EPC STORMWATER REVIEW COMMENTS ARE SHOWN IN ORANGE BOXES WITH BLACK TEXT

Remove "final" from the title.

Preliminary and Final Drainage Report
Peaceful Ridge at Fountain Valley Subdivision
El Paso County, Colorado

Prepared for:
Fountain Valley Investment Partners, LLC
3 Widefield Boulevard
Colorado Springs, Colorado 80911

Prepared by:

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

PCD File No. EGP-213

Kiowa Project No. 04092

Original Report: December 7, 2005
Revised: March 8, 2006
Revised: May 19, 2006
Revised: July 20, 2006
Revised: November 24th, 2021

Page

ENGINEER'S STATEMENT:

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

Kiowa Engineering Corporation, 1604 South 21st Street, Colorado Springs, Colorado 80904

_____ _____

Andrew W. McCord, P.E. Date
Registered Engineer #25057
For and on Behalf of Kiowa Engineering Corporation

DEVELOPER'S STATEMENT:

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

BY: _____ _____

Date

PRINT NAME: _____

ADDRESS: Fountain Valley Investment Partners, LLC
3 Widefield Boulevard
Colorado Springs, Colorado 80911

Please replace with the following:

"

El Paso County:

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

_____ _____

Jennifer Irvine, P.E.Date
County Engineer / ECM Administrator

Conditions: "

I. General Location and Description

Peaceful Ridge at Fountain Valley Subdivision is to be developed as a single-family residential subdivision. The site lies within the Southeast ¼, Section 15, Township 15 South, Range 65 West of the 6th Principal Meridian, in El Paso County, Colorado. The property covers approximately 60.14 acres of which 2.34 acres will be dedicated as additional right-of-way along Marksheffel Road. The site is bounded to the north by unplatted land, to the east by Marksheffel Road, to the south by Cottonwood Meadows Filing No. 3 and to the west by unplatted land. A vicinity map showing the location of Peaceful Ridge is presented on Figure 1 on the following page.

The property is currently undeveloped with proposed plans to plat the site into 255 single-family lots and construct several roadways. Access to the development will be provided at Marksheffel Road at the northeast corner of the site with the construction of Peaceful Ridge Drive. A secondary access will be provided with the extension of Sleepy Meadows Drive at the southwest corner of the site.

The site slopes generally to the southeast at approximately 6%. The vegetation consists primarily of native grasses and weeds. According to the *Soil Survey for El Paso County, Colorado*, the site's soil, as shown on Figure 2, consists primarily of Kim Loam (#43), which is classified within Hydrologic Soil Group B. A small portion of the site consists of Nelson-Tassel Fine Sandy Loams (#56), Razor-Midway Complex (#75) and Stoneham Sandy Loam (#86). These soils are classified within Hydrologic Soil Groups C and D.

II. Previous Reports

1) *Final Drainage Report for Cottonwood Meadows, Filing No. 1*, prepared by HMS Group, LLC, approved November 4, 1999.
2) *Final Drainage Report for Cottonwood Meadows, Filings No. 2 and 3*, prepared by HMS Group, LLC, approved May 31, 2000.
3) *City of Colorado Springs and El Paso County Drainage Criteria Manual*, current editions.
4) *City of Colorado Springs Drainage Criteria Manual Volume 2*, dated November 2002.
5) *Soil Survey of El Paso County Area, Colorado*, prepared by United States Department of Agriculture Soil Conservation Service, dated June 1981.

According to the Cottonwood Meadows drainage reports, historic offsite Basin H-3 which consists of the western and southern portions of the Peaceful Ridge site and a portion to the west of Peaceful Ridge drained in a southeasterly direction onto the Cottonwood Meadows site prior to the development of Cottonwood Meadows. A trapezoidal channel in the back of the lots along the northern boundary line was constructed with the development of the Cottonwood Meadows property that now redirects this offsite runoff to the east to Marksheffel Road. A total of Q_5=21 cfs and Q_{100}=62 cfs from Basin H-3 drains to the trapezoidal channel and discharges to the northeast corner of the Cottonwood Meadows development. According to the

Cottonwood Meadows drainage report, only historic runoff will be allowed to discharge to the trapezoidal channel.

Approximately Q_5=10.1 cfs and Q_{100}=29.5 cfs (Basin H-4) is generated offsite to the west of the Cottonwood Meadows development with a portion draining to Sleepy Meadows Drive. Runoff collected in this street gutter flows to the south to Fontaine Boulevard. Developed Basin 4 (Q_5=8.8 cfs and Q_{100}=18.0 cfs) consists of Sleepy Meadows Drive and the rear of the lots backing up to Fontaine Boulevard. A portion of Basin 4 drains to the street gutter while the remainder drains to a roadside ditch along Fontaine Boulevard. A combined flow of Q_5=23.1 cfs and Q_{100}=64.4 cfs from Basins H-4 and 4 drain to the south to a roadside ditch along the north side of Fontaine Boulevard. Runoff collected in the roadside ditch is conveyed to the east to the FMIC ditch along Fontaine Boulevard.

III. Hydrology

The hydrology for this site was estimated using the methods outlined in the *City of Colorado Springs and El Paso County, Drainage Criteria Manual*. The topography for the site was compiled using a two-foot contour interval and is presented at a horizontal scale of 1-inch to 100-feet. Exhibit E-1 presents the historic drainage patterns for the area and Exhibit D-1 presents the developed drainage patterns for the area, including the sub-basins and the corresponding flow rates. The flow rates for the sub-basins were estimated by using the Rational Method. Detention basin volumes were estimated using the Rational Stored Rate Method. The 5-year and 100-year recurrence intervals were determined. The calculations can be found in the Appendix of this report.

The runoff coefficients for the development were determined using Table 5-1 of the *City of Colorado Springs and El Paso County, Drainage Criteria Manual*. A copy of Table 5-1 is located in the Appendix of this report. The hydrologic calculations were performed assuming Hydrologic Soil Groups B, C and D and are included in the Appendix of this report.

IV. Hydraulic Calculations

The sizing of the onsite hydraulic structures were made using the methods outlined in the *City of Colorado Springs and El Paso County, Drainage Criteria Manual*. The hydraulic capacities of the curb inlets were determined using the MHFD-Inlet, v5.01 (April 2021) spreadsheet model. Colorado Department of transportation (CDOT) Type R curb inlets will be used within the site. Ramp Curb will be used throughout the development except between curb returns and at curb inlets.

Culverts were sized assuming inlet control, a 100-year storm and a maximum headwater permitted by the *Colorado Springs and El Paso County, Drainage Criteria Manual*. The hydraulic capacities of the culverts were determined using EPA -SWMM Modelling along with the HY-8 culvert analysis and design program developed by the Federal Highway Administration and Pennsylvania State University. All road culverts are proposed to be reinforced concrete with flared end sections. The outlets of all culverts will be protected with riprap which will be sized to meet the outlet velocity condition at each culvert. The riprap at

the outlet of all the culverts has been sized to withstand the forces attributable to the 100-year design discharge.

The lining of swales was determined using the Hydrologic Engineering Circular No. 15, Design of Roadside Ditches with Flexible Linings. The use of grass-lined swales with erosion netting is suitable wherever the shear stress is calculated to be less than 2.1 pounds per square foot

The size of the proposed detention basin was determined using the Rational Stored Rate Method. The basin was designed taking into account the developed flows of the Peaceful Ridge development. Water quality capture volume was also incorporated into the design of the detention basin. The detention basin was sized assuming that the outflow combined with runoff bypassing the basin would be restricted to historic 5-year and 100-year flows.

Supporting calculations associated with the sizing of hydraulic facilities for this development are located in the Appendix of this report.

V. Existing Drainage Patterns

Sub-basin E-1 contains approximately 27.76 acres and consists of the northern portion of the site. Approximately Q_5=16.4 cfs and Q_{100}=41.5 cfs generated from this sub-basin sheet flows to the east to a roadside ditch along Marksheffel Road. Runoff collected in this ditch travels to an existing 7'x4' concrete box culvert. Runoff intercepted by this culvert is directed under Marksheffel to the east and ultimately discharges into Jimmy Camp Creek.

Sub-basin E-2 contains approximately 33.34 acres and consists of the southern portion of the site. Approximately Q_5=18.6 cfs and Q_{100}=46.3 cfs generated from this sub-basin sheet flows in a southeasterly direction to the existing channel along the south boundary line. Runoff collected in the channel travels to the east to Marksheffel Road and discharges into the roadway corridor west side ditch.

Sub-basin OS-1 contains approximately 32.60 acres and is located the north of the proposed Peaceful Ridge development. Approximately Q_5=23.0 cfs and Q_{100}=61.4 cfs generated from this sub-basin sheet flows in an easterly and southeasterly direction to the roadside ditch alongside Marksheffel. Runoff from this basin does not enter the site until it nearly reaches Marksheffel Road. Runoff channel flows to the south to an existing 7'x4' concrete box culvert.

Sub-basin OS-2 contains approximately 3.05 acres and is located west of the proposed Peaceful Ridge development. Approximately Q_5=2.3 cfs and Q_{100}=6.0 cfs generated from this sub-basin sheet flows in a southeasterly direction to Sleepy Meadows Drive. Runoff gutter flows to the south towards Fontaine Boulevard, but is intercepted at a planned 20-foot inlet further described under Sub-basin C-1.

Sub-basin OS-3 contains approximately 13.50 acres and is located north of the proposed Peaceful Ridge development along Marksheffel Road. Approximately Q_5=11.1 cfs and Q_{100}=28.6 cfs generated from this sub-basin sheet flows in a southeasterly direction to the roadside ditch alongside Marksheffel. Runoff channel flows to the south to an existing 7'x4' concrete box culvert.

Sub-basin OS-4 contains 9.38 acres and is located west and south of the subject property. Flows from this basin accumulate in a broad natural channel which convey runoff to the south and away from the site. Some flows enter the we3st side borrow ditch for Sleepy Meadows Drive at a point several hundred feet south of the site. Some of these flows enter the Fontaine Boulevard Roadway Corridor, and some of these flows enter the FMIC Irrigation Ditch. Sub-basin OS-4 is raw land and is heavily vegetated with native grasses and weeds.

VI. Site Drainage Plan

The drainage of the site will be accomplished through a combination of sheet flow, gutter flow and storm sewer flow. Curb inlets will be located on grade along Sleepy Meadows Drive at Melting Sky, on grade along Melting Sky Drive and Periwinkle Place and at the low point connecting these two streets. The inlets and storm sewer are sized to accept the 5-year storm and convey it to the proposed extended detention basin in the southeast corner of the site. The detention basin will collect developed flows from the majority of the site and discharge less than historic flows to an existing 7'x4' concrete box culvert on the east side of the site. A small portion of the west end of the property that is not intercepted by inlets will drain to Sleepy Meadows Drive and gutter flow to the south to the adjacent site (Cottonwood Meadows). Offsite basins OS-1 and OS-3 will drain to the northeast corner of the site. An existing storm sewer system culminating in a 48-inch storm sewer reroutes this runoff under Marksheffel Road to a point of discharge just east of Carriage Meadows North Filing No 1 (aka Lorson Ranch). Offsite basin OS-2 will continue to sheet flow to the site and enter the back of the lots on the west side of Sleepy Meadows Drive.

A Drainage Basins: The A drainage basins are located in the northern end of the site. Runoff from this area will sheet flow to Peaceful Ridge Drive and gutter flow in ar direction to the roadside ditch along Marksheffel Road. A curb flare and riprap will direct gutter flow into the roadside ditch. Runoff from the north side of the s drain to a proposed Type 'D' grated inlet and an existing 48-inch RCP will disc runoff to the east under Marksheffel Road. A small portion of the planned Peace Drive cannot be captured due to grade, and will be exempted from treatment in ac with El Paso County criteria. Runoff then will be routed under Marksheffel to the ultimately discharge into Jimmy Camp Creek.

In an early grading drainage report please discuss temporary sediment basins and conveyance in swales during the overlot grading process.

The design of the existing 48" storm sewer was coordinated with the downstream property owner, Lorson Ranch (Carriage Meadows North Filing No 1). This Developer developed the site on the east side of Marksheffel and known as Carriage Meadows. Lorson Ranch agreed to accept the offsite runoff from the 48-inch RCP as well as the runoff discharging to an existing 7'x4' concrete box culvert under Marksheffel. Both of these discharging pipes have been constructed at the time of this report addendum.

Sub-basin A-0 contains 2.07 acres and is located along the north margin of the site. Approximately Q_5=2.7 cfs and Q_{100}=6.4 cfs generated from this sub-basin will sheet flow across backyard areas, and will be released to the adjacent property to the north in an historic fashion. Water Quality Treatment is achieved for this sub-basin by Infiltration

Reduction Factoring within the rear-yard areas. Calculations supporting Treatment are provided in The IRF Appendix (Appendix C) in accordance with El Paso County requirement (Zones A-0-a & A-0-b).

Sub-basin A-1 contains approximately 3.218 acres and is located along the north side of Peaceful Ridge Drive at the north end of the site. Approximately Q_5=5.8 cfs and Q_{100}=12.3 cfs generated from this sub-basin will sheet flow to north gutter of Peaceful Ridge Drive and will be conveyed east to an on-grade 20-foot inlet (Inlet 8).

Only 20% of the Site, up to 1 acre can be excluded from WQ

Sub-basin A-2 contains approximately 3.35 acres and is located along the south side of Peaceful Ridge Drive at the north end of the site. Approximately Q_5=6.4 cfs and Q_{100}=13.4 cfs generated from this sub-basin will sheet flow to north gutter of Peaceful Ridge Drive and will be conveyed east to an on-grade 15-foot inlet (Inlet7). This inlet captures 100% of the Minor Event and will allow 2.1 cfs to bypass the inlet and to turn south within gutter sections lying along Periwinkle Place. These flows will be further intercepted at Inlet 4 as discussed under Sub-basin B-1 in the following section.

B Drainage Basins: The B drainage basins consist of the majority of the site. Runoff from these basins will sheet flow and gutter flow to three of the four perimeter roadway corridors: Sleepy Meadows Drive, Melting Sky Drive and Periwinkle Place. Runoff in these streets will be intercepted by one of several proposed curb inlets. Melting Sky has adequate street capacity with the cumulative carry over from the curb inlets. At a minimum grade of 4.00%, Melting Sky has a capacity of 19 cfs and 159 cfs for the 5-year and 100-year storm events, respectively. The maximum flow in the street is 13 cfs at Inlet #2 for the 5-year storm and 39 cfs at Inlet #5 for the 100-year storm.

A proposed storm sewer system will convey runoff collected in these inlets to the low point of Melting Sky and Periwinkle and discharge to the proposed, full-spectrum, extended detention basin located at the southeast corner of the site. Water quality capture volume will be incorporated into the detention basin as required by El Paso County. Discharge from the detention basin will be restricted to historic rates. Runoff released from the detention basin will be conveyed to an existing 7'x4' concrete box culvert under Marksheffel Road via a 36-inch RCP outfall pipe.

inlet 4?

Sub-basin B-1 contains approximately 6.51 acres and is located on either side of Black Powder Trail in the northern portion of the site. Approximately Q_5=12.9 cfs and Q_{100}=27.2 cfs generated from this sub-basin will sheet flow to Black Powder Drive and gutter flow to the east to a proposed 25-foot on grade curb inlet on the west side of Periwinkle Place. Approximately Q_5=12.9 cfs and Q_{100}=24.6 cfs will be intercepted by the inlet. A proposed storm sewer system will convey runoff collected in the inlet to the south to the proposed detention basin at the southeast corner of the site. Carryover flow (Q_5=0.0 cfs and Q_{100}=4.7 cfs) will continue to travel in the gutter to a proposed 20-foot curb inlet in the low point in the road.

Is A-2 and B-1 flow conveyed to the proposed detention basin?

Sub-basin B-2 contains approximately 4.89 acres and is located between Mirador Lane and Periwinkle Place in the eastern portion of the site. Approximately Q_5=8.8 cfs and Q_{100}=18.7 cfs generated from this sub-basin will sheet flow to the southeast to Periwinkle

Place and gutter flow to the south to a proposed 20-foot curb inlet (Inlet 5) in a low point in the road. A combined flow from Periwinkle Place and Melting Sky Drive (Q_5=8.8 cfs and Q_{100}=23.4 cfs) will drain to the 15-foot inlet where it will be intercepted in both the Minor Event and the Major Event.. A storm sewer system will convey the collected runoff to the southeast to the proposed detention basin.

Sub-basin B-3 contains approximately 5.19 acres and is located in the central portion of the site on the west side of Mirador Lane. Approximately Q_5=8.3 cfs and Q_{100}=17.6 cfs generated from this sub-basin will sheet flow to the southeast to Mirador Lane. Runoff will gutter flow to the south along Mirador and to the east along Melting Sky Drive to a proposed 20-foot curb inlet (Inlet 5) in the low point of the road where the flows will combine with runoff from Sub-basin B-2. The combined flows (Q_5=17.1 cfs and Q_{100}=36.3 cfs) will drain to the 20-foot inlet (Inlet 5). A storm sewer system will convey the collected runoff to the proposed detention basin.

Sub-basin B-4 contains approximately 4.73 acres and is located in the central portion of the site on either side of Conundrum Court. Approximately Q_5=8.9 cfs and Q_{100}=18.9 cfs generated from this sub-basin will sheet flow to Conundrum Court. Runoff will gutter flow to the south along Conundrum and to the east along Melting Sky Drive to a proposed, on-grade 15-foot inlet (Inlet 3) near Mirador Lane. Approximately Q_5=8.6 cfs and Q_{100}=16.6 cfs will be intercepted by the inlet. A storm sewer system will convey runoff collected in the inlet to the east to the proposed detention basin. Carryover flow (Q_5=0.3 cfs and Q_{100}=10.7 cfs) will continue to travel in the gutter along Melting Sky to a proposed 20' curb inlet (Inlet 5) in the low point in the road.

Sub-basin B-5 contains approximately 6.09 acres and is located in the central portion of the site on either side of Panpipe Lane. Approximately Q_5=10.3 cfs and Q_{100}=21.9 cfs generated from this sub-basin will sheet flow to Panpipe Lane. Runoff will gutter flow to the south along Panpipe and to the east along Melting Sky Drive to a proposed, on-grade 20-foot inlet (Inlet 2). Approximately Q_5=10.9 cfs and Q_{100}=21.9 cfs will be intercepted by the inlet. A storm sewer system will convey runoff collected in the inlet to the east to the proposed detention basin. Carryover flow (Q_5=0.0 cfs and Q_{100}=8.4 cfs) will continue to travel in the gutter along Melting Sky to a proposed 15-foot curb inlet (Inlet 3) near Mirador Lane.

Sub-basin B-6 contains approximately 7.25 acres and is located east of Sleepy Meadows Drive in the western portion of the site. Approximately Q_5=14.3 cfs and Q_{100}=30.2 cfs is generated from this sub-basin. A portion of the basin's runoff will drain to Sleepy Meadows and these flows will be conveyed within gutter sections along Melting Sky Drive to an on-grade 20-foot inlet (Inlet 1). The majority of the runoff generated in this basin will sheet flow to Hazy Hollow Trail and gutter flow to the south then to the east to the same inlet. The 20-foot inlet (Inlet 1) will intercept approximately Q_5=13.7 cfs and Q_{100}=21.8 cfs. A storm sewer system will convey runoff collected in both of these inlets to the east to the proposed detention basin. Carryover flow (Q_5=0.6 cfs and Q_{100}=8.4 cfs) from the 20-

foot inlet will continue to travel in the gutter along Melting Sky to a proposed on-grade 20-foot curb inlet (Inlet 2) near Panpipe Lane.

Sub-basin B-7 contains approximately 2.95 acres and is located on the south side of Melting Sky Drive in the southern portion of the site. Approximately Q_5=5.4 cfs and Q_{100}=11.7 cfs generated from this sub-basin will sheet flow to the northeast to Melting Sky and gutter flow to the east to a proposed 15-foot curb inlet in the low point in the road. A combined flow from Periwinkle Place and Melting Sky Drive (Q_5=10.0 cfs and Q_{100}=21.3 cfs) will drain to the 15-foot inlet. A proposed storm sewer system will convey runoff collected in the inlet to the southeast to the proposed detention basin at the southeast corner of the site.

Sub-basin B-8 contains approximately 2.72 acres and is located on the east side of Periwinkle Place in the eastern portion of the site. Approximately Q_5=4.6 cfs and Q_{100}=9.6 cfs generated from this sub-basin will sheet flow to the southwest to Periwinkle Place and gutter flow to the south to a proposed 15-foot curb inlet in the low point in the road. A combined flow from Periwinkle Place and Melting Sky Drive (Q_5=10.0 cfs and Q_{100}=21.3 cfs) will drain to the 15-foot inlet. A proposed storm sewer system will convey runoff collected in the inlet to the southeast to the proposed detention basin at the southeast corner of the site.

The inlets and storm sewer at the low point in the intersection of Melting Sky Drive and Periwinkle Place have been sized for the 5-year & 100-year storm event. In a 100-year event, a portion of runoff draining to Inlet #5 will overtop the crown and drain to Inlet #6. A portion of runoff draining to Inlet #6 will overtop the curb and drain directly to the detention basin. Riprap will be installed on the inside bank of the detention basin to protect it from possible erosion in the event of clogging.

C Drainage Basins: Sub-basin C-1 contains approximately 4.29 acres and is located on the west side of Sleepy Meadows Drive in the western end of the site. Approximately Q_5=8.0 cfs and Q_{100}=16.9 cfs generated from this sub-basin will sheet flow to the southeast to Sleepy Meadows. A combined runoff of Q_5=10.3 cfs and Q_{100}=22.9 cfs with a portion of offsite Sub-basin OS-2 will gutter flow to the south to a proposed 20-foot on grade curb inlet. Approximately Q_5=6.4 cfs and Q_{100}=17.4 cfs will be intercepted by the inlet and a storm sewer system will convey the runoff to the east along Melting Sky to the proposed detention basin. Carryover flow (Q_5=3.9 cfs and Q_{100}=5.5 cfs) will continue to travel in the gutter along Sleepy Meadows to the adjacent property to the south and outfall to a ditch at Fontaine Boulevard. Therefore, a combined carry over and bypassed flow of approximately Q_5=3.9 cfs and Q_{100}=5.5 cfs will drain to the Cottonwood Meadows development to the south. Discuss where the flow go to in Cottonwood Meadows

Sleepy Meadows has adequate capacity to handle this additional flow. The street section of the existing roadway is 36-feet face of curb to face of curb with a 2-foot pan and 8-inch high curb. Carry over flow from the Peaceful Ridge development will combine with runoff from the west half of Sleepy Meadows in the Cottonwood Meadows development plus the offsite runoff west of Cottonwood Meadows. An existing crosspan will direct the flow to

the east across Sleepy Meadows to a proposed riprap chase at the end of the curb and gutter. The chase will direct the runoff to a ditch along Fontaine.

this water needs WQ

D Drainage Basins: The D drainage basins are located along the southern and eastern borders of the site. Runoff from this area will sheet flow and channel flow to Marksheffel Road.

Sub-basin D-1 contains approximately 2.61 acres and is located on the southern portion of the site. Approximately Q_5=3.4 cfs and Q_{100}=7.8 cfs generated from this sub-basin will sheet flow to the existing channel along the southern property line within the Cottonwood Meadows subdivision. The homeowners in Cottonwood Meadows have encroached upon this channel. The encroachments into the existing swale have not been done collectively and the channel is potentially unstable. With the Peaceful Ridge development, however, less runoff will be draining to this swale which will still have the capacity to carry the developed flows from the Peaceful Ridge site. See capacity calculations in the Appendix of this report. Runoff intercepted by this swale will channel flow to the east to the roadside ditch along Marksheffel Road. Flows will travel in a southerly direction along Marksheffel in the roadside ditch. Water Quality Treatment is achieved in the rear yard areas. Calculations can be found in Appendix Z (Zones D-1-a & D-1-b).

Sub-basin D-2 contains approximately 2.25 acres and consists of the backside of the single-family lots on the east side of Periwinkle Place. Approximately Q_5=4.0 cfs and Q_{100}=8.9 cfs generated from this sub-basin will sheet flow to the roadside ditch along Marksheffel Road. Flows will drain to the existing 7'x4' concrete box culvert that runs under Marksheffel. Water Quality Treatment is achieved in the rear yard areas. Calculations can be found in Appendix Z (Zones D-2-a & D-2-b).

discuss PBMP exclusion (i.e. land disturbance to Undeveloped Land where undeveloped land remains undeveloped following the activity)

Sub-basin D-3 contains approximately 2.29 acres and consists of the west half of the right-of-way for Marksheffel Road including half of the road itself and the additional 50-foot of right-of-way that will be dedicated with the platting of Peaceful Ridge at Fountain Valley Subdivision. Approximately Q_5=4.4 cfs and Q_{100}=9.8 cfs generated from this sub-basin will sheet flow to the roadside ditch along Marksheffel Road. Flows will drain to the existing 7'x4' concrete box culvert that runs under Marksheffel.

Water Quality Treatment

Water Quality Treatment will be required for the proposed development. The full-spectrum extended detention basin will be used for permanent stormwater quality treatment. The required WQCV for a 40-hour drain time is 0.721 acre-feet. The storage volume required for EURV detention is 1.118 acre-feet. The storage volume for the 100-year Major Event is 1.961 acre-feet.

Water Quality Methodology (4-Step Process):

Step 1- Runoff reduction Practices

New construction will utilize existing and proposed grassed areas as buffers, allowing sediment to drop out of the storm runoff and helping to reduce runoff. Sub-basin D-3 will contain portions of vegetated hillsides along with a broad meandering five-foot flat bottom channel

which will provide some runoff reduction benefit, along with some biofiltering. Runoff Reduction calculations and *IRF Reduction Exhibit* are provided in Appendix C for Sub-basins A-0, D-1, & D-2. IRF Reduction Analysis for this zone resulted in a treatment value of at least 60% of the expected overall WQCV.

Step 2- Implement Bmp's That Slowly Release The Water Quality Capture Volume

Treatment and slow release of 40 hours of the water quality capture volume (WQCV) will be accomplished by the implementation of the proposed private extended detention basin.

Step 3 - Stabilize Drainageways

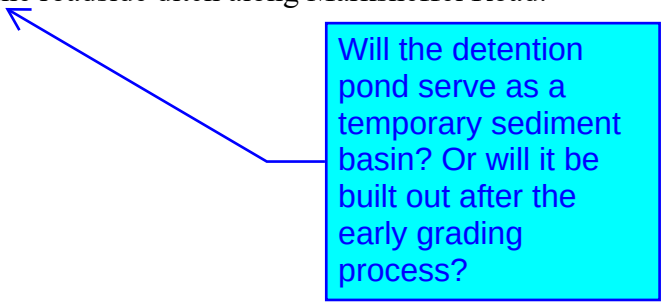
There are no major drainageways affected by the development. No improvements to any downstream drainageways are required or anticipated, at this time. The project discharges into an existing underground public storm sewer system.

Step 4 - Implement Site Specific & Source Control BMPs

There are no potential sources of contaminants that could be introduced to the City's MS4 that will not be controlled by temporary construction BMPs. Maintenance and sweeping of parking areas is recommended to limit sediment transport to new inlets, pipes and detention areas. Construction BMPs in the form of vehicle tracking control, concrete washout area, inlet protection, rock socks, and silt fences will be utilized during construction activities to protect receiving waters.

Detention Facilities

The proposed outlet structure will include two chambers: one for the 5-year and one for the 100-year storm event. An orifice plate will drain the water quality portion of the basin into the first chamber of the outlet structure. Approximately Q_5=62.8 cfs and Q_{100}=132.0 cfs (DP-7) will drain to the proposed detention basin. Runoff released from the detention basin will be restricted to 1.9 cfs and 69.8 cfs for the 5-year and 100-year storm events, respectively, to limit the total runoff draining to Marksheffel to historic rates. This takes into account the runoff from the A, D and offsite drainage basins that will discharge directly to an existing 7'x4' concrete box culvert and an existing 48-inch culvert under Marksheffel Road. With the installation of the connection to the existing 48-inch culvert at the northeast corner of the site, less runoff will actually drain to the existing 7'x4' concrete box culvert (Q_5=30.8 cfs and Q_{100}=79.6 cfs) than it does historically (Q_5=47.5 cfs and Q_{100}=123.8 cfs). A proposed 36-inch RCP will convey runoff released from the detention basin to the existing 7'x4' concrete box culvert. If the outlet structure becomes plugged, a 75-foot wide emergency spillway will convey the runoff to the roadside ditch along Marksheffel Road.



VII. Flood Plain Statement

According to the Federal Emergency Management Agency (FEMA), the proposed development does not lie within a designated floodplain. The Floodplain Insurance Rate Map (FIRM) for El Paso County panel 08041C0957 G, dated December 7, 2018, was reviewed to determine any potential floodplain delineation. A copy of the relevant portion of the FIRM panel is shown on Figure 3.

VIII. Cost Estimate and Fees

Table 1 (following pages) presents a cost estimate for the construction of all the proposed public drainage improvements for the property. All drainage structures are subject to final design. The costs presented are estimates for the proposed drainage facilities and may vary due to final design and economic considerations.

The proposed development lies within the Jimmy Camp Creek Drainage Basin. The platting of this site requires that Drainage and Bridge Fees be paid. These fees are based on impervious area in El Paso County. See Table 2 (following pages) for a summary of the weighted Impervious Area, Drainage Basin Fee and Bridge Fee calculations.

The site lies within the Jimmy Camp Creek Drainage Basin. The current drainage basin fee associated with the Jimmy Camp Creek Drainage Basin is $19,752 per impervious acre. Peaceful Ridge at Fountain Valley Subdivision contains 60.14 acres of which 3.55 acres is dedicated as additional right-of-way for Marksheffel Road or undeveloped. Therefore, the remaining acreage for calculation of fees is 56.59 acres.

IX. Summary and Conclusions

The subject site contains approximately 60.14 acres and is located on the west side of Marksheffel Road just north of Fontaine Boulevard. The property is to be developed into 255 single-family lots. A small portion of runoff generated on the west end of the site that is not intercepted by an inlet will gutter flow to the southwest corner of the site in Sleepy Meadows Drive. This runoff will gutter flow to the south to Fontaine Boulevard where flows will discharge to a roadside ditch. The majority of runoff generated from the site will sheet flow and gutter flow to a system of curb inlets and storm sewer in Melting Sky Drive and Periwinkle Place. The runoff collected in the storm sewer system will be conveyed to a proposed detention basin situated at the southeast corner of the site. Runoff collected in the detention basin will be released at or below historic rates via a 36-inch RCP and will discharge to an existing 7'x4' concrete box culvert under Marksheffel Road. The offsite runoff to the north along with runoff from the north side of the site will drain to an existing 48-inch RCP culvert that will convey runoff to the east under Marksheffel Road.

Please tailor drainage flow patterns to how the conditions will be during the overlot grading process. Inlets will not be installed with the rough cut of the roads. Please discuss where temporary sediment basin will be located and how runoff will drain from site to TSBs.

Please remove any storm system information from report and just show tributary areas and how they drain to TSBs. Hydraulic calculation should be for swales conveying runoff to TSBs.

TABLE 1

PEACEFUL RIDGE AT FOUNTAIN VALLEY SUBDIVISION
PUBLIC STORM IMPROVEMENTS
Date: 11-23-2021
By: MJK

PIPES

Description		3D Length - To Inside Edges	Unit Cost	Total Cost
18 inch Concrete Pipe	Totals:	1733.18	$65.00	$112,656.70
24 inch Concrete Pipe	Totals:	747.38	$78.00	$58,295.64
36 inch Concrete Pipe	Totals:	642.02	$120.00	$77,042.40
42 inch Concrete Pipe	Totals:	257.33	$160.00	$41,172.80
30 x 19 inch Concrete Horizontal Elliptical Culvert	Totals:	4.28	$97.00	$415.16
53 x 34 inch Concrete Horizontal Elliptical Culvert	Totals:	78.84	$220.00	$17,344.80
				$306,927.50

INLETS

Name	Description	Length		Unit Cost	Total Cost
1A	Type 'R' Inlet	20	ESTIMATED VALUE BY FOOT	$500.00	$10,000.00
1	Type 'R' Inlet	20	ESTIMATED VALUE BY FOOT	$500.00	$10,000.00
2	Type 'R' Inlet	20	ESTIMATED VALUE BY FOOT	$500.00	$10,000.00
3	Type 'R' Inlet	15	ESTIMATED VALUE BY FOOT	$500.00	$7,500.00
4	Type 'R' Inlet	25	ESTIMATED VALUE BY FOOT	$500.00	$12,500.00
5	Type 'R' Inlet	20	ESTIMATED VALUE BY FOOT	$500.00	$10,000.00
6	Type 'R' Inlet	15	ESTIMATED VALUE BY FOOT	$500.00	$7,500.00
7	Type 'R' Inlet	15	ESTIMATED VALUE BY FOOT	$500.00	$7,500.00
8	Type 'R' Inlet	20	ESTIMATED VALUE BY FOOT	$500.00	$10,000.00
9	Type 'D' Inlet	3X5	ESTIMATED VALUE BY EACH	$6,500.00	$6,500.00
					$91,500.00

MANHOLES

Name	Description	Ea		Unit Cost	Total Cost
MH-1A	4' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-1	5' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-2	5' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-3	5' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-4A	5' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-4B	5' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-5	6' Dia Storm MH (NO CONE)	1	EPC VALUE FOR BOX BASE	$11,627.00	$11,627.00
MH-6	6' Dia Storm MH (NO CONE)	1	EPC VALUE FOR BOX BASE	$11,627.00	$11,627.00
MH-7	5' Dia Storm MH	1	EPC VALUES	$6,395.00	$6,395.00
MH-10	6' Dia Storm MH (NO CONE)	1	EPC VALUE FOR BOX BASE	$11,627.00	$11,627.00
					$79,646.00

FES		Ea		Unit Cost	
87	42"	1		$960.00	$960.00
F.E.S.	36"	1		$720.00	$720.00
					$1,680.00

MISC		Count	Unit Type		
na	Rock Check Dams	2	each	$350.00	$700.00
29	Wingwalls	12	cu yd	$650.00	$7,800.00
29	Apron	8	cu yd	$650.00	$5,200.00
A-A	Channel A-A	6500	LS	$6,500.00	$6,500.00
NA	Riprap	475	cy	$75.00	$35,625.00
					$20,200.00
				GRAND TOTAL:	**$414,953.50**

TABLE 2
Peaceful Ridge Subdivision
Drainage Basin and Bridge Fees

Table 1: Impervious Area and Drainage Basin & Bridge Fee Calculation
Jimmy Camp Creek Drainage Basin

Total Lots =	255 lots
Total Development Area =	60.140 ac
Total Undeveloped Acres =	3.550 ac
Total Developed Area =	**56.59 ac**
Building/Patio/Drive Per Lot =	2,000 sf
Total Building/Patio/Drive Area =	11.708 ac
Total Street/Sidewalk Area =	13.341 ac
Total Impervious Area =	25.049 ac
% Impervious Area =	**44.26 %**

West Fork Jimmy Camp Creek Drainage Basin

Drainage Basin Fee and Bridge Fee Calculations			
Drainage Basin Fee =	$19,752 / ac	**Drainage Basin Fee =**	**$ 494,774.90**
Bridge Fee =	$924 / ac	**Bridge Fee =**	**$ 23,145.61**

	Drainage Basin	**Bridge**
Total Fees Due for Peaceful Ridge Subdivision	**$494,774.90**	**$ 23,145.61**

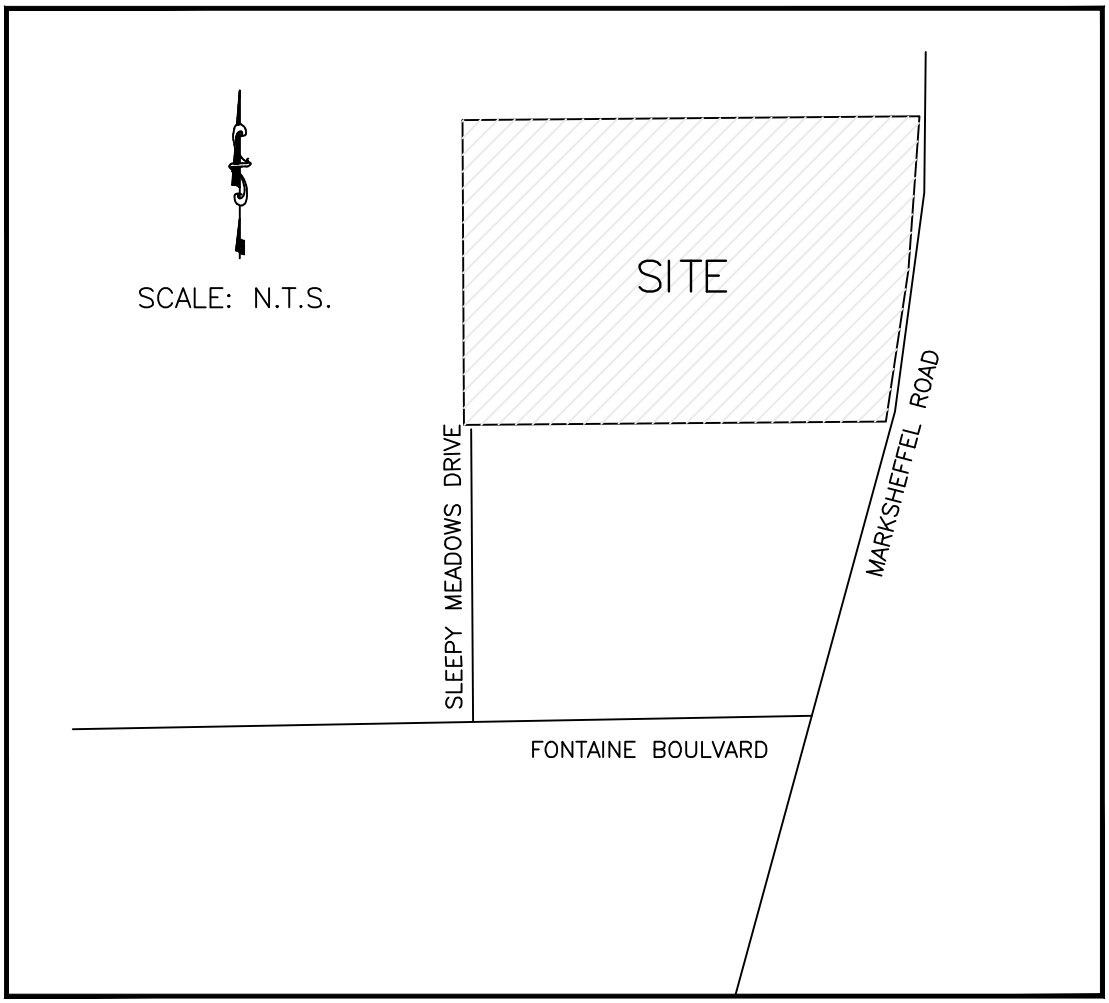
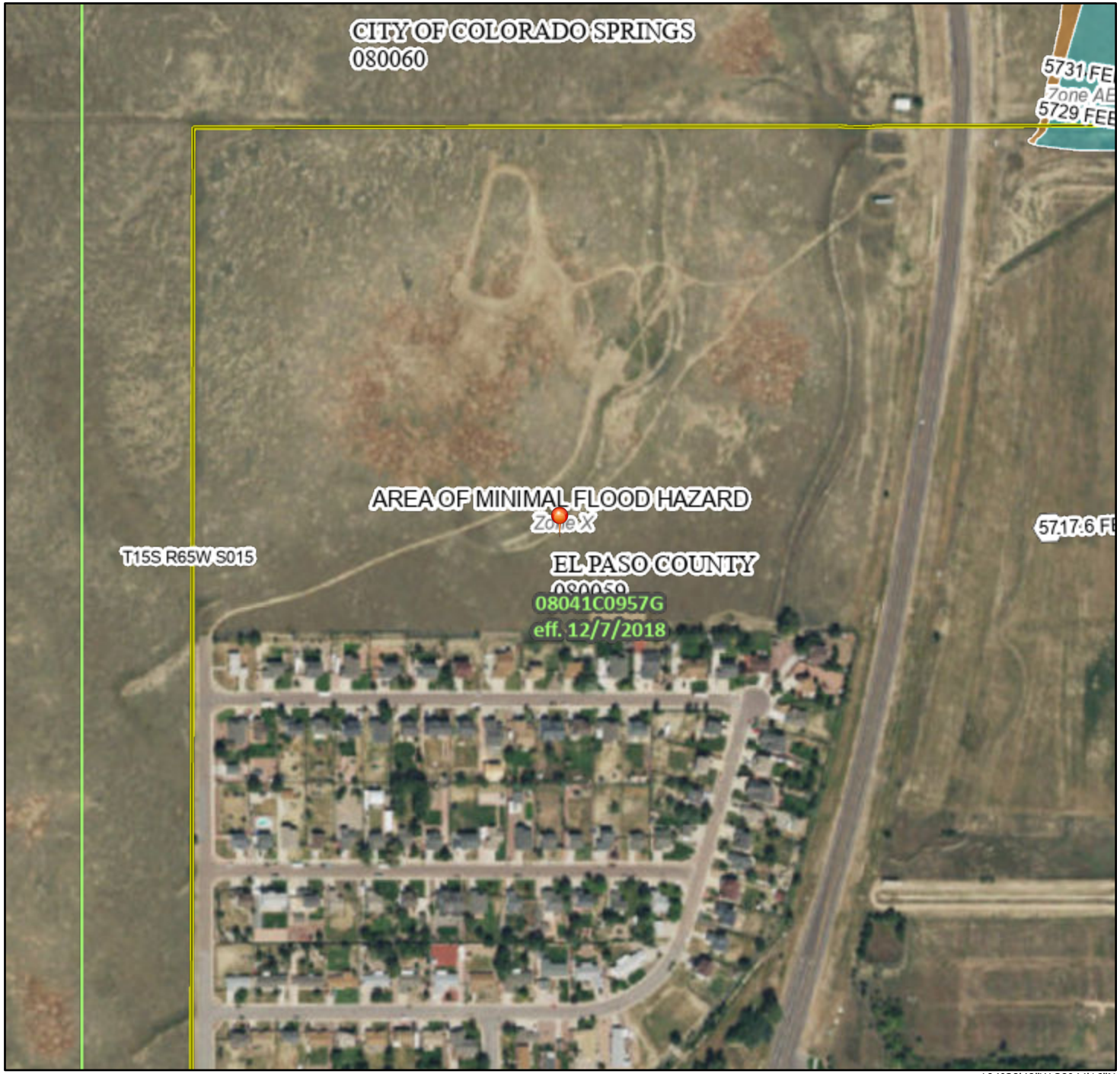


FIGURE 1
VICINITY MAP
PEACEFUL RIDGE at
FOUNTAIN VALLEY SUBDIVISION

National Flood Hazard Layer FIRMette

FEMA

104°39'25"W 38°44'44"N



104°38'48"W 38°44'16"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
- 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 10/15/2021 at 3:26 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.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,530 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

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

FIGURE 3 - SOILS

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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—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
43	Kim loam, 1 to 8 percent slopes	56.2	90.2%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	0.6	1.0%
75	Razor-Midway complex	3.8	6.1%
86	Stoneham sandy loam, 3 to 8 percent slopes	1.7	2.7%
Totals for Area of Interest		**62.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

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

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

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

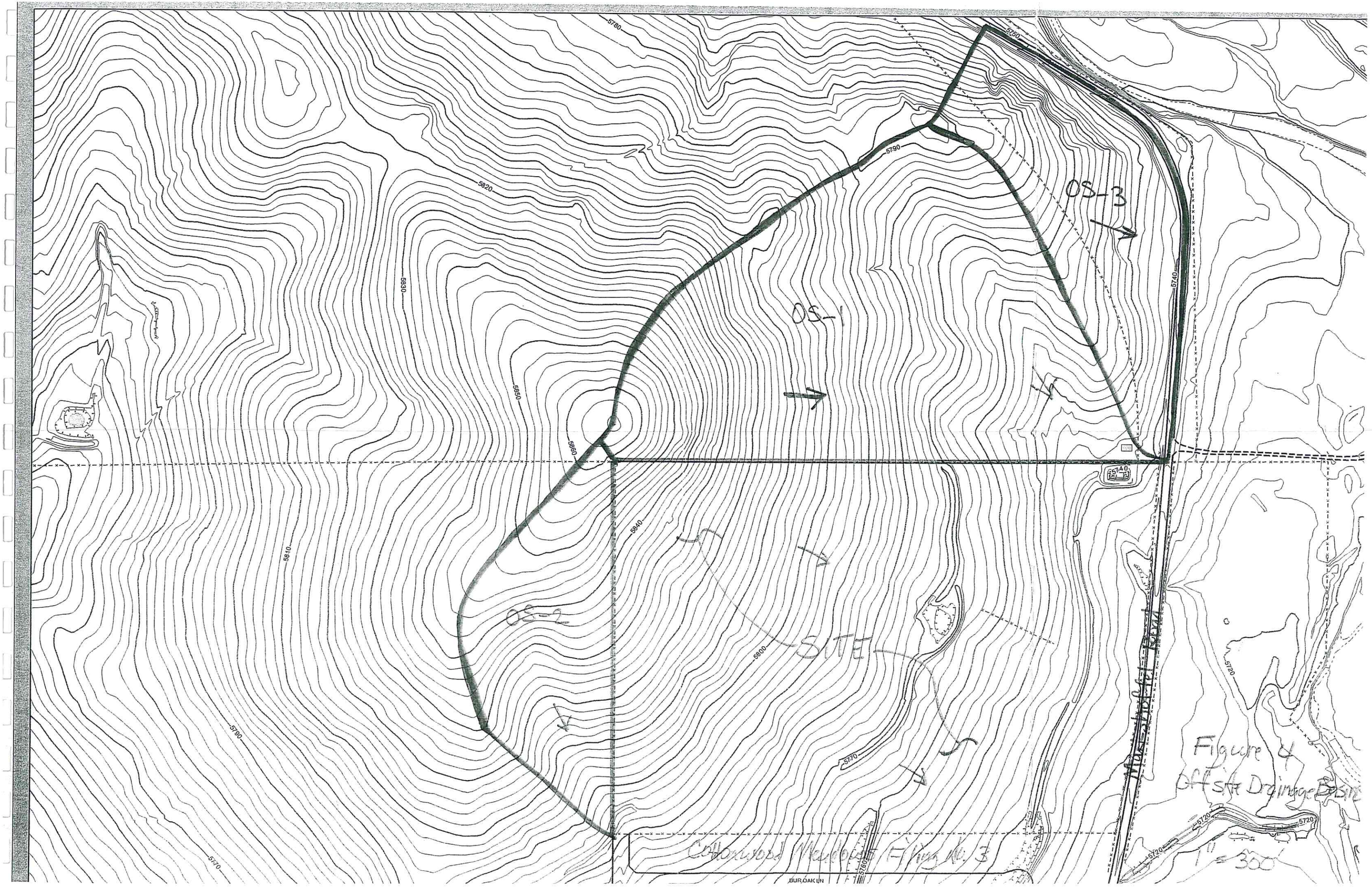
Minor Components

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


OS-1
OS-2
OS-3
SITE
5780
5790
5750
5740
5820
5830
5850
5860
5810
5840
5800
5770
5720
5760
BUR OAK LN
Meadowlark Rd
Figure 4
Offsite Drainage Basins
1" = 300'

Appendix A
Hydrologic Calculations
Runoff Coefficient Calculations
Time of Concentration
Runoff Calculations

TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group

9/30/90

Site 60.14 Acres total
less 2.34 Acres Row dedication
less 1.21 Acres detention basin tract
56.59 AC total developed area

$\frac{255 \text{ lots}}{56.59 \text{ Acres}} = 4.5 \text{ du/AC}$

Use Runoff Coefficient between 1/8 Acre & 1/4 Acre

Soils - majority of site is soil B
Southwest & northeast corners are C/D

Runoff Coefficient - Existing Condition

Basin E-1 8% soil C/D, 1% Road 99% pasture

pasture $C_5 = 0.92(.25) + 0.08(.30) = 0.25$
$C_{100} = 0.92(.35) + 0.08(.45) = 0.36$

wtd $C_5 = 0.99(.25) + 0.01(.90) = 0.26$
$C_{100} = 0.99(.36) + 0.01(.95) = 0.37$

Runoff Coefficient – Existing Condition

Basin E-2 4% soil C/D 0.5% Road

Pasture $C_5 = 0.96(.25) + 0.04(.30) = 0.25$

$C_{100} = 0.96(.35) + .04(.45) = 0.35$

wtd $C_5 = 0.995(.25) + .005(.90) = .25$

$C_{100} = .995(.35) + .005(.95) = .35$

Basin OS-1 1/3 soil B, 2/3 soil C/D

100% pasture/meadow

$C_5 = 1/3(.25) + 2/3(.30) = 0.28$

$C_{100} = 1/3(.35) + 2/3(.45) = 0.42$

Basin OS-2 Soil B 100% pasture

$C_5 = 0.25$ $C_{100} = 0.35$

Basin OS-3 Soil C/D 5% Road 95% pasture

$C_5 = 0.95(.30) + 0.05(0.90) = 0.33$

$C_{100} = 0.95(.45) + 0.05(0.95) = 0.48$

Runoff Coefficient – Existing Condition

DP-1 basins E-1, DS-1 & DS-3

Area: 27.76 + 32.60 + 13.50 = 73.86 Acres

$$C_5 = \frac{27.76(.26) + 32.60(.28) + 13.50(.33)}{73.86} = 0.28$$

$$C_{100} = \frac{27.76(.37) + 32.60(.42) + 13.50(.48)}{73.86} = 0.41$$

DP-2 basins E-2 & DS-2

Area: 33.34 + 9.30 = 42.64 Ac

$C_5 = 0.25$ $C_{100} = 0.35$

Runoff Coefficient - Developed Condition

for 4.5 du/Ac (44% impervious) soil B : $C_5 = 0.51$ $C_{100} = 0.61$
soil C/D : $C_5 = 0.61$ $C_{100} = 0.71$

Basin A-1 5% soil C/D

$C_5 = 0.95(.51) + .05(.61) = 0.52$

$C_{100} = 0.95(.61) + .05(.71) = 0.62$

Basin A-2 5% soil C/D

$C_5 = 0.95(.51) + .05(.61) = 0.52$

$C_{100} = .95(.61) + .05(.71) = 0.62$

Basin B-1 100% soil B

$C_5 = 0.51$ $C_{100} = 0.61$

Basin B-2 100% soil B

$C_5 = 0.51$ $C_{100} = 0.61$

Basin B-3 100% soil B

$C_5 = 0.51$ $C_{100} = 0.61$

Runoff Coefficient - Developed Condition

Basin B-4 soil B $C_5 = 0.51$ $C_{100} = 0.61$

Basin B-5 soil B $C_5 = 0.51$ $C_{100} = 0.61$

Basin B-6 soil B $C_5 = 0.51$ $C_{100} = 0.61$

Basin B-7 19% soil C/D 81% soil B

$C_5 = 0.19(.61) + 0.81(.51) = 0.53$

$C_{100} = 0.19(.71) + 0.81(.61) = 0.63$

Basin B-8 19% soil C/D 81% soil B

$C_5 = 0.19(.61) + .81(.51) = 0.53$

$C_{100} = 0.19(.71) + 0.81(.61) = 0.63$

Basin C-1 100% soil B

$C_5 = 0.51$ $C_{100} = 0.61$

Basin D-1 23% soil C/D 20% pavement 80% lawn

lawn $C_5 = 0.77(.25) + 0.23(.30) = 0.26$

$C_{100} = 0.77(.35) + 0.23(.45) = 0.37$

wtd $C_5 = 0.80(.26) + 0.20(.90) = 0.39$

$C_{100} = 0.80(.37) + 0.20(.95) = 0.50$

Runoff Coefficient – Developed Condition

Basin D-2 24% soil C/D 20% roof/pavement 80% lawn

lawn $C_5 = 0.76(.25) + 0.24(.30) = 0.26$

$C_{100} = 0.76(.35) + 0.24(.45) = 0.37$

wtd $C_5 = 0.80(.26) + 0.20(.90) = 0.39$

$C_{100} = 0.80(.37) + 0.20(.95) = 0.50$

Basin D-3 50% soil C/D 15% pavement 85% lawn

lawn $C_5 = 0.50(.25) + 0.50(.30) = 0.28$

$C_{100} = 0.50(.35) + 0.50(.45) = 0.40$

wtd $C_5 = 0.85(.28) + .15(.90) = 0.37$

$C_{100} = 0.85(.40) + 0.15(.95) = 0.48$

Peaceful Ridge at Fountain Valley Subdivision
Existing Condition
Time of Concentration Calculation

Basin	Slope			Length			Run Coef.	Velocity			T_c			T_c	Basin
	O'land 1	Chan. 1	Chan. 2	O'land 1	Chan. 1	Chan. 2	(5-year)	O'land 1	Chan. 1	Chan. 2	O'land 1	Chan. 1	Chan. 2		
E-1	7.1 %	5.0 %	1.6 %	1,000 lf	1,100 lf	375 lf	0.26		5.0 ft/sec	4.0 ft/sec	25.9 min.	3.7 min.	1.6 min.	**31.1 min.**	E-1
E-2	6.2 %	4.8 %	1.5 %	1,000 lf	1,100 lf	260 lf	0.25		5.0 ft/sec	4.0 ft/sec	27.4 min.	3.7 min.	1.1 min.	**32.1 min.**	E-2
OS-1	8.2 %	5.6 %		1,000 lf	700 lf		0.28		6.0 ft/sec		24.1 min.	1.9 min.		**26.0 min.**	OS-1
OS-2	4.7 %	5.5 %		600 lf	400 lf		0.28		5.0 ft/sec		22.4 min.	1.3 min.		**23.8 min.**	OS-2
OS-3	10.0 %	0.7 %		400 lf	2,000 lf		0.33		2.5 ft/sec		13.4 min.	13.3 min.		**26.7 min.**	OS-3
OS-4	10.0 %	0.7 %		400 lf	1,560 lf		0.51		2.5 ft/sec		10.2 min.	10.4 min.		**20.6 min.**	OS-4
DP-1	7.1 %	5.0 %	1.6 %	1,000 lf	1,100 lf	375 lf	0.28		5.0 ft/sec	4.0 ft/sec	25.2 min.	3.7 min.	1.6 min.	**30.5 min.**	DP-1
DP-2	4.7 %	5.5 %	3.7 %	600 lf	400 lf	1,900 lf	0.25		3.5 ft/sec	5.0 ft/sec	23.3 min.	1.9 min.	6.3 min.	**31.5 min.**	DP-2

Equations:

Time of Concentration (Overland) = $1.87(1.1-C_5)L^{0.5} S^{-0.333}$

C_5 = Runoff coefficient for five-year flow

L = Length of overland flow in feet

S = Slope of flow path in percent

Velocity (Road) = $10(10^{(0.5\log S + 0.5)})$

S = Slope of flow path in percent

Velocity (Channel) = $(1.49/n)R_n^{2/3} S^{1/2}$

Slope (S) = Slope of the channel

n = Manning's number

R_n = Hydraulic Radius (Reynold's Number)

Peaceful Ridge at Fountain Valley Subdivision
Developed Time of Concentration Calculation

Basin	Slope			Length			Run Coef.	Velocity			T_c			T_c	Basin
	O'land 1	Chan. 1	Chan. 2	O'land 1	Chan. 1	Chan. 2	(5-year)	O'land 1	Chan. 1	Chan. 2	O'land 1	Chan. 1	Chan. 2		
A-0	4.0 %	5.0 %		25 lf	25 lf		0.25		4.4 ft/sec		5.0 min.	0.1 min.		**5.1 min.**	A-0
A-1	4.0 %	5.0 %		100 lf	1,800 lf		0.52		4.4 ft/sec		6.8 min.	6.8 min.		**13.7 min.**	A-1
A-2	4.0 %	5.0 %		90 lf	1,645 lf		0.52		4.4 ft/sec		6.5 min.	6.2 min.		**12.7 min.**	A-2
B-1	4.0 %	5.0 %		100 lf	1,060 lf		0.51		4.4 ft/sec		7.0 min.	4.0 min.		**11.0 min.**	B-1
B-2	5.0 %	4.5 %	1.4 %	185 lf	280 lf	500 lf	0.51		4.3 ft/sec	2.3 ft/sec	8.8 min.	1.1 min.	3.6 min.	**13.5 min.**	B-2
B-3	5.0 %	5.0 %	2.8 %	300 lf	270 lf	970 lf	0.51		3.3 ft/sec	3.3 ft/sec	11.2 min.	1.4 min.	4.9 min.	**17.4 min.**	B-3
B-4	7.0 %	2.2 %	4.2 %	200 lf	500 lf	280 lf	0.51		2.8 ft/sec	4.1 ft/sec	8.2 min.	3.0 min.	1.1 min.	**12.3 min.**	B-4
B-5	5.0 %	2.8 %		300 lf	850 lf		0.51		3.3 ft/sec		11.2 min.	4.3 min.		**15.5 min.**	B-5
B-6	5.0 %	3.8 %		100 lf	1,050 lf		0.51		3.8 ft/sec		6.5 min.	4.6 min.		**11.1 min.**	B-6
B-7	6.0 %	4.2 %		80 lf	1,400 lf		0.53		4.1 ft/sec		5.2 min.	5.7 min.		**10.9 min.**	B-7
B-8	4.0 %	1.4 %		60 lf	1,100 lf		0.53		2.3 ft/sec		5.2 min.	8.0 min.		**13.2 min.**	B-8
C-1	4.0 %	3.2 %		100 lf	1,250 lf		0.51		3.6 ft/sec		7.0 min.	5.8 min.		**12.7 min.**	C-1
D-1	6.0 %	4.0 %		80 lf	1,525 lf		0.39		3.0 ft/sec		6.5 min.	8.5 min.		**15.0 min.**	D-1
D-2	5.0 %			85 lf			0.39				7.2 min.			**7.2 min.**	D-2
D-3		2.0 %			500 lf		0.37		2.2 ft/sec			3.8 min.		**5.0 min.**	D-3
OS-1	8.2 %	5.6 %		1,000 lf	700 lf		0.28		6.0 ft/sec		24.1 min.	1.9 min.		**26.0 min.**	OS-1
OS-2	4.7 %	5.5 %		600 lf	400 lf		0.28		5.0 ft/sec		22.4 min.	1.3 min.		**23.8 min.**	OS-2
OS-3	10.0 %	0.7 %		400 lf	2,000 lf		0.33		2.5 ft/sec		13.4 min.	13.3 min.		**26.7 min.**	OS-3
OS-4	10.0 %	0.7 %		400 lf	1,560 lf		0.28		2.5 ft/sec		14.2 min.	10.4 min.		**24.6 min.**	OS-4
DP-1*			3.2 %			70 lf	0.08			3.6 ft/sec		23.8 min.	0.3 min.	**24.1 min.**	DP-1*
DP-2	5.0 %	3.8 %	4.2 %	100 lf	1,050 lf	290 lf	0.51		3.8 ft/sec	4.1 ft/sec	6.5 min.	4.6 min.	1.2 min.	**12.2 min.**	DP-2
DP-3	5.0 %	3.8 %	4.2 %	100 lf	1,050 lf	770 lf	0.51		3.8 ft/sec	4.1 ft/sec	6.5 min.	4.6 min.	3.1 min.	**14.2 min.**	DP-3
DP-4	5.0 %	3.8 %	4.2 %	100 lf	1,050 lf	1,120 lf	0.51		3.8 ft/sec	4.1 ft/sec	6.5 min.	4.6 min.	4.6 min.	**15.6 min.**	DP-4
DP-5	4.0 %	5.0 %	1.4 %	100 lf	1,060 lf	700 lf	0.51		4.4 ft/sec	2.3 ft/sec	7.0 min.	4.0 min.	5.1 min.	**16.0 min.**	DP-5
DP-6	4.0 %	5.0 %	1.4 %	100 lf	1,060 lf	700 lf	0.33		4.4 ft/sec	2.3 ft/sec	9.1 min.	4.0 min.	5.1 min.	**18.2 min.**	DP-6
DP-7**			2.0 %			70 lf	0.38			5.0 ft/sec		18.2 min.	0.2 min.	**18.4 min.**	DP-7**
DP-8	10.0 %	0.7 %		400 lf	2,000 lf		0.32		2.5 ft/sec		13.6 min.	13.3 min.		**26.9 min.**	DP-8
DP-8a	8.2 %	5.6 %		1,000 lf	700 lf		0.31		6.0 ft/sec		23.2 min.	1.9 min.		**25.1 min.**	DP-8a
DP-9a	4.0 %	5.0 %	1.2 %	90 lf	1,645 lf	400 lf	0.77		4.4 ft/sec	2.0 ft/sec	3.7 min.	6.2 min.	3.3 min.	**13.3 min.**	DP-9a

Equations:

Time of Concentration (Overland) = $1.87(1.1-C_5)L^{0.5} S^{-0.333}$

C_5 = Runoff coefficient for five-year flow

L = Length of overland flow in feet

S = Slope of flow path in percent

Velocity (Road) = $10(10^{(0.5\log S + 0.5)})$

S = Slope of flow path in percent

Velocity (Channel) = $(1.49/n)R_n^{2/3} S^{1/2}$

Slope (S) = Slope of the channel

n = Manning's number

R_n = Hydraulic Radius (Reynold's Number)

*Time of Concentration for Basin OS-2 plus additional curb & gutter flow

**Time of Concentration for DP-6 plus pipe flow

Peaceful Ridge at Fountain Valley Subdivision

Existing Condition

Runoff Calculation

Basin / Design Point	Contributing Basins	Area	C_5	C_{100}	Time of Concentration	Rainfall Intensity i_5	Rainfall Intensity i_{100}	Runoff Q_5	Runoff Q_{100}	Basin / Design Point
E-1		27.76 ac	0.26	0.37	31.1 min.	2.3 in/hr	4.0 in/hr	**16.4 cfs**	**41.5 cfs**	E-1
E-2		33.34 ac	0.25	0.35	32.1 min.	2.2 in/hr	4.0 in/hr	**18.6 cfs**	**46.3 cfs**	E-2
OS-1		32.60 ac	0.28	0.42	26.0 min.	2.5 in/hr	4.5 in/hr	**23.0 cfs**	**61.4 cfs**	OS-1
OS-2		3.05 ac	0.28	0.42	23.8 min.	2.6 in/hr	4.7 in/hr	**2.3 cfs**	**6.0 cfs**	OS-2
OS-3		13.50 ac	0.33	0.48	26.7 min.	2.5 in/hr	4.4 in/hr	**11.1 cfs**	**28.6 cfs**	OS-3
OS-4		9.38 ac	0.28	0.42	24.6 min.	2.6 in/hr	4.6 in/hr	**6.8 cfs**	**18.2 cfs**	OS-4
DP-1	E-1, OS-1 & OS-3	73.86 ac	0.28	0.41	30.5 min.	2.3 in/hr	4.1 in/hr	**47.5 cfs**	**123.8 cfs**	DP-1
DP-2	E-2 & OS-2	36.39 ac	0.25	0.35	31.5 min.	2.3 in/hr	4.0 in/hr	**20.5 cfs**	**51.1 cfs**	DP-2

Equations:

$i_5 = 54.6/(T_c^{0.83}+6.72)$

$i_{100} = 75/((10+T_c)^{0.786})$

i_5=Average 5-year Rainafall Intensity in inches per hou

i_{100}=Average 100-year Rainfall Intensity in inches per hou

T_c=Time of Concentration

$Q = CiA$

Q = Peak Runoff Rate, in cubic feet per second (cfs

C = Runoff coefficient representing a ration of peak runoff rate to average rainfa intensity for a duration equal to the runoff time of concentratio

i = average rainfall intensity in inches per hou

A = Drainage area in acres

Peaceful Ridge at Fountain Valley Subdivision
Developed Runoff Calculation

Basin / Design Point	Contributing Basins	Area	C_5	C_{100}	Time of Concentration	Rainfall Intensity i_5	Rainfall Intensity i_{100}	Runoff Q_5	Runoff Q_{100}	Basin / Design Point
A-0	A-0	2.07 ac	0.25	0.35	5.1 min.	5.2 in/hr	8.9 in/hr	**2.7 cfs**	**6.4 cfs**	A-0
A-1	A-1	3.18 ac	0.52	0.62	13.7 min.	3.5 in/hr	6.2 in/hr	**5.8 cfs**	**12.3 cfs**	A-1
A-2	A-2	3.41 ac	0.52	0.62	12.7 min.	3.6 in/hr	6.4 in/hr	**6.5 cfs**	**13.6 cfs**	A-2
B-1	B-1	6.51 ac	0.51	0.61	11.0 min.	3.9 in/hr	6.9 in/hr	**12.9 cfs**	**27.2 cfs**	B-1
B-2	B-2	4.89 ac	0.51	0.61	13.5 min.	3.5 in/hr	6.3 in/hr	**8.8 cfs**	**18.7 cfs**	B-2
B-3	B-3	5.19 ac	0.51	0.61	17.4 min.	3.1 in/hr	5.6 in/hr	**8.3 cfs**	**17.6 cfs**	B-3
B-4	B-4	4.73 ac	0.51	0.61	12.3 min.	3.7 in/hr	6.5 in/hr	**8.9 cfs**	**18.9 cfs**	B-4
B-5	B-5	6.09 ac	0.51	0.61	15.5 min.	3.3 in/hr	5.9 in/hr	**10.3 cfs**	**21.9 cfs**	B-5
B-6	B-6	7.25 ac	0.51	0.61	11.1 min.	3.9 in/hr	6.8 in/hr	**14.3 cfs**	**30.2 cfs**	B-6
B-7	B-7	2.95 ac	0.48	0.59	11.4 min.	3.8 in/hr	6.8 in/hr	**5.4 cfs**	**11.7 cfs**	B-7
B-8	B-8	2.72 ac	0.48	0.59	13.6 min.	3.5 in/hr	6.3 in/hr	**4.6 cfs**	**10.0 cfs**	B-8
C-1	C-1	4.29 ac	0.51	0.61	12.7 min.	3.6 in/hr	6.4 in/hr	**8.0 cfs**	**16.9 cfs**	C-1
D-1	D-1	2.61 ac	0.39	0.50	15.0 min.	3.4 in/hr	6.0 in/hr	**3.4 cfs**	**7.8 cfs**	D-1
D-2	D-2	2.22 ac	0.39	0.50	7.2 min.	4.6 in/hr	8.0 in/hr	**4.0 cfs**	**8.9 cfs**	D-2
D-3	D-3	2.29 ac	0.37	0.48	5.0 min.	5.2 in/hr	8.9 in/hr	**4.4 cfs**	**9.8 cfs**	D-3
OS-1	OS-1	32.60 ac	0.28	0.42	26.0 min.	2.5 in/hr	4.5 in/hr	**23.0 cfs**	**61.4 cfs**	OS-1
OS-2	3.05 Acres is tributary to C-1	3.05 ac	0.28	0.42	23.8 min.	2.6 in/hr	4.7 in/hr	**2.3 cfs**	**6.0 cfs**	OS-2
OS-3	OS-3	13.50 ac	0.33	0.48	26.7 min.	2.5 in/hr	4.4 in/hr	**11.1 cfs**	**28.6 cfs**	OS-3
OS-4	OS-4	9.38 ac	0.28	0.42	24.1 min.	2.6 in/hr	4.7 in/hr	**6.9 cfs**	**18.4 cfs**	OS-4
DP-1a	OS-2 & C-1	7.34 ac	0.41	0.53	24.1 min.	2.6 in/hr	4.7 in/hr	**8.0 cfs**	**18.2 cfs**	DP-1a
DP-1	OS-2 & C-1, B6	14.59 ac	0.46	0.57	25.3 min.	2.6 in/hr	4.6 in/hr	**17.3 cfs**	**37.9 cfs**	DP-1
DP-2	B-5, B-6	13.34 ac	0.51	0.61	12.2 min.	3.7 in/hr	6.6 in/hr	**25.3 cfs**	**53.4 cfs**	DP-2
DP-3	B-4, B-5, B-6	18.07 ac	0.51	0.61	14.2 min.	3.5 in/hr	6.1 in/hr	**31.9 cfs**	**67.6 cfs**	DP-3
DP-4	B-3, B-4, B-5, B-6	23.26 ac	0.51	0.61	15.6 min.	3.3 in/hr	5.9 in/hr	**39.3 cfs**	**83.2 cfs**	DP-4
DP-5	A-1, A-2, B-1 & B-2	17.99 ac	0.51	0.61	16.0 min.	3.3 in/hr	5.8 in/hr	**30.0 cfs**	**63.6 cfs**	DP-5
DP-6	A-1,A-2, All B Basins + OS-2 & C-1	54.26 ac	0.33	0.39	18.2 min.	3.1 in/hr	5.4 in/hr	**54.1 cfs**	**114.9 cfs**	DP-6
DP-7	A-1,A-2, All B Basins + OS-2 & C-1	54.26 ac	0.38	0.45	18.4 min.	3.0 in/hr	5.4 in/hr	**62.8 cfs**	**132.0 cfs**	DP-7
DP-8	A-0, OS-1, & OS-3	48.17 ac	0.32	0.46	26.9 min.	2.5 in/hr	4.4 in/hr	**38.1 cfs**	**97.5 cfs**	DP-8
DP-8a	A-0 & OS-1	34.67 ac	0.31	0.45	25.1 min.	2.6 in/hr	4.6 in/hr	**27.6 cfs**	**71.4 cfs**	DP-8a
DP-9a	D-2, D-3	4.51 ac	0.77	0.96	13.3 min.	3.6 in/hr	6.3 in/hr	**12.4 cfs**	**27.3 cfs**	DP-9a
DP-9*	All except A-0, D-1, OS-1, OS-3	58.77 ac						**32.3 cfs**	**82.6 cfs**	DP-9*

Equations:

$i_5 = 54.6/(T_c^{0.83}+6.72)$

$i_{100} = 75/((10+T_c)^{0.786})$

i_5=Average 5-year Rainafall Intensity in inches per hour

i_{100}=Average 100-year Rainfall Intensity in inches per hour

T_c=Time of Concentration

Q = CiA

Q = Peak Runoff Rate, in cubic feet per second (cfs)

C = Runoff coefficient representing a ration of peak runoff rate to average rainfall intensity for a duration equal to the runoff time of concentration.

i = average rainfall intensity in inches per hour

A = Drainage area in acres

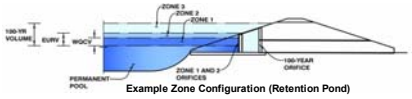
*DP-9a plus dishcarge from Detention Basin

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Peaceful Ridge Subdivion

Basin ID: All Tributary Areas to Planned Detention Basin



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	53.88	acres
Watershed Length =	2,200	ft
Watershed Slope =	0.035	ft/ft
Watershed Imperviousness =	33.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.721	acre-feet
Excess Urban Runoff Volume (EURV) =	1.839	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.423	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	2.010	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	2.992	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	4.827	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	6.040	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	7.628	acre-feet
500-yr Runoff Volume (P1 = 3.2 in.) =	11.014	acre-feet
Approximate 2-yr Detention Volume =	1.329	acre-feet
Approximate 5-yr Detention Volume =	1.886	acre-feet
Approximate 10-yr Detention Volume =	2.695	acre-feet
Approximate 25-yr Detention Volume =	3.085	acre-feet
Approximate 50-yr Detention Volume =	3.246	acre-feet
Approximate 100-yr Detention Volume =	3.799	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
3.20	inches

Stage-Storage Calculation

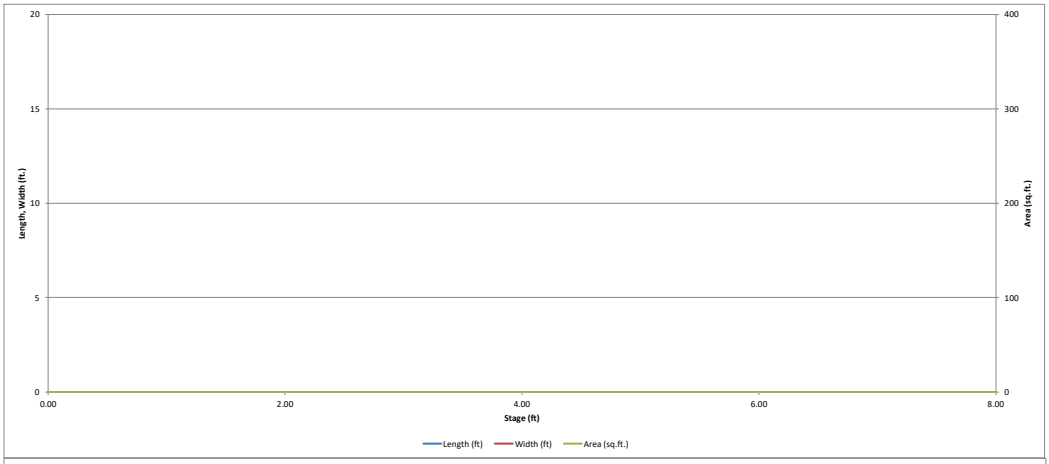
Zone 1 Volume (WQCV) =	0.721	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.118	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.961	acre-feet
Total Detention Basin Volume =	3.799	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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

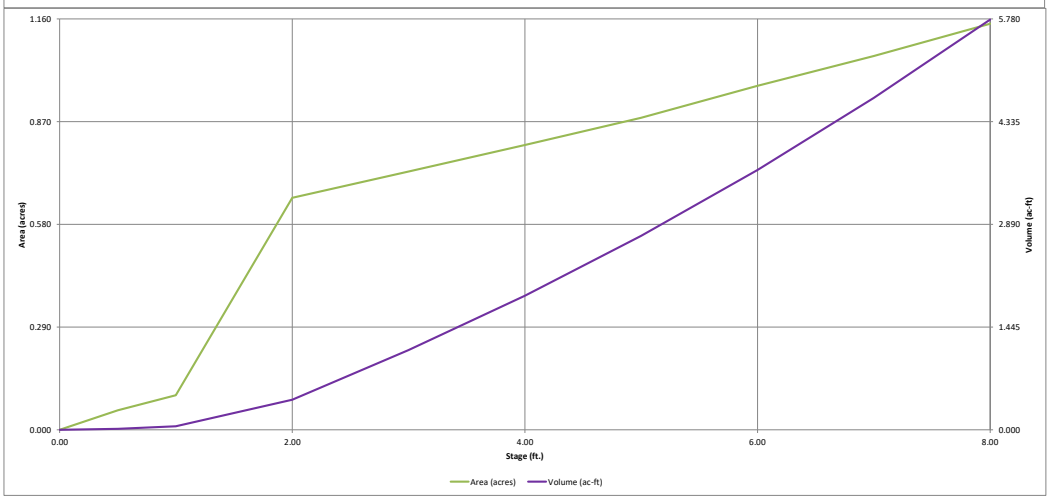
Depth Increment = ft

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	0.001		
5731	--	0.50	--	--	--	2,400	0.055	583	0.013
5731.5	--	1.00	--	--	--	4,266	0.098	2,230	0.051
5732.5	--	2.00	--	--	--	28,535	0.655	18,389	0.422
5733.5	--	3.00	--	--	--	31,757	0.729	48,819	1.121
5734.5	--	4.00	--	--	--	35,011	0.804	82,203	1.887
5735.5	--	5.00	--	--	--	38,350	0.880	118,884	2.729
5736.5	--	6.00	--	--	--	42,287	0.971	159,202	3.655
5737.5	--	7.00	--	--	--	45,960	1.055	203,326	4.668
5738.5	--	8.00	--	--	--	49,930	1.146	251,271	5.768

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



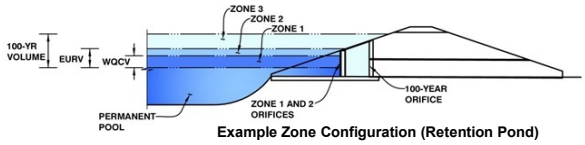


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Peaceful Valley Sub (Addendum 2021)

Basin ID: All Tributary



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.44	0.721	Orifice Plate
Zone 2 (EURV)	3.94	1.118	Rectangular Orifice
Zone 3 (100-year)	6.15	1.961	Weir&Pipe (Restrict)
		3.799	Total

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

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

Calculated Parameters for Underdrain

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

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.44	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

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

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.67	1.33					
Orifice Area (sq. inches)	1.17	1.17	4.65					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.44	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.94	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	5.00	N/A	inches
Vertical Orifice Width =	8.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.28	N/A	ft^2
Vertical Orifice Centroid =	0.21	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.94	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.94	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	3.57	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	23.09	N/A	ft^2
Overflow Grate Open Area w/ Debris =	11.54	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	36.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	31.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	6.47	N/A	ft^2
Outlet Orifice Centroid =	1.39	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.38	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.15	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	75.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.68	feet
Stage at Top of Freeboard =	7.83	feet
Basin Area at Top of Freeboard =	1.13	acres

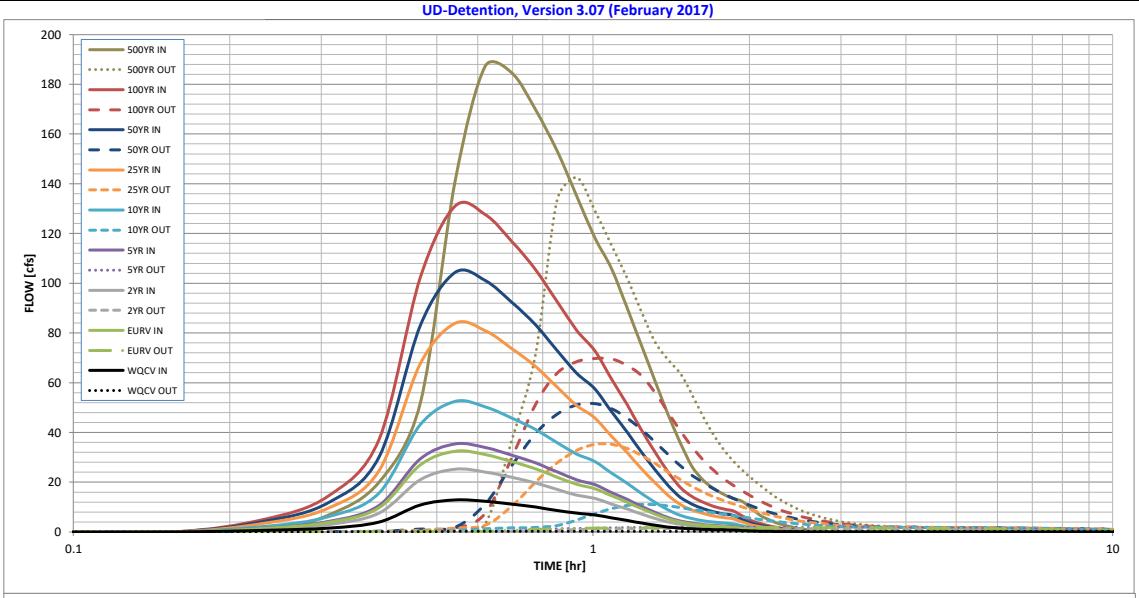
Routed Hydrograph Results

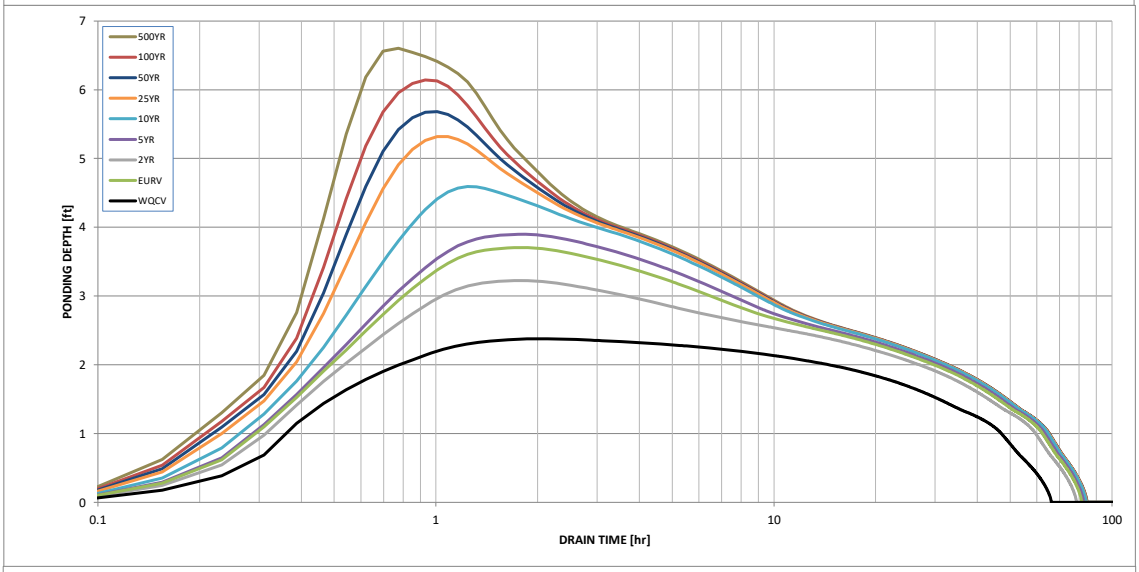
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.20
Calculated Runoff Volume (acre-ft) =	0.721	1.839	1.423	2.010	2.992	4.827	6.040	7.628	11.014
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.720	1.839	1.423	2.011	2.993	4.829	6.036	7.625	11.020
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.22	0.72	1.00	1.34	2.02
Predevelopment Peak Q (cfs) =	0.0	0.0	0.7	1.2	12.0	39.1	54.0	72.4	108.8
Peak Inflow Q (cfs) =	12.8	32.4	25.2	35.4	52.4	83.9	104.3	131.0	187.1
Peak Outflow Q (cfs) =	0.3	1.8	1.4	1.9	11.1	35.2	51.6	69.8	142.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	0.9	0.9	1.0	1.0	1.3
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 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	0.4	1.4	2.1	2.9	3.0
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) =	55	62	62	62	58	51	48	45	38
Time to Drain 99% of Inflow Volume (hours) =	**61**	71	70	72	70	66	64	61	55
Maximum Ponding Depth (ft) =	2.38	3.70	3.22	3.90	4.59	5.32	5.68	6.14	6.60
Area at Maximum Ponding Depth (acres) =	0.68	0.78	0.75	0.80	0.85	0.91	0.94	0.98	1.02
Maximum Volume Stored (acre-ft) =	0.676	1.649	1.283	1.799	2.375	3.006	3.349	3.792	4.252

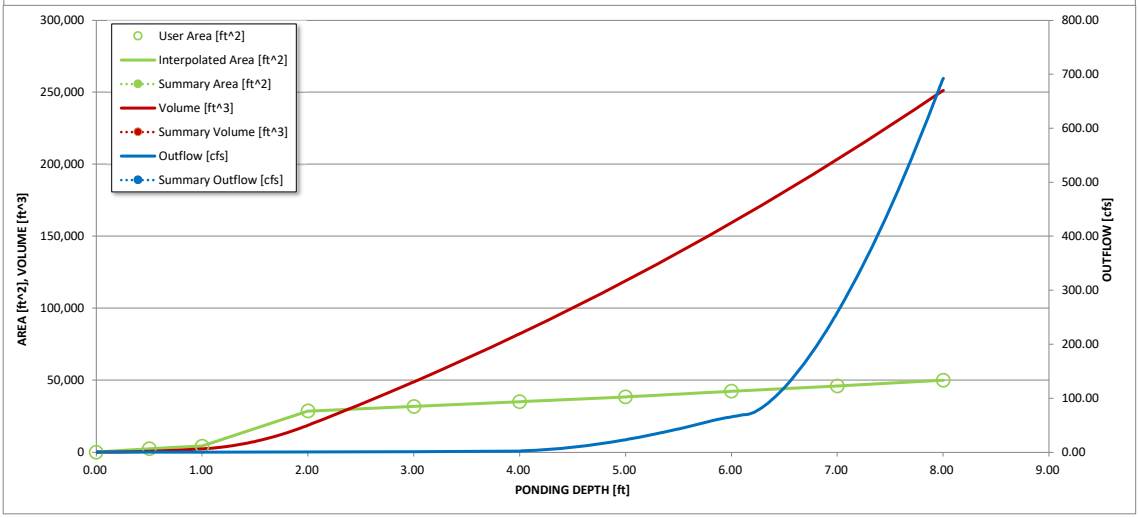
Ratio should be less than or equal to 1.

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			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

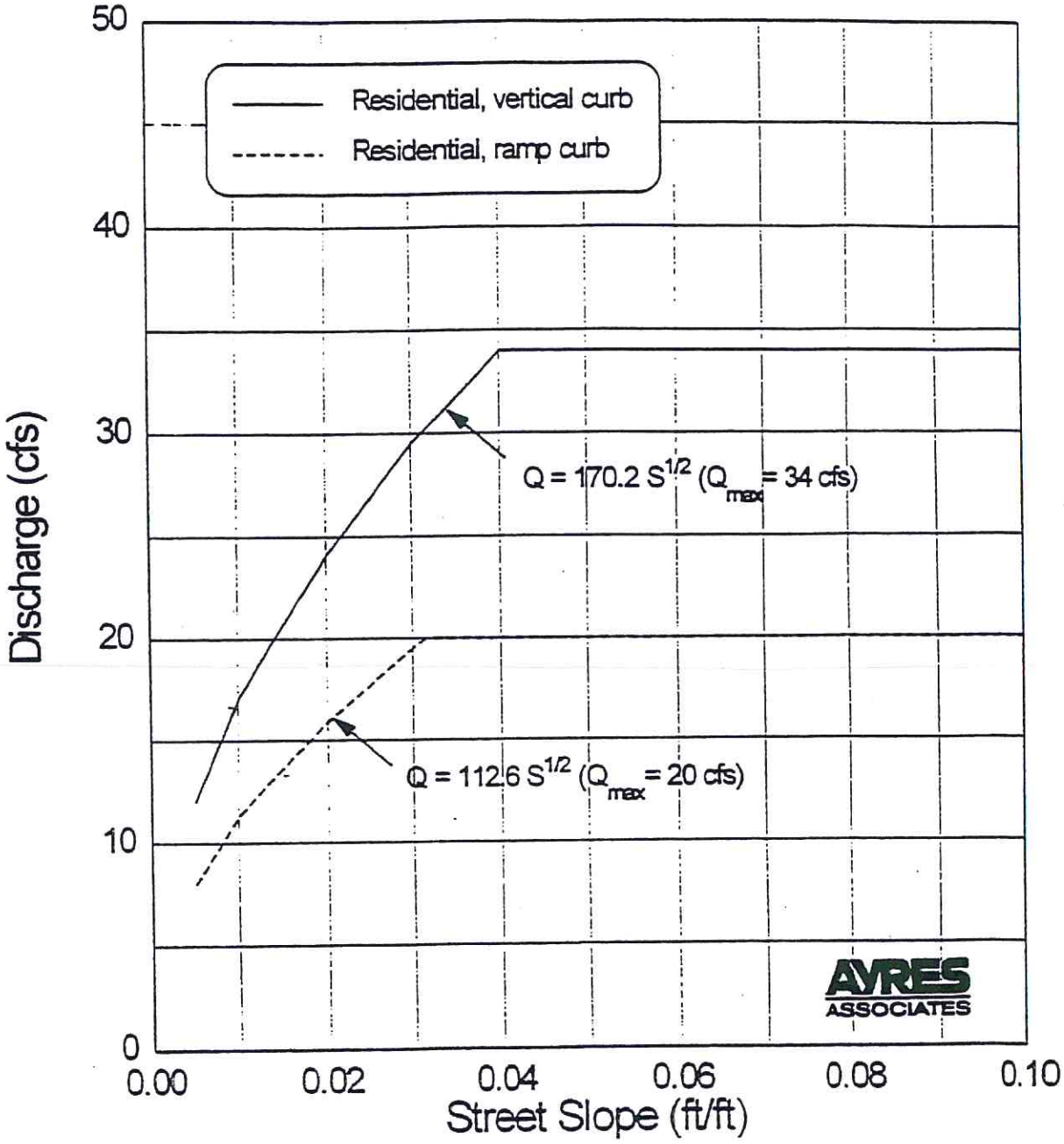
Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	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]
4.65 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:09:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:13:57	0.57	1.40	1.09	1.52	2.22	3.43	4.16	5.05	6.74
1.076	0:18:36	1.53	3.81	2.97	4.16	6.11	9.60	11.78	14.54	20.07
	0:23:15	3.93	9.80	7.63	10.68	15.69	24.66	30.25	37.33	51.57
	0:27:54	10.81	26.90	20.96	29.32	43.06	67.58	82.86	102.16	140.85
	0:32:33	12.85	32.44	25.17	35.42	52.43	83.87	104.30	130.95	187.14
	0:37:12	12.27	31.06	24.08	33.92	50.29	80.89	101.05	127.64	184.61
	0:41:51	11.17	28.27	21.92	30.87	45.77	73.76	92.32	116.87	169.75
	0:46:30	9.98	25.37	19.65	27.72	41.18	66.47	83.22	105.41	153.23
	0:51:09	8.62	22.04	17.04	24.10	35.92	58.20	73.00	92.63	135.03
	0:55:48	7.51	19.14	14.82	20.95	31.30	50.85	63.83	81.06	118.28
	1:00:27	6.80	17.36	13.44	18.99	28.32	45.85	57.45	72.81	105.87
	1:05:06	5.62	14.47	11.17	15.83	23.67	38.49	48.37	61.52	90.01
	1:09:45	4.60	11.93	9.19	13.06	19.57	31.92	40.16	51.13	74.92
	1:14:24	3.55	9.34	7.17	10.24	15.44	25.35	32.00	40.89	60.28
	1:19:03	2.65	7.11	5.42	7.81	11.86	19.62	24.85	31.84	47.12
	1:23:42	1.91	5.22	3.96	5.74	8.80	14.70	18.68	24.03	35.74
	1:28:21	1.48	3.97	3.02	4.36	6.63	10.99	13.92	17.84	26.37
	1:33:00	1.22	3.23	2.47	3.54	5.36	8.82	11.13	14.21	20.88
	1:37:39	1.03	2.73	2.09	2.99	4.52	7.42	9.35	11.92	17.48
	1:42:18	0.91	2.39	1.83	2.62	3.94	6.45	8.11	10.33	15.10
	1:46:57	0.82	2.14	1.64	2.34	3.53	5.76	7.24	9.21	13.44
	1:51:36	0.75	1.97	1.51	2.15	3.23	5.27	6.62	8.41	12.26
	1:56:15	0.55	1.45	1.11	1.59	2.40	3.95	4.99	6.39	9.46
	2:00:54	0.41	1.06	0.81	1.16	1.74	2.85	3.61	4.61	6.82
	2:05:33	0.30	0.78	0.60	0.85	1.28	2.11	2.67	3.42	5.06
	2:10:12	0.22	0.58	0.44	0.63	0.95	1.57	1.99	2.54	3.76
	2:14:51	0.16	0.42	0.32	0.46	0.70	1.15	1.46	1.87	2.78
	2:19:30	0.11	0.30	0.23	0.33	0.50	0.83	1.05	1.35	2.01
	2:24:09	0.08	0.22	0.16	0.24	0.36	0.60	0.76	0.98	1.46
	2:28:48	0.05	0.15	0.11	0.16	0.25	0.42	0.54	0.69	1.04
	2:33:27	0.03	0.09	0.07	0.10	0.16	0.27	0.35	0.46	0.69
	2:38:06	0.02	0.05	0.04	0.06	0.09	0.16	0.20	0.27	0.41
	2:42:45	0.00	0.02	0.01	0.02	0.04	0.07	0.10	0.13	0.21
	2:47:24	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.07
	2:52:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:56:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:01:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:06:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:24:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:29:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:33:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:38:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:43:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:47:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:52:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:11:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:29:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:34:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:39:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:43:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:48:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:52:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:57:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:02:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:06:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:11:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:16:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:34:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix B
Hydraulic Calculations

RESIDENTIAL STREET (34' Flowline to flowline)



Interim Release October 12, 1994
City of Colorado Springs

Use this graph to determine the allowable street capacity per side, initial storm, for the typical street section using a 2% crown.

Minor Storm

34-foot Wide Street
6-inch Ramp Curb

Area	Perimeter	Top Width	Wetted Perimeter	R_n	Slope	n	Velocity	One Lane Capacity
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	0.5 %	0.016	2.2 ft/sec	*7 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	0.7 %	0.016	2.6 ft/sec	*8 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	1.0 %	0.016	3.1 ft/sec	*9 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	1.5 %	0.016	3.8 ft/sec	*11 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	2.0 %	0.016	4.4 ft/sec	*13 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	2.5 %	0.016	4.9 ft/sec	*15 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	3.0 %	0.016	5.4 ft/sec	*16 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	3.5 %	0.016	5.9 ft/sec	*18 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	4.0 %	0.016	6.3 ft/sec	*19 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	4.5 %	0.016	6.6 ft/sec	*20 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	5.0 %	0.016	7.0 ft/sec	*21 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	5.5 %	0.016	7.3 ft/sec	*22 cfs*
3.0 sf	34.9 sf	19.5 ft	15.4 ft	0.2 ft	6.0 %	0.016	7.7 ft/sec	*23 cfs*

Minor Storm Criteria: Flow spread to crown. Maximum 20 cfs per side.

Major Storm

34-foot Wide Street
6-inch Ramp Curb

Area	Perimeter	Top Width	Wetted Perimeter	R_n	Slope	n	Velocity	Overall Capacity
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	0.5 %	0.02	3.0 ft/sec	*56 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	0.7 %	0.02	3.6 ft/sec	*67 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	1.0 %	0.02	4.3 ft/sec	*80 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	1.5 %	0.02	5.3 ft/sec	*97 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	2.0 %	0.02	6.1 ft/sec	*112 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	2.5 %	0.02	6.8 ft/sec	*126 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	3.0 %	0.02	7.4 ft/sec	*138 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	3.5 %	0.02	8.0 ft/sec	*149 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	4.0 %	0.02	8.6 ft/sec	*159 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	4.5 %	0.02	9.1 ft/sec	*169 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	5.0 %	0.02	9.6 ft/sec	*178 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	5.5 %	0.02	10.1 ft/sec	*187 cfs*
18.5 sf	85.7 sf	43.5 ft	42.2 ft	0.4 ft	6.0 %	0.02	10.5 ft/sec	*195 cfs*

Major Storm Criteria: 12" maximum depth at flowline, no adjacent overtopping.

Peaceful Ridge at Fountain Valley Subdivision
Street Capacity Calculation

Minor Storm
36-foot Wide Street
6-inch Ramp Curb

Area	Perimeter	Top Width	Wetted Perimeter	R_n	Slope	n	Velocity	One Lane Capacity
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	0.5 %	0.016	2.2 ft/sec	*8 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	0.7 %	0.016	2.6 ft/sec	*10 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	1.0 %	0.016	3.1 ft/sec	*12 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	1.5 %	0.016	3.8 ft/sec	*14 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	2.0 %	0.016	4.4 ft/sec	*17 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	2.5 %	0.016	4.9 ft/sec	*19 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	3.0 %	0.016	5.4 ft/sec	*21 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	3.5 %	0.016	5.8 ft/sec	*22 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	4.0 %	0.016	6.2 ft/sec	*24 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	4.5 %	0.016	6.6 ft/sec	*25 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	5.0 %	0.016	7.0 ft/sec	*26 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	5.5 %	0.016	7.3 ft/sec	*28 cfs*
3.8 sf	39.1 sf	19.5 ft	19.6 ft	0.2 ft	6.0 %	0.016	7.6 ft/sec	*29 cfs*

Minor Storm Criteria: Flow spread to crown. Maximum 20 cfs per side.

Major Storm
36-foot Wide Street
6-inch Ramp Curb

Area	Perimeter	Top Width	Wetted Perimeter	R_n	Slope	n	Velocity	Overall Capacity
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	0.5 %	0.02	3.0 ft/sec	*58 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	0.7 %	0.02	3.6 ft/sec	*68 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	1.0 %	0.02	4.3 ft/sec	*81 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	1.5 %	0.02	5.2 ft/sec	*100 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	2.0 %	0.02	6.0 ft/sec	*115 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	2.5 %	0.02	6.7 ft/sec	*129 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	3.0 %	0.02	7.4 ft/sec	*141 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	3.5 %	0.02	8.0 ft/sec	*152 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	4.0 %	0.02	8.5 ft/sec	*163 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	4.5 %	0.02	9.0 ft/sec	*173 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	5.0 %	0.02	9.5 ft/sec	*182 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	5.5 %	0.02	10.0 ft/sec	*191 cfs*
19.1 sf	87.7 sf	43.5 ft	44.2 ft	0.4 ft	6.0 %	0.02	10.4 ft/sec	*199 cfs*

Major Storm Criteria: 12" maximum depth at flowline, no adjacent overtopping.

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 1A	Inlet 1	Inlet 2	Inlet 3	Inlet 8	Inlet 7	Inlet 4	Inlet 5	Inlet 6
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{known} (cfs)	6.4	14.3	10.3	8.9	5.8	6.4	12.9	8.8	10.1
Major Q_{known} (cfs)	20.4	30.2	21.9	18.9	12.3	13.4	27.2	18.7	21.0

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	Inlet 1	Inlet 2	No Bypass Flow Received	No Bypass Flow Received	Inlet 7	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	8.4	8.4	0.0	0.0	2.1	13.0	0.0

Watershed Characteristics

Subcatchment Area (acres)									
Percent Impervious									
NRCS Soil Type									

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

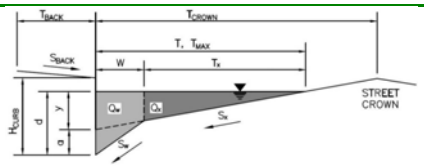
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**6.4**	**14.3**	**10.9**	**8.9**	**5.8**	**6.4**	**12.9**	**8.8**	**10.1**
Major Total Design Peak Flow, Q (cfs)	**20.4**	**30.2**	**30.3**	**27.3**	**12.3**	**13.4**	**29.3**	**31.7**	**21.0**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.6	0.0	0.3	0.0	0.0	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	3.0	8.4	8.4	10.7	0.1	2.1	4.7	N/A	N/A

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 1**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.042	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

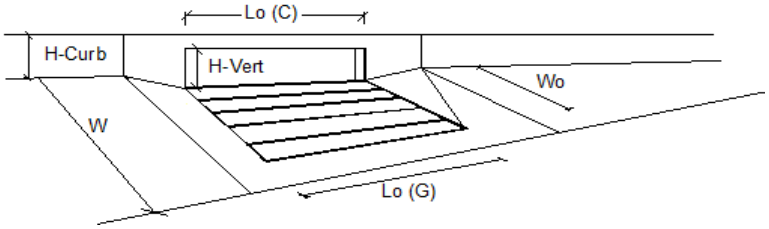
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.0**	**16.0**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



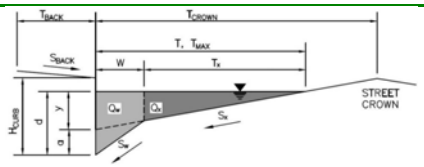
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	4	4	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**13.7**	**21.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.6**	**8.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**96**	**72**	**%**

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 1A**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.032	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

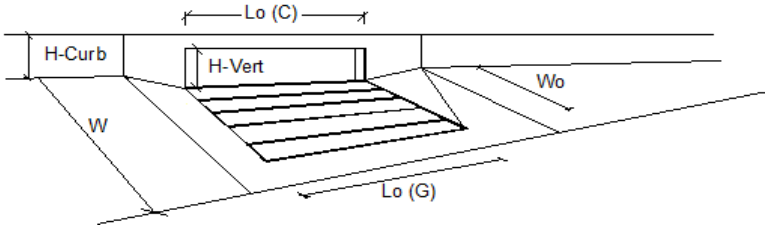
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.5**	**17.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



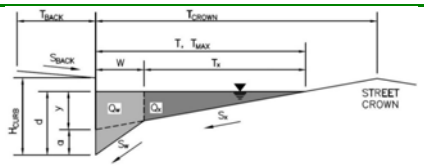
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	4	4	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.4**	**17.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**85**	**%**

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.042	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

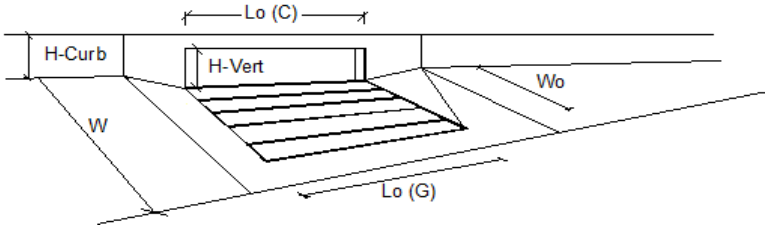
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.0**	**16.0**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



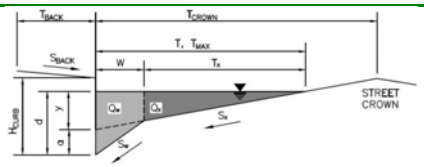
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	4	4	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**10.9**	**21.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**8.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**72**	**%**

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.042	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

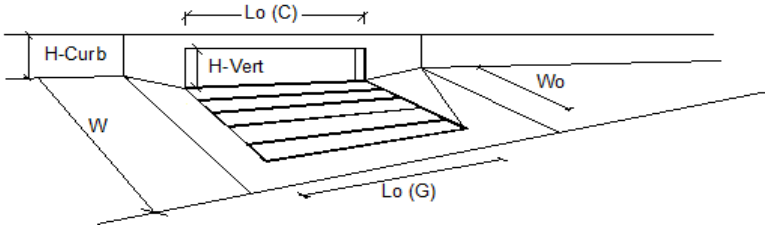
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.0**	**16.0**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



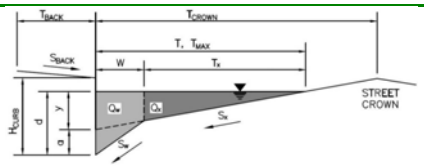
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.6**	**16.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.3**	**10.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**61**	**%**

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

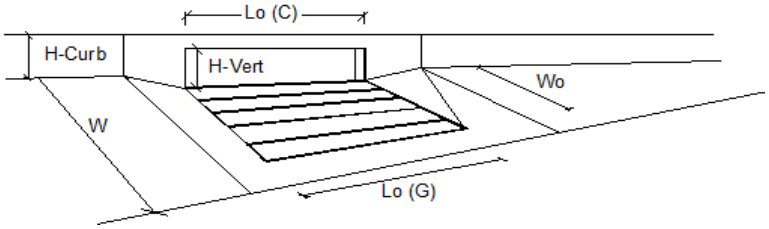
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.9**	**18.2**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



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 =	5	5	
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	

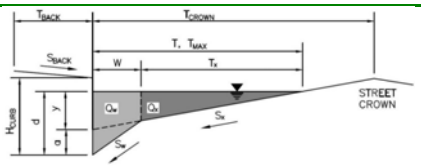
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**12.9**	**24.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**84**	**%**

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

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

Project: **Peaceful Valley Sub - Addendum**

Inlet ID: **Inlet 5**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	4.08	4.08	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	5.59	5.59	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	15.0	15.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.350	0.350	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	31.2	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	16.7	29.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.318	0.186	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

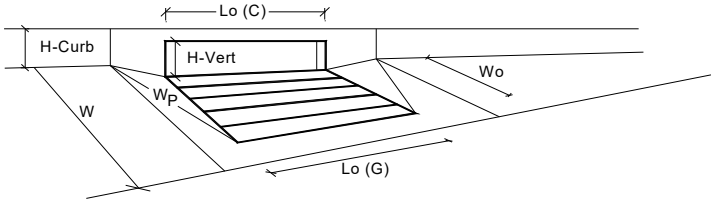
MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	4	4	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.46	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.87	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**18.2**	**32.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	8.8	31.7	cfs

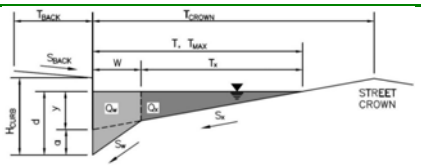
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **Peaceful Valley Sub - Addendum**

Inlet ID: **Inlet 6**



Gutter Geometry:

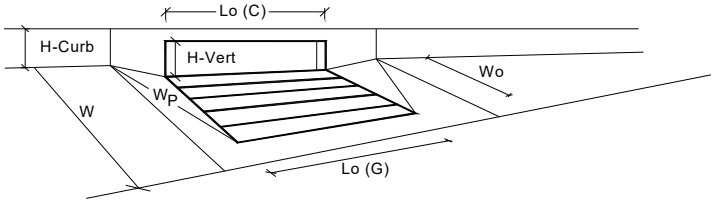
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

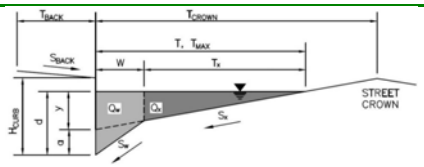


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.46	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.87	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**13.5**	**24.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	10.1	21.0	cfs

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 7**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

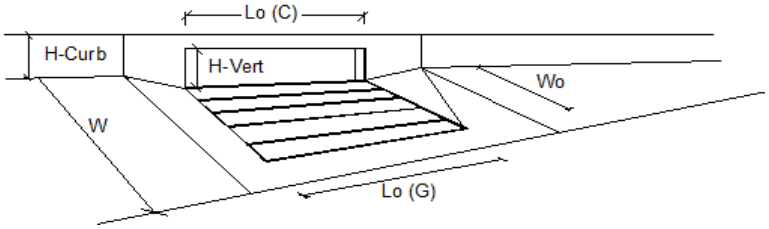
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.3**	**16.3**	**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

MHFD-Inlet, Version 5.01 (April 2021)



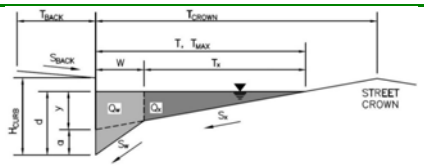
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.4**	**11.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**85**	**%**

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

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

Project: **Peaceful Valley Sub - Addendum**
Inlet ID: **Inlet 8**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	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} =	0.017	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

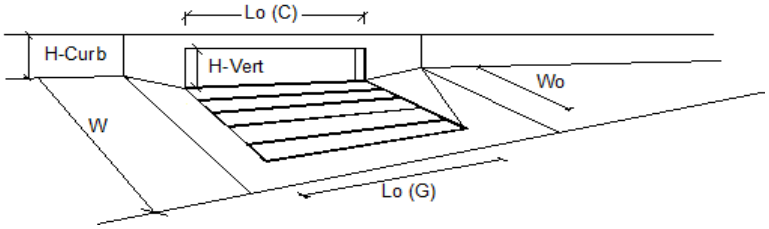
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.2	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.3**	**16.3**	**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

MHFD-Inlet, Version 5.01 (April 2021)



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 =	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 =**	**5.8**	**12.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**99**	**%**

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Peaceful Ridge Sub

100-Year HGL/EGL Analysis

****

NOTE: The summary statistics displayed in this report are

based on results found at every computational time step,

not just on results from each reporting time step.

****

****

Analysis Options

****

Flow Units ..... CFS

Process Models:

  Rainfall/Runoff ..... YES

  RDII ..... NO

  Snowmelt ..... NO

  Groundwater ..... NO

  Flow Routing ..... YES

  Ponding Allowed ..... YES

  Water Quality ..... NO

Flow Routing Method ..... DYNWAVE

Surcharge Method ..... EXTRAN

Starting Date 03/16/2021 00:00:00

Ending Date 03/16/2021 03:00:00

Antecedent Dry Days 0.0

Report Time Step 00:05:00

Routing Time Step ..... 30.00 sec

Variable Time Step ..... YES

Maximum Trials 8

Number of Threads 1

Head Tolerance ..... 0.005000 ft

**********	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
**********	---	---
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	83.871	27.331
External Outflow	73.335	23.897
Flooding Loss	10.456	3.407
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.380	0.124
Continuity Error (%)	-0.358	

****

Highest Continuity Errors

****

Node MH-3 (5.12%)

Node MH-4B (-2.01%)

Node 6 (-1.69%)

****

Time-Step Critical Elements

****

Link 25 (10165.88%)

Link 12 (68.72%)

****

Highest Flow Instability Indexes

****

Link 12 (26)

Link 26 (15)

Link 15 (9)

Link 7B (6)

Link 25 (6)

****

Routing Time Step Summary

****

Minimum Time Step	:	0.35 sec
Average Time Step	:	0.50 sec
Maximum Time Step	:	0.65 sec
Percent in Steady State	:	99.02
Average Iterations per Step	:	4.24
Percent Not Converging	:	23.70
Time Step Frequencies	:	
30.000 - 13.228 sec	:	0.00 %
13.228 - 5.833 sec	:	0.00 %
5.833 - 2.572 sec	:	0.00 %
2.572 - 1.134 sec	:	0.00 %
1.134 - 0.500 sec	:	100.00 %

****

Node Depth Summary

****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Feet
6	JUNCTION	2.54	2.83	5735.01	0	00:01	2.55
MH-6	JUNCTION	2.93	3.20	5735.56	0	00:01	2.94
MH-5	JUNCTION	3.48	4.00	5736.72	0	00:01	3.49
MH-3	JUNCTION	2.28	2.29	5746.29	0	00:01	2.29
3	JUNCTION	1.38	1.64	5747.44	0	00:00	1.38
MH-2	JUNCTION	1.55	1.59	5766.59	0	00:01	1.56
2	JUNCTION	1.48	2.50	5768.77	0	00:00	1.48
MH-1	JUNCTION	1.21	1.24	5777.60	0	00:00	1.21
1	JUNCTION	1.59	2.00	5780.13	0	00:00	1.59
MH-1A	JUNCTION	1.01	1.02	5795.46	0	00:01	1.02
1A	JUNCTION	1.22	1.50	5797.50	0	00:00	1.22
MH-4C	JUNCTION	2.48	2.50	5738.21	0	00:01	2.50
4	JUNCTION	1.90	2.50	5743.51	0	00:00	1.90
MH-4B	JUNCTION	2.37	2.41	5742.46	0	00:01	2.38
MH-4A	JUNCTION	1.36	1.50	5748.75	0	00:00	1.36
8	JUNCTION	1.04	1.50	5750.04	0	00:00	1.04
7	JUNCTION	0.77	1.01	5750.57	0	00:00	0.77
5	JUNCTION	3.14	3.94	5737.13	0	00:01	3.15
Outlet	JUNCTION	3.00	3.00	5733.61	0	00:00	3.00
MH-7	JUNCTION	2.99	3.00	5733.28	0	00:00	3.00
9	JUNCTION	1.48	1.99	5740.20	0	00:00	1.48
MH-10	JUNCTION	1.88	2.38	5732.63	0	00:00	1.88
10	JUNCTION	1.36	3.50	5735.36	0	00:00	1.36
Forebay	OUTFALL	2.19	2.20	5734.27	0	00:01	2.20
FES-1	OUTFALL	2.24	2.24	5729.74	0	00:01	2.24
END	OUTFALL	1.87	2.17	5731.24	0	00:00	1.87

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Node Inflow Summary

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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
6	JUNCTION	21.00	156.85	0 00:01	1.7	12.6	-1.659
MH-6	JUNCTION	0.00	135.42	0 00:01	0	10.9	-0.245
MH-5	JUNCTION	0.00	61.23	0 00:01	0	4.93	-0.375
MH-3	JUNCTION	0.00	78.90	0 00:01	0	6.25	5.398
3	JUNCTION	16.60	16.60	0 00:00	1.34	1.34	-0.026
MH-2	JUNCTION	0.00	60.99	0 00:01	0	4.92	0.091
2	JUNCTION	21.90	21.90	0 00:00	1.77	1.77	0.012
MH-1	JUNCTION	0.00	39.15	0 00:01	0	3.16	0.233
1	JUNCTION	21.80	21.80	0 00:00	1.76	1.76	0.006
MH-1A	JUNCTION	0.00	18.35	0 00:00	0	1.4	0.582
1A	JUNCTION	17.40	17.40	0 00:00	1.41	1.41	0.043
MH-4C	JUNCTION	0.00	49.65	0 00:01	0	3.97	0.307
4	JUNCTION	24.60	24.60	0 00:00	1.99	1.99	-0.072

MH-4B	JUNCTION	0.00	50.26	0	00:01	0	3.9	-1.971
MH-4A	JUNCTION	0.00	27.16	0	00:00	0	1.9	-0.570
8	JUNCTION	12.20	12.20	0	00:00	0.986	0.986	0.039
7	JUNCTION	11.30	11.30	0	00:00	0.913	0.913	0.064
5	JUNCTION	31.70	31.70	0	00:00	2.56	2.56	-0.604
Outlet	JUNCTION	69.80	69.80	0	00:00	5.64	5.64	0.048
MH-7	JUNCTION	0.00	79.43	0	00:00	0	3.92	0.411
9	JUNCTION	61.40	61.40	0	00:00	4.96	4.96	0.330
MH-10	JUNCTION	0.00	108.27	0	00:00	0	7.25	0.015
10	JUNCTION	28.60	28.60	0	00:00	2.31	2.31	0.013
Forebay	OUTFALL	0.00	159.53	0	00:01	0	12.8	0.000
FES-1	OUTFALL	0.00	47.54	0	00:01	0	3.83	0.000
END	OUTFALL	0.00	115.21	0	00:00	0	7.25	0.000

****

Node Surcharge Summary

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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
6	JUNCTION	0.01	0.000	0.000
MH-6	JUNCTION	2.98	0.367	0.000
MH-5	JUNCTION	2.98	1.167	0.000
2	JUNCTION	0.01	0.000	0.000
1	JUNCTION	0.01	0.000	0.000
1A	JUNCTION	0.01	0.000	0.000
MH-4C	JUNCTION	2.97	0.000	0.000
4	JUNCTION	0.01	0.000	0.000
8	JUNCTION	0.01	0.000	0.000
5	JUNCTION	2.98	1.686	0.564
Outlet	JUNCTION	2.99	0.000	0.000
MH-7	JUNCTION	2.99	0.000	0.000
10	JUNCTION	0.01	1.500	0.000

****

Node Flooding Summary

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Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
6	0.01	4.26	0 00:01	0.000	0.000
MH-6	0.01	17.04	0 00:01	0.000	0.000
MH-5	0.01	8.87	0 00:01	0.000	0.000
2	0.01	20.25	0 00:00	0.002	0.000
1	0.01	20.29	0 00:00	0.002	0.000
1A	0.01	9.53	0 00:00	0.000	0.000
MH-4C	2.97	20.10	0 00:01	1.608	0.000
4	0.01	22.34	0 00:00	0.001	0.000
8	0.01	2.91	0 00:00	0.000	0.000
Outlet	2.99	51.10	0 00:00	1.713	0.000
MH-7	2.99	26.33	0 00:00	0.080	0.000
10	0.01	12.91	0 00:00	0.000	0.000

****

Outfall Loading Summary

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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Forebay	100.00	158.65	159.53	12.816
FES-1	100.00	47.38	47.54	3.827
END	100.00	89.78	115.21	7.253
System	100.00	295.81	296.95	23.896

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Link Flow Summary

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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
17	CONDUIT	159.53	0	00:01	17.32	2.05	0.89
16	CONDUIT	135.85	0	00:01	13.65	1.66	1.00
15	CONDUIT	61.56	0	00:01	6.04	0.60	1.00
10	CONDUIT	17.33	0	00:00	8.70	0.36	0.79
8	CONDUIT	25.01	0	00:00	9.10	0.29	0.61
7D	CONDUIT	23.14	0	00:00	9.73	0.41	0.72
7	CONDUIT	39.09	0	00:01	15.31	0.47	0.56
11	CONDUIT	73.85	0	00:01	15.26	1.04	0.96
9	CONDUIT	62.31	0	00:01	17.24	0.73	0.77
7C	CONDUIT	17.35	0	00:01	13.64	0.80	0.68
14	CONDUIT	29.32	0	00:01	5.97	0.80	1.00
13	CONDUIT	49.65	0	00:01	11.65	1.08	0.98
25	CONDUIT	26.63	0	00:00	8.78	0.18	0.86
24	CONDUIT	14.78	0	00:00	10.10	1.00	0.89
23	CONDUIT	12.40	0	00:00	10.36	0.24	0.52
22	CONDUIT	25.74	0	00:01	9.60	0.88	0.82
12	CONDUIT	39.48	0	00:00	11.63	0.43	1.00
7B	CONDUIT	18.35	0	00:00	11.38	1.04	1.00
26	CONDUIT	79.43	0	00:00	17.82	1.68	1.00
27	CONDUIT	47.54	0	00:01	7.26	1.03	0.87
9AB	CONDUIT	79.54	0	00:00	17.51	0.48	0.51
10-END	CONDUIT	115.21	0	00:00	16.53	0.57	0.56
10-10MH	CONDUIT	34.26	0	00:00	14.14	0.96	0.86

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Flow Classification Summary

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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
17	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
16	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
15	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
10	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.01	0.00	0.00
8	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
7D	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
7	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00
11	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
9	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.99	0.00
7C	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
14	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
13	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.00	0.00
25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
24	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
23	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
22	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.99	0.00
12	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
7B	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
26	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
27	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
9AB	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
10-END	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
10-10MH	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

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Conduit Surcharge Summary

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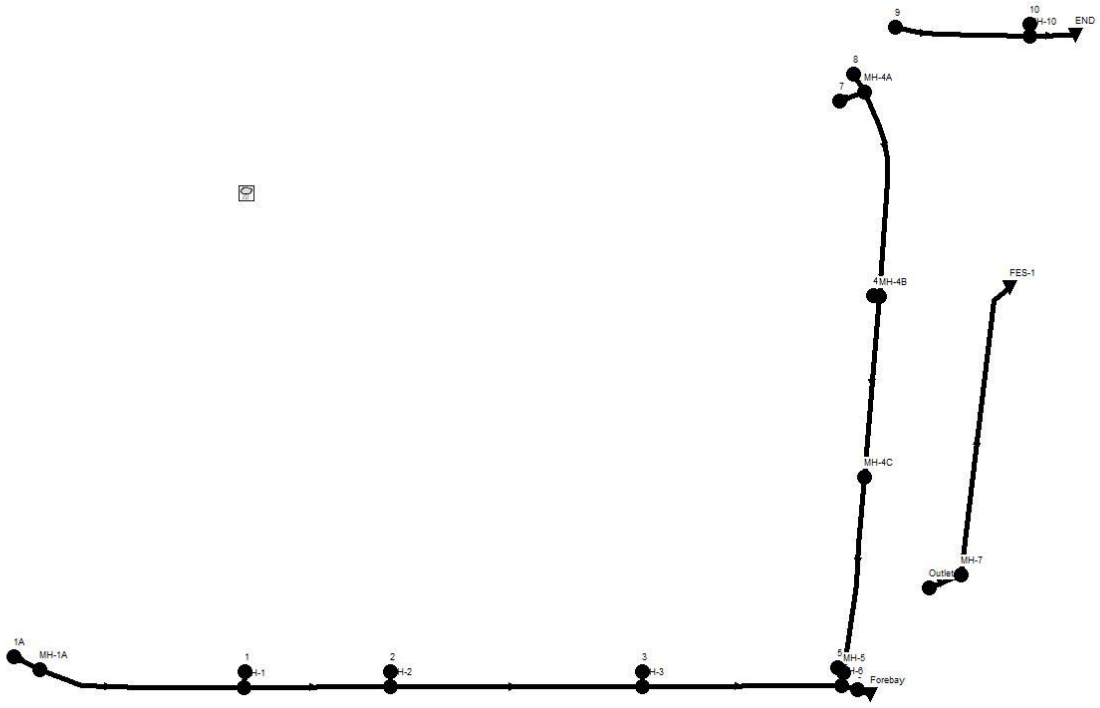
Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
17	0.01	0.01	0.01	2.98	0.01
16	0.01	2.98	0.01	2.98	0.01
15	2.98	2.98	2.98	0.01	2.98
8	0.01	0.01	0.01	0.01	0.01
7D	0.01	0.01	0.01	0.01	0.01
11	0.01	0.01	2.98	2.97	0.01
14	2.97	2.97	2.98	0.01	0.01
13	0.01	0.01	2.97	2.98	0.01
25	0.01	0.01	0.01	0.01	0.01
24	0.01	0.01	0.01	0.01	0.01
12	2.98	2.98	2.98	0.01	0.01
7B	0.01	0.01	0.01	0.01	0.01
26	2.99	2.99	2.99	3.00	0.01
27	0.01	2.99	0.01	2.98	0.01
10-10MH	0.01	0.01	0.01	0.01	0.01

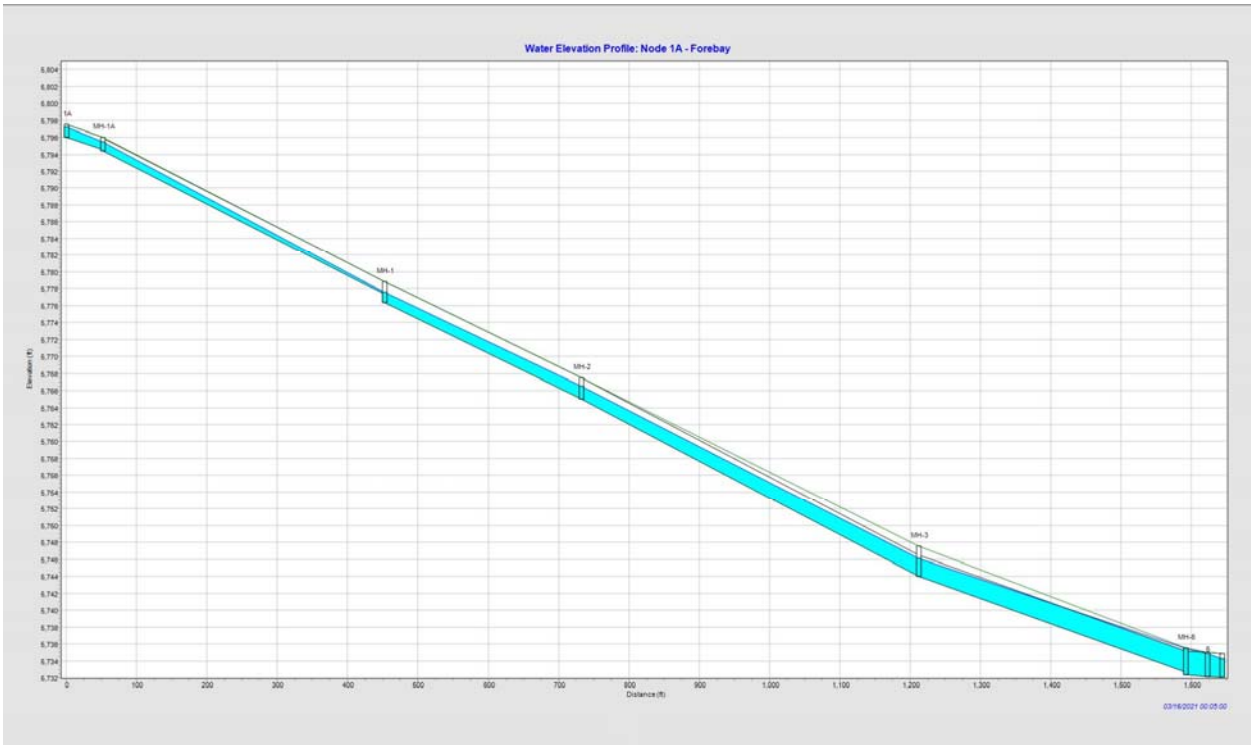
Analysis begun on: Mon Nov 22 14:21:27 2021

Analysis ended on: Mon Nov 22 14:21:27 2021

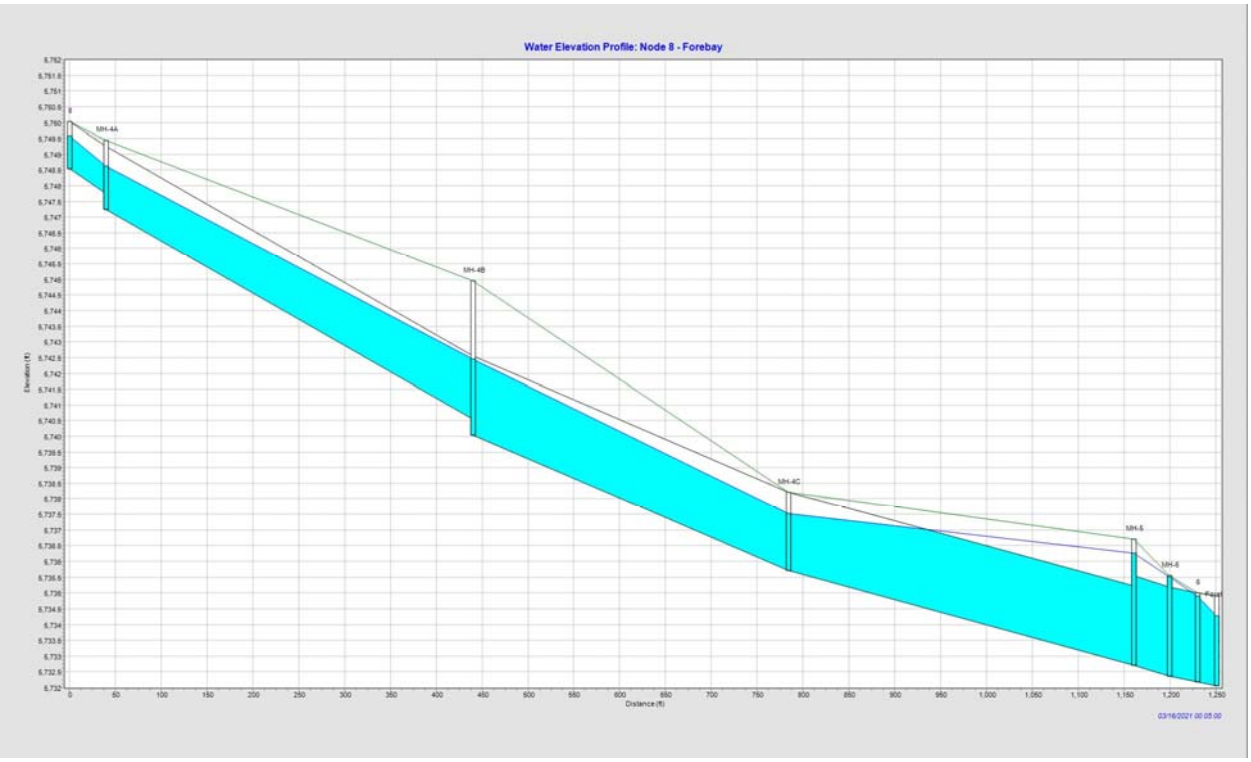
Total elapsed time: < 1 sec



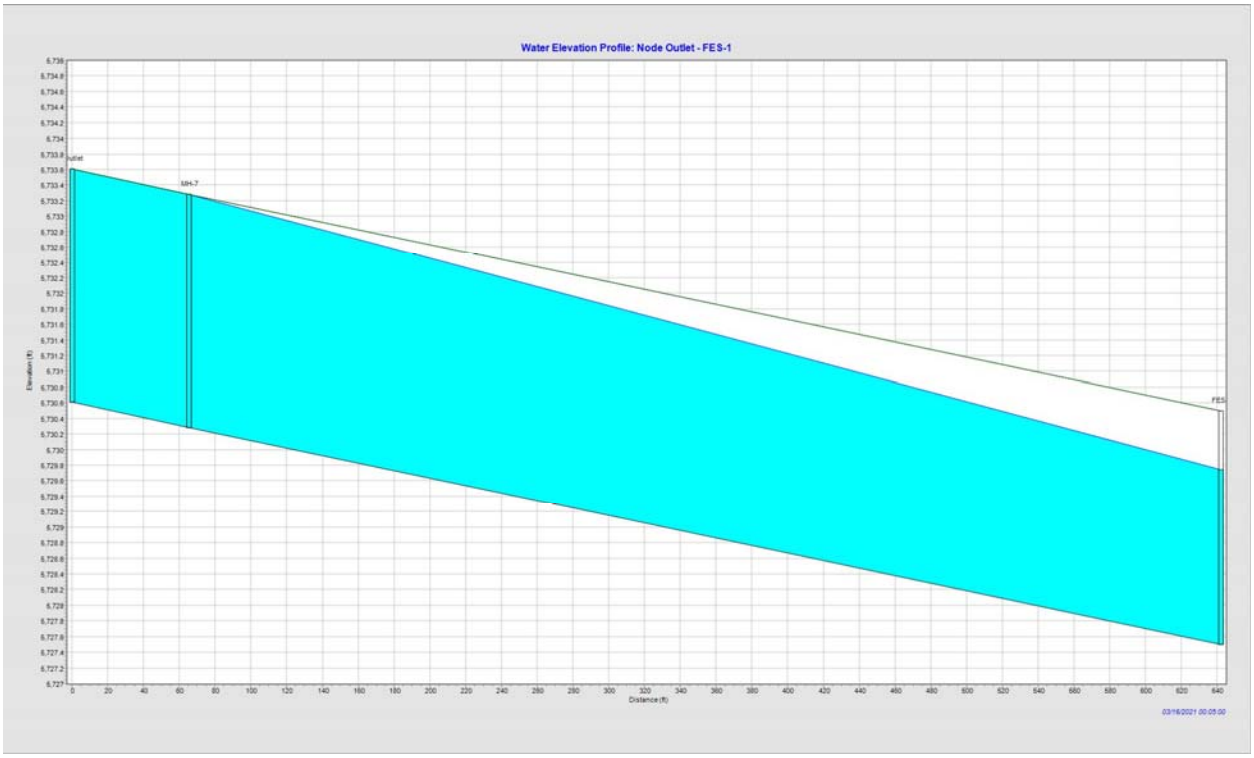
Peaceful Ridge Sub Schematic layout of storm system with designations.



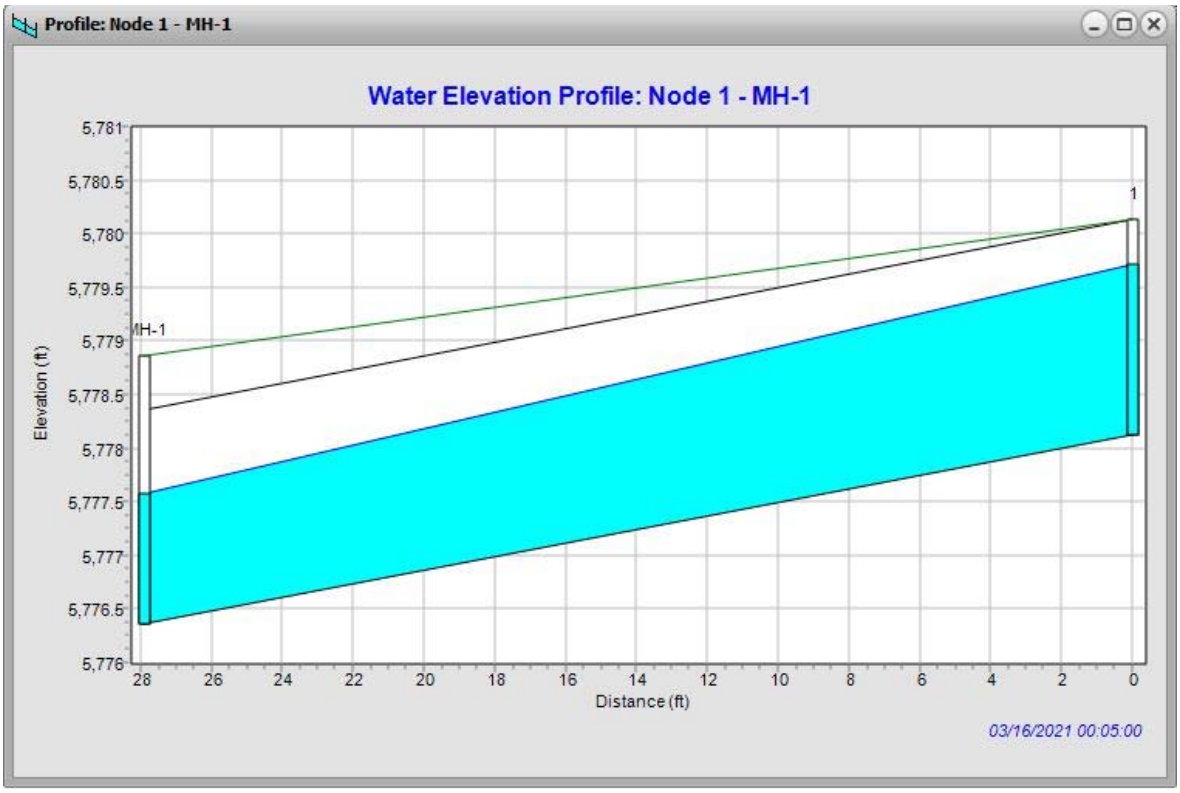
Storm A



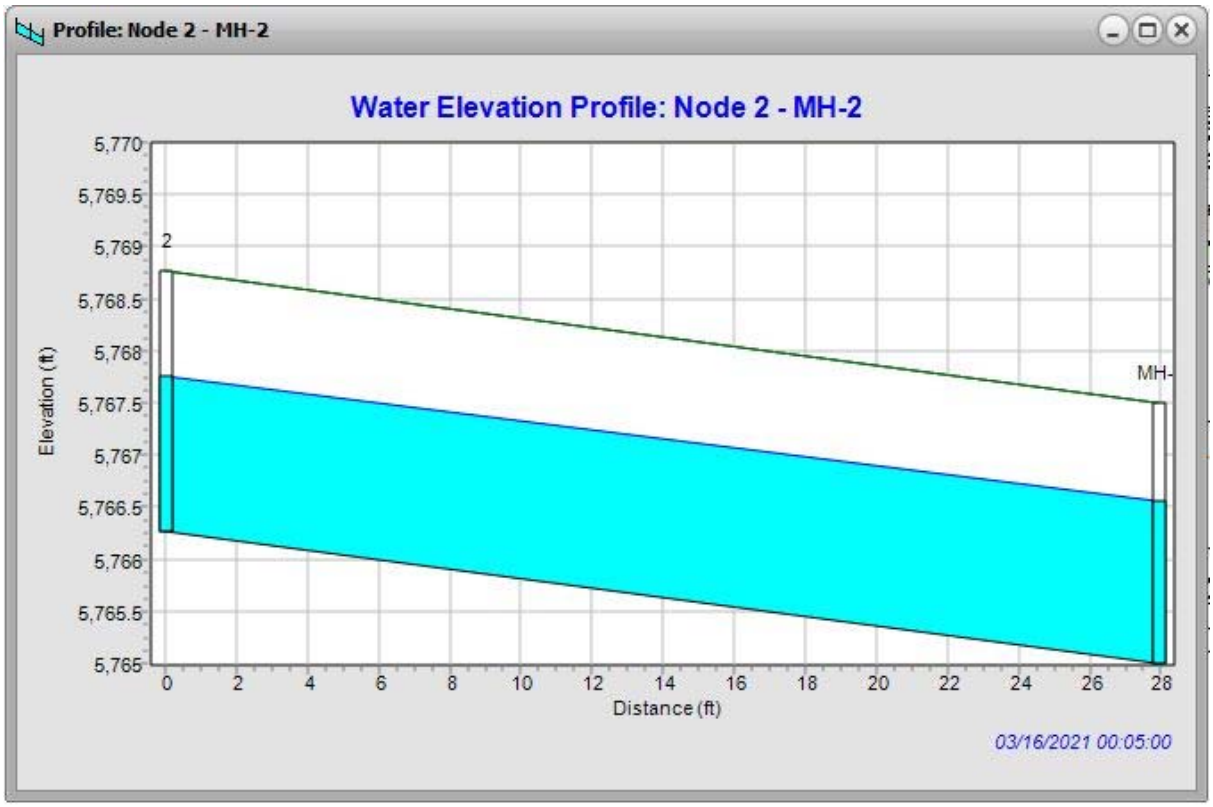
Storm B



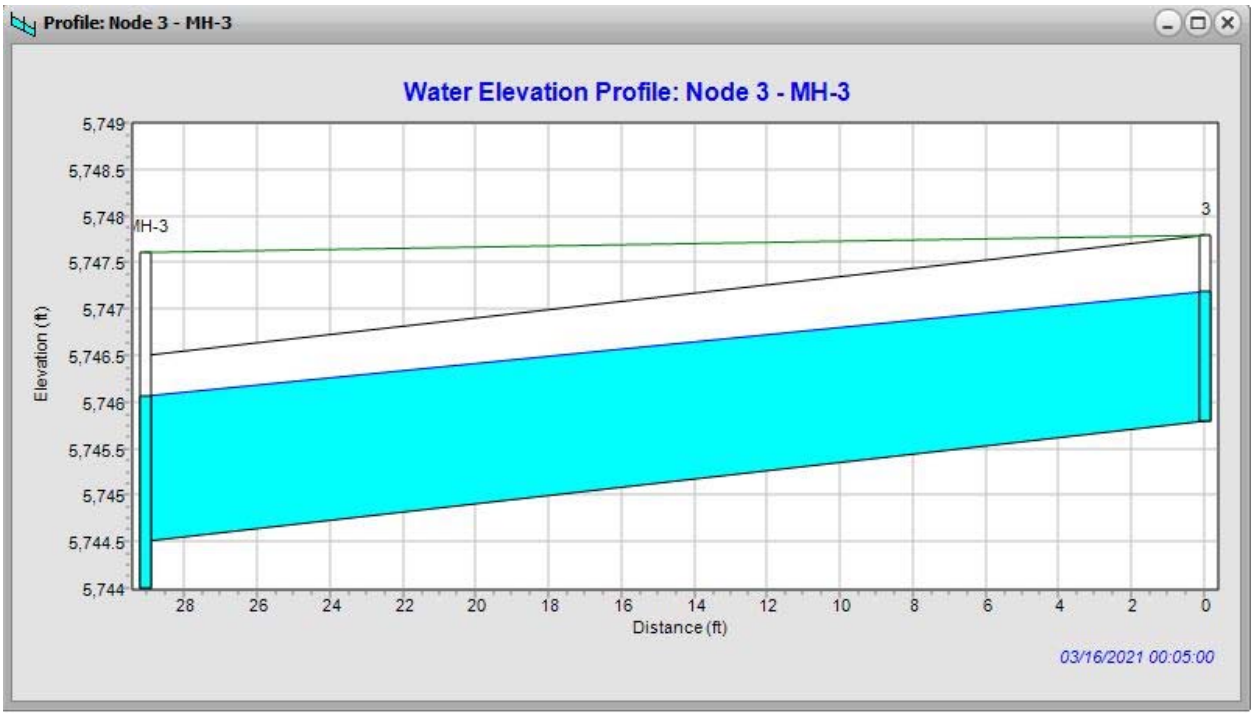
Storm C (Outfall)



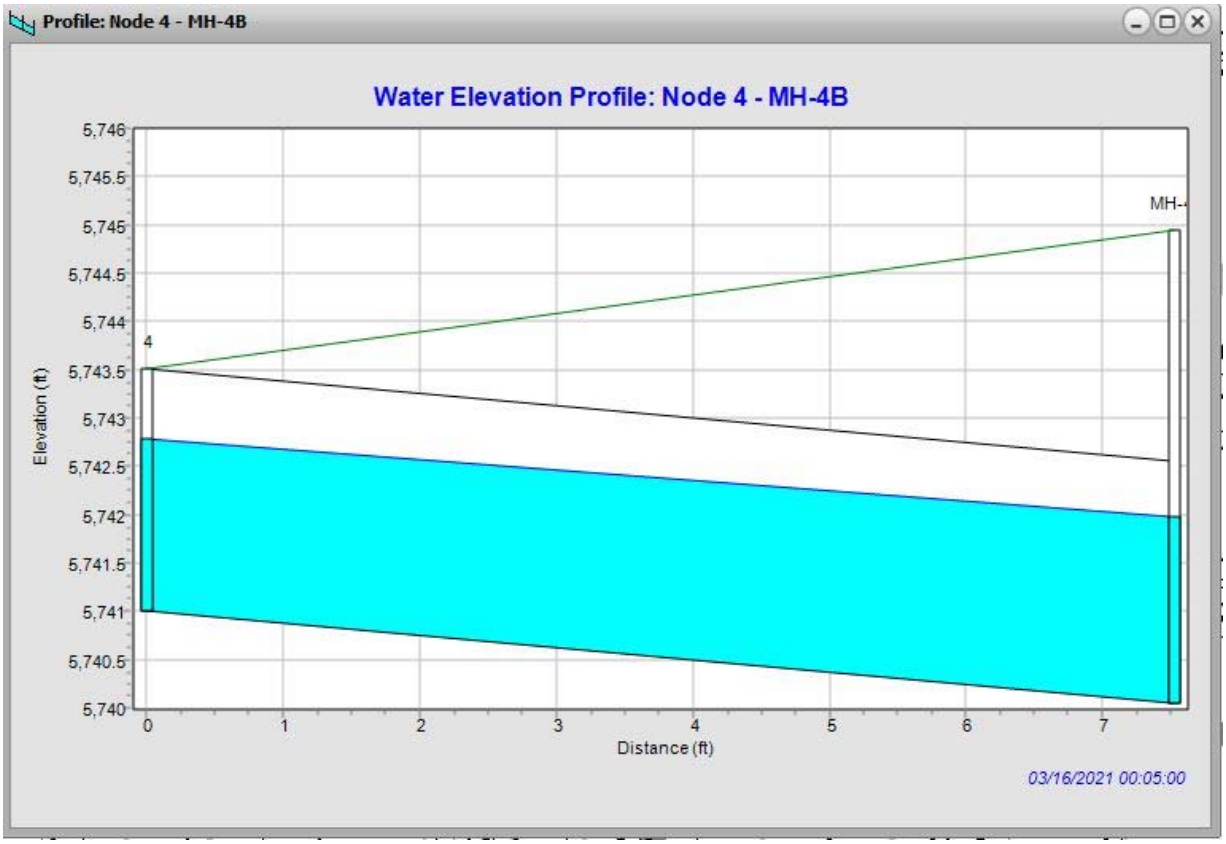
Lateral 1



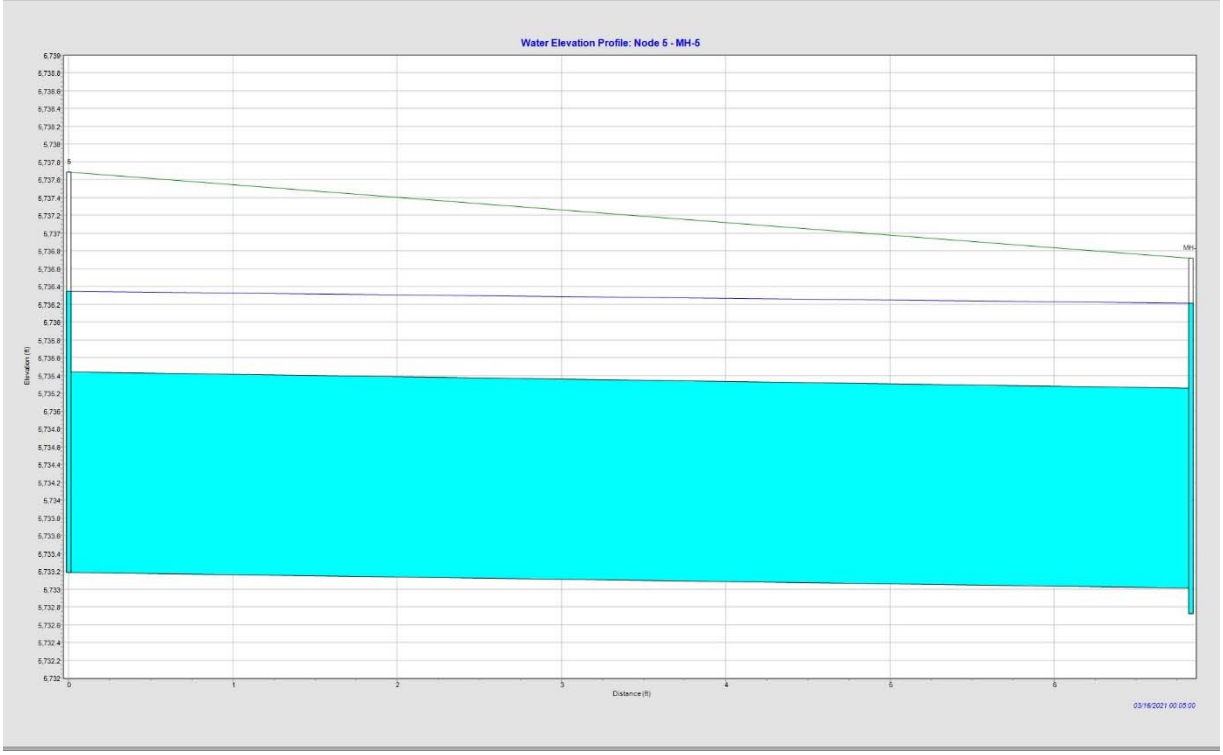
Lateral 2



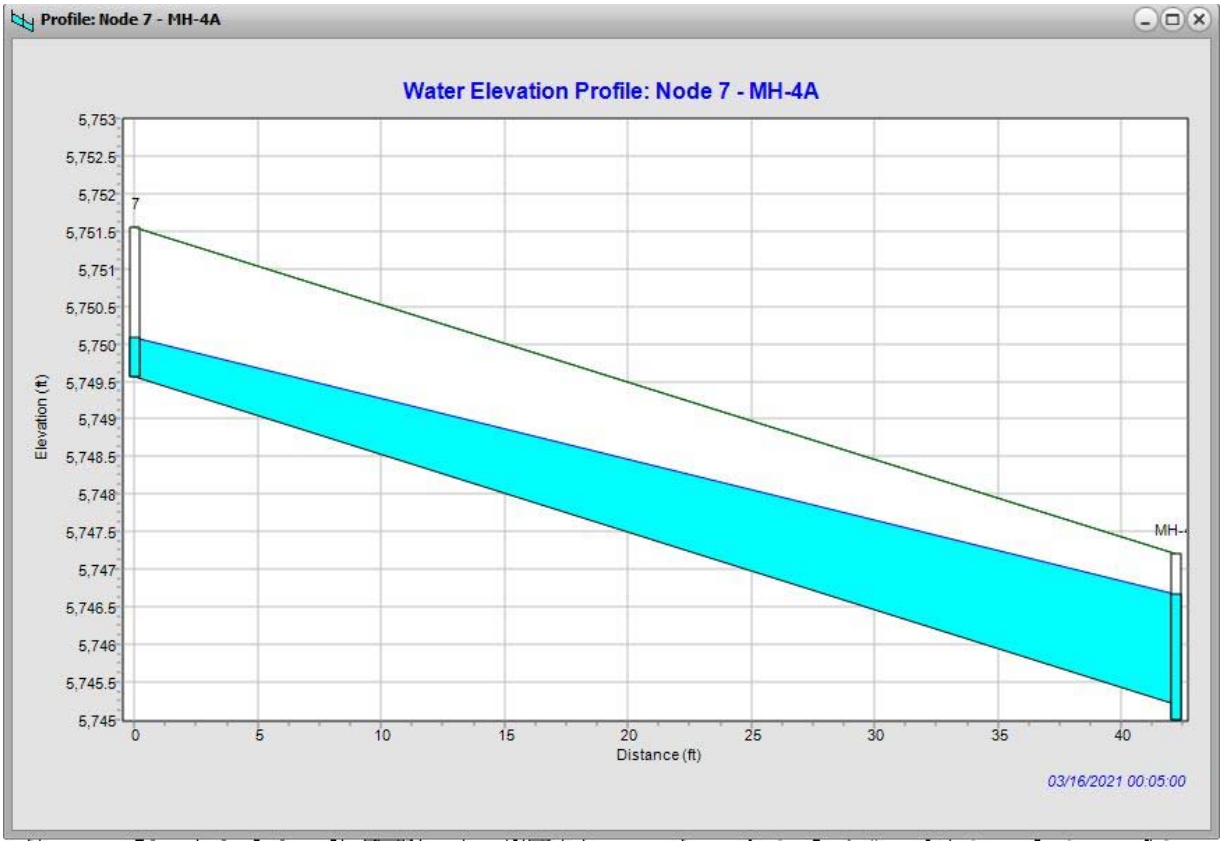
Lateral 3



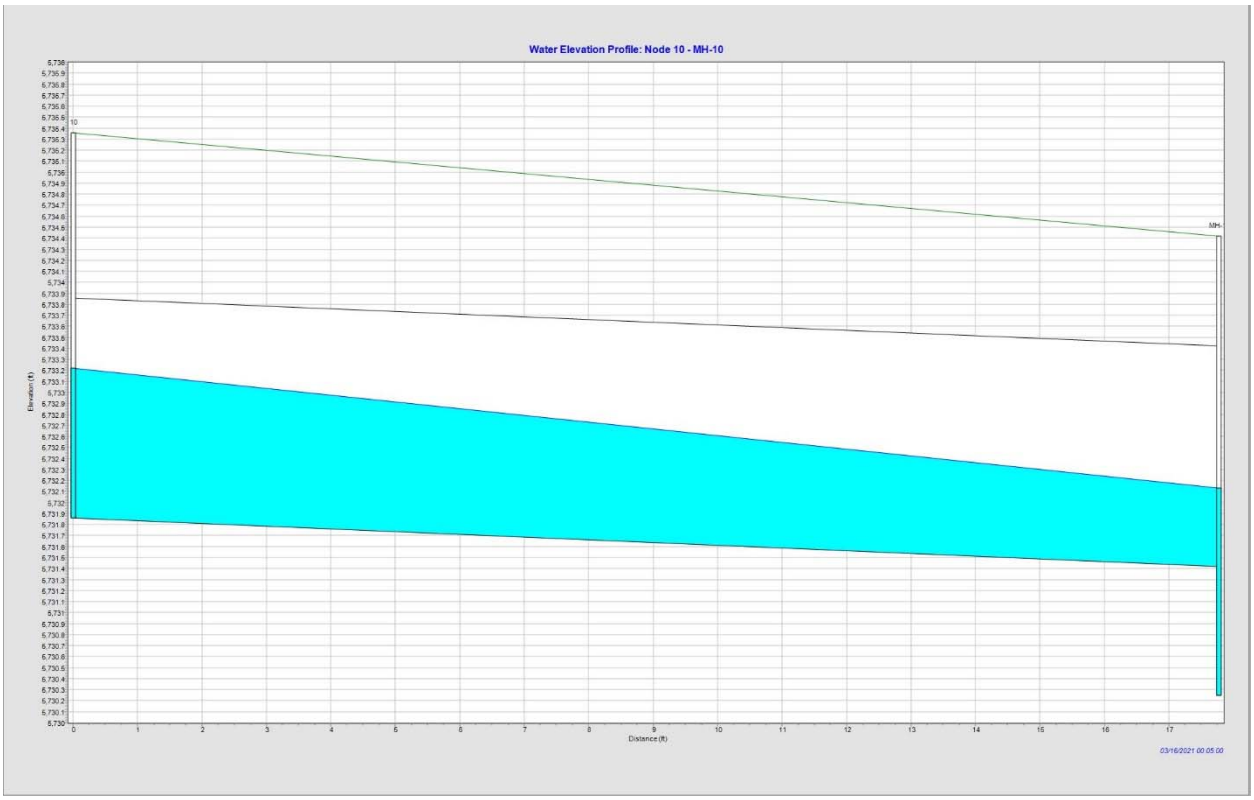
Lateral 4



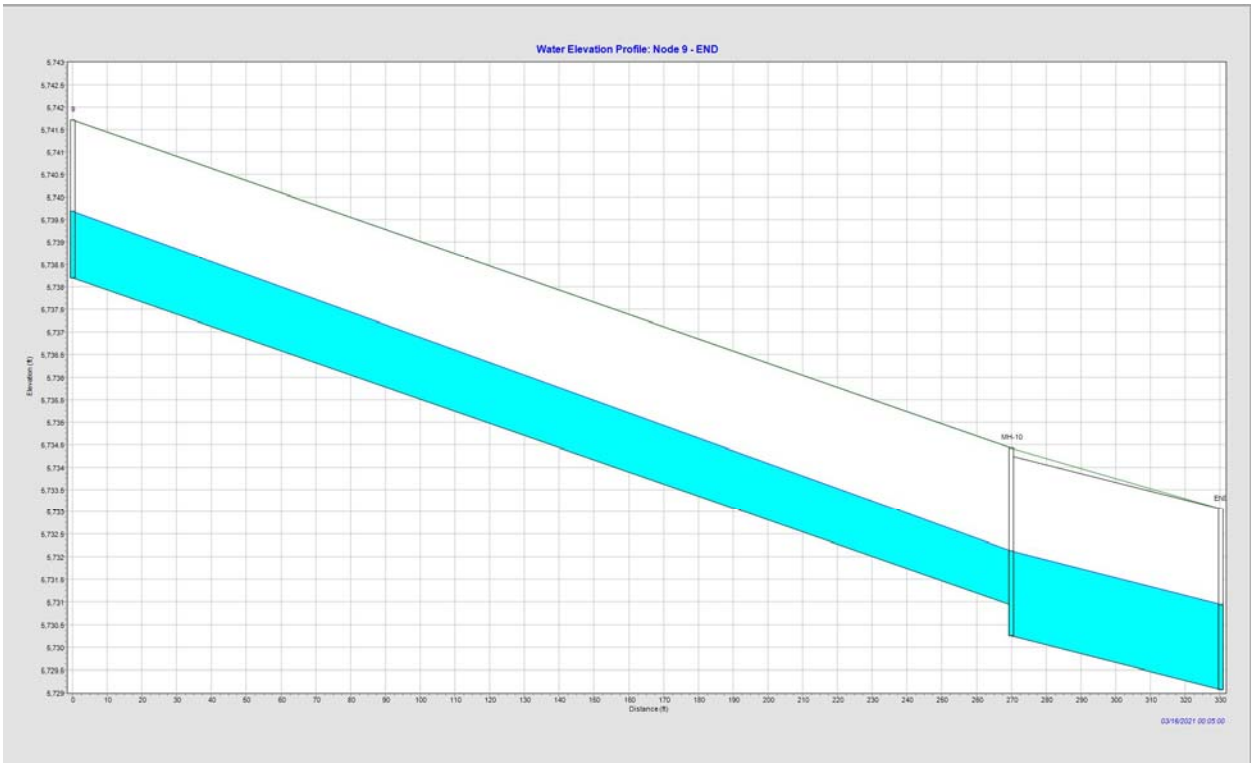
Lateral 5



Lateral 7



Lateral 10



NE Corner Crossing (Connection to Ex 48” RCP under Marksheffel Rd)

Kiowa Engineering Corporation

CLIENT
PROJECT Peaceful Ridge
DETAIL
JOB NO. 1409
DATE CHECKED
CHECKED BY
COMPUTED BY JGD

20 Grated Inlet Check

try type D inlet – Grated Inlet in Sump

Opening 35" x 108" = 16.53 sf

grate area covers 1/3 of opening

opening less grate → 2/3 (16.53) = 11 sf

Q_{100} = 28.6 cfs (Basin DS-3)
drains to inlet

Clogging Factor F = 2.0

Assume water depth d = 1.0'

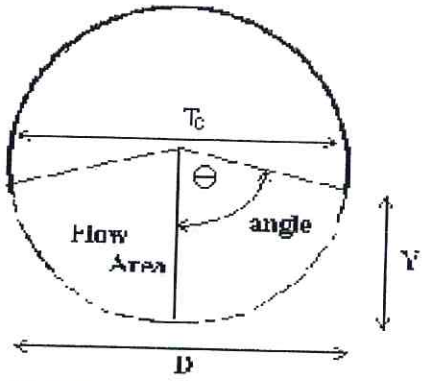
$$Q_{cap} = \frac{5.37 A d^{0.5}}{F} = \frac{5.37(11.0)(1.0)^{0.5}}{2.0}$$

Q_{cap} = 29.5 cfs > 28.6 cfs → Adequate

⇒ Use Type D inlet w/ standard inlet grate

Circular Pipe Flow

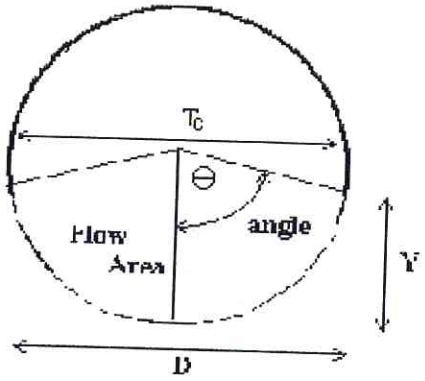
Project: 04092 Peaceful Ridge at Fountain Valley
Pipe ID: Pipe #21



Design Information (Input)		
Pipe Invert Slope	So =	0.0050 ft/ft
Pipe Manning's n-value	n =	0.0130
Pipe Diameter	D =	30.00 inches
Design discharge	**Q =**	**28.6 cfs**
Full-flow Capacity (Calculated)		
Full-flow area	Af =	4.91 sq ft
Full-flow wetted perimeter	Pf =	7.85 ft
Half Central Angle	Theta =	3.14 rad
Full-flow capacity	**Qf =**	**29.1** cfs
Calculation of Normal Flow Condition		
Half Central angle (0<Theta<3.14)	Theta =	2.23 rad
Flow area	An =	4.24 sq ft
Wetted perimeter	Pn =	5.57 ft
Flow depth	Yn =	2.01 ft
Flow velocity	Vn =	6.75 fps
Discharge	**Qn =**	**28.6 cfs**
Calculation of Critical Flow Condition		
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.05 rad
Critical flow area	Ac =	3.84 sq ft
Critical top width	Tc =	2.22 ft
Critical flow depth	Yc =	1.82 ft
Critical flow velocity	Vc =	7.45 fps
Froude number	**Fr =**	**1.00**

Circular Pipe Flow

Project: 04092 Peaceful Ridge at Fountain Valley
Pipe ID: Pipe #22

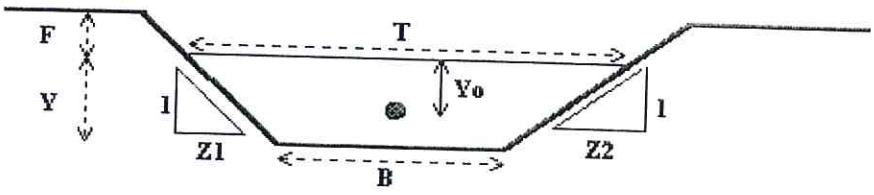


Design Information (Input)		
Pipe Invert Slope	So =	0.0060 ft/ft
Pipe Manning's n-value	n =	0.0130
Pipe Diameter	D =	48.00 inches
Design discharge	**Q =**	**104.1 cfs**
Full-flow Capacity (Calculated)		
Full-flow area	Af =	12.57 sq ft
Full-flow wetted perimeter	Pf =	12.57 ft
Half Central Angle	Theta =	3.14 rad
Full-flow capacity	**Qf =**	**111.6** cfs
Calculation of Normal Flow Condition		
Half Central angle (0<Theta<3.14)	Theta =	2.13 rad
Flow area	An =	10.32 sq ft
Wetted perimeter	Pn =	8.52 ft
Flow depth	Yn =	3.06 ft
Flow velocity	Vn =	10.08 fps
Discharge	**Qn =**	**104.2 cfs**
Calculation of Critical Flow Condition		
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.15 rad
Critical flow area	Ac =	10.42 sq ft
Critical top width	Tc =	3.35 ft
Critical flow depth	Yc =	3.09 ft
Critical flow velocity	Vc =	9.99 fps
Froude number	**Fr =**	**1.00**

provide calculations for 2-yr storm. Maximum flow velocity of the channel shall not exceed 2 feet per second at the 2-year peak flow rate (DCM Vol. 2)

Normal Flow Analysis - Trapezoidal Channel

Project: 04092 Peaceful Ridge at Fountain Valley Subdivision
Channel ID: Existing swale along southern boundary line

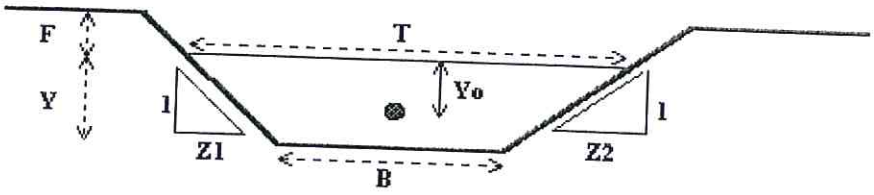


Design Information (Input)		
Channel Invert Slope	So =	0.0350 ft/ft
Channel Manning's N	N =	0.035
Bottom Width	B =	0.0 ft
Left Side Slope	Z1 =	3.0 ft/ft
Right Side Slope	Z2 =	3.0 ft/ft
Freeboard Height	F =	0.0 ft
Design Water Depth	Y =	**1.00** ft

Normal Flow Condtion (Calculated)		
Discharge	**Q =**	**14.5** cfs
Froude Number	**Fr =**	**1.21**
Flow Velocity	**V =**	**4.8** fps
Flow Area	A =	3.0 sq ft
Top Width	T =	6.0 ft
Wetted Perimeter	P =	6.3 ft
Hydraulic Radius	R =	0.5 ft
Hydraulic Depth	D =	0.5 ft
Specific Energy	Es =	1.4 ft
Centroid of Flow Area	Yo =	0.3 ft
Specific Force	Fs =	0.2 kip

Normal Flow Analysis - Trapezoidal Channel

Project: 04092 Peaceful Ridge at Fountain Valley
Channel ID: Roadside Ditch along Fontaine east of Sleepy Meadows



Design Information (Input)		
Channel Invert Slope	So =	0.0350 ft/ft
Channel Manning's N	N =	0.035
Bottom Width	B =	5.0 ft
Left Side Slope	Z1 =	3.0 ft/ft
Right Side Slope	Z2 =	3.0 ft/ft
Freeboard Height	F =	1.0 ft
Design Water Depth	Y =	**1.00** ft

Normal Flow Condtion (Calculated)		
Discharge	**Q =**	**50.5** cfs
Froude Number	**Fr =**	**1.31**
Flow Velocity	**V =**	**6.3** fps
Flow Area	A =	8.0 sq ft
Top Width	T =	11.0 ft
Wetted Perimeter	P =	11.3 ft
Hydraulic Radius	R =	0.7 ft
Hydraulic Depth	D =	0.7 ft
Specific Energy	Es =	1.6 ft
Centroid of Flow Area	Yo =	0.4 ft
Specific Force	Fs =	0.8 kip

Peaceful Ridge at Fountain Valley Subdivision
Riprap Design Calculation

Proposed Hydraulic Structure Location	Description	Design Flow	Channel Flow Velocity	Channel Slope	Riprap Value	Calculated Riprap Type	**Proposed Riprap Type**
Detention Outlet Pipe (#27)	36 inch RCP	69.8 cfs	5.0 ft/sec	2.0 %	1.9	VL	**M**

Equations:

Riprap Value = $VS^{0.17}/(S_s-1)^{0.66}$

V = mean channel flow velocity

S = Longitudinal channel slope (ft/ft)

S_s = Specific Gravity of stone (minimum S_s = 2.50)

S_s = 2.64 (most cases)

Riprap Value	Riprap Type	D50
1.4 to 3.2	VL	6 inches
3.3 to 3.9	L	9 inches
4.0 to 4.5	M	12 inches
4.6 to 5.5	H	18 inches
5.6 to 6.4	VH	24 inches

Equations taken from *Section 10.10.2, City of Colorado Springs & El Paso County Drainage Criteria Manual*

Appendix C
IRF - Infiltration Reduction Factoring

Please remove final build out drainage maps and replace with work that will be done with early grading plan: rough cutting roads and overlot grading.

UIA flow must be directed to associated RPA. The way it is shown, A-0-a UIA flows to A-0-b UIA.
Include roadway as UIA and A-0-b for RPA

T15S R65W
SECTION 15

NW 1/4 NE 1/4
SW 1/4

UNPLATTED
CITY OF COLORADO SPRINGS

N89°52'46"E

N00°05'29"E 1349.36'

S89°53'03"W 1795.06'

PEACEFUL RIDGE at Fountain Valley

PEACEFUL RIDGE DRIVE

PASSAGE WAY

BLACK POWDER TRAIL

ROCK ROSE TERRACE

HORNSTONE PATH

MELTING SKY DRIVE

SLEEPY MEADOWS DRIVE

HAZY HOLLOW TRAIL

PANPIPE LANE

CONUNDRUM COURT

MIRADOR LANE

FOUNTAIN MUTUAL IRRIGATION CANAL

ROADWAY EXEMPTION

EX WELL

TYPE 'M' RIPRAP RUNDOWN

TYPE 'M' RIPRAP

TYPE 'L' RIPRAP

TYPE 'VL' BURIED RIPRAP

DETENTION BASIN

Δ=07°42'26"
R=5649.75'
L=759.99'

EXISTING CHANNEL

EXISTING CHANNEL

COTTONWOOD MEADOWS FILING NO. 3

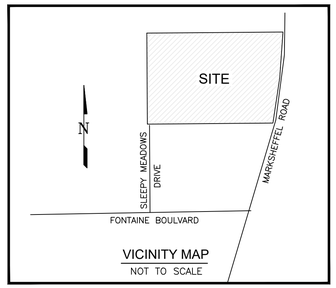
PLATTED
SLEEPY MEADOWS NORTH FILING NO. 1

LOT 1 LOT 2 LOT 3 LOT 4 LOT 5 LOT 6 LOT 7 LOT 8 LOT 9 LOT 10 LOT 11 LOT 12 LOT 13 LOT 14 LOT 15 LOT 16 LOT 17

A-0-a	3.18 ac	5.8 cfs	12.3 cfs
A-0-b	32.60 ac	23.0 cfs	61.4 cfs
OS-1		
OS-2	3.05 ac	2.3 cfs	6.0 cfs
OS-3	13.50 ac	11.1 cfs	28.6 cfs
A-1	3.35 ac	6.4 cfs	13.4 cfs
A-2		
B-1	5.54 ac	12.9 cfs	27.2 cfs
B-2	4.89 ac	8.8 cfs	18.7 cfs
B-3	5.19 ac	8.3 cfs	17.6 cfs
B-4	4.73 ac	8.9 cfs	18.9 cfs
B-5	6.09 ac	10.3 cfs	21.9 cfs
B-6	7.25 ac	14.3 cfs	30.4 cfs
B-7	2.95 ac	5.4 cfs	11.7 cfs
B-8	2.72 ac	4.6 cfs	9.6 cfs
C-1	4.29 ac	8.0 cfs	16.9 cfs
D-1	2.61 ac	3.4 cfs	7.8 cfs
D-1-a		
D-1-b		
D-2	2.22 ac	4.0 cfs	8.9 cfs
D-2-a		
D-2-b		
D-3	2.29 ac	4.4 cfs	9.8 cfs

0.0 cfs / 5.8 cfs
0.0 cfs / 11.1 cfs
2.1 cfs / 4.0 cfs
0.6 cfs / 8.4 cfs
0.0 cfs / 8.4 cfs
0.3 cfs / 10.7 cfs
0.0 cfs / 3.4 cfs
0.0 cfs / 4.0 cfs

GRADE ROADSIDE DITCH ALONG NORTH SIDE OF FONTAINE BLVD. BETWEEN SLEEPY MEADOWS DRIVE AND FMIC CANAL. DITCH IS TO BE GRASSLINED WITH B=5', SS=3:1 AND d=2.0'. INSTALL TYPE 'L' RIPRAP CHASE TO ROUTE RUNOFF FROM SLEEPY MEADOWS TO ROADSIDE DITCH.



VICINITY MAP
NOT TO SCALE

LEGEND

R 10.24 ac 7.9 cfs 28.9 cfs	DRAINAGE BASIN DESIGNATION DRAINAGE BASIN AREA 5-YEAR BASIN RUNOFF 100-YEAR BASIN RUNOFF
1	DESIGN POINT
	DRAINAGE BASIN BOUNDARY
	FLOW DIRECTION
UIA A-0-b	UIA (Unconnected Impervious Area)
	UIA/RPA INTERFACE
RPA A-0-b	RPA (Receiving Pervious Area)
	IRF ZONE DESIGNATION

0 100' 200'
SCALE: 1"=100'

IRF REDUCTION AREA SUMMARY

Basin	Area	Total Acres	UIA Acres	RPA Acres
DCIA				
UIA	137,015 sf	3.15ac	3.15ac	
RPA	145,484 sf	3.34ac		3.34ac
SPA				
SFR				
HIST				
TOTAL	1,961,090 sf	45.02ac	3.15ac	3.34ac
SUMM	On-Site Acres:	6.49	3.15	3.34

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719)630-7342

WILDEFIELD Investment Group

PEACEFUL RIDGE at FOUNTAIN VALLEY SUBDIVISION
PRELIMINARY AND FINAL DRAINAGE REPORT
INFILTRATION REDUCTION FACTOR EXHIBIT
EL PASO COUNTY, COLORADO

Project No.:	21031
Date:	Sept 2021
Design:	JGD/MJK
Drawn:	JGD/MJK
Check:	AWMc
Revisions:	
1.	11/21 Storm Revs

SHEET
IRF-1
3 OF 3 SHEETS

21031-pdron.dwg/Nov 22, 2021/3:36pm

see comments on IRF-1

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) — Sheet 1 of 1

Designer:	M Kahnke / A McCord
Company:	Kiowa Engineering
Date:	September 29, 2021
Project:	Peaceful Ridge Sub
Location:	Widefield, CO

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches

Depth of Average Runoff Producing Storm d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA						
Area ID	A-0-a	A-0-b	D-1-a	D-1-b	D-2-a	D2-b						
Downstream Design Point ID	8a	8a	N/A	N/A	9a	9a						
Downstream BMP Type	None	None	None	None	None	None						
DCIA (ft^2)	--	--	--	--	--	--						
UIA (ft^2)	24,264	19,064	18,847	21,988	26,287	26,565						
RPA (ft^2)	23,165	19,976	19,182	21,993	30,988	30,180						
SPA (ft^2)	--	--	--	--	--	--						
HSG A (%)	0%	0%	0%	0%	0%	0%						
HSG B (%)	0%	0%	0%	0%	0%	0%						
HSG C/D (%)	100%	100%	100%	100%	100%	100%						
Average Slope of RPA (ft/ft)	0.026	0.080	0.025	0.025	0.025	0.041						
UIA:RPA Interface Width (ft)	610.00	470.00	410.00	410.00	740.00	740.00						

CALCULATED RUNOFF RESULTS

Area ID	A-0-a	A-0-b	D-1-a	D-1-b	D-2-a	D2-b						
UIA:RPA Area (ft^2)	47,428	39,041	38,029	43,981	57,275	56,745						
L / W Ratio	0.13	0.18	0.23	0.26	0.10	0.10						
UIA / Area	0.5116	0.4883	0.4956	0.4999	0.4590	0.4681						
Runoff (in)	0.00	0.00	0.00	0.00	0.00	0.00						
Runoff (ft^3)	0	0	0	0	0	0						
Runoff Reduction (ft^3)	1011	794	785	916	1095	1107						

CALCULATED WQCV RESULTS

Area ID	A-0-a	A-0-b	D-1-a	D-1-b	D-2-a	D2-b						
WQCV (ft^3)	1011	794	785	916	1095	1107						
WQCV Reduction (ft^3)	1011	794	785	916	1095	1107						
WQCV Reduction (%)	100%	100%	100%	100%	100%	100%						
Untreated WQCV (ft^3)	0	0	0	0	0	0						

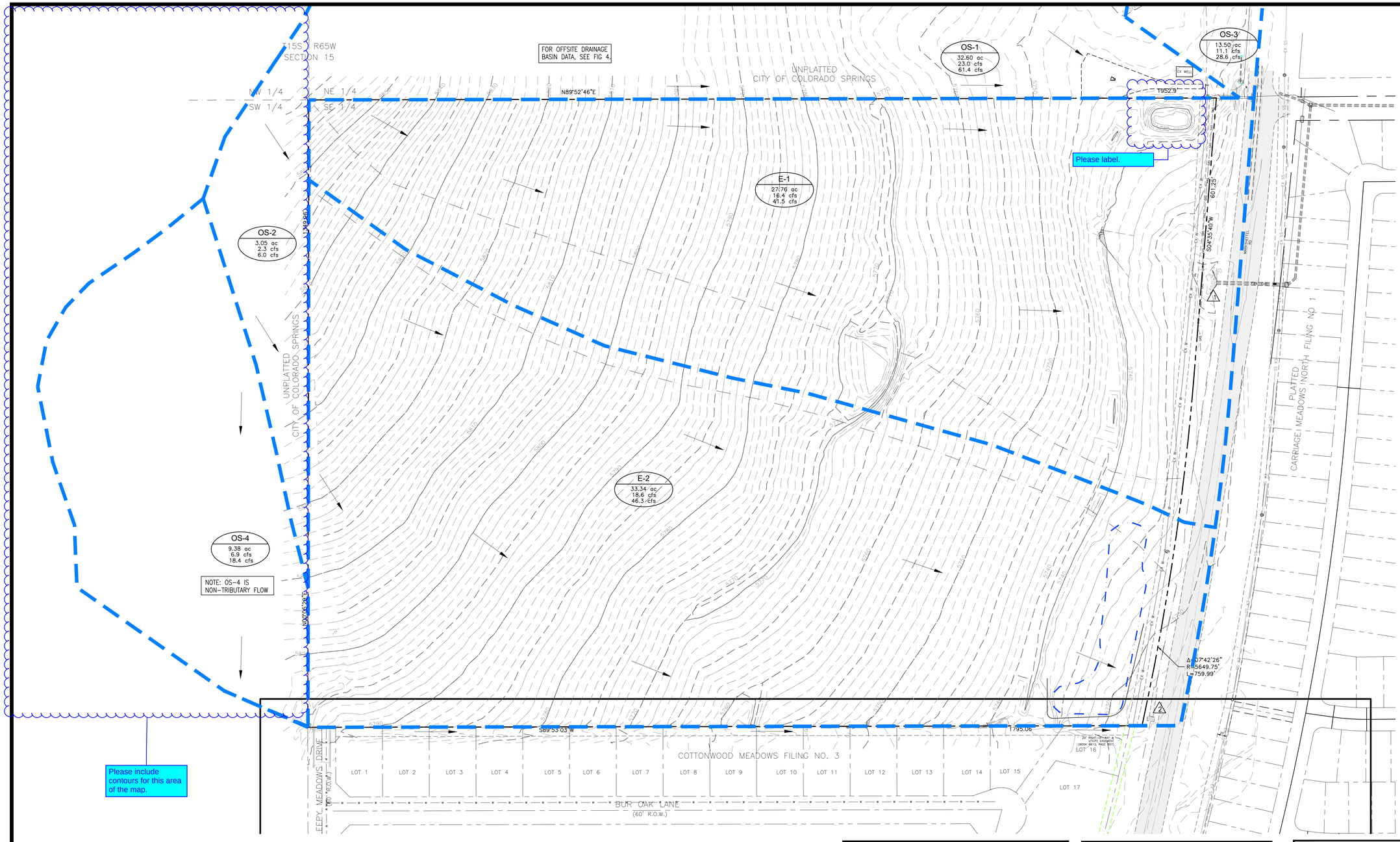
CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	8a	N/A	9a									
DCIA (ft^2)	0	0	0									
UIA (ft^2)	43,328	40,835	52,852									
RPA (ft^2)	43,141	41,174	61,168									
SPA (ft^2)	0	0	0									
Total Area (ft^2)	86,469	82,010	114,020									
Total Impervious Area (ft^2)	43,328	40,835	52,852									
WQCV (ft^3)	1,805	1,701	2,202									
WQCV Reduction (ft^3)	1,805	1,701	2,202									
WQCV Reduction (%)	100%	100%	100%									
Untreated WQCV (ft^3)	0	0	0									

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	282,499
Total Impervious Area (ft^2)	137,015
WQCV (ft^3)	5,709
WQCV Reduction (ft^3)	5,709
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

Appendix D
Existing Conditions Map
Developed Conditions Map

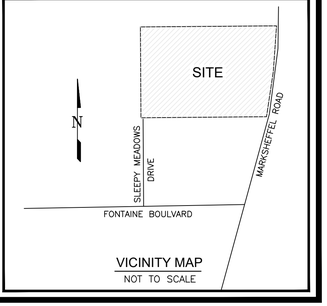


LEGEND

R 10.24 ac 7.9 cfs 28.9 cfs	DRAINAGE BASIN DESIGNATION DRAINAGE BASIN AREA 5-YEAR BASIN RUNOFF 100-YEAR BASIN RUNOFF
2.2 cfs 4.3 cfs	5-YEAR RUNOFF 100-YEAR RUNOFF
1	DESIGN POINT
	DRAINAGE BASIN BOUNDARY
	FLOW DIRECTION
	TIME OF CONCENTRATION PATH
6020	EXISTING CONTOURS

DESIGN POINT FLOWS

DESIGN POINT	5-YR FLOW	100-YR FLOW
1	47.5 cfs	123.8 cfs
2	20.5 cfs	51.1 cfs



Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

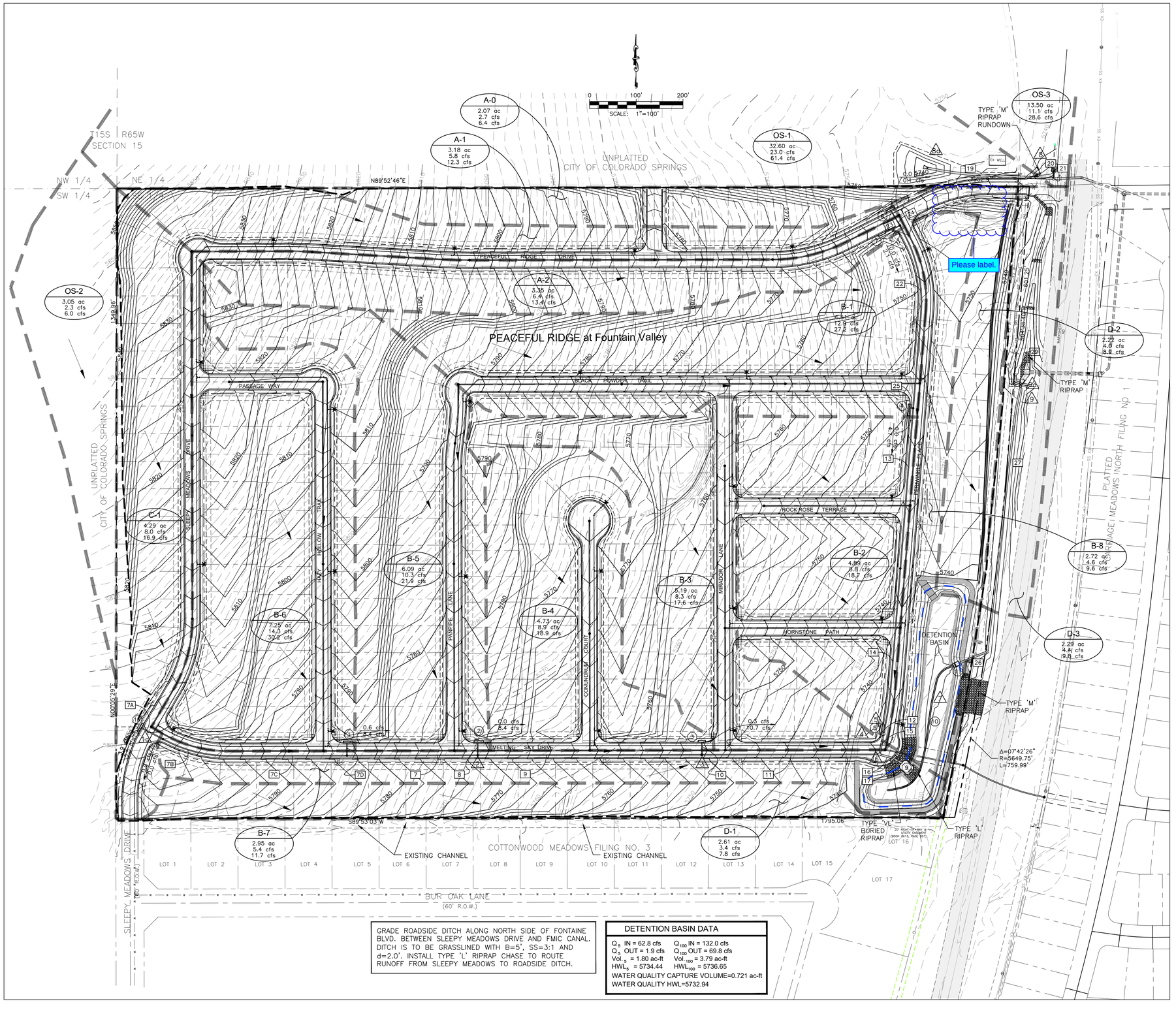
WIDEFIELD Investment Group

PEACEFUL RIDGE at FOUNTAIN VALLEY SUBDIVISION
FINAL DRAINAGE REPORT ADDENDUM
EXISTING CONDITIONS
EL PASO COUNTY, COLORADO

Project No.:	21031
Date:	Nov 23 2021
Design:	JGD/MJK
Drawn:	JGD/MJK
Check:	AWMc
Revisions:	
1.	11/21 Storm Revs

SHEET
E-1
1 OF 3 SHEETS

21031-pdran.dwg/Nov 22, 2021/3:00pm

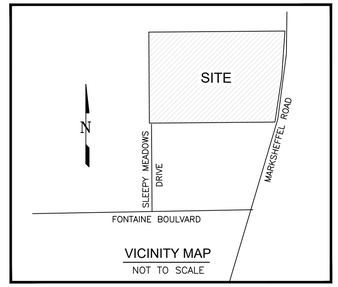


GRADE ROADSIDE DITCH ALONG NORTH SIDE OF FONTAINE BLVD. BETWEEN SLEEPY MEADOWS DRIVE AND FMIC CANAL. DITCH IS TO BE GRASSLINED WITH B=5', SS=3:1 AND d=2.0'. INSTALL TYPE 'L' RIPRAP CHASE TO ROUTE RUNOFF FROM SLEEPY MEADOWS TO ROADSIDE DITCH.

DETENTION BASIN DATA

Q_5 IN = 62.8 cfs	Q_{100} IN = 132.0 cfs
Q_5 OUT = 1.9 cfs	Q_{100} OUT = 69.8 cfs
$Vol._5$ = 1.80 ac-ft	$Vol._{100}$ = 3.79 ac-ft
HWL_5 = 5734.44	HWL_{100} = 5736.65

WATER QUALITY CAPTURE VOLUME=0.721 ac-ft
WATER QUALITY HWL=5732.94



VICINITY MAP
NOT TO SCALE

LEGEND

- R — DRAINAGE BASIN DESIGNATION
- 10.24 ac / 7.9 cfs / 28.9 cfs — DRAINAGE BASIN AREA, 5-YEAR BASIN RUNOFF, 100-YEAR BASIN RUNOFF
- 2.2 cfs / 4.3 cfs — 5-YEAR BYPASS & 100-YEAR BYPASS AT INDICATED FLOWLINE
- 1 — DESIGN POINT
- DRAINAGE BASIN BOUNDARY
- FLOW DIRECTION
- 24 — HYDRAULIC STRUCTURE IDENTIFIER
- 4 — HYDRAULIC STRUCTURE IDENTIFIER
- TIME OF CONCENTRATION PATH
- 6020 — EXISTING CONTOURS
- 6020 — PROPOSED CONTOURS
- 100-YR W.S.EL.

STRUCTURE IDENTIFIER	STRUCTURE DESCRIPTION	STRUCTURE IDENTIFIER	STRUCTURE DESCRIPTION
1A	20' CURB INLET	9	30-INCH RCP
1	20' CURB INLET	10	24-INCH RCP
2	20' CURB INLET	11	30-INCH RCP
3	15' CURB INLET	12	24-INCH RCP
4	25' CURB INLET	13	18-INCH RCP
5	20' CURB INLET	14	18-INCH RCP
6	15' CURB INLET	15	34-INCHx53-INCH HERCP
7	15' CURB INLET	16	34-INCHx53-INCH HERCP
8	20' CURB INLET	17	34-INCHx53-INCH HERCP
9	FOREBAY	19	42-INCH RCP
10	2' TRICKLE CHANNEL	20	TYPE 'D' INLET
11	OUTLET STRUCTURE	21	EX. 48" RCP
7A	18-INCH RCP	22	48-INCH RCP
7B	18-INCH RCP	23	24-INCH RCP
7C	18-INCH RCP	24	18-INCH RCP
7D	24-INCH RCP	25	24-INCH RCP
7	24-INCH RCP	26	36-INCH RCP
8	30-INCH RCP	27	36-INCH RCP
		28	36-INCH FES
		29	CONCRETE APRON AND WINGWALLS

DESIGN POINT FLOWS

DESIGN POINT	5-YEAR FLOW	100-YEAR FLOW
1a	6.7 cfs	17.4 cfs
1	17.3 cfs	37.9 cfs
2	25.3 cfs	53.4 cfs
3	31.9 cfs	67.6 cfs
4	39.3 cfs	83.2 cfs
5	30.0 cfs	63.6 cfs
6	54.1 cfs	114.9 cfs
7	62.8 cfs	132.0 cfs
8	11.1 cfs	28.6 cfs
8a	25.7 cfs	67.8 cfs
9a*	12.4 cfs	27.3 cfs
9**	32.3 cfs	82.6 cfs

* EXCLUDES DETENTION BASIN DISCHARGE
** INCLUDES DETENTION BASIN DISCHARGE

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

WILDEFIELD Investment Group

PEACEFUL RIDGE at FOUNTAIN VALLEY SUBDIVISION
FINAL DRAINAGE REPORT
DEVELOPED CONDITION
EL PASO COUNTY, COLORADO

Project No.:	21031
Date:	Nov 2021
Design:	JGD/MJK
Drawn:	JGD/MJK
Check:	AWMc
Revisions:	
1.	11/23 Storm Revs

SHEET
D-1
2 OF 3 SHEETS

21031-pdrain.dwg/Nov 22, 2021/3:07pm

Please remove the grading plan from drainage report contents.

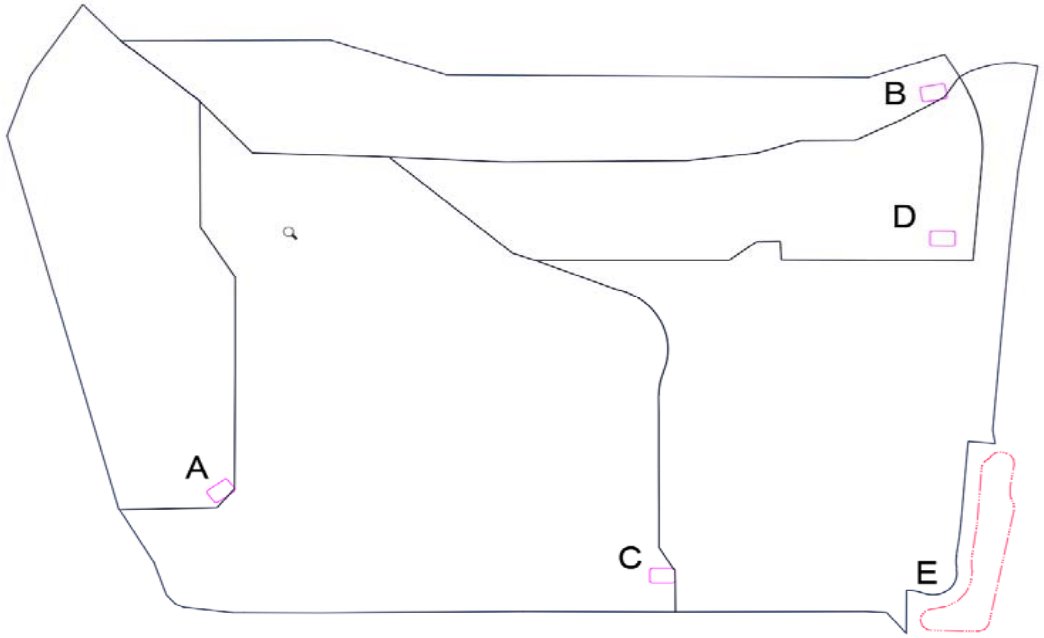
Appendix E
Early Grading Permit Exhibits & Details
Riprap Calculations
Sediment Basin Calculations

Project: Peaceful Ridge Subdivion

Basin ID: All Tributary Areas to Planned Detention Basin in Early Graded Condition

All Temporary Sediment Basins (A thru E) Designated and Sized

TSB Desig.	Trib. Ac.	Cu. Ft. Unit/Ac	Req'd. Cu. Ft	Req'd. Ac/Ft	
A	7.71	1,800.00	13,878.00	0.319	
B	6.66	1,800.00	11,988.00	0.275	
C	18.93	1,800.00	34,074.00	0.782	
D	6.05	1,800.00	10,890.00	0.250	
E	12.7	1,800.00	22,860.00	0.525	
Sum:	52.05	1,800.00	93,690.00	2.151	Required
			Basin 'E':	2.341	Provided

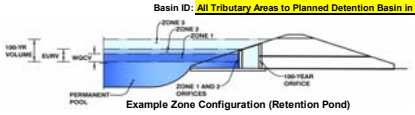


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Peaceful Ridge Subdivion

Basin ID: All Tributary Areas to Planned Detention Basin in Early Graded Condition



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	53.88	acres	
Watershed Length =	2,200	ft	
Watershed Slope =	0.035	ft/ft	
Watershed Imperviousness =	14.00%	percent	Reduced
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) =	0.397	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	0.728	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	0.518	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.784	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.541	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	3.537	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.796	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.441	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.2 in.) =	9.835	acre-feet	3.20 inches
Approximate 2-yr Detention Volume =	0.481	acre-feet	
Approximate 5-yr Detention Volume =	0.734	acre-feet	
Approximate 10-yr Detention Volume =	1.333	acre-feet	
Approximate 25-yr Detention Volume =	1.757	acre-feet	
Approximate 50-yr Detention Volume =	1.851	acre-feet	
Approximate 100-yr Detention Volume =	2.341	acre-feet	Total TSB Storage

Stage-Storage Calculation

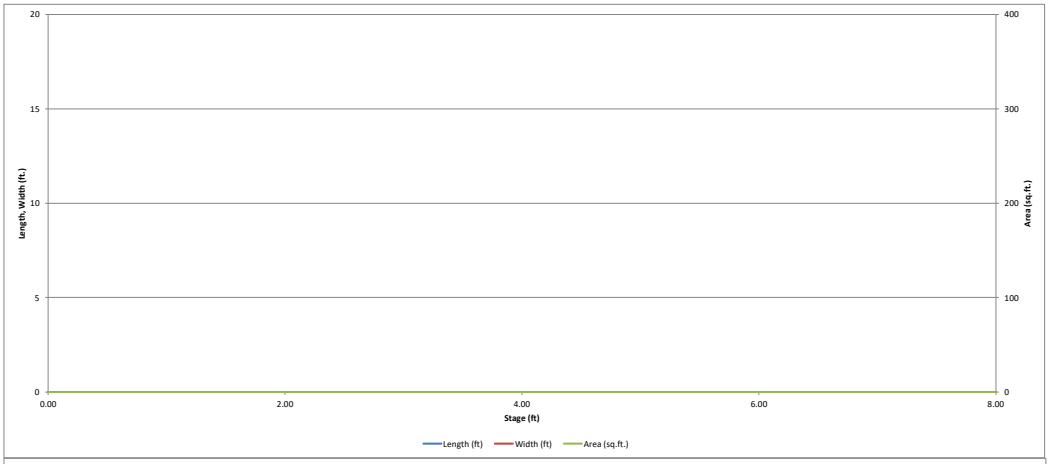
Zone 1 Volume (WQCV) =	0.397	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.332	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.613	acre-feet
Total Detention Basin Volume =	2.341	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (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

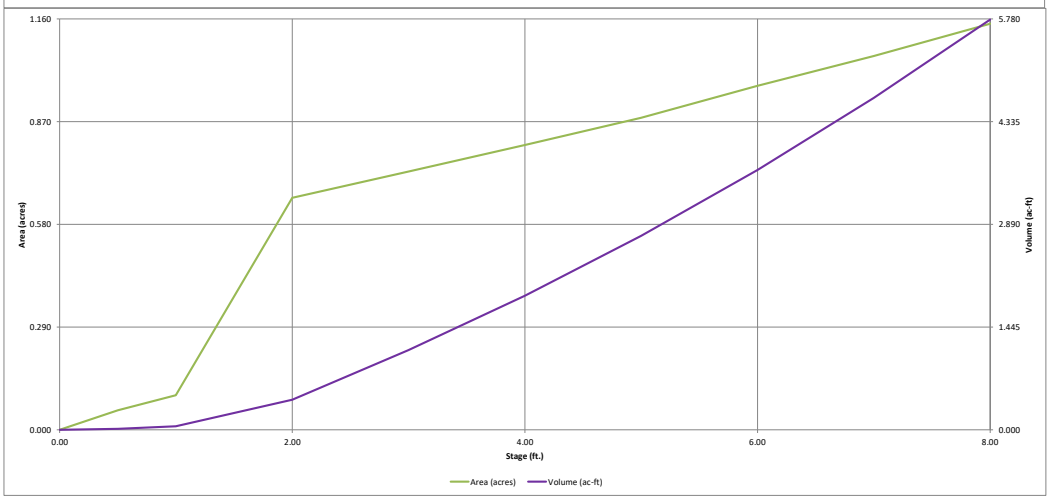
Depth Increment = ft

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	0.001		
5728.5	--	0.50	--	--	--	2,400	0.055	583	0.013
5729	--	1.00	--	--	--	4,266	0.098	2,230	0.051
5730	--	2.00	--	--	--	28,535	0.655	18,389	0.422
5731	--	3.00	--	--	--	31,757	0.729	48,819	1.121
5732	--	4.00	--	--	--	35,011	0.804	82,203	1.887
5733	--	5.00	--	--	--	38,350	0.880	118,884	2.729
5734	--	6.00	--	--	--	42,287	0.971	159,202	3.655
5735	--	7.00	--	--	--	45,960	1.055	203,326	4.668
5736	--	8.00	--	--	--	49,930	1.146	251,271	5.768
Early Grading:	--		--	--	--				
5732.5 =Crest	--		--	--	--				
5734.0 =Berm	--		--	--	--				

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

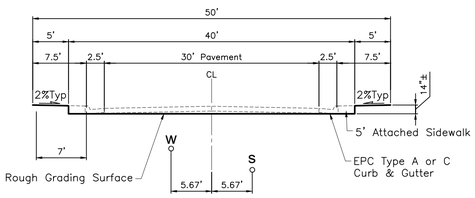
UD-Detention, Version 3.07 (February 2017)



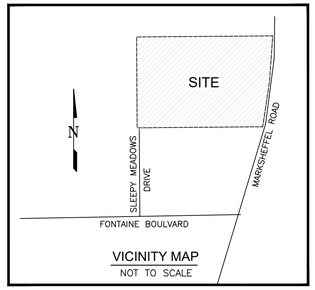


PROJECT SPECIFIC GRADING AND EROSION CONTROL NOTES

1. Stormwater discharges from construction sites shall not cause or threaten to cause pollution, contamination, or degradation of State Waters. All work and earth disturbance shall be done in a manner that minimizes pollution of any on-site or off-site waters, including wetlands.
2. Notwithstanding anything depicted in these plans in words or graphic representation, all design and construction related to roads, storm drainage and erosion control shall conform to the standards and requirements of the most recent version of the relevant adopted El Paso County standards, including the Land Development Code, the Engineering Criteria Manual, the Drainage Criteria Manual, and the Drainage Criteria Manual Volume 2. Any deviations from regulations and standards must be requested, and approved, in writing.
3. A separate Stormwater Management Plan (SMWP) for this project shall be completed and an Erosion and Stormwater Quality Control Permit (ESQCP) issued prior to commencing construction. Management of the SWMP during construction is the responsibility of the designated Qualified Stormwater Manager or Certified Erosion Control Inspector. The SWMP shall be located on site at all times during construction and shall be kept up to date with work progress and changes in the field.
4. Once the ESQCP is approved and a "Notice to Proceed" has been issued, the contractor may install the initial stage erosion and sediment control measures as indicated on the approved GEC. A Preconstruction Meeting between the contractor, engineer, and El Paso County will be held prior to any construction. It is the responsibility of the applicant to coordinate the meeting time and place with County staff.
5. Control measures must be installed prior to commencement of activities that could contribute pollutants to stormwater. Control measures for all slopes, channels, ditches, and disturbed land areas shall be installed immediately upon completion of the disturbance.
6. All temporary sediment and erosion control measures shall be maintained and remain in effective operating condition until permanent soil erosion control measures are implemented and final stabilization is established. All persons engaged in land disturbance activities shall assess the adequacy of control measures at the site and identify if changes to those control measures are needed to ensure the continued effective performance of the control measures. All changes to temporary sediment and erosion control measures must be incorporated into the Stormwater Management Plan.
7. Temporary stabilization shall be implemented on disturbed areas and stockpiles where ground disturbing construction activity has permanently ceased or temporarily ceased for longer than 14 days.
8. Final stabilization must be implemented at all applicable construction sites. Final stabilization is achieved when all ground disturbing activities are complete and all disturbed areas either have a uniform vegetative cover with individual plant density of 70 percent of pre-disturbance levels established or equivalent permanent alternative stabilization method is implemented. All temporary sediment and erosion control measures shall be removed upon final stabilization and before permit closure.
9. All permanent stormwater management facilities shall be installed as designed in the approved plans. Any proposed changes that affect the design or function of permanent stormwater management structures must be approved by the ECM Administrator prior to implementation.
10. Earth disturbances shall be conducted in such a manner so as to effectively minimize accelerated soil erosion and resulting sedimentation. All disturbances shall be designed, constructed, and completed so that the exposed area of any disturbed land shall be limited to the shortest practical period of time. Pre-existing vegetation shall be protected and maintained within 50 horizontal feet of a waters of the state unless shown to be infeasible and specifically requested and approved.
11. Compaction of soil must be prevented in areas designated for infiltration control measures or where final stabilization will be achieved by vegetative cover. Areas designated for infiltration control measures shall also be protected from sedimentation during construction until final stabilization is achieved. If compaction prevention is not feasible due to site constraints, all areas designated for infiltration and vegetation control measures must be loosened prior to installation of the control measure(s).
12. Any temporary or permanent facility designed and constructed for the conveyance of stormwater around, through, or from the earth disturbance area shall be a stabilized conveyance designed to minimize erosion and the discharge of sediment off site.
13. Concrete wash water shall be contained and disposed of in accordance with the SWMP. No wash water shall be discharged to or allowed to enter State Waters, including any surface or subsurface storm drainage system or facilities. Concrete washouts shall not be located in an area where shallow groundwater may be present, or within 50 feet of a surface water body, creek or stream.
14. During dewatering operations of uncontaminated ground water may be discharged on site, but shall not leave the site in the form of surface runoff unless an approved State dewatering permit is in place.
15. Erosion control blanketing or other protective covering shall be used on slopes steeper than 3:1.
16. Contractor shall be responsible for the removal of all wastes from the construction site for disposal in accordance with local and State regulatory requirements. No construction debris, tree slash, building material wastes or unused building materials shall be buried, dumped, or discharged at the site.
17. Waste materials shall not be temporarily placed or stored in the street, alley, or other public way, unless in accordance with an approved Traffic Control Plan. Control measures may be required by El Paso County Engineering if deemed necessary, based on specific conditions and circumstances.
18. Tracking of soils and construction debris off-site shall be minimized. Materials tracked off-site shall be cleaned up and properly disposed of immediately.
19. The owner/developer shall be responsible for the removal of all construction debris, dirt, trash, rock, sediment, soil, and sand that may accumulate in roads, storm drains and other drainage conveyance systems and stormwater appurtenances as a result of site development.
20. The quantity of materials stored on the project site shall be limited, as much as practical, to that quantity required to perform the work in an orderly sequence. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with original manufacturer's labels.
21. No chemical(s) having the potential to be released in stormwater are to be stored or used onsite unless permission for the use of such chemical(s) is granted in writing by the ECM Administrator. In granting approval for the use of such chemical(s), special conditions and monitoring may be required.
22. Bulk storage of allowed petroleum products or other allowed liquid chemicals in excess of 55 gallons shall require adequate secondary containment protection to contain all spills onsite and to prevent any spilled materials from entering State Waters, any surface or subsurface storm drainage system or other facilities.
23. No person shall cause the impediment of stormwater flow in the curb and gutter or ditch except with approved sediment control measures.
24. Owner/developer and their agents shall comply with the "Colorado Water Quality Control Act" (Title 25, Article 8, CRS), and the "Clean Water Act" (33 USC 1344), in addition to the requirements of the Land Development Code, DCM Volume II and the ECM Appendix I. All appropriate permits must be obtained by the contractor prior to construction (1041, NPDES, Floodplain, 404, fugitive dust, etc.). In the event of conflicts between these requirements and other laws, rules, or regulations of other Federal, State, local, or County agencies, the most restrictive laws, rules, or regulations shall apply.
25. All construction traffic must enter/exit the site only at approved construction access points.
26. Prior to construction the permittee shall verify the location of existing utilities.
27. A water source shall be available on site during earthwork operations and shall be utilized as required to minimize dust from earthwork equipment and wind.
28. The soils report for this site has been prepared by Vivid Engineering Group (Dated: April 24, 2020) and shall be considered a part of these plans.
29. At least ten (10) days prior to the anticipated start of construction, for projects that will disturb one (1) acre or more, the owner or operator of construction activity shall submit a permit application for stormwater discharge to the Colorado Department of Public Health and Environment, Water Quality Division. The application contains certification of completion of a stormwater management plan (SWMP), of which this Grading and Erosion Control Plan may be a part. For information or application materials contact:
    Colorado Department of Public Health and Environment
    Water Quality Control Division
    WQCD - Permits
    4300 Cherry Creek Drive South
    Denver, CO 80246-1530
    Attn: Permits Unit
30. Base mapping was provided by Pinnacle Land Surveying. The date of the last survey update was March 2005.
31. Proposed Construction Schedule:
    Begin Construction: Spring 2022
    End Construction: Autumn 2022
    Total Site Area = 60.1 Acres
32. Area to be disturbed = 57.7 Acres.
    Existing 100-year runoff coefficient = 0.35
    Proposed 100-year runoff coefficient = 0.61
    Existing Hydrologic Soil Groups: B, C & D
    (B--Nelson-Tassel fine sandy loams; B--Stoneham sandy loam;
    C--Razor-Midway Complex)
33. Site is currently undeveloped and covered with native grasses on moderate to steep slopes (3%-18%).
34. Site is located in the West Fork Jimmy Camp Creek Drainage Basin.
35. No Asphalt Batch Plants will be utilized at the site.



ROUGH CUT STREET ELEVATION
EARLY GRADING CONDITION
1" = 10'



VICINITY MAP
NOT TO SCALE

El Paso County (standalone GEC Plan):
County plan review is provided only for general conformance with County Design Criteria. The County is not responsible for the accuracy and adequacy of the design, dimensions, and/or elevations which shall be confirmed at the job site. The County through the approval of this document assumes no responsibility for completeness and/or accuracy of this document. Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manuals Volumes 1 and 2, and Engineering Criteria Manmual, as amended.

In accordance with ECM Section 1.12, these construction documents will be valid for construction for a period of 2 years from the date signed by the El Paso County Engineer. If construction has not started within those 2 years, the plans will need to be resubmitted for approval, including payment of review fees at the Planning and Community Development Director's discretion.

County Engineer/ECM Administrator — Date
JENNIFER IRVINE, P.E.

Engineer's Statement:
This grading and erosion control plan was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said plan has been prepared according to the criteria established by the County for grading and erosion control plans. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this plan.

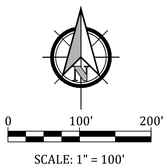
Engineer of Record Signature — Date
ANDREW W. McCORD P.E. 25057

Owner's Statement:
I, the owner/developer have read and will comply with the requirements of the Grading and Erosion Contro lPlan.

Owner Signature — Date
J. Mark Watson, President
ADDRESS: GLEN DEVELOPMENT COMPANY
1 WIDEFIELD BOULEVARD
COLORADO SPRINGS, COLORADO 80911

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

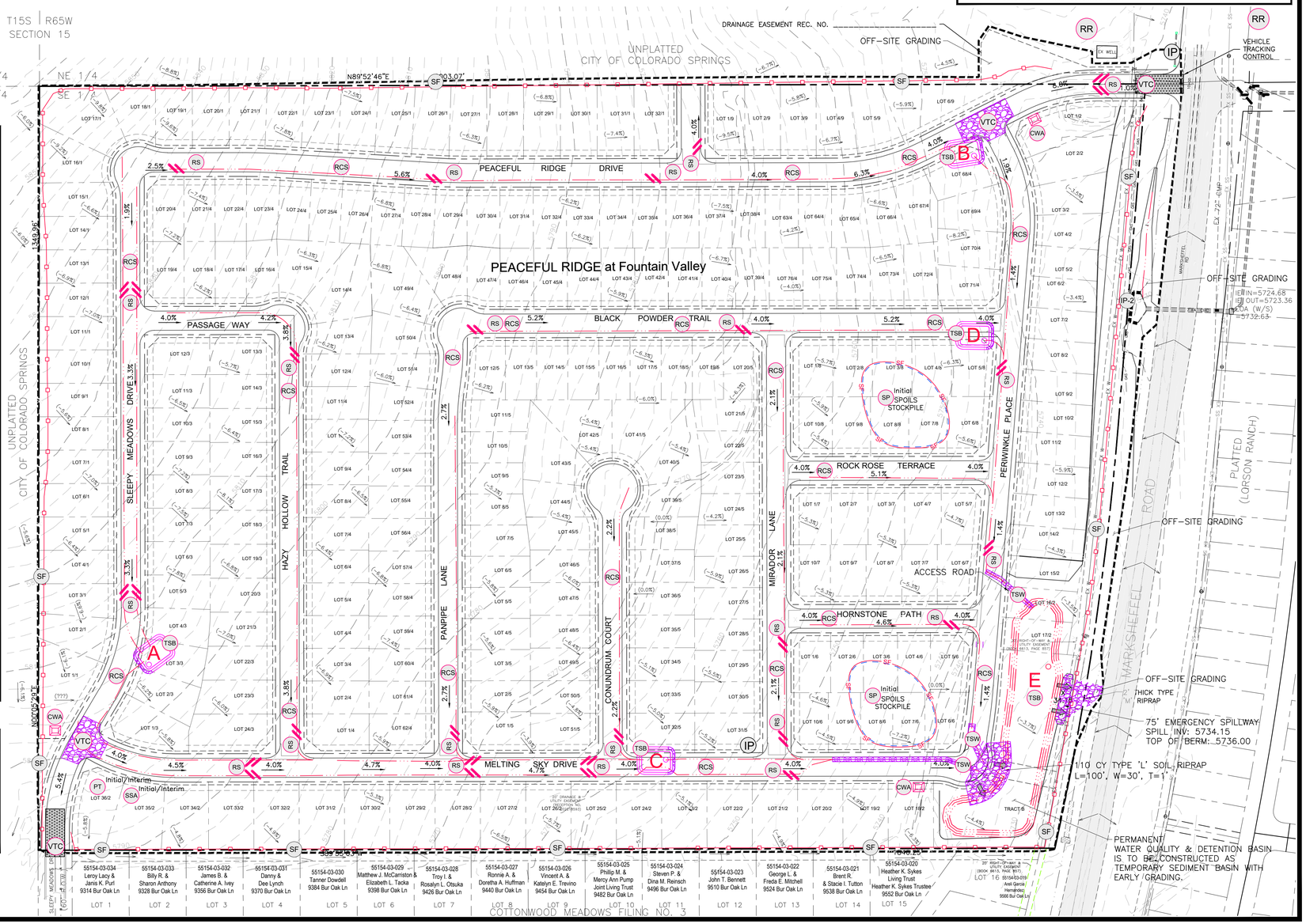
WIDEFIELD Investment Group



SCALE: 1" = 100'

T15S | R65W
SECTION 15

NW 1/4 | NE 1/4
SW 1/4 | SE 1/4



INITIAL GRADING LEGEND

- Ex. Flow Direction Arrow And Slope
- SP — Stockpile With Double Silt Fence Perimeter
- Initial Interim SF — Silt Fence Or Approved Alt.
- VTC — Vehicle Tracking Control
- Initial TSW — Temporary Swale
- Initial IP — Inlet Protection
- Initial RCS — Rough-cut Street Control Initial Condition Only
- Initial CWA — Concrete Washout Area
- Initial RS — Rock Sock(s) (count)
- Initial SSA — Stabilized Staging Area
- Initial PT — Portable Toilet
- Initial SP — Stock Pile Management
- Initial TSB A — Temporary Sediment Basin w/ Desig. See Dtl. Sht 'EGP-3'
- Riprap Stabilization
- IP-2 — Inlet Protection 2 (StrawBale)
- Limits Of Soil Disturbance/ Limits Of Construction
- Property Line
- 5925 — Existing Contour
- Initial — Emergency Overflow Path
- Existing Storm
- CX SS — Existing Sanitary Sewer
- CX W — Existing Water
- GAS GAS GAS — Existing Gas
- Channel Flowline

EROSION CONTROL INSPECTION AND MAINTENANCE

A Thorough Inspection of the Erosion Control Plan/Stormwater Management System shall be performed every 14 days as well as after any rain or snowmelt event that causes Surface Erosion:
* When Silt Fences have silted up to half their height, the silt shall be removed, final grade re-established and slopes re-seeded, if necessary. Any silt fence that has shifted or decayed shall be repaired or replaced.
* Any Accumulated Trash or debris shall be removed from outlets.

An inspection and maintenance log shall be kept.

PEACEFUL RIDGE AT FOUNTAIN VALLEY
EARLY GRADING PLAN
INITIAL GRADING AND EROSION CONTROL PLAN
EL PASO COUNTY, COLORADO

FOUNTAIN VALLEY INVESTMENT PARTNERS, LLC

Project No.:	04092/21031
Date:	Nov 16, 2021
Design:	MJK
Drawn:	MJK
Check:	AWMc
Revisions:	
No.	"EGP-213"

SHEET
EGP-1
OF 30 SHEETS

21031_EGP-1 thru 5_SWMP.dwg/Nov 17, 2021

OPINION OF COST FOR EROSION CONTROL REQUIREMENTS				
ITEM	QUANTITY	UNIT	UNIT COST	AMOUNT
VEHICLE TRACKING CONTROL	2	EA	$2,453.00	$4,906.00
SILT FENCE	16,532	LF	$2.60	$42,983.00
INLET PROTECTION	13	EA	$173.00	$2,249.00
CONCRETE WASH OUT	2	EA	$932.00	$1,864.00
EROSION CONTROL BLANKET	17,875	SY	$6.20	$110,825.00
TEMPORARY SEDIMENT BASIN	1	EA	$1824.00	$1,824.00
TEMPORARY SEEDING AND MULCH	45.2	AC	$1605.00	$72,546.00
MAINTAINANCE (25% OF EROSION CONTROL)	1	LS	$14,879.00	$59,299.00
			TOTAL	$296,496.00

SEED MIX

AREAS DISTURBED BY THE EARTHWORK ACTIVITIES AND NOT RECEIVING OTHER TREATMENT SHALL BE PERMANENTLY REVEGETATED WITH THE FOLLOWING SEED MIX.

SPECIES	VARIETY	pls/acre
SIDEOATS GRAMA	*El Reno*	3.0
WESTERN WHEAT GRASS	*Barton*	2.5
SLENDER WHEAT GRASS	*Native*	2.0
LITTLE BLUESTEM	*Pastura*	2.0
SAND DROPSEED	*Native*	0.5
SWITCH GRASS	*Nebraska 28*	3.0
WEEPING LOVE GRASS	*Morpha*	1.0
		14.0 lbs

SEEDING APPLICATION: DRILL SEED 1/4" TO 1/2" INTO TOPSOIL. IN AREAS INACCESSIBLE TO A DRILL, HAND BROADCAST AT DOUBLE THE RATE AND RAKE 1/4" TO 1/2" INTO THE TOPSOIL. MULCHING APPLICATION: 1-1/2 TONS NATIVE HAY PER ACRE, MECHANICALLY CRIMPED INTO THE TOPSOIL.

EROSION CONTROL INSPECTION AND MAINTENANCE

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An inspection and maintenance log shall be kept.

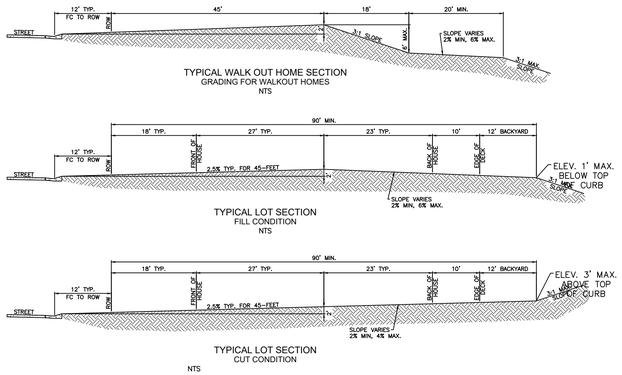
0 100' 200'

SCALE: 1" = 100'

LEGEND

- (-30.1%) Ex. Flow Direction Arrow And Slope
- 2.0% New Flow Direction Arrow And Slope
- CUT / FILL — Cut/fill Delineation
- SP — Stockpile With Double Silt Fence Perimeter
- Initial / Interim SF — Silt Fence Or Approved Alt.
- Initial / Interim VTC — Vehicle Tracking Control
- Initial / Interim IP — Inlet Protection (Existing Only)
- Final ECB — Erosion Control Blanket*
- Initial RCS — Rough-cut Street Control Initial Condition Only
- Interim CWA — Concrete Washout Area
- Interim RS — Rock Sock(s) (count)
- Interim SSA — Stabilized Staging Area
- Interim PT — Portable Toilet
- Interim SP — Stock Pile Management
- Interim TS — Temporary Seeding And Mulching
- Interim CD — Rock Check Dam
- Limits Of Soil Disturbance/ Limits Of Construction
- Property Line
- 5925 — Existing Contour
- 5925 — Proposed Contour
- Interim/Final — Emergency Overflow Path
- Existing Storm
- EX SS — Existing Sanitary Sewer
- EX W — Existing Water
- Proposed Water
- GAS GAS GAS — Existing Gas
- Channel Flowline

*Shaded area denotes permanent erosion blanket. Curlex heavy duty erosion control blanket by american excelsior or equal shall be used.



TYPICAL WALK OUT HOME SECTION
GRADING FOR WALKOUT HOMES
NTS

TYPICAL LOT SECTION
FILL CONDITION
NTS

TYPICAL LOT SECTION
CUT CONDITION
NTS

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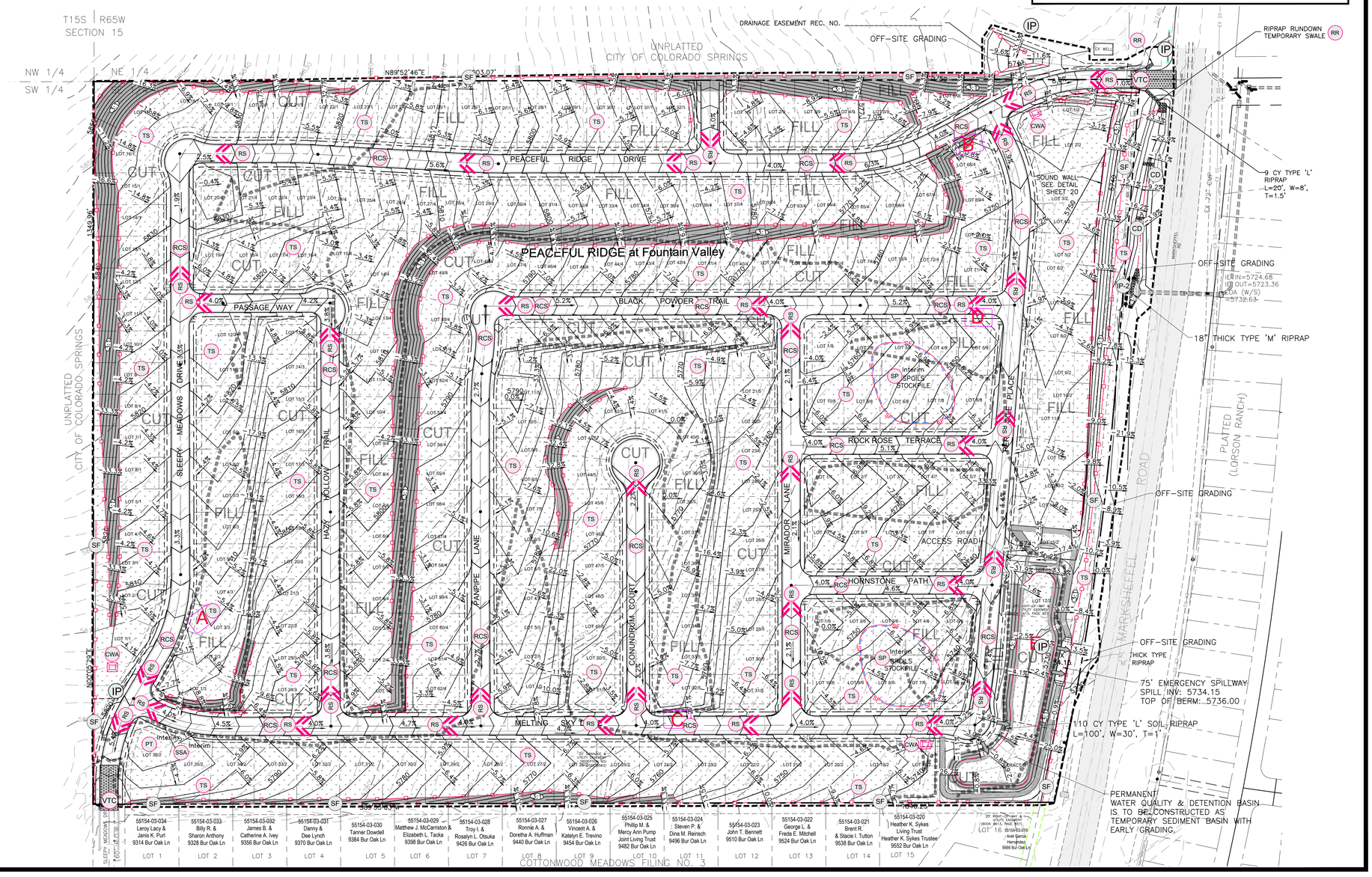
County Engineer/ECM Administrator — Date
JENNIFER IRVINE, P.E.

Engineer's Statement:
This grading and erosion control plan was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said plan has been prepared according to the criteria established by the County for grading and erosion control plans. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this plan.

Engineer of Record Signature — Date
ANDREW W. McCORD P.E. 25057

Owner's Statement:
I, the owner/developer have read and will comply with the requirements of the Grading and Erosion Contro lPlan.

Owner Signature — Date
J. Mark Watson, President
ADDRESS: GLEN DEVELOPMENT COMPANY
3 WIDEFIELD BOULEVARD
COLORADO SPRINGS, COLORADO 80911



Kiowa Engineering Corporation
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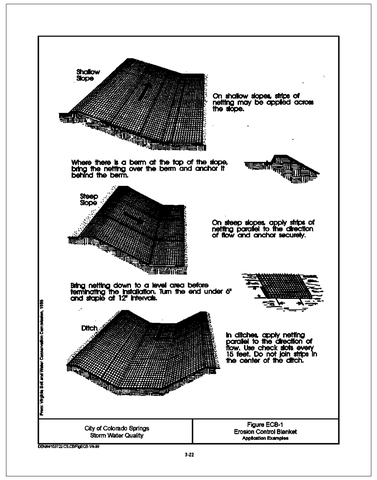
WIDEFIELD Investment Group

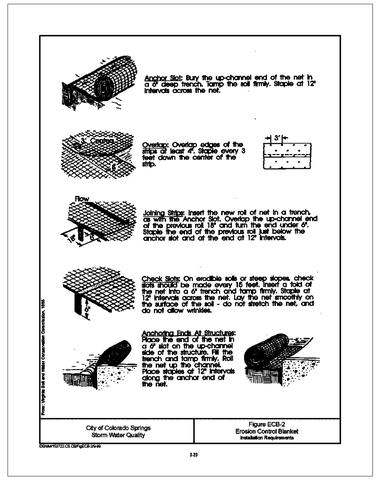
PEACEFUL RIDGE AT FOUNTAIN VALLEY
EARLY GRADING PLAN
INTERIM / FINAL GRADING AND EROSION CONTROL PLAN
EL PASO COUNTY, COLORADO
FOUNTAIN VALLEY INVESTMENT PARTNERS, LLC

Project No.:	04092/21031
Date:	October 4, 2021
Design:	JGD
Drawn:	MJK
Check:	AWMc
Revisions:	
No.	"EGP-2"

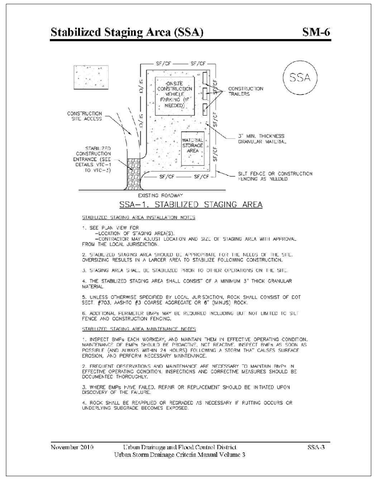
SHEET
EGP-2
OF 30 SHEETS

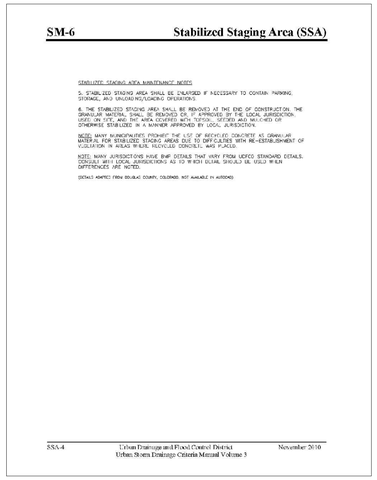
21031_EGP-1 thru 5_SWMP.dwg/Nov 17, 2021



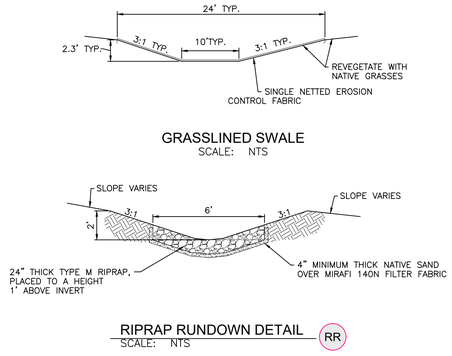


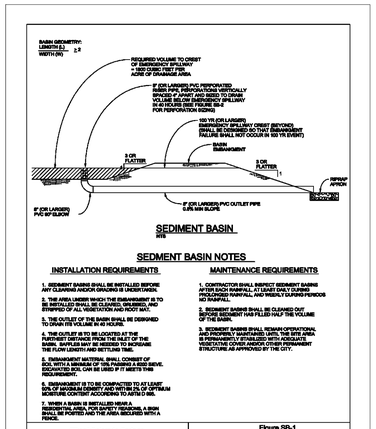
EROSION CONTROL BLANKET (ECB)
NTS

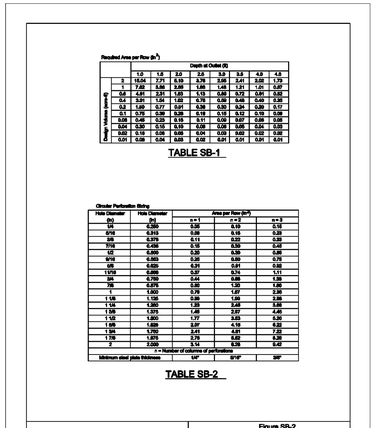




STABILIZED STAGING AREA (SSA)
NTS







SEDIMENT BASIN GENERAL NOTES

Installation requirements:

1. Sediment basins shall be installed before any clearing and/or grading is undertaken.

2. The area under which the enbankment is to be installed shall be cleared, grubbed, and stripped of all vegetation and root mat.

3. The outlet of the basin shall be designed to drain it's volume in 40 hours.

4. The outlet is to be located at the furthest distance from the inlet of the basin. Baffles may be needed to increase the flow length and settling time.

5. Embankment material shall consist of soil with a minimum of 15% passing a #200 sieve. Excavated soil can be used if it meets this requirement.

6. Embankment is to be compacted to at least 90% of max density and within 2% of optimum moisture content according to astm d 689.

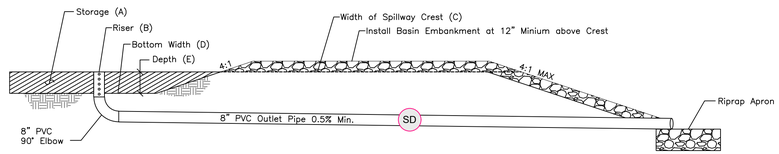
7. When a basin is installed near a residentual area, for safety reasons, a sign shall be posted and the area secured with a fence.

Maintenance requirements:

1. Contractor shall inspect sediment basins after each rainfall, at least daily during prolonged rainfall, and weekly during periods of no rainfall.

2. Sediment Basins shall be cleaned out before sediment has filled half the volume of the basin.

3. Sediment Basins shall remain operational and properly maintained until the site area is permanently stabilized with adequate vegetative cover and/or other permanent structure as approved by El Paso County.



TEMPORARY SEDIMENT BASIN "A"
A. 0.32 ac-ft Required to Spillway Crest

B. Use 8" PVC Perforated Riser Pipe: Perforations Vertically Spaced 4" Apart, 1 Column of 5 5/16" ø Holes.

C. 12' Long Spillway: 1' Depth, Lined With 12" Thick Type 'L' Riprap to toe of slope.

D. Basin Bottom Width = 51'

E. Depth = 2.0'

TEMPORARY SEDIMENT BASIN "B"
A. 0.28 ac-ft Required to Spillway Crest

B. Use 8" PVC Perforated Riser Pipe: Perforations Vertically Spaced 4" Apart, 1 Column of 5 5/16" ø Holes.

C. 11' Long Spillway: 1' Depth, Lined With 12" Thick Type 'L' Riprap to toe of slope.

D. Basin Bottom Width = 47.25'

E. Depth = 2.0'

TEMPORARY SEDIMENT BASIN "C"
A. 0.78 ac-ft Required to Spillway Crest

B. Use 8" PVC Perforated Riser Pipe: Perforations Vertically Spaced 4" Apart, 1 Column of 5 3/4" ø Holes.

C. 22' Long Spillway: 1' Depth, Lined With 12" Thick Type 'L' Riprap to toe of slope.

D. Basin Bottom Width = 75'

E. Depth = 3.0'

TEMPORARY SEDIMENT BASIN "D"
A. 0.53 ac-ft Required to Spillway Crest

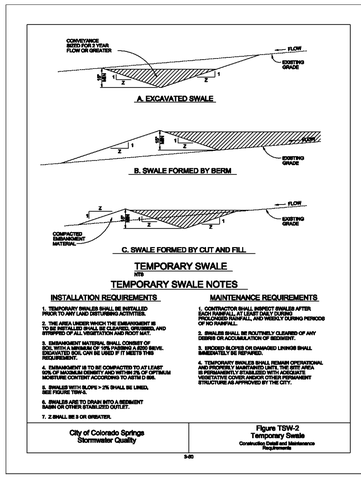
B. Use 8" PVC Perforated Riser Pipe: Perforations Vertically Spaced 4" Apart, 1 Column of 5 9/16" ø Holes.

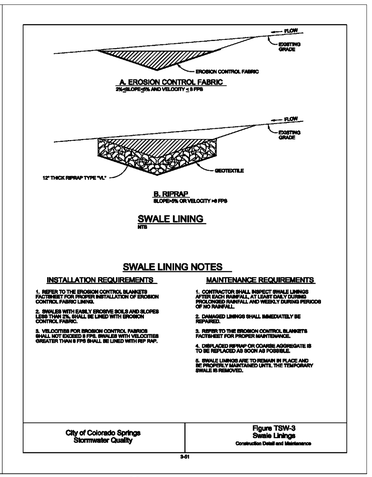
C. 9' Long Spillway: 1' Depth, Lined With 12" Thick Type 'L' Riprap to toe of slope.

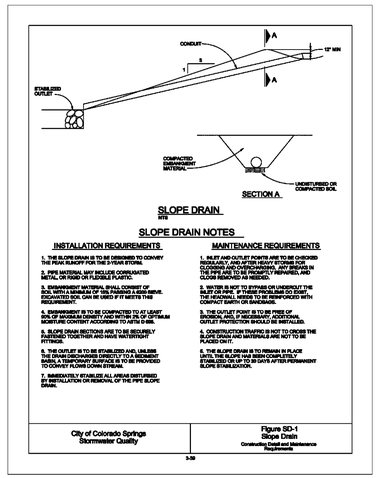
D. Basin Bottom Width = 43'

E. Depth = 2.5'

TEMPORARY SEDIMENT BASIN (TSB)
NTS







TEMPORARY SWALES (TSW)
NTS

TEMPORARY SLOPE DRAIN (SD)
NTS

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SHEET
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OF 30 SHEETS

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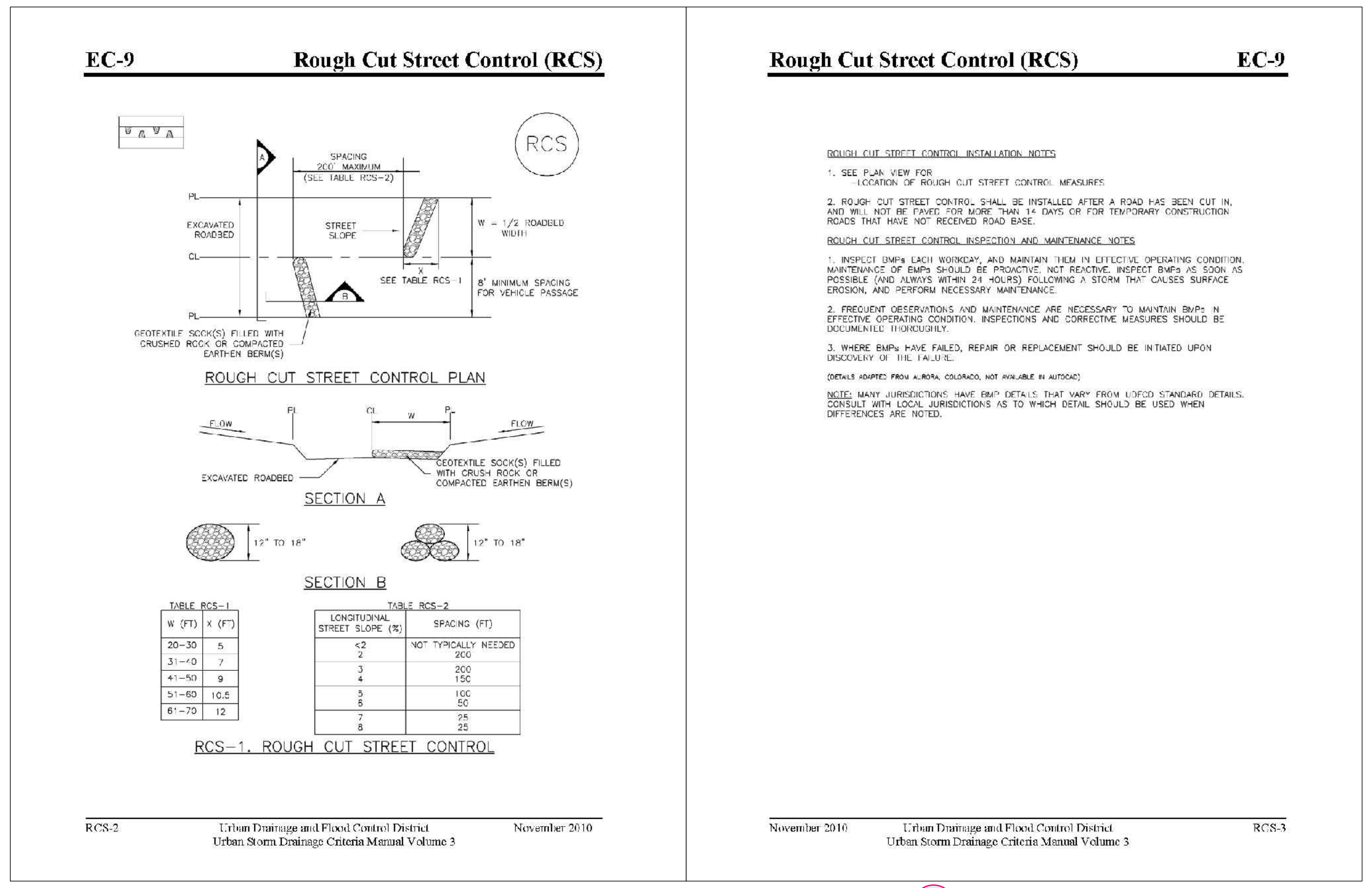
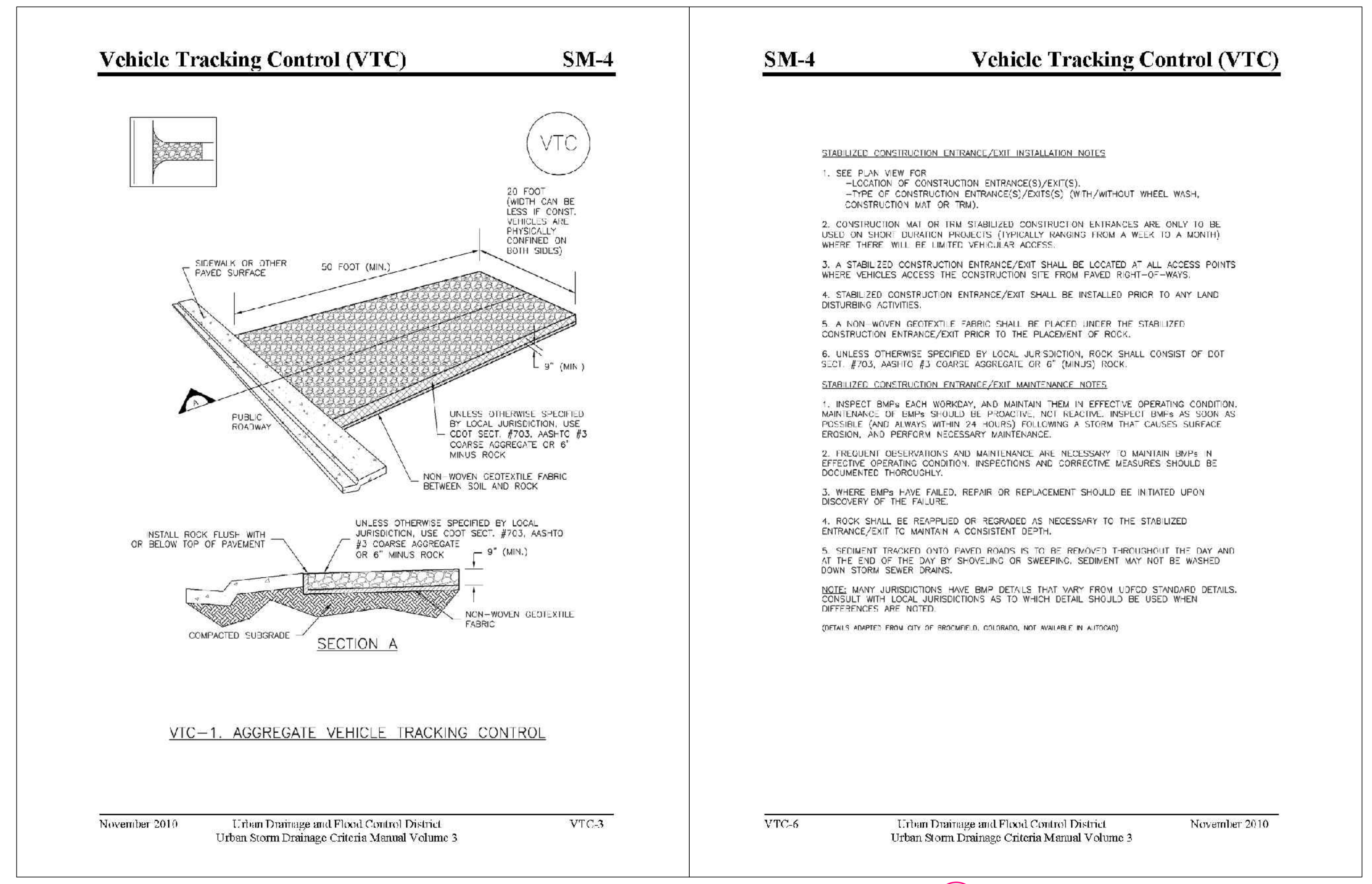


ROUGH-CUT STREET CONTROL (RCS)

NTS



VEHICLE TRACKING CONTROL (VTC)

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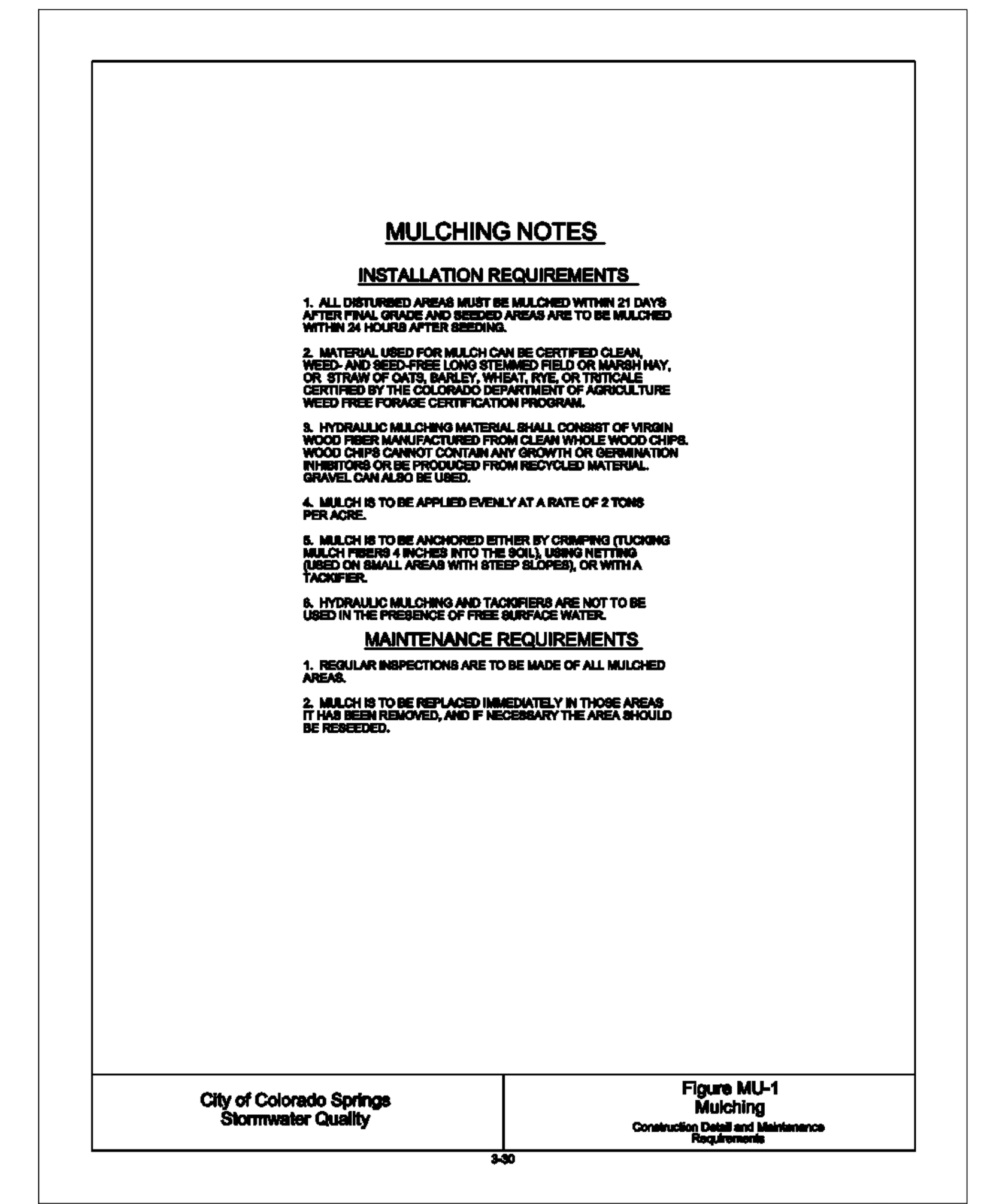

MULCHING (MU)

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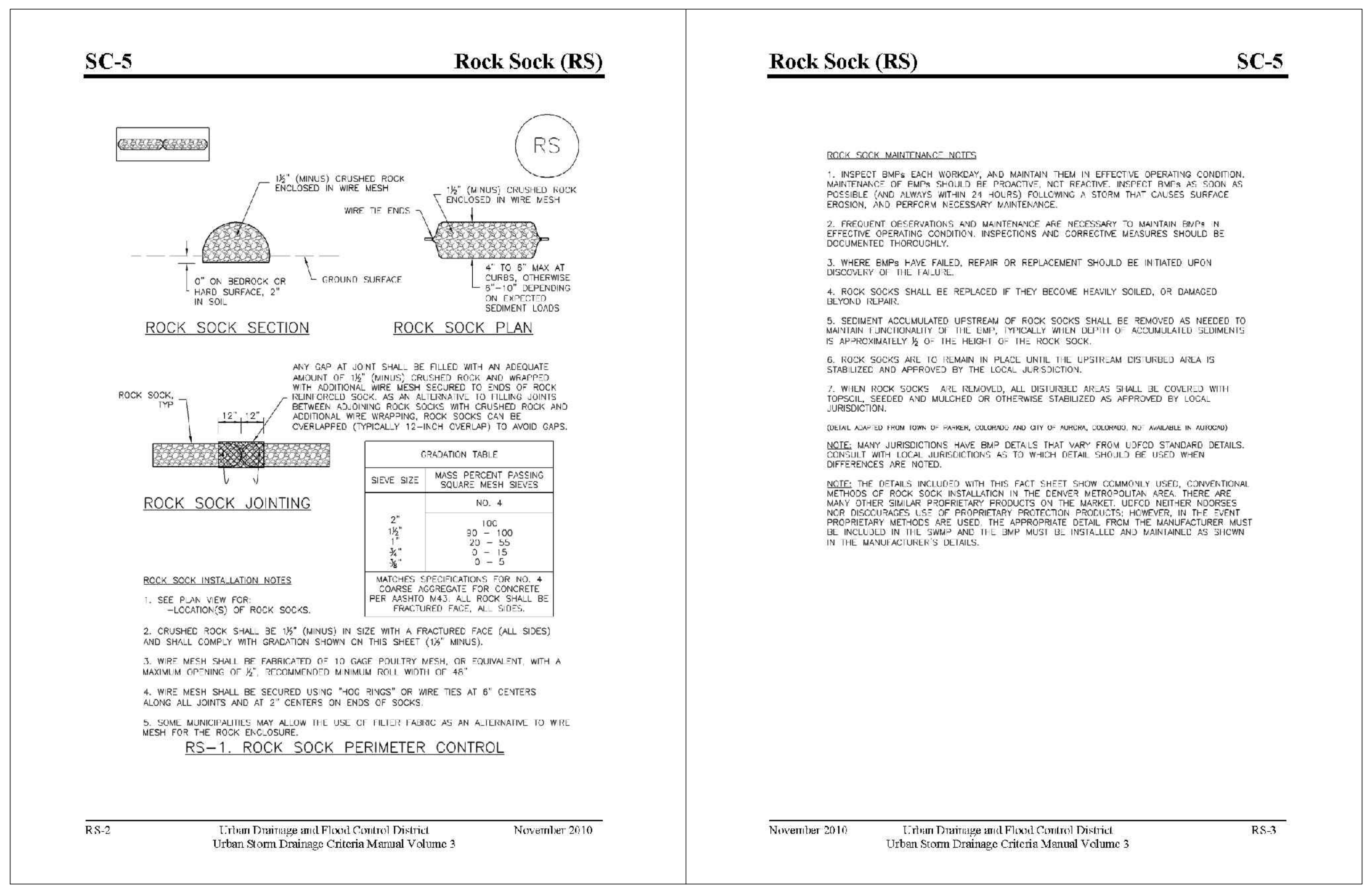

ROCK SOCK (RS)

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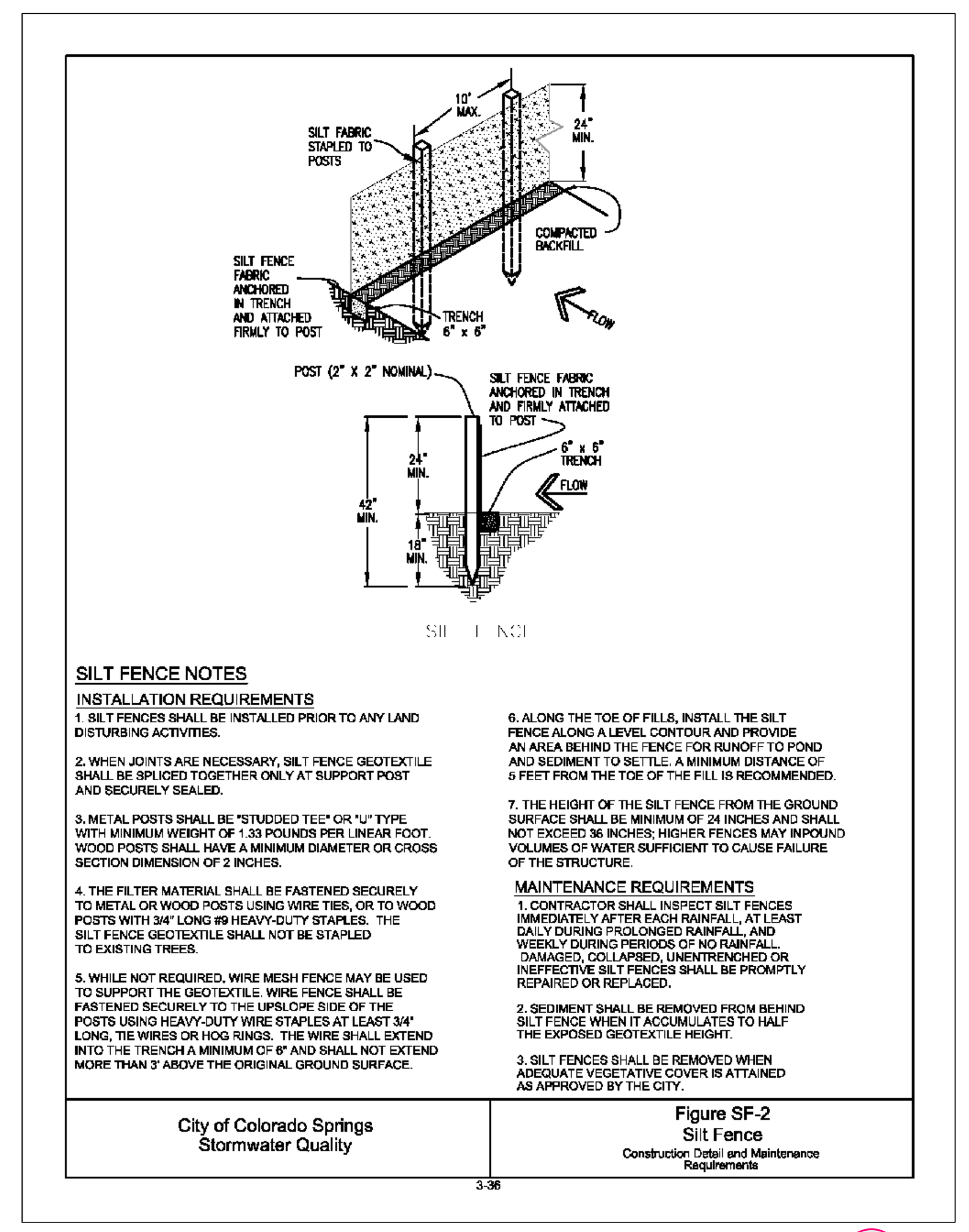

SILT FENCE (SF)

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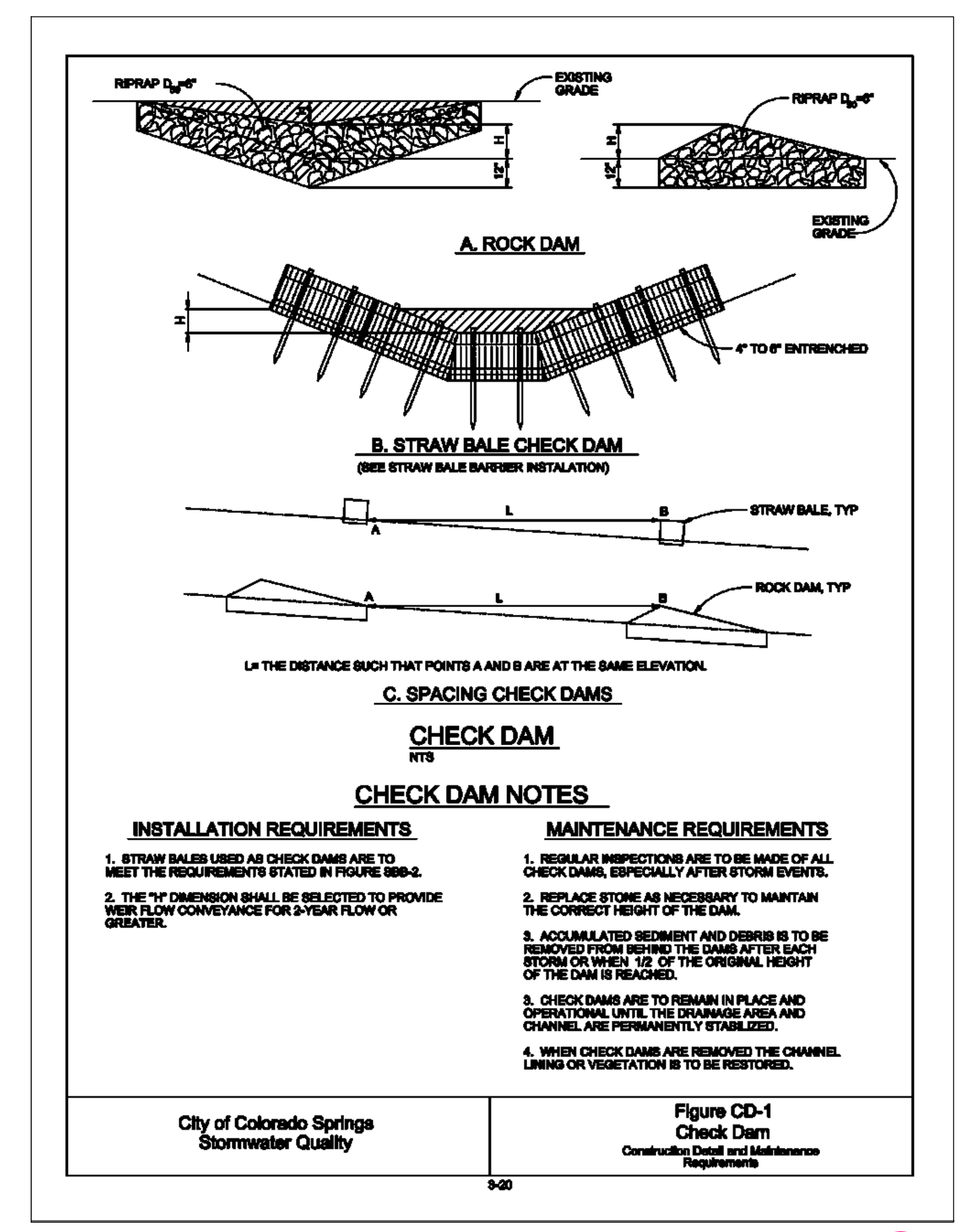
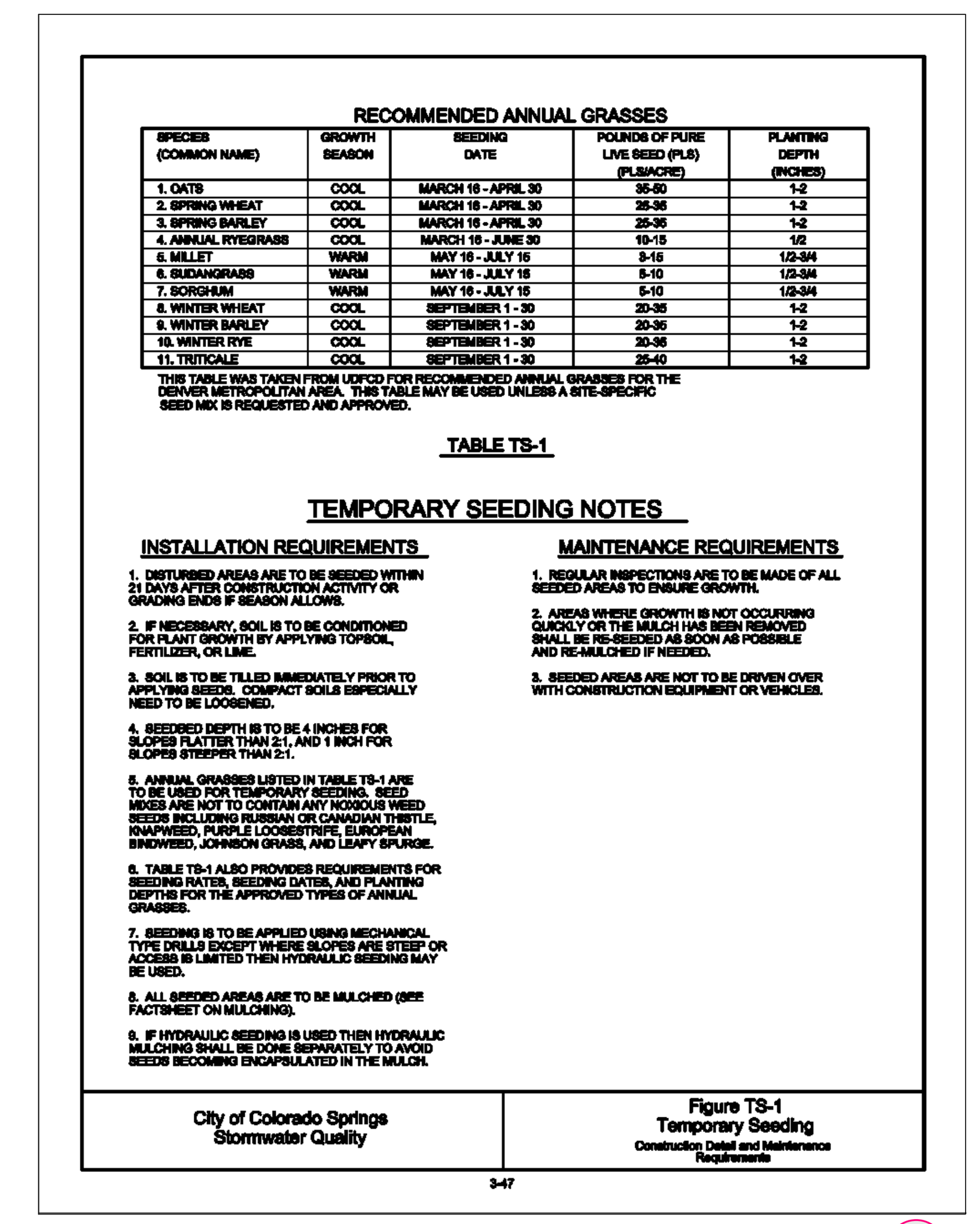


CHECK DAM (CD)

NTS



TEMPORARY SEEDING (TS)

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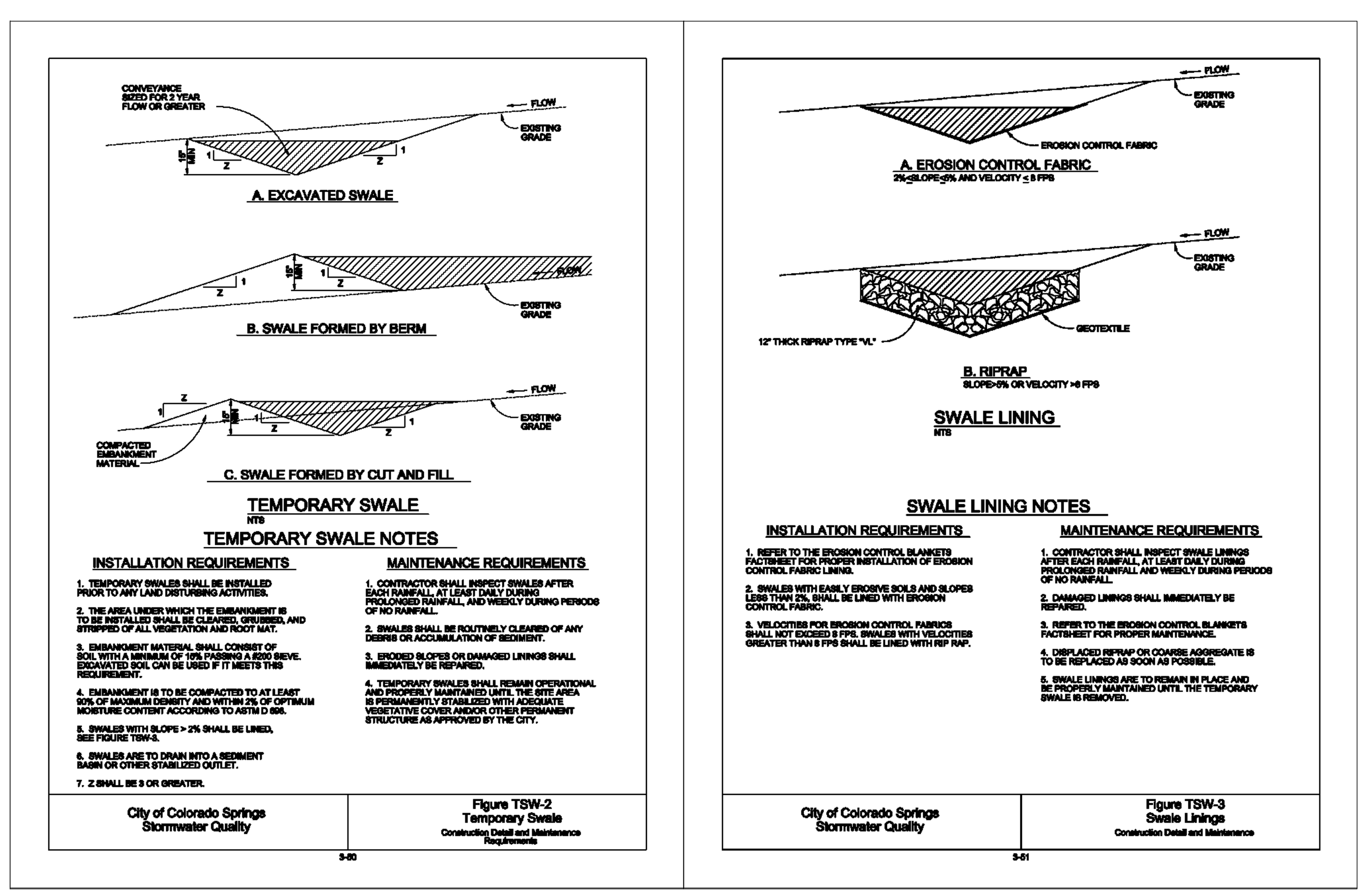

TEMPORARY SWALES (TSW)

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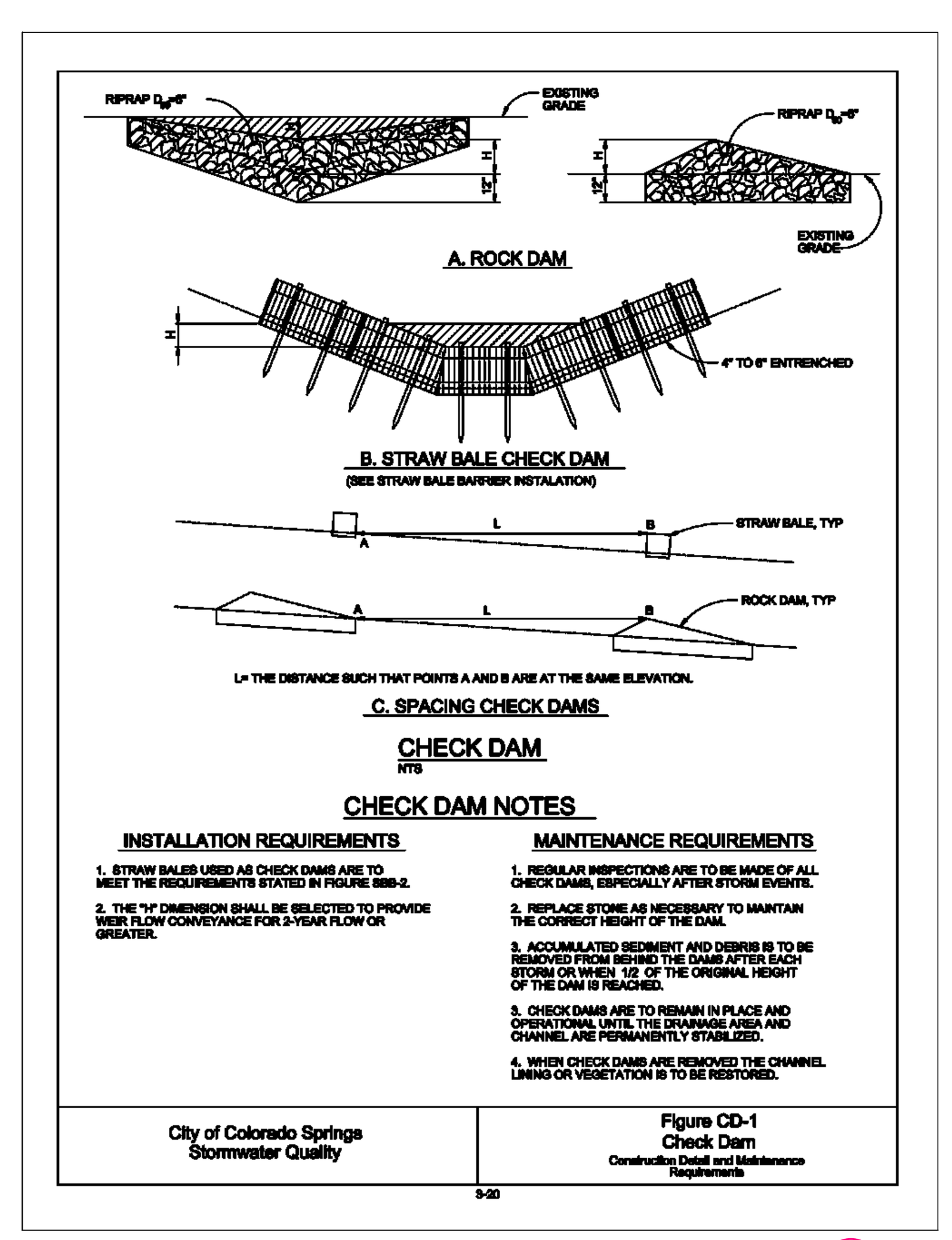

CHECK DAM (CD)

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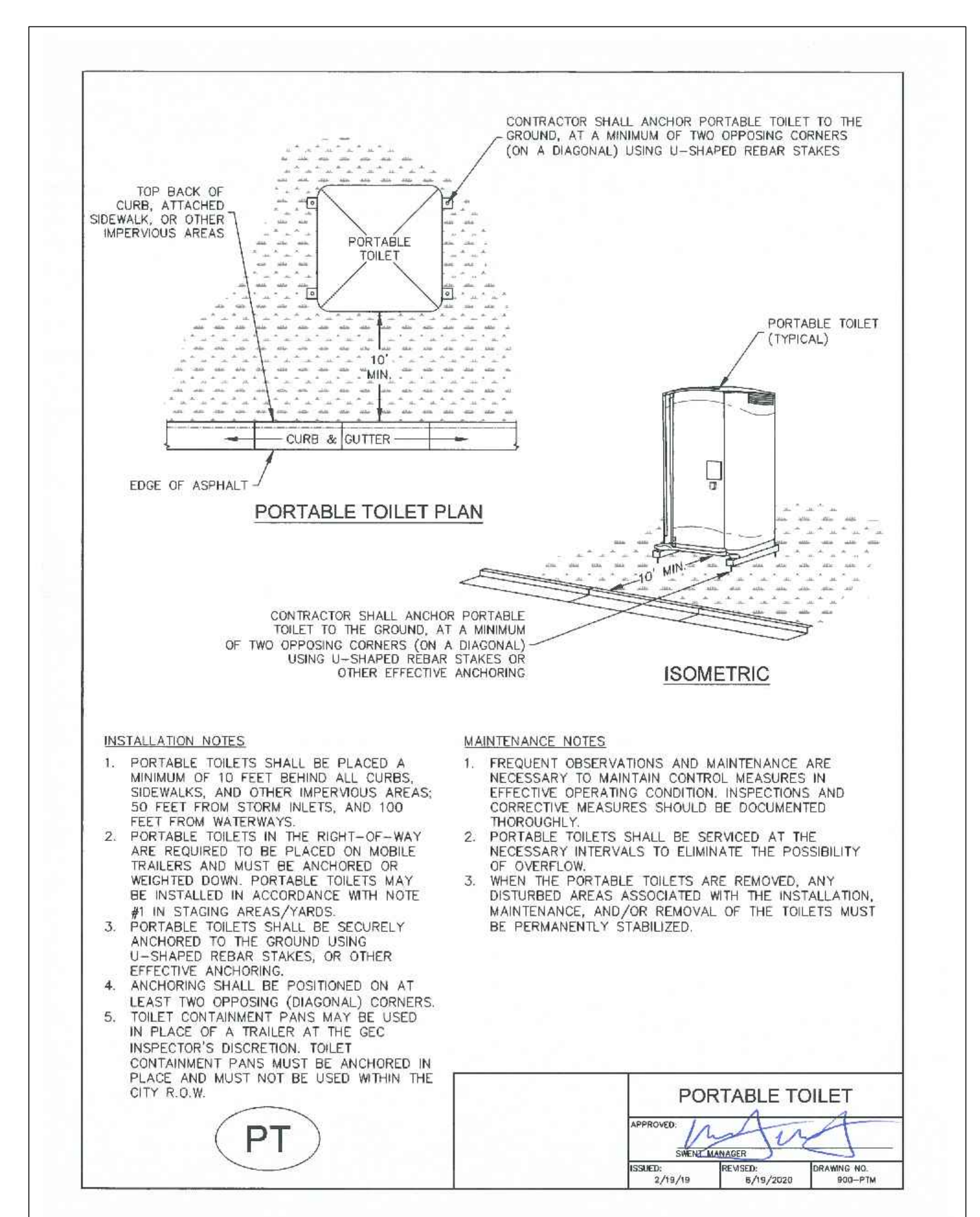

PORTABLE TOILET (PT)

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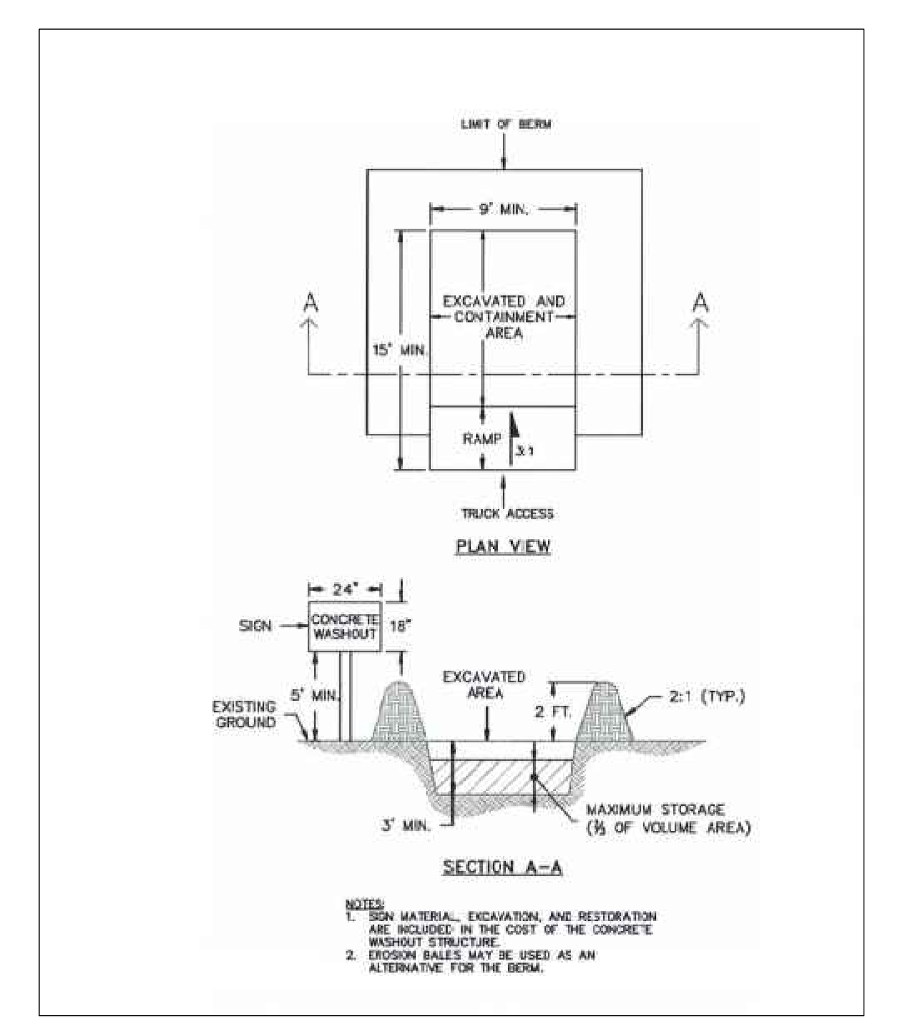

CONCRETE WASHOUT AREA (CWA)

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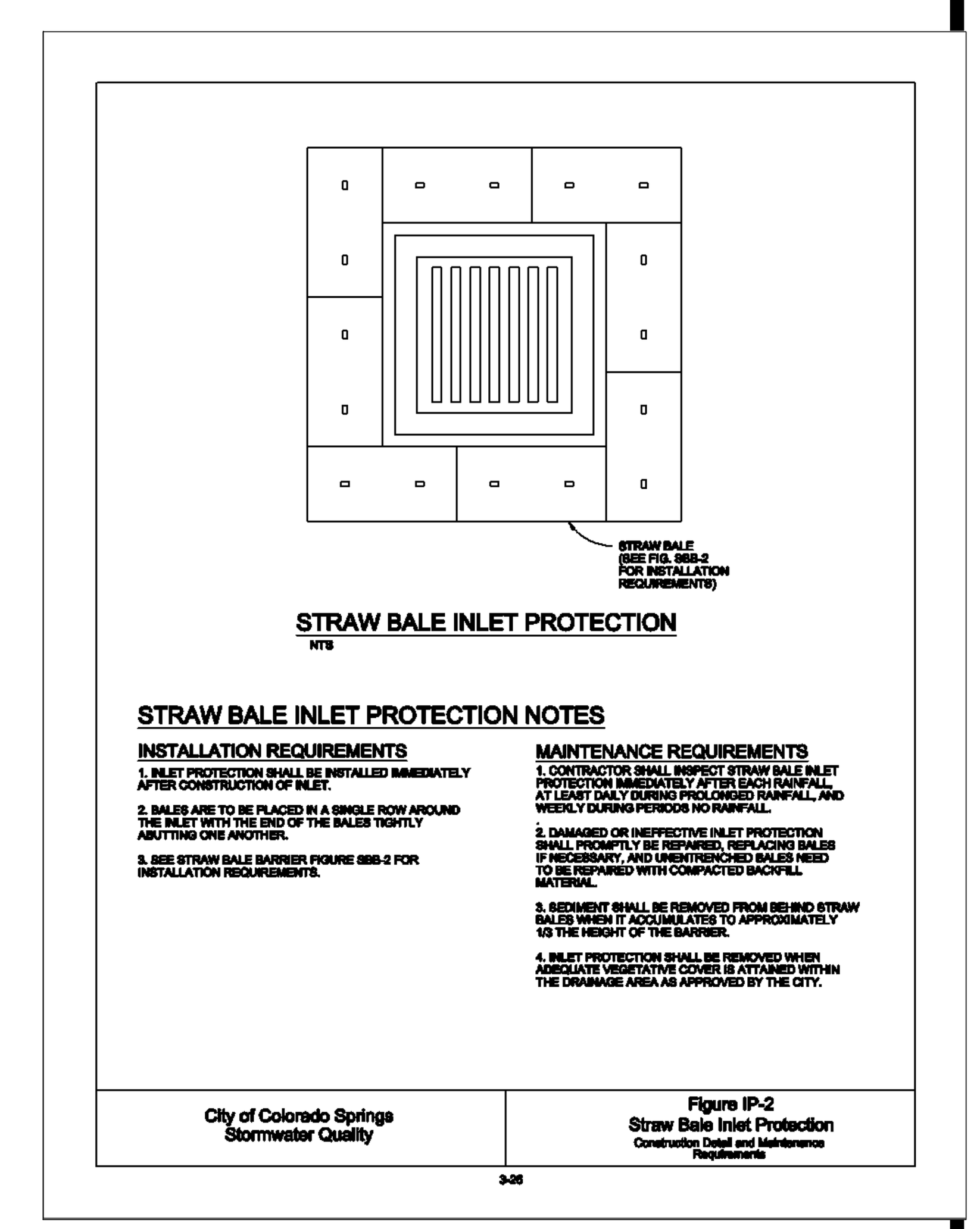

INLET PROTECTION -2 (IP-2)

NTS

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SHEET

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