.35	0.53	0.93	1.17	1.46	2.43
Peak Inflow Q (cfs) =	N/A	N/A	9.6	13.1	15.6	19.4	22.5	26.7	39.5
Peak Outflow Q (cfs) =	0.1	0.2	0.2	1.4	3.2	8.0	10.3	10.6	25.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.8	1.1	1.1	0.9	1.3
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.5	1.2	1.6	1.7	1.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	63	69	67	65	64	62	56
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	68	74	74	73	72	71	69
Maximum Ponding Depth (ft) =	3.44	6.31	5.75	6.44	6.55	6.76	6.90	7.34	8.07
Area at Maximum Ponding Depth (acres) =	0.10	0.18	0.17	0.19	0.19	0.20	0.21	0.22	0.25
Maximum Volume Stored (acre-ft) =	0.169	0.569	0.471	0.592	0.615	0.656	0.685	0.779	0.948

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)





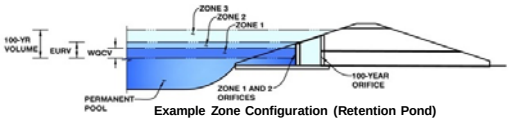


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: West Fork of Jimmy Camp Creek: East Pond(located in Sub-basin M)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	160.87	acres	
Watershed Length =	3,742	ft	
Watershed Slope =	0.030	ft/ft	
Watershed Imperviousness =	44.95%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	87.0%	percent	
Percentage Hydrologic Soil Groups C/D =	13.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	2.585	acre-feet	
Excess Urban Runoff Volume (EURV) =	7.550	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	6.146	acre-feet	
5-yr Runoff Volume (P1 = 1.5 in.) =	8.580	acre-feet	
10-yr Runoff Volume (P1 = 1.75 in.) =	11.782	acre-feet	
25-yr Runoff Volume (P1 = 2 in.) =	16.952	acre-feet	
50-yr Runoff Volume (P1 = 2.25 in.) =	20.524	acre-feet	
100-yr Runoff Volume (P1 = 2.52 in.) =	25.177	acre-feet	
500-yr Runoff Volume (P1 = 3.55 in.) =	39.142	acre-feet	
Approximate 2-yr Detention Volume =	5.750	acre-feet	
Approximate 5-yr Detention Volume =	8.061	acre-feet	
Approximate 10-yr Detention Volume =	10.622	acre-feet	
Approximate 25-yr Detention Volume =	11.715	acre-feet	
Approximate 50-yr Detention Volume =	12.257	acre-feet	
Approximate 100-yr Detention Volume =	13.894	acre-feet	

Optional User Override 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.55	inches

Stage-Storage Calculation

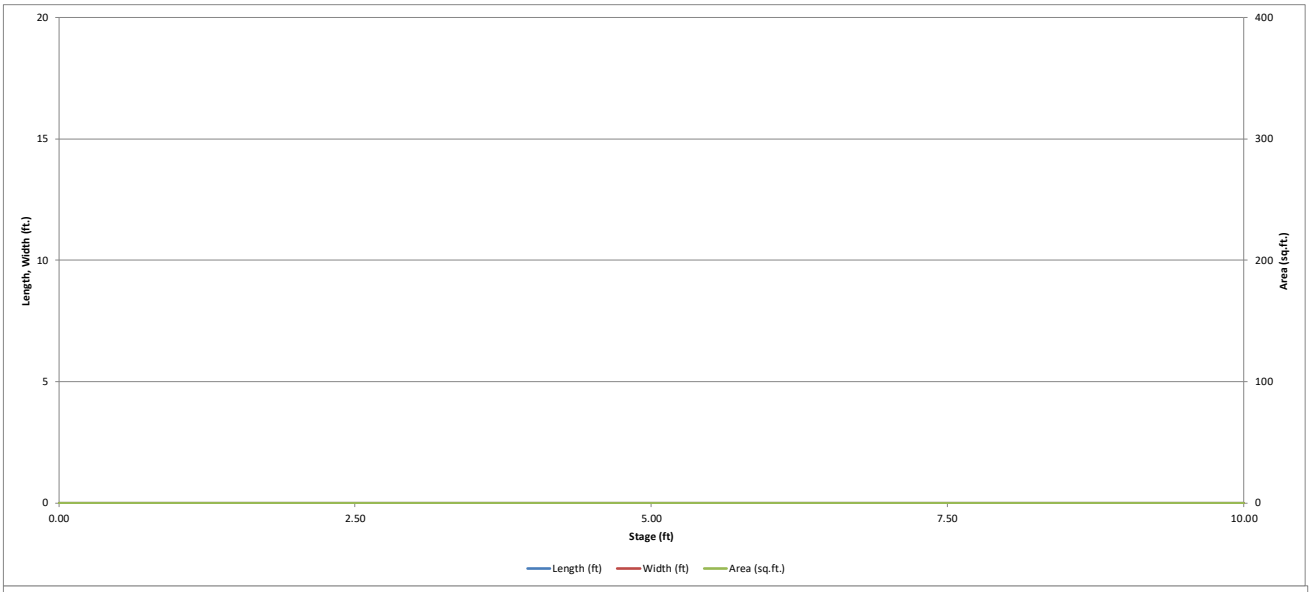
Zone 1 Volume (WQCV) =	2.585	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.965	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.343	acre-feet
Total Detention Basin Volume =	13.894	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

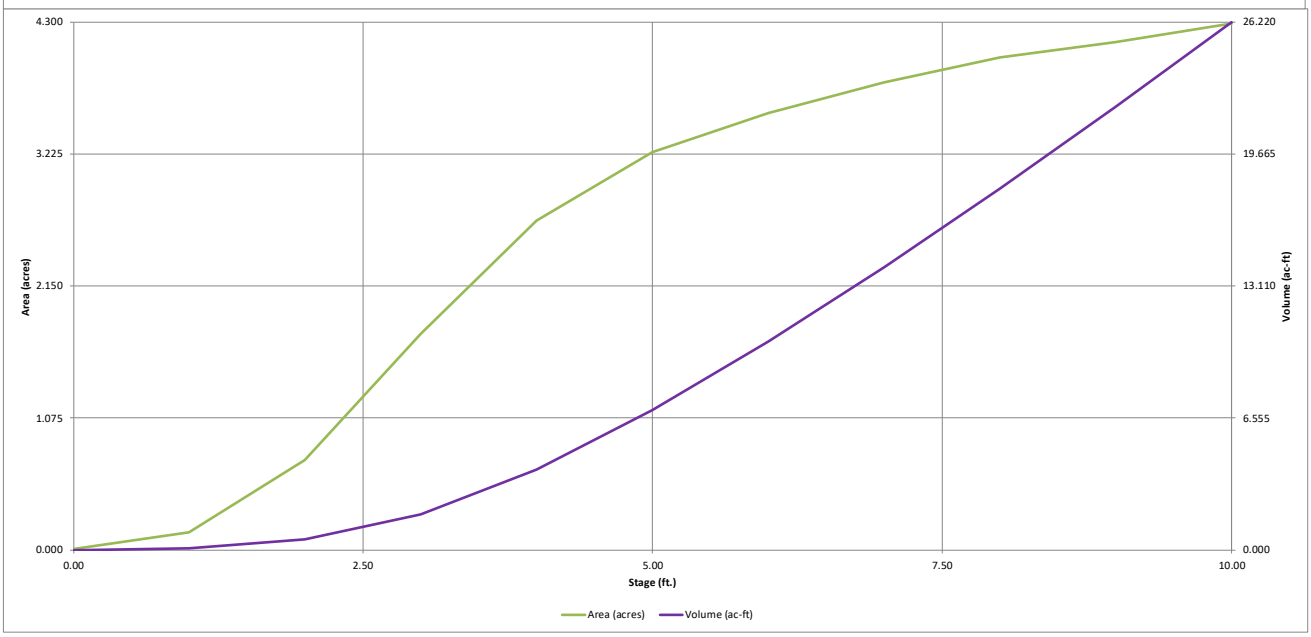
Depth Increment = 1 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	443	0.010		
5817	--	1.00	--	--	--	6,211	0.143	3,265	0.075
5818	--	2.00	--	--	--	31,782	0.730	22,007	0.505
5819	--	3.00	--	--	--	76,551	1.757	76,490	1.756
5820	--	4.00	--	--	--	116,770	2.681	173,150	3.975
5821	--	5.00	--	--	--	141,034	3.238	302,052	6.934
5822	--	6.00	--	--	--	154,951	3.557	450,045	10.332
5823	--	7.00	--	--	--	165,754	3.805	610,397	14.013
5824	--	8.00	--	--	--	174,708	4.011	780,628	17.921
5825	--	9.00	--	--	--	180,233	4.138	958,098	21.995
5826	--	10.04	--	--	--	186,799	4.288	1,141,614	26.208

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



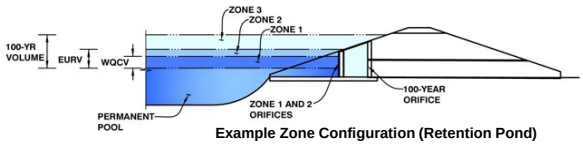


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: West Fork of Jimmy Camp Creek-East Pond. (Full Buildout with SWMM Hydrographs-PDR Amendment)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.33	2.371	Orifice Plate
Zone 2 (EURV)	5.00	4.554	Rectangular Orifice
Zone 3 (100-year)	6.67	5.818	Weir&Pipe (Restrict)
		12.744	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area CHECK CELLS AB84:BE84	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.33	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00							
Orifice Area (sq. inches)	32.50							

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	5.22	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	2.33	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.58	N/A	feet
Vertical Orifice Height =	14.00	N/A	inches				
Vertical Orifice Width =	24.00		inches				

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

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.94	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.94	N/A	feet
Overflow Weir Front Edge Length =	14.50	N/A	feet	Over Flow Weir Slope Length =	9.50	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	9.23	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	9.50	N/A	feet	Overflow Grate Open Area w/o Debris =	103.31	N/A	ft^2
Overflow Grate Open Area % =	75%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	56.82	N/A	ft^2
Debris Clogging % =	45%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	11.19	N/A	ft^2
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	1.80	N/A	feet
Restrictor Plate Height Above Pipe Invert =	40.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.02	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.02	feet
Spillway Crest Length =	136.00	feet	Stage at Top of Freeboard =	10.04	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.29	acres
Freeboard above Max Water Surface =	1.00	feet			

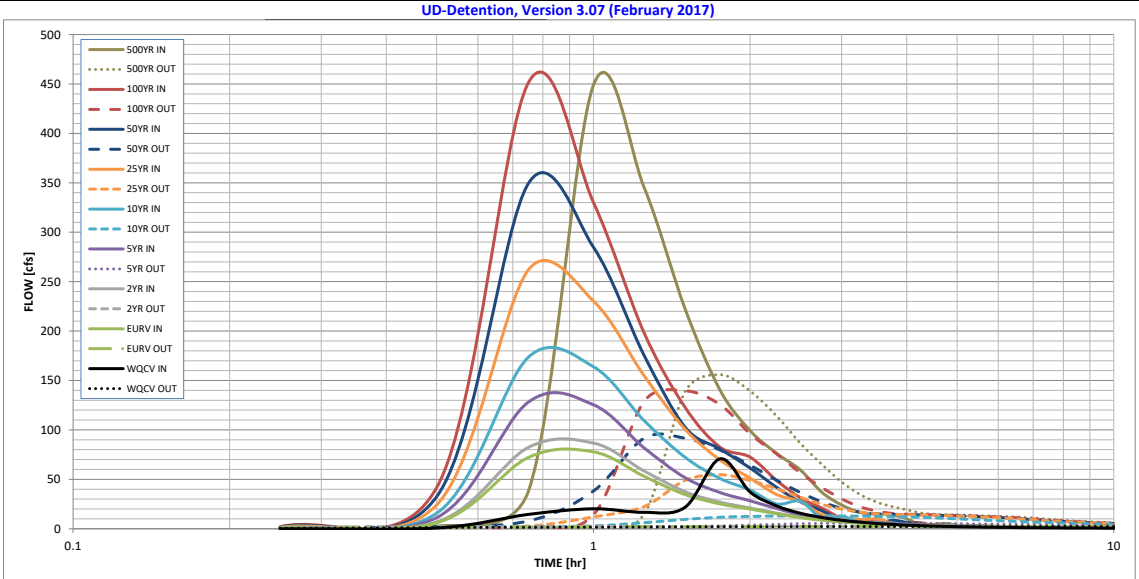
Calculated Parameters for Spillway

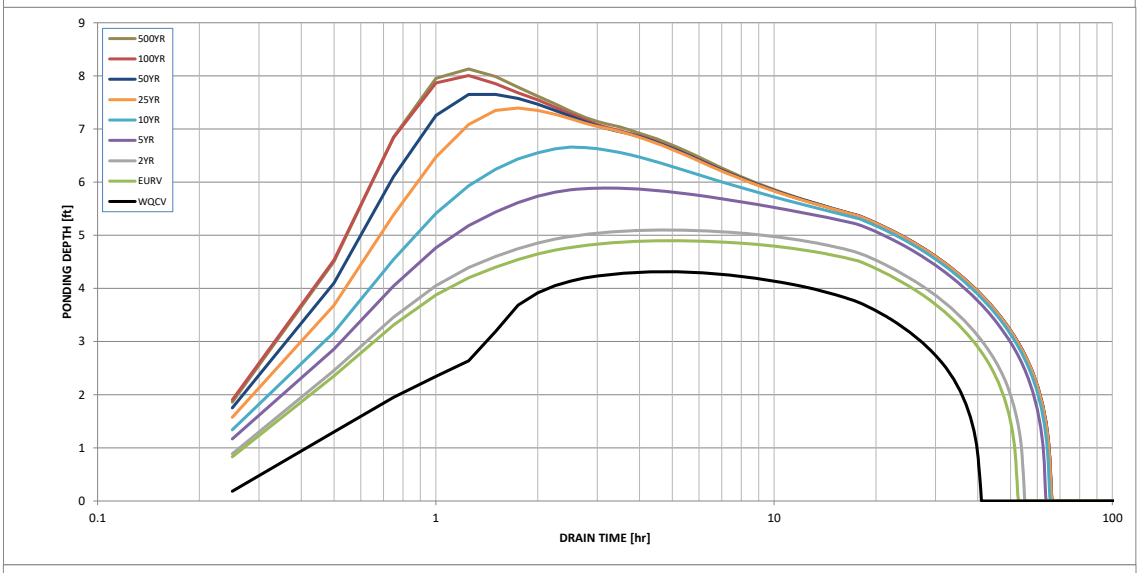
Routed Hydrograph Results

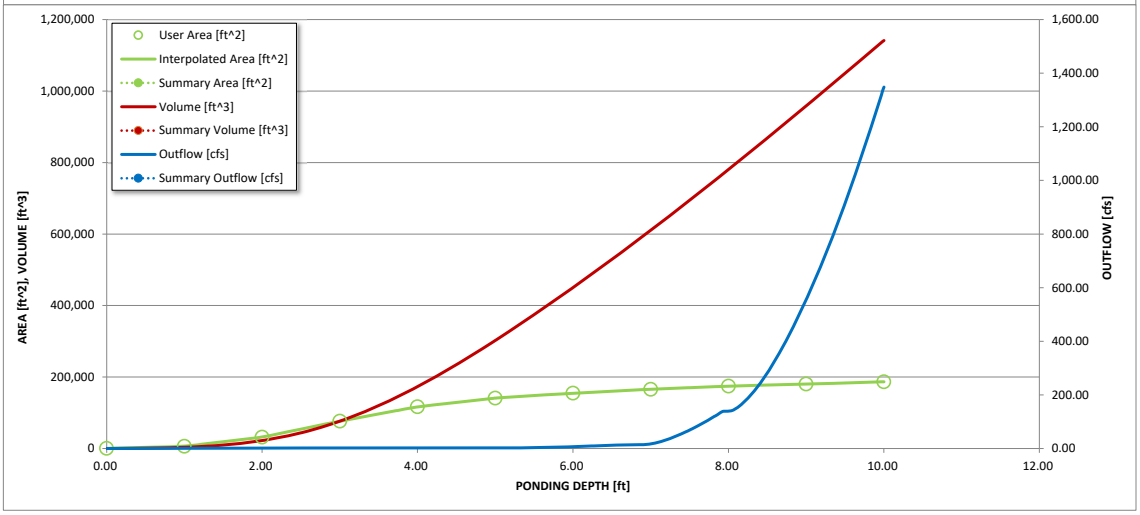
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.55
Calculated Runoff Volume (acre-ft) =	2.371	6.925	5.637	7.870	10.807	15.550	18.826	23.094	35.904
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	6.426	8.837	9.369	12.837	16.730	22.692	26.955	31.615	33.910
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.04	0.23	0.71	0.97	1.30	2.16
Predevelopment Peak Q (cfs) =	0.0	0.0	1.9	5.3	33.8	104.4	143.4	191.8	319.3
Peak Inflow Q (cfs) =	70.8	77.8	86.7	128.3	173.8	262.1	349.6	451.5	448.9
Peak Outflow Q (cfs) =	2.3	2.4	2.5	5.8	13.2	54.8	91.7	139.5	155.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.4	0.5	0.6	0.7	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	0.7	1.2	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	50	52	60	61	60	59	58	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	54	62	63	64	63	63	63
Maximum Ponding Depth (ft) =	4.32	4.90	5.10	5.89	6.66	7.40	7.65	8.01	8.13
Area at Maximum Ponding Depth (acres) =	2.85	3.18	3.27	3.52	3.72	3.89	3.94	4.01	4.03
Maximum Volume Stored (acre-ft) =	4.833	6.581	7.227	9.907	12.733	15.512	16.530	17.921	18.443

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

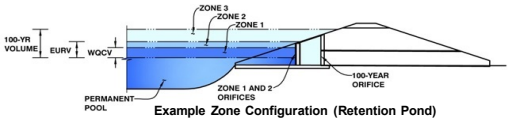
User-Defined	SOURCE	USER	USER	USER	USER	USER	USER	USER	USER	USER
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
15.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:15:00	0.05	0.16	0.20	0.50	0.84	1.46	1.96	1.98	2.59
Hydrograph	0:30:00	0.86	6.19	6.90	11.37	15.89	24.35	32.72	41.96	38.17
Constant	0:45:00	14.59	72.22	82.41	128.26	173.76	262.12	349.57	451.53	448.91
1.035	1:00:00	20.26	77.83	86.71	125.47	164.01	230.42	284.89	330.27	346.20
	1:15:00	16.66	53.21	58.69	82.08	109.73	155.23	176.00	198.88	222.45
	1:30:00	21.81	34.61	37.49	51.69	72.34	100.66	102.80	122.84	140.70
	1:45:00	70.78	25.32	27.05	36.78	50.97	69.72	80.85	82.80	99.35
	2:00:00	37.20	20.01	21.02	28.35	39.21	51.27	61.54	72.60	76.35
	2:15:00	23.23	15.22	15.91	20.49	25.16	34.72	41.92	48.89	59.38
	2:30:00	15.71	11.27	11.69	14.20	27.85	27.48	27.15	31.29	36.74
	2:45:00	11.39	8.76	9.00	11.68	10.26	14.46	18.19	20.89	24.07
	3:00:00	8.61	7.04	7.18	7.32	12.43	11.79	8.43	10.54	16.48
	3:15:00	6.74	5.83	5.91	6.76	6.67	9.19	9.45	6.82	14.94
	3:30:00	5.43	4.94	4.97	5.63	6.37	10.11	5.00	9.65	13.91
	3:45:00	4.47	4.28	4.28	4.80	5.66	5.64	8.57	4.66	10.21
	4:00:00	3.76	3.76	3.73	4.18	4.47	3.31	6.50	5.93	3.86
	4:15:00	3.21	3.35	3.31	3.69	3.92	4.26	4.80	6.20	4.43
	4:30:00	2.78	3.02	2.97	3.31	3.49	3.69	3.85	3.32	5.36
	4:45:00	2.44	2.76	2.70	3.00	3.14	3.30	3.41	3.48	3.59
	5:00:00	2.16	2.54	2.48	2.75	2.87	3.00	3.08	3.16	3.26
	5:15:00	1.94	2.36	2.29	2.55	2.65	2.75	2.82	2.88	2.96
	5:30:00	1.76	2.21	2.13	2.37	2.46	2.55	2.61	2.66	2.71
	5:45:00	1.60	2.08	1.93	2.23	2.31	2.38	2.43	2.48	2.50
	6:00:00	1.46	1.99	1.85	2.06	2.13	2.24	2.28	2.32	2.33
	6:15:00	1.44	1.98	2.27	1.97	2.04	2.09	2.24	2.33	2.32
	6:30:00	1.26	1.62	1.81	1.90	1.85	2.10	1.97	2.12	1.98
	6:45:00	1.20	2.07	1.45	1.86	1.56	1.94	2.21	1.58	1.95
	7:00:00	1.09	1.47	1.55	1.65	2.02	1.87	1.80	2.37	1.80
	7:15:00	1.05	1.79	1.45	1.80	1.76	1.81	1.72	1.59	1.71
	7:30:00	0.99	1.55	1.32	1.91	1.97	1.75	1.72	1.39	1.94
	7:45:00	0.95	1.50	1.35	1.34	1.83	1.48	1.66	1.65	1.63
	8:00:00	0.90	1.43	1.38	1.37	1.61	1.64	1.46	1.63	1.32
	8:15:00	0.86	1.54	1.37	1.42	1.41	1.56	1.87	1.32	1.43
	8:30:00	0.83	1.54	1.33	1.60	1.51	1.34	1.75	1.29	1.45
	8:45:00	0.80	1.32	1.14	1.61	1.36	1.51	1.64	1.47	1.45
	9:00:00	0.77	1.34	1.21	1.73	1.35	1.46	1.37	1.51	1.31
	9:15:00	0.75	1.36	1.02	1.35	1.46	1.59	1.66	1.65	1.50
	9:30:00	0.73	1.28	1.20	1.35	1.47	1.42	1.27	1.28	1.38
	9:45:00	0.71	1.23	1.15	1.16	1.41	1.34	1.47	1.33	1.35
	10:00:00	0.69	1.23	1.12	1.31	1.24	1.31	1.52	1.35	1.29
	10:15:00	0.67	1.21	1.10	1.27	1.13	1.24	1.39	1.47	1.37
	10:30:00	0.66	1.20	1.08	1.29	1.20	1.33	1.39	1.34	1.45
	10:45:00	0.64	1.18	1.06	1.15	1.29	1.23	1.44	1.25	1.17
	11:00:00	0.63	1.16	1.05	1.23	1.26	1.29	1.30	1.15	1.15
	11:15:00	0.61	1.14	1.03	1.19	1.24	1.24	1.29	1.30	1.10
	11:30:00	0.60	1.13	1.02	1.20	1.22	1.24	1.24	1.25	1.16
	11:45:00	0.59	1.12	1.00	1.18	1.21	1.23	1.23	1.23	1.16
	12:00:00	0.58	1.10	0.98	1.16	1.20	1.21	1.22	1.22	1.15
	12:15:00	0.57	1.09	0.97	1.15	1.18	1.20	1.20	1.21	1.13
	12:30:00	0.56	1.08	0.96	1.14	1.17	1.19	1.19	1.19	1.12
	12:45:00	0.56	1.07	0.94	1.13	1.16	1.17	1.18	1.18	1.11
	13:00:00	0.55	1.05	0.93	1.11	1.15	1.16	1.16	1.17	1.09
	13:15:00	0.54	1.04	0.92	1.10	1.13	1.15	1.15	1.16	1.08
	13:30:00	0.53	1.03	0.91	1.09	1.12	1.14	1.14	1.15	1.07
	13:45:00	0.53	1.02	0.89	1.08	1.11	1.13	1.13	1.14	1.06
	14:00:00	0.52	1.01	0.88	1.07	1.10	1.12	1.12	1.13	1.05
	14:15:00	0.52	1.00	0.87	1.06	1.09	1.11	1.11	1.12	1.04
	14:30:00	0.51	0.99	0.86	1.05	1.08	1.10	1.10	1.10	1.03
	14:45:00	0.51	0.98	0.85	1.04	1.07	1.09	1.09	1.09	1.02
	15:00:00	0.50	0.97	0.84	1.03	1.06	1.08	1.08	1.08	1.01
	15:15:00	0.50	0.96	0.83	1.02	1.06	1.07	1.07	1.07	1.00
	15:30:00	0.49	0.95	0.82	1.01	1.05	1.06	1.06	1.06	0.99
	15:45:00	0.49	0.95	0.82	1.01	1.04	1.05	1.06	1.05	0.98
	16:00:00	0.48	0.93	0.81	1.00	1.03	1.05	1.05	1.05	0.98
	16:15:00	0.48	0.92	0.80	0.99	1.02	1.04	1.04	1.04	0.97
	16:30:00	0.48	0.92	0.79	0.98	1.01	1.03	1.03	1.03	0.96
	16:45:00	0.47	0.91	0.78	0.97	1.01	1.02	1.02	1.02	0.95
	17:00:00	0.47	0.90	0.77	0.96	1.00	1.01	1.02	1.02	0.94
	17:15:00	0.47	0.89	0.76	0.96	0.99	1.01	1.01	1.01	0.94
	17:30:00	0.46	0.88	0.75	0.95	0.98	1.00	1.00	1.00	0.93
	17:45:00	0.46	0.88	0.74	0.94	0.97	0.99	0.99	0.99	0.92
	18:00:00	0.46	0.86	0.73	0.93	0.97	0.98	0.98	0.99	0.91

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge - Filing No. 4

Basin ID: Northeast Pond: Marksheffel Tributary to Jimmy Camp Creek: Sub-basin L



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	9.09	acres	
Watershed Length =	1,058	ft	
Watershed Slope =	0.060	ft/ft	
Watershed Imperviousness =	59.05%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	100.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	0.177	acre-feet	
Excess Urban Runoff Volume (EURV) =	0.582	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	0.477	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.642	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.840	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.113	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.307	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.561	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.55 in.) =	2.364	acre-feet	3.55 inches
Approximate 2-yr Detention Volume =	0.446	acre-feet	
Approximate 5-yr Detention Volume =	0.603	acre-feet	
Approximate 10-yr Detention Volume =	0.779	acre-feet	
Approximate 25-yr Detention Volume =	0.844	acre-feet	
Approximate 50-yr Detention Volume =	0.880	acre-feet	
Approximate 100-yr Detention Volume =	0.962	acre-feet	

Optional User Override 1-hr Precipitation

Stage-Storage Calculation

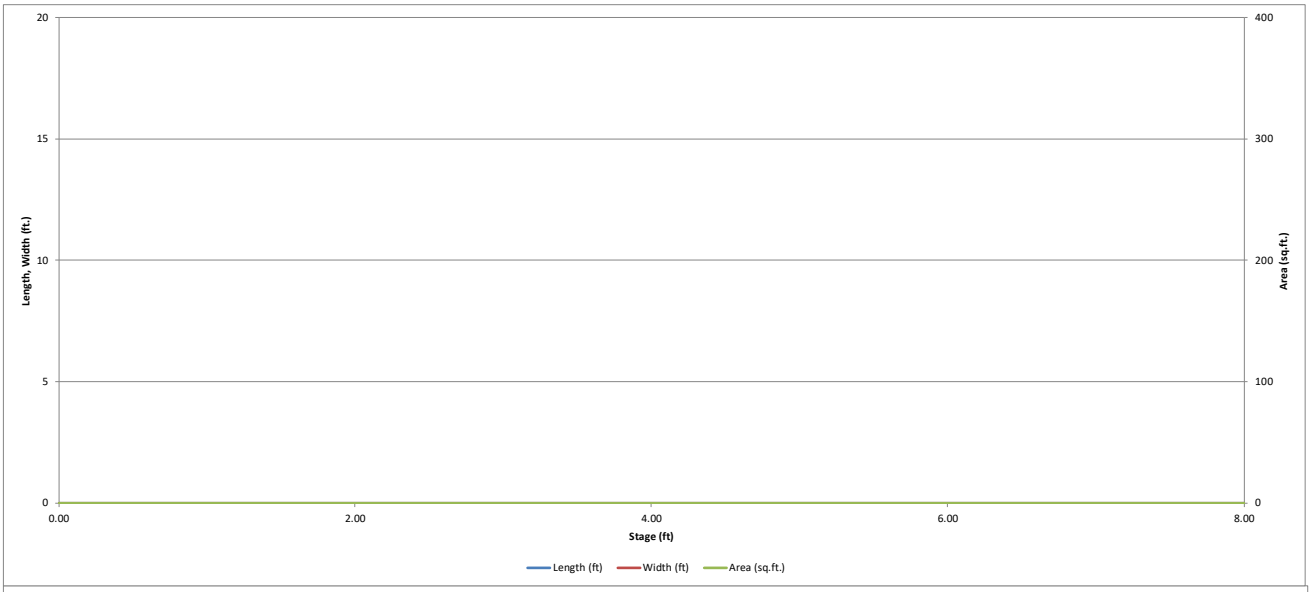
Zone 1 Volume (WQCV) =	0.177	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.405	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.381	acre-feet
Total Detention Basin Volume =	0.962	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

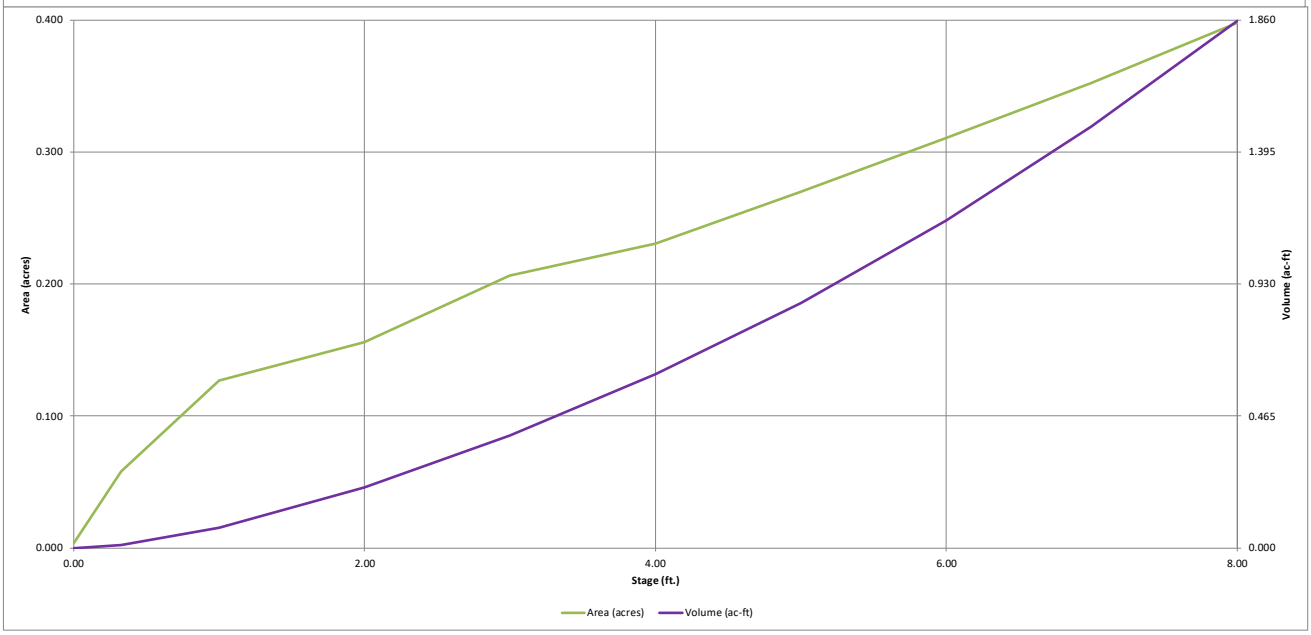
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	150	0.003		
5879.01	--	0.33	--	--	--	2,507	0.058	414	0.009
5880	--	1.00	--	--	--	5,513	0.127	3,070	0.070
	--	2.00	--	--	--	6,788	0.156	9,208	0.211
	--	3.00	--	--	--	8,990	0.206	17,165	0.394
	--	4.00	--	--	--	10,035	0.230	26,677	0.612
	--	5.00	--	--	--	11,748	0.270	37,569	0.862
	--	6.00	--	--	--	13,514	0.310	50,200	1.152
	--	7.00	--	--	--	15,331	0.352	64,622	1.484
5887	--	8.00	--	--	--	17,330	0.398	80,952	1.858
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



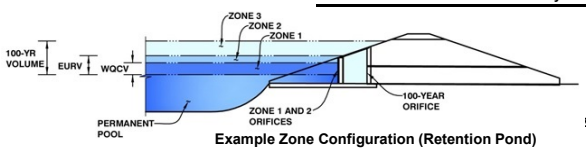


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge - Filing No. 4

Basin ID: Northeast Pond: Marksheffel Tributary to Jimmy Camp Creek: Sub-basin L



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.77	0.177	Orifice Plate
Zone 2 (EURV)	3.87	0.405	Circular Orifice
Zone 3 (100-year)	5.37	0.381	Weir&Pipe (Restrict)
		0.962	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	7.639E-03	ft^2
Depth at top of Zone using Orifice Plate =	1.77	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.10	sq. inches (diameter = 1-3/16 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.59	1.18					
Orifice Area (sq. inches)	1.10	1.10	1.10					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected		Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.77	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.00	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	3.87	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.02	N/A	feet
Vertical Orifice Diameter =	0.38	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.25	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Over Flow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	24.85	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.32	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	8.66	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.70	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.36	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.40	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.70	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.42	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	7.12	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.36	acres
Freeboard above Max Water Surface =	1.00	feet			

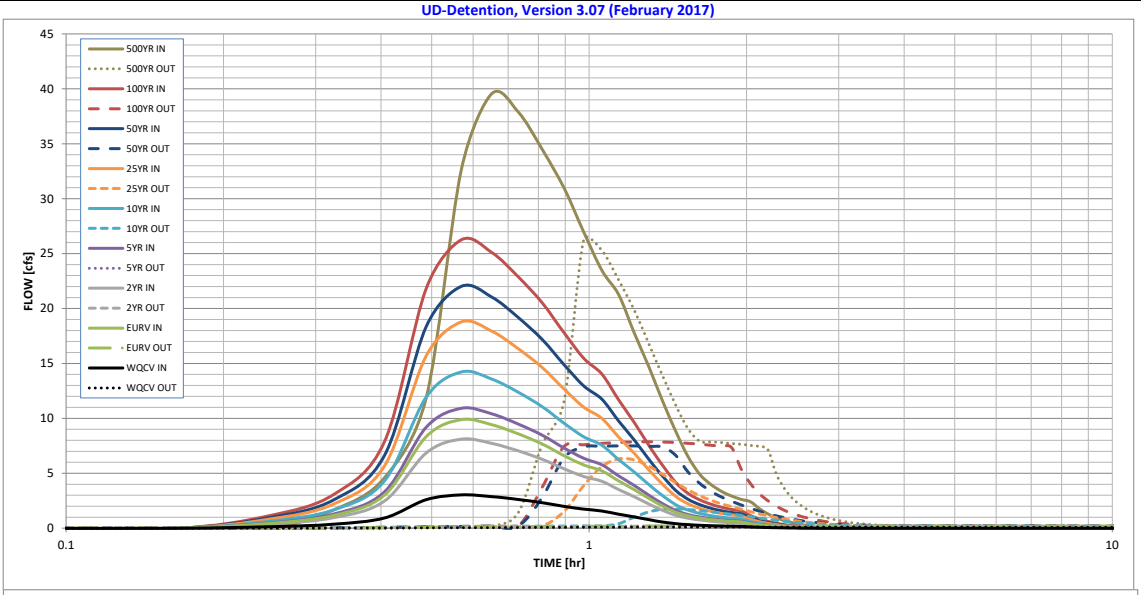
Calculated Parameters for Spillway

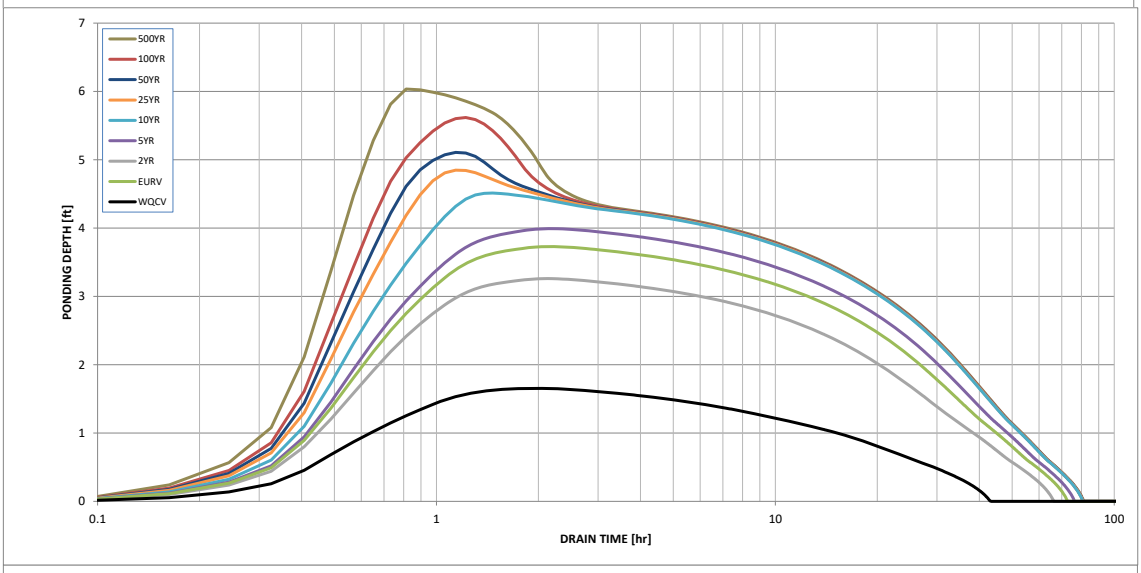
Routed Hydrograph Results

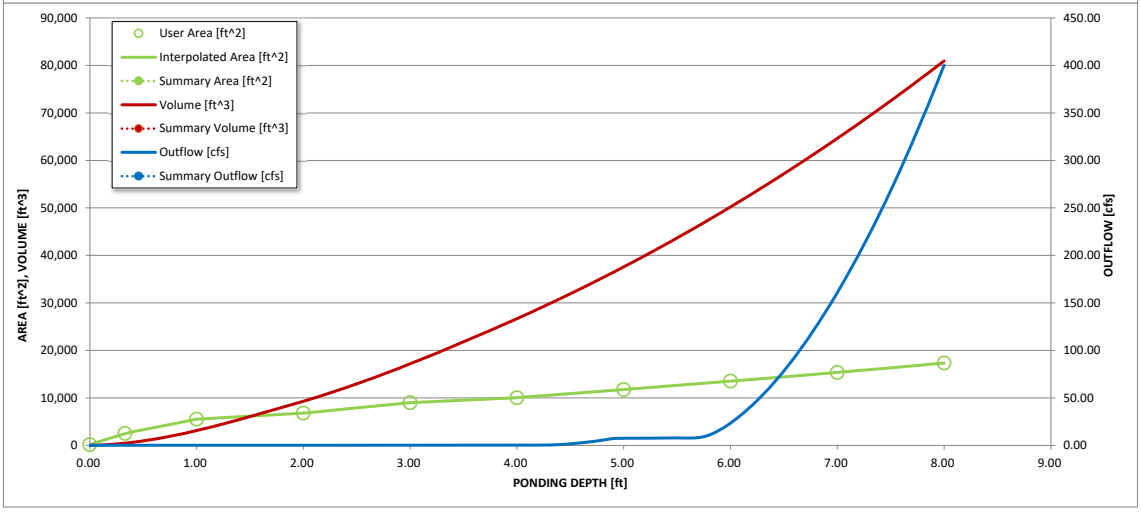
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.55
Calculated Runoff Volume (acre-ft) =	0.177	0.582	0.477	0.642	0.840	1.113	1.307	1.561	2.364
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.176	0.581	0.475	0.642	0.839	1.111	1.305	1.560	2.361
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.20	0.66	0.91	1.23	2.05
Predevelopment Peak Q (cfs) =	0.0	0.0	0.1	0.2	1.8	6.0	8.3	11.2	18.7
Peak Inflow Q (cfs) =	3.0	9.9	8.1	10.9	14.2	18.8	22.0	26.3	39.5
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	1.8	6.3	7.5	7.9	26.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	1.0	1.1	0.9	0.7	1.4
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.4	0.4	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	61	56	64	65	62	61	59	54
Time to Drain 99% of Inflow Volume (hours) =	**41**	67	62	71	74	72	71	70	67
Maximum Ponding Depth (ft) =	1.66	3.73	3.26	3.99	4.51	4.85	5.11	5.62	6.04
Area at Maximum Ponding Depth (acres) =	0.15	0.22	0.21	0.23	0.25	0.26	0.27	0.29	0.31
Maximum Volume Stored (acre-ft) =	0.160	0.551	0.449	0.610	0.735	0.820	0.890	1.035	1.162

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)





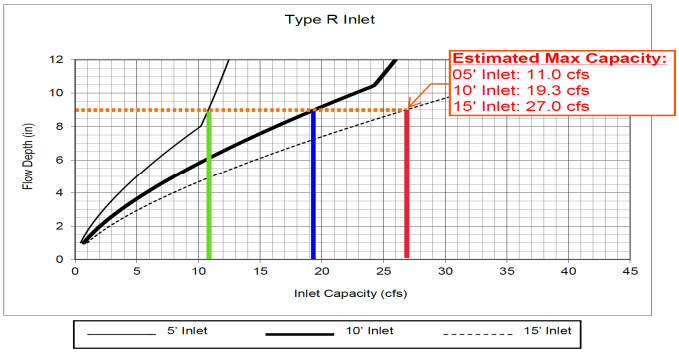


INITIAL STORM SEWER CAPACITY CALCULATIONS - MANNINGS CHANNEL FLOW METHOD					Storm Pipe													
Design Point	Notes	Max Q (Q100) Proposed	Flow Type / Capacity Analysis	Calculated Max Q for Pipe (CFS)	Percent of Pipe Channel Capacity Used	n(full)	Slope (ft/ft)	n	Pipe Diameter (ft)	Width (ft) Box Culvert Only	Pipe Depth (inches)	Optimum Flow Depth (+/- 0.94 x D)	Θ (Radians)	A (Sq. Ft.)	Wetted Perimeter (ft)	Velocity at Max Pipe Capacity
A	WESTERNMOST ENTRANCE PIPE	11.6	Channel/Adequate	19.1	61%	0.013	0.030	0.013	1.5		18	1.41	0.990	1.724	3.970	11.05
B	BETWEEN A AND C	25.3	Channel/Adequate	41.0	62%	0.013	0.030	0.013	2		24	1.88	0.990	3.065	5.293	13.39
C	BRADLEY LANDING BLVD	25.3	Channel/Adequate	44.9	56%	0.013	0.036	0.013	2		24	1.88	0.990	3.065	5.293	14.67
D	BLISS-EAST WEST	36.5	Channel/Adequate	37.2	98%	0.013	0.0075	0.013	2.5		30	2.35	0.990	4.788	6.617	7.77
D	BLISS-NORTH SOUTH	36.5	Channel/Adequate	37.5	97%	0.013	0.025	0.013	2		24	1.88	0.990	3.065	5.293	12.22
RHC1	Sump Inlet	14.0	Channel/Adequate	16.8	84%	0.013	0.005	0.013	2		24	1.88	0.990	3.065	5.293	5.47
RH2	RHC1, RHC2	17.4	Channel/Adequate	23.7	73%	0.013	0.010	0.013	2		24	1.88	0.990	3.065	5.293	7.73
BHE	BRADLEY HEIGHTS EAST POND DISCHARGE	103.1	Channel/Adequate	138.1	75%	0.013	0.017	0.013	3.5		42	3.29	0.990	9.385	9.263	14.72
E	COMBINED BRADLEY HEIGHTS EAST POND DISCHARGE AND DP D	139.6	Pressure	105.3	132%	0.013	0.010	0.013	3.5		42	3.29	0.990	9.385	9.263	11.22
BL-1	SUMP INLET-BRADLEY LANDING WEST SIDE	18.9	Channel/Adequate	23.7	80%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
BL-2	SUMP INLET-BRADLEY LANDING EAST SIDE	28.0	Channel/Adequate	41.0	68%	0.013	0.0300	0.013	2		24	1.88	0.990	3.065	5.293	13.39
F	AT GRADE INLET	15.0	Channel/Adequate	15.6	97%	0.013	0.020	0.013	1.5		18	1.41	0.990	1.724	3.970	9.02
G	AT GRADE INLET	5.6	Channel/Adequate	15.6	36%	0.013	0.020	0.013	1.5		18	1.41	0.990	1.724	3.970	9.02
H	MANHOLE/MIN SLOPE ON RUN USED.	20.2	Channel/Adequate	33.5	60%	0.013	0.020	0.013	2		24	1.88	0.990	3.065	5.293	10.93
I	SUMP INLET	13.8	Channel/Adequate	23.7	58%	0.013	0.010	0.013	2		24	1.88	0.990	3.065	5.293	7.73
J	SUMP INLET	9.1	Channel/Adequate	11.0	83%	0.013	0.010	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
K	MANHOLE	22.2	Channel/Adequate	23.7	94%	0.013	0.010	0.013	2		24	1.88	0.990	3.065	5.293	7.73
BHE3	STUB TO DEVELOPMENT	91.6	Channel/Adequate	105.4	87%	0.013	0.010	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
L	MANHOLE	104.1	Channel/Adequate	105.4	99%	0.013	0.010	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
N	SUMP INLET	9.2	Channel/Adequate	11.0	84%	0.013	0.010	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
O	SUMP INLET	4.4	Channel/Adequate	11.0	40%	0.013	0.010	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
P	SUMP INLET	10.8	Channel/Adequate	11.0	98%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
Q	MANHOLE	21.8	Channel/Adequate	23.7	92%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
MK2	STUB TO DEVELOPMENT	48.2	Channel/Adequate	69.8	69%	0.013	0.0100	0.013	3		36	2.82	0.990	6.895	7.940	10.13
R	MANHOLE	72.7	Channel/Adequate	105.4	69%	0.013	0.0100	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
S	SUMP INLET	11.5	Channel/Adequate	23.7	48%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
T	SUMP INLET	2.9	Channel/Adequate	11.0	27%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
U	MANHOLE	13.8	Channel/Adequate	23.7	58%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
MK13	STUB TO DEVELOPMENT	65.5	Channel/Adequate	69.8	94%	0.013	0.0100	0.013	3		36	2.82	0.990	6.895	7.940	10.13
U2	MANHOLE	82.3	Channel/Adequate	105.4	78%	0.013	0.0100	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
MK14	STUB TO DEVELOPMENT	14.0	Channel/Adequate	23.7	59%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
V	MANHOLE	92.3	Channel/Adequate	105.4	88%	0.013	0.0100	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
W	SUMP INLET	5.1	Channel/Adequate	11.0	47%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
X	SUMP INLET	11.7	Channel/Adequate	23.7	49%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
Y	MANHOLE	15.7	Channel/Adequate	23.7	66%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
Z	MANHOLE	105.1	Channel/Adequate	150.4	70%	0.013	0.0100	0.013	4		48	3.76	0.990	12.259	10.587	12.27
AA	SUMP INLET	5.5	Channel/Adequate	11.0	50%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AB	SUMP INLET	5.6	Channel/Adequate	11.0	51%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AC	MANHOLE	11.0	Channel/Adequate	23.7	47%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
JC3	STUB TO DEVELOPMENT	81.8	Channel/Adequate	105.4	78%	0.013	0.0100	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
AD	MANHOLE	90.9	Channel/Adequate	105.4	86%	0.013	0.0100	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
JC	TOTAL INTO JCC POND #3 THIS MAY BE COMBINED IN THE MAIN OR COME INTO THE POND SEPARATELY DEPENDING ON THE DESIGN OF THE FUTURE DEVELOPMENT	83.3	Channel/Adequate	150.4	55%	0.013	0.0100	0.013	4		48	3.76	0.990	12.259	10.587	12.27
AF	SUMP INLET	10.9	Channel/Adequate	11.0	99%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AG	SUMP INLET	7.6	Channel/Adequate	11.0	69%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AH	MANHOLE	18.5	Channel/Adequate	23.7	78%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
AI	PAIR OF SUMP INLETS AND STUB TO DEVELOPMENT	282.1	Pressure	237.8	119%	0.013	0.0250	0.013	4		48	3.76	0.990	12.259	10.587	19.40
AJ	PAIR OF SUMP INLETS AND STUB TO DEVELOPMENT	123.4	Channel/Adequate	150.4	82%	0.013	0.0100	0.013	4		48	3.76	0.990	12.259	10.587	12.27
AK	MANHOLE WORST CASE FLOWS. FUTURE DEVLOPMENT IS UNLIKELY TO DIRECT ALL FLOWS TO THIS LOCATION. FUTURE FDR MUST CONFIRM ADEQUATE DEPTH TO MAINTAIN HGL COMPLIANCE WITH DCM	358.7	Pressure	220.6	163%	0.013	0.0215	0.013	4		48	3.76	0.990	12.259	10.587	17.99
AL	AT GRADE INLET ON SOUTH BOUND OF BRADLEY HEIGHTS	0.7	Channel/Adequate	11.0	6%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AM	AT GRADE INLET ON SOUTH BOUND OF BRADLEY HEIGHTS	0.7	Channel/Adequate	11.0	6%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AN	MANHOLE	1.4	Channel/Adequate	11.0	13%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AO	MANHOLE PRESSURE FLOWS. FUTURE FDR MUST CONFIRM ADEQUATE COVER TO MAINTAIN HGL COMPLIANCE WITH DCM WORST CASE FLOW. UNLIKELY THAT FUTURE DEVELOPMENT WILL DIRECT ALL FLOWS TO THIS POINT.	359.5	Pressure	220.6	163%	0.013	0.0215	0.013	4		48	3.76	0.990	12.259	10.587	17.99
AR	AT GRADE INLET	1.4	Channel/Adequate	11.0	13%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AS	AT GRADE INLET	2.8	Channel/Adequate	11.0	25%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AT	SUMP INLET	5.3	Channel/Adequate	11.0	48%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AU	SUMP INLET	12.4	Channel/Adequate	23.7	52%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
AV	MANHOLE	19.5	Channel/Adequate	23.7	82%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
WF1	STUB TO DEVELOPMENT	54.5	Channel/Adequate	69.8	78%	0.013	0.0100	0.013	3		36	2.82	0.990	6.895	7.940	10.13
AW	MANHOLE	86.8	Channel/Adequate	105.4	82%	0.013	0.0100	0.013	3.5		42	3.29	0.990	9.385	9.263	11.23
AX	AT GRADE INLET	22.4	Channel/Adequate	23.7	95%	0.013	0.0100	0.013	2		24	1.88	0.990	3.065	5.293	7.73
AY	AT GRADE INLET	6.6	Channel/Adequate	11.0	60%	0.013	0.0100	0.013	1.5		18	1.41	0.990	1.724	3.970	6.38
AZ	MANHOLE	27.9	Channel/Adequate	43.0	65%	0.013	0.0100	0.013	2.5		30	2.35	0.990	4.788	6.617	8.97
BA	MANHOLE	101.5	Channel/Adequate	150.4	67%	0.013	0.0100	0.013	4		48	3.76	0.990	12.259	10.587	12.27
WF4	STUB TO DEVELOPMENT	59.0	Channel/Adequate	69.8	84%	0.013	0.0100	0.013	3		36	2.82	0.990	6.895	7.940	10.13
BB	MANHOLE	170.9	Pressure	150.4	114%	0.013	0.0100	0.013	4		48	3.76	0.990	12.259	10.587	12.27
BC	Future FDR will need to confirm HGL compliance with DCM	226.7	Pressure	212.7	107%	0.013	0.0200	0.013	4		48	3.76	0.990	12.259	10.587	17.35

INLET SUMMARY

BRADLEY HEIGHTS MDDP

DESIGN POINT or SUB-BASIN	SUB-BASINS/ DESCRIPTION	TOTAL AREA (AC)	INLET			Q(5) TOTAL INFLOW	Q5 INLET CAPACTIY	Q(100) BYPASS FLOWS (cfs)	Q(100) TOTAL INFLOW (cfs)	MAX INLET CAPACITY	NOTES:
			SIZE (Ft.)	TYPE	CONDITION						
RHC1	RHC1	2.48	10	R	SUMP	7.7	7.7	0.0	14.0	19.3	FDR
RHC2	RHC2	0.59	10	R	SUMP	2.3	2.3	0.0	4.2	19.3	FDR
BL1	WEST HALF OF BRADLEY LANDING DRAINING TO	2.88	10	R	SUMP	10.3	10.3	0.0	18.9	19.3	FDR
BL2	EAST HALF OF BRADLEY LANDING	1.39	10	R	SUMP	5.3	5.3	0.0	9.6	19.3	FDR
G	BS2	0.83	15	R	AT-GRADE	3.1	3.1	0.0	5.6	5.6	FDR
F	BS1	3.16	15	R	AT-GRADE	7.6	7.6	2.8	15.0	12.2	FDR-BYPASS TO BHE 1-2 SUMP INLET
I	10a	1.97	10	R	SUMP	7.6	7.6	0.0	13.8	19.3	
J	10b	1.20	10	R	SUMP	5.0	5.0	0.0	9.1	19.3	
N	N	1.64	5	R	SUMP	5.1	5.1	0.0	9.2	11.0	
P	P	1.63	5	R	SUMP	5.9	5.9	0.0	10.8	11.0	
S	MK11	1.79	5	R	SUMP	6.3	6.3	0.0	11.5	11.5	FLOWS EQUALIZE ACROSS CROWN IN MAJOR EVENT
T	MK12	0.38	5	R	SUMP	1.6	1.6	0.0	2.9	11.0	
X	MK10	1.97	15	R	SUMP	6.4	6.4	0.0	11.7	27.0	
W	MK15	0.67	10	R	SUMP	2.8	2.8	0.0	5.1	19.3	
AA	JC1	0.74	5	R	SUMP	3.0	3.0	0.0	5.5	11.0	
AB	JC2	0.75	5	R	SUMP	3.0	3.0	0.0	5.6	11.0	
AG	WF11	1.08	5	R	SUMP	4.2	4.2	0.0	7.6	11.0	
AF	WF10	1.56	5	R	SUMP	6.0	6.0	0.0	10.9	11.0	
WF13	WEST HALF OF COLLECTOR 2	1.03	15	R	SUMP	4.1	4.1	0.0	7.5	27.0	INLETS ARE OVER SIZED TO ACCOUNT FOR ADDITIONAL FLOWS IN THE DEVELOPMENT ADJACENT
WF14	EAST HALF OF COLLECTOR 2	1.17	15	R	SUMP	4.7	4.7	0.0	8.5	27.0	
AL	WF16	0.09	5	R	AT-GRADE	0.4	0.4	0.0	0.7	0.7	
AM	WF17	0.09	5	R	AT-GRADE	0.4	0.4	0.0	0.7	0.7	
AQ	LH1 - AT GRADE AT BORDER WITH TRAILS AT	0.18	10	R	AT-GRADE	0.8	0.8	0.0	1.4	1.4	
AR	LH2 - AT GRADE AT BORDER WITH TRAILS AT	0.18	10	R	AT-GRADE	0.8	0.8	0.0	1.4	1.4	
AU	WF2	4.63	10	R	SUMP	2.8	2.8	0.0	12.4	19.3	
AT	WF3	0.75	5	R	SUMP	2.9	2.9	0.0	5.3	11.0	
AX	WF5	6.44	10	R	AT-GRADE	10.1	10.1	0.0	22.4	22.4	4 INLETS FOR FULL CAPTURE
AY	WF6	1.06	10	R	AT-GRADE	3.6	3.6	0.0	6.6	6.6	2 INLETS FOR FULL CAPTURE
AQ	LH1 - AT GRADE AT BORDER WITH TRAILS AT	0.18	10	R	AT-GRADE	0.8	0.8	0.0	1.4	1.4	
AS	LH1-LH2	0.36	10	R	AT-GRADE	1.5	1.5	0.0	2.8	2.8	



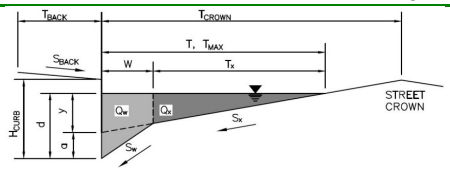
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: INLET BS1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.5	ft
Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.018	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

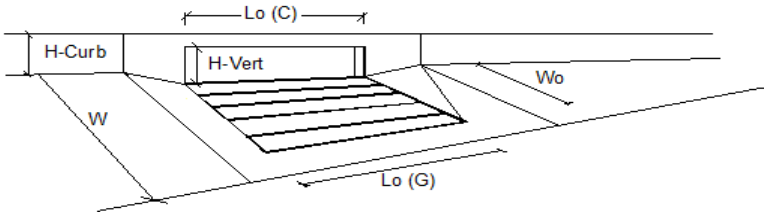
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.9**	**47.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	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'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.6**	**12.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**81**	**%**

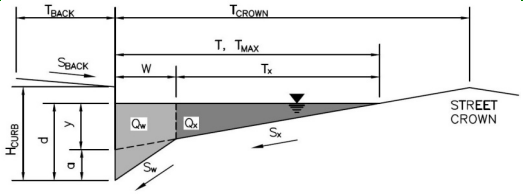
Version 4.05 Released March 2017

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

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

Enter Your Project Name Here

INLET BS2



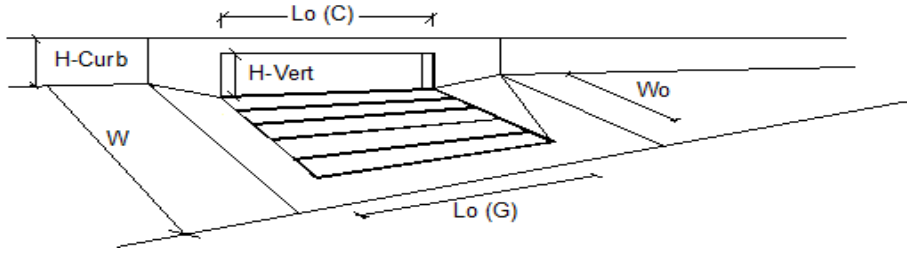
Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.5		ft
Gutter Width	W =	2.50		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.053		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion		Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.6**	**34.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	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'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.1**	**5.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

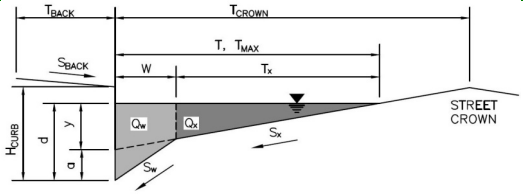
Version 4.05 Released March 2017

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

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

Enter Your Project Name Here

INLETS AL AND AM



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

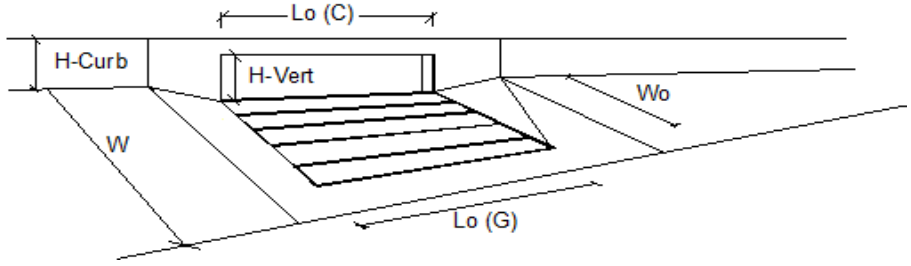
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.2**	**42.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**0.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

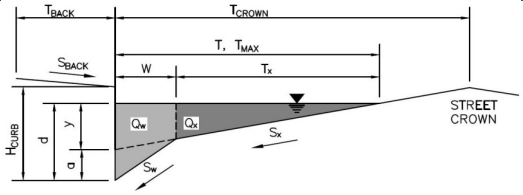
Version 4.05 Released March 2017

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

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

Enter Your Project Name Here

INLETS AQ AND AR



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

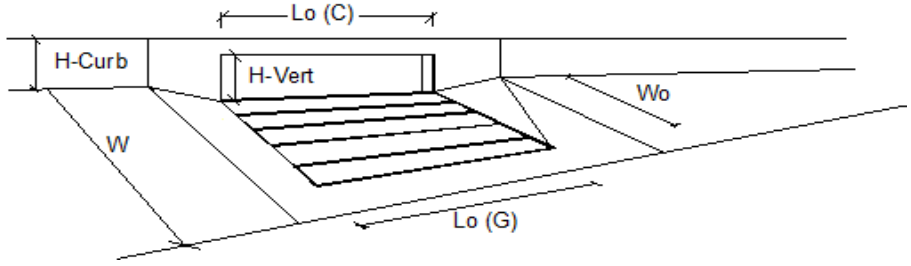
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**5.9**	**52.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_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 =**	**0.8**	**1.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

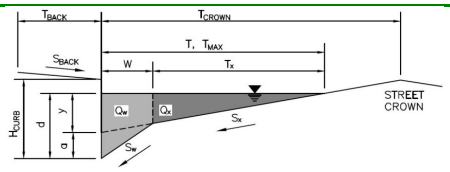
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: INLET AX



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.1	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

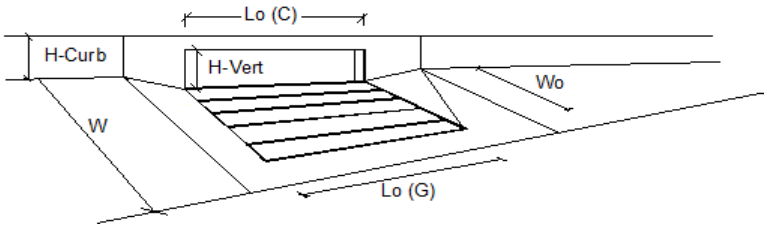
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.2**	**46.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	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_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_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 =**	**10.1**	**22.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

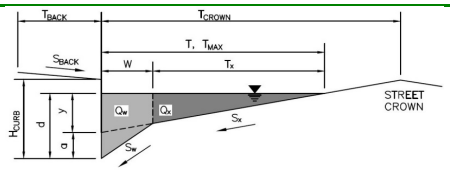
Version 4.05 Released March 2017

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

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

Project: Enter Your Project Name Here

Inlet ID: INLET AY



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.011	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

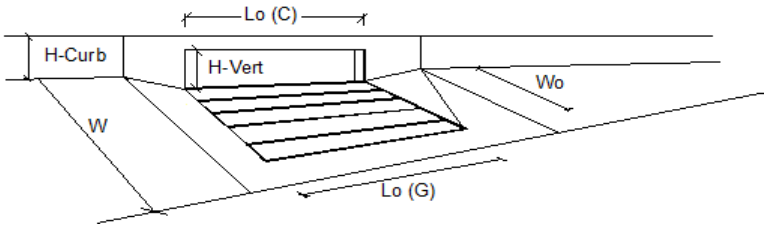
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.6**	**46.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

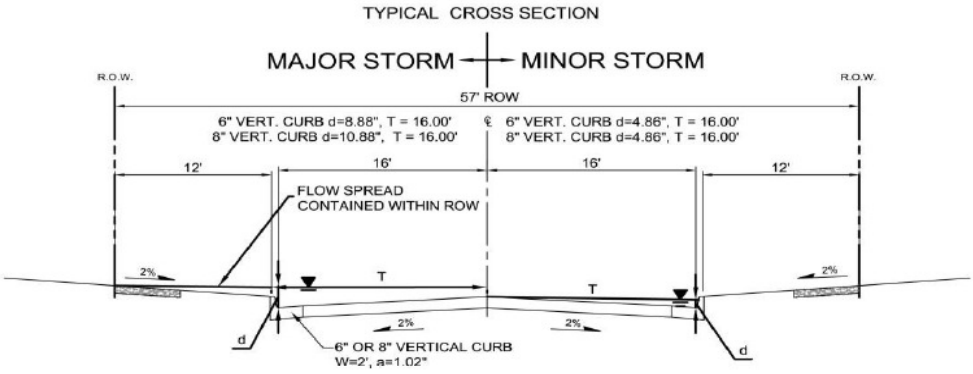


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_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	

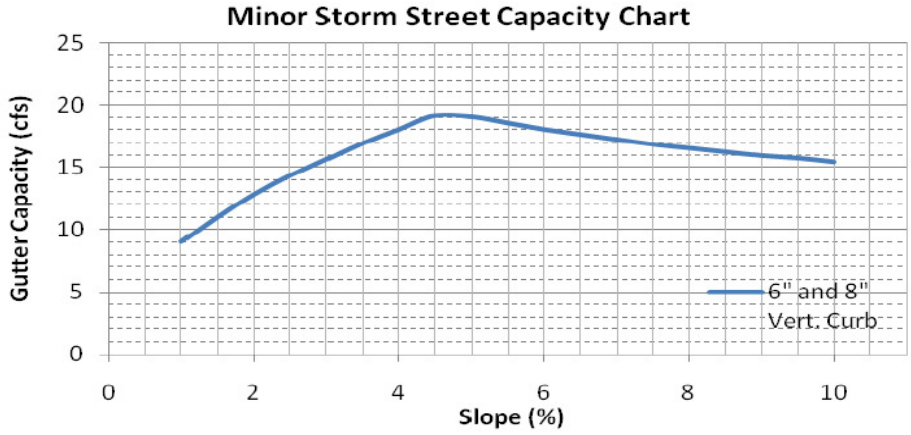
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.6**	**6.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

STREET CAPACITIES BRADLEY HEIGHTS MDDP									
Street	Road Section	Sub-basin	BYPASS SOURCE (Design Point)	Slope %	ROAD CAPACITY MINOR STORM (cfs)	Q(5) TOTAL FLOW	Q(100) BYPASS FLOWS RECEIVED (cfs)	ROAD CAPACITY MAJOR STORM (cfs)	Q(100) TOTAL FLOW (cfs)
BRADLEY ROAD	ARTERIAL	BL1	N/A	3.2%	22.5	8.2	0.0	65	16.9
BRADLEY ROAD	ARTERIAL	RHC1	N/A	2.1%	25	6.1	0.0	80	12.5
BRADLEY LANDING	COLLECTOR	WF2	N/A	2.0%	12.5	2.2	0.0	60	11.0
BRADLEY LANDING	COLLECTOR	WF5	N/A	1.1%	10	8.0	0.0	58	20.0
BRADLEY LANDING	COLLECTOR	WF6	N/A	1.1%	10.0	2.9	0.0	58.0	5.9
BRADLEY LANDING	COLLECTOR	MK3	N/A	1.2%	10.0	4.1	0.0	58.0	8.4
BRADLEY RIDGE	COLLECTOR	WF11	N/A	1.7%	12.0	3.3	0.0	60.0	6.8
BRADLEY RIDGE	COLLECTOR	MK10	N/A	5.0%	19.0	5.1	0.0	43.0	10.5
COLLECTOR 1	COLLECTOR	JC1	N/A	2.3%	14.0	2.4	0.0	60.0	4.9
COLLECTOR 2	COLLECTOR	WF14	N/A	4.6%	19.0	3.7	0.0	43	7.6

Figure 7-6. Street Capacity Charts Collector (without Parking)



PLEASE NOTE THAT THE WIDTH IS CONSERVATIVE. THE PROPOSED SECTION HAS A DISTANCE FROM FACE OF CURB TO CL OF 24.5 FEET



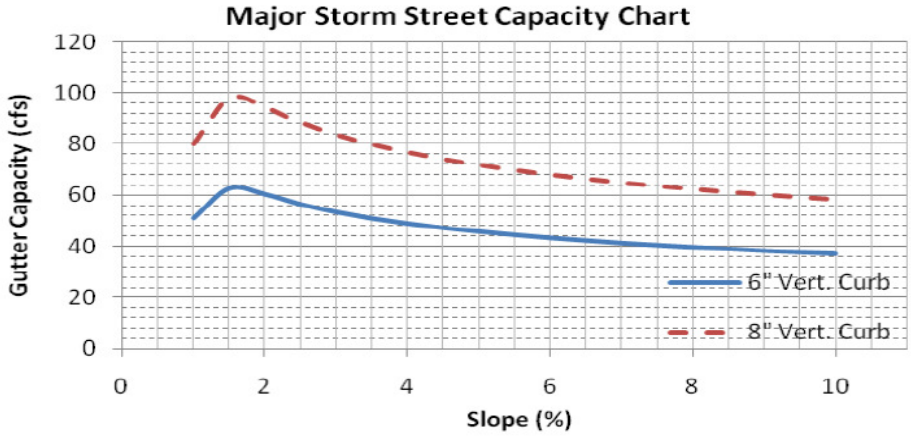
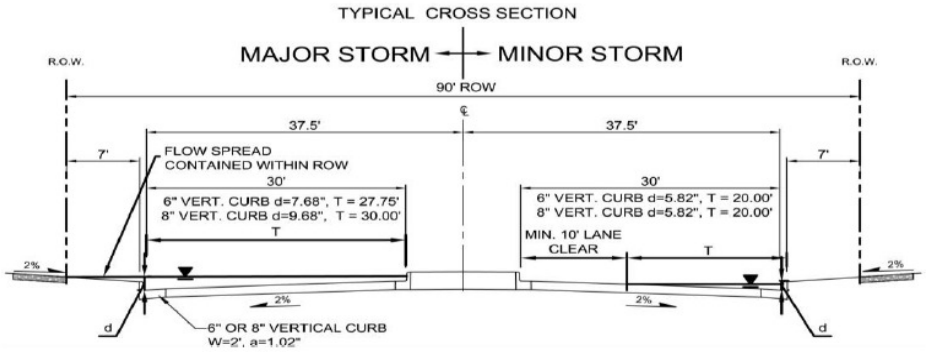
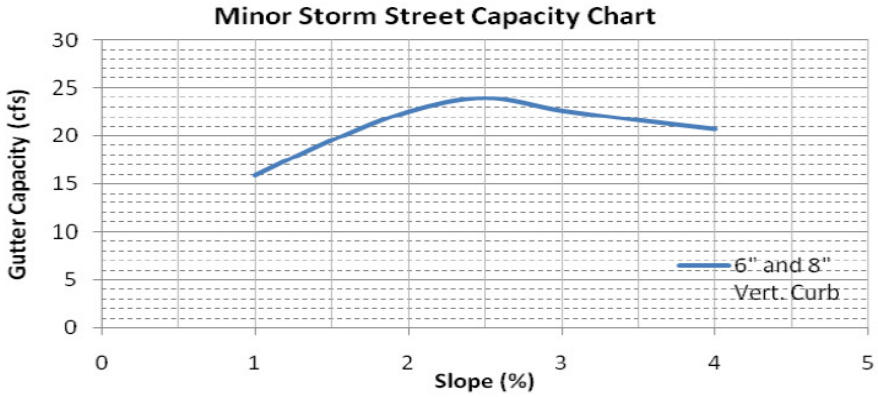
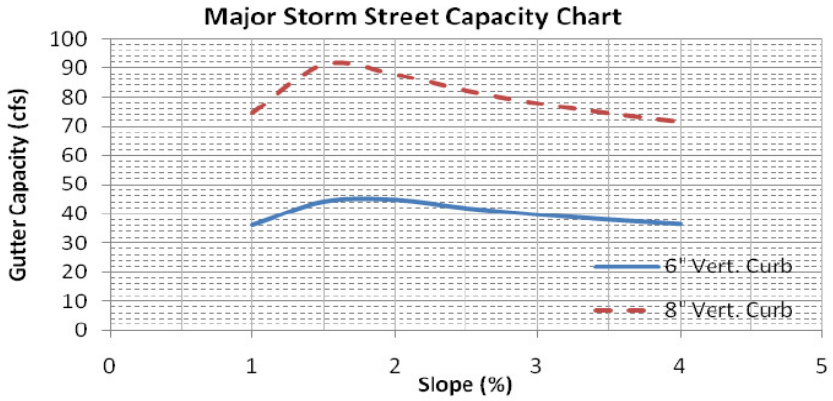


Figure 7-3. Street Capacity Charts Minor Arterial

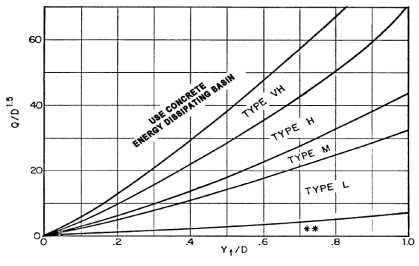






OUTFALL PROTECTION CALCULATIONS

	A		B	
Design Point				
Pipe Size (D)	18	Inches	24	Inches
Q	18.2	cfs	24.4	cfs
L	4.5	Feet	6	Feet
W	4.5	Feet	6	Feet
D	0	Feet	0	Feet
d50	0.41	Feet	0.36	Feet
	4.97	Inches	4.26	Inches
Depth of Flow	0.91	Feet	1.23	Feet
Q/D^1.5	9.92		8.63	
Yt/D	0.609		0.616	
Rip Rap	Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream	
Length of Rock	4.5	Feet	6	Feet
Width of Rock	4.5	Feet	6.0	Feet



Use D_o instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

CLASSIFICATION AND GRADATION OF ORDINARY RIP RAP			
Rip Rap Designation by Weight	**% Smaller Than Given Size (inches)**	**Intermediate Rock Dimension**	**d50* (inches)**
Type VL	70 – 100	12	
	50 – 70	9	
	35 – 50	6	6**
	2 - 10	2	
Type L	70 – 100	15	
	50 – 70	12	
	35 – 50	9	9**
	2 - 10	3	
Type M	70 – 100	21	
	50 – 70	18	
	35 – 50	12	12
	2 - 10	4	
Type H	70 – 100	30	
	50 – 70	24	
	35 – 50	18	18
	2 - 10	6	
Type VH	70 – 100	42	
	50 – 70	33	
	35 – 50	24	24
	2 - 10	9	

* d50 = Mean particle size
** Bury types VL and L with native top soil and revegetate to protect from vandalism.

Inputs
calculations

3.2.3 Rock Sizing for Riprap Apron and Low Tailwater Basin

Scour resulting from highly turbulent, rapidly decelerating flow is a common problem at conduit outlets. The following section summarizes the method for sizing riprap protection for both riprap aprons (Section 3.2.1) and low tailwater basins (Section 3.2.2).

Use Figure 9-38 to determine the required rock size for circular conduits and Figure 9-39 for rectangular conduits. Figure 9-38 is valid for $Q/D_c^{2.5}$ of 6.0 or less and Figure 9-39 is valid for $Q/WH^{2.5}$ of 8.0 or less. The parameters in these two figures are:

1. $Q/D^{2.5}$ or $Q/WH^{2.5}$ in which Q is the design discharge in cfs, D_c is the diameter of a circular conduit in feet, and W and H are the width and height of a rectangular conduit in feet.
2. Y_t/D_c or Y_t/H in which Y_t is the tailwater depth in feet, D_c is the diameter of a circular conduit in feet, and H is the height of a rectangular conduit in feet. In cases where Y_t is unknown or a hydraulic jump is suspected downstream of the outlet, use $Y_t/D_c = Y_t/H = 0.40$ when using Figures 9-38 and 9-39.
3. The riprap size requirements in Figures 9-38 and 9-39 are based on the non-dimensional parametric Equations 9-16 and 9-17 (Steven, Simons, and Watts 1971 and Smith 1975).

Circular culvert:

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}} \qquad \text{Equation 9-16}$$

Rectangular culvert:

$$d_{50} = \frac{0.014H^{0.5}Q}{Y_t W} \qquad \text{Equation 9-17}$$

3.2.2 Low Tailwater Basin

The design of low tailwater riprap basins is necessary when the receiving channel may have little or no flow or tailwater at time when the pipe or culvert is in operation. Figure 9-37 provides a plan and profile view of a typical low tailwater riprap basin.

By providing a low tailwater basin at the end of a storm drain conduit or culvert, the kinetic energy of the discharge dissipates under controlled conditions without causing scour at the channel bottom.

Low tailwater is defined as being equal to or less than ⅓ of the height of the storm drain, that is:

$$y_t \le \frac{D}{3} \quad \text{or} \quad y_t \le \frac{H}{3}$$

Where:

y_t = tailwater depth at design flow (feet)

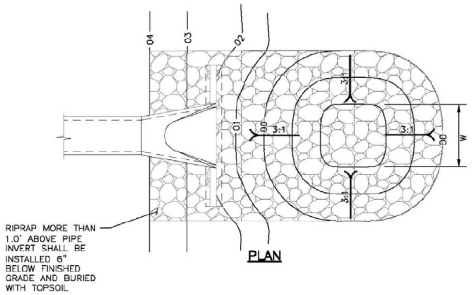
D = diameter of circular pipe (feet)

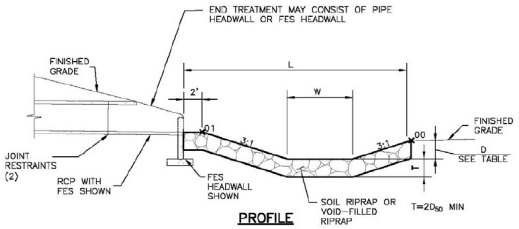
H = height of rectangular pipe (feet)

Rock Size
The procedure for determining the required riprap size downstream of a conduit outlet is in Section 3.2.3.

After selecting the riprap size, the minimum thickness of the riprap layer, T, in feet, in the basin is defined as:

$$T = 2D_{50} \qquad \text{Equation 9-15}$$





PIPE SIZE OR BOX HEIGHT	D	W*	L
18" – 24"	1'–0"	4'	15'
30" – 36"	1'–6"	6'	20'
42" – 48"	2'–0"	7'	24'
54" – 60"	2'–6"	8'	28'
66" – 72"	3'–0"	9'	32'

* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

Figure 9-37. Low tailwater riprap basin

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 4 2022

BRADLEY ROAD-DRAINAGE FLUME

Rectangular

Bottom Width (ft)	= 3.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.00
N-Value	= 0.013

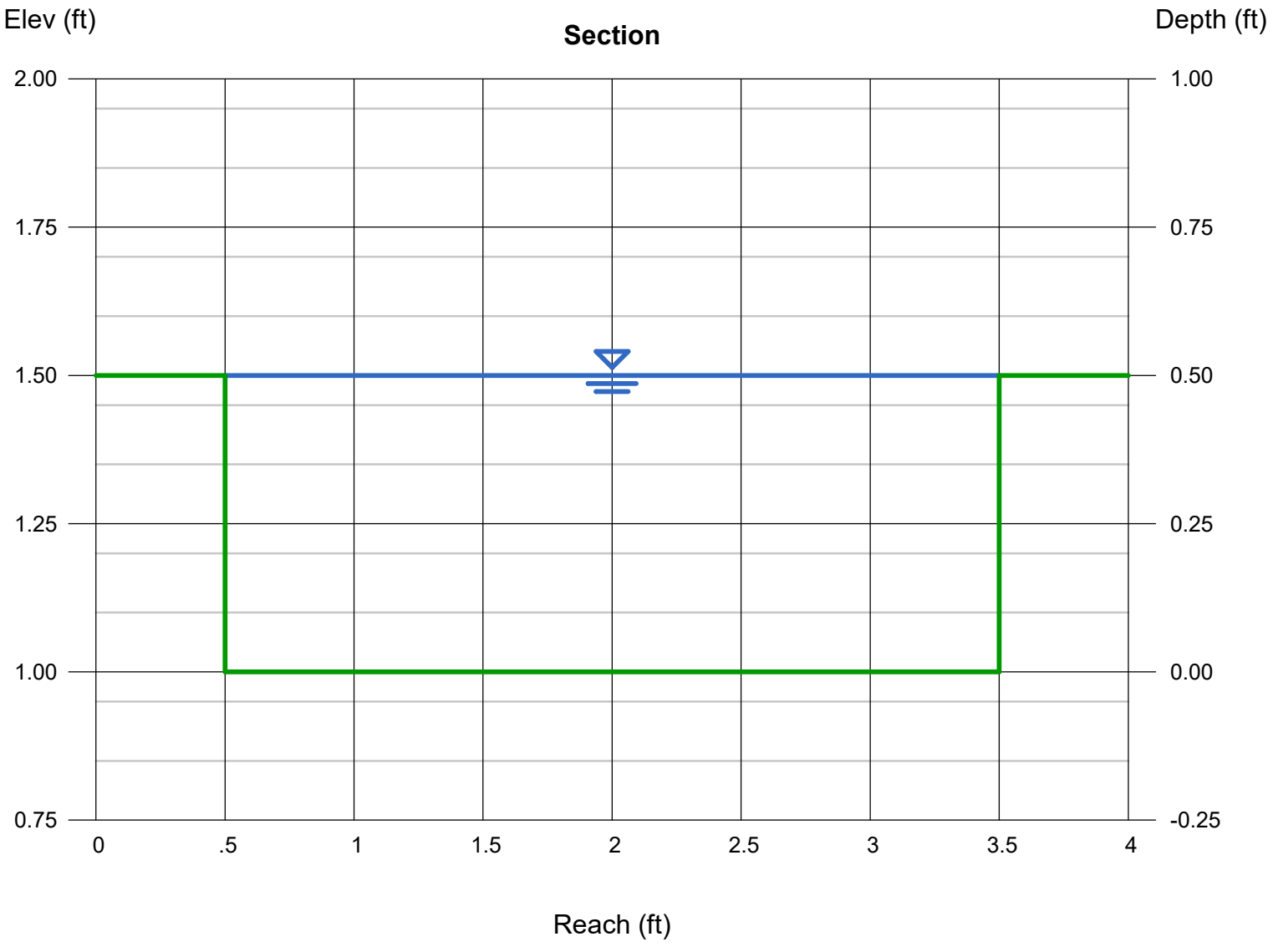
Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 17.83
Area (sqft)	= 1.50
Velocity (ft/s)	= 11.88
Wetted Perim (ft)	= 4.00
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 3.00
EGL (ft)	= 2.70

Note: Tributary to this flume is less than 1% of overall basin containing the area (Sub-basin CC, Q100: 30.2 cfs), therefore, this flume has more than adequate capacity to convey runoff into the Bradley Road ditch.



Channel Report

BRADLEY ROAD-DITCH - DESIGN POINT D

Triangular

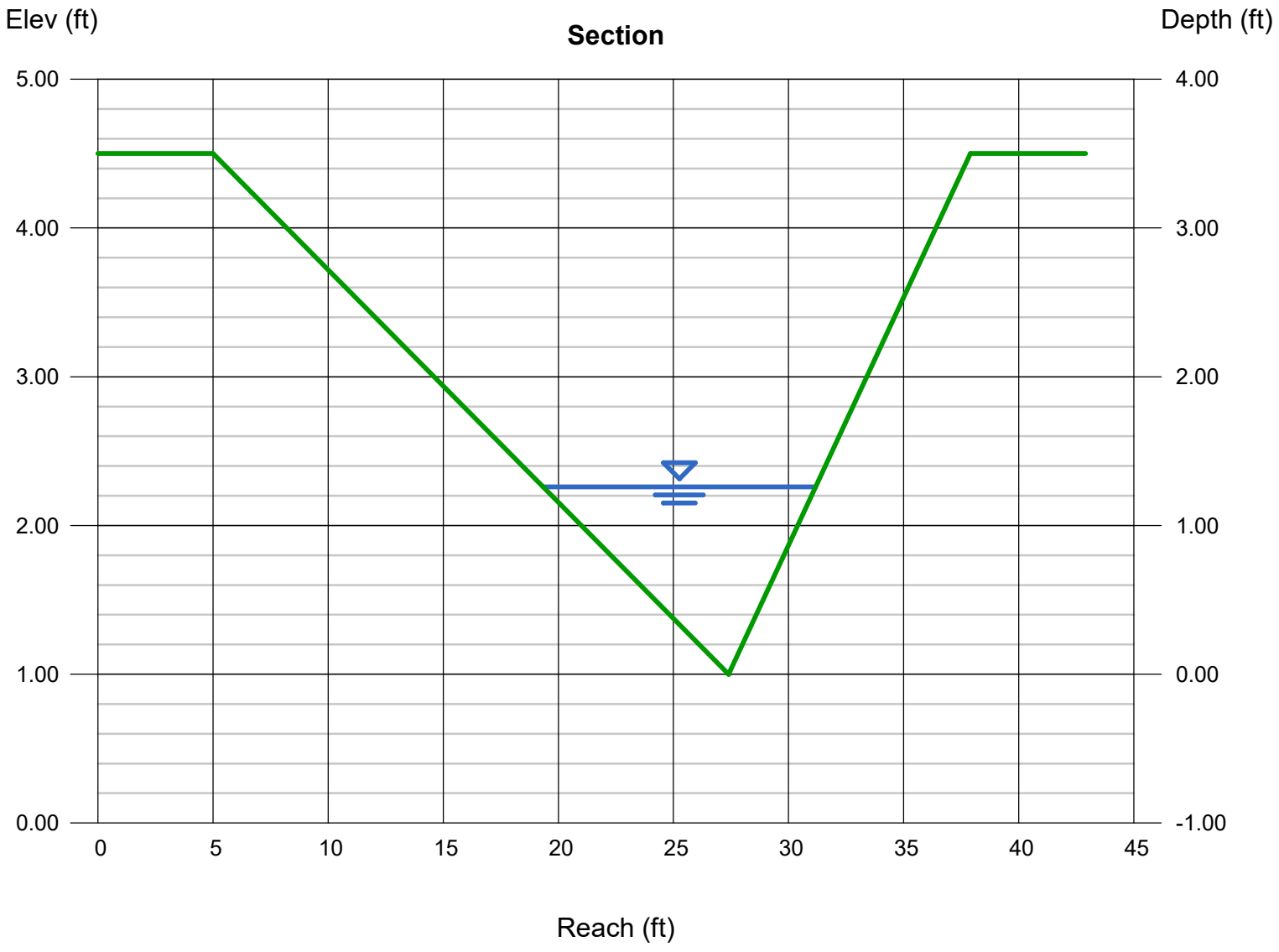
Side Slopes (z:1)	= 6.40, 3.00
Total Depth (ft)	= 3.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.035

Calculations

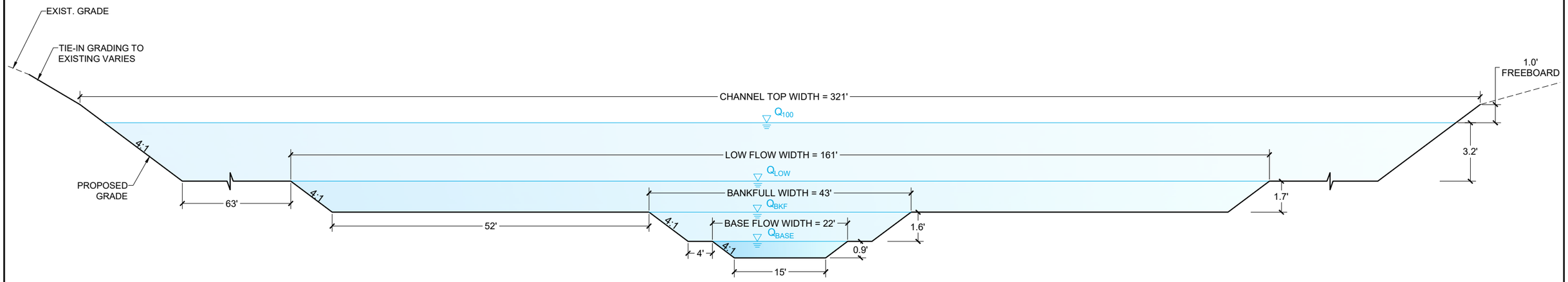
Compute by:	Known Q
Known Q (cfs)	= 32.60

Highlighted

Depth (ft)	= 1.26
Q (cfs)	= 32.60
Area (sqft)	= 7.46
Velocity (ft/s)	= 4.37
Wetted Perim (ft)	= 12.15
Crit Depth, Yc (ft)	= 1.25
Top Width (ft)	= 11.84
EGL (ft)	= 1.56



811
Know what's below.
Call before you dig.



TYPICAL DESIGN CHANNEL SECTION

NOTE: 3:1 VERTICAL EXAGGERATION
NOT TO SCALE

Stage	Required Capacity (cfs)	Channel Capacity (cfs)
Base Flow	25	26
Bankfull, Undev.	200	206
Low Flow (2-yr)	1037	1043
100-yr	6254	6322

CHANNEL DESIGN

CHANNEL SLOPE = 0.2%

6' HIGH DROP STRUCTURE - 4 TOTAL

2.5' HIGH DROP STRUCTURE - 1 TOTAL

REFERENCE DRAWINGS

X-1213-TITLE-WR CHANNEL

No.	DATE	DESCRIPTION	BY

REVISIONS

COMPUTER FILE MANAGEMENT

FILE NAME: S:\21.1213.001 Bradley Heights Metro District\100 Dwg\105 Exhibits\Channel Drainage\MDDP Cross Section Exhibit.dwg
CTB FILE: Matrix(black).ctb
PLOT DATE: 3/11/2022 9:15 AM
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE.

PREPARED BY:
Matrix
Excellence by Design

SEAL

PRELIMINARY
THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 21.1213.001

BRADLEY HEIGHTS METROPOLITAN DISTRICT

MARKSHEFFEL TRIBUTARY TO JIMMY CAMP

TYPICAL CROSS SECTION

DESIGNED BY:	JTB	SCALE		DATE ISSUED:	MARCH 2022
DRAWN BY:	EAL	HORIZ.	N/A	SHEET	01 OF 01
CHECKED BY:	DWB	VERT.	N/A		

DRAWING No. EXHIBIT

Marksheffel Tributary Proposed Cross Section - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00200	ft/ft
Normal Depth	7.40	ft

Section Definitions

Station (ft)	Elevation (ft)
-1+61	8.50
-1+43	4.20
-0+80	4.20
-0+74	2.50
-0+74	2.50
-0+74	2.50
-0+22	2.50
-0+15	0.90
-0+11	0.90
-0+08	0.00
0+08	0.00
0+11	0.90
0+15	0.90
0+22	2.50
0+74	2.50
0+74	2.50
0+74	2.50
0+80	4.20
1+43	4.20
1+61	8.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-1+61, 8.50)	(1+61, 8.50)	0.035

Marksheffel Tributary Proposed Cross Section - 100-yr

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge		6321.63	ft³/s
Elevation Range	0.00 to 8.50 ft		
Flow Area		1294.84	ft²
Wetted Perimeter		314.02	ft
Hydraulic Radius		4.12	ft
Top Width		312.20	ft
Normal Depth		7.40	ft
Critical Depth		5.50	ft
Critical Slope		0.01339	ft/ft
Velocity		4.88	ft/s
Velocity Head		0.37	ft
Specific Energy		7.77	ft
Froude Number		0.42	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.40	ft
Critical Depth	5.50	ft
Channel Slope	0.00200	ft/ft
Critical Slope	0.01339	ft/ft

Marksheffel Tributary Proposed Cross Section - Low Flow

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00200	ft/ft
Normal Depth	4.20	ft

Section Definitions

Station (ft)	Elevation (ft)
-1+61	8.50
-1+43	4.20
-0+80	4.20
-0+74	2.50
-0+74	2.50
-0+74	2.50
-0+22	2.50
-0+15	0.90
-0+11	0.90
-0+08	0.00
0+08	0.00
0+11	0.90
0+15	0.90
0+22	2.50
0+74	2.50
0+74	2.50
0+74	2.50
0+80	4.20
1+43	4.20
1+61	8.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-1+61, 8.50)	(1+61, 8.50)	0.035

Marksheffel Tributary Proposed Cross Section - Low Flow

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge		1043.01	ft³/s
Elevation Range	0.00 to 8.50 ft		
Flow Area		336.76	ft²
Wetted Perimeter		161.63	ft
Hydraulic Radius		2.08	ft
Top Width		160.60	ft
Normal Depth		4.20	ft
Critical Depth		3.15	ft
Critical Slope		0.01723	ft/ft
Velocity		3.10	ft/s
Velocity Head		0.15	ft
Specific Energy		4.35	ft
Froude Number		0.38	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.20	ft
Critical Depth	3.15	ft
Channel Slope	0.00200	ft/ft
Critical Slope	0.01723	ft/ft

15% Design Opinion of Probable Construction Cost
AACE International Class 4 Cost Estimate

BRADLEY HEIGHTS METRO DISTRICT - MARKSHEFFEL TRIBUTARY
MATRIX PROJECT NO. 21.1213.001

ITEM NO.	ITEM	QUANTITY	PAY UNITS	UNIT PRICE	TOTAL COST OF ITEM
1	Mobilization and Demobilization	1	LS	$200,000	$200,000
2	Traffic Control	1	LS	$25,000	$25,000
3	Water Control and Dewatering	1	LS	$50,000	$50,000
4	Erosion and Sediment Control	1	LS	$50,000	$50,000
5	Clearing and Grubbing	37.1	AC	$1,000	$37,100
6	Earthwork Cut/Fill Onsite	18,483	CY	$8	$147,864
7	Haul Cut/Fill	252,480	CY	$12	$3,029,760
8	Drop Structure - 6' High	4	EA	$735,110	$2,940,440
9	Drop Structure - 2.5' High	1	EA	$434,425	$434,425
10	Coconut Erosion Control Blanket (Nedia C400B)	154,763	SY	$7	$1,083,341
11	Erosion Control Fabric (Nedia KoirWrap 1200)	8,158	SY	$17	$138,686
12	Soil Amendment (5 CY per 1,000 SF)	33.70	AC	$15,000	$505,500
13	Seeding (Wetland/Riparian/Upland)	33.70	AC	$2,500	$84,250
				Total	**$8,726,366**

AACE Class 4 Low Estimate (-20%)	$6,981,093
AACE Class 4 Upper Estimate (+30%)	$11,344,276

AACE International Class 4 Cost Estimate Definition – Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. Typically, engineering is 10% to 40% complete. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Virtually all Class 4 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric and modeling techniques. Expected accuracy ranges are from –15% to –30% on the low side and +20% to 50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.

JDH Comments

Unit Cost from MB2 Bids					Notes
		$200,000		$209,106.65	2.5% Development projects proceeding adajcent
		$25,000			from Cottonwood; similar type of road access?
		$50,000			from Cottonwood 30 % design b/c similar stream length; may be less since typic
		$50,000			5x times Cottonwood since clearing & grubbing is 5x larger
		$37,100	$	185,564.79	
$	12.00	**$221,796**			Barr II - 150000 YD - $5/YD
$	12.00	**$3,029,760**			
		$2,940,440			See previous sheet
		$434,425			See previous sheet
$	7.00	**$1,083,341**			Barr II - 30000 SY - $3.60/ SY
$	17.00	**$138,686**			13th Street - 17000 SY - $13.60 SY
$	15,000.00	**$505,500**			Cottonwood, 5CY per 1000 SF
$	3,500.00	**$117,950**			Cottonwood per acre
		$8,833,998		$2,387.57	$/lf

APPENDIX B

STANDARD DESIGN CHARTS AND TABLES

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

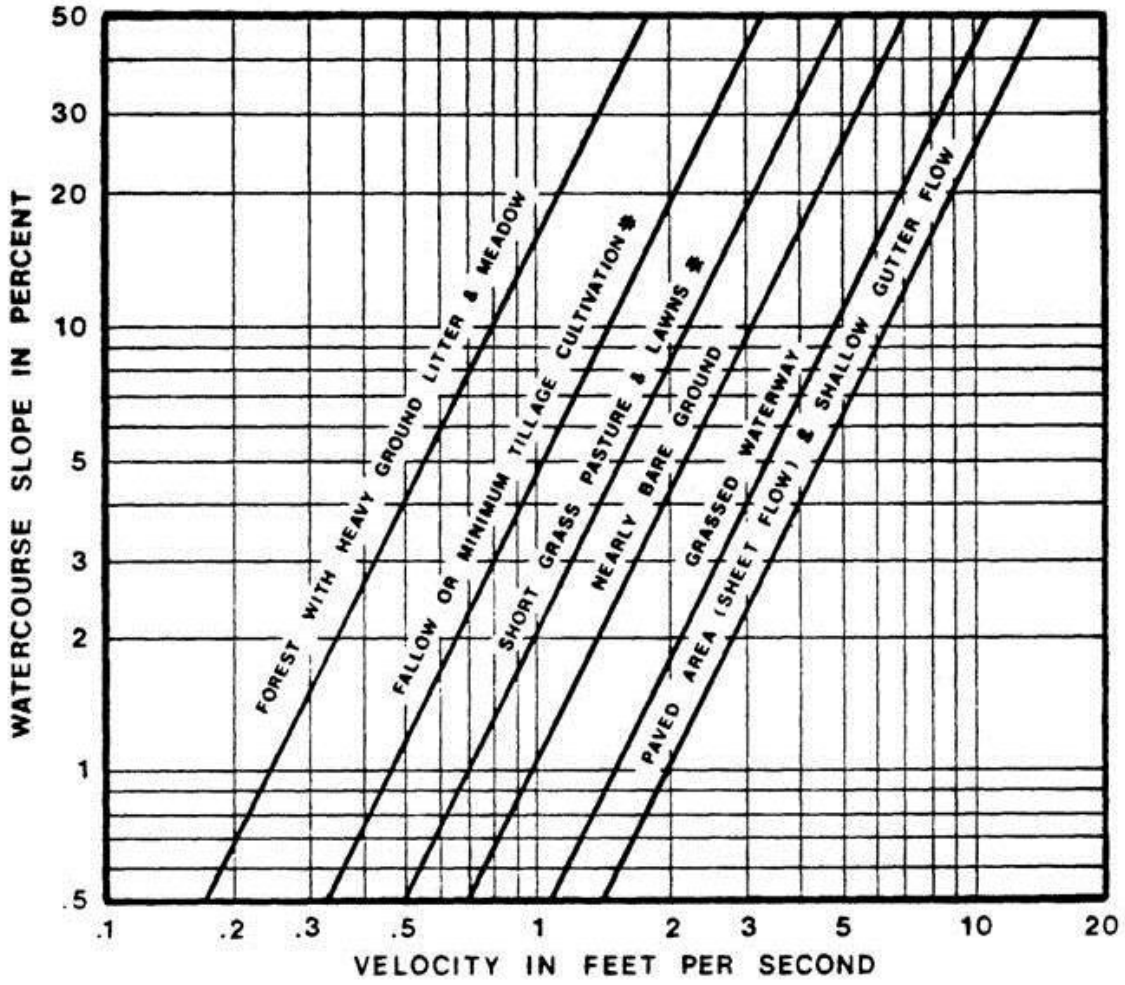
Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

Figure 6-25. Estimate of Average Concentrated Shallow Flow



APPENDIX C

REPORT REFERENCES

NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

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

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

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

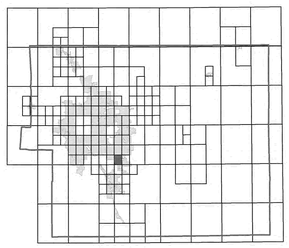
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

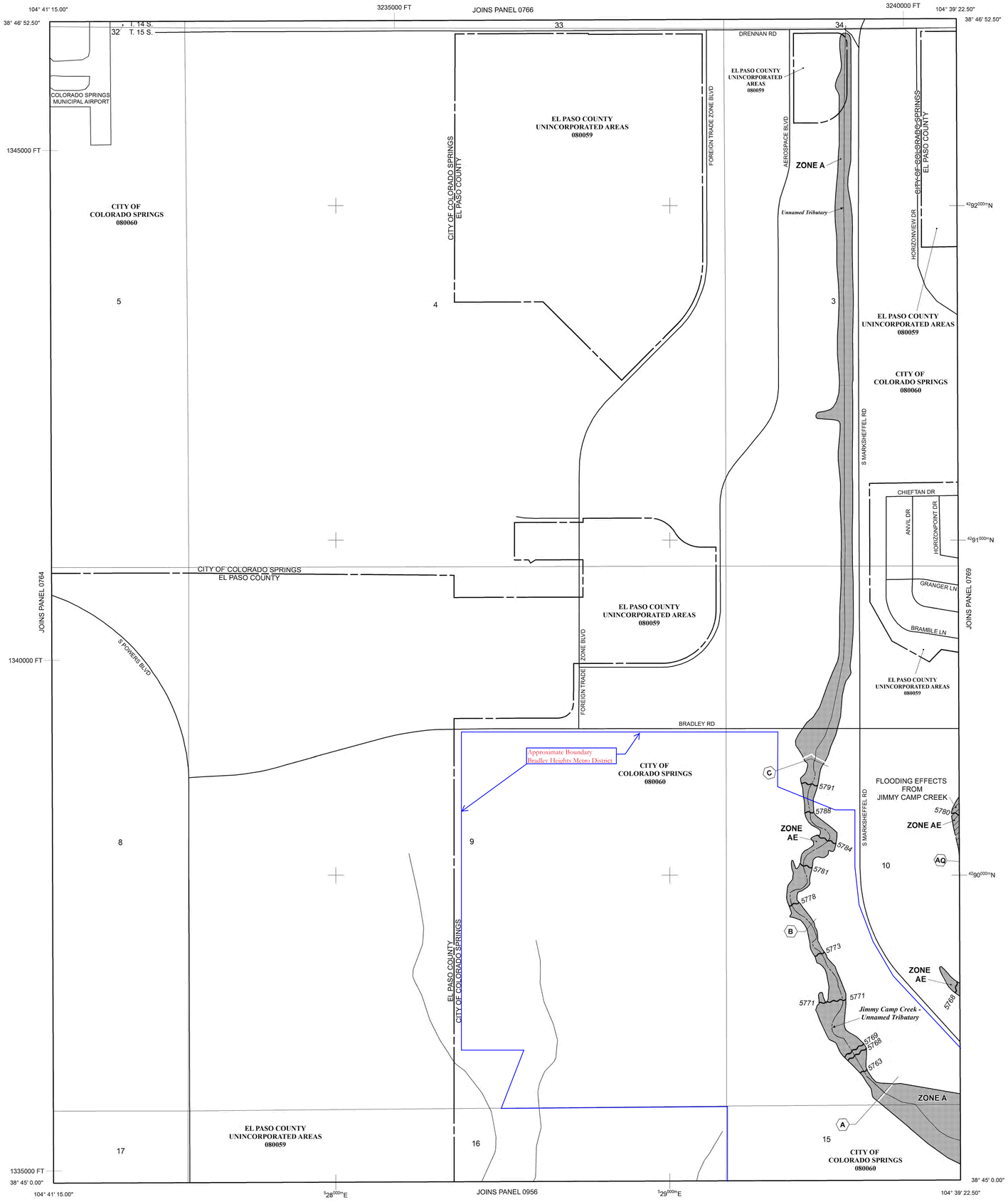
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 65 WEST, AND TOWNSHIP 15 SOUTH, RANGE 65 WEST.

LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being 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, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

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

A — A	Cross section line
23 — 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0768G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 768 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0768	G
EL PASO COUNTY	080059	0768	G

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
08041C0768G

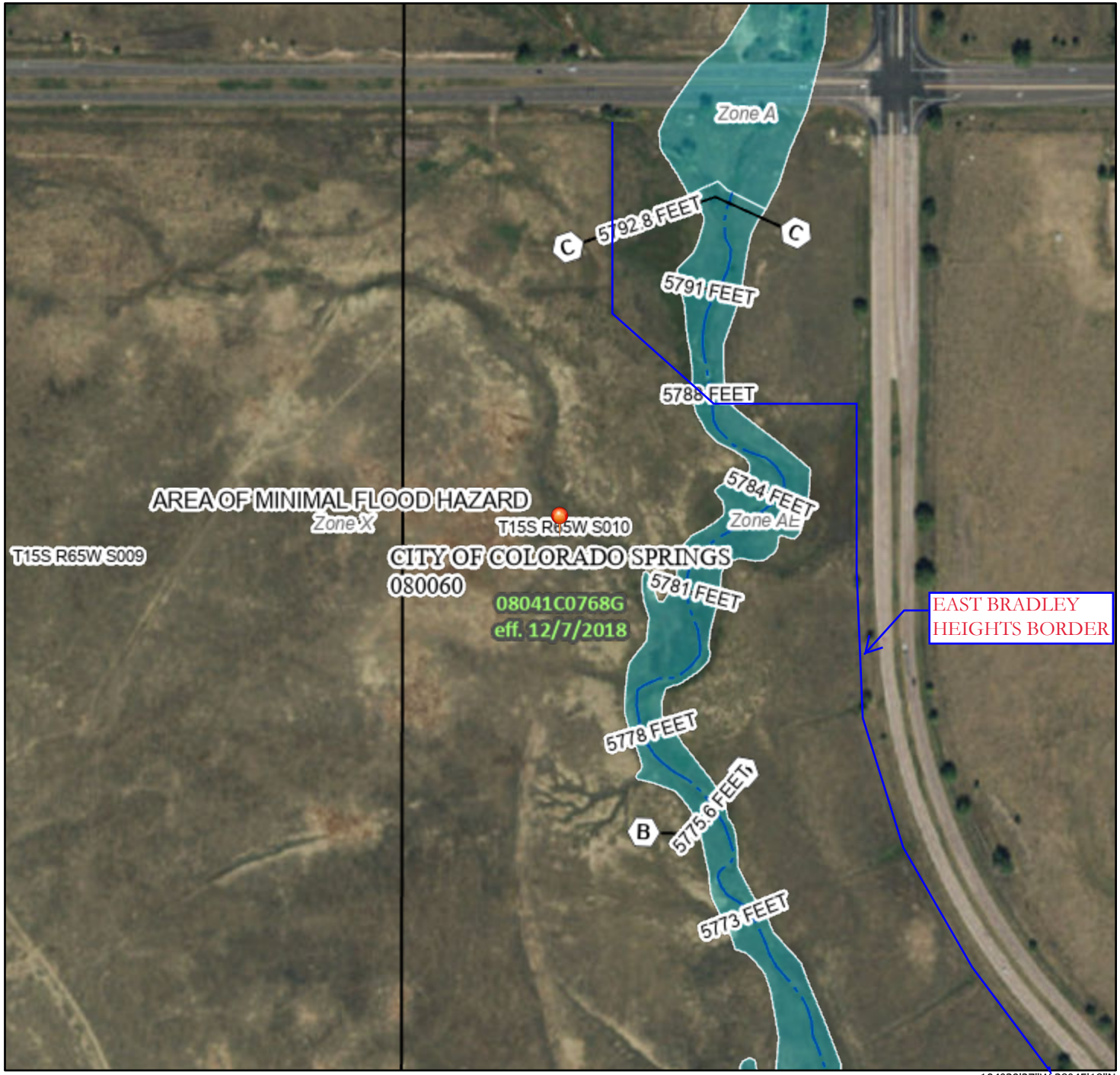
MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

National Flood Hazard Layer FIRMette

FEMA

104°40'5"W 38°45'46"N



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

1:6,000

104°39'27"W 38°45'18"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

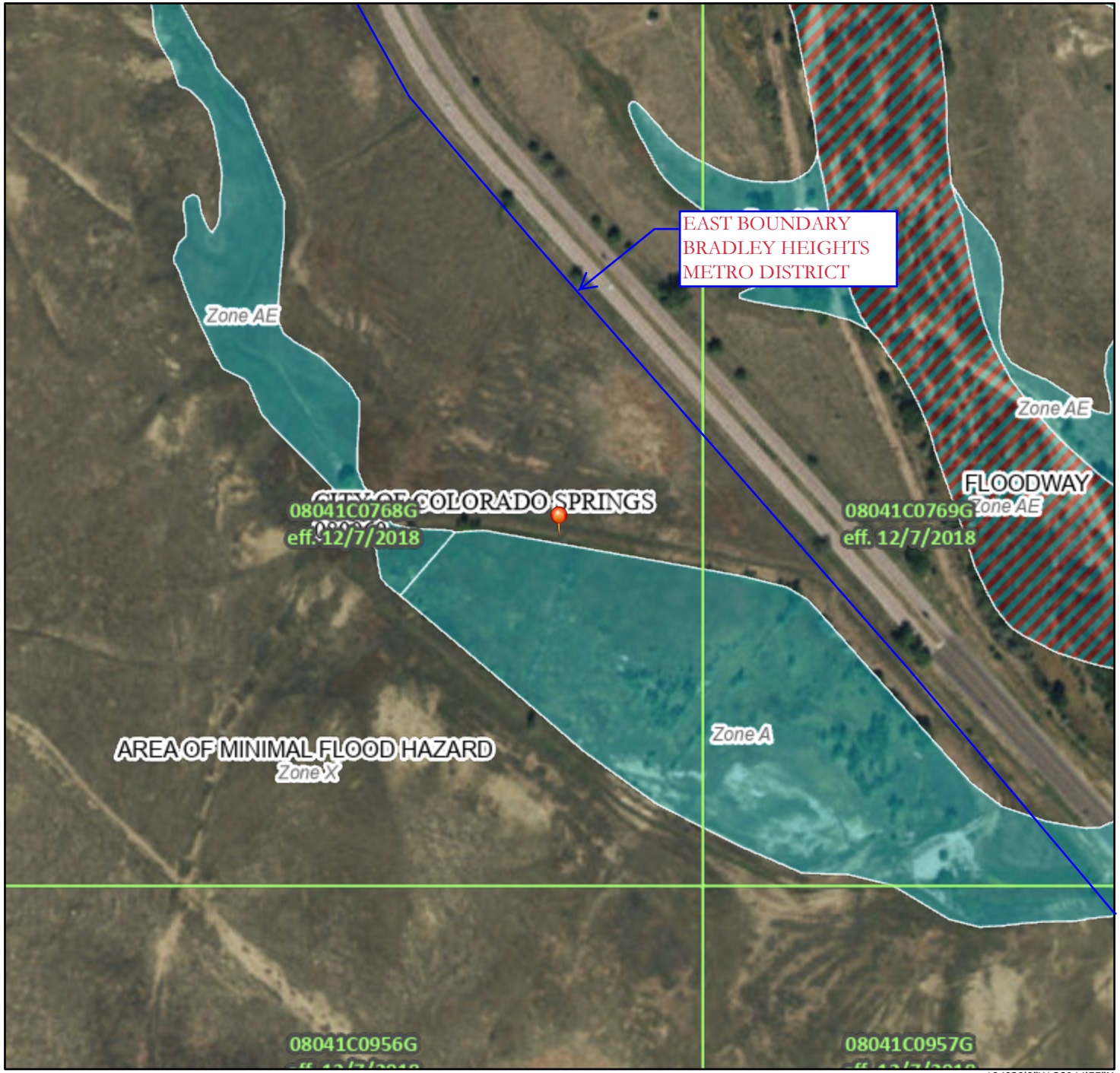
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/24/2022 at 1:29 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

National Flood Hazard Layer FIRMette

FEMA

104°39'46"W 38°45'23"N



104°39'9"W 38°44'55"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/24/2022 at 2:31 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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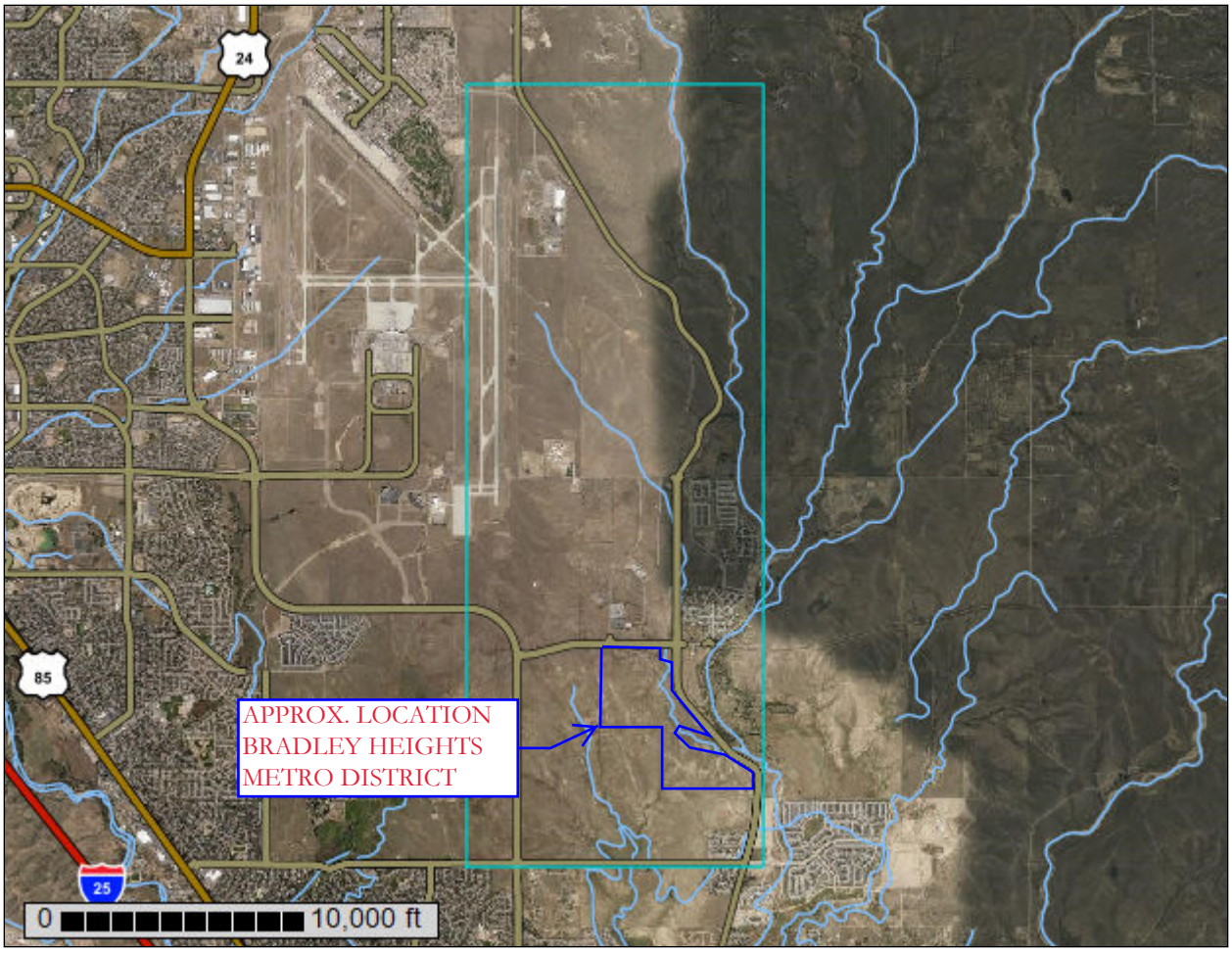
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado



November 12, 2021

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

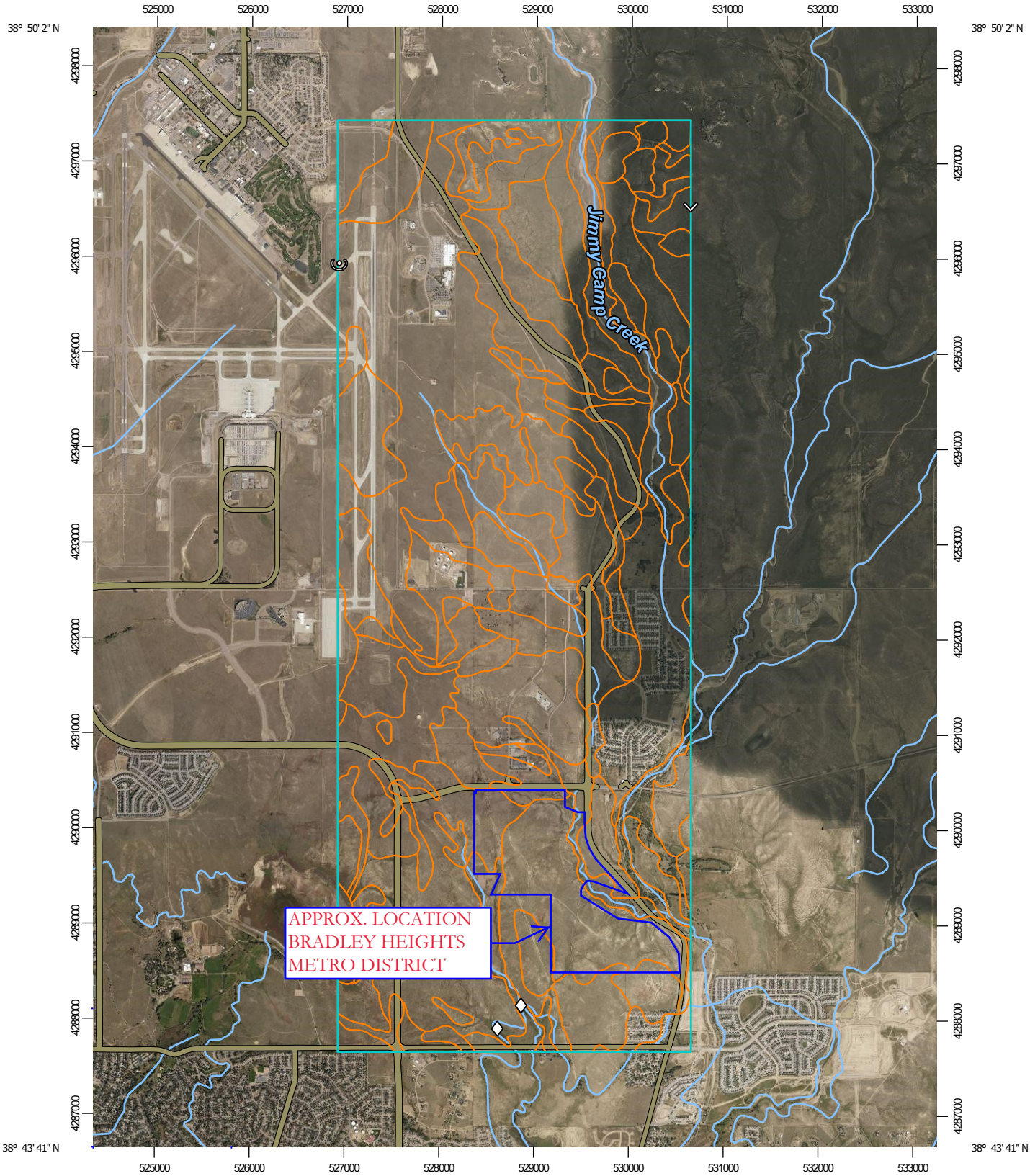
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:57,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2500 5000 10000 15000

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 14, 2018—Oct 20, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	389.5	4.3%
3	Ascalon sandy loam, 3 to 9 percent slopes	114.5	1.3%
8	Blakeland loamy sand, 1 to 9 percent slopes	1,577.6	17.5%
10	Blendon sandy loam, 0 to 3 percent slopes	277.6	3.1%
11	Bresser sandy loam, cool, 0 to 3 percent slopes	63.1	0.7%
12	Bresser sandy loam, cool, 3 to 5 percent slopes	59.4	0.7%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	369.3	4.1%
30	Fort Collins loam, 0 to 3 percent slopes	366.0	4.1%
31	Fort Collins loam, 3 to 8 percent slopes	327.0	3.6%
33	Heldt clay loam, 0 to 3 percent slopes	23.6	0.3%
43	Kim loam, 1 to 8 percent slopes	149.7	1.7%
47	Limon clay, 0 to 3 percent slopes	26.1	0.3%
52	Manzanst clay loam, 0 to 3 percent slopes	400.6	4.4%
54	Midway clay loam, 3 to 25 percent slopes	9.5	0.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	1,268.1	14.0%
59	Nunn clay loam, 0 to 3 percent slopes	21.4	0.2%
75	Razor-Midway complex	806.5	8.9%
86	Stoneham sandy loam, 3 to 8 percent slopes	464.6	5.1%
89	Tassel fine sandy loam, 3 to 18 percent slopes	195.7	2.2%
90	Terry sandy loam, 1 to 8 percent slopes	30.4	0.3%
94	Travessilla-Rock outcrop complex, 8 to 90 percent slopes	70.4	0.8%
95	Truckton loamy sand, 1 to 9 percent slopes	6.6	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
96	Truckton sandy loam, 0 to 3 percent slopes	227.0	2.5%
97	Truckton sandy loam, 3 to 9 percent slopes	714.3	7.9%
101	Ustic Torrifluvents, loamy	818.8	9.1%
104	Vona sandy loam, warm, 0 to 3 percent slopes	79.8	0.9%
106	Wigton loamy sand, 1 to 8 percent slopes	46.4	0.5%
108	Wiley silt loam, 3 to 9 percent slopes	87.1	1.0%
111	Water	45.5	0.5%
Totals for Area of Interest		**9,036.4**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

2—Ascalon sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367q
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 8 inches: sandy loam
Bt - 8 to 21 inches: sandy clay loam
BC - 21 to 27 inches: sandy loam
Ck1 - 27 to 48 inches: sandy loam
Ck2 - 48 to 60 inches: loamy sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R069XY026CO - Sandy Plains LRU's A and B
Other vegetative classification: SANDY PLAINS (069BY026CO)
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

3—Ascalon sandy loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tlny
Elevation: 3,870 to 5,960 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 95 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk1 - 19 to 35 inches: fine sandy loam
Bk2 - 35 to 80 inches: fine sandy loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.98 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Olnest

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Vona

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671

Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blendon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blendon

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

11—Bresser sandy loam, cool, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tlph
Elevation: 5,850 to 6,880 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 100 to 130 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

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

Description of Bresser, Cool

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Tertiary aged alluvium derived from arkose

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt1 - 5 to 8 inches: sandy loam
Bt2 - 8 to 27 inches: sandy clay loam
Bt3 - 27 to 36 inches: sandy loam
C - 36 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c

Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Truckton
Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Yoder
Percent of map unit: 5 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

12—Bresser sandy loam, cool, 3 to 5 percent slopes

Map Unit Setting
National map unit symbol: 2tlpd
Elevation: 6,300 to 6,800 feet
Mean annual precipitation: 13 to 19 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 140 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition
Bresser, cool, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser, Cool

Setting
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Tertiary aged alluvium derived from arkose

Typical profile

Ap - 0 to 5 inches: sandy loam
Bt1 - 5 to 8 inches: sandy loam
Bt2 - 8 to 27 inches: sandy clay loam
Bt3 - 27 to 36 inches: sandy loam
C - 36 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Truckton

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Yoder

Percent of map unit: 5 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

28—Ellicott loamy coarse sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 3680
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ellicott

Setting

Landform: Flood plains, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 4 inches: loamy coarse sand
C - 4 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R069XY031CO - Sandy Bottomland LRU's A and B
Other vegetative classification: SANDY BOTTOMLAND (069AY031CO)
Hydric soil rating: No

Minor Components

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

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

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

30—Fort Collins loam, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 3683
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile
A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

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

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

31—Fort Collins loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 3684
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Farmland classification: Not prime farmland

Map Unit Composition
Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

33—Heldt clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3686
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Heldt and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Heldt

Setting

Landform: Alluvial fans, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from shale

Typical profile

Ap - 0 to 8 inches: clay loam
Bw - 8 to 41 inches: silty clay
Bk - 41 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 4 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: C
Ecological site: R069XY047CO - Alkaline Plains LRU's A and B
Other vegetative classification: ALKALINE PLAINS (069BY047CO)
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

43—Kim loam, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368k
Elevation: 5,300 to 5,600 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Kim and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kim

Setting

Landform: Fans, hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 6 inches: loam
C - 6 to 60 inches: loam

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R069XY006CO - Loamy Plains, LRU's A and B 10-14 Inches, P.Z.
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

47—Limon clay, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 368p
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Limon, occasionally flooded, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Limon, Occasionally Flooded

Setting

Landform: Flood plains, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from shale

Typical profile

A - 0 to 4 inches: clay
AC - 4 to 12 inches: silty clay
C - 12 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent

Gypsum, maximum content: 2 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R069XY033CO - Salt Flat LRU's A and B
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

52—Manzanst clay loam, 0 to 3 percent slopes

Map Unit Setting

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

Map Unit Composition

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

Description of Manzanst

Setting

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

Typical profile

A - 0 to 3 inches: clay loam
Bt - 3 to 12 inches: clay
Btk - 12 to 37 inches: clay

Bk1 - 37 to 52 inches: clay
Bk2 - 52 to 79 inches: clay

Properties and qualities

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

Interpretive groups

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

Minor Components

Ritoazul

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

Arvada

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

Wiley

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

54—Midway clay loam, 3 to 25 percent slopes

Map Unit Setting

National map unit symbol: 368y
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Midway and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Midway

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
C - 4 to 13 inches: clay
Cr - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains LRU's A and B

Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

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

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting
National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition
Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting
Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile
A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities
Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting
Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile
A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities
Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent

Hydric soil rating: No

Pleasant

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

59—Nunn clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3693
Elevation: 5,400 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nunn and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting

Landform: Fans, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A - 0 to 12 inches: clay loam
Bt - 12 to 26 inches: clay loam
BC - 26 to 30 inches: clay loam
Bk - 30 to 58 inches: sandy clay loam
C - 58 to 72 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: R069XY042CO - Clayey Plains LRU's A and B
Other vegetative classification: CLAYEY PLAINS (069AY042CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

75—Razor-Midway complex

Map Unit Setting

National map unit symbol: 369p
Elevation: 5,300 to 6,100 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Razor and similar soils: 60 percent
Midway and similar soils: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Razor

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear
Parent material: Clayey slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: stony clay loam
Bw - 4 to 22 inches: cobbly clay loam
Bk - 22 to 29 inches: cobbly clay
Cr - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R069XY047CO - Alkaline Plains LRU's A and B
Other vegetative classification: ALKALINE PLAINS (069AY047CO)
Hydric soil rating: No

Description of Midway

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
C - 4 to 13 inches: clay
Cr - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains LRU's A and B
Other vegetative classification: SHALY PLAINS (069AY045CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

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

86—Stoneham sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 36b2
Elevation: 5,100 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition
Stoneham and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stoneham

Setting
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile
A - 0 to 4 inches: sandy loam
Bt - 4 to 8 inches: sandy clay loam
Btk - 8 to 11 inches: sandy clay loam
Ck - 11 to 60 inches: loam

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069AY026CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

89—Tassel fine sandy loam, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 36b5
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 51 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Tassel and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile
A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities
Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069AY026CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 5 percent
Hydric soil rating: No

90—Terry sandy loam, 1 to 8 percent slopes

Map Unit Setting
National map unit symbol: 36b7
Elevation: 5,600 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition
Terry and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terry

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from sandstone

Typical profile

A - 0 to 5 inches: sandy loam
Bt - 5 to 8 inches: sandy loam
C - 8 to 23 inches: sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 5 percent
Hydric soil rating: No

94—Travessilla-Rock outcrop complex, 8 to 90 percent slopes

Map Unit Setting

National map unit symbol: 36bc
Elevation: 6,200 to 6,700 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 130 to 150 days

Farmland classification: Not prime farmland

Map Unit Composition

Travessilla and similar soils: 55 percent
Rock outcrop: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Travessilla

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone

Typical profile

A1 - 0 to 3 inches: sandy loam
C - 3 to 11 inches: sandy loam
R - 11 to 15 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 45 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F048AY924CO - Douglas Fir/Gambel Oak
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 90 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

95—Truckton loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2yvrm
Elevation: 5,800 to 7,100 feet
Mean annual precipitation: 12 to 19 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 90 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Truckton and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Fan remnants, interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: loamy sand
Bt1 - 4 to 12 inches: sandy loam
Bt2 - 12 to 19 inches: sandy loam
C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 5 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 5 percent
Landform: Terraces, interfluves
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Urban land

Percent of map unit: 2 percent
Hydric soil rating: No

Ellicott, occasionally flooded

Percent of map unit: 1 percent
Landform: Drainageways, flood plains
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

96—Truckton sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2yvrd
Elevation: 5,400 to 7,000 feet
Mean annual precipitation: 14 to 23 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 90 to 155 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

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

Description of Truckton

Setting

Landform: Interfluves, fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: sandy loam
Bt1 - 4 to 12 inches: sandy loam
Bt2 - 12 to 19 inches: sandy loam
C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 5 percent
Landform: Interfluves, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 5 percent
Landform: Interfluves, terraces
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Pleasant, frequently ponded
Percent of map unit: 2 percent
Landform: Closed depressions
Down-slope shape: Concave, linear
Across-slope shape: Concave
Ecological site: R067BY010CO - Closed Upland Depression
Hydric soil rating: Yes

Urban land
Percent of map unit: 2 percent
Hydric soil rating: No

Ellicott, occasionally flooded
Percent of map unit: 1 percent
Landform: Flood plains, drainageways
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

97—Truckton sandy loam, 3 to 9 percent slopes

Map Unit Setting
National map unit symbol: 2x0j2
Elevation: 5,300 to 6,850 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 85 to 155 days
Farmland classification: Not prime farmland

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

Description of Truckton

Setting
Landform: Interfluves, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Re-worked alluvium derived from arkose

Typical profile

A - 0 to 4 inches: sandy loam
Bt1 - 4 to 12 inches: sandy loam
Bt2 - 12 to 19 inches: sandy loam
C - 19 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 8 percent
Landform: Interfluves, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Landform: Interfluves, low hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

101—Ustic Torrifluvents, loamy

Map Unit Setting

National map unit symbol: 3673
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 125 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Ustic torrifluvents and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ustic Torrifluvents

Setting

Landform: Flood plains, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy, clayey, stratified loamy

Typical profile

A - 0 to 6 inches: variable
C - 6 to 60 inches: stratified loamy sand to clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R069XY037CO - Saline Overflow LRU's A and B
Other vegetative classification: OVERFLOW (069BY036CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

104—Vona sandy loam, warm, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t516
Elevation: 3,590 to 6,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Vona, Warm

Setting

Landform: Sand sheets
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sands

Typical profile

A - 0 to 5 inches: sandy loam
Bt1 - 5 to 12 inches: sandy loam
Bt2 - 12 to 17 inches: sandy loam
Bk - 17 to 41 inches: sandy loam
BCk - 41 to 79 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to slightly saline (0.5 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Forage suitability group: Loamy, Dry (G067BW019CO)
Other vegetative classification: Sandy Plains #24 (067XY024CO_2), Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Minor Components

Olnest, warm

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Otero

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (067XY024CO_1), Loamy, Dry (G067BW019CO)
Hydric soil rating: No

Valent, warm

Percent of map unit: 5 percent
Landform: Sand sheets
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R067BY015CO - Deep Sand
Other vegetative classification: Deep Sands #15 (067XY015CO_3), Sandy, Dry (G067BW026CO)
Hydric soil rating: No

106—Wigton loamy sand, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3678
Elevation: 5,300 to 6,000 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Wigton and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wigton

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Noncalcareous, dune-like sandy eolian deposits

Typical profile

A - 0 to 8 inches: loamy sand
AC - 8 to 19 inches: loamy sand
C - 19 to 60 inches: sand

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY015CO - Deep Sand
Other vegetative classification: DEEP SANDS (069BY019CO)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

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

108—Wiley silt loam, 3 to 9 percent slopes

Map Unit Setting
National map unit symbol: 367b
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition
Wiley and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wiley

Setting
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty eolian deposits

Typical profile
A - 0 to 4 inches: silt loam
Bt - 4 to 16 inches: silt loam
Bk - 16 to 60 inches: silt loam

Properties and qualities
Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

111—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Soil Information for All Uses

Soil Properties and Qualities

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

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Saturated Hydraulic Conductivity (Ksat), Standard Classes

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits. The classes are:

Very low: 0.00 to 0.01

Low: 0.01 to 0.1

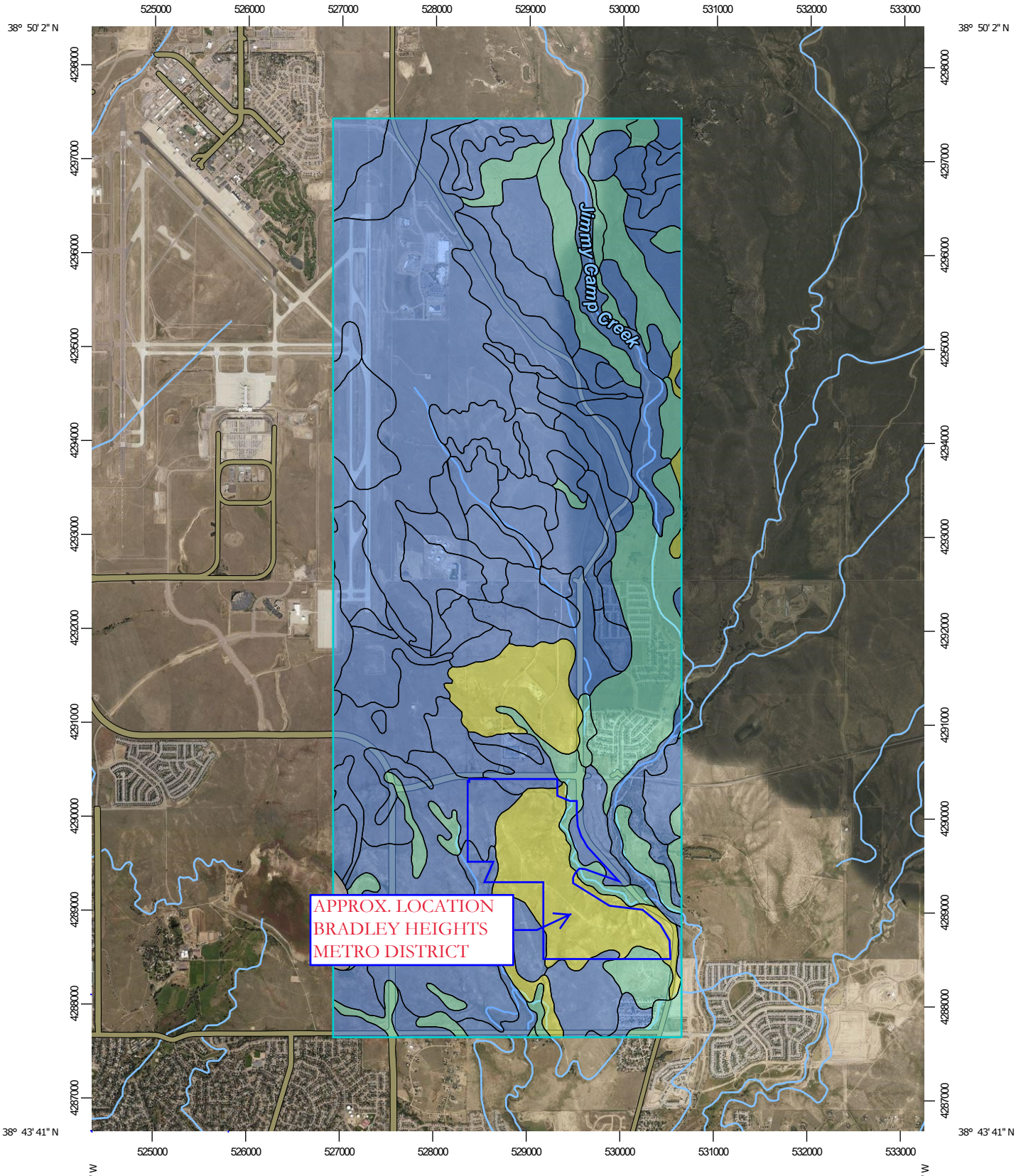
Moderately low: 0.1 to 1.0

Moderately high: 1 to 10

High: 10 to 100

Very high: 100 to 705

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat), Standard Classes



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Soil Rating Lines

- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Soil Rating Points

- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 14, 2018—Oct 20, 2018

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

Table—Saturated Hydraulic Conductivity (Ksat), Standard Classes

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	28.0000	389.5	4.3%
3	Ascalon sandy loam, 3 to 9 percent slopes	28.2250	114.5	1.3%
8	Blakeland loamy sand, 1 to 9 percent slopes	92.0000	1,577.6	17.5%
10	Blendon sandy loam, 0 to 3 percent slopes	28.0000	277.6	3.1%
11	Bresser sandy loam, cool, 0 to 3 percent slopes	28.2250	63.1	0.7%
12	Bresser sandy loam, cool, 3 to 5 percent slopes	28.2250	59.4	0.7%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	92.0000	369.3	4.1%
30	Fort Collins loam, 0 to 3 percent slopes	23.0000	366.0	4.1%
31	Fort Collins loam, 3 to 8 percent slopes	23.0000	327.0	3.6%
33	Heldt clay loam, 0 to 3 percent slopes	3.0000	23.6	0.3%
43	Kim loam, 1 to 8 percent slopes	9.0000	149.7	1.7%
47	Limon clay, 0 to 3 percent slopes	1.0000	26.1	0.3%
52	Manzanst clay loam, 0 to 3 percent slopes	2.8200	400.6	4.4%
54	Midway clay loam, 3 to 25 percent slopes	2.0000	9.5	0.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	28.0000	1,268.1	14.0%
59	Nunn clay loam, 0 to 3 percent slopes	3.0000	21.4	0.2%
75	Razor-Midway complex	1.0000	806.5	8.9%
86	Stoneham sandy loam, 3 to 8 percent slopes	28.0000	464.6	5.1%
89	Tassel fine sandy loam, 3 to 18 percent slopes	28.0000	195.7	2.2%
90	Terry sandy loam, 1 to 8 percent slopes	23.0000	30.4	0.3%

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
94	Travessilla-Rock outcrop complex, 8 to 90 percent slopes	23.0000	70.4	0.8%
95	Truckton loamy sand, 1 to 9 percent slopes	91.7400	6.6	0.1%
96	Truckton sandy loam, 0 to 3 percent slopes	28.2250	227.0	2.5%
97	Truckton sandy loam, 3 to 9 percent slopes	28.2250	714.3	7.9%
101	Ustic Torrifluvents, loamy	9.0000	818.8	9.1%
104	Vona sandy loam, warm, 0 to 3 percent slopes	20.0000	79.8	0.9%
106	Wigton loamy sand, 1 to 8 percent slopes	92.0000	46.4	0.5%
108	Wiley silt loam, 3 to 9 percent slopes	9.0000	87.1	1.0%
111	Water		45.5	0.5%
Totals for Area of Interest			**9,036.4**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat), Standard Classes

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

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

Soil Qualities and Features

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

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the

soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

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

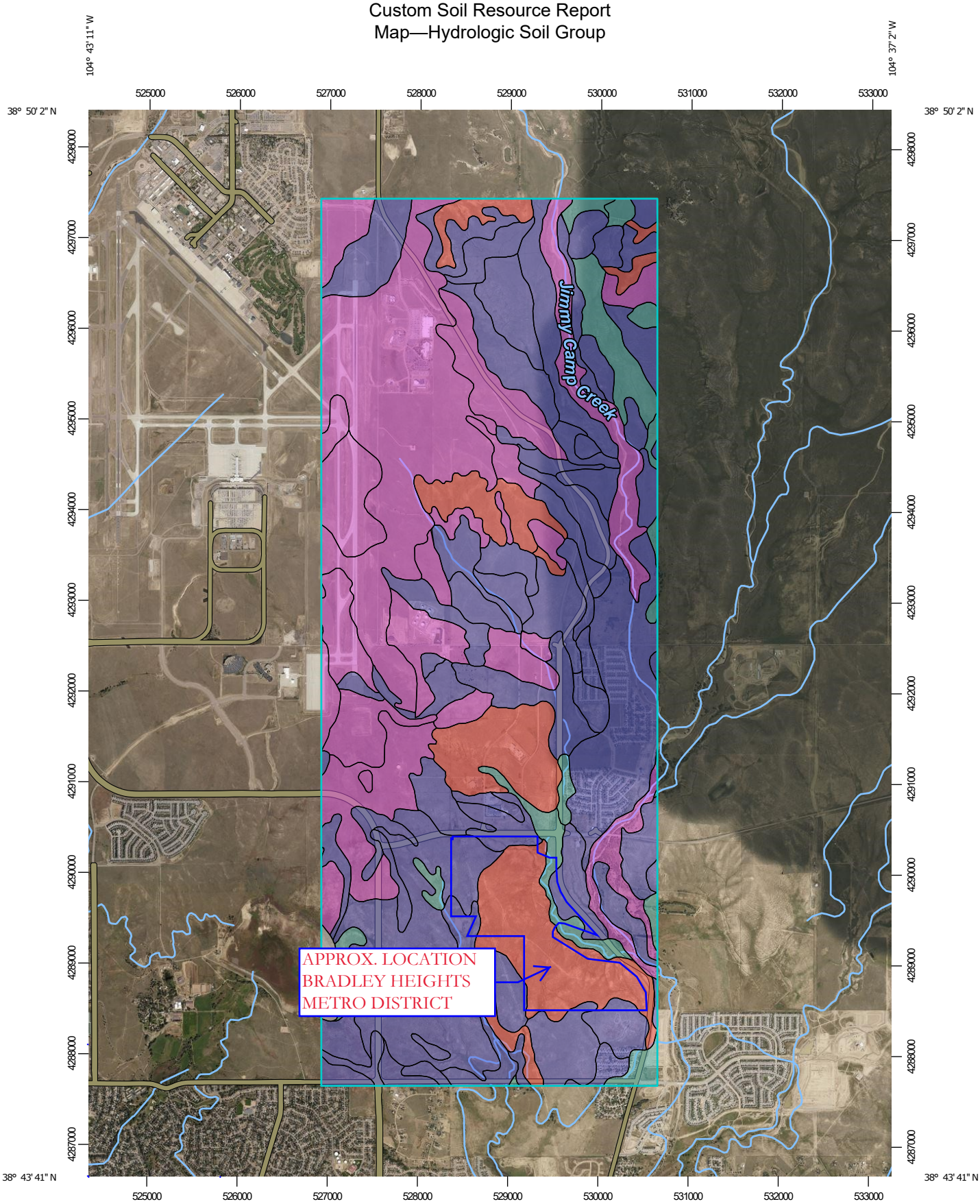
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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

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

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

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



Map Scale: 1:57,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2500 5000 10000 15000

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil 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 1:24,000.

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

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

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	B	389.5	4.3%
3	Ascalon sandy loam, 3 to 9 percent slopes	B	114.5	1.3%
8	Blakeland loamy sand, 1 to 9 percent slopes	A	1,577.6	17.5%
10	Blendon sandy loam, 0 to 3 percent slopes	B	277.6	3.1%
11	Bresser sandy loam, cool, 0 to 3 percent slopes	B	63.1	0.7%
12	Bresser sandy loam, cool, 3 to 5 percent slopes	B	59.4	0.7%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	369.3	4.1%
30	Fort Collins loam, 0 to 3 percent slopes	B	366.0	4.1%
31	Fort Collins loam, 3 to 8 percent slopes	B	327.0	3.6%
33	Heldt clay loam, 0 to 3 percent slopes	C	23.6	0.3%
43	Kim loam, 1 to 8 percent slopes	B	149.7	1.7%
47	Limon clay, 0 to 3 percent slopes	C	26.1	0.3%
52	Manzanst clay loam, 0 to 3 percent slopes	C	400.6	4.4%
54	Midway clay loam, 3 to 25 percent slopes	D	9.5	0.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	1,268.1	14.0%
59	Nunn clay loam, 0 to 3 percent slopes	C	21.4	0.2%
75	Razor-Midway complex	D	806.5	8.9%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	464.6	5.1%
89	Tassel fine sandy loam, 3 to 18 percent slopes	D	195.7	2.2%
90	Terry sandy loam, 1 to 8 percent slopes	B	30.4	0.3%
94	Travessilla-Rock outcrop complex, 8 to 90 percent slopes	D	70.4	0.8%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
95	Truckton loamy sand, 1 to 9 percent slopes	A	6.6	0.1%
96	Truckton sandy loam, 0 to 3 percent slopes	A	227.0	2.5%
97	Truckton sandy loam, 3 to 9 percent slopes	A	714.3	7.9%
101	Ustic Torrifluvents, loamy	B	818.8	9.1%
104	Vona sandy loam, warm, 0 to 3 percent slopes	A	79.8	0.9%
106	Wigton loamy sand, 1 to 8 percent slopes	A	46.4	0.5%
108	Wiley silt loam, 3 to 9 percent slopes	B	87.1	1.0%
111	Water		45.5	0.5%
Totals for Area of Interest			**9,036.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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United States Department of Agriculture

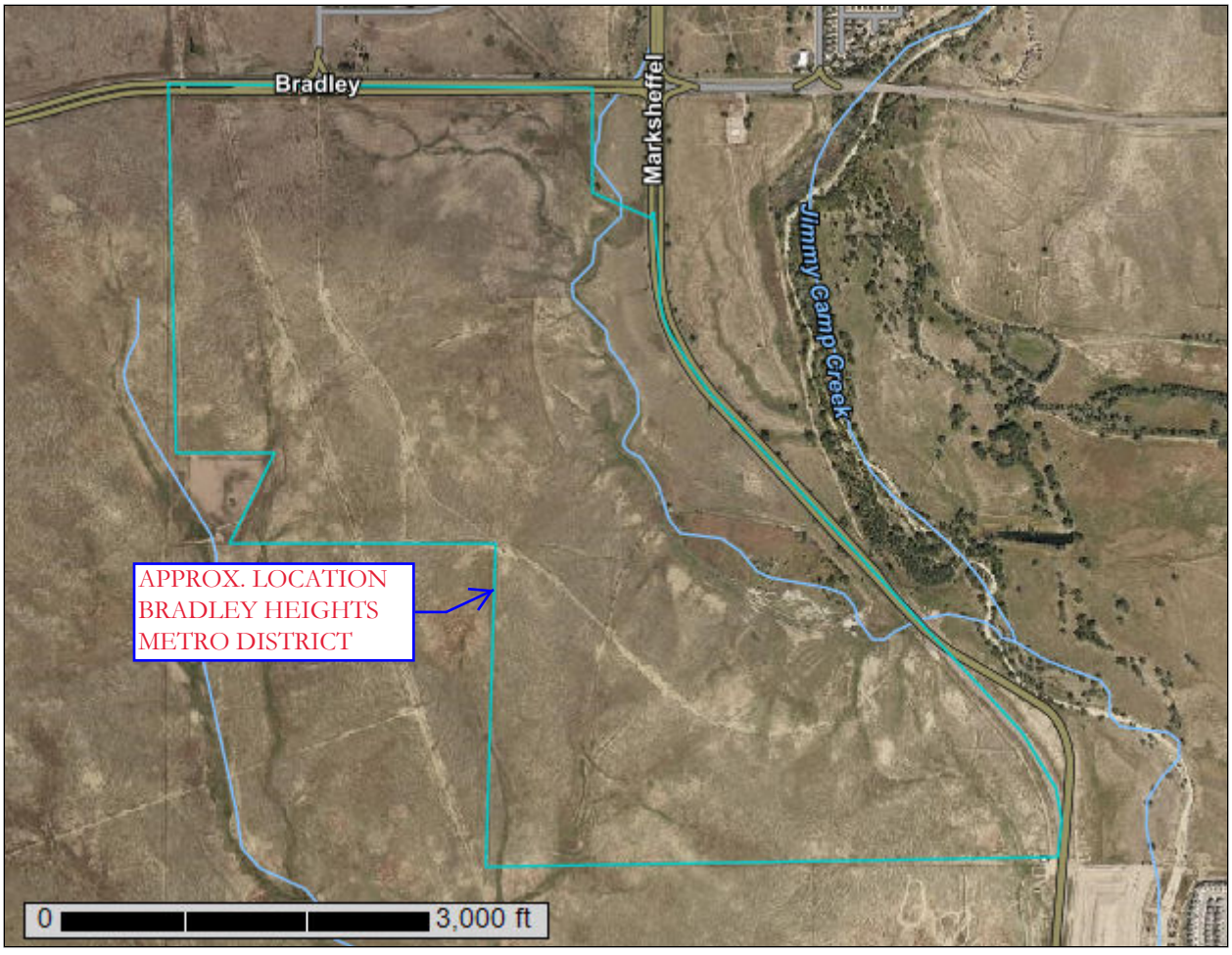
NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado

BRADLEY HEIGHTS MDDP



September 28, 2021

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

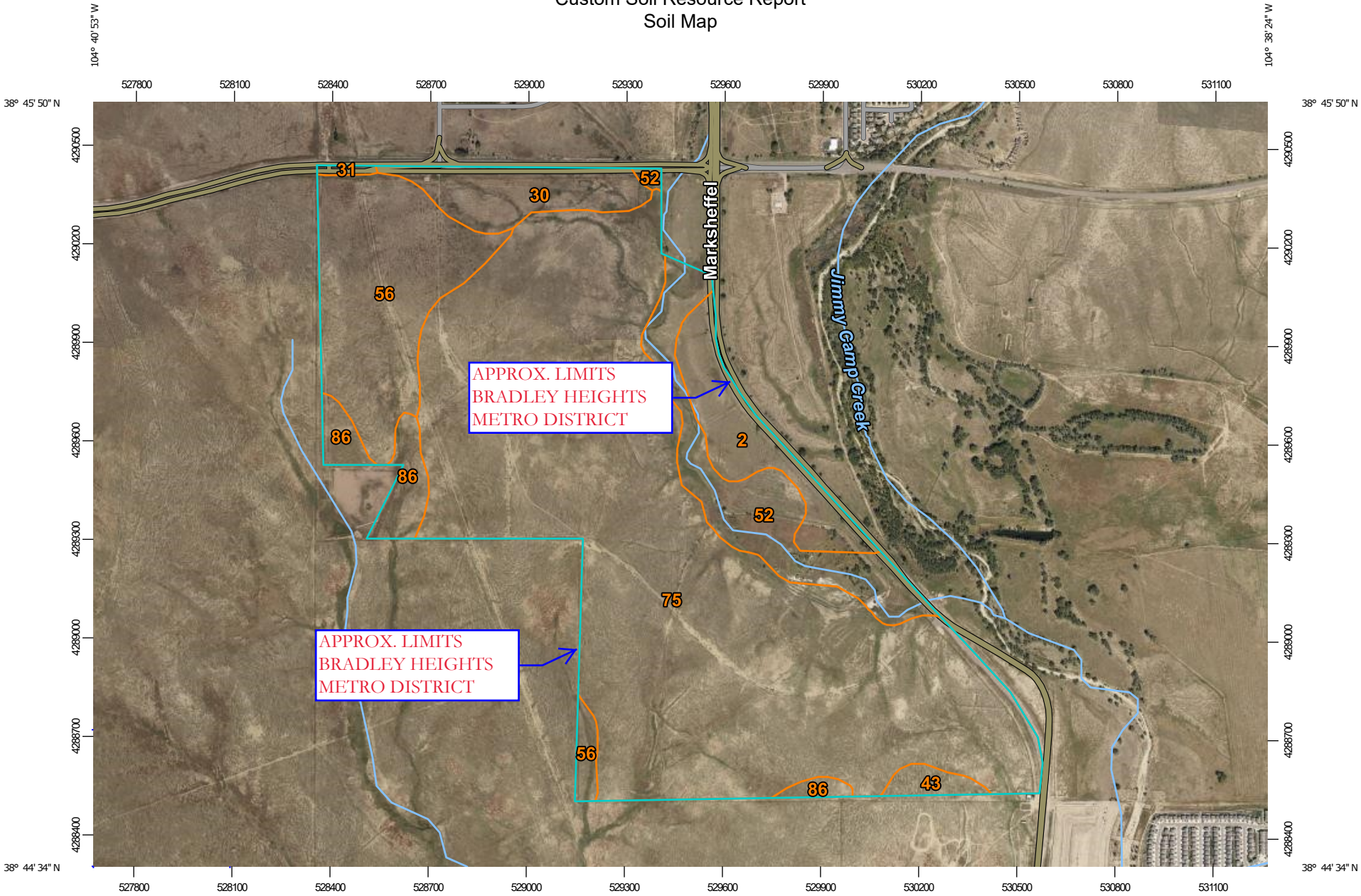
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map



MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, 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: Aug 14, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	30.3	5.2%
30	Fort Collins loam, 0 to 3 percent slopes	26.1	4.5%
31	Fort Collins loam, 3 to 8 percent slopes	1.3	0.2%
43	Kim loam, 1 to 8 percent slopes	5.3	0.9%
52	Manzanst clay loam, 0 to 3 percent slopes	47.4	8.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	75.2	12.9%
75	Razor-Midway complex	381.8	65.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	17.6	3.0%
Totals for Area of Interest		**585.0**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit

descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

2—Ascalon sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367q
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 130 to 150 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 8 inches: sandy loam
Bt - 8 to 21 inches: sandy clay loam
BC - 21 to 27 inches: sandy loam
Ck1 - 27 to 48 inches: sandy loam
Ck2 - 48 to 60 inches: loamy sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R069XY026CO - Sandy Plains LRU's A & B
Other vegetative classification: SANDY PLAINS (069BY026CO)
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

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

30—Fort Collins loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3683
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

31—Fort Collins loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3684
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Farmland classification: Not prime farmland

Map Unit Composition

Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam

Ck - 21 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

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

43—Kim loam, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368k
Elevation: 5,300 to 5,600 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Kim and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kim

Setting

Landform: Fans, hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 6 inches: loam
C - 6 to 60 inches: loam

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R069XY006CO - Loamy Plains, LRU's A & B 10-14 Inches, P.Z.
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

52—Manzanst clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w4nr
Elevation: 4,060 to 6,660 feet
Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Manzanst

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

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

Minor Components

Ritoazul

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

Arvada

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

Wiley

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

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

75—Razor-Midway complex

Map Unit Setting

National map unit symbol: 369p
Elevation: 5,300 to 6,100 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Razor and similar soils: 60 percent
Midway and similar soils: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Razor

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Clayey slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: stony clay loam
Bw - 4 to 22 inches: cobbly clay loam
Bk - 22 to 29 inches: cobbly clay
Cr - 29 to 33 inches: weathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 5 percent
Maximum salinity: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R069XY047CO - Alkaline Plains LRU's A & B
Other vegetative classification: ALKALINE PLAINS (069AY047CO)
Hydric soil rating: No

Description of Midway

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: clay loam
C - 4 to 13 inches: clay
Cr - 13 to 17 inches: weathered bedrock

Properties and qualities

Slope: 3 to 25 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 15 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water supply, 0 to 60 inches: Very low (about 2.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R069XY046CO - Shaly Plains LRU's A & B
Other vegetative classification: SHALY PLAINS (069AY045CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

86—Stoneham sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b2
Elevation: 5,100 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Stoneham and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stoneham

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 8 inches: sandy clay loam
Btk - 8 to 11 inches: sandy clay loam
Ck - 11 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069AY026CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

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

Soil Information for All Uses

Soil Properties and Qualities

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

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

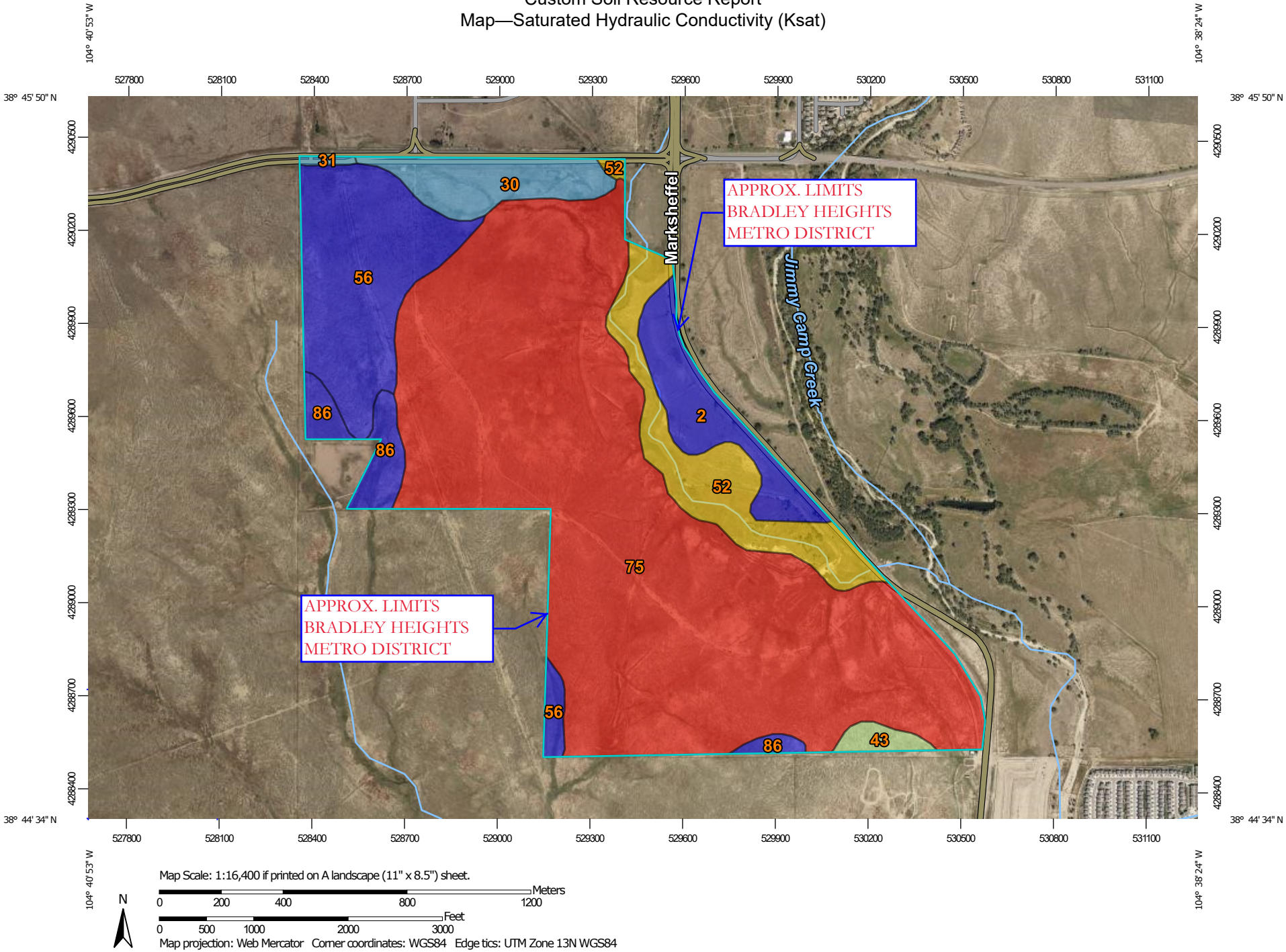
Saturated Hydraulic Conductivity (Ksat)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- <= 1.0000
- > 1.0000 and <= 2.8200
- > 2.8200 and <= 9.0000
- > 9.0000 and <= 23.0000
- > 23.0000 and <= 28.0000
- Not rated or not available

Soil Rating Lines

- <= 1.0000
- > 1.0000 and <= 2.8200
- > 2.8200 and <= 9.0000
- > 9.0000 and <= 23.0000
- > 23.0000 and <= 28.0000
- Not rated or not available

Soil Rating Points

- <= 1.0000
- > 1.0000 and <= 2.8200
- > 2.8200 and <= 9.0000
- > 9.0000 and <= 23.0000
- > 23.0000 and <= 28.0000
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, 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: Aug 14, 2018—Sep 23, 2018

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

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	28.0000	30.3	5.2%
30	Fort Collins loam, 0 to 3 percent slopes	23.0000	26.1	4.5%
31	Fort Collins loam, 3 to 8 percent slopes	23.0000	1.3	0.2%
43	Kim loam, 1 to 8 percent slopes	9.0000	5.3	0.9%
52	Manzanst clay loam, 0 to 3 percent slopes	2.8200	47.4	8.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	28.0000	75.2	12.9%
75	Razor-Midway complex	1.0000	381.8	65.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	28.0000	17.6	3.0%
Totals for Area of Interest			**585.0**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

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

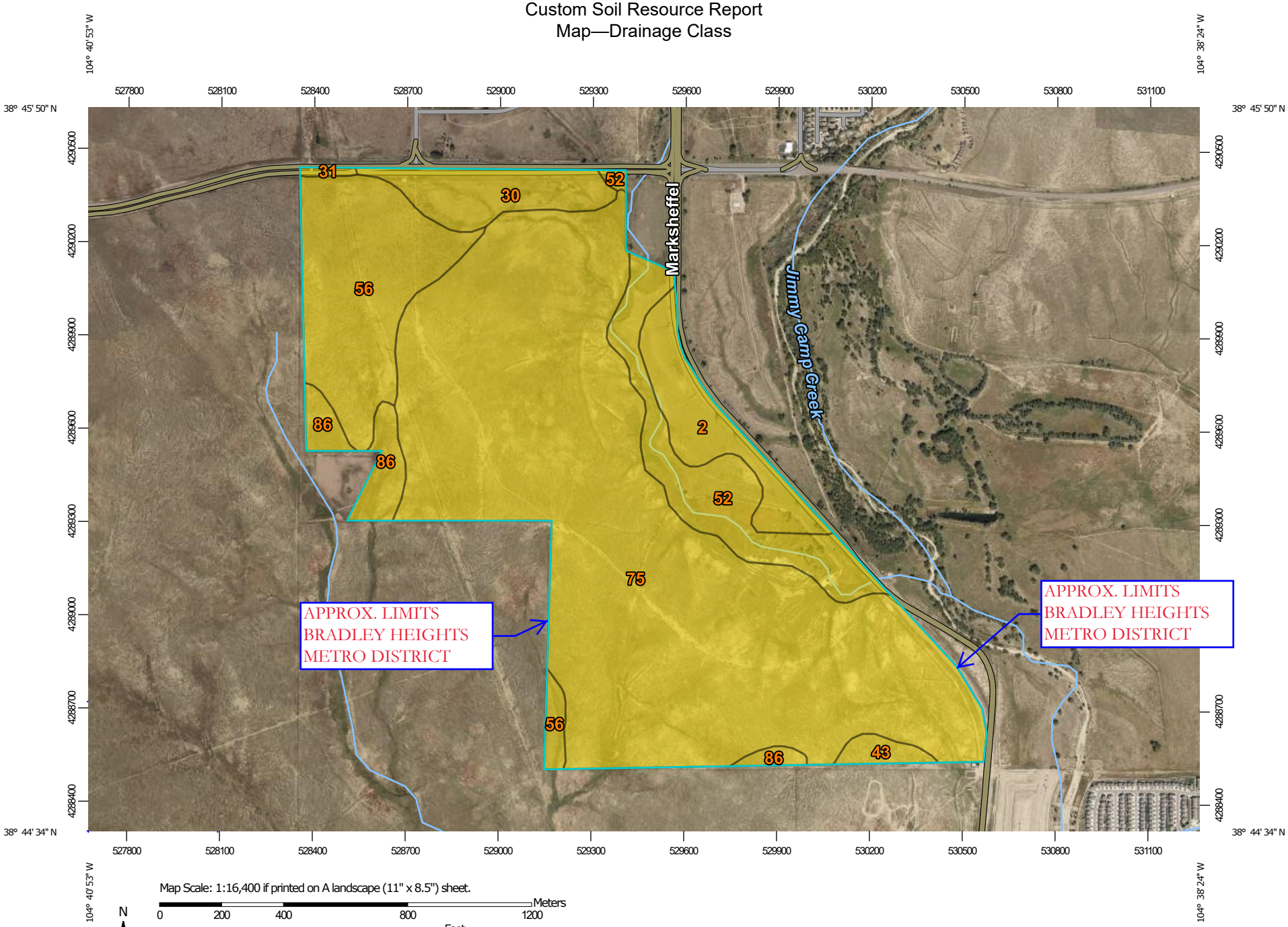
Soil Qualities and Features

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

Drainage Class

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Custom Soil Resource Report
Map—Drainage Class



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, 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: Aug 14, 2018—Sep 23, 2018

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Table—Drainage Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	Well drained	30.3	5.2%
30	Fort Collins loam, 0 to 3 percent slopes	Well drained	26.1	4.5%
31	Fort Collins loam, 3 to 8 percent slopes	Well drained	1.3	0.2%
43	Kim loam, 1 to 8 percent slopes	Well drained	5.3	0.9%
52	Manzanst clay loam, 0 to 3 percent slopes	Well drained	47.4	8.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	Well drained	75.2	12.9%
75	Razor-Midway complex	Well drained	381.8	65.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	Well drained	17.6	3.0%
Totals for Area of Interest			**585.0**	**100.0%**

Rating Options—Drainage Class

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group

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

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

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

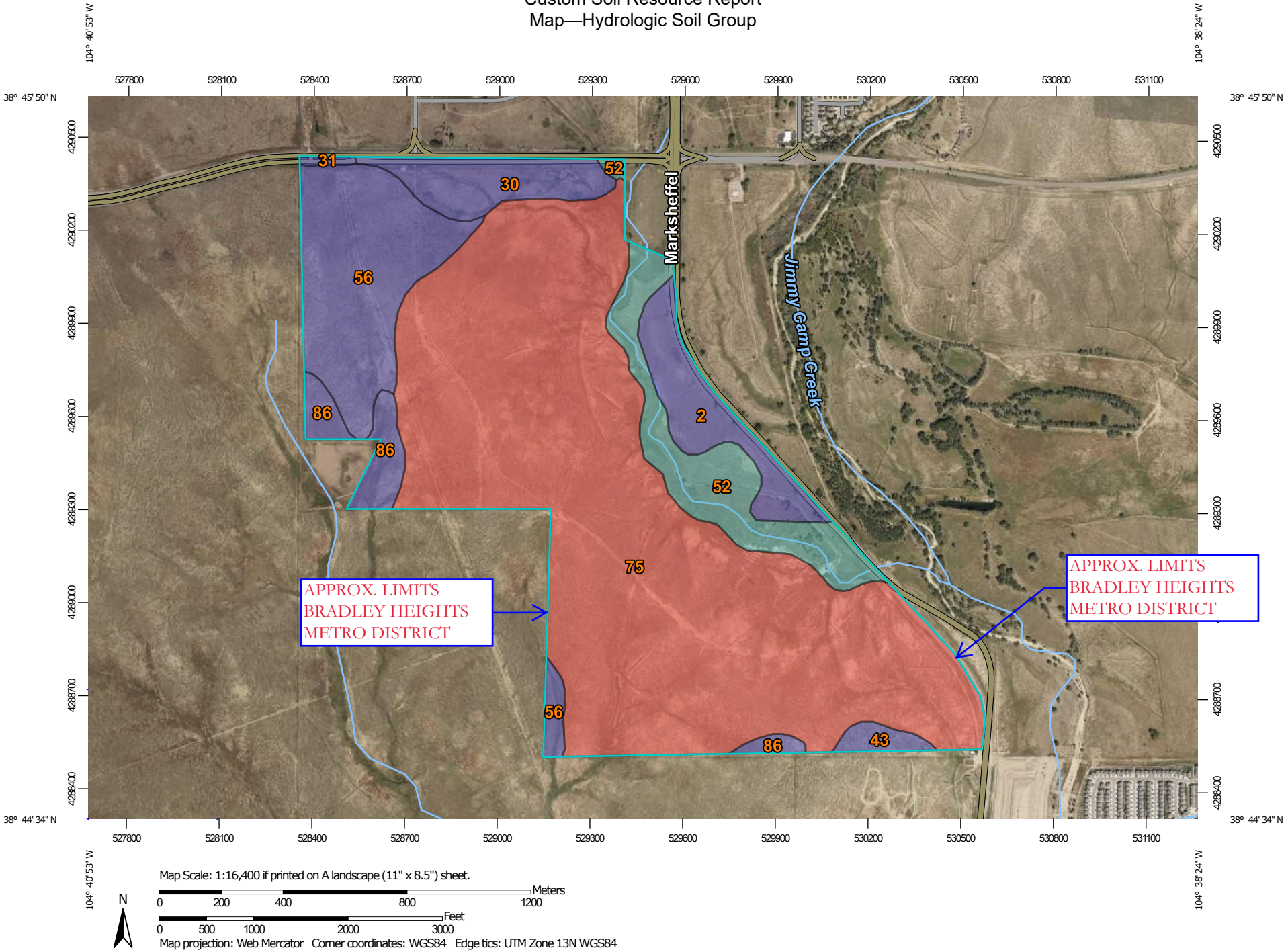
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2	Ascalon sandy loam, 1 to 3 percent slopes	B	30.3	5.2%
30	Fort Collins loam, 0 to 3 percent slopes	B	26.1	4.5%
31	Fort Collins loam, 3 to 8 percent slopes	B	1.3	0.2%
43	Kim loam, 1 to 8 percent slopes	B	5.3	0.9%
52	Manzanst clay loam, 0 to 3 percent slopes	C	47.4	8.1%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	75.2	12.9%
75	Razor-Midway complex	D	381.8	65.3%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	17.6	3.0%
Totals for Area of Interest			**585.0**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.7611°, Longitude: -104.6617°
Elevation: 5804.25 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.246** (0.204-0.300)	**0.296** (0.246-0.363)	**0.386** (0.319-0.473)	**0.467** (0.383-0.575)	**0.588** (0.468-0.761)	**0.688** (0.532-0.901)	**0.795** (0.591-1.07)	**0.911** (0.646-1.26)	**1.07** (0.728-1.53)	**1.21** (0.791-1.73)
10-min	**0.360** (0.299-0.440)	**0.434** (0.360-0.531)	**0.565** (0.467-0.693)	**0.684** (0.561-0.842)	**0.860** (0.685-1.11)	**1.01** (0.779-1.32)	**1.17** (0.865-1.56)	**1.33** (0.945-1.84)	**1.57** (1.07-2.23)	**1.77** (1.16-2.53)
15-min	**0.439** (0.364-0.536)	**0.529** (0.439-0.647)	**0.689** (0.569-0.846)	**0.834** (0.684-1.03)	**1.05** (0.835-1.36)	**1.23** (0.950-1.61)	**1.42** (1.06-1.91)	**1.63** (1.15-2.25)	**1.92** (1.30-2.72)	**2.15** (1.41-3.09)
30-min	**0.653** (0.542-0.798)	**0.786** (0.651-0.961)	**1.02** (0.843-1.25)	**1.23** (1.01-1.52)	**1.55** (1.24-2.01)	**1.82** (1.41-2.38)	**2.10** (1.56-2.82)	**2.41** (1.71-3.33)	**2.84** (1.93-4.03)	**3.19** (2.09-4.57)
60-min	**0.861** (0.714-1.05)	**1.01** (0.840-1.24)	**1.30** (1.07-1.59)	**1.57** (1.29-1.94)	**1.99** (1.60-2.61)	**2.36** (1.83-3.11)	**2.76** (2.06-3.73)	**3.21** (2.28-4.45)	**3.85** (2.62-5.49)	**4.37** (2.87-6.27)
2-hr	**1.07** (0.892-1.30)	**1.24** (1.03-1.51)	**1.58** (1.31-1.92)	**1.91** (1.57-2.33)	**2.44** (1.97-3.18)	**2.90** (2.28-3.82)	**3.42** (2.58-4.61)	**4.00** (2.88-5.54)	**4.86** (3.33-6.90)	**5.56** (3.68-7.92)
3-hr	**1.18** (0.987-1.42)	**1.35** (1.13-1.63)	**1.69** (1.41-2.06)	**2.05** (1.70-2.50)	**2.64** (2.16-3.45)	**3.17** (2.50-4.17)	**3.77** (2.86-5.08)	**4.45** (3.21-6.15)	**5.45** (3.77-7.73)	**6.29** (4.18-8.93)
6-hr	**1.34** (1.13-1.61)	**1.52** (1.28-1.82)	**1.90** (1.59-2.29)	**2.29** (1.92-2.78)	**2.97** (2.45-3.87)	**3.58** (2.86-4.70)	**4.29** (3.28-5.75)	**5.08** (3.71-7.00)	**6.27** (4.37-8.86)	**7.28** (4.88-10.3)
12-hr	**1.46** (1.24-1.74)	**1.69** (1.44-2.02)	**2.14** (1.81-2.57)	**2.59** (2.18-3.12)	**3.32** (2.75-4.27)	**3.97** (3.18-5.15)	**4.70** (3.61-6.24)	**5.52** (4.05-7.52)	**6.72** (4.71-9.39)	**7.72** (5.22-10.8)
24-hr	**1.63** (1.39-1.93)	**1.89** (1.62-2.25)	**2.40** (2.05-2.86)	**2.90** (2.46-3.46)	**3.67** (3.05-4.67)	**4.35** (3.50-5.57)	**5.10** (3.94-6.69)	**5.93** (4.37-7.99)	**7.13** (5.03-9.88)	**8.12** (5.54-11.3)
2-day	**1.83** (1.58-2.16)	**2.15** (1.85-2.53)	**2.73** (2.34-3.22)	**3.26** (2.79-3.88)	**4.09** (3.40-5.12)	**4.79** (3.87-6.06)	**5.54** (4.31-7.20)	**6.37** (4.73-8.51)	**7.56** (5.37-10.4)	**8.53** (5.86-11.8)
3-day	**1.98** (1.72-2.32)	**2.32** (2.01-2.72)	**2.93** (2.53-3.45)	**3.49** (2.99-4.13)	**4.34** (3.62-5.40)	**5.06** (4.10-6.37)	**5.83** (4.55-7.53)	**6.66** (4.97-8.85)	**7.86** (5.61-10.7)	**8.82** (6.09-12.1)
4-day	**2.11** (1.84-2.47)	**2.47** (2.14-2.89)	**3.10** (2.68-3.64)	**3.68** (3.16-4.34)	**4.55** (3.81-5.64)	**5.28** (4.29-6.62)	**6.06** (4.74-7.80)	**6.91** (5.16-9.14)	**8.11** (5.81-11.0)	**9.08** (6.30-12.5)
7-day	**2.48** (2.17-2.89)	**2.87** (2.51-3.34)	**3.55** (3.10-4.15)	**4.17** (3.61-4.90)	**5.09** (4.29-6.27)	**5.86** (4.80-7.30)	**6.69** (5.26-8.54)	**7.57** (5.69-9.95)	**8.82** (6.35-11.9)	**9.82** (6.85-13.4)
10-day	**2.81** (2.47-3.26)	**3.23** (2.84-3.75)	**3.97** (3.47-4.62)	**4.63** (4.02-5.42)	**5.61** (4.73-6.86)	**6.41** (5.26-7.94)	**7.27** (5.74-9.24)	**8.18** (6.18-10.7)	**9.47** (6.85-12.7)	**10.5** (7.36-14.3)
20-day	**3.69** (3.26-4.25)	**4.24** (3.75-4.89)	**5.18** (4.57-5.99)	**5.99** (5.24-6.96)	**7.14** (6.04-8.61)	**8.06** (6.64-9.86)	**9.00** (7.15-11.3)	**9.99** (7.59-12.9)	**11.3** (8.26-15.1)	**12.4** (8.76-16.8)
30-day	**4.41** (3.92-5.06)	**5.09** (4.52-5.84)	**6.20** (5.49-7.14)	**7.13** (6.27-8.25)	**8.42** (7.14-10.1)	**9.43** (7.80-11.5)	**10.4** (8.32-13.0)	**11.5** (8.74-14.7)	**12.9** (9.39-17.0)	**13.9** (9.89-18.7)
45-day	**5.34** (4.77-6.10)	**6.16** (5.50-7.05)	**7.49** (6.66-8.59)	**8.57** (7.58-9.88)	**10.0** (8.53-11.9)	**11.1** (9.24-13.4)	**12.2** (9.78-15.1)	**13.3** (10.2-17.0)	**14.7** (10.8-19.4)	**15.8** (11.3-21.1)
60-day	**6.14** (5.51-7.00)	**7.09** (6.35-8.09)	**8.60** (7.67-9.84)	**9.81** (8.69-11.3)	**11.4** (9.70-13.5)	**12.6** (10.5-15.1)	**13.7** (11.0-16.9)	**14.9** (11.4-18.9)	**16.3** (12.0-21.3)	**17.3** (12.4-23.1)

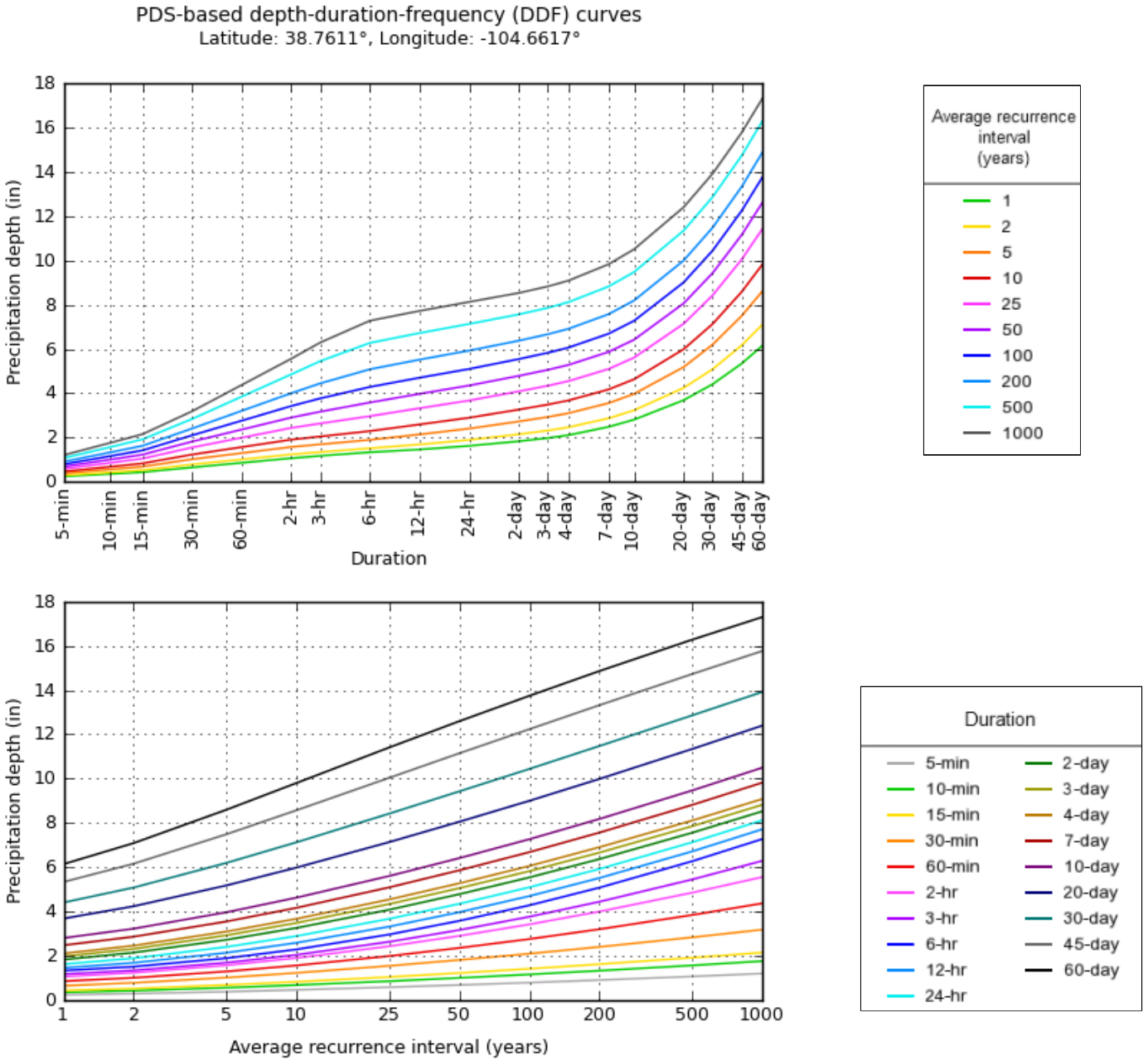
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



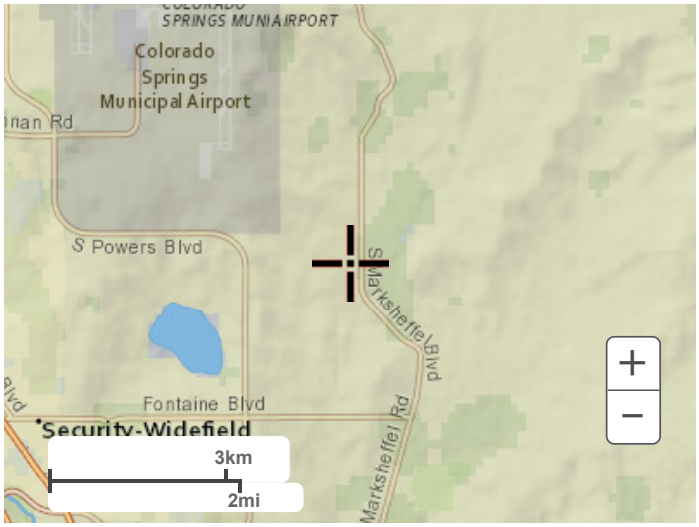
NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Nov 17 14:39:09 2021

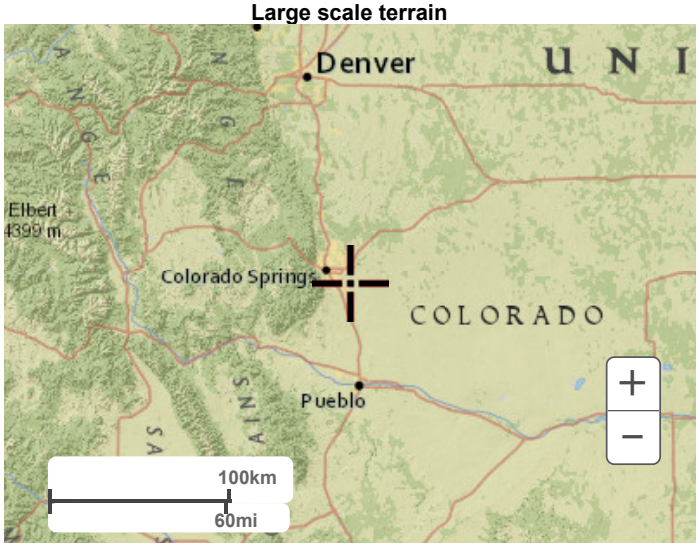
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Maps & aerials

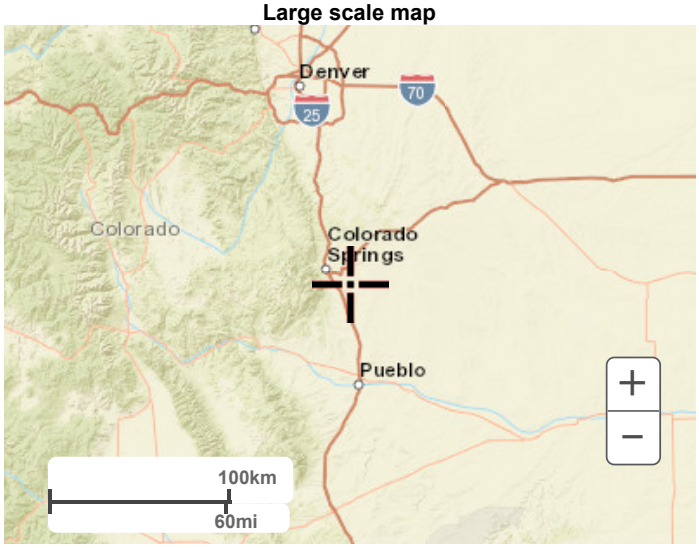
Small scale terrain



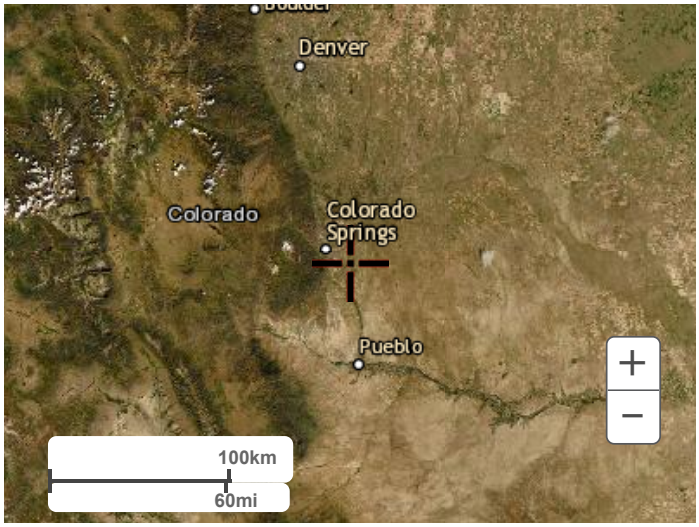
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

WEST FORK JIMMY CAMP CREEK
DRAINAGE BASIN PLANNING STUDY

Prepared for:

New Generation Homes, Inc.
3 Widefield Boulevard
Colorado Springs, CO 80911

Prepared by:

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, CO 80904

KIOWA Project No. 98.93
wfjc*.doc

June 1999
July 2000
November 2000
October 17, 2003

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.

PROPOSED CULVERT
100LF, 5'H x 18'W CBC
Q100 = 570 CFS
DP 3000-1

PROPOSED CULVERT
100LF, 5'H x 12'W CBC
Q100 = 410 CFS
DP 3005-2

PROPOSED COLLECTOR

PROPOSED ARTERIAL

PROPOSED CULVERT
100 LF, 5'H x 12'W CBC
Q100 = 380 CFS
DP 3010

EL PASO COUNTY

PROPOSED COLLECTOR

PROPOSED CULVERT
120 LF, 2-6'H x 12'W CBC
Q100 = 935 CFS
DP 3000

PROPOSED CULVERT
120 LF, 5'H x 12'W CBC
Q100 = 420 CFS
DP 3020

IRRIGATION AND STORMWATER SEPARATION STRUCTURE

PROPOSED CULVERT
150 LF 2-6'H x 12'W CBC
Q100=910 CFS
DP 3025

IRRIGATION AND STORMWATER SEPARATION STRUCTURE

WEST FORK JIMMY CAMP CREEK

DETENTION BASIN OUTLET STRUCTURE

FOUNTAIN MUTUAL IRRIGATION DITCH

CITY OF COLORADO SPRINGS

CITY OF FOUNTAIN

PROPOSED COLLECTOR

FONTAINE BOULEVARD

EXISTING CBC TO REMAIN

DETENTION BASIN DP 3021
VOL 100 = 80 AF
Q100 IN = 2,710 CFS
Q100 OUT = 1,850

RIPRAP CHANNEL DATA

CHANNEL NO.	Q100 (cfs)	BOTTOM WIDTH (ft)	DEPTH (ft)	SLOPE %	NO. OF CHECKS
3000	570	25	3.0	1.0	10
3005	410	20	3.0	1.0	10
3012	380	20	3.0	0.5	4
3015	935	35	4.0	1.0	3
3021	420	20	3.0	1.0	6
3025	910	35	4.0	1.0	4

LEGEND

ROADWAY CROSSING

DRAINAGEWAY AND ROUTING ELEMENT NUMBER

DRAINAGEWAY GRADE CONTROL STRUCTURE

DESIGN POINT NUMBER

0' 200' 400'

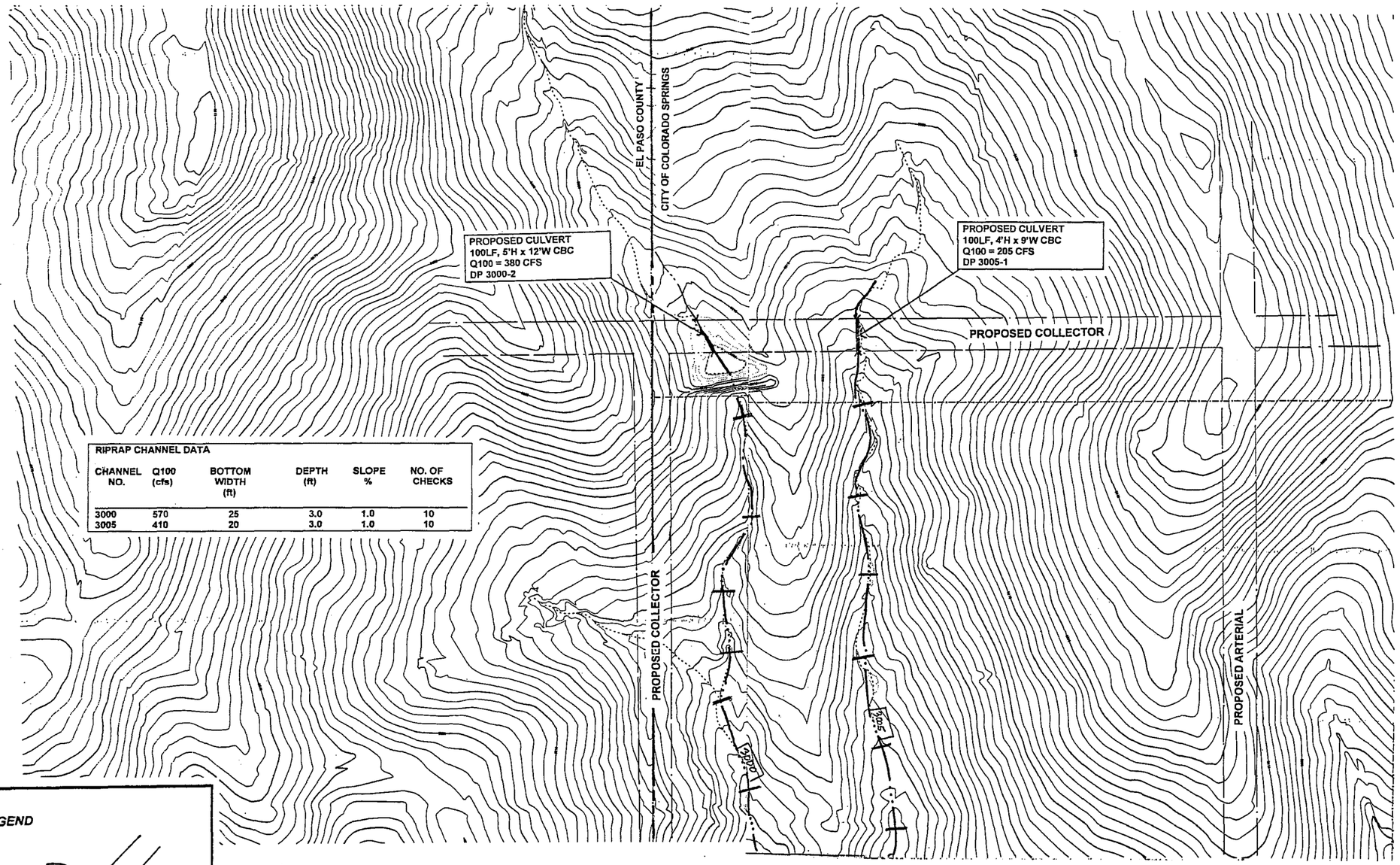
Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado
80904
(719) 630-7342

WEST FORK JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY PLAN
EL PASO COUNTY, COLORADO

Project No.:	9893
Date:	2/00
Design:	RNW
Drawn:	CAD
Check:	RNW
Revisions:	

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RIPRAP CHANNEL DATA

CHANNEL NO.	Q100 (cfs)	BOTTOM WIDTH (ft)	DEPTH (ft)	SLOPE %	NO. OF CHECKS
3000	570	25	3.0	1.0	10
3005	410	20	3.0	1.0	10

LEGEND

ROADWAY CROSSING

DRAINAGEWAY AND ROUTING ELEMENT NUMBER — 3015

DRAINAGEWAY GRADE CONTROL STRUCTURE

DESIGN POINT NUMBER — 3021

0' 200' 400'

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado
80904
(719) 630-7342

WEST FORK JIMMY CAMP CREEK
DRAINAGE BASIN PLANNING STUDY
PRELIMINARY PLAN
EL PASO COUNTY, COLORADO

Project No.:	9893
Date:	2/00
Design:	RNW
Drawn:	CAD
Check:	RNW
Revisions:	

6

NEW DOC

PHASE I DETENTION

FOR COLORADO CENTRE
EL PASO COUNTY, COLORADO

OCTOBER, 1985

FINAL

Prepared For:

COLORADO CENTRE METROPOLITAN DISTRICT
1250 ACADEMY PARK LOOP, #214
COLORADO SPRINGS, COLORADO 80910

Prepared By:

JR DEVELOPERS, LTD.
2120 HOLLOWBROOK DRIVE, #201
COLORADO SPRINGS, COLORADO 80918

PHASE I DETENTION

FOR COLORADO CENTRE
EL PASO COUNTY, COLORADO

OCTOBER, 1985

I Scope and Purpose

This report addresses a detention scheme that will accommodate 832 acres of industrial and business development, and 122 acres of residential development. This represents the full buildout condition of Colorado Centre in this basin. (See Exhibit A.)

The purpose of this report is to show the hydrologic properties of this basin in relation to the hydraulic properties of the proposed pond at different levels of development.

The Phase I Detention Pond plans are Exhibit B of this report.

II Location and Description of Study Area

A. Location

Colorado Centre, an industrial, commercial, and residential development, is located in the unincorporated portion of El Paso County, southeast of and adjoining the City of Colorado

Springs. Existing Marksheffel Road runs north and south through the site and existing Drennan Road borders the property on the north. The total development encompasses approximately 4,000 acres.

Phase I of the Colorado Centre includes approximately 528 acres in the northwest corner of the development. The subject site is bounded on the north by Old Drennan Road, on the east by Marksheffel Boulevard, and on the south by New Drennan Road. The site lies within portions of Sections 3, 4, 9, and 10, Township 15 South, Range 65 West, of the Sixth Principal Meridian.

B. Major Drainage Basin

The site lies within the main Jimmy Camp Creek Basin. A detailed description of the Jimmy Camp Creek Basin appears in the Master Drainage Plan.

The Jimmy Camp Creek Basin originates approximately 6.5 miles north of the northern boundary of the Colorado Centre development. This basin is drained by four major channels north of the property. Main channels which contribute to flow in Jimmy Camp Creek and converge in the northern area of Colorado Centre are the Corral Tributary, the Strip Mine Tributary, the Franceville Tributary, and the main channel of Jimmy Camp Creek.

Three of these tributaries: the Corral Tributary, the Franceville Tributary, and the main channel of Jimmy Camp Creek, have a confluence point in the mid-northern area of the Colorado Centre property. Another unnamed tributary basin from the west, which includes approximately 4.8 square miles of area, combined with the Jimmy Camp Creek flow in the lower portion of the property, this being the basin this report addresses. Several minor tributaries also flow into Jimmy Camp Creek north of and within the Colorado Centre boundaries.

Soil Conservation Service (SCS) survey information (see Appendix, Soil Survey Map) indicates that soils in the Colorado Centre area generally have moderate permeability. Vegetative cover in the Colorado Centre development consists generally of native grass-rangeland estimated to be in poor condition. The terrain in the Jimmy Camp Creek Basin in the vicinity of Colorado Centre consists of gently rolling foothills with some relatively flat areas and elevations ranging from approximately 5,720 to 6,200.

The Jimmy Camp Creek channel can be characterized as an irregularly shaped sandy bottom channel with widely varying bottom widths and erodible side slopes. The existing main channel width varies from less than 100 feet to over 200 feet on the Colorado Centre property.

In general, the soil types in the Colorado Centre development areas located away from the main channel of Jimmy Camp Creek have moderate erosion susceptibility as indicated in the 1980 SCS soil survey. In general, soil types in these areas of Colorado Centre consist of clay to clayey loam material. Surface runoff potention for these soils is medium to high.

III Existing Conditions

A. Existing under Marksheffel are two CMP 66" diameter culverts near the outfall of the detention pond. These have a combined capacity of approximately 500 CFS before topping the road. In the 100-year flood the depth of water on the road will be 1.4' with a velocity of 6 feet per second. Their replacement is proposed at a future date which is unknown. They will probably be replaced when the traffic volumes increase to the point of necessitating Marksheffel widening at this point. These culverts have grouted rip-rap slope protection on both the upstream and downstream slopes which will protect the embankment if the road is overtopped before it is replaced.

B. The existing channel between the southside of Phase I and the northside of the proposed pond is unimproved and is proposed to remain unimproved until platting occurs adjacent to this channel. At that time it will be improved.

IV Analysis and Design Criteria

A. Hydrologic Analysis

Criteria used in the analysis and preparation of this report is from the "Areawide Urban Runoff Control Manual" prepared for the Pikes Peak Area Council of Governments. The methodology for defining hydrologic parameters and determining storm runoff values is as presented by the Soil Conservation Service in the National Engineering Handbook, Section 4, Hydrology. Supplemental publications include Procedures for Determining Peak Flows in Colorado, S.C.S., and Urban Hydrology for Small Watersheds, Technical Release No. 55, S.C.S., U.S. Department of Agriculture.

B. The hydrologic method used for determining peak flows and volumes is the SCS Dimensionless Unit Hydrograph method as outlined in S.C.S. National Engineering Handbook. The method for determining storage is the Modified Puls method. These methods were performed using the U.S. Army Corps of Engineers' HEC-1 program.

C. A type II-A, 24HR SCS Rainfall Distribution supplied by Mr. Glade Wilkes of the S.C.S. office in Denver is used in this analysis. The rainfall amounts of 4.92" for the 100-year storm and 3.11" for the 5-year storm were received by calibrating our model to the TR-20, Kellogg study flows. The historic and developed Soil Curve Numbers were also taken

from the Kellogg report. Times of concentration were taken from a F.E.M.A. floodplain report done by JR Developers, Ltd. and dated June 20, 1985. These were then compared to the Master Drainage Plan by G.M.S. and dated December, 1984 for conformance with theirs. The times of concentration used in this report are 3.20 hours for historic and 2.93 hours for developed conditions. These are shorter than G.M.S.'s times of concentrations of 3.72 hours and 3.46 hours, and are therefore more conservative.

D. The criteria used for the design of the Phase I detention pond are as follows:

1. The historic 5-year flows will be conveyed by box culverts under the embankment.
2. The historic 100-year flows will be conveyed by a combination of the box culverts and overflow spillway.
3. The overflow spillway will be designed to carry the full 100-year developed flow if the culvert system gets blocked.
4. A grass-lined channel is provided to transmit flows through the pond area that has a capacity of approximately 450 CFS.
5. A trickle channel is proposed to carry nuisance flows through the pond area with a capacity of approximately 29 CFS. This trickle channel will be implemented once the construction of upstream channels is complete or when

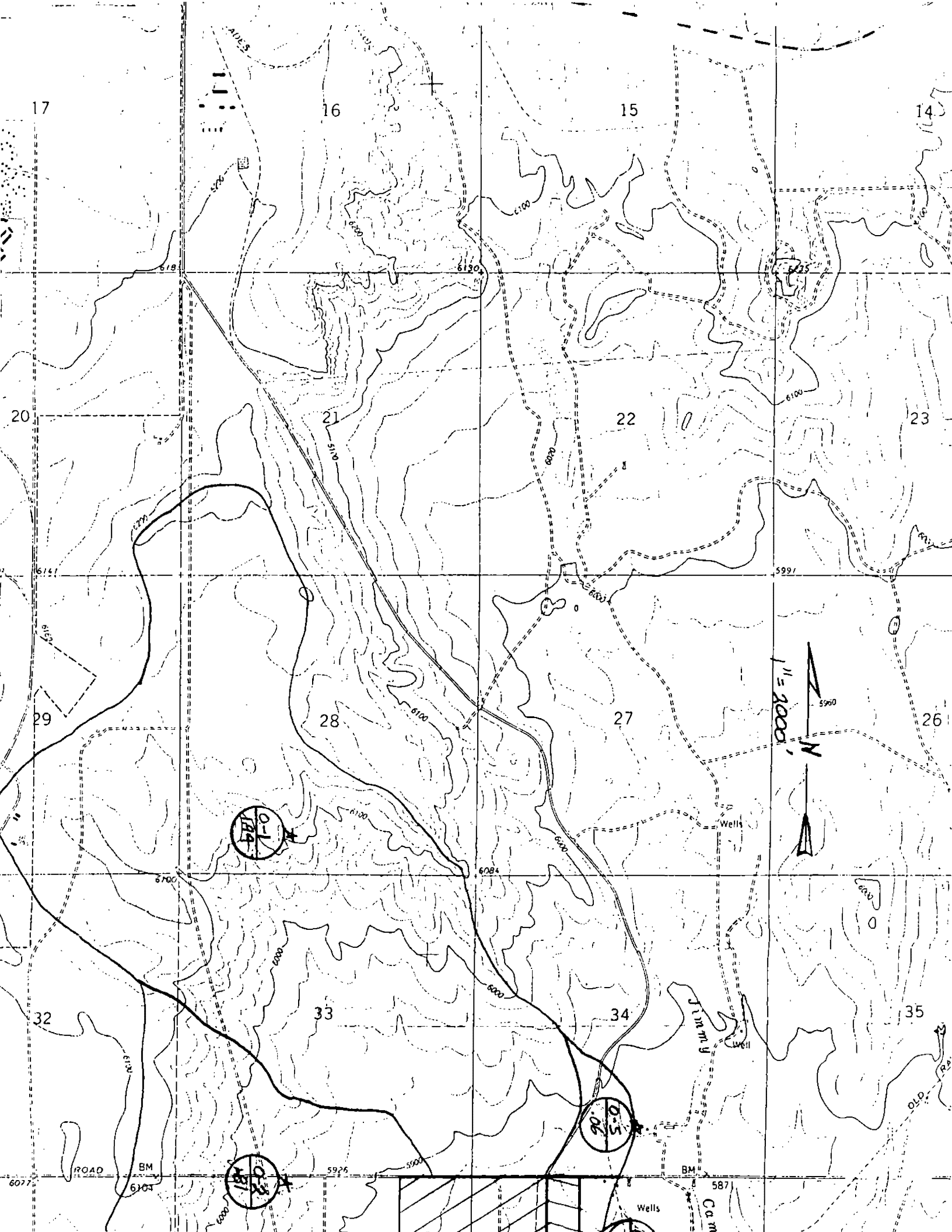
it is designated to be done as agreed to in the intergovernmental agreement that addresses this improvement.

6. All maintenance to the proposed structure will be performed by the Colorado Centre Metropolitan District.

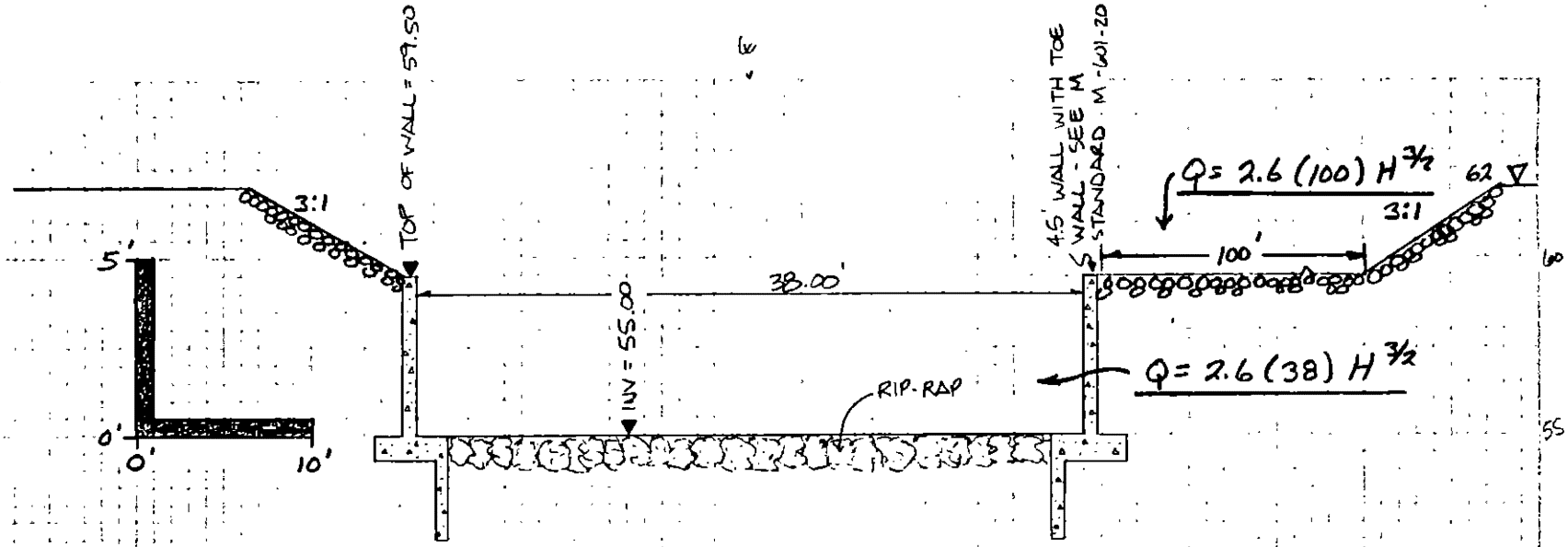
V Conclusions and Summary

This report encompasses an investigation of a detention pond that will facilitate the full buildout of Colorado Centre within this study basin. The procedures and assumptions that were used here to evaluate the historic and developed flows within this basin are sound and for the most part conservative. And, therefore, the proposed detention pond represents a workable solution to the problem of reducing developed flows back to historic flows.

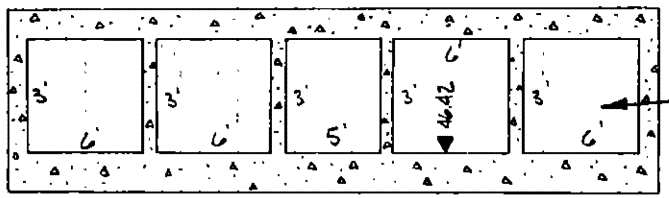
APPENDIX


17
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1" = 2000'
N
Wells
Well
Jimmy
ROAD
BM
6104
5926
5871
Wells
Ca
O-1
184
O-2
187
O-3
182

JR DEVELOPERS, LTD
2120 HOLLOWBROOK DR.
COLORADO SPRINGS, COLORADO 80918
303-528-8833
LAND DEVELOPMENT CONSULTANTS



WITH PLUGGED BOX CULVERTS



OUTLET CAPACITIES WERE CALCULATED UNDER INLET CONTROL

FOR ELEV. = 62

$Q = 2.6 (38)\ 7^{3/2}$
$+ 2.6 (100)\ 2.5^{3/2}$
$= 28.58$ CFS

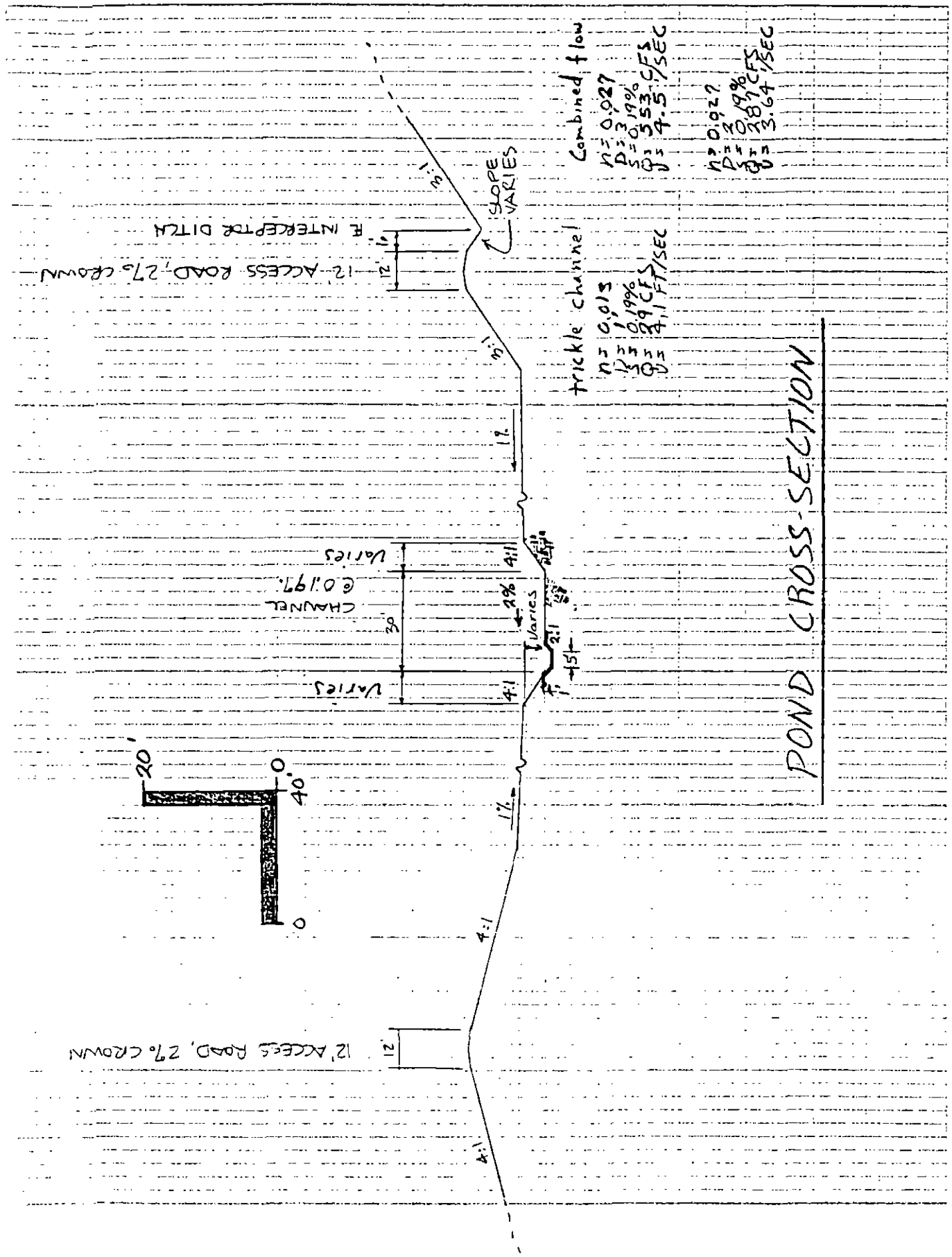
$Q_{100\ DEV} = 28.48$ CFS

SO HAS CAPACITY

OUTLET FORMULAS

JR DEVELOPERS, LTD
2120 HOLLOWBROOK DR.
COLORADO SPRINGS, COLORADO 80918
303-528-8833

LAND DEVELOPMENT CONSULTANTS



MASTER DEVELOPMENT DRAINAGE PLAN
FOR
BRADLEY HEIGHTS

JANUARY 2015

Prepared for:
THE CASE COMPANY
102 EAST PIKES PEAK AVE., SUITE 200
COLORADO SPRINGS, CO 80903
(719) 633-2700

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

Job no. 2266.00

CLASSIC CONSULTING ENGINEERS & SURVEYORS

land at the intersection of Bradley Road and Marksheffel Road and the undeveloped land west of the site, south of Bradley Road. This runoff enters the proposed site boundary and continues south within the existing, natural Marksheffel Tributary Channel, eventually into the existing Colorado Centre regional detention pond at Design Point E5.

Design Point E4 (Q_5 = 389.77 cfs, Q_{100} = 1,691.97 cfs) consists of runoff from Design Point E3 and Basin EX-1 (Q_5 = 49.23 cfs, Q_{100} = 169.71 cfs). Basin EX-1 is 111.17 acres of undeveloped area within the Bradley Heights proposed development. Storm water sheet flows east through this basin into the Marksheffel Tributary Channel where the combined flow continues south toward the existing regional detention facility.

Design Point E5 (Q_5 = 403.83 cfs, Q_{100} = 1,738.05 cfs) consists of runoff from Design Point E4 and Basin EX-4 (Q_5 = 70.89 cfs, Q_{100} = 245.59 cfs). Basin EX-4 is 131.78 acres of undeveloped land within the proposed site that drains to the east, directly into the Marksheffel Tributary Channel that runs through the site. This design point is the entry point into the existing regional detention facility from the Tributary Channel.

Existing Colorado Centre Regional Detention Facility (Q_5 = 412.39 cfs, Q_{100} = 1,764.80 cfs) consists of stormwater from Design Point E5, Basin EX-4A, and Basin OS-5. Basin EX-4A (Q_5 = 65.86 cfs, Q_{100} = 200.29 cfs) is 76.47 acres of undeveloped land within the proposed site that drains directly into the detention pond. Basin OS-5 is the area of the pond itself. In the existing conditions, this Colorado Centre regional detention facility releases Q_2 = 193.12 cfs, Q_5 = 398.16 cfs and Q_{100} = 1,147.02 cfs through the existing (5) cell box culvert and concrete weir. Each cell of the box culvert is 6.0' x 3.0' (width x height) and the weir measures 38.0' wide at elevation 5754.50. This weir structure was constructed with concrete side walls that are 4.8' in height, above elevation 5754.50.

The top of berm elevation is 5761.50 with the invert of the box culvert at 5746.50. This creates an embankment of 15.0' tall. Also, this pond has a capacity (to top of berm) of more than 100 acre-feet, making this pond a state jurisdictional facility. Any improvements made to this facility will require the State of Colorado approval as well as the City of Colorado Springs. This facility does not provide water quality measures as required by the City of Colorado Springs. Pictures of the existing outlet structure are included in the Appendix of this report.

this pond will need to be continuously re-evaluated to determine the available volume, and therefore how much more developed area this pond is able to serve. The developer will be responsible for evaluation of the existing facility with each Development Plan submittal. See the 'Detention Facilities' section on Page 14 for more details. A Developed Conditions Drainage Map is also included in the Appendix of this report that depicts the basins, pipe runs, and design points that are described below.

Basins M4-DEV, M5-DEV, & M8-DEV

The future development within these basins of Colorado Centre are planned to be Industrial land use. CN values for this land use and soil type were assigned to these basins per the Drainage Criteria Manual Table 5-5. However, it is anticipated that these developments will be of less imperviousness than the average industrial use site. Therefore the CN values of the planned developed basins north of Bradley Road have been decreased by four (approximately 12% less site imperviousness). As these developments take place, the estimated runoff amounts within this report shall be verified and the functionality of the detention pond shall remain intact. Adjustments to the allowable developable area tributary to this regional facility are to be made as upstream development occurs. The remainder of the off-site tributary basins to the north are modeled as 'existing' and are required to provide their own detention and storm water quality prior to release into downstream facilities.

Basin M9-DEV

The same reduction in assigned CN value occurs for this upstream Residential basin. Density of the future home lots within this basin are planned to be 8 DU/Ac., however with the incorporation of open space & park parcels this density will be less. Again, as final development within Basin M9 takes place, the runoff to the existing facility shall be monitored.

Design Point E1 (Q_5 = 222.10 cfs, Q_{100} = 660.54 cfs) consists of off-site 'historic' flows Basins M4-EX, M5-EX, M6-EX, and M7-EX. Also this point contains developed flows from the planned Colorado Centre developments within Basins M4-DEV, and M5-DEV. See Drainage Map and Hydrologic Calculations within the appendix of this report for the basin runoff results. This design point location corresponds exactly with the existing drainage conditions and the runoff is conveyed under Bradley Road via the existing large box culvert. This culvert has more than adequate capacity to convey this flow (approximately 4,300 cfs).

Design Point E2 (Q_5 = 309.65 cfs, Q_{100} = 1,325.18 cfs) consists of off-site flows from the existing tributary basins described within the Existing Conditions portion of the report. The only difference is the incorporation

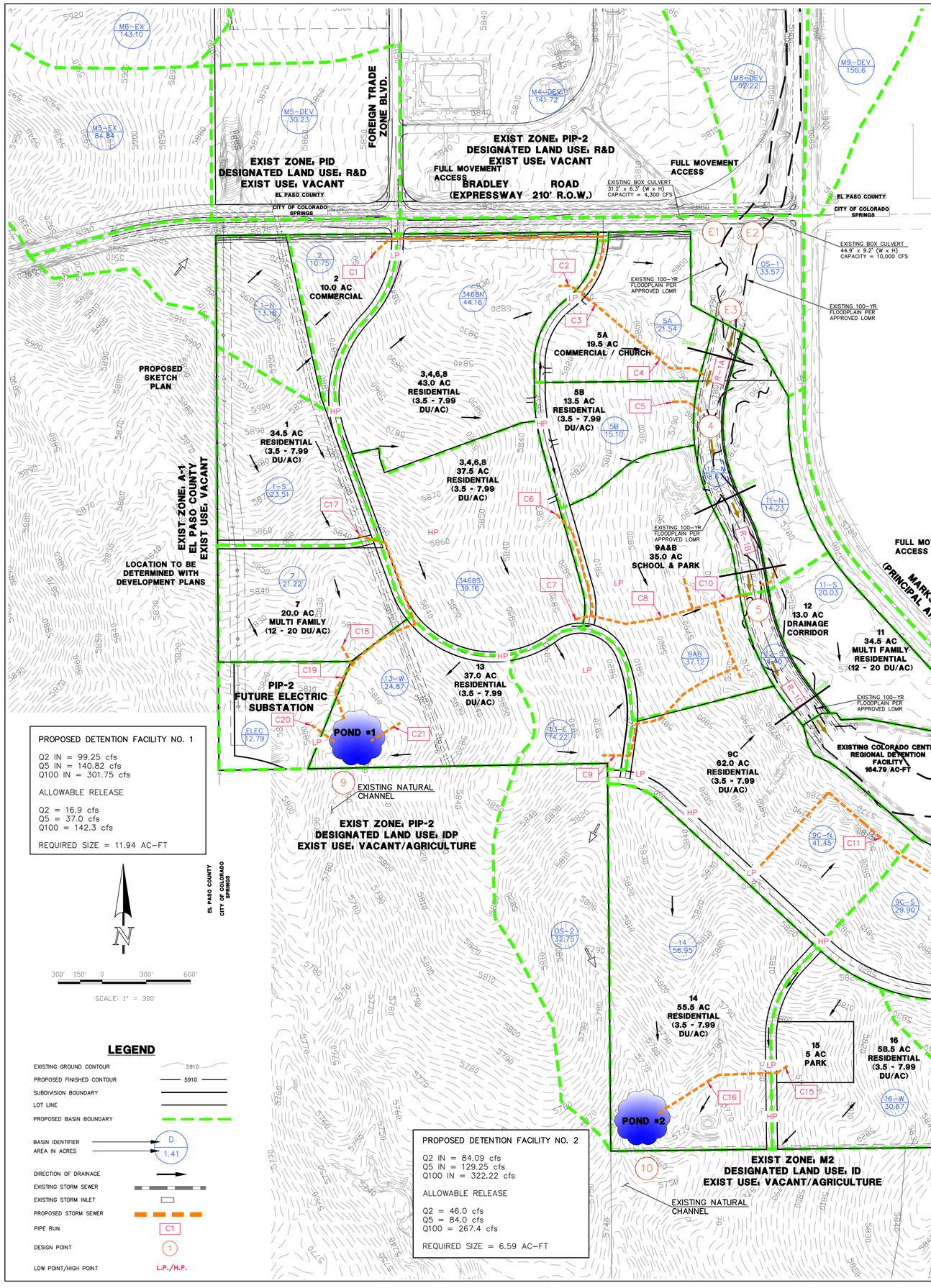
103.98 cfs) is 37.12 acres of school and park with incorporated roadways. This basin also includes a planned 5 acre park. Preliminary pipe sizes are provided on the drainage map that for each of these developed parcels. The outfall into the improved channel from these parcels is estimated to be another 72" RCP at 0.50% minimum. Final design to dictate this pipe size and slope and will be detailed within a site specific final drainage report for any development of these parcels.

Existing Colorado Centre Detention Facility

The total flow into this facility in the developed conditions is Q_2 = 459.86 cfs, Q_5 = 739.86, Q_{10} = 1,126.01 cfs and Q_{100} = 2,029.97 cfs. This flow into the pond comes from DP-5, and developed on-site Basins 11-S, 12-S, 9C-N, 9C-S, 16-N, and the detention pond area Basin DET. Basin 11-S (Q_5 = 49.69 cfs, Q_{100} = 95.55 cfs) is the south half of the multi-family parcel to the east of the improved channel corridor. Basin 12-S is the southern half of the channel corridor. Basin 9C-N (Q_5 = 56.63 cfs, Q_{100} = 132.52 cfs) is 41.45 acres of single-family residential just west of the pond. Basin 9C-S is also single-family residential and surrounding roadways of 29.90 acres in size (Q_5 = 41.05 cfs, Q_{100} = 96.06 cfs). Basin 16-N is a portion of the residential parcel (16.88 acres) located west of the parcel 9C subdivision. Flows from this basin are Q_5 = 25.83 cfs and Q_{100} = 59.00 cfs. As previously discussed, these flows into this facility represent a certain amount of development north of Bradley Road releasing un-detained developed flows into this channel corridor and to the pond. As development occurs within the tributary basin, continual re-analysis of this facility will need to take place in order to maintain these maximum flows into this facility. The developer will be responsible for evaluation of the existing facility with each Development Plan submittal.

The existing Colorado Centre regional detention facility is not required to be expanded with this specified maximum in-flow. The D.B.P.S. for Jimmy Camp Creek currently being completed by Kiowa Engineering, requires that all detention facilities within the basin be of full-spectrum design. Essentially this increases the required volume of water to be treated with a storm water quality outlet structure and is currently required by the City of Colorado Springs. The City of Colorado Springs has implemented this full-spectrum pond design and has provided a spreadsheet to determine the required volume to be treated with water quality measures. This volume is called the Extended Urban Runoff Volume (EURV), and the calculations for all the proposed detention facilities for this volume is included in the Appendix of this report.

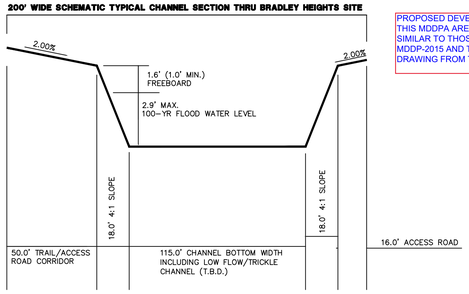
The overall tributary developed area to this pond is 779.17 acres, including those basins designated as developed north of Bradley Road. Using the impervious values from the Draina24.16ge Criteria Manual, the



COMPOSITE Cn VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (ac)	LAND USE	SUB-AREA LAND USE 1 AREA (ac)	SUB-AREA LAND USE 1 ESTIMATED CN	SUB-AREA LAND USE 2 AREA (ac)	SUB-AREA LAND USE 2 ESTIMATED CN	TOTAL BASIN AREA (ac)	TOTAL BASIN AREA (sq mi)	WEIGHTED C
1-N	13.16	RES	13.16	85	0	N/A	13.16	0.020563	85.0
1-S	23.51	RES	23.51	85	0	N/A	23.51	0.03673	85.0
2	10.75	COMM	10.75	94	0	N/A	10.75	0.01680	94.0
5A	21.54	COMM	21.54	94	0	N/A	21.54	0.03366	94.0
3468N	44.16	RES	44.16	85	0	N/A	44.16	0.06900	85.0
11-N	14.23	MULTIFAM	14.23	91	0	N/A	14.23	0.02223	91.0
11-S	20.03	MULTIFAM	20.03	91	0	N/A	20.03	0.03130	91.0
7	21.22	MULTIFAM	21.22	91	0	N/A	21.22	0.03316	91.0
ELEC	12.79	ELEC SUB	12.79	91	0	N/A	12.79	0.01998	91.0
3468S	39.16	RES	39.16	85	0	N/A	39.16	0.06119	85.0
12-N	8.67	CHANNEL	8.67	74	0	N/A	8.67	0.01355	74.0
12-S	4.40	CHANNEL	4.40	74	0	N/A	4.40	0.00688	74.0
13-W	24.87	RES	24.87	85	0	N/A	24.87	0.03886	85.0
13-E	14.22	RES	14.22	85	0	N/A	14.22	0.02222	85.0
5B	15.10	RES	15.10	85	0	N/A	15.10	0.02359	85.0
9AB	37.12	SCHL & PARK	27.12	91	5.00	74	37.12	0.05800	76.5
9C-N	41.45	RES	41.45	85	0	N/A	41.45	0.06477	85.0
9C-S	29.90	RES	29.90	85	0	N/A	29.90	0.04672	85.0
17	20.98	MULTIFAM	20.98	91	0	N/A	20.98	0.03278	91.0
16-N	16.88	RES	16.88	85	0	N/A	16.88	0.02638	85.0
16-W	30.67	RES & PARK	25.67	85	5.00	74	30.67	0.04792	83.2
16-E	18.20	RES	18.20	85	0	N/A	18.20	0.02844	85.0
14	56.95	RES	56.95	85	0	N/A	56.95	0.08898	85.0
OS-1	33.57	UNDEV	33.57	74	0	N/A	33.57	0.05245	87.4
OS-2	32.75	UNDEV	32.75	74	0	N/A	32.75	0.05117	74.0
OS-3	15.85	UNDEV	15.85	74	0	N/A	15.85	0.02477	74.0
OS-4	20.09	UNDEV	20.09	74	0	N/A	20.09	0.03139	74.0
DET	24.91	POND	24.91	74	0	N/A	24.91	0.03892	72.6

200' WIDE SCHEMATIC TYPICAL CHANNEL SECTION THRU BRADLEY HEIGHTS SITE



PROPOSED DEVELOPMENT IN THIS MDDPA ARE SUBSTANTIALLY SIMILAR TO THOSE INDICATED IN MDDP-2015 AND THIS EXCERPTED DRAWING FROM THAT REPORT.

SCHEMATIC CHANNEL DESIGN:

0.50% TYPICAL SLOPE.

4 SLOPING DROP STRUCTURES (3.0'-4.0' HEIGHT EACH).

BOTTOM WIDTH NECKS DOWN TO 80.0' THRU DROP STRUCTURES WITH MAX. SLOPE OF 10.0%

EXISTING MARKSHEFFEL TRIBUTARY DETENTION FACILITY

Q2 IN = 459.86 cfs
Q5 IN = 739.86 cfs
Q100 IN = 2,029.97 cfs

DEVELOPED RELEASE

Q2 = 24.16 cfs
Q5 = 125.75 cfs
Q100 = 1,153.73 cfs

EXISTING VOLUME TO TOP OF BERM (ELEV. 5761.50) = 193.66 AC-FT

PROPOSED DETENTION FACILITY NO. 1

Q2 IN = 99.25 cfs
Q5 IN = 140.82 cfs
Q100 IN = 301.75 cfs

ALLOWABLE RELEASE

Q2 = 16.9 cfs
Q5 = 37.0 cfs
Q100 = 142.3 cfs

REQUIRED SIZE = 11.94 AC-FT

PROPOSED DETENTION FACILITY NO. 2

Q2 IN = 84.09 cfs
Q5 IN = 129.25 cfs
Q100 IN = 322.22 cfs

ALLOWABLE RELEASE

Q2 = 46.0 cfs
Q5 = 84.0 cfs
Q100 = 267.4 cfs

REQUIRED SIZE = 6.59 AC-FT

PROPOSED DETENTION FACILITY NO. 3

Q2 IN = 52.4 cfs
Q5 IN = 73.0 cfs
Q100 IN = 151.5 cfs
ALLOWABLE RELEASE
Q2 = 12.0 cfs
Q5 = 22.6 cfs
Q100 = 72.6 cfs

REQUIRED SIZE = 4.89 AC-FT

EL PASO COUNTY
CITY OF COLORADO SPRINGS

N

300' 150' 0 300' 600'

SCALE: 1" = 300'

LEGEND

- EXISTING GROUND CONTOUR — 5910
- PROPOSED FINISHED CONTOUR — 5910
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- BASIN IDENTIFIER / AREA IN ACRES — D / 1.41
- DIRECTION OF DRAINAGE
- EXISTING STORM SEWER
- EXISTING STORM INLET
- PROPOSED STORM SEWER
- PIPE RUN — C1
- DESIGN POINT — 1
- LOW POINT/HIGH POINT — L.P./H.P.

BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	TOTAL BASIN AREA (acres)	TOTAL BASIN AREA (sq mi)	LAND USE	WEIGHTED CN	TOTAL Time of Concentration (hours)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
1-N	13.16	0.0206	RES	85.0	0.4167	18.07	42.28
1-S	23.51	0.0367	RES	85.0	0.4167	32.78	75.53
2	10.75	0.0168	COMM	94.0	0.2000	29.24	53.53
5A	21.54	0.0337	COMM	94.0	0.2000	58.59	107.25
3468N	44.16	0.0690	RES	85.0	0.4167	60.83	141.87
11-N	14.23	0.0222	MULTIFAM	91.0	0.1667	35.30	67.88
11-S	20.03	0.0313	MULTIFAM	91.0	0.1667	49.69	95.55
7	21.22	0.0332	MULTIFAM	91.0	0.2500	48.93	95.69
ELEC	12.79	0.0200	ELEC SUB	91.0	0.1667	31.70	60.97
3468S	39.16	0.0612	RES	85.0	0.4167	53.76	125.81
12-N	8.67	0.0135	CHANNEL	74.0	0.2500	7.27	22.37
12-S	4.40	0.0069	CHANNEL	74.0	0.1667	3.69	11.35
13-W	24.87	0.0389	RES	85.0	0.4167	34.15	79.90
13-E	14.22	0.0222	RES	85.0	0.4167	19.52	45.68
5B	15.10	0.0236	RES	85.0	0.3330	23.11	52.78
9AB	37.12	0.0580	SCHL & PARK	76.5	0.2500	36.36	103.98
9C-N	41.45	0.0648	RES	85.0	0.4167	56.63	132.52
9C-S	29.90	0.0467	RES	85.0	0.4167	41.05	96.06
17	20.98	0.0328	MULTIFAM	91.0	0.2000	50.51	98.27
16-N	16.88	0.0264	RES	85.0	0.3330	25.83	59.00
16-W	30.67	0.0479	RES & PARK	83.2	0.5000	38.05	89.68
16-E	18.20	0.0284	RES	85.0	0.4167	24.99	58.47
14	56.95	0.0890	RES	85.0	0.5000	70.65	166.53
OS-1	33.57	0.0525	UNDEV	87.4	0.2629	53.02	134.50
OS-2	32.75	0.0512	UNDEV	74.0	0.4174	20.57	66.00
OS-3	15.85	0.0248	UNDEV	74.0	0.3297	11.54	36.20
OS-4	20.09	0.0314	UNDEV	74.0	0.2691	16.32	50.11
DET	24.91	0.0389	POND	72.6	0.2981	17.82	56.55
M4-EX	6.50	0.0102	UNDEV	75.1	0.1667	6.88	19.18
M4-DEV	141.72	0.2214	INDUS *	86.0	0.6667	152.99	356.32
M5-EX	84.84	0.1326	UNDEV	67.9	0.6667	20.43	90.95
M5-DEV	30.23	0.0472	INDUS *	84.0	0.3833	40.65	96.34
M6-EX	143.10	0.2236	UNDEV	65.8	0.6390	3.16	62.71
M7-EX	108.54	0.1696	UNDEV	68.0	0.6279	31.55	138.81
M8-EX	66.31	0.1036	UNDEV	78.7	0.5833	48.99	137.22
M8-DEV	92.22	0.1441	INDUS *	86.0	0.5000	121.84	279.74
M9-DEV	150.66	0.2354	RES (8 DU/AC.) *	81.0	1.4167	64.44	171.57
M10-EX	88.83	0.1388	UNDEV	71.7	1.2781	19.55	71.39
M11-EX	69.06	0.1079	UNDEV	73.0	0.7223	26.54	91.53
M12-EX	106.24	0.1660	UNDEV	63.5	0.7502	13.77	80.33
M13-EX	144.45	0.2257	UNDEV	61.7	0.9169	11.62	80.42
M14-EX	72.70	0.1136	UNDEV	70.3	0.8335	18.62	73.79
M15-EX	59.14	0.0924	UNDEV	57.8	0.4723	3.04	39.50
M16-EX	148.54	0.2321	UNDEV	64.8	0.9447	18.78	99.49
M17-EX	182.02	0.2844	UNDEV	75.7	0.8335	81.13	255.04
M18-EX	163.40	0.2553	UNDEV	71.4	0.9169	42.71	162.25
M19-EX	192.00	0.3000	UNDEV	65.2	0.9724	23.63	126.16
M20-EX	89.54	0.1399	UNDEV	63.7	1.0836	8.83	50.28
M21-EX	146.56	0.2290	UNDEV	63.7	0.6390	21.28	125.81
M22-EX	66.11	0.1033	UNDEV	50.3	0.6113	0.17	14.09
M23-EX	132.80	0.2075	UNDEV	53.7	1.2219	1.19	28.28
M24-EX	99.58	0.1556	UNDEV	65.0	0.6668	16.35	88.24
M25-EX	101.82	0.1591	UNDEV	57.7	0.6390	4.28	54.33
M26-EX	114.30	0.1786	UNDEV	54.1	1.8392	0.97	19.58
M27-EX	124.86	0.1951	UNDEV	49.8	1.0333	0.31	12.48

ne of Concentrations for all developed parcels are estimated as grading and storm design are unknown at this tir
* Developed basins north of Bradley Road were modeled as reduced industrial and residential (M9) land uses. Reduction equates to approx. 12% imperviousness.

DEVELOPED CONDITIONS - PRELIMINARY PIPE SIZING

Pipe Run	Contributing Basins	Flow Q(5)	Flow Q(100)	Pipe Size*
C1	PARCEL 1-N & PARCEL 2	45.2	92.1	48" RCP @ 0.50% minimum
C2	PARCEL 3468N	60.8	60.8	42" RCP @ 0.50% minimum
C3	PIPE C1 & C2	101.6	228.6	72" RCP @ 0.50% minimum
C4	PARCEL 5A + PIPE C3	158.5	331.7	78" RCP @ 0.50% minimum
C5	PARCEL 5B	23.1	52.8	42" RCP @ 0.50% minimum
C6	PARCEL 3468S (1/2)	26.9	62.9	42" RCP @ 0.50% minimum
C7	PARCEL 3467S (1/2)	26.9	62.9	42" RCP @ 0.50% minimum
C8	PIPE C6 & C7	53.8	125.8	54" RCP @ 0.50% minimum
C9	PARCEL 13-E	19.5	45.7	36" RCP @ 0.50% minimum
C10	PARCEL 9AB + PIPES C8 & C9	108.8	269.0	72" RCP @ 0.53% minimum
C11	PARCEL 9C-N	56.6	132.5	54" RCP @ 0.50% minimum
C12	PARCEL 16-N	25.8	59.0	42" RCP @ 0.50% minimum
C13	PARCEL 9C-S + PIPE C11	97.7	228.6	66" RCP @ 0.50% minimum
C14	PIPE C12 & C13	123.5	234.2	66" RCP @ 0.50% minimum
C15	PARCEL 16-W	38.1	89.7	48" RCP @ 0.50% minimum
C16	PARCEL 14 + PIPE C15	108.7	256.2	72" RCP @ 0.50% minimum
C17	PARCEL 1-S	32.3	75.5	54" RCP @ 0.50% minimum
C18	PARCEL 7	48.9	95.7	48" RCP @ 0.50% minimum
C19	PIPE C17 & C18	79.0	167.8	60" RCP @ 0.50% minimum
C20	PARCEL ELEC	31.7	61.0	42" RCP @ 0.50% minimum
C21	PARCEL 13-W	34.2	79.9	48" RCP @ 0.50% minimum
C22	PARCEL 16-E	25.0	58.5	42" RCP @ 0.50% minimum
C23	PARCEL 17 + PIPE C22	73.0	151.5	60" RCP @ 0.50% minimum

DESIGN POINTS - DEVELOPED CONDITIONS

Design Point (label)	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 10 Yr. Q (cfs)	Q 50 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
E1	138.75	222.10	343.00	602.30	660.54
E2	144.46	309.65	582.39	1,187.02	1,325.18
E3	287.43	461.82	760.37	1,498.54	1,667.15
4	355.17	566.27	843.14	1,547.84	1,720.53
5	397.10	632.14	956.89	1,611.37	1,771.82
Pond-Marksheffel In	459.86	739.86	1,126.01	1,866.91	2,029.97
Pond-Marksheffel Out	57.36	125.45	380.70	1,009.18	1,156.30
7 - Marksheffel Trib. Out	24.16	125.75	379.52	1,006.65	1,153.73
8	6.22	11.54	19.01	33.18	36.20
Pond 1 In	99.25	140.82	193.07	283.40	301.75
9 (Historic Release)	16.92	36.98	67.07	128.54	142.30
Pond 2 In	84.09	129.25	190.00	299.45	322.22
10 (Historic Release)	45.99	83.97	138.22	244.61	267.42
Pond 3 In	52.38	73.01	98.67	142.61	151.49
11 (Historic Release)	12.05	22.63	37.64	66.45	72.63

DEVELOPED DRAINAGE MAP
BRADLEY HEIGHTS
JOB NO. 2266.00
JANUARY 2015
SHEET 1 OF 1

CLASSIC CONSULTING ENGINEERS & SURVEYORS
6385 Corporate Drive, Suite 101
Colorado Springs, Colorado 80919
(719)785-0790
(719)785-0799 (Fax)

M-27
124.9

M-26
114.3

M-23
132.8

M11

COLORADO SPRINGS AIRPORT

M-25
101.6

M-24
99.6

M-21
146.5

M10

M-22
66.1

M-20
89.5

M9

M-18
163.4

M-19
192.0

M-16
148.5

M-17
182.0

M-15
59.1

ENNAN RD

DRENNAN ROAD

M8

M-14
72.7

M-13
144.5

COLORADO
CENTER

M-10
88.9

M7

M-11
69.1

M-12
109.2

M6

M-7
108.5

M-6
143.1

S POWERS BLVD

M-5
115.1

M5

EXIST ZONE PID
DESIGNATED LAND USE: RAD
EXIST USE: VACANT

EXIST ZONE: PD-2
DESIGNATED LAND USE: RAD
EXIST USE: VACANT

BRADLEY ROAD

PROPOSED BRADLEY HEIGHTS SITE

E1

E2

MARKSHEFFEL RD

LEGEND

FUTURE FULL SPECTRUM DETENTION FACILITY

COLORADO CENTRE DEVELOPED ALLOWABLE TRIBUTARY AREA TO EXISTING DETENTION POND

N

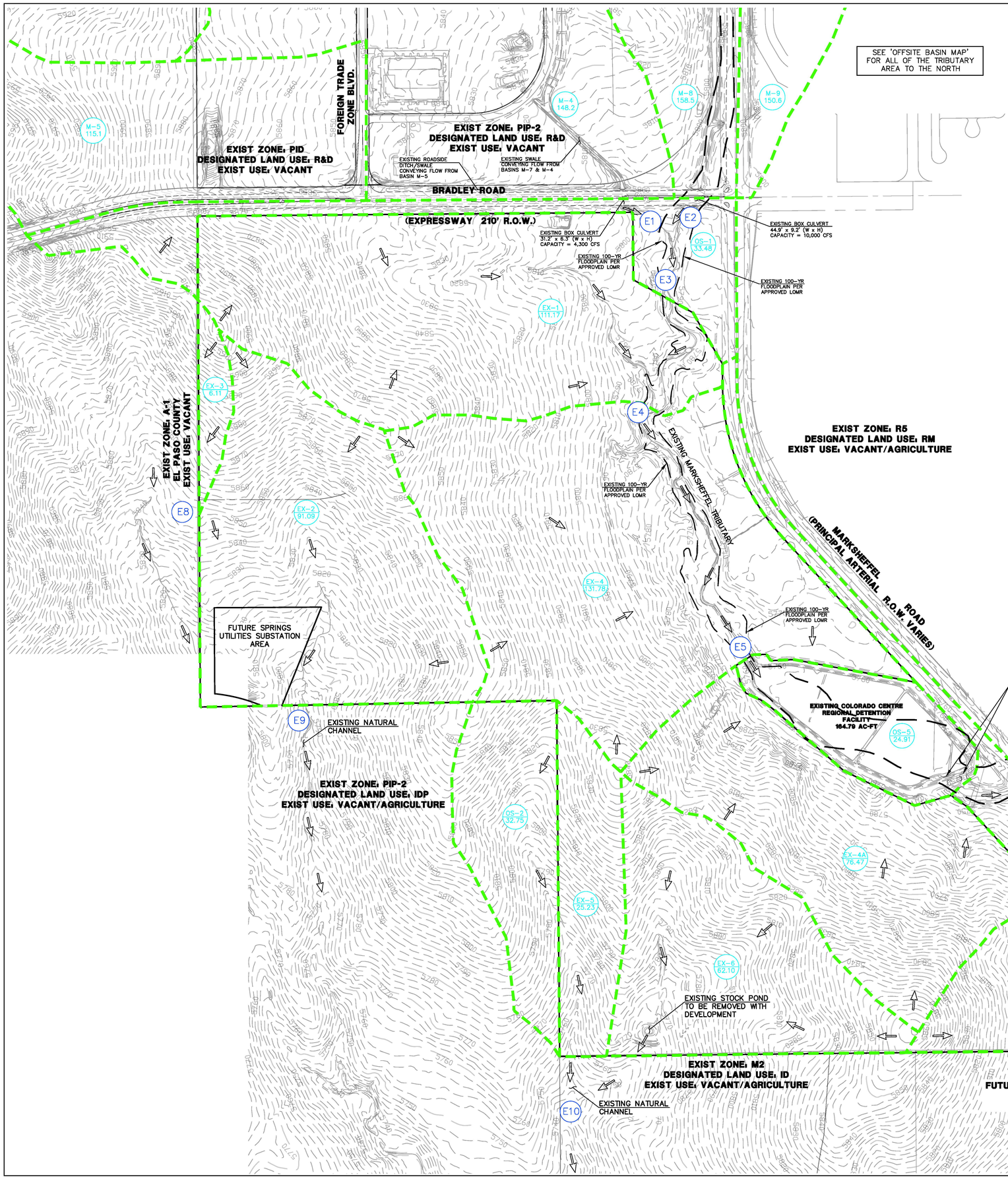
600′ 300′ 0 600′ 1200′

SCALE: 1″ = 600′

MDDP OFFSITE BASINS
BRADLEY HEIGHTS
JOB NO. 2266.10
SEPTEMBER 2014
SHEET 1 OF 1

CLASSIC CONSULTING ENGINEERS & SURVEYORS
6385 Corporate Drive, Suite 101
Colorado Springs, Colorado 80919
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(719)785-0799 (Fax)

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COMPOSITE C_N VALUES - EXISTING CONDITIONS

BASIN (label)	BASIN AREA (Ac)	SOIL TYPE A CN	SOIL TYPE A AREA (Ac.)	SOIL TYPE B CN	SOIL TYPE B AREA (Ac.)	SOIL TYPE C CN	SOIL TYPE C AREA (Ac.)	WEIGHTED C
M-4 thru M-27		SEE DRAINAGE BASIN PLANNING STUDY						
OS-1 (undev)	22.48	39		61	3.96	74	21.73	82.3
OS-1 (roadway)	11.00	39		98	4.61	98	6.39	98.0
OS-1 (composite)	33.48							87.4
OS-2	32.75	39		61		74	32.75	74.0
OS-3	15.85	39		61		74	15.85	74.0
OS-4	20.09	39		61		74	20.09	74.0
OS-5	24.91	39		61	2.65	74	22.26	72.6
EX-1	111.17	39		61	12.47	74	98.70	72.5
EX-2	91.09	39		61	28.4	74	62.69	69.9
EX-3	6.11	39		61		74	6.11	74.0
EX-4	131.78	39		61	16.18	74	115.60	72.4
EX-4A	76.47	39		61		74	76.47	74.0
EX-5	25.23	39		61		74	25.23	74.0
EX-6	62.10	39		61		74	62.10	74.0
EX-7	35.97	39		61		74	35.97	74.0

ALL UNDEVELOPED LAND ASSUMED "GOOD PASTURE OR RANGE" LAND USAGE

BASIN SUMMARY - EXISTING CONDITIONS

BASIN (label)	TOTAL BASIN AREA (acres)	TOTAL BASIN AREA (sq mi)	WEIGHTED CN	TOTAL LAG TIME (hours)	TOTAL Time of Concentration PondPak Model (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 10 Yr. (cfs)	Q 50 Yr. (cfs)	Q 100 Yr. (cfs)
M4	148.22	0.2316	75.1	0.5167	0.8613	32.08	58.92	97.47	173.52	190.04
M5	115.07	0.1798	67.9	0.3833	0.6390	11.85	28.82	56.45	114.49	127.46
M6	143.10	0.2236	55.8	0.3833	0.6390	0.35	3.16	15.28	52.92	62.82
M7	108.54	0.1696	68.0	0.3167	0.5279	12.93	31.57	61.02	124.47	138.68
M8	158.53	0.2477	78.7	0.7500	1.2503	38.61	64.75	100.95	169.42	184.02
M9	150.66	0.2354	72.5	1.1167	1.8615	14.24	27.13	46.04	83.79	92.28
M10	88.83	0.1388	71.7	0.7667	1.2781	9.88	19.55	34.27	64.85	71.39
M11	69.06	0.1079	73.0	0.4333	0.7223	13.55	26.56	45.62	83.36	91.57
M12	106.24	0.1660	63.5	0.4500	0.7502	4.18	13.79	31.40	71.24	80.42
M13	144.45	0.2257	61.7	0.5500	0.9169	2.87	11.63	28.75	70.50	80.39
M14	72.70	0.1136	70.3	0.5000	0.8335	8.53	18.61	34.20	66.43	73.79
M15	59.14	0.0924	57.8	0.2833	0.4723	0.32	3.04	11.35	33.88	39.49
M16	148.54	0.2321	64.8	0.5667	0.9447	6.44	18.78	40.37	88.46	99.46
M17	182.02	0.2844	75.7	0.5000	0.8335	45.59	81.11	132.20	233.23	255.04
M18	163.40	0.2553	71.4	0.5500	0.9169	20.41	42.69	76.56	146.74	162.28
M19	192.00	0.3000	65.2	0.5833	0.9724	8.16	23.64	50.51	111.88	126.13
M20	89.54	0.1399	63.7	0.6500	1.0836	2.87	8.82	19.74	44.49	50.25
M21	146.56	0.2290	63.7	0.3833	0.6390	6.41	21.29	48.71	111.51	126.01
M22	66.11	0.1033	50.3	0.3667	0.6113	0.01	0.17	1.32	11.07	14.10
M23	132.80	0.2075	53.7	0.7330	1.2219	0.21	1.19	6.18	23.65	28.29
M24	99.58	0.1556	65.0	0.4000	0.6668	5.45	16.36	35.20	78.36	88.30
M25	101.82	0.1591	57.7	0.3833	0.6390	0.54	4.28	15.40	46.59	54.43
M26	114.30	0.1786	54.1	0.9833	1.6392	0.18	0.97	4.53	16.41	19.58
M27	124.86	0.1951	49.8	1.0333	1.7225	0.02	0.31	1.83	10.03	12.48
OS-1	33.48	0.0523	87.4	0.1577	0.2629	44.11	62.85	86.20	126.09	134.14
OS-2	32.75	0.0512	74.0	0.2504	0.4174	10.96	20.57	34.22	60.39	66.00
OS-3	15.85	0.0248	74.0	0.1978	0.3297	6.22	11.54	19.01	33.18	36.20
OS-4	20.09	0.0314	74.0	0.1614	0.2691	9.12	16.32	26.33	45.94	50.11
OS-5	24.91	0.0389	72.6	0.1788	0.2981	9.47	17.82	29.53	51.78	56.55
EX-1	111.17	0.1737	72.5	0.3591	0.5986	25.50	49.23	84.45	154.50	169.71
EX-2	91.09	0.1423	69.9	0.2764	0.4607	16.92	36.98	67.07	128.54	142.30
EX-3	6.11	0.0095	74.0	0.1796	0.2995	2.59	4.72	7.67	13.24	14.43
EX-4	131.78	0.2059	72.4	0.2453	0.4090	35.27	70.89	122.64	223.73	245.59
EX-4A	76.47	0.1195	74.0	0.1436	0.2393	36.11	65.86	106.96	183.99	200.29
EX-5	25.23	0.0394	74.0	0.2771	0.4620	7.89	14.69	24.57	43.99	48.17
EX-6	62.10	0.0970	74.0	0.1343	0.2238	30.81	55.53	89.50	152.82	166.19
EX-7	35.97	0.0562	74.0	0.2520	0.4201	12.05	22.63	37.64	66.45	72.63

BASINS M4 - M27 INPUT DATA MATCHES JIMMY CAMP CREEK D.B.P.S.

DESIGN POINTS - EXISTING CONDITIONS

Design Point (label)	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 10 Yr. Q (cfs)	Q 50 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
E1	52.54	110.34	204.78	424.10	474.03
E2	133.27	299.67	574.39	1,186.78	1,328.17
E3	169.53	372.13	710.48	1,455.90	1,628.44
E4	179.50	389.77	741.42	1,514.32	1,691.97
E5	187.65	403.83	765.45	1,555.84	1,738.05
Pond-Marksheffel In	193.18	412.39	779.38	1,580.25	1,764.80
Pond-Marksheffel Out	193.12	398.16	699.03	1,078.09	1,147.02
E6 - Marksheffel Trib. Out	194.24	399.69	701.23	1,080.70	1,149.69
E8	2.59	4.72	7.67	13.24	14.43
E9	16.92	36.98	67.07	128.54	142.30
E10	45.99	83.97	138.22	244.61	267.42
E11	12.05	22.63	37.64	66.45	72.63
E12	6.22	11.54	19.01	33.18	36.20

N

300' 150' 0 300' 600'

SCALE: 1" = 300'

LEGEND

- EXISTING INDEX CONTOUR — 5910
- EXISTING NOMINAL CONTOUR — 5910
- SUBDIVISION BOUNDARY
- LOT LINE
- BASIN IDENTIFIER / AREA IN ACRES — D / 1.41
- HISTORIC BASIN BOUNDARY
- DIRECTION OF DRAINAGE
- EXISTING STORM SEWER
- EXISTING STORM INLET
- FEMA 100-YR FLOODPLAIN BOUNDARY LINE
- DESIGN POINT — 1

EXISTING DRAINAGE MAP
BRADLEY HEIGHTS
JOB NO. 2266.10
SEPTEMBER 2014
SHEET 1 OF 1

CLASSIC CONSULTING ENGINEERS & SURVEYORS
6385 Corporate Drive, Suite 101
Colorado Springs, Colorado 80919
(719)785-0790
(719)785-0799 (Fax)

N:\2266\01\DRAWINGS\DEVELOPMENT\2266D-MDDP EXIST.dwg, 2/20/2015 3:34:11 PM, DWG To PDF.pc3

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

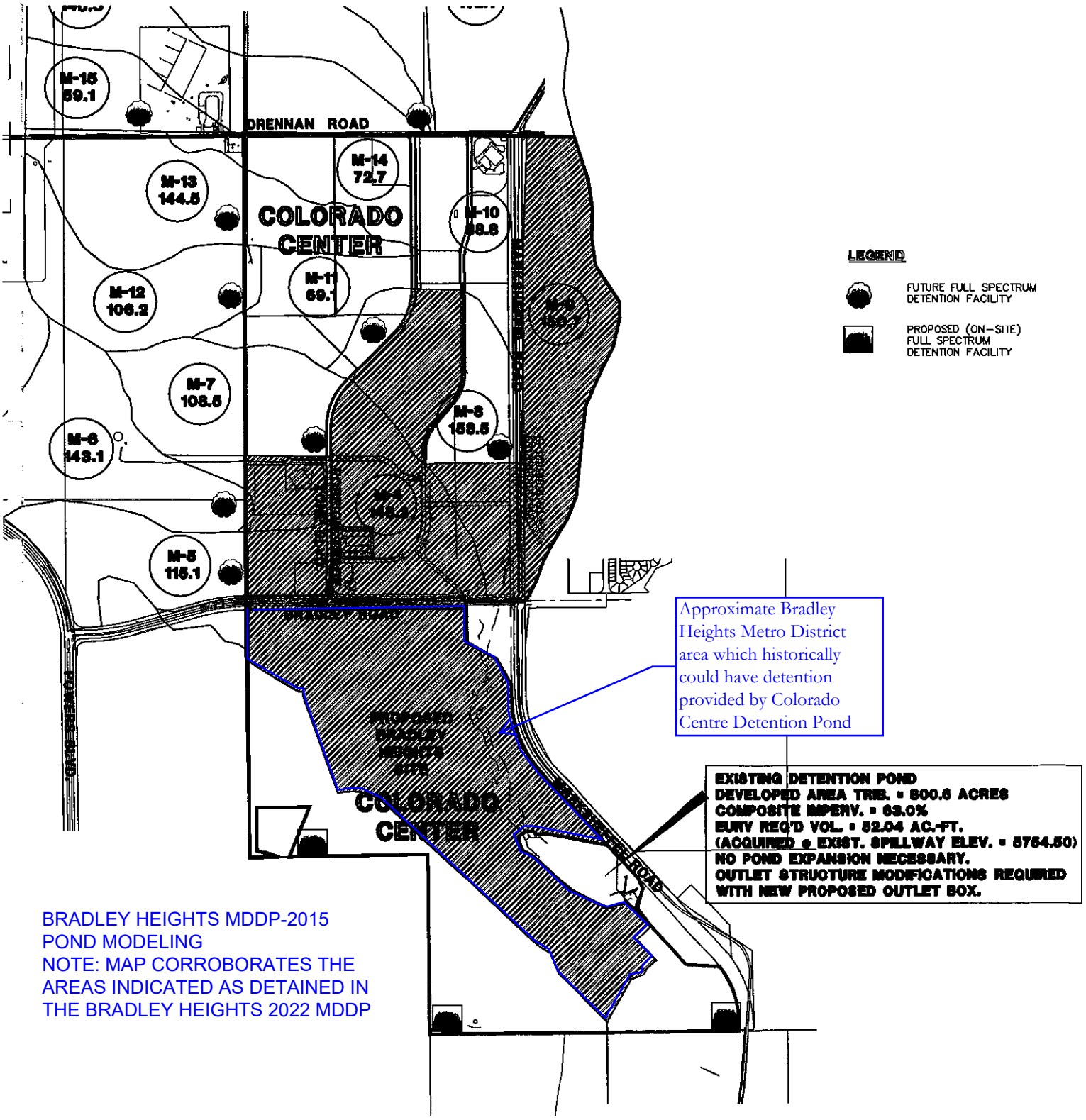
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Colorado Springs, Colorado 80919

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BRADLEY HEIGHTS MDDP
COLORADO CENTRE DEVELOPMENT
TO REGIONAL DETENTION POND EXHIBIT

JOB NO. 2266.00

NOVEMBER 2009



BRADLEY HEIGHTS MDDP-2015
POND MODELING
NOTE: MAP CORROBORATES THE AREAS INDICATED AS DETAINED IN THE BRADLEY HEIGHTS 2022 MDDP

PROPOSED CONDITIONS

HYDROLOGIC CALCULATIONS & PONDPACK RESULTS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

COMPOSITE C_N VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (ac)	LAND USE	SUB-AREA LAND USE 1		SUB-AREA LAND USE 2		TOTAL BASIN AREA (ac)	TOTAL BASIN AREA (sq mi)	WEIGHTED C_N
			AREA (ac)	ESTIMATED CN	AREA (ac)	ESTIMATED CN			
1-N	13.16	RES	13.16	85	0	N/A	13.16	0.020563	85.0
1-S	23.51	RES	23.51	85	0	N/A	23.51	0.03673	85.0
2	10.75	COMM	10.75	94	0	N/A	10.75	0.01680	94.0
5A	21.54	COMM	21.54	94	0	N/A	21.54	0.03366	94.0
3468N	44.16	RES	44.16	85	0	N/A	44.16	0.06900	85.0
11-N	14.23	MULTIFAM	14.23	91	0	N/A	14.23	0.02223	91.0
11-S	20.03	MULTIFAM	20.03	91	0	N/A	20.03	0.03130	91.0
7	21.22	MULTIFAM	21.22	91	0	N/A	21.22	0.03316	91.0
ELEC	12.79	ELEC SUB	12.79	91	0	N/A	12.79	0.01998	91.0
3468S	39.16	RES	39.16	85	0	N/A	39.16	0.06119	85.0
12-N	8.67	CHANNEL	8.67	74	0	N/A	8.67	0.01355	74.0
12-S	4.40	CHANNEL	4.40	74	0	N/A	4.40	0.00688	74.0
13-W	24.87	RES	24.87	85	0	N/A	24.87	0.03886	85.0
13-E	14.22	RES	14.22	85	0	N/A	14.22	0.02222	85.0
5B	15.10	RES	15.10	85	0	N/A	15.10	0.02359	85.0
9AB	37.12	SCHL & PARK	27.12	91	5.00	74	37.12	0.05800	76.5
9C-N	41.45	RES	41.45	85	0	N/A	41.45	0.06477	85.0
9C-S	29.90	RES	29.90	85	0	N/A	29.90	0.04672	85.0
17	20.98	MULTIFAM	20.98	91	0	N/A	20.98	0.03278	91.0
16-N	16.88	RES	16.88	85	0	N/A	16.88	0.02638	85.0
16-W	30.67	RES & PARK	25.67	85	5.00	74	30.67	0.04792	83.2
16-E	18.20	RES	18.20	85	0	N/A	18.20	0.02844	85.0
14	56.95	RES	56.95	85	0	N/A	56.95	0.08898	85.0
OS-1	33.57	UNDEV	33.57	74	0	N/A	33.57	0.05245	87.4
OS-2	32.75	UNDEV	32.75	74	0	N/A	32.75	0.05117	74.0
OS-3	15.85	UNDEV	15.85	74	0	N/A	15.85	0.02477	74.0
OS-4	20.09	UNDEV	20.09	74	0	N/A	20.09	0.03139	74.0
DET	24.91	POND	24.91	74	0	N/A	24.91	0.03892	72.6

BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	TOTAL BASIN AREA (acres)	TOTAL BASIN AREA (sq mi)	LAND USE	WEIGHTED CN	TOTAL Time of Concentration (hours)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
1-N	13.16	0.0206	RES	85.0	0.4167	18.07	42.28
1-S	23.51	0.0367	RES	85.0	0.4167	32.78	75.53
2	10.75	0.0168	COMM	94.0	0.2000	29.24	53.53
5A	21.54	0.0337	COMM	94.0	0.2000	58.59	107.25
3468N	44.16	0.0690	RES	85.0	0.4167	60.83	141.87
11-N	14.23	0.0222	MULTIFAM	91.0	0.1667	35.30	67.88
11-S	20.03	0.0313	MULTIFAM	91.0	0.1667	49.69	95.55
7	21.22	0.0332	MULTIFAM	91.0	0.2500	48.93	95.69
ELEC	12.79	0.0200	ELEC SUB	91.0	0.1667	31.70	60.97
3468S	39.16	0.0612	RES	85.0	0.4167	53.76	125.81
12-N	8.67	0.0135	CHANNEL	74.0	0.2500	7.27	22.37
12-S	4.40	0.0069	CHANNEL	74.0	0.1667	3.69	11.35
13-W	24.87	0.0389	RES	85.0	0.4167	34.15	79.90
13-E	14.22	0.0222	RES	85.0	0.4167	19.52	45.68
5B	15.10	0.0236	RES	85.0	0.3330	23.11	52.78
9AB	37.12	0.0580	SCHL & PARK	76.5	0.2500	36.36	103.98
9C-N	41.45	0.0648	RES	85.0	0.4167	56.63	132.52
9C-S	29.90	0.0467	RES	85.0	0.4167	41.05	96.06
17	20.98	0.0328	MULTIFAM	91.0	0.2000	50.51	98.27
16-N	16.88	0.0264	RES	85.0	0.3330	25.83	59.00
16-W	30.67	0.0479	RES & PARK	83.2	0.5000	38.05	89.68
16-E	18.20	0.0284	RES	85.0	0.4167	24.99	58.47
14	56.95	0.0890	RES	85.0	0.5000	70.65	166.53
OS-1	33.57	0.0525	UNDEV	87.4	0.2629	63.02	134.50
OS-2	32.75	0.0512	UNDEV	74.0	0.4174	20.57	66.00
OS-3	15.85	0.0248	UNDEV	74.0	0.3297	11.54	36.20
OS-4	20.09	0.0314	UNDEV	74.0	0.2691	16.32	50.11
DET	24.91	0.0389	POND	72.6	0.2981	17.82	56.55
M4-EX	6.50	0.0102	UNDEV	75.1	0.1667	6.88	19.18
M4-DEV	141.72	0.2214	INDUS *	86.0	0.6667	152.99	356.32
M5-EX	84.84	0.1326	UNDEV	67.9	0.6667	20.43	90.95
M5-DEV	30.23	0.0472	INDUS *	84.0	0.3833	40.65	96.34
M6-EX	143.10	0.2236	UNDEV	55.8	0.6390	3.16	62.71
M7-EX	108.54	0.1696	UNDEV	68.0	0.5279	31.55	138.81
M8-EX	66.31	0.1036	UNDEV	78.7	0.5833	48.99	137.22
M8-DEV	92.22	0.1441	INDUS *	86.0	0.5000	121.84	279.74
M9-DEV	150.66	0.2354	RES (8 DU/AC.) *	81.0	1.4167	64.44	171.57
M10-EX	88.83	0.1388	UNDEV	71.7	1.2781	19.55	71.39
M11-EX	69.06	0.1079	UNDEV	73.0	0.7223	26.54	91.53
M12-EX	106.24	0.1660	UNDEV	63.5	0.7502	13.77	80.33
M13-EX	144.45	0.2257	UNDEV	61.7	0.9169	11.62	80.42
M14-EX	72.70	0.1136	UNDEV	70.3	0.8335	18.62	73.79
M15-EX	59.14	0.0924	UNDEV	57.8	0.4723	3.04	39.50
M16-EX	148.54	0.2321	UNDEV	64.8	0.9447	18.78	99.49
M17-EX	182.02	0.2844	UNDEV	75.7	0.8335	81.13	255.04
M18-EX	163.40	0.2553	UNDEV	71.4	0.9169	42.71	162.25
M19-EX	192.00	0.3000	UNDEV	65.2	0.9724	23.63	126.16
M20-EX	89.54	0.1399	UNDEV	63.7	1.0836	8.83	50.26
M21-EX	146.56	0.2290	UNDEV	63.7	0.6390	21.28	125.81
M22-EX	66.11	0.1033	UNDEV	50.3	0.6113	0.17	14.09
M23-EX	132.80	0.2075	UNDEV	53.7	1.2219	1.19	28.28
M24-EX	99.58	0.1556	UNDEV	65.0	0.6668	16.35	88.24
M25-EX	101.82	0.1591	UNDEV	57.7	0.6390	4.28	54.33
M26-EX	114.30	0.1786	UNDEV	54.1	1.6392	0.97	19.58
M27-EX	124.86	0.1951	UNDEV	49.8	1.0333	0.31	12.48

me of Concentrations for all developed parcels are estimated as grading and storm design are unknown at this tim

* Developed basins north of Bradley Road were modeled as reduced industrial and residential (M9) land uses. Reduction equates to approx. 12% imperviousness.

DESIGN POINTS - DEVELOPED CONDITIONS

Design Point (label)	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 10 Yr. Q (cfs)	Q 50 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
E1	138.75	222.10	343.00	602.30	660.54
E2	144.46	309.65	582.39	1,187.02	1,325.18
E3	287.43	461.82	760.37	1,498.54	1,667.15
4	355.17	556.27	843.14	1,547.84	1,720.53
5	397.10	632.14	956.89	1,611.37	1,771.82
Pond-Marksheffel In	459.86	739.86	1,126.01	1,866.91	2,029.97
Pond-Marksheffel Out	57.36	125.45	380.70	1,009.18	1,156.30
7 - Marksheffel Trib. Out	24.16	125.75	379.52	1,006.65	1,153.73
8	6.22	11.54	19.01	33.18	36.20
Pond 1 In	99.25	140.82	193.07	283.40	301.75
9 (Historic Release)	16.92	36.98	67.07	128.54	142.30
Pond 2 In	84.09	129.25	190.00	299.45	322.22
10 (Historic Release)	45.99	83.97	138.22	244.61	267.42
Pond 3 In	52.38	73.01	98.67	142.61	151.49
11 (Historic Release)	12.05	22.63	37.64	66.45	72.63

JOB NAME	*BRADLEY HEIGHTS*
JOB NUM	*2266.00*
DATE	*03/17/09*
CALC BY	*DLG*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE. REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

DEVELOPED CONDITIONS - PRELIMINARY PIPE SIZING

Pipe Run	Contributing Basins	Flow		Pipe Size*
		Q(5)	Q(100)	
C1	PARCEL 1-N & PARCEL 2	45.2	92.1	48" RCP @ 0.50% minimum
C2	PARCEL 3468N	60.8	60.8	42" RCP @ 0.50% minimum
C3	PIPE C1 & C2	101.6	228.6	72" RCP @ 0.50% minimum
C4	PARCEL 5A + PIPE C3	158.5	331.7	78" RCP @ 0.50% minimum
C5	PARCEL 5B	23.1	52.8	42" RCP @ 0.50% minimum
C6	PARCEL 3468S (1/2)	26.9	62.9	42" RCP @ 0.50% minimum
C7	PARCEL 3467S (1/2)	26.9	62.9	42" RCP @ 0.50% minimum
C8	PIPE C6 & C7	53.8	125.8	54" RCP @ 0.50% minimum
C9	PARCEL 13-E	19.5	45.7	36" RCP @ 0.50% minimum
C10	PARCEL 9AB + PIPES C8 & C9	108.8	269.0	72" RCP @ 0.53% minimum
C11	PARCEL 9C-N	56.6	132.5	54" RCP @ 0.50% minimum
C12	PARCEL 16-N	25.8	59.0	42" RCP @ 0.50% minimum
C13	PARCEL 9C-S + PIPE C11	97.7	228.6	66" RCP @ 0.50% minimum
C14	PIPE C12 & C13	123.5	234.2	66" RCP @ 0.50% minimum
C15	PARCEL 16-W	38.1	89.7	48" RCP @ 0.50% minimum
C16	PARCEL 14 + PIPE C15	108.7	256.2	72" RCP @ 0.50% minimum
C17	PARCEL 1-S	32.3	75.5	54" RCP @ 0.50% minimum
C18	PARCEL 7	48.9	95.7	48" RCP @ 0.50% minimum
C19	PIPE C17 & C18	79.0	167.8	60" RCP @ 0.50% minimum
C20	PARCEL ELEC	31.7	61.0	42" RCP @ 0.50% minimum
C21	PARCEL 13-W	34.2	79.9	48" RCP @ 0.50% minimum
C22	PARCEL 16-E	25.0	58.5	42" RCP @ 0.50% minimum
C23	PARCEL 17 + PIPE C22	73.0	151.5	60" RCP @ 0.50% minimum

BRADLEY HEIGHTS

Project Summary	
Title	BRADLEY HEIGHTS
Engineer	DAVID GIBSON
Company	
Date	9/11/2014

Notes	DEVELOPED CONDITIONS MARKSHEFFEL TRIBUTARY CHANNEL AND REGIONAL DETENTION POND

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BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
OS-1	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.754	6.050	44.23
OS-1	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.904	6.050	63.02
OS-1	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.358	6.050	86.43
OS-1	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	8.411	6.050	134.50
OS-3	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.525	6.100	6.22
OS-3	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.879	6.100	11.54
OS-3	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.370	6.100	19.01
OS-3	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	2.504	6.100	36.20
OS-4	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.666	6.100	9.12
OS-4	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.114	6.100	16.32
OS-4	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.737	6.050	26.33
OS-4	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.174	6.050	50.11
M21-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.759	6.400	6.41
M21-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.742	6.350	21.28
M21-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.829	6.300	48.62

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M21-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	14.718	6.300	125.81
M23-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.195	20.050	0.21
M23-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	S	0.944	7.500	1.19
M23-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.474	7.000	6.16
M23-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	7.174	6.800	28.28
M20-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.075	6.800	2.87
M20-EX	COLO SPRGS: 1 - Synthetic Curve, S yrs	5	2.287	6.650	8.83
M20-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.173	6.650	19.74
M20-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	8.994	6.650	50.26
M24-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.355	6.400	5.45
M24-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	2.787	6.400	16.34
M24-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.982	6.350	35.20
M24-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	10.524	6.300	88.24
M27-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.010	24.100	0.02
M27-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	S	0.353	20.200	0.31
M27-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.338	7.800	1.82

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M27-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	4.833	7.150	12.48
M26-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.168	20.100	0.18
M26-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.813	8.100	0.97
M26-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.129	7.250	4.53
M26-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	6.175	7.000	19.58
M22-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.005	20.150	0.01
M22-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	S	0.187	20.000	0.17
M22-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	0.708	6.600	1.32
M22-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	2.559	6.350	14.09
M25-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.457	8.100	0.54
M25-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.341	6.450	4.28
M25-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.895	6.400	15.40
M25-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	7.252	6.300	54.33
M16-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.022	6.650	6.44
M16-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	4.157	6.550	18.78
M16-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	7.432	6.550	40.39

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M16-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	15.699	6.550	99.49
M17-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	7.069	6.450	45.60
M17-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	11.464	6.450	81.13
M17-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	17.473	6.350	132.20
M17-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	31.098	6.350	255.05
M18-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	4.177	6.500	20.42
M18-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	7.379	6.500	42.71
M18-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	11.957	6.500	76.60
M18-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	22.800	6.450	162.25
M19-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.614	6.700	8.15
M19-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	5.373	6.600	23.63
M19-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	9.606	6.600	50.48
M19-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	20.291	6.500	126.16
M10-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.483	6.800	9.88
M10-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	4.304	6.800	19.55
M10-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.882	6.650	34.28

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M10-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	12.931	6.650	71.39
M15-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.265	8.050	0.32
M15-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.779	6.300	3.04
M15-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.682	6.250	11.35
M15-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	4.213	6.200	39.50
M14-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.693	6.450	8.53
M14-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.052	6.450	18.62
M14-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.016	6.450	34.21
M14-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	9.713	6.350	73.79
M13-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.314	6.750	2.87
M13-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.030	6.600	11.62
M13-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.790	6.500	28.76
M13-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	13.037	6.500	80.42
M12-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.275	6.500	4.18
M12-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	2.713	6.400	13.77
M12-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.951	6.400	31.37

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M12-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	10.669	6.400	80.33
M11-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.106	6.350	13.54
M11-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.584	6.350	26.54
M11-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.658	6.350	45.59
M11-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	10.480	6.350	91.53
M8-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	3.216	6.250	29.44
M8-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	5.002	6.250	48.99
M8-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	7.387	6.200	75.61
M8-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	12.670	6.200	137.22
M9-DEV	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	8.397	6.800	40.07
M9-DEV	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	12.734	6.800	64.44
M9-DEV	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	18.443	6.800	97.45
M9-DEV	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	30.908	6.800	171.57
M5-DEV	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.054	6.100	26.87
M5-DEV	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.007	6.100	40.65
M5-DEV	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.237	6.100	58.45

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M5-DEV	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	6.867	6.100	96.34
M7-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.071	6.300	12.93
M7-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.910	6.250	31.55
M7-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.626	6.250	60.99
M7-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	13.253	6.200	138.81
M4-DEV	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	10.929	6.300	103.11
M4-DEV	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	15.655	6.250	152.99
M4-DEV	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	21.672	6.250	217.97
M4-DEV	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	34.381	6.250	356.32
PARCEL 5A	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.675	6.000	44.96
PARCEL 5A	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.528	6.000	58.59
PARCEL 5A	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.567	6.000	74.90
PARCEL 5A	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	6.673	6.000	107.25
PARCEL 2	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.335	6.000	22.44
PARCEL 2	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.761	6.000	29.24
PARCEL 2	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.279	6.000	37.38

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PARCEL 2	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.330	6.000	53.53
PARCEL 1-N	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.953	6.150	12.17
PARCEL 1-N	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.380	6.100	18.07
PARCEL 1-N	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.928	6.100	25.82
PARCEL 1-N	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.091	6.100	42.28
PARCEL 3468N	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	3.199	6.150	40.83
PARCEL 3468N	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	4.632	6.100	60.63
PARCEL 3468N	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.469	6.100	86.63
PARCEL 3468N	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	10.372	6.100	141.87
DET	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.759	6.100	9.47
DET	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.292	6.100	17.82
DET	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.040	6.100	29.53
DET	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.779	6.050	56.55
PARCEL 16-N	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.222	6.100	17.56
PARCEL 16-N	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.770	6.100	25.83
PARCEL 16-N	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.471	6.100	36.33

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PARCEL 16-N	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.962	6.050	59.00
PARCEL 11-S	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.089	6.000	37.01
PARCEL 11-S	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	2.840	6.000	49.69
PARCEL 11-S	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	3.769	6.000	64.99
PARCEL 11-S	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	5.678	6.000	95.55
M6-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.397	8.200	0.35
M6-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.420	6.550	3.16
M6-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	3.334	6.400	15.29
M6-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	8.928	6.300	62.71
M5-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.619	6.400	8.55
M5-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.057	6.350	20.43
M5-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.179	6.300	39.93
M5-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	10.359	6.300	90.95
M8-DEV	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	7.112	6.200	82.88
M8-DEV	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	10.188	6.150	121.84
M8-DEV	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	14.104	6.150	172.55

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
M8-DEV	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	22.374	6.150	279.74
PARCEL 5B	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.093	6.100	15.71
PARCEL 5B	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.583	6.100	23.11
PARCEL 5B	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.211	6.100	32.50
PARCEL 5B	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.544	6.050	52.78
PARCEL 11-N	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.484	6.000	26.29
PARCEL 11-N	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	2.018	6.000	35.30
PARCEL 11-N	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.678	6.000	46.17
PARCEL 11-N	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	4.034	6.000	67.88
PARCEL 3468S	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.837	6.150	36.21
PARCEL 3468S	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	4.108	6.100	53.76
PARCEL 3468S	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.737	6.100	76.82
PARCEL 3468S	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	9.198	6.100	125.81
PARCEL 13-E	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.030	6.150	13.15
PARCEL 13-E	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.492	6.100	19.52
PARCEL 13-E	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	2.083	6.100	27.90

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PARCEL 13-E	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	3.340	6.100	45.68
PARCEL 9AB	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.442	6.100	21.16
PARCEL 9AB	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	2.338	6.050	36.36
PARCEL 9AB	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	3.564	6.050	57.26
PARCEL 9AB	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	6.343	6.050	103.98
PARCEL 12-N	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.287	6.100	4.08
PARCEL 12-N	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.481	6.050	7.27
PARCEL 12-N	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	0.750	6.050	11.88
PARCEL 12-N	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	1.370	6.050	22.37
PARCEL 9C-N	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.988	6.150	38.14
PARCEL 9C-N	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	4.327	6.100	56.63
PARCEL 9C-N	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.043	6.100	80.92
PARCEL 9C-N	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	9.689	6.100	132.52
PARCEL 9C-S	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.166	6.150	27.64
PARCEL 9C-S	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.136	6.100	41.05
PARCEL 9C-S	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.380	6.100	58.66

BRADLEY HEIGHTS

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
PARCEL 9C-S	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	7.023	6.100	96.06
M4-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.233	6.050	4.08
M4-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.385	6.050	6.88
M4-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	0.593	6.050	10.62
M4-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	1.068	6.000	19.18
PARCEL 12-S	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.146	6.100	2.07
PARCEL 12-S	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.244	6.050	3.69
PARCEL 12-S	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	0.380	6.050	6.03
PARCEL 12-S	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	0.695	6.050	11.35

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DP-E3	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	68.486	6.200	287.43
DP-E3	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	117.139	6.250	461.82
DP-E3	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	188.442	6.600	760.37
DP-E3	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	361.874	6.600	1,667.15

BRADLEY HEIGHTS

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DP E2	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	48.429	6.850	144.46
DP E2	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	85.802	6.850	309.65
DP E2	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	141.444	6.800	582.39
DP E2	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	278.607	6.800	1,325.18
Junc 15	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	65.732	6.250	268.18
Junc 15	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	113.235	6.300	443.40
Junc 15	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	183.084	6.600	751.10
Junc 15	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	353.463	6.650	1,653.93
DP-M10	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	3.026	6.900	6.62
DP-M10	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	6.971	6.750	22.12
DP-M10	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	13.473	6.650	54.37
DP-M10	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	30.884	6.550	168.51
DP-M9	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	5.014	7.000	9.92
DP-M9	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	12.439	6.600	36.07
DP-M9	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	25.508	6.500	90.44
DP-M9	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	62.205	6.500	294.62

BRADLEY HEIGHTS

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DP-M11	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.178	20.300	0.19
DP-M11	COLO SPRGS: 1 - Synthetic Curve, S yrs	S	1.166	8.500	1.09
DP-M11	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	3.467	7.400	6.23
DP-M11	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	11.008	7.150	32.00
DP-M8	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	20.785	6.500	78.45
DP-M8	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	40.673	6.550	183.11
DP-M8	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	71.818	6.500	362.05
DP-M8	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	151.922	6.500	862.24
DP-M6	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	29.738	6.700	98.18
DP-M6	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	57.917	6.750	235.69
DP-M6	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	101.552	6.700	467.58
DP-M6	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	212.700	6.700	1,113.98
DP-M7	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	6.648	6.450	24.55
DP-M7	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	S	13.150	6.450	66.17
DP-M7	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	23.084	6.450	138.43
DP-M7	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	48.094	6.400	343.80

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DP E1	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	17.303	6.300	138.75
DP E1	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	27.433	6.300	222.10
DP E1	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	41.641	6.300	343.01
DP E1	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	74.856	6.300	660.54
DP-M5	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	4.070	6.150	31.61
DP-M5	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	7.484	6.150	54.05
DP-M5	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	12.750	6.200	92.51
DP-M5	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	26.155	6.200	203.01
DP-4	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	77.711	6.200	355.17
DP-4	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	129.990	6.200	556.27
DP-4	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	205.860	6.250	843.14
DP-4	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	388.848	6.600	1,720.53
Junc 30	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	8.162	6.050	113.71
Junc 30	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	11.301	6.050	158.49
Junc 30	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	15.243	6.050	214.71
Junc 30	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	23.466	6.050	331.70

BRADLEY HEIGHTS

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Junc 20	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	5.487	6.100	70.25
Junc 20	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	7.773	6.100	101.64
Junc 20	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	10.676	6.050	142.33
Junc 20	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	16.793	6.050	228.64
DP-5	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	84.750	6.250	397.10
DP-5	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	140.381	6.200	632.14
DP-5	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	220.624	6.200	956.89
DP-5	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	413.083	6.550	1,771.82
Junc 80	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	5.308	6.100	70.03
Junc 80	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	7.938	6.100	108.83
Junc 80	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	11.384	6.100	159.57
Junc 80	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	18.881	6.050	269.00
Junc 10	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.837	6.150	36.21
Junc 10	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	4.108	6.100	53.76
Junc 10	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	5.737	6.100	76.82
Junc 10	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	9.198	6.100	125.81

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Junc 50	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.397	8.200	0.35
Junc 50	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	1.420	6.550	3.16
Junc 50	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	3.334	6.400	15.29
Junc 50	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	8.928	6.300	62.71
Junc 60	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	2.071	6.300	12.93
Junc 60	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.910	6.250	31.55
Junc 60	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.626	6.250	60.99
Junc 60	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	13.253	6.200	138.81
Junc 70	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	6.376	6.100	82.70
Junc 70	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	9.233	6.100	123.52
Junc 70	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	12.894	6.100	175.91
Junc 70	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	20.674	6.100	286.87
Junc 40	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	5.154	6.150	65.78
Junc 40	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	7.463	6.100	97.69
Junc 40	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	10.423	6.100	139.58
Junc 40	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	16.712	6.100	228.58

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
DP-7	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	56.880	20.000	24.35
DP-7	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	111.697	8.800	126.28
DP-7	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	195.993	7.850	381.01
DP-7	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	399.612	7.350	1,156.32
DP-8	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.525	6.100	6.22
DP-8	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.879	6.100	11.54
DP-8	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.370	6.100	19.01
DP-8	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	2.504	6.100	36.20
J-M21-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.759	6.400	6.41
J-M21-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	3.742	6.350	21.28
J-M21-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	6.829	6.300	48.62
J-M21-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	14.718	6.300	125.81
J-M15-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	0.265	8.050	0.32
J-M15-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	0.779	6.300	3.04
J-M15-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	1.682	6.250	11.35
J-M15-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	4.213	6.200	39.50

BRADLEY HEIGHTS

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
J-M12-EX	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	1.275	6.500	4.18
J-M12-EX	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	2.713	6.400	13.77
J-M12-EX	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	4.951	6.400	31.37
J-M12-EX	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	10.669	6.400	80.33

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
EX POND MRK-1 (IN)	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	94.081	6.250	459.86	(N/A)	(N/A)
EX POND MRK-1 (OUT)	COLO SPRGS: 1 - Synthetic Curve, 2 yrs	2	S6.215	20.500	24.16	5,754.42	58.236
EX POND MRK-1 (IN)	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	153.949	6.200	739.86	(N/A)	(N/A)
EX POND MRK-1 (OUT)	COLO SPRGS: 1 - Synthetic Curve, 5 yrs	5	110.583	8.800	125.75	5,755.41	76.269
EX POND MRK-1 (IN)	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	239.663	6.200	1,126.01	(N/A)	(N/A)
EX POND MRK-1 (OUT)	COLO SPRGS: 1 - Synthetic Curve, 10 yrs	10	194.256	7.850	379.52	5,756.62	98.727
EX POND MRK-1 (IN)	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	443.862	6.200	2,029.97	(N/A)	(N/A)
EX POND MRK-1 (OUT)	COLO SPRGS: 1 - Synthetic Curve, 100 yrs	100	396.437	7.350	1,153.73	5,759.09	146.616

BRADLEY HEIGHTS

Subsection: Time-Depth Curve
Label: COLO SPRGS: 1

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

Time-Depth Curve: TYPEIIA 24HR (2.1 in)	
Label	TYPEIIA 24HR (2.1 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.0	0.0	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.2	0.2	0.8	1.5
6.250	1.5	1.6	1.6	1.6	1.7
7.500	1.7	1.7	1.7	1.7	1.7
8.750	1.8	1.8	1.8	1.8	1.8
10.000	1.8	1.8	1.8	1.8	1.8
11.250	1.8	1.9	1.9	1.9	1.9
12.500	1.9	1.9	1.9	1.9	1.9
13.750	1.9	1.9	1.9	1.9	1.9
15.000	2.0	2.0	2.0	2.0	2.0
16.250	2.0	2.0	2.0	2.0	2.0
17.500	2.0	2.0	2.0	2.0	2.0
18.750	2.0	2.0	2.0	2.0	2.1
20.000	2.1	2.1	2.1	2.1	2.1
21.250	2.1	2.1	2.1	2.1	2.1
22.500	2.1	2.1	2.1	2.1	2.1
23.750	2.1	2.1	(N/A)	(N/A)	(N/A)

BRADLEY HEIGHTS

Subsection: Time-Depth Curve
Label: COLO SPRGS: 1

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Time-Depth Curve: TYPEIIA 24HR (2.6 in)	
Label	TYPEIIA 24HR (2.6 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.0
2.500	0.0	0.0	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.2	0.2	0.3	1.0	1.8
6.250	1.9	2.0	2.0	2.0	2.1
7.500	2.1	2.1	2.1	2.1	2.2
8.750	2.2	2.2	2.2	2.2	2.2
10.000	2.2	2.2	2.3	2.3	2.3
11.250	2.3	2.3	2.3	2.3	2.3
12.500	2.3	2.3	2.4	2.4	2.4
13.750	2.4	2.4	2.4	2.4	2.4
15.000	2.4	2.4	2.4	2.4	2.4
16.250	2.5	2.5	2.5	2.5	2.5
17.500	2.5	2.5	2.5	2.5	2.5
18.750	2.5	2.5	2.5	2.5	2.5
20.000	2.5	2.6	2.6	2.6	2.6
21.250	2.6	2.6	2.6	2.6	2.6
22.500	2.6	2.6	2.6	2.6	2.6
23.750	2.6	2.6	(N/A)	(N/A)	(N/A)

BRADLEY HEIGHTS

Subsection: Time-Depth Curve
Label: COLO SPRGS: 1

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

Time-Depth Curve: TYPEIIA 24HR (3.2 in)	
Label	TYPEIIA 24HR (3.2 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.0
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.1	0.2
5.000	0.2	0.2	0.3	1.3	2.2
6.250	2.3	2.4	2.4	2.5	2.5
7.500	2.6	2.6	2.6	2.6	2.7
8.750	2.7	2.7	2.7	2.7	2.7
10.000	2.8	2.8	2.8	2.8	2.8
11.250	2.8	2.8	2.8	2.8	2.9
12.500	2.9	2.9	2.9	2.9	2.9
13.750	2.9	2.9	2.9	3.0	3.0
15.000	3.0	3.0	3.0	3.0	3.0
16.250	3.0	3.0	3.0	3.0	3.0
17.500	3.1	3.1	3.1	3.1	3.1
18.750	3.1	3.1	3.1	3.1	3.1
20.000	3.1	3.1	3.1	3.1	3.2
21.250	3.2	3.2	3.2	3.2	3.2
22.500	3.2	3.2	3.2	3.2	3.2
23.750	3.2	3.2	(N/A)	(N/A)	(N/A)

BRADLEY HEIGHTS

Subsection: Time-Depth Curve
Label: COLO SPRGS: 1

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Time-Depth Curve: TYPEIIA 24HR (4.4 in)	
Label	TYPEIIA 24HR (4.4 in)
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.250 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.2	0.2	0.2
5.000	0.3	0.3	0.4	1.8	3.1
6.250	3.2	3.3	3.4	3.4	3.5
7.500	3.5	3.6	3.6	3.6	3.7
8.750	3.7	3.7	3.7	3.7	3.8
10.000	3.8	3.8	3.8	3.8	3.9
11.250	3.9	3.9	3.9	3.9	3.9
12.500	3.9	4.0	4.0	4.0	4.0
13.750	4.0	4.0	4.1	4.1	4.1
15.000	4.1	4.1	4.1	4.1	4.1
16.250	4.1	4.2	4.2	4.2	4.2
17.500	4.2	4.2	4.2	4.2	4.2
18.750	4.3	4.3	4.3	4.3	4.3
20.000	4.3	4.3	4.3	4.3	4.3
21.250	4.3	4.3	4.4	4.4	4.4
22.500	4.4	4.4	4.4	4.4	4.4
23.750	4.4	4.4	(N/A)	(N/A)	(N/A)

BRADLEY HEIGHTS

Subsection: Elevation-Area Volume Curve
Label: EX POND MRK-1

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
5,746.50	0.0	0.001	0.000	0.000	0.000
5,747.00	0.0	0.020	0.024	0.004	0.004
5,748.00	0.0	0.233	0.322	0.107	0.111
5,750.00	0.0	4.801	6.091	4.061	4.172
5,752.00	0.0	12.294	24.777	16.518	20.690
5,754.00	0.0	17.855	44.964	29.976	50.666
5,756.00	0.0	18.612	54.696	36.464	87.130
5,758.00	0.0	19.387	56.995	37.996	125.127
5,760.00	0.0	20.276	59.490	39.660	164.787

BRADLEY HEIGHTS

Subsection: Elevation-Area Volume Curve
Label: EX POND MRK-1

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
5,746.50	0.0	0.001	0.000	0.000	0.000
5,747.00	0.0	0.020	0.024	0.004	0.004
5,748.00	0.0	0.233	0.322	0.107	0.111
5,750.00	0.0	4.801	6.091	4.061	4.172
5,752.00	0.0	12.294	24.777	16.518	20.690
5,754.00	0.0	17.855	44.964	29.976	50.666
5,756.00	0.0	18.612	54.696	36.464	87.130
5,758.00	0.0	19.387	56.995	37.996	125.127
5,760.00	0.0	20.276	59.490	39.660	164.787

BRADLEY HEIGHTS

Subsection: Elevation-Area Volume Curve
Label: EX POND MRK-1

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
5,746.50	0.0	0.001	0.000	0.000	0.000
5,747.00	0.0	0.020	0.024	0.004	0.004
5,748.00	0.0	0.233	0.322	0.107	0.111
5,750.00	0.0	4.801	6.091	4.061	4.172
5,752.00	0.0	12.294	24.777	16.518	20.690
5,754.00	0.0	17.855	44.964	29.976	50.666
5,756.00	0.0	18.612	54.696	36.464	87.130
5,758.00	0.0	19.387	56.995	37.996	125.127
5,760.00	0.0	20.276	59.490	39.660	164.787

BRADLEY HEIGHTS

Subsection: Elevation-Area Volume Curve
Label: EX POND MRK-1

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
5,746.50	0.0	0.001	0.000	0.000	0.000
5,747.00	0.0	0.020	0.024	0.004	0.004
5,748.00	0.0	0.233	0.322	0.107	0.111
5,750.00	0.0	4.801	6.091	4.061	4.172
5,752.00	0.0	12.294	24.777	16.518	20.690
5,754.00	0.0	17.855	44.964	29.976	50.666
5,756.00	0.0	18.612	54.696	36.464	87.130
5,758.00	0.0	19.387	56.995	37.996	125.127
5,760.00	0.0	20.276	59.490	39.660	164.787

BRADLEY HEIGHTS

Subsection: Outlet Input Data
Label: REVISED OUTLET

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	5,746.50 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	5,760.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	O0	Forward	TW	5,746.75	5,760.00
Rectangular Weir	W0	Forward	TW	5,754.50	5,760.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

BRADLEY HEIGHTS

Subsection: Outlet Input Data
Label: REVISED OUTLET

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

Structure ID: O0 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	5,746.75 ft
Orifice Area	0.1 ft²
Top Elevation	5,752.00 ft
Datum Elevation	5,746.75 ft
Orifice Coefficient	0.600

Structure ID: W0 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	5,754.50 ft
Weir Length	38.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	40
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

BRADLEY HEIGHTS

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.95	(N/A)	0.00
5,747.25	1.90	(N/A)	0.00
5,747.50	2.85	(N/A)	0.00
5,747.75	3.81	(N/A)	0.00
5,748.00	4.76	(N/A)	0.00
5,748.25	5.71	(N/A)	0.00
5,748.50	6.66	(N/A)	0.00
5,748.75	7.61	(N/A)	0.00
5,749.00	8.56	(N/A)	0.00
5,749.25	9.52	(N/A)	0.00
5,749.50	10.47	(N/A)	0.00
5,749.75	11.42	(N/A)	0.00
5,750.00	12.37	(N/A)	0.00
5,750.25	13.32	(N/A)	0.00
5,750.50	14.27	(N/A)	0.00
5,750.75	15.23	(N/A)	0.00
5,751.00	16.18	(N/A)	0.00
5,751.25	17.13	(N/A)	0.00
5,751.50	18.08	(N/A)	0.00
5,751.75	19.03	(N/A)	0.00
5,752.00	19.98	(N/A)	0.00
5,752.25	20.45	(N/A)	0.00
5,752.50	20.91	(N/A)	0.00
5,752.75	21.36	(N/A)	0.00
5,753.00	21.80	(N/A)	0.00
5,753.25	22.23	(N/A)	0.00
5,753.50	22.66	(N/A)	0.00
5,753.75	23.07	(N/A)	0.00
5,754.00	23.48	(N/A)	0.00
5,754.25	23.88	(N/A)	0.00
5,754.50	24.28	(N/A)	0.00
5,754.75	24.67	(N/A)	0.00
5,755.00	25.05	(N/A)	0.00
5,755.25	25.43	(N/A)	0.00
5,755.50	25.80	(N/A)	0.00

BRADLEY HEIGHTS

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,755.75	26.16	(N/A)	0.00
5,756.00	26.52	(N/A)	0.00
5,756.25	26.88	(N/A)	0.00
5,756.50	27.23	(N/A)	0.00
5,756.75	27.58	(N/A)	0.00
5,757.00	27.92	(N/A)	0.00
5,757.25	28.26	(N/A)	0.00
5,757.50	28.59	(N/A)	0.00
5,757.75	28.92	(N/A)	0.00
5,758.00	29.25	(N/A)	0.00
5,758.25	29.58	(N/A)	0.00
5,758.50	29.89	(N/A)	0.00
5,758.75	30.21	(N/A)	0.00
5,759.00	30.52	(N/A)	0.00
5,759.25	30.83	(N/A)	0.00
5,759.50	31.14	(N/A)	0.00
5,759.75	31.44	(N/A)	0.00
5,760.00	31.75	(N/A)	0.00

Computation Messages

HW & TW below invert
Hi=.00; Ht=5.25; Qt=1.33
Hi=.25; Ht=5.25; Qt=1.33
Hi=.50; Ht=5.25; Qt=1.33
Hi=.75; Ht=5.25; Qt=1.33
Hi=1.00; Ht=5.25; Qt=1.33
Hi=1.25; Ht=5.25; Qt=1.33
Hi=1.50; Ht=5.25; Qt=1.33
Hi=1.75; Ht=5.25; Qt=1.33
Hi=2.00; Ht=5.25; Qt=1.33
Hi=2.25; Ht=5.25; Qt=1.33
Hi=2.50; Ht=5.25; Qt=1.33
Hi=2.75; Ht=5.25; Qt=1.33
Hi=3.00; Ht=5.25; Qt=1.33
Hi=3.25; Ht=5.25; Qt=1.33
Hi=3.50; Ht=5.25; Qt=1.33
Hi=3.75; Ht=5.25; Qt=1.33
Hi=4.00; Ht=5.25; Qt=1.33

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
Hi=4.25; Ht=5.25; Qt=1.33
Hi=4.50; Ht=5.25; Qt=1.33
Hi=4.75; Ht=5.25; Qt=1.33
Hi=5.00; Ht=5.25; Qt=1.33
H =5.25
H =5.50
H =5.75
H =6.00
H =6.25
H =6.50
H =6.75
H =7.00
H =7.25
H =7.50
H =7.75
H =8.00
H =8.25
H =8.50
H =8.75
H =9.00
H =9.25
H =9.50
H =9.75
H =10.00
H =10.25
H =10.50
H =10.75
H =11.00
H =11.25
H =11.50
H =11.75
H =12.00
H =12.25
H =12.50
H =12.75
H =13.00
H =13.25

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.00	(N/A)	0.00
5,747.25	0.00	(N/A)	0.00
5,747.50	0.00	(N/A)	0.00
5,747.75	0.00	(N/A)	0.00
5,748.00	0.00	(N/A)	0.00
5,748.25	0.00	(N/A)	0.00
5,748.50	0.00	(N/A)	0.00
5,748.75	0.00	(N/A)	0.00
5,749.00	0.00	(N/A)	0.00
5,749.25	0.00	(N/A)	0.00
5,749.50	0.00	(N/A)	0.00
5,749.75	0.00	(N/A)	0.00
5,750.00	0.00	(N/A)	0.00
5,750.25	0.00	(N/A)	0.00
5,750.50	0.00	(N/A)	0.00
5,750.75	0.00	(N/A)	0.00
5,751.00	0.00	(N/A)	0.00
5,751.25	0.00	(N/A)	0.00
5,751.50	0.00	(N/A)	0.00
5,751.75	0.00	(N/A)	0.00
5,752.00	0.00	(N/A)	0.00
5,752.25	0.00	(N/A)	0.00
5,752.50	0.00	(N/A)	0.00
5,752.75	0.00	(N/A)	0.00
5,753.00	0.00	(N/A)	0.00
5,753.25	0.00	(N/A)	0.00
5,753.50	0.00	(N/A)	0.00
5,753.75	0.00	(N/A)	0.00
5,754.00	0.00	(N/A)	0.00
5,754.25	0.00	(N/A)	0.00
5,754.50	0.00	(N/A)	0.00
5,754.75	14.25	(N/A)	0.00
5,755.00	40.31	(N/A)	0.00
5,755.25	74.05	(N/A)	0.00
5,755.50	114.00	(N/A)	0.00

BRADLEY HEIGHTS

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 2 years
Storm Event: TYPEIIA 24HR (2.1 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,755.75	159.32	(N/A)	0.00
5,756.00	209.43	(N/A)	0.00
5,756.25	263.91	(N/A)	0.00
5,756.50	322.44	(N/A)	0.00
5,756.75	384.75	(N/A)	0.00
5,757.00	450.62	(N/A)	0.00
5,757.25	519.88	(N/A)	0.00
5,757.50	592.36	(N/A)	0.00
5,757.75	667.93	(N/A)	0.00
5,758.00	746.46	(N/A)	0.00
5,758.25	827.85	(N/A)	0.00
5,758.50	912.00	(N/A)	0.00
5,758.75	998.82	(N/A)	0.00
5,759.00	1,088.24	(N/A)	0.00
5,759.25	1,180.17	(N/A)	0.00
5,759.50	1,274.56	(N/A)	0.00
5,759.75	1,371.34	(N/A)	0.00
5,760.00	1,470.45	(N/A)	0.00

Computation Messages

HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
H=.00; Htw=.00; Qfree=.00;
H=.25; Htw=.00; Qfree=14.25;
H=.50; Htw=.00; Qfree=40.31;
H=.75; Htw=.00; Qfree=74.05;
H=1.00; Htw=.00; Qfree=114.00;
H=1.25; Htw=.00; Qfree=159.32;
H=1.50; Htw=.00; Qfree=209.43;
H=1.75; Htw=.00; Qfree=263.91;
H=2.00; Htw=.00; Qfree=322.44;
H=2.25; Htw=.00; Qfree=384.75;
H=2.50; Htw=.00; Qfree=450.62;
H=2.75; Htw=.00; Qfree=519.88;
H=3.00; Htw=.00; Qfree=592.36;
H=3.25; Htw=.00; Qfree=667.93;
H=3.50; Htw=.00; Qfree=746.46;
H=3.75; Htw=.00; Qfree=827.85;
H=4.00; Htw=.00; Qfree=912.00;
H=4.25; Htw=.00; Qfree=998.82;
H=4.50; Htw=.00; Qfree=1088.24;
H=4.75; Htw=.00; Qfree=1180.17;
H=5.00; Htw=.00; Qfree=1274.56;
H=5.25; Htw=.00; Qfree=1371.34;
H=5.50; Htw=.00; Qfree=1470.45;

BRADLEY HEIGHTS

Subsection: Outlet Input Data
Label: REVISED OUTLET

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	5,746.50 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	5,760.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	O0	Forward	TW	5,746.75	5,760.00
Rectangular Weir	W0	Forward	TW	5,754.50	5,760.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: O0 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	5,746.75 ft
Orifice Area	0.1 ft²
Top Elevation	5,752.00 ft
Datum Elevation	5,746.75 ft
Orifice Coefficient	0.600

Structure ID: W0 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	5,754.50 ft
Weir Length	38.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	40
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.95	(N/A)	0.00
5,747.25	1.90	(N/A)	0.00
5,747.50	2.85	(N/A)	0.00
5,747.75	3.81	(N/A)	0.00
5,748.00	4.76	(N/A)	0.00
5,748.25	5.71	(N/A)	0.00
5,748.50	6.66	(N/A)	0.00
5,748.75	7.61	(N/A)	0.00
5,749.00	8.56	(N/A)	0.00
5,749.25	9.52	(N/A)	0.00
5,749.50	10.47	(N/A)	0.00
5,749.75	11.42	(N/A)	0.00
5,750.00	12.37	(N/A)	0.00
5,750.25	13.32	(N/A)	0.00
5,750.50	14.27	(N/A)	0.00
5,750.75	15.23	(N/A)	0.00
5,751.00	16.18	(N/A)	0.00
5,751.25	17.13	(N/A)	0.00
5,751.50	18.08	(N/A)	0.00
5,751.75	19.03	(N/A)	0.00
5,752.00	19.98	(N/A)	0.00
5,752.25	20.45	(N/A)	0.00
5,752.50	20.91	(N/A)	0.00
5,752.75	21.36	(N/A)	0.00
5,753.00	21.80	(N/A)	0.00
5,753.25	22.23	(N/A)	0.00
5,753.50	22.66	(N/A)	0.00
5,753.75	23.07	(N/A)	0.00
5,754.00	23.48	(N/A)	0.00
5,754.25	23.88	(N/A)	0.00
5,754.50	24.28	(N/A)	0.00
5,754.75	24.67	(N/A)	0.00
5,755.00	25.0S	(N/A)	0.00
5,755.25	25.43	(N/A)	0.00
5,755.50	2S.80	(N/A)	0.00
5,755.75	26.16	(N/A)	0.00
5,756.00	26.52	(N/A)	0.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,756.25	26.88	(N/A)	0.00
5,756.50	27.23	(N/A)	0.00
5,756.75	27.58	(N/A)	0.00
5,757.00	27.92	(N/A)	0.00
5,757.25	28.26	(N/A)	0.00
5,757.50	28.59	(N/A)	0.00
5,757.75	28.92	(N/A)	0.00
5,758.00	29.25	(N/A)	0.00
5,758.25	29.58	(N/A)	0.00
5,758.50	29.89	(N/A)	0.00
5,758.75	30.21	(N/A)	0.00
5,759.00	30.52	(N/A)	0.00
5,759.25	30.83	(N/A)	0.00
5,759.50	31.14	(N/A)	0.00
5,759.75	31.44	(N/A)	0.00
5,760.00	31.75	(N/A)	0.00

Computation Messages

HW & TW below invert
Hi=.00; Ht=5.25; Qt=1.33
Hi=.25; Ht=5.25; Qt=1.33
Hi=.50; Ht=5.25; Qt=1.33
Hi=.75; Ht=5.25; Qt=1.33
Hi=1.00; Ht=5.25; Qt=1.33
Hi=1.25; Ht=5.25; Qt=1.33
Hi=1.50; Ht=5.25; Qt=1.33
Hi=1.75; Ht=5.25; Qt=1.33
Hi=2.00; Ht=5.25; Qt=1.33
Hi=2.25; Ht=5.25; Qt=1.33
Hi=2.50; Ht=5.25; Qt=1.33
Hi=2.75; Ht=5.25; Qt=1.33
Hi=3.00; Ht=5.25; Qt=1.33
Hi=3.25; Ht=5.25; Qt=1.33
Hi=3.50; Ht=5.25; Qt=1.33
Hi=3.75; Ht=5.25; Qt=1.33
Hi=4.00; Ht=5.25; Qt=1.33
Hi=4.25; Ht=5.25; Qt=1.33
Hi=4.50; Ht=5.25; Qt=1.33
Hi=4.75; Ht=5.25; Qt=1.33
Hi=5.00; Ht=5.25; Qt=1.33

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = 00 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =5.25
H =5.50
H =5.75
H =6.00
H =6.25
H =6.50
H =6.75
H =7.00
H =7.25
H =7.50
H =7.75
H =8.00
H =8.25
H =8.50
H =8.75
H =9.00
H =9.25
H =9.50
H =9.75
H =10.00
H =10.25
H =10.50
H =10.75
H =11.00
H =11.25
H =11.50
H =11.75
H =12.00
H =12.25
H =12.50
H =12.75
H =13.00
H =13.25

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.00	(N/A)	0.00
5,747.25	0.00	(N/A)	0.00
5,747.50	0.00	(N/A)	0.00
5,747.75	0.00	(N/A)	0.00
5,748.00	0.00	(N/A)	0.00
5,748.25	0.00	(N/A)	0.00
5,748.50	0.00	(N/A)	0.00
5,748.75	0.00	(N/A)	0.00
5,749.00	0.00	(N/A)	0.00
5,749.25	0.00	(N/A)	0.00
5,749.50	0.00	(N/A)	0.00
5,749.75	0.00	(N/A)	0.00
5,750.00	0.00	(N/A)	0.00
5,750.25	0.00	(N/A)	0.00
5,750.50	0.00	(N/A)	0.00
5,750.75	0.00	(N/A)	0.00
5,751.00	0.00	(N/A)	0.00
5,751.25	0.00	(N/A)	0.00
5,751.50	0.00	(N/A)	0.00
5,751.75	0.00	(N/A)	0.00
5,752.00	0.00	(N/A)	0.00
5,752.25	0.00	(N/A)	0.00
5,752.50	0.00	(N/A)	0.00
5,752.75	0.00	(N/A)	0.00
5,753.00	0.00	(N/A)	0.00
5,753.25	0.00	(N/A)	0.00
5,753.50	0.00	(N/A)	0.00
5,753.75	0.00	(N/A)	0.00
5,754.00	0.00	(N/A)	0.00
5,754.25	0.00	(N/A)	0.00
5,754.50	0.00	(N/A)	0.00
5,754.75	14.25	(N/A)	0.00
5,755.00	40.31	(N/A)	0.00
5,755.25	74.05	(N/A)	0.00
5,755.50	114.00	(N/A)	0.00
5,755.75	159.32	(N/A)	0.00
5,756.00	209.43	(N/A)	0.00

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 5 years
Storm Event: TYPEIIA 24HR (2.6 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,756.25	263.91	(N/A)	0.00
5,756.50	322.44	(N/A)	0.00
5,756.75	384.75	(N/A)	0.00
5,757.00	450.62	(N/A)	0.00
5,757.25	519.88	(N/A)	0.00
5,757.50	592.36	(N/A)	0.00
5,757.75	667.93	(N/A)	0.00
5,758.00	746.46	(N/A)	0.00
5,758.25	827.85	(N/A)	0.00
5,758.50	912.00	(N/A)	0.00
5,758.75	998.82	(N/A)	0.00
5,759.00	1,088.24	(N/A)	0.00
5,759.25	1,180.17	(N/A)	0.00
5,759.50	1,274.56	(N/A)	0.00
5,759.75	1,371.34	(N/A)	0.00
5,760.00	1,470.45	(N/A)	0.00

Computation Messages

HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
H=.00; Htw=.00; Qfree=.00;
H=.25; Htw=.00; Qfree=14.25;
H=.50; Htw=.00; Qfree=40.31;
H=.75; Htw=.00; Qfree=74.05;
H=1.00; Htw=.00; Qfree=114.00;
H=1.25; Htw=.00; Qfree=159.32;
H=1.50; Htw=.00; Qfree=209.43;
H=1.75; Htw=.00; Qfree=263.91;
H=2.00; Htw=.00; Qfree=322.44;
H=2.25; Htw=.00; Qfree=384.75;
H=2.50; Htw=.00; Qfree=450.62;
H=2.75; Htw=.00; Qfree=519.88;
H=3.00; Htw=.00; Qfree=592.36;
H=3.25; Htw=.00; Qfree=667.93;
H=3.50; Htw=.00; Qfree=746.46;
H=3.75; Htw=.00; Qfree=827.85;
H=4.00; Htw=.00; Qfree=912.00;
H=4.25; Htw=.00; Qfree=998.82;
H=4.50; Htw=.00; Qfree=1088.24;
H=4.75; Htw=.00; Qfree=1180.17;
H=5.00; Htw=.00; Qfree=1274.56;
H=5.25; Htw=.00; Qfree=1371.34;
H=5.50; Htw=.00; Qfree=1470.45;

BRADLEY HEIGHTS

Subsection: Outlet Input Data
Label: REVISED OUTLET

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	5,746.50 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	5,760.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	O0	Forward	TW	5,746.75	5,760.00
Rectangular Weir	W0	Forward	TW	5,754.50	5,760.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: O0 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	5,746.75 ft
Orifice Area	0.1 ft²
Top Elevation	5,752.00 ft
Datum Elevation	5,746.75 ft
Orifice Coefficient	0.600

Structure ID: W0 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	5,754.50 ft
Weir Length	38.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	40
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.95	(N/A)	0.00
5,747.25	1.90	(N/A)	0.00
5,747.50	2.85	(N/A)	0.00
5,747.75	3.81	(N/A)	0.00
5,748.00	4.76	(N/A)	0.00
5,748.25	5.71	(N/A)	0.00
5,748.50	6.66	(N/A)	0.00
5,748.75	7.61	(N/A)	0.00
5,749.00	8.56	(N/A)	0.00
5,749.25	9.52	(N/A)	0.00
5,749.50	10.47	(N/A)	0.00
5,749.75	11.42	(N/A)	0.00
5,750.00	12.37	(N/A)	0.00
5,750.25	13.32	(N/A)	0.00
5,750.50	14.27	(N/A)	0.00
5,750.75	15.23	(N/A)	0.00
5,751.00	16.18	(N/A)	0.00
5,751.25	17.13	(N/A)	0.00
5,751.50	18.08	(N/A)	0.00
5,751.75	19.03	(N/A)	0.00
5,752.00	19.98	(N/A)	0.00
5,752.25	20.45	(N/A)	0.00
5,752.50	20.91	(N/A)	0.00
5,752.75	21.36	(N/A)	0.00
5,753.00	21.80	(N/A)	0.00
5,753.25	22.23	(N/A)	0.00
5,753.50	22.66	(N/A)	0.00
5,753.75	23.07	(N/A)	0.00
5,754.00	23.48	(N/A)	0.00
5,754.25	23.88	(N/A)	0.00
5,754.50	24.28	(N/A)	0.00
5,754.75	24.67	(N/A)	0.00
5,755.00	25.05	(N/A)	0.00
5,755.25	25.43	(N/A)	0.00
5,755.50	25.80	(N/A)	0.00
5,755.75	26.16	(N/A)	0.00
5,756.00	26.52	(N/A)	0.00

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,756.25	26.88	(N/A)	0.00
5,756.50	27.23	(N/A)	0.00
5,756.75	27.58	(N/A)	0.00
5,757.00	27.92	(N/A)	0.00
5,757.25	28.26	(N/A)	0.00
5,757.50	28.59	(N/A)	0.00
5,757.75	28.92	(N/A)	0.00
5,758.00	29.25	(N/A)	0.00
5,758.25	29.58	(N/A)	0.00
5,758.50	29.89	(N/A)	0.00
5,758.75	30.21	(N/A)	0.00
5,759.00	30.52	(N/A)	0.00
5,759.25	30.83	(N/A)	0.00
5,759.50	31.14	(N/A)	0.00
5,759.75	31.44	(N/A)	0.00
5,760.00	31.75	(N/A)	0.00

Computation Messages

HW & TW below invert
HI=.00; Ht=5.25; Qt=1.33
HI=.25; Ht=5.25; Qt=1.33
HI=.50; Ht=5.25; Qt=1.33
HI=.75; Ht=5.25; Qt=1.33
HI=1.00; Ht=5.25; Qt=1.33
HI=1.25; Ht=5.25; Qt=1.33
HI=1.50; Ht=5.25; Qt=1.33
HI=1.75; Ht=5.25; Qt=1.33
HI=2.00; Ht=5.25; Qt=1.33
HI=2.25; Ht=5.25; Qt=1.33
HI=2.50; Ht=5.25; Qt=1.33
HI=2.75; Ht=5.25; Qt=1.33
HI=3.00; Ht=5.25; Qt=1.33
HI=3.25; Ht=5.25; Qt=1.33
HI=3.50; Ht=5.25; Qt=1.33
HI=3.75; Ht=5.25; Qt=1.33
HI=4.00; Ht=5.25; Qt=1.33
HI=4.25; Ht=5.25; Qt=1.33
HI=4.50; Ht=5.25; Qt=1.33
HI=4.75; Ht=5.25; Qt=1.33
HI=5.00; Ht=5.25; Qt=1.33

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =5.25
H =5.50
H =5.75
H =6.00
H =6.25
H =6.50
H =6.75
H =7.00
H =7.25
H =7.50
H =7.75
H =8.00
H =8.25
H =8.50
H =8.75
H =9.00
H =9.25
H =9.50
H =9.75
H =10.00
H =10.25
H =10.50
H =10.75
H =11.00
H =11.25
H =11.50
H =11.75
H =12.00
H =12.25
H =12.50
H =12.75
H =13.00
H =13.25

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.00	(N/A)	0.00
5,747.25	0.00	(N/A)	0.00
5,747.50	0.00	(N/A)	0.00
5,747.75	0.00	(N/A)	0.00
5,748.00	0.00	(N/A)	0.00
5,748.25	0.00	(N/A)	0.00
5,748.50	0.00	(N/A)	0.00
5,748.75	0.00	(N/A)	0.00
5,749.00	0.00	(N/A)	0.00
5,749.25	0.00	(N/A)	0.00
5,749.50	0.00	(N/A)	0.00
5,749.75	0.00	(N/A)	0.00
5,750.00	0.00	(N/A)	0.00
5,750.25	0.00	(N/A)	0.00
5,750.50	0.00	(N/A)	0.00
5,750.75	0.00	(N/A)	0.00
5,751.00	0.00	(N/A)	0.00
5,751.25	0.00	(N/A)	0.00
5,751.50	0.00	(N/A)	0.00
5,751.75	0.00	(N/A)	0.00
5,752.00	0.00	(N/A)	0.00
5,752.25	0.00	(N/A)	0.00
5,752.50	0.00	(N/A)	0.00
5,752.75	0.00	(N/A)	0.00
5,753.00	0.00	(N/A)	0.00
5,753.25	0.00	(N/A)	0.00
5,753.50	0.00	(N/A)	0.00
5,753.75	0.00	(N/A)	0.00
5,754.00	0.00	(N/A)	0.00
5,754.25	0.00	(N/A)	0.00
5,754.50	0.00	(N/A)	0.00
5,754.75	14.25	(N/A)	0.00
5,755.00	40.31	(N/A)	0.00
5,755.25	74.05	(N/A)	0.00
5,755.50	114.00	(N/A)	0.00
5,755.75	159.32	(N/A)	0.00
5,756.00	209.43	(N/A)	0.00

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 10 years
Storm Event: TYPEIIA 24HR (3.2 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,756.25	263.91	(N/A)	0.00
5,756.50	322.44	(N/A)	0.00
5,756.75	384.75	(N/A)	0.00
5,757.00	450.62	(N/A)	0.00
5,757.25	519.88	(N/A)	0.00
5,757.50	592.36	(N/A)	0.00
5,757.75	667.93	(N/A)	0.00
5,758.00	746.46	(N/A)	0.00
5,758.25	827.85	(N/A)	0.00
5,758.50	912.00	(N/A)	0.00
5,758.75	998.82	(N/A)	0.00
5,759.00	1,088.24	(N/A)	0.00
5,759.25	1,180.17	(N/A)	0.00
5,759.50	1,274.56	(N/A)	0.00
5,759.75	1,371.34	(N/A)	0.00
5,760.00	1,470.45	(N/A)	0.00

Computation Messages

HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
H=.00; Htw=.00; Qfree=.00;
H=.25; Htw=.00; Qfree=14.25;
H=.50; Htw=.00; Qfree=40.31;
H=.75; Htw=.00; Qfree=74.05;
H=1.00; Htw=.00; Qfree=114.00;
H=1.25; Htw=.00; Qfree=159.32;
H=1.50; Htw=.00; Qfree=209.43;
H=1.75; Htw=.00; Qfree=263.91;
H=2.00; Htw=.00; Qfree=322.44;
H=2.25; Htw=.00; Qfree=384.75;
H=2.50; Htw=.00; Qfree=450.62;
H=2.75; Htw=.00; Qfree=519.88;
H=3.00; Htw=.00; Qfree=592.36;
H=3.25; Htw=.00; Qfree=667.93;
H=3.50; Htw=.00; Qfree=746.46;
H=3.75; Htw=.00; Qfree=827.85;
H=4.00; Htw=.00; Qfree=912.00;
H=4.25; Htw=.00; Qfree=998.82;
H=4.50; Htw=.00; Qfree=1088.24;
H=4.75; Htw=.00; Qfree=1180.17;
H=5.00; Htw=.00; Qfree=1274.56;
H=5.25; Htw=.00; Qfree=1371.34;
H=5.50; Htw=.00; Qfree=1470.45;

BRADLEY HEIGHTS

Subsection: Outlet Input Data
Label: REVISED OUTLET

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	5,746.50 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	5,760.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	O0	Forward	TW	5,746.75	5,760.00
Rectangular Weir	W0	Forward	TW	5,754.50	5,760.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: O0 Structure Type: Orifice-Area	
Number of Openings	15
Elevation	5,746.75 ft
Orifice Area	0.1 ft²
Top Elevation	5,752.00 ft
Datum Elevation	5,746.75 ft
Orifice Coefficient	0.600

Structure ID: W0 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	5,754.50 ft
Weir Length	38.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	40
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.95	(N/A)	0.00
5,747.25	1.90	(N/A)	0.00
5,747.50	2.85	(N/A)	0.00
5,747.75	3.81	(N/A)	0.00
5,748.00	4.76	(N/A)	0.00
5,748.25	5.71	(N/A)	0.00
5,748.50	6.66	(N/A)	0.00
5,748.75	7.61	(N/A)	0.00
5,749.00	8.56	(N/A)	0.00
5,749.25	9.52	(N/A)	0.00
5,749.50	10.47	(N/A)	0.00
5,749.75	11.42	(N/A)	0.00
5,750.00	12.37	(N/A)	0.00
5,750.25	13.32	(N/A)	0.00
5,750.50	14.27	(N/A)	0.00
5,750.75	15.23	(N/A)	0.00
5,751.00	16.18	(N/A)	0.00
5,751.25	17.13	(N/A)	0.00
5,751.50	18.08	(N/A)	0.00
5,751.75	19.03	(N/A)	0.00
5,752.00	19.98	(N/A)	0.00
5,752.25	20.45	(N/A)	0.00
5,752.50	20.91	(N/A)	0.00
5,752.75	21.36	(N/A)	0.00
5,753.00	21.80	(N/A)	0.00
5,753.25	22.23	(N/A)	0.00
5,753.50	22.66	(N/A)	0.00
5,753.75	23.07	(N/A)	0.00
5,754.00	23.48	(N/A)	0.00
5,754.25	23.88	(N/A)	0.00
5,754.50	24.28	(N/A)	0.00
5,754.75	24.67	(N/A)	0.00
5,755.00	25.05	(N/A)	0.00
5,755.25	25.43	(N/A)	0.00
5,755.50	25.80	(N/A)	0.00
5,755.75	26.16	(N/A)	0.00
5,756.00	26.52	(N/A)	0.00

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,756.25	26.88	(N/A)	0.00
5,756.50	27.23	(N/A)	0.00
5,756.75	27.58	(N/A)	0.00
5,757.00	27.92	(N/A)	0.00
5,757.25	28.26	(N/A)	0.00
5,757.50	28.59	(N/A)	0.00
5,757.75	28.92	(N/A)	0.00
5,758.00	29.25	(N/A)	0.00
5,758.25	29.58	(N/A)	0.00
5,758.50	29.89	(N/A)	0.00
5,758.75	30.21	(N/A)	0.00
5,759.00	30.52	(N/A)	0.00
5,759.25	30.83	(N/A)	0.00
5,759.50	31.14	(N/A)	0.00
5,759.75	31.44	(N/A)	0.00
5,760.00	31.75	(N/A)	0.00

Computation Messages

HW & TW below invert
Hi=.00; Ht=5.25; Qt=1.33
Hi=.25; Ht=5.25; Qt=1.33
Hi=.50; Ht=5.25; Qt=1.33
Hi=.75; Ht=5.25; Qt=1.33
Hi=1.00; Ht=5.25; Qt=1.33
Hi=1.25; Ht=5.25; Qt=1.33
Hi=1.50; Ht=5.25; Qt=1.33
Hi=1.75; Ht=5.25; Qt=1.33
Hi=2.00; Ht=5.25; Qt=1.33
Hi=2.25; Ht=5.25; Qt=1.33
Hi=2.50; Ht=5.25; Qt=1.33
Hi=2.75; Ht=5.25; Qt=1.33
Hi=3.00; Ht=5.25; Qt=1.33
Hi=3.25; Ht=5.25; Qt=1.33
Hi=3.50; Ht=5.25; Qt=1.33
Hi=3.75; Ht=5.25; Qt=1.33
Hi=4.00; Ht=5.25; Qt=1.33
Hi=4.25; Ht=5.25; Qt=1.33
Hi=4.50; Ht=5.25; Qt=1.33
Hi=4.75; Ht=5.25; Qt=1.33
Hi=5.00; Ht=5.25; Qt=1.33

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = O0 (Orifice-Area)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =5.25
H =5.50
H =5.75
H =6.00
H =6.25
H =6.50
H =6.75
H =7.00
H =7.25
H =7.50
H =7.75
H =8.00
H =8.25
H =8.50
H =8.75
H =9.00
H =9.25
H =9.50
H =9.75
H =10.00
H =10.25
H =10.50
H =10.75
H =11.00
H =11.25
H =11.50
H =11.75
H =12.00
H =12.25
H =12.50
H =12.75
H =13.00
H =13.25

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,746.50	0.00	(N/A)	0.00
5,746.75	0.00	(N/A)	0.00
5,747.00	0.00	(N/A)	0.00
5,747.25	0.00	(N/A)	0.00
5,747.50	0.00	(N/A)	0.00
5,747.75	0.00	(N/A)	0.00
5,748.00	0.00	(N/A)	0.00
5,748.25	0.00	(N/A)	0.00
5,748.50	0.00	(N/A)	0.00
5,748.75	0.00	(N/A)	0.00
5,749.00	0.00	(N/A)	0.00
5,749.25	0.00	(N/A)	0.00
5,749.50	0.00	(N/A)	0.00
5,749.75	0.00	(N/A)	0.00
5,750.00	0.00	(N/A)	0.00
5,750.25	0.00	(N/A)	0.00
5,750.50	0.00	(N/A)	0.00
5,750.75	0.00	(N/A)	0.00
5,751.00	0.00	(N/A)	0.00
5,751.25	0.00	(N/A)	0.00
5,751.50	0.00	(N/A)	0.00
5,751.75	0.00	(N/A)	0.00
5,752.00	0.00	(N/A)	0.00
5,752.25	0.00	(N/A)	0.00
5,752.50	0.00	(N/A)	0.00
5,752.75	0.00	(N/A)	0.00
5,753.00	0.00	(N/A)	0.00
5,753.25	0.00	(N/A)	0.00
5,753.50	0.00	(N/A)	0.00
5,753.75	0.00	(N/A)	0.00
5,754.00	0.00	(N/A)	0.00
5,754.25	0.00	(N/A)	0.00
5,754.50	0.00	(N/A)	0.00
5,754.75	14.25	(N/A)	0.00
5,755.00	40.31	(N/A)	0.00
5,755.25	74.05	(N/A)	0.00
5,755.50	114.00	(N/A)	0.00
5,755.75	159.32	(N/A)	0.00
5,756.00	209.43	(N/A)	0.00

Subsection: Individual Outlet Curves
Label: REVISED OUTLET

Return Event: 100 years
Storm Event: TYPEIIA 24HR (4.4 in)

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
5,756.25	263.91	(N/A)	0.00
5,756.50	322.44	(N/A)	0.00
5,756.75	384.75	(N/A)	0.00
5,757.00	450.62	(N/A)	0.00
5,757.25	519.88	(N/A)	0.00
5,757.50	592.36	(N/A)	0.00
5,757.75	667.93	(N/A)	0.00
5,758.00	746.46	(N/A)	0.00
5,758.25	827.85	(N/A)	0.00
5,758.50	912.00	(N/A)	0.00
5,758.75	998.82	(N/A)	0.00
5,759.00	1,088.24	(N/A)	0.00
5,759.25	1,180.17	(N/A)	0.00
5,759.50	1,274.56	(N/A)	0.00
5,759.75	1,371.34	(N/A)	0.00
5,760.00	1,470.45	(N/A)	0.00

Computation Messages

HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = W0 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
HW & TW below Inv.El.=5754.500
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HW & TW below Inv.El.=5754.500
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H=.50; Htw=.00; Qfree=40.31;
H=.75; Htw=.00; Qfree=74.05;
H=1.00; Htw=.00; Qfree=114.00;
H=1.25; Htw=.00; Qfree=159.32;
H=1.50; Htw=.00; Qfree=209.43;
H=1.75; Htw=.00; Qfree=263.91;
H=2.00; Htw=.00; Qfree=322.44;
H=2.25; Htw=.00; Qfree=384.75;
H=2.50; Htw=.00; Qfree=450.62;
H=2.75; Htw=.00; Qfree=519.88;
H=3.00; Htw=.00; Qfree=592.36;
H=3.25; Htw=.00; Qfree=667.93;
H=3.50; Htw=.00; Qfree=746.46;
H=3.75; Htw=.00; Qfree=827.85;
H=4.00; Htw=.00; Qfree=912.00;
H=4.25; Htw=.00; Qfree=998.82;
H=4.50; Htw=.00; Qfree=1088.24;
H=4.75; Htw=.00; Qfree=1180.17;
H=5.00; Htw=.00; Qfree=1274.56;
H=5.25; Htw=.00; Qfree=1371.34;
H=5.50; Htw=.00; Qfree=1470.45;

BRADLEY HEIGHTS

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COLO SPRGS: 1 (Time-Depth Curve, 2 years)...21

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REVISED OUTLET (Outlet Input Data, 5 years)...37, 38

Jimmy Camp Creek

Drainage Basin Planning Study
Development of Alternatives &
Design of Selected Plan Report

Prepared for:

City of Colorado Springs

Prepared by:

Kiowa
Engineering Corporation

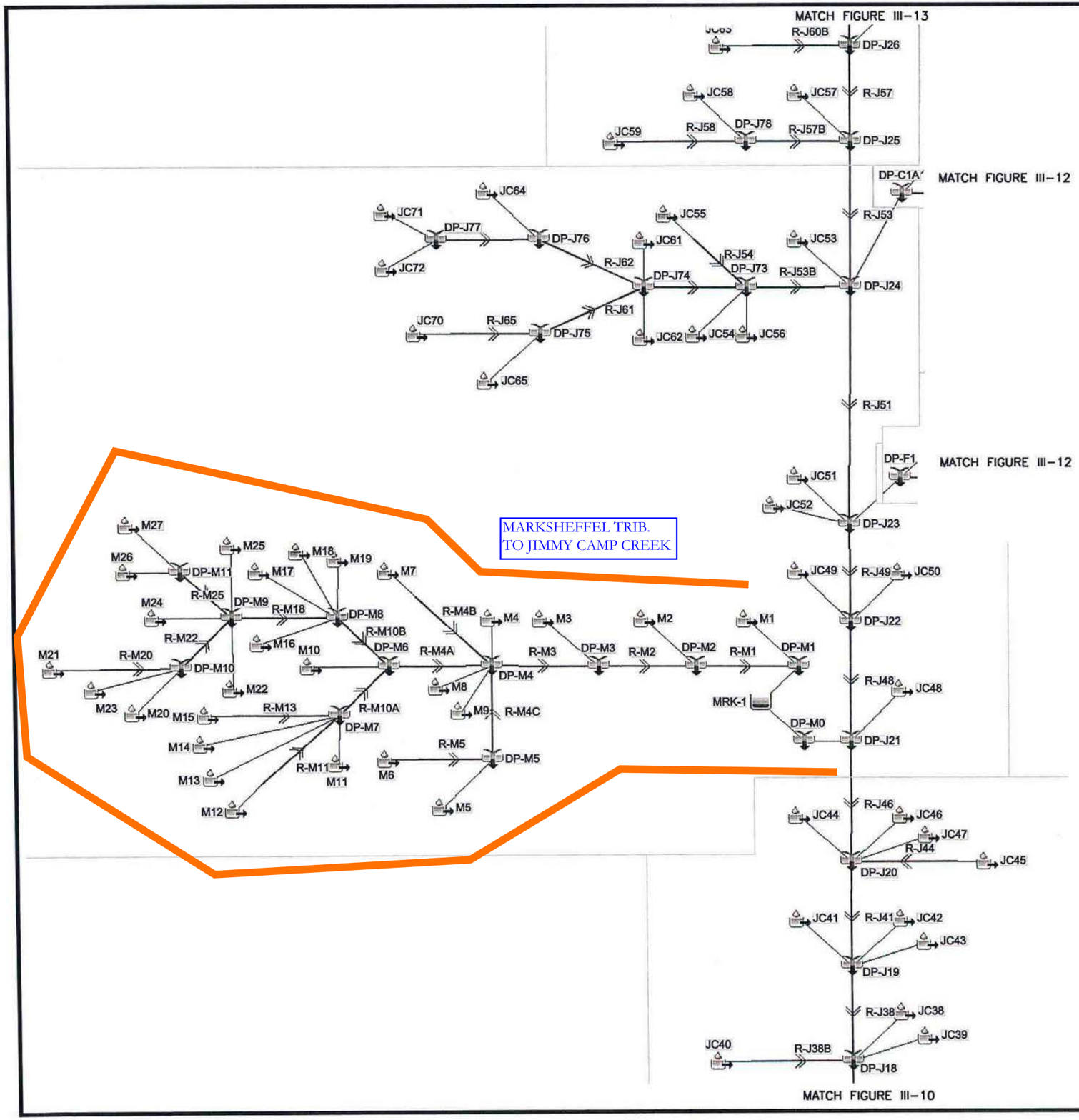
1604 South 21st Street
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(719) 630-7342

March 9, 2015

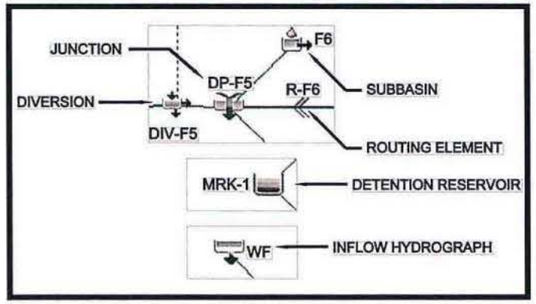
Table III-10
Hydrology Results - Peak Flows

			24hr - Type II AMCII		6hr - AMC I	
		Existing Conditions				
Location	Area (sq.mi.)	Model ID	Q100 (cfs)	Q10 (cfs)	Q5 (cfs)	Q2 (cfs)
Outfall to Fountain Creek	67.11	DP-J1	22,094	9,443	438	112
Ohio Avenue	66.11	DP-J3	22,139	9,447	441	113
Link Road	60.93	DP-J9	21,878	9,310	447	114
Confluence with West Fork	59.77	DP-J12	21,875	9,296	451	116
Confluence with East Fork	53.92	DP-J16	21,784	9,243	455	122
Peaceful Valley Road	44.16	DP-J17	17,709	7,731	385	105
Confluence with Marksheffel Trib	41.99	DP-J21	17,361	7,667	386	108
Bradley Road	36.64	DP-J22	16,502	7,153	374	106
Confluence with Franceville Trib	36.19	DP-J23	16,422	7,119	377	108
Confluence with Corral Trib	31.60	DP-J24	15,382	6,834	378	110
Drennan Road	14.84	DP-J25	5,881	2,509	163	56
*** areal adjustment not applied to rainfall for drainage areas less than 10 square miles ***						
State Highway 94	9.62	DP-J31	5,031	2,300	210	76
Confluence with Blaney Trib	6.39	DP-J40	4,107	1,959	202	76
Jimmy Camp u/s of Blaney	4.67	DP-J41	2,773	1,245	116	48
Corral Tributary	8.25	DP-C4	6,212	2,885	197	52
East Fork Tributary	9.77	DP-E1	4,677	2,030	123	30
Marksheffel Tributary	5.18	DP-M1	1,916	832	42	12
Strip Mine Tributary	5.18	DP-SM2	4,627	2,451	248	98
Franceville Tributary	4.23	DP-F5	1,515	640	28	8
C and S Tributary	2.07	DP-CS1	1,770	898	72	19
Blaney Tributary	1.55	DP-B1	1,927	1,102	131	61
Ohio Tributary	1.22	DP-O1	661	268	4	0

	24hr - Type II AMCII		6hr - AMC I	
	Future Conditions			
Location	Q100	Q10	Q5	Q2
Outfall to Fountain Creek	31,986	15,806	7,293	4,525
Ohio Avenue	32,149	15,921	7,296	4,529
Link Road	31,934	15,836	7,235	4,517
Confluence with West Fork	32,064	15,897	7,232	4,521
Confluence with East Fork	32,547	16,080	7,221	4,521
Peaceful Valley Road	26,734	13,402	6,053	3,833
Confluence with Marksheffel Trib	26,531	13,371	5,963	3,783
Bradley Road	23,508	11,856	5,089	3,079
Confluence with Franceville Trib	23,413	11,812	5,071	3,069
Confluence with Corral Trib	22,741	11,473	4,946	3,004
Drennan Road	10,248	5,846	2,278	1,395
*** areal adjustment not applied to rainfall for drainage areas less than 10 square miles ***				
State Highway 94	7,135	3,613	1,532	926
Confluence with Blaney Trib	5,793	3,031	1,191	756
Jimmy Camp u/s of Blaney	4,150	2,003	791	486
Corral Tributary	7,274	3,497	1,383	827
East Fork Tributary	6,607	3,223	1,512	847
Marksheffel Tributary	6,254	3,830	1,404	1,037
Strip Mine Tributary	5,103	2,743	1,038	681
Franceville Tributary	1,927	824	324	172
C and S Tributary	2,695	1,459	435	291
Blaney Tributary	2,638	1,559	416	296
Ohio Tributary	1,566	796	193	121



LEGEND



Kiowa
Engineering Corporation
1604 South 21st Street
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JIMMY CAMP CREEK WATERSHED
DRAINAGE BASIN PLANNING STUDY
HMS MODEL SCHEMATIC
CITY OF COLORADO SPRINGS, COLORADO

Project No.:	14008
Date:	SEPT. 2014
Design:	
Drawn:	BJW
Check:	
Revisions:	

APPENDIX A

HEC-HMS RESULTS

Summary Tables
Hydrologic Basin Map Exhibit 1

	Existing 100-year with areal adjustment				24-hour Type II Storm	
	Area (SM)	Q100	Volume (in)	acft	ac	cfs/ac
M8	0.25	163.90	2.11	27.87	158.53	1.03
M9	0.24	86.90	1.62	20.34	150.66	0.58
MRK-1	5.18	882.10	1.29	356.49	3316.22	0.27
O1	0.14	46.90	0.97	7.15	88.51	0.53
O2	0.12	40.90	0.79	5.19	78.78	0.52
O3	0.14	21.80	0.61	4.41	86.72	0.25
O4	0.22	129.60	1.38	16.41	142.72	0.91
O5	0.22	144.40	1.42	16.81	142.08	1.02
O6	0.23	124.90	1.37	17.04	149.25	0.84
O7	0.15	110.70	1.42	11.00	92.93	1.19
R-B1	1.39	1621.70	2.44	180.94	889.86	1.82
R-B2	1.12	1305.60	2.42	144.53	716.67	1.82
R-B5	0.55	603.60	2.27	66.48	351.42	1.72
R-B8	0.27	264.80	2.05	29.05	170.05	1.56
R-C11	6.52	4537.00	1.75	608.78	4174.46	1.09
R-C12	6.16	4380.90	1.75	574.47	3939.20	1.11
R-C14	0.38	332.70	2.02	40.93	243.14	1.37
R-C15	0.22	196.90	1.95	22.85	140.61	1.40
R-C16	5.21	3718.50	1.70	472.48	3335.17	1.11
R-C19	0.85	723.70	1.75	79.28	543.62	1.33
R-C1A	14.68	10335.10	2.01	1573.27	9392.64	1.10
R-C1B	14.30	9882.60	1.80	1373.06	9153.73	1.08
R-C1B2	13.74	9706.60	1.82	1333.84	8794.56	1.10
R-C2	8.25	5504.60	1.77	778.95	5281.02	1.04
R-C20A	3.96	2880.90	1.69	357.32	2537.15	1.14
R-C20B	0.13	172.90	2.40	16.68	83.39	2.07
R-C22	0.47	456.30	1.89	47.77	303.30	1.50
R-C24	0.32	311.10	1.86	32.15	207.42	1.50
R-C27	0.54	413.50	1.82	52.23	344.38	1.20
R-C3	0.76	485.80	1.92	78.02	487.62	1.00
R-C31	2.58	1875.90	1.61	221.44	1650.50	1.14
R-C32	0.26	281.80	2.22	31.03	167.74	1.68
R-C35	0.21	224.20	1.77	19.92	135.04	1.66
R-C37	0.14	163.80	1.71	12.58	88.26	1.86
R-C39	0.34	318.80	2.11	38.10	216.70	1.47
R-C42A	1.58	1168.50	1.50	126.44	1011.52	1.16
R-C42B	1.28	1021.10	1.53	104.29	817.98	1.25
R-C43	0.57	474.40	1.54	46.45	361.92	1.31
R-C45	0.30	400.50	2.29	36.68	192.19	2.08
R-C48	0.21	287.80	2.27	25.18	133.12	2.16
R-C6	0.23	202.50	2.28	28.43	149.63	1.35
R-C8	0.35	252.20	1.90	35.09	221.63	1.14
R-C9	0.21	174.20	2.00	22.69	136.13	1.28
R-CS1A	0.37	279.30	2.01	39.78	237.50	1.18
R-CS1B	1.42	1149.90	1.77	134.51	911.94	1.26
R-CS3	1.08	918.80	1.80	103.20	688.00	1.34
R-CS4	0.45	407.40	1.80	43.40	289.34	1.41
R-CS5	0.29	338.70	2.12	33.14	187.58	1.81
R-E1	9.67	4101.30	1.77	912.86	6188.86	0.66
R-E10	8.23	3947.90	1.80	790.51	5270.08	0.75

Teble I\ Existing Major Drainegeway Structure Inventory

Drainageway	Dratnage Structure Description	Structure tnventory #	Roadway	Structure Condition	Intet Channel Condition	Outlet Channel Condition	Extsting 100-year (cfs)	Structure Capacity (cfs)	% of Extstng 100-year Q
Jimmy Camp Creek	360' Bridge 3-spans	PR1	Old Pueblo Road	Good to Fair	Good	Fair	22,100	>24000	100
	244' Bridga Mulit-span	RR1	D & RGW RR	Good to Fair	Good to Fair	Good to Feir	22,100	>>24000	100
	220' Bridga 3-spens	O1	Ohio Avenua	Good to Feir	Good to Fair	Fair	22,100	19800	95
	190' Bridge 3-spans	LR1	Link Roed	Good	Good Floodplain well vegatated	Poor Headcut et outlet	21,880	26000	100
	4-48" X 29" CMP	PV1	Peeceful Velley Roed	Poor Mosily clogged	Poor	Poor	17,360	< 200	<5
	Bridge	FB1	Fonlalna Boulaverd	Good	Good	Good Riprap channel	15,380	>16000	100
	360' Bridge 3-spans	B2	Bradley Roed	Good	Fair	Fair Benk sloughing along west benk	15,380	>18000	100
	54' Bridge 2-spans	DR3	Drennen Roed	Feir	Good	Low flow stable	5,760	>6500	100
	160' Bridge 4-spans	NF2	State Highway 94	Good	Good to Fair	Feir Bank sloughing elong west bank	4,760	15000	100
East Fork Jimmy Camp Creek	Twin CBC 8' x 12'	B4	Bradley Roed	Good	Good Chennel poorly defined	Good Chennel poorly defined	2,860	2400	84
	54' Bridge 2-spans	DR5	Drannan Road	Poor to Feir	Good	Good	1,720	>3000	100
	2-43" X 29" CMP	M7	Meridien Roed	Inlet bent Outlat rusted	Poor	Poor	1,610	140	<10
Marksheffel Tributery	Twin 72-inch CMP	MS2	Marksheffal Road	Poor No wingwalls	Good	Feir	950	300	32
	Detention Basin	MK1	Marksheffel Roed	Good	Good	Poor	1,920 in/950 out	na	100
	Triple 7' X 12' CBC	B3	Bradley Road	Good	Good Well vegeleted	Good Well vegeteted	1,640	2800	100
Corral Tributary	80' Bridga 2-spans	DR4	Drannan Roed	Fair Wingwalls in poor condition	Good Send invert	Poor Bank sloughing on west benk	11,550	>40000	100
	Triple 12' X 10' CBC	NF12	Stete Highway 94	Good	Feir Wide sand Invert	Feir Wide sand Invert	3,230	>3750	100

(1) Bridge capacity equel to the bridge erea below the low chord et a velocity of 10 feet per second. Culvart cepacity besed upon inlet control at a HW/D equal to 1.

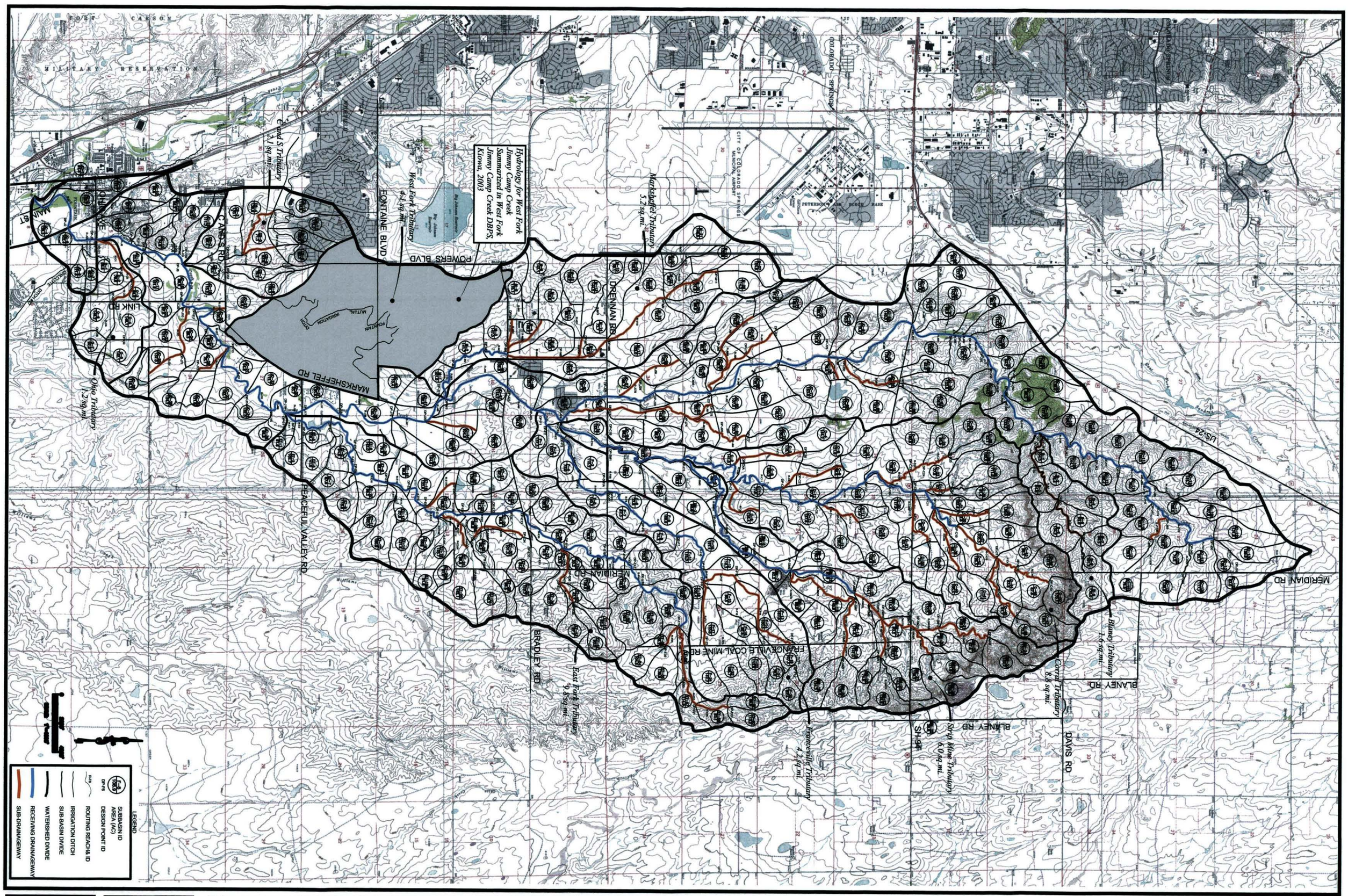


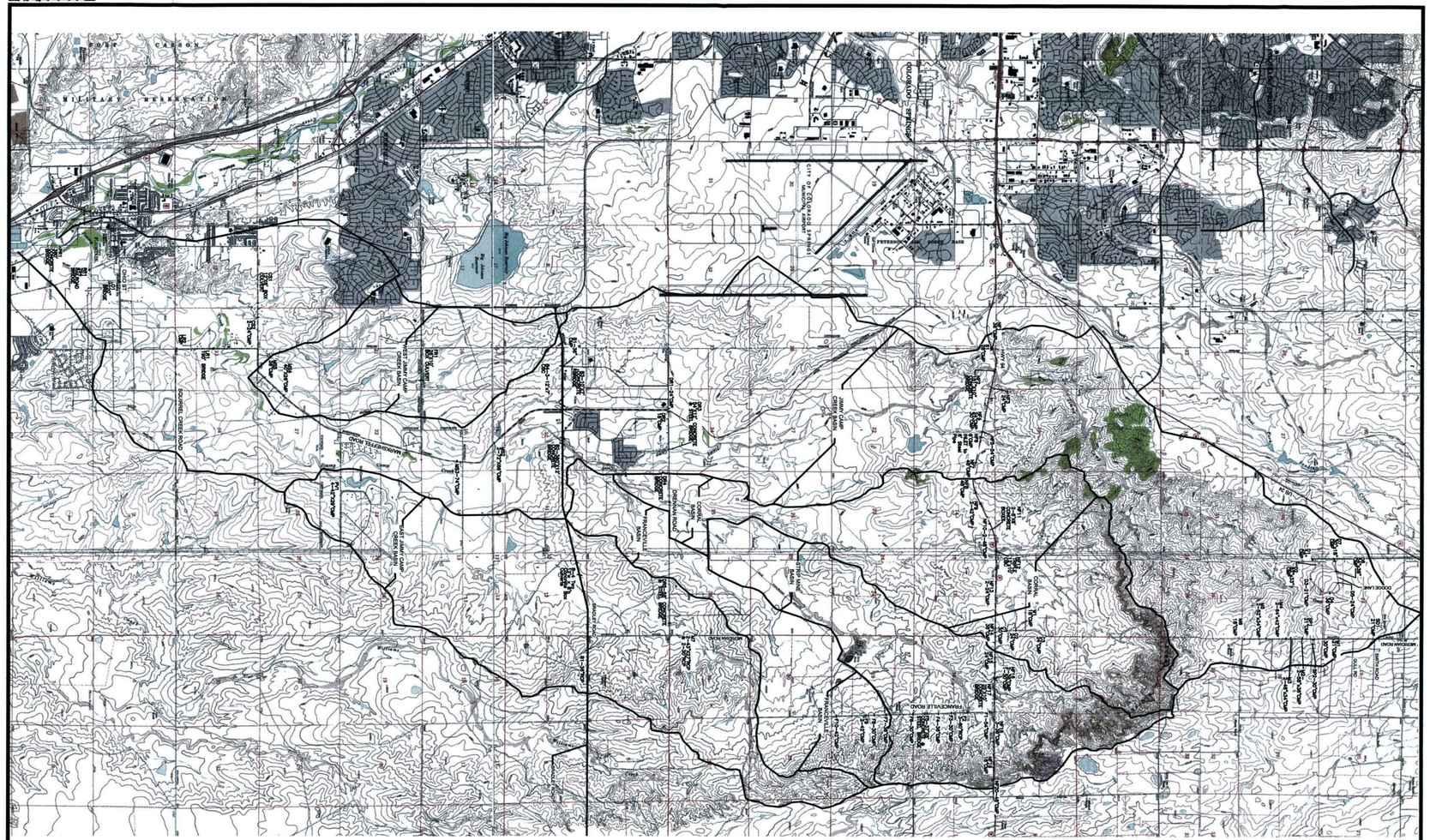
EXHIBIT 1

Project No.:	14008
Date:	APRIL 2015
Design:	RNW
Drawn:	EAK
Check:	
Revisions:	

JIMMY CAMP CREEK WATERSHED
DRAINAGE BASIN PLANNING STUDY
SUBBASIN MAP
CITY OF COLORADO SPRINGS, COLORADO

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(719) 630-7342

14008-Sheet1-hydromap.dwg/May 04, 2015



JIMMY CAMP CREEK WATERSHED
DRAINAGE BASIN PLANNING STUDY
STRUCTURE INVENTORY MAP
CITY OF FOUNTAIN, CITY OF COLORADO SPRINGS, EL PASO COUNTY

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
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Project No.:	06025
Date:	DECEMBER 2008
Design:	
Drawn:	EAK
Check:	
Revisions:	

SHEET 1 OF 4 SHEETS



Figure 1-COLORADO CENTRE POND OUTLET CULVERT



Figure 2 - COLORADO CENTRE DETENTION POND SPILLWAY



Figure 3 - DOUBLE 9-FOOT x 12-FOOT CBC ACROSS MARKSHEFFEL ROAD



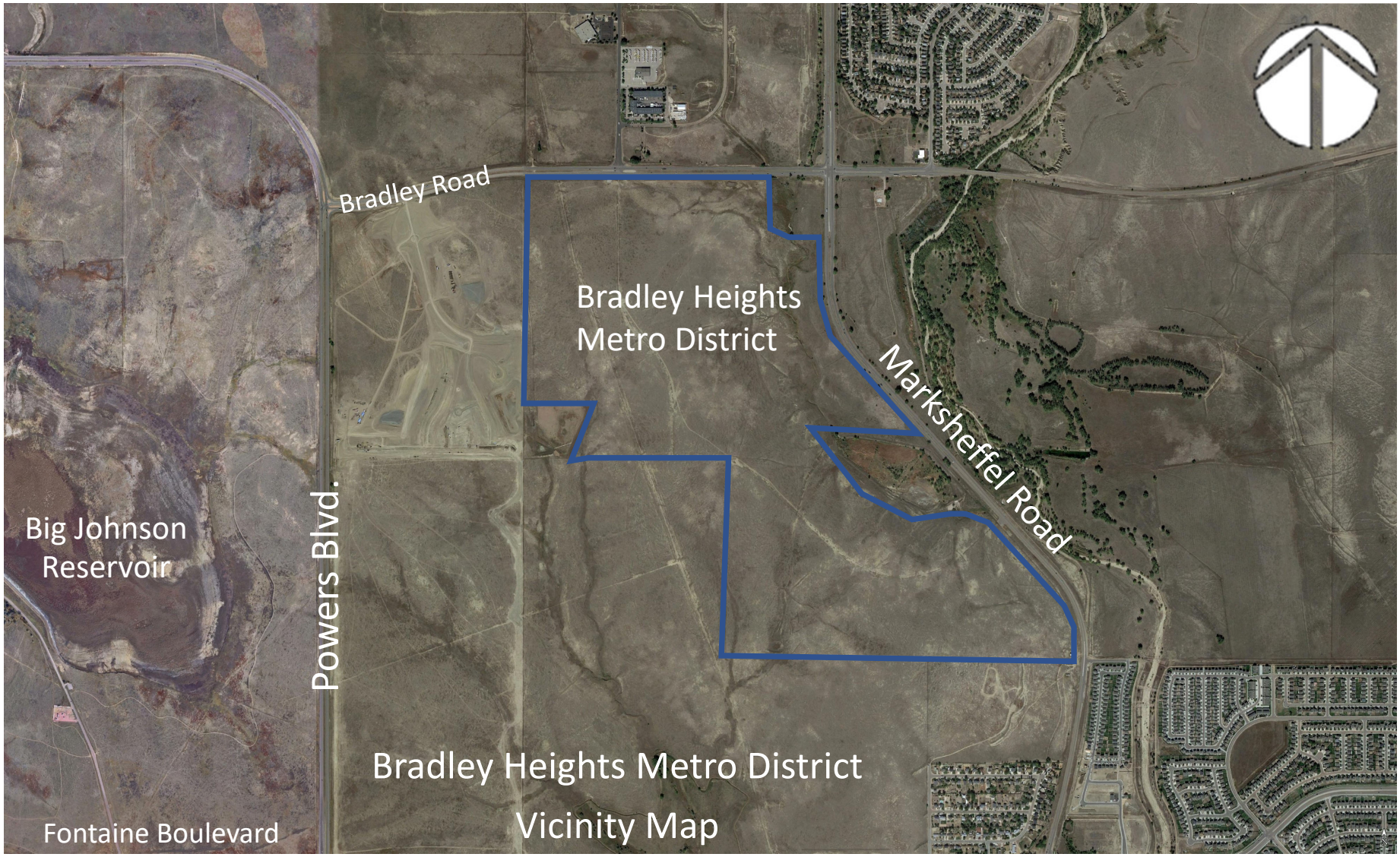
Figure 4 – TRIPLE 8-FOOT x 13.5-FOOT CBC ACROSS BRADLEY ROAD JUST WEST OF MARKSHEFFEL ROAD



Figure 5 - TRIPLE 6-FOOT x 9-FOOT CBC ACROSS BRADLEY ROAD

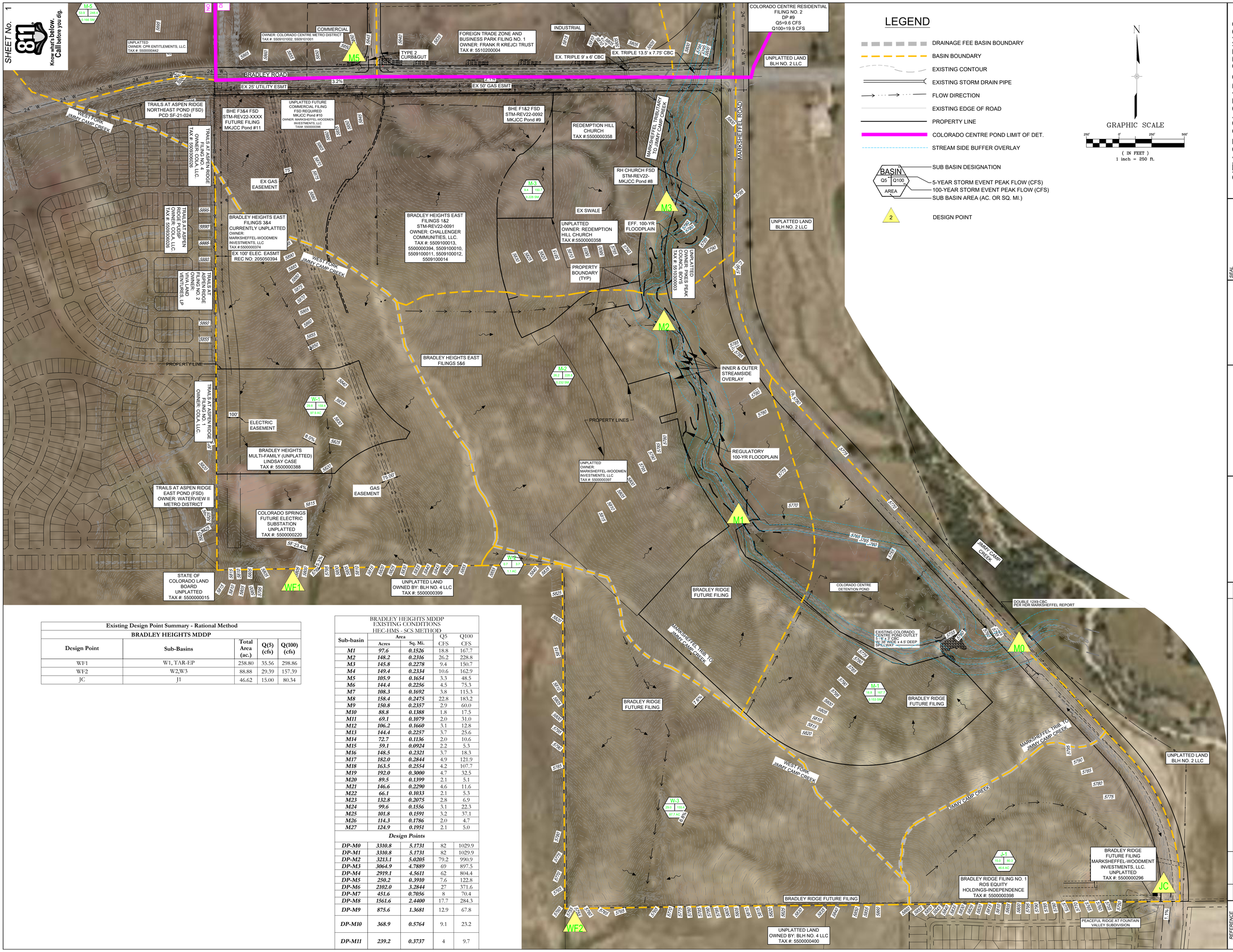
APPENDIX D

MAPS


Bradley Road
Bradley Heights
Metro District
Marksheffel Road
Powers Blvd.
Big Johnson
Reservoir
Fontaine Boulevard
Bradley Heights Metro District
Vicinity Map

SHEET No. 1

811 Know what's below. Call before you dig.



LEGEND

- DRAINAGE FEE BASIN BOUNDARY
- BASIN BOUNDARY
- EXISTING CONTOUR
- EXISTING STORM DRAIN PIPE
- FLOW DIRECTION
- EXISTING EDGE OF ROAD
- PROPERTY LINE
- COLORADO CENTRE POND LIMIT OF DET.
- STREAM SIDE BUFFER OVERLAY
- BASIN — Q5 / Q100 / AREA — SUB BASIN DESIGNATION
- 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 100-YEAR STORM EVENT PEAK FLOW (CFS)
- SUB BASIN AREA (AC. OR SQ. MI.)
- 2 — DESIGN POINT

N

GRAPHIC SCALE

250' 0' 250' 500'

(IN FEET)
1 inch = 250 ft.

Existing Design Point Summary - Rational Method

BRADLEY HEIGHTS MDDP

Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
WF1	W1, TAR-EP	258.80	35.56	298.86
WF2	W2,W3	88.88	29.39	157.39
JC	J1	46.62	15.00	80.34

BRADLEY HEIGHTS MDDP
EXISTING CONDITIONS
HEC-HMS - SCS METHOD

Sub-basin	Area Acres	Area Sq. Mi.	Q5 CFS	Q100 CFS
M1	*97.6*	*0.1526*	18.8	167.7
M2	*148.2*	*0.2316*	26.2	228.8
M3	*145.8*	*0.2278*	9.4	150.7
M4	*149.4*	*0.2334*	10.6	162.9
M5	*105.9*	*0.1654*	3.3	48.5
M6	*144.4*	*0.2256*	4.5	75.3
M7	*108.3*	*0.1692*	3.8	115.3
M8	*158.4*	*0.2475*	22.8	183.2
M9	*150.8*	*0.2357*	2.9	60.0
M10	*88.8*	*0.1388*	1.8	17.5
M11	*69.1*	*0.1079*	2.0	31.0
M12	*106.2*	*0.1660*	3.1	12.8
M13	*144.4*	*0.2257*	3.7	25.6
M14	*72.7*	*0.1136*	2.0	10.6
M15	*59.1*	*0.0924*	2.2	5.3
M16	*148.5*	*0.2321*	3.7	18.3
M17	*182.0*	*0.2844*	4.9	121.9
M18	*163.5*	*0.2554*	4.2	107.7
M19	*192.0*	*0.3000*	4.7	32.5
M20	*89.5*	*0.1399*	2.1	5.1
M21	*146.6*	*0.2290*	4.6	11.6
M22	*66.1*	*0.1033*	2.1	5.3
M23	*132.8*	*0.2075*	2.8	6.9
M24	*99.6*	*0.1556*	3.1	22.3
M25	*101.8*	*0.1591*	3.2	37.1
M26	*114.3*	*0.1786*	2.0	4.7
M27	*124.9*	*0.1951*	2.1	5.0
Design Points				
DP-M0	*3310.8*	*5.1731*	82	1029.9
DP-M1	*3310.8*	*5.1731*	82	1029.9
DP-M2	*3213.1*	*5.0205*	79.2	990.9
DP-M3	*3064.9*	*4.7889*	69	897.5
DP-M4	*2919.1*	*4.5611*	62	804.4
DP-M5	*250.2*	*0.3910*	7.6	122.8
DP-M6	*2102.0*	*3.2844*	27	371.6
DP-M7	*451.6*	*0.7056*	8	70.4
DP-M8	*1561.6*	*2.4400*	17.7	284.3
DP-M9	*875.6*	*1.3681*	12.9	67.8
DP-M10	*368.9*	*0.5764*	9.1	23.2
DP-M11	*239.2*	*0.3737*	4	9.7

CITY OF COLORADO SPRINGS

BRADLEY HEIGHTS METRO DISTRICT
MASTER DEVELOPMENT DRAINAGE REPORT

PREDEVELOPMENT DRAINAGE CONDITIONS

DESIGNED BY: MO
DRAWN BY: JTS
CHECKED BY: JTS
SCALE: HORIZ 1" = 250' VERT. N/A
DATE ISSUED: March 2022
SHEET: 1 OF 5
DRAWING No. DR-01

SEAL

PRELIMINARY
THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No: 21.1213.004

PREPARED BY: Matrix

No.	DATE	REVISIONS	BY

COMPUTER FILE MANAGEMENT
CE FILE NAME: S:\21.1213.001 Bradley Heights Metro District\200 Drainage\201 Drainage Reports\MDDP\DWG\BRADLEY HEIGHTS DR.dwg
PLOT DATE: April 21, 2022 12:50:51 PM
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE

REFERENCE DRAWINGS

811 Know what's below. Call before you dig.

BRADLEY HEIGHTS MDDP EXISTING CONDITIONS HEC-HMS - SCS METHOD				
Sub-basin	Area		Q5	Q100
	Acres	Sq. Mi.	CFS	CFS
M1	*97.6*	*0.1526*	18.8	167.7
M2	*148.2*	*0.2316*	26.2	228.8
M3	*145.8*	*0.2278*	9.4	150.7
M4	*149.4*	*0.2334*	10.6	162.9
M5	*105.9*	*0.1654*	3.3	48.5
M6	*144.4*	*0.2256*	4.5	75.3
M7	*108.3*	*0.1692*	3.8	115.3
M8	*158.4*	*0.2475*	22.8	183.2
M9	*150.8*	*0.2357*	2.9	60.0
M10	*88.8*	*0.1388*	1.8	17.5
M11	*69.1*	*0.1079*	2.0	31.0
M12	*106.2*	*0.1660*	3.1	12.8
M13	*144.4*	*0.2257*	3.7	25.6
M14	*72.7*	*0.1136*	2.0	10.6
M15	*59.1*	*0.0924*	2.2	5.3
M16	*148.5*	*0.2321*	3.7	18.3
M17	*182.0*	*0.2844*	4.9	121.9
M18	*163.5*	*0.2554*	4.2	107.7
M19	*192.0*	*0.3000*	4.7	32.5
M20	*89.5*	*0.1399*	2.1	5.1
M21	*146.6*	*0.2290*	4.6	11.6
M22	*66.1*	*0.1033*	2.1	5.3
M23	*132.8*	*0.2075*	2.8	6.9
M24	*99.6*	*0.1556*	3.1	22.3
M25	*101.8*	*0.1591*	3.2	37.1
M26	*114.3*	*0.1786*	2.0	4.7
M27	*124.9*	*0.1951*	2.1	5.0
Design Points				
DP-M0	*3310.8*	*5.1731*	82	1029.9
DP-M1	*3310.8*	*5.1731*	82	1029.9
DP-M2	*3213.1*	*5.0205*	79.2	990.9
DP-M3	*3064.9*	*4.7889*	69	897.5
DP-M4	*2919.1*	*4.5611*	62	804.4
DP-M5	*250.2*	*0.3910*	7.6	122.8
DP-M6	*2102.0*	*3.2844*	27	371.6
DP-M7	*451.6*	*0.7056*	8	70.4
DP-M8	*1561.6*	*2.4400*	17.7	284.3
DP-M9	*875.6*	*1.3681*	12.9	67.8
DP-M10	*368.9*	*0.5764*	9.1	23.2
DP-M11	*239.2*	*0.3737*	4	9.7

LEGEND

- BASIN BOUNDARY
- EXISTING CONTOUR
- EXISTING STORM DRAIN PIPE
- FLOW DIRECTION
- EXISTING EDGE OF ROAD
- PROPERTY LINE
- COLORADO CENTRE DETENTION BOUNDARY
- STREAM SIDE BUFFER OVERLAY
- BASIN (Q5 | Q100 / AREA) — SUB BASIN DESIGNATION
  - 5-YEAR STORM EVENT PEAK FLOW (CFS)
  - 100-YEAR STORM EVENT PEAK FLOW (CFS)
  - SUB BASIN AREA (AC. OR SQ. MI.)
- 2 — DESIGN POINT

N

GRAPHIC SCALE

250' 0' 250' 500'

(IN FEET)

1 inch = 250 ft.

REFERENCE DRAWINGS
X-1213-PR_BASE MATRIX X-1213-EX BASE HRG/BEEN EAST X-1213-EX BASE NES SOUTH PM-BASE UTIL X-1213-EX_BASE-From Others X-MDG30xN2 X-1213-EX BASE- TERRA NOVA CHURCH 0-5886-EX-TOPO-TAR

No.	DATE	DESCRIPTION	BY
		REVISIONS	

COMPUTER FILE MANAGEMENT

FILE NAME: S:\21.1213.001 Bradley Heights Metro District\200 Drainage\201 Drainage Reports\MDDP\DWG\BRADLEY HEIGHTS DR.dwg
CTB FILE: ----
PLOT DATE: March 28, 2022 2:30:18 PM
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE.

PREPARED BY: Matrix

SEAL

PRELIMINARY
THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 19.224.008

CITY OF COLORADO SPRINGS

BRADLEY HEIGHTS METRO DISTRICT
MASTER DEVELOPMENT DRAINAGE REPORT

PREDEVELOPMENT CONDITIONS

DESIGNED BY:	JAO	SCALE	DATE ISSUED:	March 2022	DRAWING No.
DRAWN BY:	JTS	HORIZ. 1" = 250'			
CHECKED BY:	JTS	VERT. N/A	SHEET	2 OF 5	DR-02

811 Know what's below. Call before you dig.

BRADLEY HEIGHTS
COMPARISON OF PREDEVELOPMENT AND POST-DEVELOPMENT CONDITIONS

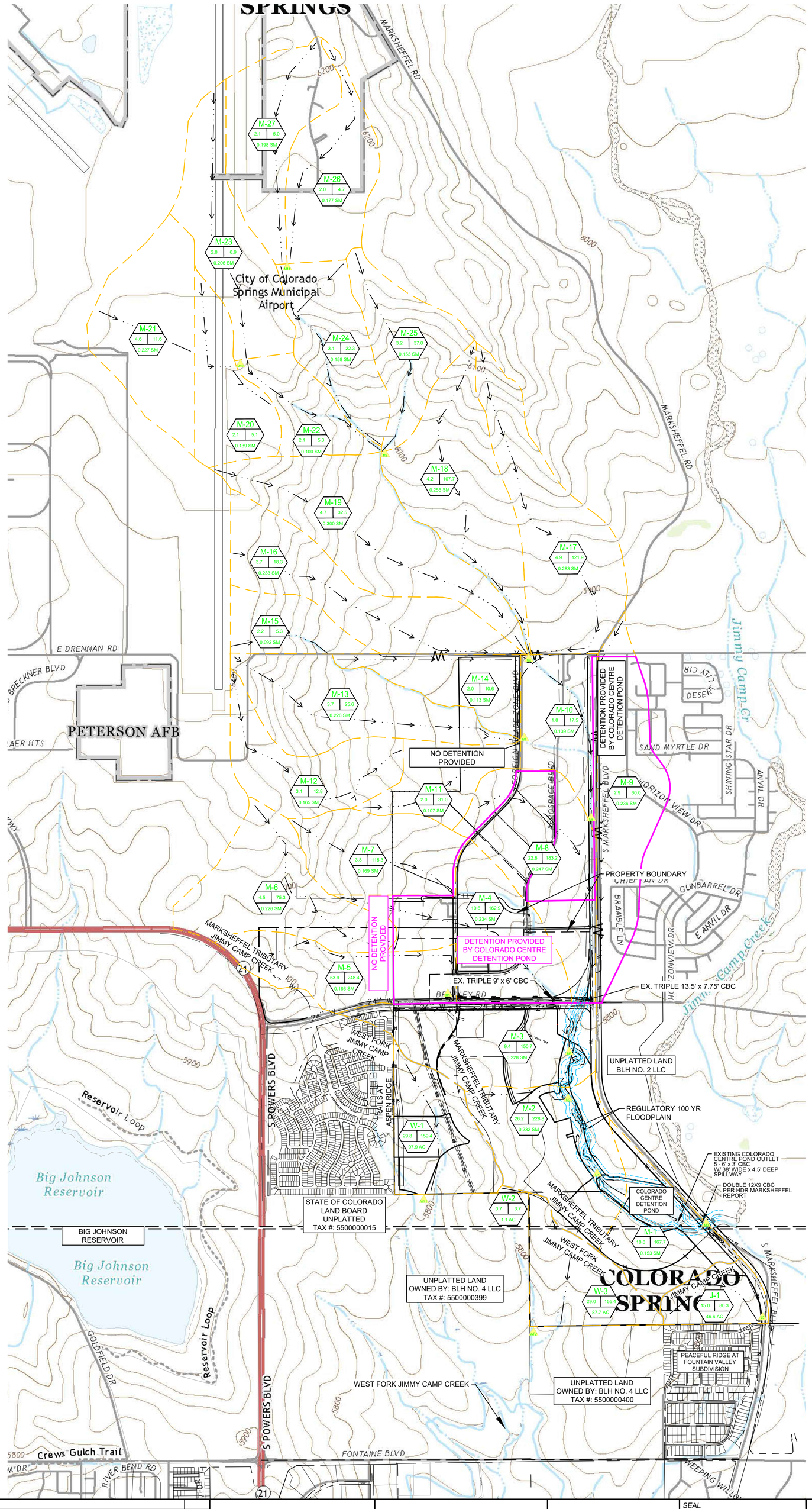
Sub-basin	Area		Q2		DELTA	Q5		DELTA	Q10		DELTA	Q100		DELTA
	Acres	Sq. Mi.	EX	PR	Q	EX	PR	Q	EX	PR	Q	EX	PR	Q
M1	97.6	0.15256	8.8	-	-	18.8	-	-	87	-	-	167.7	-	-
M2	148.2	0.23162	12.3	-	-	26.2	-	-	118.1	-	-	228.8	-	-
M3	145.8	0.22781	3.3	-	-	9.4	-	-	67	-	-	150.7	-	-
BH2	3.0	0.00470	-	0.4	-	-	0.9	-	-	4	-	-	7.4	-
CC	51.9	0.08109	-	5.3	-	-	8	-	-	19.6	-	-	33.2	-
MK8	8.1	0.01260	-	6.4	-	-	8.8	-	-	19.4	-	-	29.7	-
M4	149.4	0.23337	3.7	65.2	61.5	10.6	88.3	77.7	73.3	204.6	131.3	162.9	328.1	165.2
M5	105.9	0.16539	2.6	38.2	35.6	3.3	53.9	50.6	12.2	147.2	135	48.5	248.4	199.9
M6	144.4	0.22559	3.6	3.6	0	4.5	4.5	0	20.4	20.7	0.3	75.3	76	0.7
M7	108.3	0.16917	3	4.5	1.5	3.8	5.6	1.8	43.9	47.2	3.3	115.3	119.7	4.4
M8	158.4	0.24746	11	70.5	59.5	22.8	96.2	73.4	94.5	205.8	111.3	183.2	317.2	134
M9	150.8	0.23570	1.9	38.6	36.7	2.9	52.3	49.4	23.3	111.3	88	60	178.4	118.4
M10	88.8	0.13880	1.5	1.5	0	1.8	1.8	0	4.3	4.3	0	17.5	17.5	0
M11	69.1	0.10790	1.6	1.6	0	2	2	0	8.2	8.2	0	31	31	0
M12	106.2	0.16600	2.4	2.4	0	3.1	3.1	0	5.5	5.5	0	12.8	12.8	0
M13	144.4	0.22570	2.9	2.9	0	3.7	3.7	0	6.7	6.7	0	25.6	25.6	0
M14	72.7	0.11360	1.6	1.6	0	2	2	0	3.5	3.5	0	10.6	10.6	0
M15	59.1	0.09240	1.7	1.7	0	2.2	2.2	0	3.8	3.8	0	5.3	5.3	0
M16	148.5	0.23210	3	3	0	3.7	3.7	0	6.6	6.6	0	18.3	18.3	0
M17	182.0	0.28440	3.9	3.9	0	4.9	4.9	0	43.3	43.3	0	121.9	121.9	0
M18	163.5	0.25540	3.3	3.3	0	4.2	4.2	0	39.5	39.5	0	107.7	107.7	0
M19	192.0	0.30000	3.8	3.8	0	4.7	4.7	0	8.6	8.6	0	32.5	32.5	0
M20	89.5	0.13990	1.6	1.6	0	2.1	2.1	0	3.6	3.6	0	5.1	5.1	0
M21	146.6	0.22900	3.7	3.7	0	4.6	4.6	0	8.2	8.2	0	11.6	11.6	0
M22	66.1	0.10330	1.7	1.7	0	2.1	2.1	0	3.8	3.8	0	5.3	5.3	0
M23	132.8	0.2075	2.2	2.2	0	2.8	2.8	0	4.9	4.9	0	6.9	6.9	0
DP-M0	3310.8	5.17307	45.6	205.5	159.9	82	338.4	256.4	417.9	624.5	206.6	1029.9	1003.8	-26.1
DP-M1	3310.8	5.17307	45.6	203.6	158	82	330.7	248.7	417.9	672.8	254.9	1029.9	1217.9	188
DP-M2	3213.1	5.02052	45	201.9	156.9	79.2	305.9	226.7	386.5	673.2	286.7	990.9	1220.2	229.3
DP-M3	3064.9	4.78890	40.8	199.2	158.4	69	284.6	215.6	322.3	668.7	346.4	897.5	1209.3	311.8
DP-M4	2919.1	4.56109	38.2	197.3	159.1	62	269.7	207.7	291.3	661.8	370.5	804.4	1206.8	402.4
DP-M5	250.2	0.39098	6	41.3	35.3	7.6	58.1	50.5	32	161.2	129.2	122.8	311.3	188.5

BRADLEY HEIGHTS
COMPARISON OF PREDEVELOPMENT AND POST-DEVELOPMENT CONDITIONS

Sub-basin	Area		Q2		DELTA	Q5		DELTA	Q10		DELTA	Q100		DELTA
	Acres	Sq. Mi.	EX	PR	Q	EX	PR	Q	EX	PR	Q	EX	PR	Q
DP-M6	2102.0	3.28440	21.2	21.2	0	27	27	0	122.3	122.3	0	371.6	371.6	0
DP-M7	451.6	0.70560	6.3	6.3	0	8	8	0	19.8	19.8	0	70.4	70.4	0
DP-M8	1561.6	2.44000	13.9	13.9	0	17.7	17.7	0	98.7	98.7	0	284.3	284.3	0
DP-M9	875.6	1.36810	10.2	10.2	0	12.9	12.9	0	25.1	25.1	0	67.8	67.6	0
DP-M10	368.9	0.57640	7.2	7.2	0	9.1	9.1	0	16.3	16.3	0	23.2	23.2	0
DP-M11	239.2	0.37370	3.2	3.2	0	4	4	0	6.9	6.9	0	9.7	9.7	0
MKJCC POND 4	49.0	0.07662	-	1.1	-	-	10	-	-	18.7	-	-	70.3	-
MKJCC POND 5	67.3	0.10513	-	2.9	-	-	24.2	-	-	50.2	-	-	203.5	-
MKJCC POND 6	41.2	0.06444	-	1.7	-	-	17	-	-	28.3	-	-	89	-
MKJCC POND 7	70.0	0.10930	-	1.5	-	-	23.5	-	-	44.6	-	-	177.2	-
MKJCC POND 8	13.0	0.02027	-	0.3	-	-	3.6	-	-	6.8	-	-	11.3	-
MKJCC POND 9	51.9	0.08114	-	1	-	-	12.2	-	-	24.7	-	-	103.1	-
MKJCC POND 10	14.0	0.02184	-	0.4	-	-	2	-	-	5.1	-	-	16.7	-
MKJCC POND 11	8.0	0.01251	-	0.2	-	-	0.4	-	-	2.4	-	-	16.4	-
TAR-NE	9.1	0.01421	-	0.2	-	-	0.2	-	-	1.8	-	-	7.9	-
MRK-1	3248.5	5.07583	-	203.4	-	-	327.1	-	-	621.8	-	-	1001.2	-

BRADLEY HEIGHTS MDDP
EXISTING CONDITIONS
HEC-HMS - SCS METHOD

Sub-basin	Area		Q5	Q100
	Acres	Sq. Mi.	CFS	CFS
M1	*97.6*	*0.1526*	18.8	167.7
M2	*148.2*	*0.2316*	26.2	228.8
M3	*145.8*	*0.2278*	9.4	150.7
M4	*149.4*	*0.2334*	10.6	162.9
M5	*105.9*	*0.1654*	3.3	48.5
M6	*144.4*	*0.2256*	4.5	75.3
M7	*108.3*	*0.1692*	3.8	115.3
M8	*158.4*	*0.2475*	22.8	183.2
M9	*150.8*	*0.2357*	2.9	60.0
M10	*88.8*	*0.1388*	1.8	17.5
M11	*69.1*	*0.1079*	2.0	31.0
M12	*106.2*	*0.1660*	3.1	12.8
M13	*144.4*	*0.2257*	3.7	25.6
M14	*72.7*	*0.1136*	2.0	10.6
M15	*59.1*	*0.0924*	2.2	5.3
M16	*148.5*	*0.2321*	3.7	18.3
M17	*182.0*	*0.2844*	4.9	121.9
M18	*163.5*	*0.2554*	4.2	107.7
M19	*192.0*	*0.3000*	4.7	32.5
M20	*89.5*	*0.1399*	2.1	5.1
M21	*146.6*	*0.2290*	4.6	11.6
M22	*66.1*	*0.1033*	2.1	5.3
M23	*132.8*	*0.2075*	2.8	6.9
M24	*99.6*	*0.1556*	3.1	22.3
M25	*101.8*	*0.1591*	3.2	37.1
M26	*114.3*	*0.1786*	2.0	4.7
M27	*124.9*	*0.1951*	2.1	5.0
Design Points				
DP-M0	*3310.8*	*5.1731*	82	1029.9
DP-M1	*3310.8*	*5.1731*	82	1029.9
DP-M2	*3213.1*	*5.0205*	79.2	990.9
DP-M3	*3064.9*	*4.7889*	69	897.5
DP-M4	*2919.1*	*4.5611*	62	804.4
DP-M5	*250.2*	*0.3910*	7.6	122.8
DP-M6	*2102.0*	*3.2844*	27	371.6
DP-M7	*451.6*	*0.7056*	8	70.4
DP-M8	*1561.6*	*2.4400*	17.7	284.3
DP-M9	*875.6*	*1.3681*	12.9	67.8
DP-M10	*368.9*	*0.5764*	9.1	23.2
DP-M11	*239.2*	*0.3737*	4	9.7



BRADLEY HEIGHTS MDDP
DEVELOPED CONDITIONS
HEC-HMS - SCS METHOD

Sub-basin	Area		Q5	Q100
	Acres	Sq. Mi.	CFS	CFS
BH2	*3.0*	*0.0047*	0.9	7.4
CC	*51.9*	*0.0811*	8.0	33.2
MK8	*8.1*	*0.0126*	8.8	29.7
M4	*149.4*	*0.2334*	88.3	328.1
M5	*105.9*	*0.1654*	53.9	248.4
M6	*144.4*	*0.2256*	4.5	76.0
M7	*108.3*	*0.1692*	5.6	119.7
M8	*158.4*	*0.2475*	96.2	317.2
M9	*150.8*	*0.2357*	52.3	178.4
M10	*88.8*	*0.1388*	1.8	17.5
M11	*69.1*	*0.1079*	2.0	31.0
M12	*106.2*	*0.1660*	3.1	12.8
M13	*144.4*	*0.2257*	3.7	25.6
M14	*72.7*	*0.1136*	2.0	10.6
M15	*59.1*	*0.0924*	2.2	5.3
M16	*148.5*	*0.2321*	3.7	18.3
M17	*182.0*	*0.2844*	4.9	121.9
M18	*163.5*	*0.2554*	4.2	107.7
M19	*192.0*	*0.3000*	4.7	32.5
M20	*89.5*	*0.1399*	2.1	5.1
M21	*146.6*	*0.2290*	4.6	11.6
M22	*66.1*	*0.1033*	2.1	5.3
M23	*132.8*	*0.2075*	2.8	6.9
M24	*99.6*	*0.1556*	3.1	22.3
M25	*101.8*	*0.1591*	3.2	37.0
M26	*114.3*	*0.1786*	2.0	4.7
M27	*124.9*	*0.1951*	2.1	5.0
Design Points				
DP-M0	*3305.6*	*5.1650*	338.4	1003.8
DP-M1	*3248.5*	*5.0758*	330.7	1217.9
DP-M2	*3140.0*	*4.9063*	305.9	1220.2
DP-M3	*3018.2*	*4.7159*	284.6	1209.3
DP-M4	*2919.2*	*4.5612*	269.7	1206.8
DP-M5	*250.2*	*0.3910*	58.1	311.3
DP-M6	*2102.0*	*3.2844*	27	371.6
DP-M7	*451.6*	*0.7056*	8	70.4
DP-M8	*1561.6*	*2.4400*	17.7	284.3
DP-M9	*875.6*	*1.3681*	12.9	67.6
DP-M10	*368.9*	*0.5764*	9.1	23.2
DP-M11	*239.2*	*0.3737*	4	9.7
MKJCC POND 4	*49.0*	*0.0766*	10	70.3
MKJCC POND 5	*67.3*	*0.1051*	24.2	203.5
MKJCC POND 6	*41.2*	*0.0644*	17	89
MKJCC POND 7	*70.0*	*0.1093*	23.5	177.2
MKJCC POND 8	*13.0*	*0.0203*	3.6	11.3
MKJCC POND 9	*51.9*	*0.0811*	12.2	103.1
MKJCC POND 10	*14.0*	*0.0218*	2	16.7
MKJCC POND 11	*8.0*	*0.0125*	0.4	16.4
TAR-NE	*9.1*	*0.0142*	0.2	7.9
MRK-1	*3248.5*	*5.0758*	327.1	1001.2

LEGEND

- BASIN BOUNDARY
- EXISTING CONTOUR
- EXISTING STORM DRAIN PIPE
- FLOW DIRECTION
- EXISTING EDGE OF ROAD
- PROPERTY LINE
- COLORADO CENTRE DETENTION BOUNDARY
- STREAM SIDE BUFFER OVERLAY

BASIN (Q5 | Q100 / AREA) — SUB BASIN DESIGNATION
PREDEVELOPMENT VALUES
5-YEAR STORM EVENT PEAK FLOW (CFS)
100-YEAR STORM EVENT PEAK FLOW (CFS)
SUB BASIN AREA (AC. OR SQ. MI.)

2 — DESIGN POINT

N

GRAPHIC SCALE
1000' 0' 1000' 2000'
(IN FEET)
1 inch = 1000 ft.

REFERENCE DRAWINGS
X-1213-PR_BASE MATRIX
X-1213-EX BASE HRG/REEN EAST
X-1214-EX BASE NES SOUTH
PM-BASE UTS
X-1213-EX_BASE-From Others
X-MDG3XN2
X-1214-EX BASE TERRA NOVA CHURCH
0-886-EX-TOPO-TAR

No.	DATE	DESCRIPTION	BY

REVISIONS

COMPUTER FILE MANAGEMENT
FILE NAME: S:\21.1213.001 Bradley Heights Metro District\200 Drainage\201 Drainage Reports\MDDP\DWG\BRADLEY HEIGHTS DR.dwg
CTB FILE: ----
PLOT DATE: March 28, 2022 2:30:56 PM
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PREPARED BY: Matrix

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FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 21.1213.004

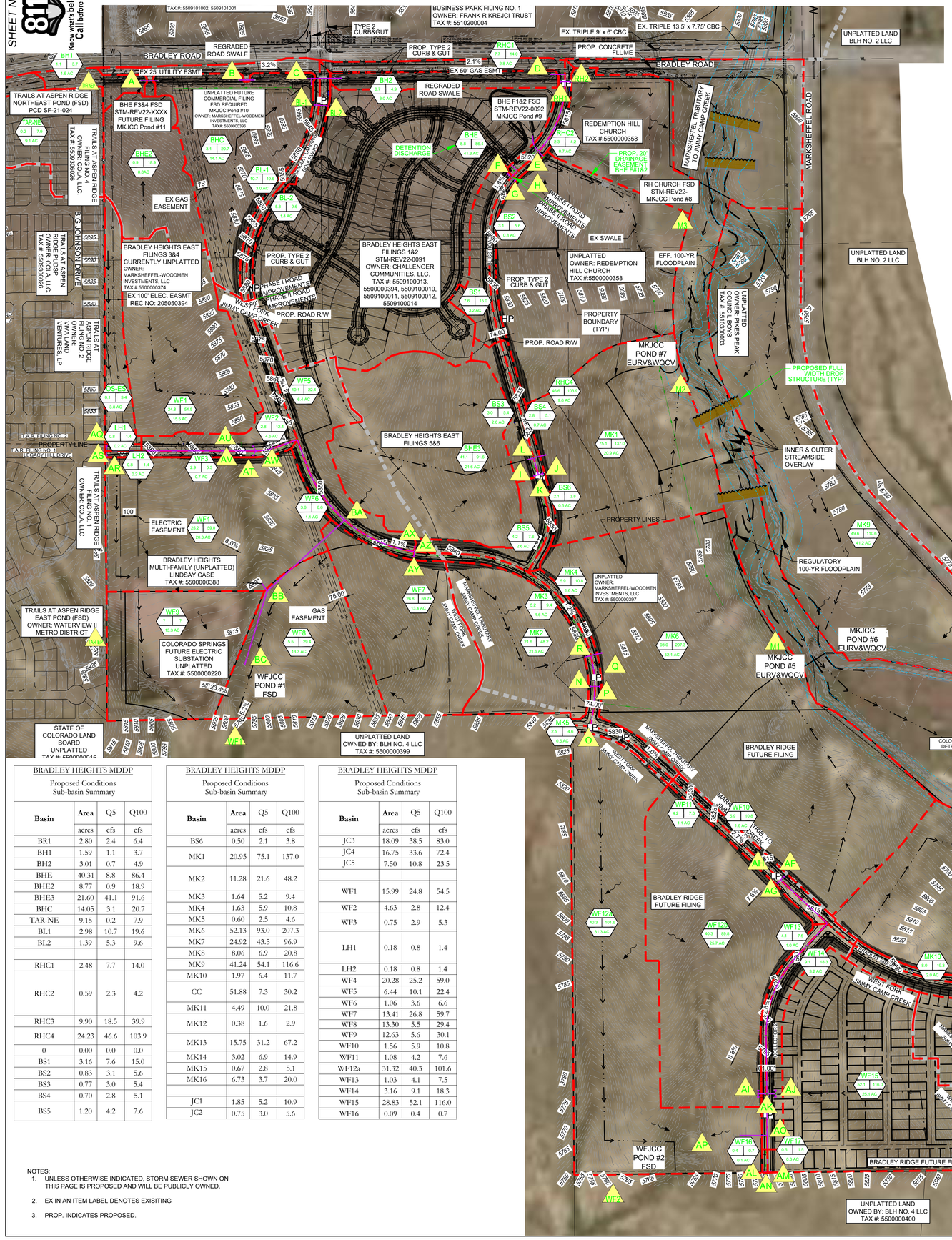
CITY OF COLORADO SPRINGS
BRADLEY HEIGHTS METRO DISTRICT
MASTER DEVELOPMENT DRAINAGE REPORT

MARKSHEFFEL TRIB. TO JIMMY CAMP CREEK

DESIGNED BY:	JAO	SCALE	DATE ISSUED:	March 2022	DRAWING No.
DRAWN BY:	JTS	HORIZ. 1" = 1000'	SHEET	3 OF 5	DR-03
CHECKED BY:	JTS	VERT. N/A			

SHEET No. 4

811 Know what's below. Call before you dig.



LEGEND

- MAJOR BASIN BOUNDARY
- BASIN BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- FLOW DIRECTION
- EXISTING EDGE OF ROAD
- PROPERTY LINE
- STREAM SIDE BUFFER OVERLAY
- SUB BASIN DESIGNATION (BASIN / Q5 / Q100 / AREA)
- 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 100-YEAR STORM EVENT PEAK FLOW (CFS)
- SUB BASIN AREA (AC. OR SQ. MI.)
- DESIGN POINT (2)
- CHANNEL IMPROVEMENTS-DROP STRUCTURE

Proposed Design Point Summary
BRADLEY HEIGHTS MDDP

Design Point	Comments/Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
TAR-NEP	TRAILS AT ASPEN RIDGE NORTHEAST POND	9.15	0.20	7.90
A	1ST ENTRANCE EAST OF TAR	13.53	1.30	11.64
B	2ND ENTRANCE EAST OF TAR	36.36	5.68	28.34
C	BRADLEY LANDING BLVD CROSSING	36.36	5.68	28.34
D	BLISS ROAD BYPASS STORM	39.36	6.68	37.29
E	MKJCC POND #9 DISCHARGE & DP D	79.67	15.48	123.69
F	BS1	3.16	7.59	15.05
G	BS2	0.83	3.06	5.59
H	BS1-2	3.99	10.39	20.18
RH1	RHC1	2.48	7.70	14.05
RH2	RHC1-RHC2	3.06	9.51	17.36
I	BS3, BS5	1.97	7.56	13.78
J	BS4, BS6	1.20	4.98	9.08
K	BS3-BS6	3.17	12.17	22.19
L	BS3-BS6, BHE3	24.77	48.47	104.14
N	MK3	1.64	5.07	9.25
O	MK5	0.60	2.39	4.35
P	MK4	1.63	5.90	10.76
Q	MK3-MK5	3.87	11.97	21.82
R	MK2-5	15.16	34.92	72.65
S	MK11	4.49	10.02	21.77
T	MK12	0.38	1.60	2.92
U	MK11-MK12	4.87	11.21	23.93
U2	MK11-MK13	20.61	43.87	94.33
V	MK11-MK14	23.63	48.64	104.63
W	MK15	0.67	2.82	5.15
X	MK10	1.97	6.43	11.72
Y	MK10, MK15	2.64	8.61	15.70
Z	MK10-MK15	26.27	55.69	117.15
MKJCC POND #4	MK7, MK10-MK16-INFLOW	51.19	96.11	207.57
MKJCC POND #4	MK7, MK10-MK16-OUTFLOW	51.19	10.00	70.30
MKJCC POND #6	MK9	41.24	17.00	89.00
DP-M0	HEC-HMS CALCS CUMULATIVE OF OFFSITE FLOWS, COLORADO CENTRE REGIONAL POND DISCHARGE, POND MKJCC #4 DISCHARGE, AND MK-8	3305.63	338.40	1003.80
AA	JC1	1.85	5.18	10.92
AB	JC2	0.75	3.05	5.56
AC	JC1-JC2	2.60	8.20	16.44
AD	JC1-JC3	20.69	45.65	97.36
AE	JC1-JC4	37.44	77.75	166.60
JCC POND #3	JC1-JC4	37.44	7.40	59.80
JC	JC1-JC5	44.94	18.20	83.32
AF	WF10	1.56	5.98	10.91
AG	WF11	1.08	4.16	7.58
AH	WF10-WF11	2.64	10.14	18.49
AI	WF12b & WF13	32.34	43.11	106.80
AJ	WF14 & WF15	31.99	59.72	131.43
AK	WF10-WF15 (Excluding WF12a)	66.97	91.97	210.95
AL	WF16	0.09	0.38	0.69
AM	WF17	0.27	0.55	1.50
AN	WF16-WF17	0.36	0.93	2.19
AO	WF10-WF17 (Excluding WF12a)	67.33	92.49	212.17
WFJCC POND #2	DP AK and Sub-basin WF12a DESIGN POINT AP: POND DISCHARGE	93.01	22.60	153.50
WF2	SITE DISCHARGE TO SOUTH	93.01	22.60	153.50
AQ	LH1 - AT GRADE AT BORDER WITH TRAILS AT ASPEN RIDGE	0.18	0.75	1.38
AR	LH2 - AT GRADE AT BORDER WITH TRAILS AT ASPEN RIDGE	0.18	0.75	1.38
AS	LH1-LH2	0.36	1.51	2.75
AT	WF3	0.75	2.90	5.28
AU	WF2	4.63	2.78	12.36
AV	WF2-WF3, LH1-LH2	5.74	6.53	19.46
AW	WF1-WF3, LH1-LH2	21.73	37.02	86.80
AX	WF5	6.44	10.07	22.45
AY	WF6	1.06	3.64	6.64
AZ	WF5-WF6	7.50	13.03	27.89
BA	WF1-WF3, WF5-WF6, LH1, LH2	29.23	43.77	101.53
BB	WF1-WF6, LH1-LH2	49.51	72.74	170.87
BC	WF1-WF8, LH1-LH2 INTO WFJCC POND #1	76.22	89.73	226.69
WFJCC POND #1	POND DISCHARGE	76.22	10.70	106.70
TAR-EP	TRAILS AT ASPEN RIDGE-EAST POND FULL BUILD-OUT DISCHARGE	160.87	5.80	139.50
WF1	TAR-EP, WF9, WFJCC POND #1 DISCHARGE	249.72	22.13	276.32

BRADLEY HEIGHTS MDDP
Proposed Conditions Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
BR1	2.80	2.4	6.4
BH1	1.59	1.1	3.7
BH2	3.01	0.7	4.9
BHE	40.31	8.8	86.4
BHE2	8.77	0.9	18.9
BHE3	21.60	41.1	91.6
BHC	14.05	3.1	20.7
TAR-NE	9.15	0.2	7.9
BL1	2.98	10.7	19.6
BL2	1.39	5.3	9.6
RHC1	2.48	7.7	14.0
RHC2	0.59	2.3	4.2
RHC3	9.90	18.5	39.9
RHC4	24.23	46.6	103.9
0	0.00	0.0	0.0
BS1	3.16	7.6	15.0
BS2	0.83	3.1	5.6
BS3	0.77	3.0	5.4
BS4	0.70	2.8	5.1
BS5	1.20	4.2	7.6

BRADLEY HEIGHTS MDDP
Proposed Conditions Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
BS6	0.50	2.1	3.8
MK1	20.95	75.1	137.0
MK2	11.28	21.6	48.2
MK3	1.64	5.2	9.4
MK4	1.63	5.9	10.8
MK5	0.60	2.5	4.6
MK6	52.13	93.0	207.3
MK7	24.92	43.5	96.9
MK8	8.06	6.9	20.8
MK9	41.24	54.1	116.6
MK10	1.97	6.4	11.7
CC	51.88	7.3	30.2
MK11	4.49	10.0	21.8
MK12	0.38	1.6	2.9
MK13	15.75	31.2	67.2
MK14	3.02	6.9	14.9
MK15	0.67	2.8	5.1
MK16	6.73	3.7	20.0
JC1	1.85	5.2	10.9
JC2	0.75	3.0	5.6

BRADLEY HEIGHTS MDDP
Proposed Conditions Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
JC3	18.09	38.5	83.0
JC4	16.75	33.6	72.4
JC5	7.50	10.8	23.5
WF1	15.99	24.8	54.5
WF2	4.63	2.8	12.4
WF3	0.75	2.9	5.3
LH1	0.18	0.8	1.4
LH2	0.18	0.8	1.4
WF4	20.28	25.2	59.0
WF5	6.44	10.1	22.4
WF6	1.06	3.6	6.6
WF7	13.41	26.8	59.7
WF8	13.30	5.5	29.4
WF9	12.63	5.6	30.1
WF10	1.56	5.9	10.8
WF11	1.08	4.2	7.6
WF12a	31.32	40.3	101.6
WF13	1.03	4.1	7.5
WF14	3.16	9.1	18.3
WF15	28.83	52.1	116.0
WF16	0.09	0.4	0.7

NOTES:
1. UNLESS OTHERWISE INDICATED, STORM SEWER SHOWN ON THIS PAGE IS PROPOSED AND WILL BE PUBLICLY OWNED.
2. EX IN AN ITEM LABEL DENOTES EXISITING
3. PROP. INDICATES PROPOSED.

CITY OF COLORADO SPRINGS

BRADLEY HEIGHTS METRO DISTRICT
MASTER DEVELOPMENT DRAINAGE REPORT

POST DEVELOPMENT DRAINAGE CONDITIONS

DRAWING No. DR-04

DESIGNED BY: MO | SCALE: 1" = 250' | DATE ISSUED: March 2022 | SHEET: 4 OF 5
DRAWN BY: JTS | HORIZ: 1" = 250' | VERT: N/A
CHECKED BY: JTS

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FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No: 21.1213.004

PREPARED BY: Matrix

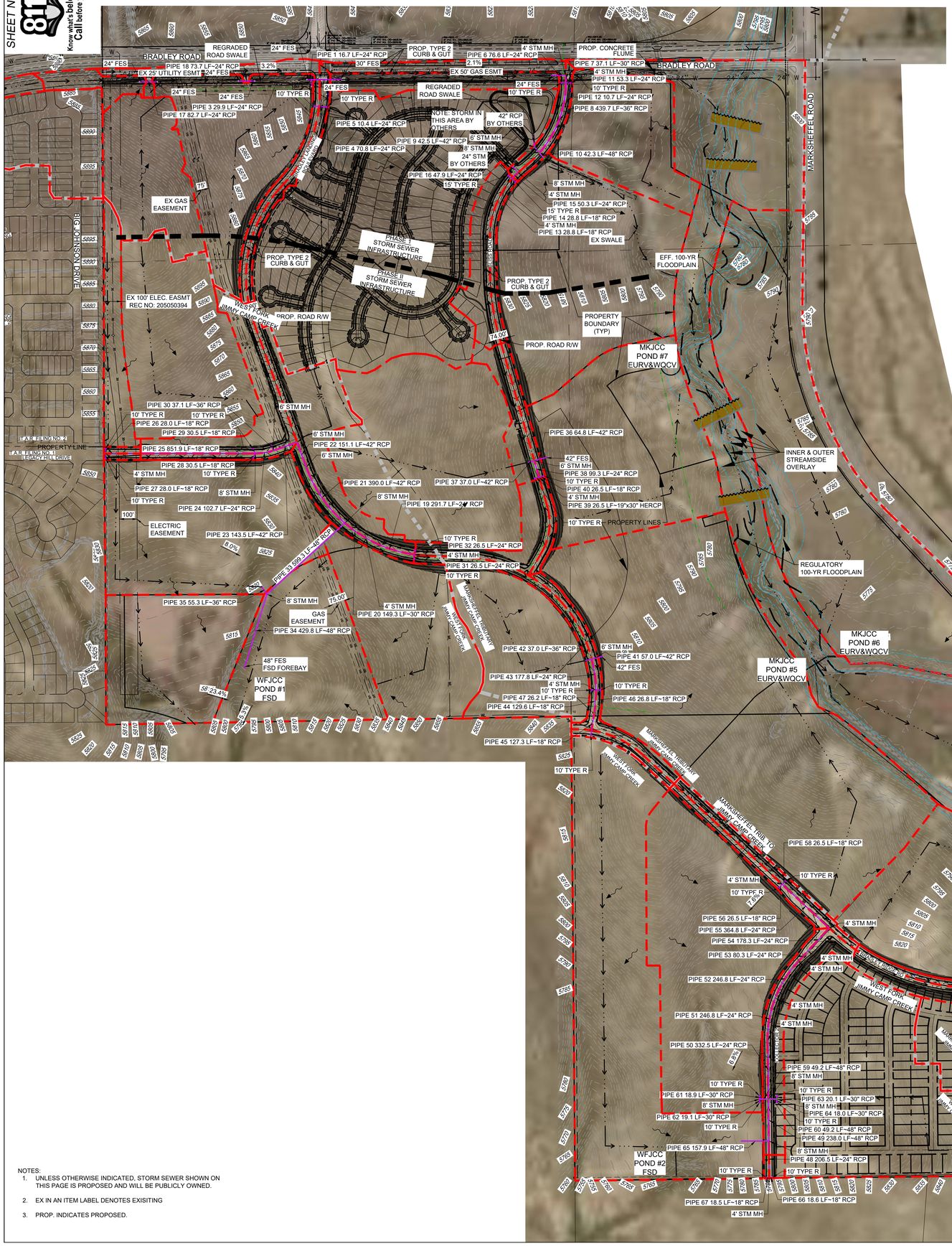
No.	DATE	DESCRIPTION
		REVISIONS

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PLOT DATE: March 28, 2022 2:47:27 PM
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REFERENCE DRAWINGS

SHEET No. 5

811 Know what's below. Call before you dig.



LEGEND

- BASIN BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- FLOW DIRECTION
- EXISTING EDGE OF ROAD
- PROPERTY LINE
- STREAM SIDE BUFFER OVERLAY
- SUB BASIN DESIGNATION
- 5-YEAR STORM EVENT PEAK FLOW (CFS)
- 100-YEAR STORM EVENT PEAK FLOW (CFS)
- SUB BASIN AREA (AC. OR SQ. MI.)
- DESIGN POINT

BASIN / Q5 / Q100 / AREA

GRAPHIC SCALE
250' 0' 250' 500'
(IN FEET)
1 inch = 250 ft.

PHASE I STORM SEWER INFRASTRUCTURE
PHASE II STORM SEWER INFRASTRUCTURE

Pipe Table		
Pipe Name	Size	Length
PIPE 11	24	53
PIPE 12	24	11
PIPE 1	24	17
PIPE 4	24	71
PIPE 5	24	10
PIPE 17	24	83
PIPE 18	24	74
PIPE 6	24	77
PIPE 7	30	37
PIPE 8	36	440
TEST PIPE 1	42	59
PIPE 9	42	42
PIPE 10	48	42
PIPE 14	18	29
PIPE 13	18	29
PIPE 15	24	50
PIPE 16	24	48
PIPE 2	30	165
PIPE 3	24	30

Pipe Table		
Pipe Name	Size	Length
PIPE 39	30	26
PIPE 38	24	99
PIPE 36	42	65
PIPE 40	18	26
PIPE 37	42	37

Pipe Table		
Pipe Name	Size	Length
PIPE 45	18	127
PIPE 44	18	130
PIPE 43	24	178
PIPE 41	42	57
PIPE 42	36	37
PIPE 47	18	26
PIPE 46	18	27

Pipe Table		
Pipe Name	Size	Length
PIPE 73	24	20
PIPE 72	24	84
PIPE 70	42	247
PIPE 69	42	266
PIPE 77	48	61
PIPE 74	18	20
PIPE 79	18	26
PIPE 68	24	77
PIPE 78	30	26
PIPE 76	24	37
PIPE 71	42	63
PIPE 75	36	45

Pipe Table		
Pipe Name	Size	Length
PIPE 80	24	20
PIPE 82	24	50
PIPE 84	42	141
PIPE 85	48	124
PIPE 86	48	43
PIPE 83	42	52
PIPE 81	18	20
PIPE 87	48	150

Pipe Table		
Pipe Name	Size	Length
PIPE 29	18	31
PIPE 24	24	103
PIPE 23	42	143
PIPE 22	42	151
PIPE 21	42	390
PIPE 33	48	599
PIPE 34	48	430
PIPE 28	18	31
PIPE 30	36	37
PIPE 35	36	55
PIPE 32	24	27
PIPE 19	24	292
PIPE 20	30	149
PIPE 31	24	27
PIPE 26	18	28
PIPE 25	18	852
PIPE 27	18	28

Pipe Table		
Pipe Name	Size	Length
PIPE 56	18	27
PIPE 55	24	365
PIPE 54	24	178
PIPE 53	24	80
PIPE 52	24	247
PIPE 51	24	247
PIPE 50	24	333
PIPE 49	48	238
PIPE 65	48	158
PIPE 61	30	19
PIPE 59	48	49
PIPE 62	30	19
PIPE 63	30	20
PIPE 60	48	49
PIPE 64	30	18
PIPE 67	18	19
PIPE 48	24	206
PIPE 66	18	19
PIPE 58	18	27

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CITY OF COLORADO SPRINGS

BRADLEY HEIGHTS METRO DISTRICT
MASTER DEVELOPMENT DRAINAGE REPORT

PRELIMINARY STORM SEWER

DRAWING No. DR-05

DESIGNED BY: MO
DRAWN BY: JTS
CHECKED BY: JTS

SCALE: HORIZ 1" = 250' VERT. NA

DATE ISSUED: March 2022
SHEET: 5 OF 5

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FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No: 21.1213.004

PREPARED BY: Matrix

REFERENCE DRAWINGS

No.	DATE	DESCRIPTION	BY
		REVISIONS	

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