



DRAINAGE LETTER

for

**SOUTH FLATROCK TRAIL ROADWAY EXTENSION
AURORA, CO**

Prepared for

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AUGUST 2022

Approved For One Year From This Date

City Engineer

Date

Water Department

Date

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A. INTRODUCTION

1. Location

This extension of South Flatrock Trail is within existing 70' width right-of-way from existing South Flatrock Trail (constructed by Murphy Creek East Filing No. 1 (*RSN 1508256*), (*RSN 1508256*), (*RSN 1508256*), (*RSN 1508256*) at East Warren Place to future East Yale Avenue. More specifically, the property is a part of Section 19, Township 4 South, Range 65 west of the Sixth Principal Meridian.

The site is bounded on the north by Murphy Creek East Filing No. 1 (*RSN 1508256*) (currently under construction), on the east by future Murphy Creek East Filing No. 3, on the south by future East Yale Pkwy., and on the west by future Murphy Creek Filing No. 7.

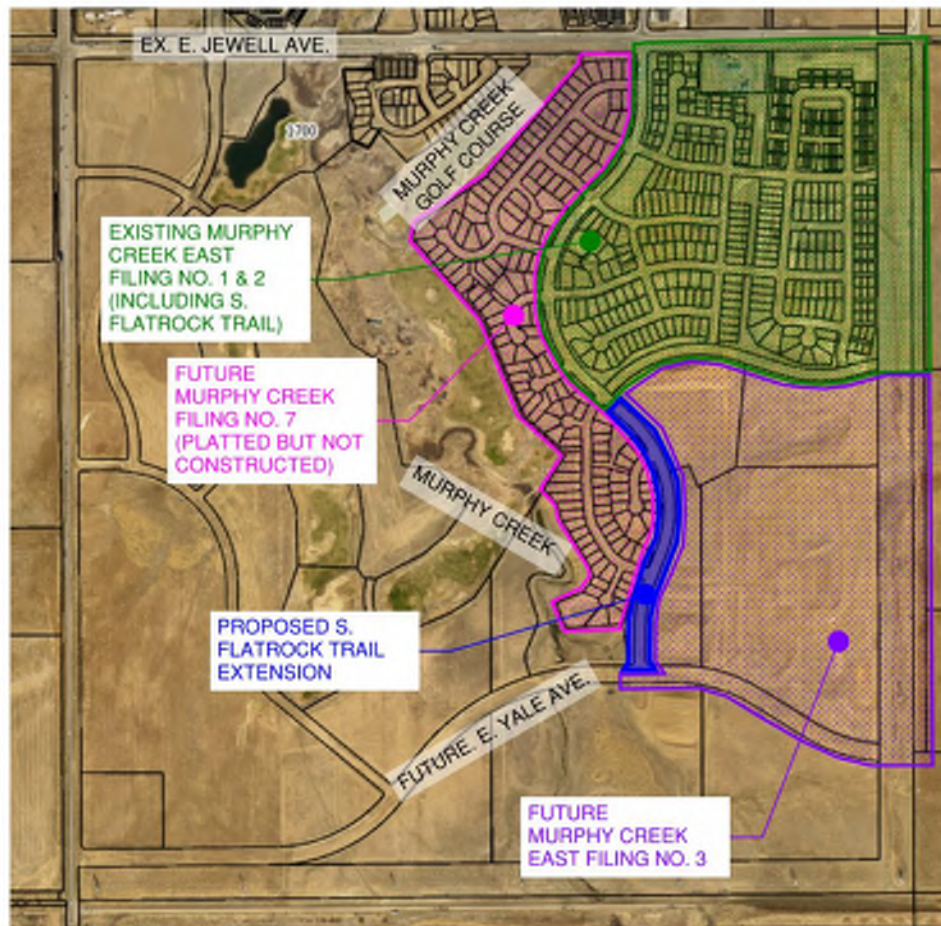


Figure 1 – Vicinity Map

Projects that are approved or are to be constructed ahead of South Flatrock Trail:

- Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, & 4 Master Drainage Report (*Murphy Creek East MDR*), approved, *EDN 220220*
- Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1 & 2 Preliminary Drainage Report (*Murphy Creek East PDR*), approved, *EDN 221062*

- Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1 & 2 Final Drainage Report (*Murphy Creek East FDR*), currently under review, *EDN 221063*
- Murphy Creek East Filing No. 1 Offsite Infrastructure Site Plan, approved, *EDN 221064*
- Murphy Creek East Filing No. 1 Civil Plans, currently under review, *RSN 1508256*

Projects that are future or are to be constructed after South Flatrock Trail:

- Murphy Creek Filing No. 7
- Murphy Creek East Filing No. 3

2. Proposed Development

The project consists of the construction of an approximately 2,030 lineal foot of 70' right-of-way collector roadway. A typical section is provided in the Civil Plans showing the asphalt paved lane widths, concrete curb and gutter, landscape tree line buffer, and detached concrete pedestrian sidewalk. The roadway follows the previously existing right-of-way alignment for South Flatrock Trail from East Warren Place in the north to East Yale Avenue in the south. The site consists of 142,009 square feet, or 3.26 acres.

The road construction for this project began several years ago. Utilities were installed and the street was rough graded. Curbs and asphalt were not installed, however. This project proposed to complete this road, which maintaining the existing infrastructure as much as feasible.

Where this project connects to existing South Flatrock Trail in the north (constructed by Murphy Creek East Filing No. 1 (*RSN 1508256*)), the existing infrastructure by others will be completed prior to the initiation of this project. This includes two sump inlets receiving drainage for this extension as well as the curb and asphalt that this project ties to.

The Civil Plans submitted to the City of Aurora show all of the existing utilities that were previously constructed including water main, sanitary sewer, and storm sewer infrastructure. The existing storm system is designed to collect and convey stormwater runoff tributary to the roadway which ultimately is conveyed to Pond C located toward the south of the project area, near East Yale Avenue, or Pond 7-C (constructed by Murphy Creek East Filing No. 1 (*RSN 1508256*)) to the south adjacent to Murphy Creek. This project proposed to maintain these existing ponds as currently constructed, with minimal changes. The interim condition proposed by this project will be analyzed to ensure the ponds can receive the slight increase of developed flows.

The purpose of this report is to analyze the existing and developed conditions for the proposed paving project as it relates to stormwater runoff and capture volumes. A Master Drainage Report (Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, & 4 Master Drainage Report (*EDN 220220*)) for this area has been approved by the City of Aurora. This report will also ensure that the design is in conformance with the Murphy Creek East MDR. Hydrology exhibits and calculations are included in Appendix D.

Property Description

This project includes existing right-of-way dedicated for the South Flatrock Trail extension between East Warren Place and East Yale Avenue. This land is currently overlot graded for the future corridor

and has utilities installed including water main, sanitary sewer, and storm sewer. These utilities were installed in accordance with City approved design plans (EDN 205189). This project proposed to maintain the existing utilities and finalize the road paving.

The north end of the paving project begins at the intersection of East Warren Place south of the Murphy Creek East Filing No. 1 development (*RSN 1508256*). This development and a portion of the South Flatrock Trail extension runoff outfall to an offsite pond, Pond 7-C. This drainage is not tributary to the South Flatrock Trail, but instead is routed through a temporary channel (constructed by Murphy Creek East Filing No. 1 (*RSN 1508256*)) to the west.

In the south, the storm system was previously constructed in accordance with the Construction Drawings developed dated 06/20/2001 (*EDN 205189*). At present, Pond C located east of South Flatrock Trail and north of East Yale Avenue has been excavated but a trickle channel, micropool, and outlet structure with orifice plate, well screen, and trash rack have not been installed.

Directly east and west of the existing right-of-way is undisturbed land consisting of pervious soil with native weeds and grasses. Murphy Creek East Filing No. 3 is to be developed in the future east of South Flatrock Trail. Murphy Creek Filing No. 7 (including the area where Pond 7-C is located) is to be developed in the future west of South Flatrock Trail. Coordination between all of these projects is ongoing to ensure the design is adequate and in conformance with master studies.

Type of Development

The paving of the South Flatrock Trail right-of-way corridor results in an increased percent imperviousness for the tributary area of Pond C and Pond 7-C. Pond 7-C to the west and the outfall channel were designed by Murphy Creek East Filing No. 1 (*RSN 1508256*) (*EDN 221062*). These will be reviewed to ensure that slight additional flow can be adequately handled within their existing system.

Pond C to the south is where a water quality and detention pond has been partially constructed as a temporary sediment basin for the overlot grading and utility construction of the South Flatrock Trail corridor in the past. The existing storm system was constructed per previous City-approved plans and reports (EDN 205189) which assumed a 70' collector road corridor for South Flatrock Trail. Because the typical section for the developed conditions matches that of previous reports, the existing storm system is sufficient. Hydraulic design calculations verifying the storm system are provided in Appendix E.

Hydrology exhibits are provided in Appendix D showing the developed conditions stormwater runoff that flows to Pond C (Design Point 1) as a result of the construction of South Flatrock Trail.

An assessment of existing conditions versus developed conditions is provided in the summary below.

3. Requested Variances

No variances have been requested for the construction of South Flatrock Trail.

B. HISTORIC DRAINAGE

1. Overall Basin Description

Offsite Basins

A significant amount of flow currently traverses the existing right-of-way of South Flatrock Trail. A majority of this runoff is routed to the existing infrastructure that is currently onsite. This project proposes a street through the right-of-way that will route more flow into existing infrastructure, or capture it within curb and gutter to be routed to inlets.

The Murphy Creek East MDR (*EDN 220220*) shows the ultimate assumed flows for the area adjacent to this project. There is ongoing coordination with the future Murphy Creek East Filing No. 3 project (east of South Flatrock Trail) and it has been decided that the South Flatrock Trail project would analyze the ultimate condition described in the Murphy Creek East Filing 3 PDR. This provides a more detailed account of the ultimate conditions that will have to be taken into consideration when compared to the general concepts proposed in the Murphy Creek MDR. As such, that project will be responsible for ensuring their design is in conformance with master studies.

There are two offsite basins adjacent to the site. Both of these basins are defined in the Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, & 4 Master Drainage Report (*EDN 220220*).

- 1) Offsite Basin 1 (OS1) is a combination of Basins D and OS-2 from the approved MDR and consists of 61.6 acres. Together these basins contribute 41.61 and 160.93 cfs in the minor and major storm events. However, the Murphy Creek Filing No. 3 PDR prepared by Redland combines Basins C and D from the Murphy Creek East MDR. This is the condition by which the existing storm network is analyzed due to the higher level of detail and more current design when compared to the original MDR.
- 2) Offsite Basin 2 (OS2) corresponds to Basin C of the approved MDR and consists of 34.6 acres. This basin contributes 28.85 and 114.28 cfs in the minor and major storm events. The Murphy Creek East Filing 3 PDR is proposing that existing Pond D be abandoned and EURV Pond C be expanded. The PDR states that the tributary area for Pond C will be 92.41 acres with a composite percent impervious of 31%. Pond C will have a release rate of 0.9 cfs in the minor storm event, and 153.2 cfs in the major storm event.

Major Drainageways

The site lies within the Sand Creek Drainage Basin, which is the ultimate outfall for the site. Murphy Creek is the major drainageway through the site with several major tributaries to Murphy Creek that also flow through the site. These tributaries include: East Murphy Creek Tributary, Gun Club Tributary, Alexandra Gulch, and Harvest Gulch. The FEMA map, included in Appendix C, shows the site lies within Zone X, which is described as an area with minimal flood hazard.

2. Drainage Patterns Through Property

South Flatrock Trail is currently overlot graded for the future corridor, with all existing flows ultimately being discharged into the Murphy Creek Floodplain (FEMA FIRM 08005C0212K 12/17/2010). These flows are conveyed and treated via temporary swale (Murphy Creek East Filing No. 1 Offsite ISP, 1506588), existing Private Water Quality Pond C (Murphy Creek East MDR), and existing F7-C Pond (Murphy Creek East Filing No. 1 Offsite ISP, 1506588).

3. Outfalls Downstream from Property

There are no new water quality ponds associated with this project. All flows from the site will be treated in the existing Water Quality Pond C which is to be improved per the Murphy Creek East Filing 3 PDR or routed via an existing temporary swale to the existing F7-C Pond from Murphy Creek East Filing No. 1 Offsite Infrastructure Site Plan (210121).

C. DESIGN CRITERIA

1. References

Existing Drainage Reports

A Final Drainage Study & Water Quality Control Design for Murphy Creek Subdivision Filing No. 7 (Reference 6, 2003) (C.O.A. approval 202195) prepared by Costin Engineering consultants, Inc. has been previously approved on January 2, 2004. This report also references two other adjacent drainage reports, Final Drainage Study, Murphy Creek filing No. 8 (C.O.A. approval 205203) and Preliminary Drainage Study for Murphy Creek Filing No. 9 (C.O.A. approval 201170) both prepared by Peak Civil Engineering Co.

Mile High Flood District Criteria

The water quality ponds were sized using the Mile High Flood District (MHFD) UD-Detention spreadsheet found in Appendix B for WQ and EURV detention.

City Master Plan and Floodplain Studies

- A. Master Drainage Plan for Murphy Creek, a Planned Community was completed by Costin Engineering Consultants, Inc. (Reference 1, 1998) (C.O.A. approval 980080).
- B. 2008 Murphy Creek OSP
- C. Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, & 4 Master Drainage Report (Also referenced as Murphy Creek East MDR) (Approved)
- D. Murphy Creek Fluvial Hazard Zone Mapping Report, dated January 2021

2. Hydrologic Criteria

Rainfall Source

The rainfall data that was used for this report was taken from Figures RA-1 through RA6 in Appendix C and are presented in the table below.

2-YR	5-YR	10-YR	50-YR	100-YR
0.98	1.38	1.63	2.32	2.67

Calculation Method

The rational method was used for this Drainage Letter.

Water Quality Capture Volume Computation Method

The volumes for the water quality ponds were calculated based on MHFD's criteria.

Design Frequencies

A 2-year design frequency was used for the minor storm and a 100-year design frequency was used for the major storm.

3. Hydraulic Criteria

The City of Aurora Storm Drainage Design & Technical Criteria was used in conjunction with the MHFD Urban Storm Drainage Criteria Manual. The 2-year and 100-year events were used to size the water quality ponds. These ponds have been sized to capture and treat 1.2 * WQCV and the EURV and it will not be required to detain the 100-year detention volume. Calculations for sizing can be found in Appendix E. It should be noted that storm sewer infrastructure including pipes and inlets will be sized and modeled as part of the Final Drainage Report and are not included with the preliminary report. The design storm for the storm drains is the 100-year storm event.

City of Aurora allowable pavement encroachment and depth of flow design criteria in the SDDTC Manual are to be met (Section 3.32). The depth of flow in streets is not to overtop curb for the minor storm and the maximum depth of water over the gutter flowline shall not exceed 12" for the major storm event. Street and cross plan flow depth calculations are to be included in the Final Drainage Report.

City of Aurora pond design criteria in the SDDTC Manual are to be met including Section 6.32 for freeboard requirements. The minimum freeboard for open space detention facilities is 1.0' above the computed 100-year water surface elevation. The emergency overflow weir sill shall be set at the freeboard elevation. The pond embankment will be constructed a minimum of 1.0' above the maximum overflow depth for the emergency overflow for the 100-year developed overflow conditions as required by the MFHD criteria.

D. DRAINAGE PLAN

1. General Concept

Offsite drainage basins will be conveyed through the site via existing storm infrastructure. Per the Murphy Creek East Filing 3 PDR, all flows from Basins OS1 and OS2 will be collected and treated at Water Quality Pond C. Flows are then routed south and west via existing storm infrastructure under the proposed S. Flatrock Trail. Flows are then routed west to discharge into Murphy Creek via an existing grouted boulder outfall. Offsite basin OS2 is collected by the existing private water quality Pond C constructed with The Murphy Creek East MDR (*EDN 220220*). After treatment, flows are collected at the outlet structure at DP-2 and routed west under the proposed S. Flatrock Trail to be discharged into Murphy Creek via the existing storm sewer and existing grouted boulder outfall.

The water quality ponds, outlet structures, and associated on-site drainage facilities will be the responsibility of the homeowner's association that will be created with the development of this site.

2. Specific Details

Basin A1

Basin A1 is 1.20 acres primarily consisting of roadway drainage. Stormwater runoff from Basin A1 is collected in the roadway where it is conveyed via curb and gutter to be collected by an existing 10' CDOT Type R sump inlet (DP-A1), it is then conveyed north and west via existing storm infrastructure and discharged via an existing temporary FES outlet structure. It is then conveyed south via an existing temporary swale to be collected at the existing Pond F7-C and ultimately discharged into Murphy Creek. Flows from Basin A1 amount to 3.16 cfs during the minor event and 9.20 cfs during the major event.

Basin A2

Basin A2 is 0.80 acres primarily consisting of roadway drainage. Stormwater runoff from Basin A2 is collected in the roadway where it is conveyed via curb and gutter to collected by an existing CDOT 15' Type R sump inlet (DP-A2), it is then conveyed north and west via existing storm infrastructure and discharged via an existing temporary FES outlet structure. It is then conveyed south via an existing temporary swale to be collected at the existing Pond F7-C and ultimately discharged into Murphy Creek. Flows from Basin A2 amount to 2.08 cfs during the minor event and 6.07 cfs during the major event.

Basin B1

Basin B1 is 1.00 acres primarily consisting of roadway drainage. Stormwater runoff from Basin B1 is collected in the roadway where it is conveyed via curb and gutter to collected by an existing CDOT 10' Type R sump inlet (DP-B1), it is then routed east under S. Flatrock Trail to be collected at the Existing Private Water Quality Pond C. It is then released via outlet structure to be conveyed west and south under S. Flatrock Trail via existing storm infrastructure to discharge into Murphy Creek. Flows from Basin B1 amount to 2.60 cfs during the minor event and 7.58 cfs during the major event.

Basin B2

Basin B2 is 1.00 acres primarily consisting of roadway drainage. Stormwater runoff from Basin B2 is collected in the roadway where it is conveyed via curb and gutter to collected by an existing CDOT 15' Type R sump inlet (DP-B2), it is then routed east to be collected at the Existing Private Water Quality Pond C. It is then released via outlet structure to be conveyed west and south under S. Flatrock Trail to discharge into Murphy Creek. Flows from Basin B2 amount to 2.60 cfs during the minor event and 7.58 cfs during the major event.

E. CONCLUSIONS

1. Compliance with Standards

This Drainage Letter and associated Site Plan are in conformance with the City of Aurora Storm Drainage Criteria and the MHFD Urban Storm Drainage Criteria Manuals.

2. Summary of Concepts

There are two existing water quality ponds, Ponds C and F7-C, that are to be utilized by this project. All of the storm infrastructure is existing or proposed by others.

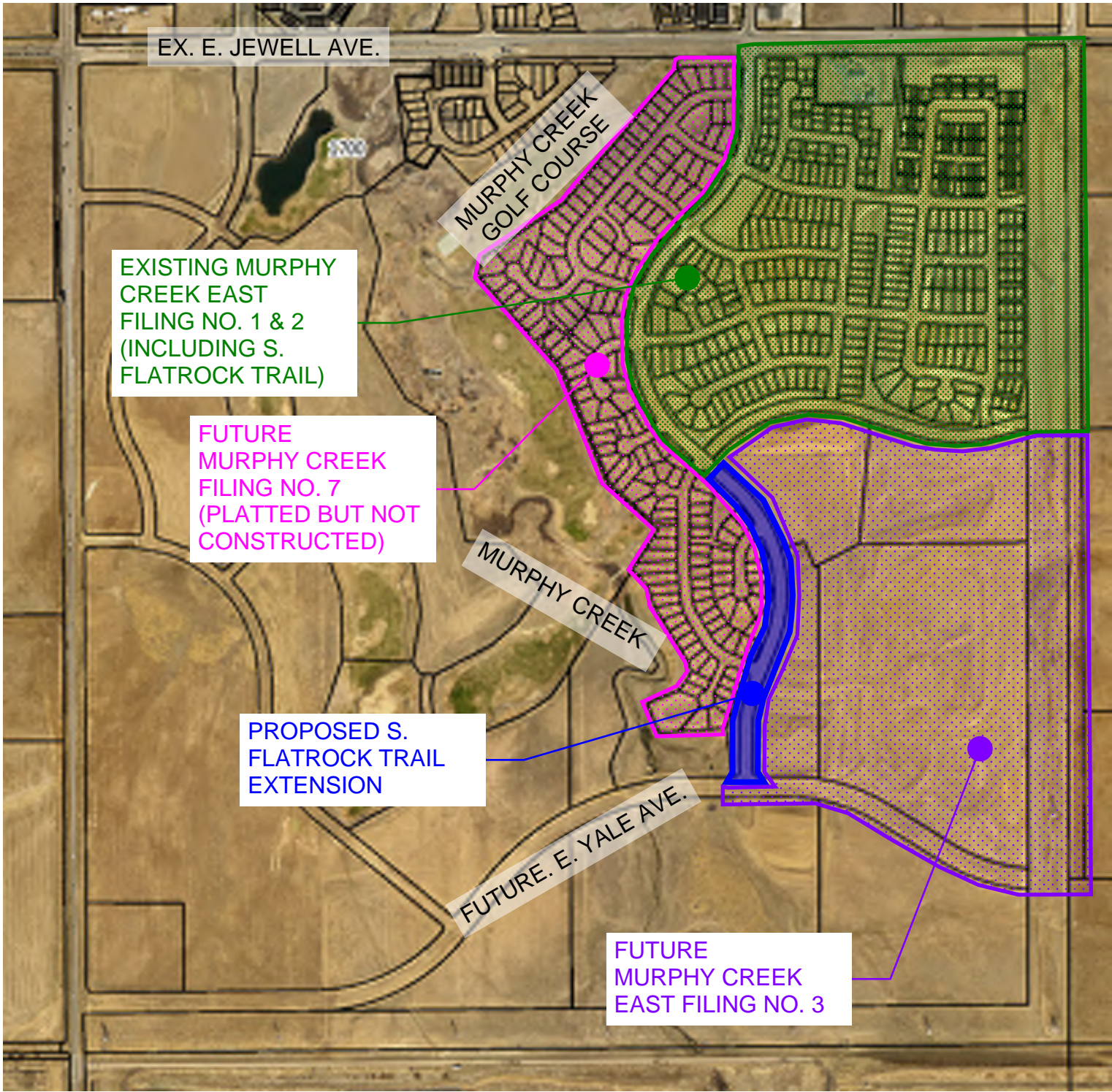
Storm water will be collected by existing inlets and will flow overland to be collected in water quality ponds. Pond D will release attenuated flows through previously constructed storm sewer into Murphy Creek and Pond C will release attenuated flows directly into Murphy Creek. The proposed drainage patterns follow those proposed in the Master Drainage Plan for Murphy Creek, a Planned Community (Reference 1, 1998) and the Murphy Creek East MDR.

F. REFERENCES

1. Master Drainage Plan for Murphy Creek, a Planned Community, Costin Engineering Consultants, Inc., last revised February 1998. (COA # 980080).
2. Flood Insurance Rate Map, City of Aurora Colorado, Federal Emergency Management Agency Panel No. 08005C0212K, last revised December 17, 2010.
3. Web Soil Survey, Natural Resource Conservation Service. websoilsurvey.nrcs.usda.gov
4. City of Aurora Storm Drainage Design & Technical Criteria, City of Aurora, dated October 11th, 2010.
5. Mile High Flood District Urban Storm Drainage Criteria Manuals, Mile High Flood District, Vol. 1 Revised August 2018, Vol. 2 Revised September 2017, Vol. 3 Dated November 2010.
6. Murphy Creek Proposed Amendment to the General Development Plan, Costin Engineering Consultants, Inc., dated October 25, 1999.
7. Murphy Creek Filing 9 (COA EDN 205204)
8. Murphy Creek Filing 8 (COA EDN 205203)
9. Murphy Creek Golf Course Plans (COA EDN 980087)
10. Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, & 4 Master Drainage Report (Also referenced as Murphy Creek East MDR) (220220, Approved)
11. Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1 & 2 Preliminary Drainage Report (Also referenced as Murphy Creek East PDR) (221062, Approved)
12. Murphy Creek Filing #7 (COA EDN 202195)
13. Murphy Creek Subdivision Filing #7 (COA EDN 20003064)
14. Murphy Creek East Filing No. 1 Offsite Infrastructure Site Plan (210121, Currently Under Review)
15. Murphy Creek East Filing No. 1 Civil Plans (RSN 1508256, Currently Under Review)
16. Murphy Creek Fluvial Hazard Zone Mapping, January 2021
17. Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1 & 2 Final Drainage Report, (*Murphy Creek East FDR*), currently under review, *EDN 221063*
18. Murphy Creek East Filing 3 Preliminary Drainage Report, (*Murphy Creek East Filing 3 PDR*), Redland, dated May 6th 2022, currently under review



APPENDIX A – Vicinity Map





APPENDIX B – Soil Survey

Hydrologic Soil Group—Arapahoe County, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:4,430 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 200 400 800 1200 Feet

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



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

10/5/2021
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MAP LEGEND

Area of Interest (AOI)









Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines


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

Soil Rating Points






-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available


Water Features

-  Streams and Canals

Transportation

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

Background

-  Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Arapahoe County, Colorado
Survey Area Data: Version 17, 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: Oct 3, 2018—Dec 4, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FdB	Fondis silt loam, 1 to 3 percent slopes	C	6.5	9.5%
FdC	Fondis silt loam, 3 to 5 percent slopes	C	4.1	5.9%
NIB	Nunn loam, 1 to 3 percent slopes	C	11.9	17.3%
RhD	Renohill-Buick loams, 3 to 9 percent slopes	D	30.6	44.4%
Tc	Terrace escarpments	D	15.8	22.9%
Totals for Area of Interest			69.0	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



APPENDIX C – FEMA Flood Insurance Rate Map



APPENDIX D – Hydrological Calculations

Calculation of Peak Runoff using Rational Method

Designer: EAP
Company: Ahuel
Date: 8/3/2022
Project:
Location:

Version 2.00 released May 2017
Cells of this color are for required user input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_1 = \frac{0.395(1.1 - C_p)\sqrt{L_1}}{S^{0.25}}$$
$$t_1 = \frac{L_1}{60K\sqrt{S_1}} = \frac{L_1}{60V_1}$$

Computed $t_c = t_1 + t_2$
Regional $t_c = (26 - 17t_1) + \frac{L_1}{60(1.4 + 9)\sqrt{S_1}}$

$t_{\text{minimum}} = 5 \text{ (urban)}$
 $t_{\text{minimum}} = 10 \text{ (non-urban)}$
Selected $t_c = \max(t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c))$

Select UICFD location for NOAA Atlas 14 Rainfall Depth from the pull-down list OR enter your own depths obtained from the NOAA website (click this link)
1-hour rainfall depth, P1 (in) =
Rainfall Intensity Equation Coefficients =
 $t(h/hr) = \frac{a + P_1}{(b + t_c)^c}$
 $Q(cfs) = CIA$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time				Channelized (Travel) Flow Time					Time of Concentration			Rainfall Intensity, I (in/hr)								Peak Flow, Q (cfs)								
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L ₁ (ft)	US Elevation (ft) (Optional)	DIS Elevation (ft) (Optional)	Overland Flow Slope S ₁ (ft/ft)	Overland Flow Time t ₁ (min)	Channelized Flow Length L ₂ (ft)	US Elevation (ft) (Optional)	DIS Elevation (ft) (Optional)	Channelized Flow Slope S ₂ (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V ₁ (ft/sec)	Channelized Flow Time t ₂ (min)	Computed t _c (min)	Regional t _c (min)	Selected t _c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A1 (Existing)	1.20	D	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	22.00			0.020	6.90	740.00			0.020	7	0.99	12.46	19.36	34.14	19.36	1.98	2.76	3.28	4.20	4.64	5.34	6.60	0.07	0.25	0.66	1.75	2.33	3.23	4.78
A2 (Existing)	0.80	D	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	22.00			0.020	6.90	775.00			0.020	7	0.99	13.05	19.95	34.57	19.95	1.93	2.72	3.21	4.14	4.57	5.26	6.50	0.04	0.16	0.43	1.15	1.53	2.12	3.14
B1 (Existing)	1.00	D	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	22.00			0.020	6.90	780.00			0.020	7	0.99	13.13	20.03	34.63	20.03	1.93	2.71	3.20	4.13	4.56	5.25	6.49	0.06	0.21	0.54	1.43	1.90	2.65	3.92
B2 (Existing)	1.00	D	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	22.00			0.020	6.90	780.00			0.020	7	0.99	13.13	20.03	34.63	20.03	1.93	2.71	3.20	4.13	4.56	5.25	6.49	0.06	0.21	0.54	1.43	1.90	2.65	3.92
OS1 (Existing)	61.60	D	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	100.00			0.025	13.67	320.00			0.020	7	0.99	5.39	19.05	29.04	19.05	1.98	2.76	3.29	4.24	4.68	5.39	6.66	3.52	12.99	34.18	90.55	120.42	167.37	247.58
OS2 (Existing)	34.80	D	5.0	0.03	0.08	0.17	0.35	0.42	0.50	0.60	300.00			0.020	25.46	320.00			0.020	7	0.99	5.39	30.87	29.04	29.04	1.57	2.21	2.61	3.36	3.71	4.27	5.28	1.57	5.78	15.22	40.32	53.62	74.53	110.25



RATIONAL SUMMARY

Project Name: S. Flatrock Trail
Project Number: 21003852
Submittal:

Date: 8/2/2022
Date: 8/2/2022

Calculated By: EAP
Checked By: RDL

BASIN	AREA (AC)	2-YEAR (CFS)	100-YEAR (CFS)
A1	1.20	3.16	9.20
A2	0.80	2.08	6.07
B1	1.00	2.60	7.58
B2	1.00	2.60	7.58
OS1	61.60	41.61	160.93
OS2	34.60	28.85	114.28

WEIGHTED PERCENT IMPERVIOUSNESS ANALYSIS PROPOSED

Project Name: S. Flatrock Trail
Project Number: 21003852
Submittal:

Date: 8/2/2022
Date: 8/2/2022

Calculated By: EAP
Checked By: RDL



Percent Impervious

	I (%)
Single Family	42%
Multi-Unit (detached)	60%
Multi-Unit (attached)	75%
Lawns (C & D Soils)	5.0%
Paved Streets/Ponds	100%
Gravel Streets	13%
Drive and walks	96%
Roofs	90%

BASIN	Design Point	Total Area	Single Family	Multi-Unit (detached)	Multi-Unit (attached)	Lawns (C & D Soils)	Paved Streets/Ponds	Gravel Streets	Drive and walks	Roofs	Area Check	Comp. i (%)
		(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	i
A1	A1	1.20					1.20				Ok	100.0%
A2	A2	0.80					0.80				Ok	100.0%
B1	B1	1.00					1.00				Ok	100.0%
B2	B2	1.00					1.00				Ok	100.0%
OS1	1	61.60									NotOk	37.2%
OS2	2	34.60									NotOk	57.2%
Sum		100.20	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	NotOk	4.0%

VALUES FROM MURPHY
CREEK EAST MDR (EDN
220220)

Designer: EAP
Company: Ahuel
Date: 8/2/2022
Project: S. Flatrock Trail
Location: Aurora, CO

Version 2.00 released May 2017

$t_1 = \frac{0.395(1.1 - C_p)\sqrt{L_1}}{S^{0.22}}$

Computed $t_c = t_1 + t_2$

$t_{\text{minimum}} = 5 \text{ (urban)}$
 $t_{\text{minimum}} = 10 \text{ (non-urban)}$

$t_2 = \frac{L_2}{60\% \sqrt{S_2}} = \frac{L_2}{60\%}$

Regional $t_c = (26 - 17t_1) + \frac{L_2}{60(1.6 + 9)\sqrt{S_2}}$

Selected $t_c = \max(t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c))$

Select UOFCD location for NOAA Atlas 14 Rainfall Depth from the pull-down list OR enter your own depths obtained from the NOAA website (click this link)

1-hour rainfall depth, P1 (in) =

2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
0.98	1.38	1.63	2.10	2.32	2.67	3.30

Rainfall Intensity Equation Coefficients =

a	b	c
28.50	10.00	0.798

$t(h/hr) = \frac{a + P_1}{(b + t_c)^c}$

$Q(cfs) = CUA$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time				Channelized (Travel) Flow Time					Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)									
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L ₁ (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S ₁ (ft/ft)	Overland Flow Time t ₁ (min)	Channelized Flow Length L ₂ (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S ₂ (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V ₁ (ft/sec)	Channelized Flow Time t ₂ (min)	Computed t _c (min)	Regional t _c (min)	Selected t _c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A1	1.20	D	100.0	0.83	0.85	0.87	0.88	0.89	0.89	0.90	22.00			0.020	1.68	740.00			0.020	20	2.83	4.36	6.04	12.79	6.04	3.15	4.44	5.24	6.76	7.46	8.59	10.62	3.16	4.53	5.46	7.13	7.94	9.20	11.50
A2	0.80	D	100.0	0.83	0.85	0.87	0.88	0.89	0.89	0.90	22.00			0.020	1.68	775.00			0.020	20	2.83	4.57	6.25	12.97	6.25	3.12	4.40	5.19	6.69	7.39	8.50	10.51	2.08	2.99	3.60	4.70	5.24	6.07	7.59
B1	1.00	D	100.0	0.83	0.85	0.87	0.88	0.89	0.89	0.90	22.00			0.020	1.68	780.00			0.020	20	2.83	4.60	6.28	13.00	6.28	3.12	4.39	5.18	6.68	7.38	8.49	10.50	2.60	3.73	4.49	5.87	6.54	7.58	9.48
B2	1.00	D	100.0	0.83	0.85	0.87	0.88	0.89	0.89	0.90	22.00			0.020	1.68	780.00			0.020	20	2.83	4.60	6.28	13.00	6.28	3.12	4.39	5.18	6.68	7.38	8.49	10.50	2.60	3.73	4.49	5.87	6.54	7.58	9.48
OS1	61.60	D	57.2	0.27	0.34	0.41	0.53	0.58	0.64	0.71	100.00			0.025	10.17	318.00			0.020	20	2.83	1.87	12.04	22.31	12.04	2.46	3.46	4.99	5.26	6.82	6.69	6.27							
OS2	34.80	D	57.2	0.45	0.50	0.55	0.64	0.68	0.72	0.77	300.00			0.020	14.90	318.00			0.020	20	2.83	1.87	16.77	18.48	16.77	2.11	2.97	3.51	4.52	4.99	5.74	7.10							

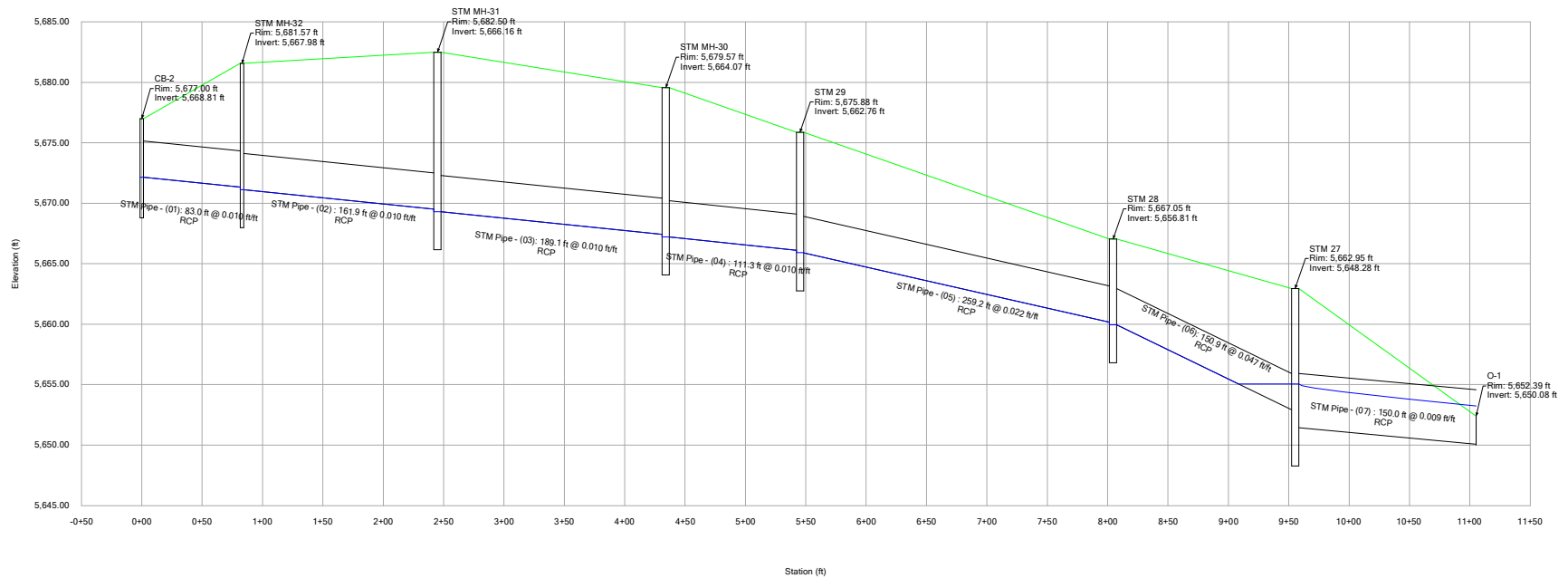
BASIN OS1: (Murphy Creek East MDR (EDN 220220))
Q2 = 41.61 CFS
Q100 = 160.93 CFS

BASIN OS2: (Murphy Creek East MDR (EDN 220220))
Q2 = 28.85 CFS
Q100 = 114.28 CFS



APPENDIX E – Hydraulic Calculations

Profile Report **Engineering Profile - S. FLATROCK TRAIL (21003852-StormCAD.stsw)**



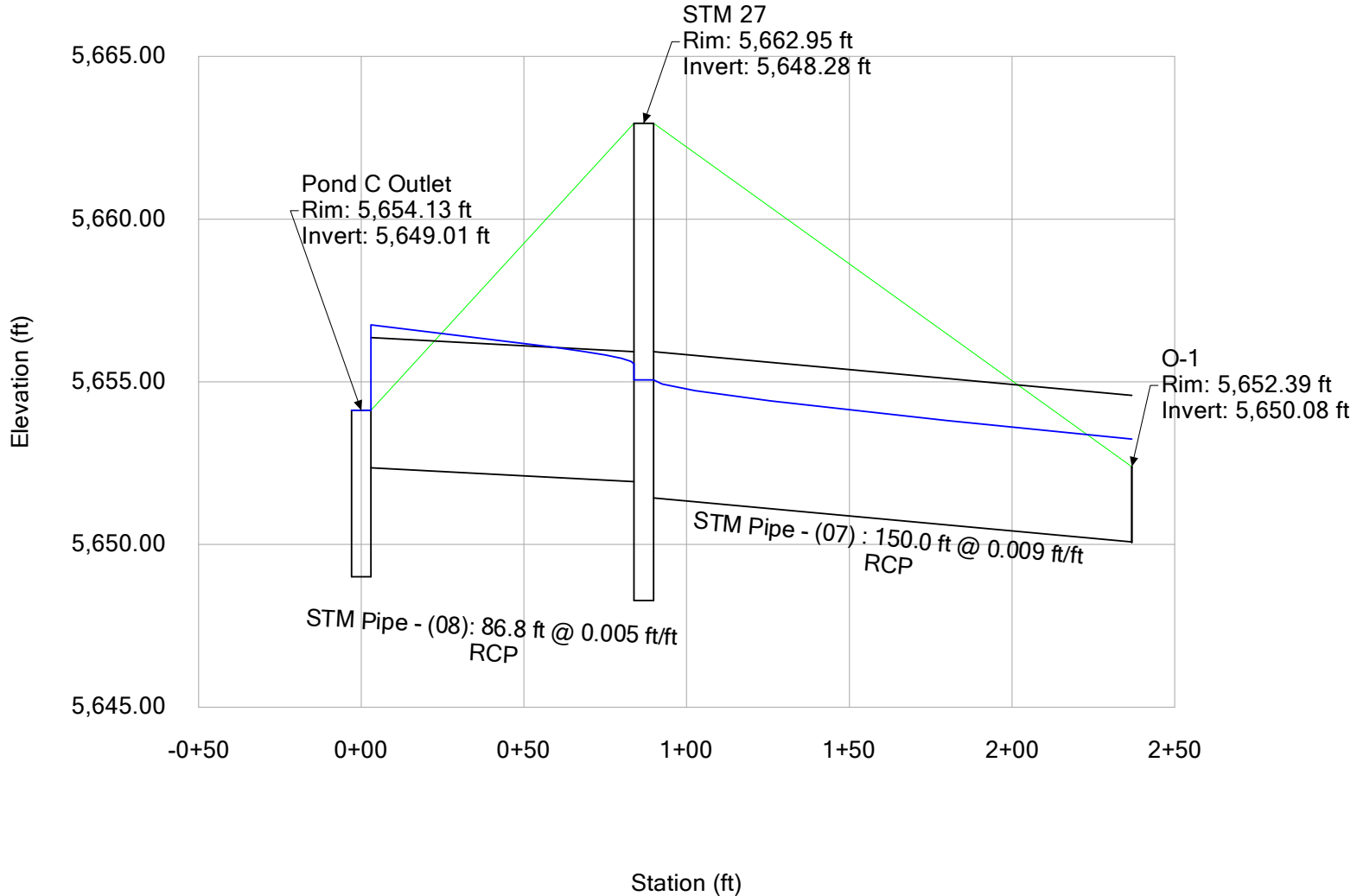
21003852-StormCAD.stsw
8/8/2022

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA
+1-203-755-1666

StormCAD
[10.03.02.04]
Page 1 of 1

**FOR REFERENCE ONLY: MURPHY CREEK
EAST FILING 3 PDR 100-YR CONDITION**

Profile Report **Engineering Profile - POND C OUTFALL (21003852-StormCAD.stsw)**



**FOR REFERENCE ONLY: MURPHY CREEK
 EAST FILING 3 PDR 100-YR CONDITION**



APPENDIX F – Reference Materials

Preliminary Drainage Report

Murphy Creek East Filing 3

Prepared for:

Joseph Huey
Lennar
9193 S. Jamaica St., 4th Floor
Englewood, CO 80112
(720) 369-3835
Joseph.Huey@Lennar.com

Prepared by:



May 6th, 2022

Project No. 21030

Approved for One Year From this Date

City Engineer

Date

Water Department

Date

Proposed Development

The site was partially graded in 2008. Since then the existing vegetation of the Site that grew back is mostly native prairie grasses. Soil data for the site was obtained from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey. Soils within the site are predominately Hydrologic Soil Type D with about 15 percent Type C. The soils encountered on the site consist of Renohill-Buick Loams and Fondis Silt Loams. A map depicting the soil type along with a description of the hydrologic soil group is contained within Appendix A. Type D soils have been used for the purposes of this report.

Since the site was partially graded in 2008 the existing slope conditions generally range from 2% to 8% in areas where homes and roads were proposed and 20% to 35% where drainage ways and ponds were proposed.

Proposed land uses within the site include: single family residential, and park space.

There is one variance being proposed in the site at this time. It is being requested that Pond C, which is being proposed at the southwest portion of the site, be designed as a EURV pond. Pond C was designed and approved as a EURV pond in the Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, 4 Master Drainage Report, Prepared by CVL, November 2020. Also, Section 3.64 of the City of Aurora Storm Drainage Criteria states that an exemption from the detention requirements may be granted at the option of the City if runoff from single-family developments which have five dwelling units per acre or less, discharge to an improved publicly dedicated storm drain facility, and result in no adverse impacts. The proposed site currently has 3.5 dwelling units per acre.

Historic Drainage

Overall Basin Description

The overall Murphy Creek East development encompasses approximately 218 acres which has been planned for single family residential dwelling units, multifamily dwelling units, a school, and open space. The Filing 3 portion of the overall development consists of 84 acres which includes 253 single-family lots, and 29 tracts.

The area in which the Murphy Creek East Filing 3 site is located was included in the Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, 4 Master Drainage Report, prepared by CVL, November 2020. The Site is located within Major Basins C and D of the Master Drainage Report.

Major Basins C and D are a part of the Murphy Creek Drainage Basin. Murphy Creek flows predominantly from south to north and is tributary to Sand Creek. The entire Murphy Creek

Basin is approximately 8,172 acres, with approximately 213 acres being a part of the Murphy Creek East Development.

The Site lies within FEMA designated Zone X floodplain limits. FEMA Flood Insurance Rate Map (FIRM) panel 08005C0212K, which is included in Appendix A. There are no existing local irrigation ditches or canals within the development. A tributary to Murphy Creek lies directly to the south of the site but is not within the drainage boundaries of Filing 3.

In the Master Drainage Report Major Basins C and D are planned to receive offsite flows from the east where proposed development Harvest Ridge is currently being planned. Full detention with 90 percent release rate is being planned for those offsite facilities. Harvest Ridge has provided the flows that the site will need to receive. Since the sites are being designed at the same time constant coordination between the two sites will continue to happen.

Drainage Patterns Through Property

The flows on the site will generally sheet flow to the southwest until picked up by storm infrastructure. It will then be routed to EURV Pond C where it will be treated and released into the Murphy Creek Tributary.

Outfalls Downstream from Property

EURV Pond C discharges into an existing outfall. This outfall was designed and built as a part of the Murphy Creek Metropolitan District (South of East Jewell Avenue) (Then Water Quality Pond G conveying flow from Basin G) construction plans approved in 2005. This outfall was designed as a grouted boulder stilling basin with the intent to take 224.8 cfs of flow and slow it down to achieve a velocity of 5 fps in the adjacent channel. This outfall has been unmaintained since it was built. Pictures of the outfall taken in November 2021 are attached below. The Preliminary Drainage Report for Murphy Creek Subdivision Filing No. 9 proposed that a release structure be built to help convey the flow of Pond C (Then Water Quality Pond 1 conveying flow from Basin A). That structure was never built. **Proposed EURV Pond C is connecting into that existing outfall and has an outlet structure which has a 100-year release rate of 153.2 cfs.** Since EURV Pond C has a lower release rate than what was proposed for the outfall, the downstream outfall should work as intended. It is recommended that this outfall be cleaned, maintained, and inspected to confirm that it is still able to achieve its original purpose.

The area included in Major Basin C and D was a part of the Murphy Creek Flood Hazard Area Delineation (FHAD), prepared by Moser & associates Engineering, Inc., August 2006. This area was also included in the Murphy Creek and Tributaries Watersheds Outfall Systems Planning (OSP), prepared by Moser & associates Engineering, Inc, October 2008, and the Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, 4, Master Drainage Report, prepared by CVL Engineering, November 2020.

The OSP and FHAD are primarily focused on Murphy Creek. Harvest Gulch which runs to the south of the site was recommended to be improved once development of the area begins. Improvements to Harvest Gulch will not be included with the development of Filing 3.

The Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, 4 Master Drainage Report has Major Basin C and D both being detained by EURV ponds then being discharged into Murphy Creek. The standard for detention ponds in Aurora is that all detention ponds must be designed for 100-year full spectrum detention. The basin C and D ponds were originally designed in the Murphy Creek Metropolitan District (South of E. Jewell Avenue) Final Drainage Report, Prepared by Peak Civil Consultants, November 2005. This report was a part of the construction in the site that halted in 2008 and was abandoned. The ponds were designed as water quality ponds. The Master Drainage Report prepared by CVL in November 2020 adopted the design of those ponds and upgraded them to EURV ponds. The City of Aurora Storm Drainage Design and Technical Criteria section 3.64 2 states that an exemption from the detention requirement may be granted at the option of the City under the condition that runoff from a single-family development which have five dwelling units per acre or less, discharge to an improved publicly dedicated storm drain facility, and result in no adverse impacts. The site has less than 5 dwelling units per acre which is why EURV ponds and not 100 year full spectrum ponds are being proposed.

Major Basin C and D have been combined in this report and now get detained by one pond, Pond C. Pond C's design and comparison to the Master Drainage Report are discussed in detail in the Proposed Permanent BMP section below.

Specific Details

The major basin within which the Site has been subdivided into smaller basins for the purposes of determining peak flow rates and sizing storm sewer infrastructure, which includes inlet and conduit sizing, and determining peak flow rates at various points within the major basin. Major Basins C and D identified in the Murphy Creek East (Harvest Ridge) Subdivision Filing No. 1, 2, 3, 4 Master Drainage Report and their ponds have been combined into one basin labeled as Major Basin C and one pond labeled as Pond C in this report.

Major Basin C

Major Basin C is the only onsite basin that is in the site. Runoff from this basin flows to Pond C. Pond C outfalls to a short existing channel which drains into Murphy Creek. Major Basin C

detain the Excess Urban Runoff Volume (EURV) and routes the 100-year flow through the pond. The City of Aurora Storm Drainage Design and Technical Criteria states that all detention ponds must be designed to treat the 100-year storm. Under section 3.64 in the drainage standards it states that if the site is under 5 dwelling units per acre that there can be an exemption to the City's standards. Since the site is under 5 dwelling units per acre and EURV ponds were designed in the master studies, Pond C is being designed to treat the EURV and not the 100-year flow. The WQCV for Pond C has been increased by 20% to account for sedimentation. The pond and the respective tributary basins are discussed in further detail below.

EURV Pond C

EURV Pond C is located in the southwest portion of the site within Basin PC and will treat and detain runoff from all of the basins onsite and an offsite undeveloped area. The pond is proposed in a location where an old water quality pond was built and plans to use existing drainage structures. The land uses of the basins onsite are single family detached homes, single family alley loaded homes, and park area. In the Murphy Creek East Subdivision Filing No. 1, 2, 3, 4 Master Drainage Report the basins contributing to ponds on site had a combined tributary area of 96.1 acres with a composite imperviousness of 44.5%. The actual combined tributary area of Pond C is 92.41 acres with a composite imperviousness of 31%. The EURV storage volume for Pond C is 2.61 acre-feet. The additional volume needed to route the 100-year storm through the ponds is 1.71 acre-feet causing the total volume needed to be 4.32 acre-feet. The release rate of the EURV is 1.0 cfs and the release rate of the 100-year storm is 153.2 cfs.

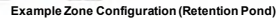
EURV Pond C's outlet structure will tie into existing storm sewer which is located under South Flatrock Trail and discharge into an existing channel. This channel was designed with a stilling basin which had the intent to slow 224.8 cfs of flow into 5 fps in the adjacent channel. With EURV Pond C's release rating being 153.2 cfs and the additional water quality being provided by this pond the existing outfall structure should work as intended. However, since it was built the outfall has not been maintained so it is recommended to clean, maintain, and inspect the outfall to make sure it works as intended.

Conclusion

Compliance with Standards

This drainage report presents the concepts for the drainage analysis for the Murphy Creek East Filing 3 development and complies with the City of Aurora's Storm Drainage Design and Technical Criteria and the MHFD Urban Storm Drainage Criteria Manual.

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: EURV POND C

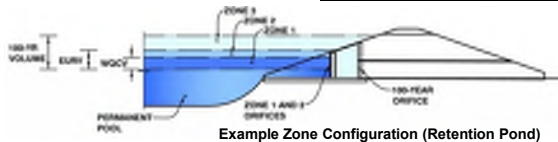
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: MURPHY CREEK EAST FILING 3

Basin ID: EURV POND C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.38	1.428	Orifice Plate
Zone 2 (EURV)	6.05	1.180	Orifice Plate
Zone 3 (100-year)	#VALUE!	3.912	Weir&Pipe (Restrict)
Total (all zones)		6.521	

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

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

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

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

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

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.71	3.41					
Orifice Area (sq. inches)	4.74	4.74	4.74					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

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

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

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

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

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

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

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

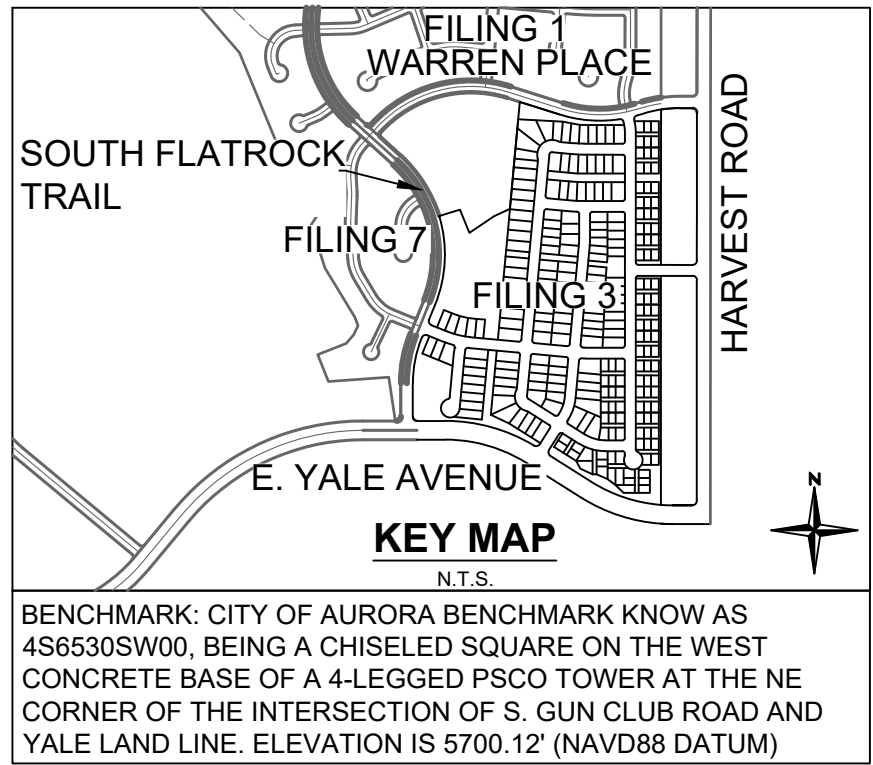
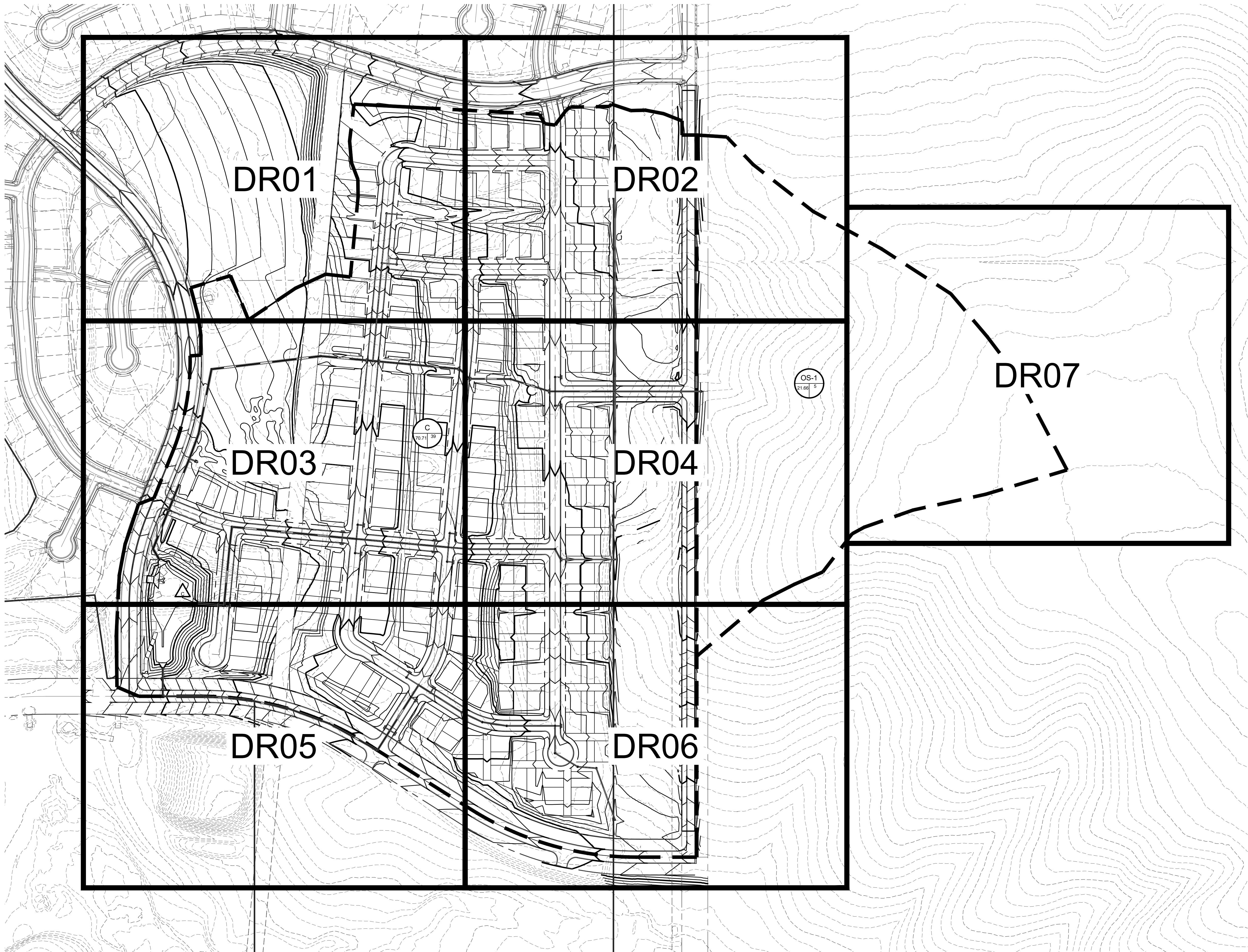
Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

Routed Hydrograph Results

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

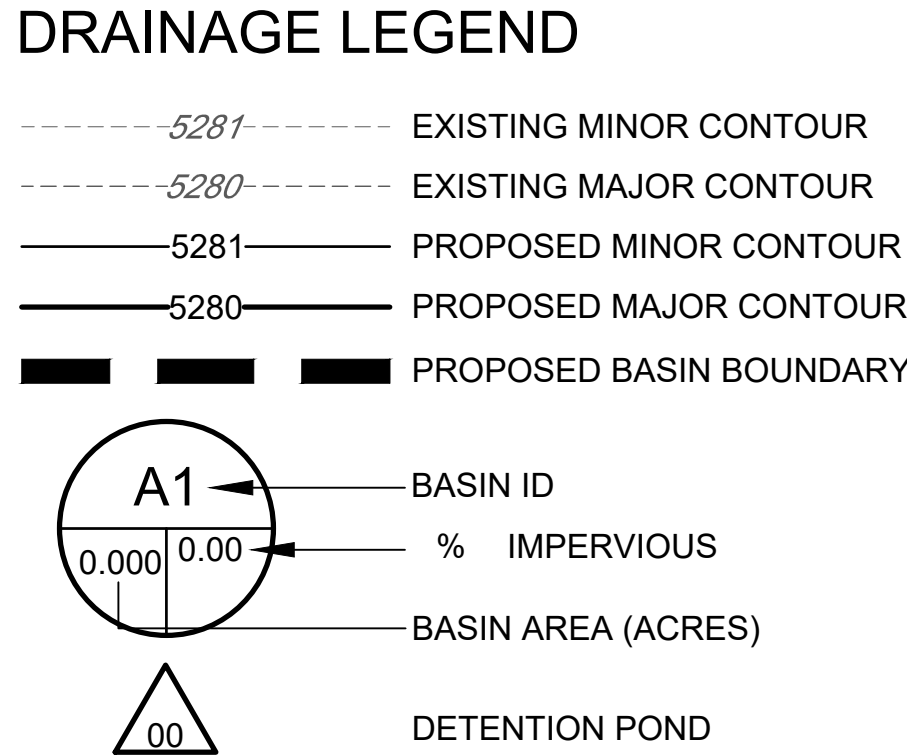
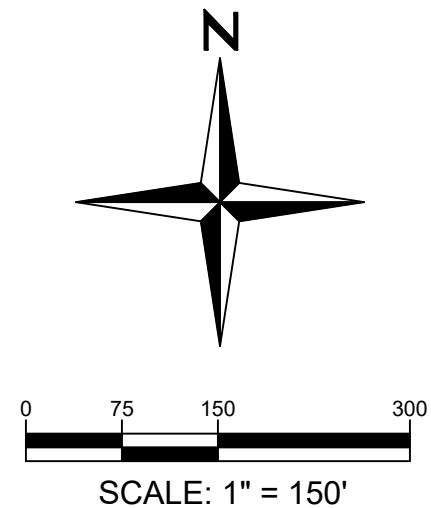
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	0.98	1.38	1.62	2.00	2.32	2.67	3.30
One-Hour Rainfall Depth (in)	N/A	N/A	0.98	1.38	1.62	2.00	2.32	2.67	3.30
CUHP Runoff Volume (acre-ft)	1.428	2.608	2.197	4.740	6.491	9.812	12.338	15.532	20.598
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	2.197	4.740	6.491	9.812	12.338	15.532	20.598
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	2.7	24.8	37.1	71.4	92.8	120.6	163.3
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.03	0.27	0.40	0.77	1.00	1.30	1.77
Peak Inflow Q (cfs)	N/A	N/A	22.3	50.5	65.7	107.4	133.7	167.7	220.4
Peak Outflow Q (cfs)	0.7	1.0	0.9	17.5	38.3	83.6	114.2	153.2	216.2
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.7	1.0	1.2	1.2	1.3	1.3
Structure Controlling Flow	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.0
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	52	48	61	59	55	53	50	46
Time to Drain 99% of Inflow Volume (hours)	40	56	51	66	65	63	62	60	58
Maximum Ponding Depth (ft)	4.38	6.05	5.24	7.22	7.41	7.71	7.89	8.09	8.31
Area at Maximum Ponding Depth (acres)	0.65	0.77	0.71	0.85	0.87	0.89	0.90	0.92	0.94
Maximum Volume Stored (acre-ft)	1.434	2.614	2.017	3.562	3.716	3.989	4.142	4.324	4.538

I:\2021\21030 - Murphy Creek CADD\Sheet Sets\Drainage\Filing 3\Drainage Basins Index.dwg tab: INDEX May 17, 2022 - 2:15pm mwatson



NOTES

- CITY OF AURORA PLAN REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH CITY OF AURORA DESIGN CRITERIA AND THE CITY CODE. THE CITY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, OF DIMENSIONS AND ELEVATIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE. THE CITY OF AURORA, THROUGH THE APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.
- MURPHY CREEK EAST FILING 3 HAS A DENSITY OF LESS THAN FIVE DWELLING UNITS PER ACRE.



Approved for One Year From this Date

City Engineer	Date
Water Department	Date

Redland
WHERE GREAT PLACES BEGIN
7700 383 4793 Office
1500 West Canal Court
Littleton, Colorado 80120
REDLAND.COM

DATE	NO	FIRST SUBMITTAL	NOTES
5/06/2022	1		

MURPHY CREEK EAST FILING 3

DRAINAGE INDEX

DRAWN	MW
CHECKED	
APPROVED	BCI
PROJECT NO.	
HORIZ. SCALE	
VERT. SCALE	

DR00

**MURPHY CREEK EAST
(HARVEST RIDGE) SUBDIVISION
FILING No. 1, 2, 3, 4
MASTER DRAINAGE REPORT
AURORA, COLORADO**



Prepared for:

Lennar Corporation.
9781 S. Meridian Blvd., Suite 120
Englewood, CO 80112
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Phone: (720) 369-3835

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FACSIMILE
THIS ELECTRONIC PLAN IS A FACSIMILE OF THE SIGNED AND SEALED PDF SET.

Brian K. Schaffer
CO PROFESSIONAL ENGINEER
BRIAN SCHAFER CO P.E. NO. 18751

11/19/2020
DATE

Preparation Date:
November 2020

GG5

Approved For One Year From This Date	
11/30/2020	
<i>Haley B. Hansen</i>	11/23/2020
City Engineer	Date
<i>Tony H. Tran</i>	11/10/2020
Water Department	Date

10333 E. Dry Creek Road, Suite 240
Englewood, Colorado 80112
cvlinc.net westwoodps.com
720.482.9526

2. Specific Details

Runoff from the site is to be conveyed via streets, pipes, channels, swales, and overland flow. The basins, ponds, and overland conveyance systems are described in the proceeding narrative. Land use assumption values for each basin is included in **Appendix 2A**. Drainage maps showing basin areas are included in **Appendix 5** which has been submitted separately with this report.

Drainage Basins

Murphy Creek Subdivision Filings No. 1, 2, 3, and 4 are delineated into eight onsite basins and five offsite basins which discharge into Murphy Creek and its tributary, East Murphy Creek. Each onsite basin has an EURV pond which provides water quality for onsite runoff. See **Table 1** for Basin Summary Table.

Table 1. Basin Summary Table

Basin ID	Design Point	Area	Imperviousness	Q _{2-Year}	Q _{100-Year}
		(acres)	(%)	(cfs)	(cfs)
A	1-A	32.2	58.8	43.00	154.12
B	1-B	38.8	51.7	48.18	166.91
C	1-C	34.6	57.2	28.85	114.28
D	1-D	39.3	55.5	33.59	134.23
E	1-E	24.9	64.6	28.11	99.02
J	1-J	2.0	100.0	3.67	10.70
F7-A	1-F7-A	11.4	55.8	15.04	51.95
F7-B	1-F7-B	3.6	62.2	4.92	17.93
F7-C	1-F7-C	16.4	24.6	13.68	43.84
F7-A1	A1-F7	14.5	47.3	14.42	50.40
F7-B1	B1-F7	13.8	47.8	13.43	48.54
F7-C1	C1-F7	21.9	44.7	19.12	68.66
EMC	1-EMC	43.4	77.7	67.33	236.16
OS-1	1-OS	53.9	5.0	15.42	51.36
OS-2	2-OS	22.3	5.0	8.02	26.70
OS-3	3-OS	84.8	5.0	29.02	96.62
OS-4	4-OS	10.3	5.0	3.75	12.50
OS-J	J-OS	8.0	5.0	6.70	11.70

Basin A primarily consists of the lots on the northwest side of the site. Runoff generated by this basin flows to EURV Pond A. This pond ultimately pipes flows west to Murphy Creek and does not collect additional flow.

Basin B primarily consists of the lots on the northeast side of the site. Runoff generated by this basin flows to EURV Pond B. Pond B outfalls to tributary 3000E channel immediately upstream of the culvert under E. Jewell Avenue.

Basin C primarily consists of the lots in the middle of the site north of Yale. Runoff generated by this basin flows to EURV Pond C. Pond C outfalls to Murphy Creek via an existing swale and culvert under S. Flatrock Trail.

Basin D primarily consists of the lots in center of the site. Runoff generated by this basin flows to EURV Pond D. Pond D outfalls to Murphy Creek via an existing swale and culvert under Flatrock Trail.

Basin E primarily consists of the lots on the south side of the site. Runoff generated by this basin flows to EURV Pond E. Pond E outfalls to the existing Tributary 3000E channel to Murphy Creek.

Basin J primarily consists of the additional lanes of Jewell Ave. Runoff generated by this basin flows to the curb and gutter, which continues west to Design Point 1-J. The flow then enters a swale that directs the flow to Detention Pond OS100-20 that discharges to Murphy Creek. Written agreement with the adjoining property owner for the swale is provided in Appendix 4G.

Basin F7-A primarily consists of the lots on the northwest side of the site. Runoff generated by this basin flows to the curb and gutter and the proposed storm sewer network, which continues to Design Point 1-F7-A where it is piped to EURV Pond F7-A in Murphy Creek Subdivision Filing No. 7. This pond will be constructed with Filing No. 1 & 2 even if the construction of Filing No. 7 has not yet begun.

Basin F7-B primarily consists of the lots on the west side of the site. Runoff generated by this basin flows to the curb and gutter, which continues to Design Point 1-F7-B. If Filing No. 7 is constructed first, this flow will be piped to EURV Pond F7-B in Murphy Creek Subdivision Filing No. 7. If construction of Filing No. 7 has not yet occurred, a temporary swale will be constructed to carry the flow to the EURV pond in Filing No. 7. This pond will be constructed with Filing No. 1 & 2 even if the construction of Filing No. 7 has not yet begun.

Basin F7-C primarily consists of the lots on the west side of the site and a large undeveloped area that is being reserved for a potential future school site. Since plans for the school are undetermined at this time, this area is being treated based on historic flows. Any future development will need to provide full spectrum detention prior to tying into the storm system. A pipe will be provided for any future tie-in. Runoff generated by this basin flows to the curb and gutter and the proposed storm sewer system, which continues to Design Point 1-F7-C where it is piped to EURV Pond F7-C in Murphy Creek Subdivision Filing No. 7. If construction of Filing No. 7 has not yet occurred, a temporary swale will be constructed to carry the flow to the EURV pond in Filing No. 7. This pond will be constructed with Filing No. 1 & 2 even if the construction of Filing No. 7 has not yet begun.

Basin OS-1 consists of the open space east of Harvest Road just south of Jewell Avenue. Runoff generated by this basin flows west following historic drainage paths to Design Point 1-OS to

Culvert A under Harvest Road. Flow will then be piped around EURV Pond B west to the existing 2 – 5' x 5' RCBC under Jewell Avenue to the Tributary 3000E Channel and eventually to East Murphy Creek. EURV Pond B was not sized to provide EURV detention and treatment for historic flows from Basin OS-1. Therefore, all future offsite development in this basin will need to release at historic flows and will be required to provide full spectrum detention before allowing flow to cross Harvest Road and enter the site.

Basin OS-2 primarily consists of undeveloped land east of Harvest Road just south of Basin OS-1. Runoff generated by this basin flows west to Design Point 2-OS to Culvert B under Harvest Road where it flows west through Basin D to EURV Pond D. Undeveloped flows were used to size infrastructure for this basin. Therefore, all future development in this basin will need to release at historic flows and will be required to provide full spectrum detention before allowing flow to cross Harvest Road and enter the site.

Basin OS-3 primarily consists of the undeveloped land east of Harvest Road just south of Basin OS-2. Runoff generated by this basin flows west to Design Point 3-OS to Culvert C under Harvest Road where it flows west through Basin E via an open channel named as Tributary 4000E per the 2008 OSP. This Tributary ultimately discharges to Murphy Creek. Undeveloped flows were used for this basin. Therefore, all future offsite development in this basin will need to release at historic flows and will be required to provide full spectrum detention before allowing flow to cross Harvest Road and enter the site.

Basin OS-4 primarily consists of undeveloped land west of Harvest Road just south of onsite Basin E. Runoff generated by this basin flows north to a swale where it flows west to Design Point 4-OS and eventually to Murphy Creek.

Basin EMC primarily consists of undeveloped land north of Jewell Avenue. Runoff generated by this basin flows to the Tributary 3000E Channel where it combines flow from Basin B and Basin OS-1, then flows north to Design Point 3-EMC and eventually to East Murphy Creek. Basin EMC has been analyzed as high-density mixed-use development in conformance with the “*Master Drainage Plan for Murphy Creek*” by Costin Engineering Consultants, INC, April 1998 [Ref. 3].

Basin OS-J primarily consists of vacant graded property that is tributary to the Basin J swale and detention pond south of Jewell Avenue. Runoff generated by this basin flows into the swale to detention pond OS100-20 and eventually to Murphy Creek. This basin is located on land to be developed by Meritage Homes. The future development will include routing for basin J and the final detention pond for all on-site and tributary areas. Preliminary design drawing and permission to grade is provided in Appendix 4G.

EURV Ponds

In August 2018 Craig Perl, PE, CFM (COA) [Ref. 5] approved multiple EURV ponds in lieu of full spectrum detention. This is allowed because the site will remain below 5 du/ac. As described in Chapter 12 section 3.2 of the USDCM [Ref. 2], the excess urban runoff volume (EURV) is the difference in volume between developed and pre-developed conditions. This volume is usually two to three times the water quality capture volume (WQCV) and has comparable release rates.

EURV Pond B receives flow from Basin B. Pond B provides WQCV and EURV detention for basin runoff. Pond B outfall and emergency overflow for both Basin B and OS-1 are directed north to an existing 2 – 5' x 5' RCBC under Jewell Avenue to the Tributary 3000E Channel (East Murphy Creek). The RCBC under Jewell Avenue will convey the developed 100-yr flow from Basin B and Basin OS-1 with no road overtop.

EURV Pond F7-A (Filing 7 Pond A) is an off-site pond that receives flow from Basin F7-A and F7-A1 (Filing No. 7). The pond is located west of Flatrock Trail and will ultimately provide WQCV and EURV for both project basins. Flows from basin F7-A will be captured with inlet and pipe networks discharging to an open swale near design point 1-F7-A and conveyed to the pond location. Pond F7-A will be constructed, and certification approved by the City of Aurora before any paving begins in tributary basins. If Filing 1 & 2 construction starts prior to Filing 7, the pond and swale will be constructed as part of Filing 1&2 and maintained by the Metropolitan District. The swale path and typical cross section is provided in the plan and will final sized with easement information in the preliminary drainage report. The pond and swale design will be finalized with the final drainage report. Once Filing 7 is constructed a maintenance agreement for the pond will be determined between the owners of the two neighborhoods.

Emergency overflow will be conveyed via future Filing 7 streets and overflow route to Murphy Creek. If Filings No.1 & 2 are constructed prior to Filing No. 7, emergency overflow will flow overland to Murphy Creek. The pond outfall pipe will connect to an existing storm system, at the border of Filing 7 and the Murphy Creek Golf Course as shown in 980080 MDP and 980087 Civil Plans. Additional erosion protection and conveyance elements through the golf course will be designed during the preliminary design if needed. Based on our preliminary calculations, the existing storm sewer has sufficient capacity to convey the 100-yr developed flow from Pond F7-A.

EURV Pond F7-B (Filing 7 Pond B) receives flow from Basins F7-B and F7-B1 (Filing No. 7). The pond is located offsite in Filing 7 west of Flatrock Trail and will ultimately provide WQCV and EURV for both project basins. Flows from basin F7-B will be captured with inlet and pipe networks discharging to an open swale near design point 1-F7-B and conveyed to the pond location. If Filings 1&2 construction starts prior to Filing 7, the pond and swale will be constructed as part of Filing 1&2, and maintained by the Metropolitan District. The swale path and typical cross section is provided in the plan and will final sized with easement information in the preliminary drainage report. Once Filing 7 is constructed a maintenance agreement for the pond will be determined between the owners of the two neighborhoods.

Emergency overflow will be conveyed via overland flow to Murphy Creek. The pond outfall pipe will connect to an existing storm system, at the border of Filing 7 and the Murphy Creek Golf Course as shown in 980080 MDP and 980087 Civil Plans. Additional erosion protection and conveyance elements through the golf course will be designed during the preliminary design if needed. Based on our preliminary calculations, the existing storm sewer has sufficient capacity to convey the 100-yr developed flow from Pond F7-B.

EURV Pond F7-C (Filing 7 Pond C) receives flow from Basins F7-C and F7-C1 (Filing No. 7). The pond is located offsite in Filing 7 west of Flatrock Trail and will ultimately provide EURV

for both project basins. Flows from basin F7-C will be captured with inlet and pipe networks discharging to an open swale near design point 1-F7-C and conveyed to the pond location. If Filing 1 & 2 construction starts prior to Filing 7, the pond and swale will be constructed as part of Filing 1&2, and maintained by the Metropolitan District. The swale will be sized in the preliminary drainage report. The pond and swale design will be finalized with the final drainage report. Once Filing 7 is constructed a maintenance agreement for the pond will be determined between the owners of the two neighborhoods.

Emergency overflow will be conveyed via overland flow to Murphy Creek. The pond outfall pipe will convey flow to Murphy Creek. Additional erosion protection and conveyance elements through the golf course may be utilized to minimize impact. These elements will be designed in the Murphy Creek Filing No. 7 Preliminary Drainage Report by Atwell, LLC or in the Final Drainage Report for Filing No. 1, and 2 if Filing No. 7 has not been designed at that point.

EURV Pond C receives flow from Basin C. The pond provides water quality and excess urban runoff detention for basin runoff. The pond outfalls through an existing RCP located beneath S. Flatrock Trail and the flow is conveyed within existing swale and channel elements to Murphy Creek. The size of the existing system will be confirmed in the preliminary drainage report to ensure that it can convey the 100-year storm developed flow. Emergency overflow will be conveyed south via Flatrock Trail to a shared low point where the discharge will overtop the road and flow directly to Murphy Creek.

EURV Pond D receives flow from Basin D and offsite basin OS-2. The pond provides water quality and excess urban runoff detention for basin runoff. Pond D discharge will be conveyed through a pipe south to the same existing RCP outfall as Pond C. The pipe size will be verified in the preliminary drainage report to ensure that it can handle the 100-year developed flow, or will be replaced. Emergency overflow will be conveyed south via Flatrock Trail to a shared low point where the discharge will overtop the road and flow directly to Murphy Creek.

EURV Pond E receives flow from Basin E. The pond provides water quality and excess urban runoff detention for basin runoff. The downstream swale will be evaluated for capacity and erosion protection requirements for the 100 year storm in the Preliminary Drainage Report. The pond outfalls west, following historic drainage paths, to Murphy Creek.

Drainage corridors will be dedicated for all discharges to the golf course property and/or open space owned by the City of Aurora. Some pipes, swales and erosion protection elements have already been constructed per previous reports and plans. These existing elements shall be surveyed and replaced or repaired to convey flows and prevent erosion with current standards. Corridors for these dedicated areas will be shown in preliminary drainage reports and dedicated with Final CDs.

Table 2. EURV Pond Summary Table

POND SUMMARY TABLE						
Pond ID	Contributing Basins	Tributary Area	Average Impervious	1.2 * WQCV	EURV	Peak Inflow Q
		(ac)	(%)	(ac-ft)	(ac-ft)	(cfs)
Pond A	A	32.2	58.8	0.75	1.82	139.1
Pond B	B	38.8	51.7	0.82	1.90	129.3
Pond C	C	34.6	57.2	0.79	1.89	120.0
Pond D	D & OS-2	61.5	37.3	1.06	2.12	135.9
Pond E	E & OS-4	35.2	47.2	0.70	1.57	117.6
Pond F7-A	F7-A & F7-A1	25.9	51.1	0.54	1.25	71.4
Pond F7-B	F7-B & F7-B1	17.4	50.8	0.36	0.84	23.2
Pond F7-C	F7-C & F7-C1	38.3	36.1	0.65	1.27	39.7
Pond OS 100-20	OS-J & J	10.0	24.2	0.13	0.22	14.8
NOTE: These ponds are EURV only and do not provide 100-year detention. They are allowed to release at rates up to the peak 100 year inflow rate.						

Tributary 3000E and 4000E Channel

Tributary 3000E is located north of Jewell Avenue and is an existing channel that was previously designed in the OSP [Ref. 4]. This channel captures flow from Basins B, OS-1, and EMC. The existing channel slope is approximately 2.7% and erosion is expected due to the relatively steep slope and sandy soils. See **Table 4** for channel flow comparison between previous reports.

Table 3. Flow Comparison for Tributary 3000E Channel

Report	E. Jewell Ave. Culvert Flow (cfs)	E. Murphy Creek Channel Flow (cfs)	E. Murphy Creek Channel Slope (ft/ft)
Master Drainage Plan for Murphy Creek (MDP) (Costin Engineering Consultants, Inc.)	425.0	425.0	0.008
Murphy Creek Final Drainage Report Filing No. 8 (Peak Civil Consultants)	425.0	-	-
Outfall Systems Planning Phase 8 - Planning Report (OSP) (Moser & Associates)	225.0 (DP 3560)	345.0 (DP 3550)	0.005

The channel was designed for the flows calculated in the OSP report [Ref. 4].

SF-1 PROPOSED COMPOSITE BASIN LAND USE

Subdivision: Murphy Creek Farms

Project Name: Murphy Creek Farms
 Project No. 8130323701
 Calculated By: EAC
 Checked By: BS
 Date: 9/24/2020

Basin	Total Area	Soil Type A	Soil Type B	Soil Type C/D	Single Family Res.**	Multi-Unit Dettached	Multi-Unit Attached	Parks, Cemeteries	Paved/ Impervious	Business (Neighbor hood Areas)	Undeveloped	Schools	Avg. Imp.	C ₂	C ₅	C ₁₀₀
	(acres)	(%)	(%)	(%)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(%)			
OS-1	53.89	0.0%	0.0%	100.0%	0.0	0.0	0.0	0.0	0.0	0.0	53.89	0.00	5.0	0.18	0.19	0.22
OS-2	22.26	0.0%	0.0%	100.0%	0.0	0.0	0.0	0.0	0.0	0.0	22.26	0.00	5.0	0.18	0.19	0.22
OS-3	84.83	0.0%	0.0%	100.0%	0.0	0.0	0.0	0.0	0.0	0.0	84.83	0.00	5.0	0.18	0.19	0.22
OS-4	10.26	0.0%	0.0%	100.0%	0.0	0.0	0.0	0.0	0.0	0.0	10.26	0.00	5.0	0.18	0.19	0.22
EMC	43.42	0.0%	0.0%	100.0%	1.7	0.0	0.0	0.0	5.2	32.4	4.10	0.00	77.7	0.58	0.63	0.75
F7-A	11.45	0.0%	0.0%	100.0%	0.0	4.7	0.0	0.0	3.4	0.0	3.34	0.00	55.8	0.50	0.52	0.63
A	32.22	0.0%	0.0%	100.0%	3.1	15.1	0.0	0.0	8.2	0.0	5.82	0.00	58.8	0.50	0.54	0.66
B	38.80	0.0%	0.0%	100.0%	0.0	15.1	0.0	0.0	10.3	0.0	13.37	0.00	51.7	0.47	0.49	0.60
F7-B	3.60	0.0%	0.0%	100.0%	0.0	2.2	0.0	0.0	0.9	0.0	0.50	0.00	62.2	0.52	0.55	0.69
F7-C	16.37	0.0%	0.0%	100.0%	0.1	0.86	0.0	0.0	2.84	0.0	12.57	0.00	24.6	0.32	0.33	0.37
C	34.58	0.0%	0.0%	100.0%	0.0	22.50	6.60	0.0	1.1	0.0	4.38	0.00	57.2	0.46	0.50	0.67
D	39.28	0.0%	0.0%	100.0%	0.0	27.9	4.4	0.0	1.5	0.0	5.48	0.00	55.5	0.45	0.49	0.65
E	24.93	0.0%	0.0%	100.0%	0.0	0.0	18.5	0.0	2.0	0.0	4.43	0.00	64.6	0.55	0.59	0.71
J	2.02	0.0%	0.0%	100.0%	0.0	0.0	0.0	0.0	2.0	0.0	0.00	0.00	100.0	0.87	0.88	0.93
F7-A1	14.46	0.0%	0.0%	100.0%									47.3	0.46	0.49	0.59
F7-B1	13.81	0.0%	0.0%	100.0%									47.8	0.46	0.50	0.61
F7-C1	21.88	0.0%	0.0%	100.0%									44.7	0.44	0.47	0.58
OS-J	8.00	0.0%	0.0%	100.0%	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	5.0	0.18	0.19	0.22

Land Use	% Imp.
Single Family Res.**	45
Multi-Unit Dettached	60
Multi-Unit Attached	75
Parks, Cemeteries	5
Paved/ Impervious	100
Business (Neighborhood Areas)	85
Undeveloped	5
Schools	50

** Valid for up to 5 units per acre. Single-family with more than 5 units per acre uses values for multi-unit/ detached

SF-2 TIME OF CONCENTRATION FOR EACH SUB-BASIN

SUB-BASIN DATA		INITIAL/OVERLAND FLOW TIME				CHANNELIZED FLOW TIME					TOTAL T _c	FIRST DESIGN POINT T _c		EFFECTIVE
DATA											T _c = T _i + T _T	COA T _c Check		T _c
BASIN	D.A.	C ₅	L	S	T _i	L	S	LAND SURFACE	VEL.	T _t	T _c	LENGTH	MIN. T _c	
ID	(AC)		FT	FT/FT	MINUTES	FT	FT/FT		FPS	MINUTES	MINUTES	FT	MINUTES	MINUTES
OS-1	53.89	0.19	300	0.03	19.8	3000	0.02	Short pasture and lawns	1.0	50.5	70.3	3300	28.3	28.3
OS-2	22.26	0.19	300	0.01	28.5	1250	0.04	Short pasture and lawns	1.3	15.9	44.4	1550	18.6	18.6
OS-3	84.83	0.19	300	0.03	20.0	1600	0.04	Short pasture and lawns	1.4	19.0	39.1	1900	20.6	20.6
OS-4	10.26	0.19	250	0.10	12.2	1200	0.02	Short pasture and lawns	1.1	18.8	31.0	1450	18.1	18.1
EMC	43.42	0.63						Paved area				0	10.0	10.0
F7-A	11.45	0.52						Paved area				0	10.0	10.0
A	32.22	0.54						Paved area				0	10.0	10.0
B	38.80	0.49						Paved area				0	10.0	10.0
F7-B	3.60	0.55						Paved area				0	10.0	10.0
F7-C	16.37	0.33						Paved area				0	10.0	10.0
C	34.58	0.50	250	0.05	9.8	2100	0.02	Paved area	2.8	12.4	22.2	2350	23.1	22.2
D	39.28	0.49	300	0.03	12.9	1525	0.02	Paved area	2.8	9.0	21.9	1825	20.1	20.1
E	24.93	0.59	300	0.05	9.4	1060	0.01	Paved area	1.4	12.5	21.9	1360	17.6	17.6
J	2.02	0.88	300	0.02	5.8	976	0.02	Paved area				1276	17.1	17.1

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision Murphy Creek Farms

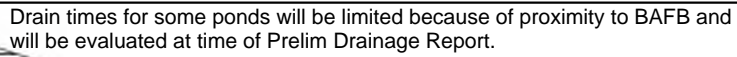
Project Name: Murphy Creek Farms
Project No. 8130323701
Calculated By: BP

Design Storm 100 YR
100-Year P1 = 2.67 in. UDFCD Figure RA-6

	DIRECT RUNOFF								TOTAL RUNOFF						
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff. (C100)	Tc (minutes)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Bypass)	Tc (minutes)	C*A (Ac)	I (in/hr)	Q (cfs)
OS-1	1-OS	OS-1	53.89	0.22	28.3	11.86	4.3	51.36	0.0	0.0	51.4	28.3	11.86	4.3	51.4
	1-OS	OS-1										28.3	0.00	4.3	0.0
	1-OS	OS-1										28.3	11.86	4.3	51.4
OS-2	2-OS	OS-2	22.26	0.22	18.6	4.90	5.5	26.70		26.7	0.0	18.6	4.90	5.5	26.7
	2-OS	OS-2							0.0			18.6	4.90	5.5	26.7
	2-OS	OS-2										18.6	0.00	5.5	0.0
OS-3	3-OS	OS-3	84.83	0.22	20.6	18.66	5.2	96.62	0.0	96.6	0.0	20.6	18.66	5.2	96.6
	3-OS	OS-3										20.6	18.66	5.2	96.6
	3-OS	OS-3										20.6	0.00	5.2	0.0
OS-4	4-OS	OS-4	10.26	0.22	18.1	2.26	5.5	12.50	0.0	0.0	12.5	18.1	2.26	5.5	12.5
	4-OS	OS-4										18.1	0.00	5.5	0.0
	4-OS	OS-4										18.1	2.26	5.5	12.5
A	1-A	A	32.22	0.66	10.0	21.34	7.2	154.12	0.0	0.0	154.1	10.0	21.34	7.2	154.1
	1-A	A										10.0	0.00	7.2	0.0
	1-A	A										10.0	21.34	7.2	154.1
B	1-B	B	38.80	0.60	10.0	23.11	7.2	166.91	0.0	0.0	166.9	10.0	23.11	7.2	166.9
	1-B	B										10.0	0.00	7.2	0.0
	1-B	B										10.0	23.11	7.2	166.9
C	1-C	C	34.58	0.67	22.2	23.02	5.0	114.28		114.3	0.0	22.2	23.02	5.0	114.3
	1-C	C							0.0			22.2	23.02	5.0	114.3
	1-C	C										22.2	0.00	5.0	0.0
D	1-D	D	39.28	0.65	20.1	25.65	5.2	134.23		134.2	0.0	20.1	25.65	5.2	134.2
	1-D	D							0.0			20.1	25.65	5.2	134.2
	1-D	D										20.1	0.00	5.2	0.0
D, OS-2	1-D	D	61.55	0.65	20.14	40.19	5.2	210.32		210.3	0.0	20.1	40.19	5.2	210.3

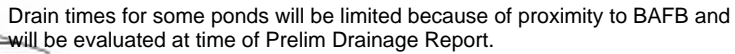
	1-D	D							0.0			20.1	40.19	5.2	210.3
	1-D	D										20.1	0.00	5.2	0.0
E	1-E	E	24.93	0.71	17.6	17.63	5.6	99.02	0.0	99.0	0.0	17.6	17.63	5.6	99.0
	1-E	E										17.6	17.63	5.6	99.0
	1-E	E										17.6	0.00	5.6	0.0
J	1-J	J	2.02	0.93	17.1	1.88	5.7	10.70	SWALE	0.0	10.7	17.1	1.88	5.7	10.7
	1-J	J										17.1	0.00	5.7	0.0
	1-J	J										17.1	1.88	5.7	10.7
OS-1, B	OF-B	0	92.68	0.60	28.33	55.20	4.3	239.12	Existing 2 - 5' x 5' RCBC at E. Jewell Ave	239.1	0.0	28.3	55.20	4.3	239.1
	OF-B	0										28.3	55.20	4.3	239.1
	OF-B	0										28.3	0.00	4.3	0.0
EMC	1-EMC	EMC	43.42	0.75	10.0	32.69	7.2	236.16	0.0	236.2	0.0	10.0	32.69	7.2	236.2
	1-EMC	EMC										10.0	32.69	7.2	236.2
	1-EMC	EMC										10.0	0.00	7.2	0.0
OS-1, B and EMC	1-EMC	0	136.10	0.75	28.33	102.48	4.3	443.93	0.0	443.9	0.0	28.3	102.48	4.3	443.9
	1-EMC	0										28.3	102.48	4.3	443.9
	1-EMC	0										28.3	0.00	4.3	0.0
F7-A	1-F7-A	F7-A	11.45	0.63	10.0	7.19	7.2	51.95	0.0	51.9	0.0	10.0	7.19	7.2	51.9
	1-F7-A	F7-A										10.0	7.19	7.2	51.9
	1-F7-A	F7-A										10.0	0.00	7.2	0.0
F7-B	1-F7-B	F7-B	3.60	0.69	10.0	2.48	7.2	17.93	0.0	17.9	0.0	10.0	2.48	7.2	17.9
	1-F7-B	F7-B										10.0	2.48	7.2	17.9
	1-F7-B	F7-B										10.0	0.00	7.2	0.0
F7-C	1-F7-C	F7-C	16.37	0.37	10.0	6.07	7.2	43.84	0.0	0.0	43.8	10.0	6.07	7.2	43.8
	1-F7-C	F7-C										10.0	0.00	7.2	0.0
	1-F7-C	F7-C										10.0	6.07	7.2	43.8
F7-A1	A1-F7	F7-A1	14.46	0.59	15.8	8.53	5.9	50.40	0.0	0.0	50.4	15.8	8.53	5.9	50.4
	A1-F7	F7-A1										15.8	0.00	5.9	0.0
	A1-F7	F7-A1										15.8	8.53	5.9	50.4
F7-B1	B1-F7	F7-B1	13.81	0.61	16.7	8.42	5.8	48.54	0.0	0.0	48.5	16.7	8.42	5.8	48.5
	B1-F7	F7-B1										16.7	0.01	5.8	0.0
	B1-F7	F7-B1										16.7	8.42	5.8	48.5
F7-C1	C1-F7	F7-C1	21.88	0.58	18.9	12.69	5.4	68.66	0.0	0.0	68.7	18.9	12.69	5.4	68.7
	C1-F7	F7-C1										18.9	-0.01	5.4	0.0
	C1-F7	F7-C1										18.9	12.70	5.4	68.7
OS-J	J-OS	OS-J	8.00	0.22	12.3	1.76	6.6	11.7	POND	0.0	20.7	17.1	3.64	5.7	20.7
	J-OS	OS-J										17.1	0.00	5.7	0.0
	J-OS	OS-J										17.1	3.64	5.7	20.7

MHFD-Detention, Version 4.02 (February 2020)

Basin ID: **EURV Pond C**

MHFD-Detention, Version 4.02 (February 2020)

Project: MURPHY CREEK EAST (HARVEST RIDGE) SUBDIVISION

Basin ID: **EURV Pond D**

Example Zone Configuration (Retention Pond)

Selected BMP Type =	EDB	
Watershed Area =	61.55	acres
Watershed Length =	3,300	ft
Watershed Length to Centroid =	1,315	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	37.25%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = Aurora Reservoir		

This worksheet includes WQCV and EURV volume for OS-2. Final design of this pond will only include WQCV for onsite and offsite basins and EURV for onsite basins. Volume will be refined in Preliminary Design.

Water Quality Capture Volume (WQCV) =	1.062	acre-feet	1.062	acre-feet
Excess Urban Runoff Volume (EURV) =	2.119	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.98 in.) =	1.788	acre-feet	0.98	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	2.350	acre-feet		inches
10-yr Runoff Volume (P1 = 1.39 in.) =	3.508	acre-feet		inches
25-yr Runoff Volume (P1 = 1.77 in.) =	5.698	acre-feet		inches
50-yr Runoff Volume (P1 = 2.08 in.) =	7.317	acre-feet		inches
100-yr Runoff Volume (P1 = 2.67 in.) =	10.689	acre-feet	2.67	inches
500-yr Runoff Volume (P1 = 3.3 in.) =	14.074	acre-feet		inches
Approximate 2-yr Detention Volume =	1.516	acre-feet		
Approximate 5-yr Detention Volume =	2.201	acre-feet		
Approximate 10-yr Detention Volume =	2.663	acre-feet		
Approximate 25-yr Detention Volume =	3.278	acre-feet		
Approximate 50-yr Detention Volume =	3.569	acre-feet		
Approximate 100-yr Detention Volume =	4.861	acre-feet		

Zone 1 Volume (WQV_1) =	1.062	acre-feet
Zone 2 Volume ($EURV - Zone 1$) =	1.057	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	2.119	acre-feet
Initial Surcharge Volume (ISV) =		ft^3
Initial Surcharge Depth (ISD) =		ft
Total Available Detention Depth (H_{total}) =		ft
Depth of Trickle Channel (H_{TC}) =		ft
Slope of Trickle Channel (S_{TC}) =		ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =		

Total detention volume is less than 100-year volume.

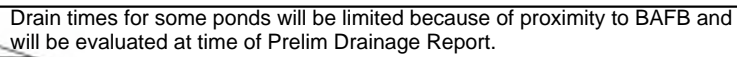
100-year detention is not required pond is 1.2 * WQ and EURV only

Initial Surcharge Area (A_{ISW}) =		ft ²
Surcharge Volume Length (L_{ISW}) =		ft
Surcharge Volume Width (W_{ISW}) =		ft
Depth of Basin Floor (H_{LFLOOR}) =		ft
Length of Basin Floor (L_{LFLOOR}) =		ft
Width of Basin Floor (W_{LFLOOR}) =		ft
Area of Basin Floor (A_{LFLOOR}) =		ft ²
Volume of Basin Floor (V_{LFLOOR}) =		ft ³
Depth of Main Basin (H_{MAIN}) =		ft
Length of Main Basin (L_{MAIN}) =		ft
Width of Main Basin (W_{MAIN}) =		ft
Area of Main Basin (A_{MAIN}) =		ft ²
Volume of Main Basin (V_{MAIN}) =		ft ³
Calculated Total Basin Volume (V_{TOTAL}) =		acre-feet

[illegible]

MHFD-Detention, Version 4.02 (February 2020)

Basin ID: **EURV Pond F7-C**



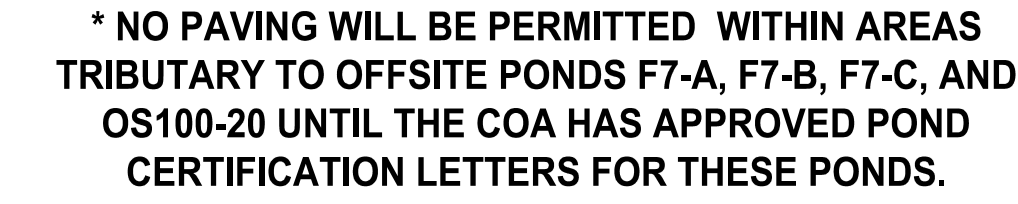
Watershed Information

Water Quality Capture Volume (WQCV) =	0.648	acre-feet	0.648	acre-feet
Excess Urban Runoff Volume (EURV) =	1.273	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.98 in.) =	1.067	acre-feet	0.98	inches
5-yr Runoff Volume (P1 = 1.13 in.) =	1.414	acre-feet		inches
10-yr Runoff Volume (P1 = 1.39 in.) =	2.128	acre-feet		inches
25-yr Runoff Volume (P1 = 1.77 in.) =	3.485	acre-feet		inches
50-yr Runoff Volume (P1 = 2.08 in.) =	4.485	acre-feet		inches
100-yr Runoff Volume (P1 = 2.67 in.) =	6.572	acre-feet		inches
500-yr Runoff Volume (P1 = 3.3 in.) =	8.664	acre-feet	2.67	inches
Approximate 2-yr Detention Volume =	0.909	acre-feet		
Approximate 5-yr Detention Volume =	1.330	acre-feet		
Approximate 10-yr Detention Volume =	1.611	acre-feet		
Approximate 25-yr Detention Volume =	1.988	acre-feet		
Approximate 50-yr Detention Volume =	2.166	acre-feet		
Approximate 100-yr Detention Volume =	2.962	acre-feet		

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



















Total detention volume is less than 100-year volume.

MHFD-Detention_v4-02_Pond F7_C, Basin



BASIN SUMMARY TABLE					
Basin ID	Design Point	Area	Imperviousness	Q2-Year	Q100-Year
		(acres)	(%)	(cfs)	(cfs)
A	1-A	32.2	58.8	43.00	154.12
B	1-B	38.8	51.7	48.18	166.91
C	1-C	34.6	57.2	28.85	114.28
D	1-D	39.3	55.5	33.59	134.23
E	1-E	24.9	64.6	28.11	99.02
J	1-J	2.0	100.0	3.67	10.70
F7-A	1-F7-A	11.4	55.8	15.04	51.95
F7-B	1-F7-B	3.6	62.2	4.92	17.93
F7-C	1-F7-C	16.4	24.6	13.68	43.84
F7-A1	A1-F7	14.5	47.3	14.42	50.40
F7-B1	B1-F7	13.8	47.8	13.43	48.54
F7-C1	C1-F7	21.9	44.7	19.12	68.66
EMC	1-EMC	43.4	77.7	67.33	236.16
OS-1	1-OS	53.9	5.0	15.42	51.36
OS-2	2-OS	22.3	5.0	8.02	26.70
OS-3	3-OS	84.8	5.0	29.02	96.62
OS-4	4-OS	10.3	5.0	3.75	12.50
OS-J	J-OS	8.0	5.0	6.70	11.70

LEGEND

	X-X BASIN DESIGNATION A = AREA IN ACRES X = PERCENT IMPERVIOUSNESS
	DESIGN POINT
	DETENTION POND
	PROPOSED MAJOR BASIN BOUNDARY
	PROPOSED MINOR BASIN BOUNDARY
	LIMITS OF CONSTRUCTION
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
	PROPOSED MAJOR CONTOUR
	PROPOSED MINOR CONTOUR
	100-YR FLOODPLAIN
	FLOODWAY
	PROPOSED STORM
	EXISTING STORM
	PROPERTY BOUNDARY
	EASEMENT
	EMERGENCY OVERTFLOW PATH
	FLOW DIRECTION

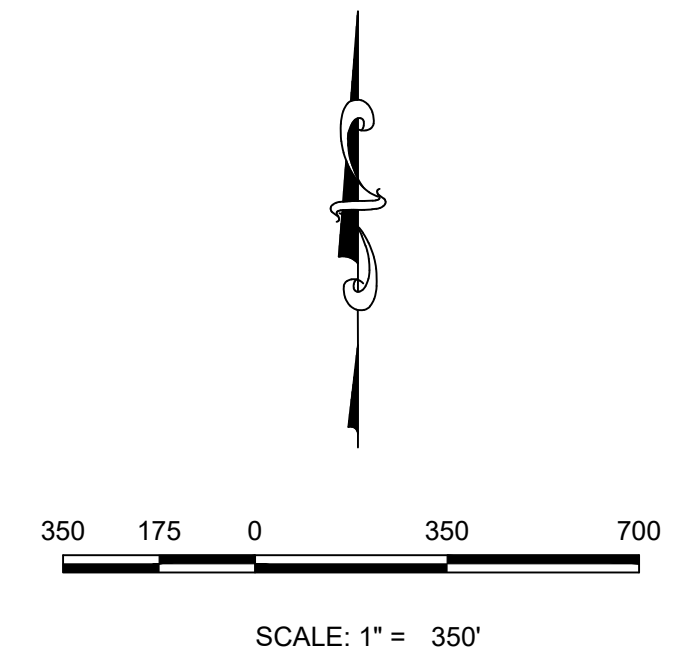
1. CITY OF AURORA PLAN REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH CITY OF AURORA DESIGN CRITERIA AND THE CITY CODE. THE CITY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, OF DIMENSIONS AND EVALUATIONS WHICH SHALL BE CHECKED BY A P.E. AND CORRELATED AT THE JOB SITE. THE CITY OF AURORA, THROUGH THE APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.
2. ALL STORM DRAIN WITHIN PUBLIC STREETS WILL BE PUBLICLY MAINTAINED UNLESS OTHERWISE NOTED BY THE CITY.
3. EIGHT (8) PONDS A, B, C, D, E, F, G, POND OUTFALL PIPES, AND ALL SWALES WILL BE MAINTAINED BY THE MURPHY CREEK METROPOLITAN DISTRICT.
4. TRIBUTARY 3000E CHANNEL AND 4000E CHANNEL WILL BE DESIGNED AND CONSTRUCTED TO BE MHFD MAINTENANCE ELIGIBLE.
5. THIS SINGLE-FAMILY DEVELOPMENT WILL HAVE A DENSITY OF FIVE DWELLING UNITS PER ACRE OR LESS.
6. STREAM CORRIDORS WILL BE EVALUATED IN GREATER DETAIL FOR STABILITY AS THEY ARE INCORPORATED INTO THE LAND USE CHANGES. IMPROVEMENTS WILL BE INFORMED BY GEOMORPHIC PRINCIPLES. STRUCTURAL STABILITY WILL BE PROVIDED THROUGH EROSION CONTROL MATERIALS AND IMPORTED ROCK THAT WORKS COHESIVELY WITH THE OTHER REGIONAL INFRASTRUCTURE.


BENCH MARK
A CITY OF AURORA BENCHMARK KNOWN AS 4S6518SW001 (FORMERLY KNOWN AS M-095) BEING A 3" DIAMETER BRASS CAP IN CONCRETE AT THE NORTH RIGHT OF WAY FENCE LINE OF EAST MISSISSIPPI AVENUE, NEAR THE NORTH QUARTER CORNER OF SECTION 19, TOWNSHIP 4 SOUTH, RANGE 65 WEST, HAVING A PUBLISHED ELEVATION OF 5603.652, NAVD 1988 DATUM.

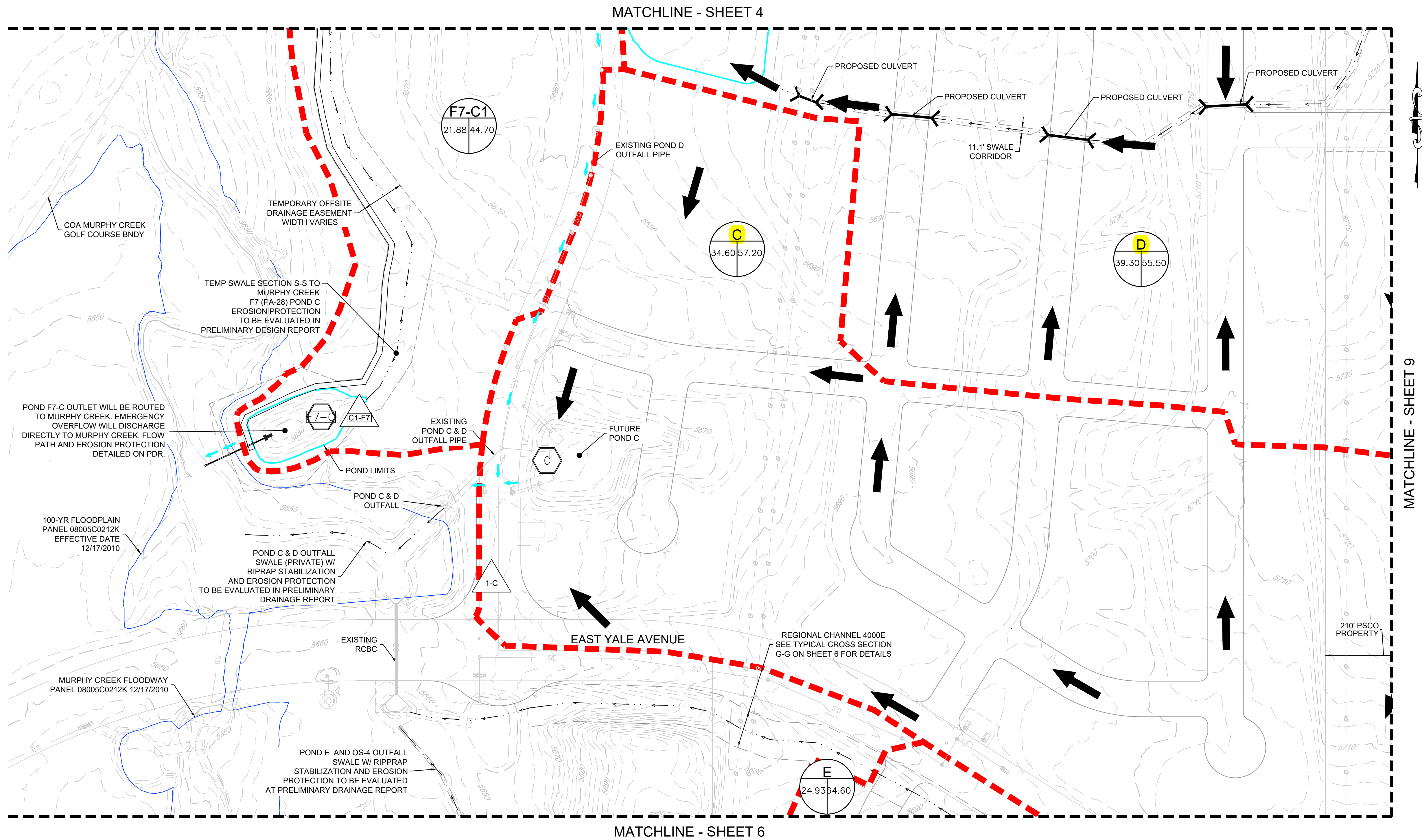
11/19/2020
DATE

<u><i>Heley E. Hansen</i></u>	<u>11/23/2020</u>
CITY ENGINEER	DATE
<u><i>James A. Adam</i></u>	<u>11/29/2020</u>
WATER DEPARTMENT	DATE

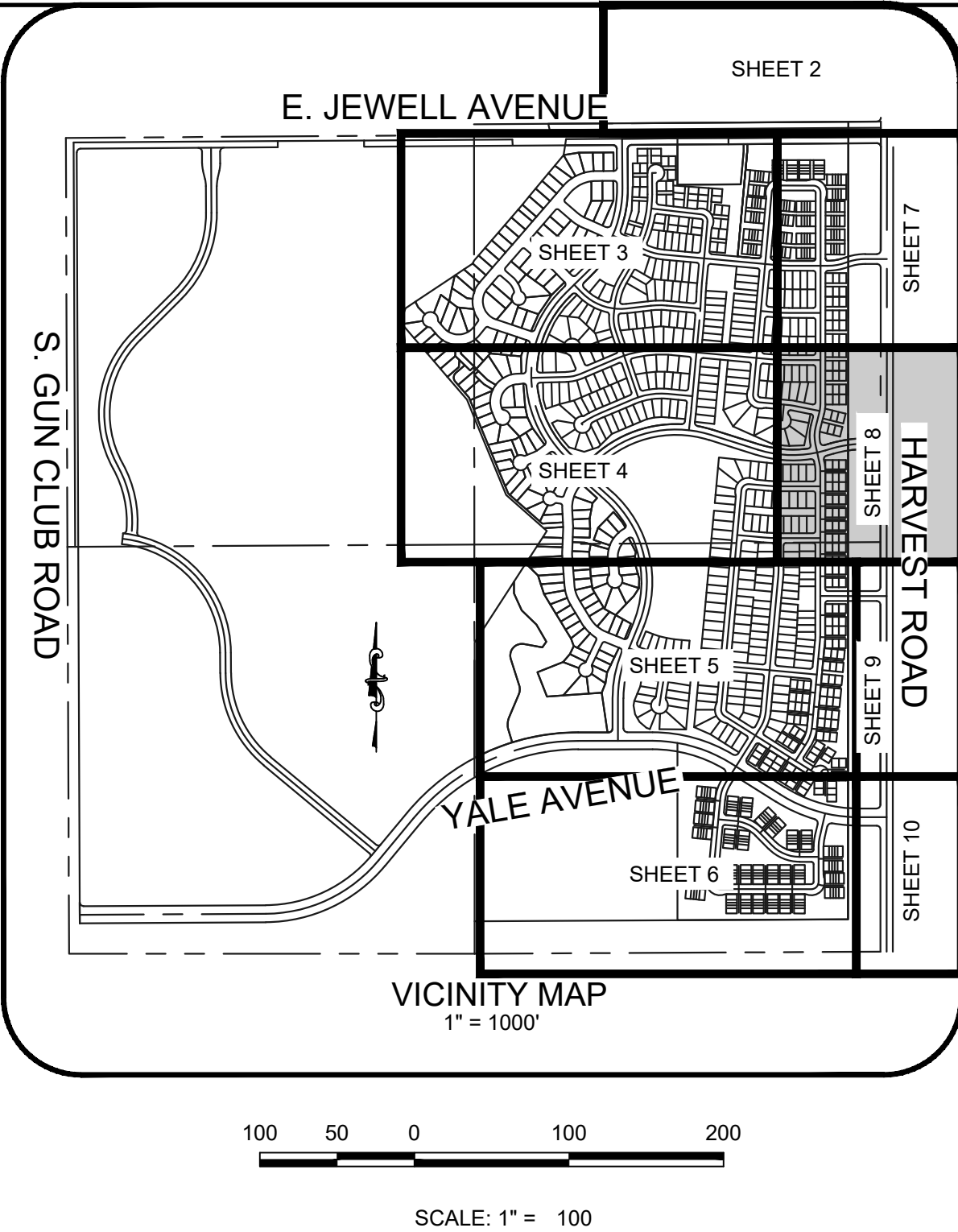
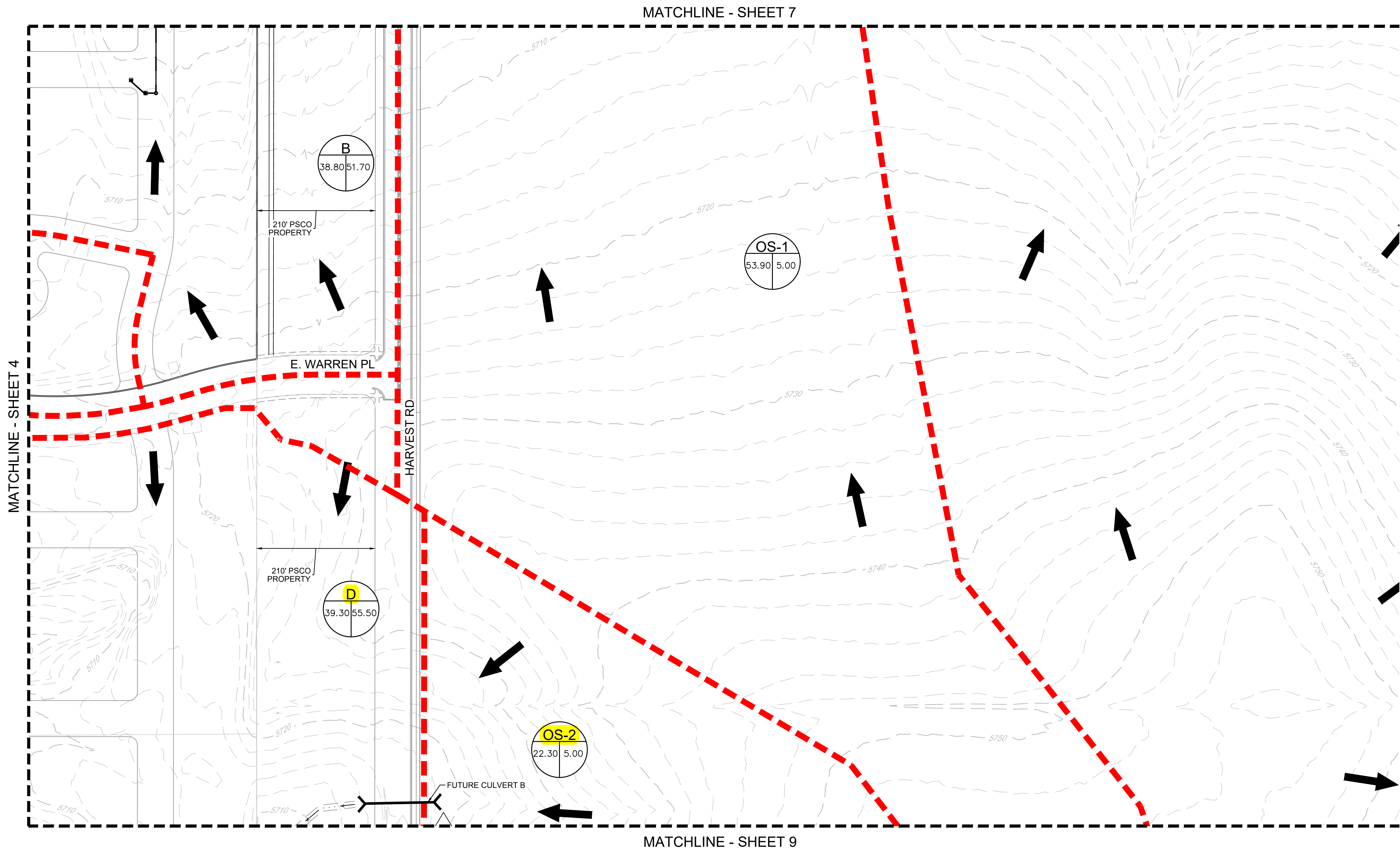
BRIAN SCHAFFER
COLORADO P.E. 57673



SHEET NUMBER <div>1</div>	DRAWN BY: BTP		SCALE: AS SHOWN	MURPHY CREEK EAST (HARVEST RIDGE) FILING NO. 1, 2, 3 & 4 MDR - DRAINAGE MAPS	<div>LENNAR CORPORATION 9781 S. MERIDIAN BLVD., SUITE 120 ENGLEWOOD, CO 80112 TEL: (303)-754-0600</div> <div>CML CONSULTANTS</div> <div>10333 E. Dry Creek Rd Suite 240 Englewood, CO 80112 Tel: 720-482-9526 CVLING.NET</div>							
	CHECKED BY: BS					FILE NO: 8130323701						
	DATE: NOVEMBER 2020											
				No.	Revisions	Date	Int.	Appr.	Date			



N:\PROJECTS\MURPHY CREEK FARMS - LENNAR\DCS\ENGINEERING\MASTER DRAINAGE REPORT\DRAINAGE MAPS\DRAINAGE MAP - PROPOSED 8TH SUBMITTAL.DWG, CS-CLOCKHART, 11/19/2020 1:50 PM



LEGEND

- X-X BASIN DESIGNATION
A = AREA IN ACRES
X = PERCENT IMPERVIOUSNESS
- DESIGN POINT
- DETENTION POND
- PROPOSED MAJOR BASIN BOUNDARY
- PROPOSED MINOR BASIN BOUNDARY
- LIMITS OF CONSTRUCTION
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 100-YR FLOODPLAIN
- FLOODWAY
- PROPOSED STORM
- EXISTING STORM
- PROPERTY BOUNDARY
- EASEMENT
- EMERGENCY OVERFLOW PATH
- GENERAL BASIN FLOW DIRECTION

BASIN SUMMARY TABLE					
Basin ID	Design Point	Area	Imperviousness	Q2-Year	Q100-Year
		(acres)	(%)	(cfs)	(cfs)
A	1-A	32.2	58.8	43.00	154.12
B	1-B	38.8	51.7	48.18	166.91
C	1-C	34.6	57.2	28.85	114.28
D	1-D	39.3	55.5	33.59	134.23
E	1-E	24.9	64.6	28.11	99.02
J	1-J	2.0	100.0	3.67	10.70
F7-A	1-F7-A	11.4	55.8	15.04	51.95
F7-B	1-F7-B	3.6	62.2	4.92	17.93
F7-C	1-F7-C	16.4	24.6	13.68	43.84
F7-A1	A1-F7	14.5	47.3	14.42	50.40
F7-B1	B1-F7	13.8	47.8	13.43	48.54
F7-C1	C1-F7	21.9	44.7	19.12	68.66
EMC	1-EMC	43.4	77.7	67.33	236.16
OS-1	1-OS	53.9	5.0	15.42	51.36
OS-2	2-OS	22.3	5.0	8.02	26.70
OS-3	3-OS	84.8	5.0	29.02	96.62
OS-4	4-OS	10.3	5.0	3.75	12.50
OS-J	J-OS	8.0	5.0	6.70	11.70

POND SUMMARY TABLE						
Pond ID	Contributing Basins	Tributary Area	Average Impervious	1.2 * WQV	EURV	Peak Inflow Q
		(ac)	(%)	(ac-ft)	(ac-ft)	(cfs)
Pond A	A	32.2	58.8	0.75	1.82	139.1
Pond B	B	38.8	51.7	0.82	1.90	129.3
Pond C	C	34.6	57.2	0.79	1.89	120.0
Pond D	D & OS-2	61.5	37.3	1.06	2.12	135.9
Pond E	E & OS-4	35.2	47.2	0.70	1.57	117.6
Pond F7-A	F7-A & F7-A1	25.9	51.1	0.54	1.25	71.4
Pond F7-B	F7-B & F7-B1	17.4	50.8	0.36	0.84	23.2
Pond F7-C	F7-C & F7-C1	38.3	36.1	0.65	1.27	39.7
Pond OS 100-20	OS-J & J	10.0	24.2	0.13	0.22	14.8

NOTE: These ponds are EURV only and do not provide 100-year detention. They are allowed to release at rates up to the peak 100 year inflow rate.

- NOTE:
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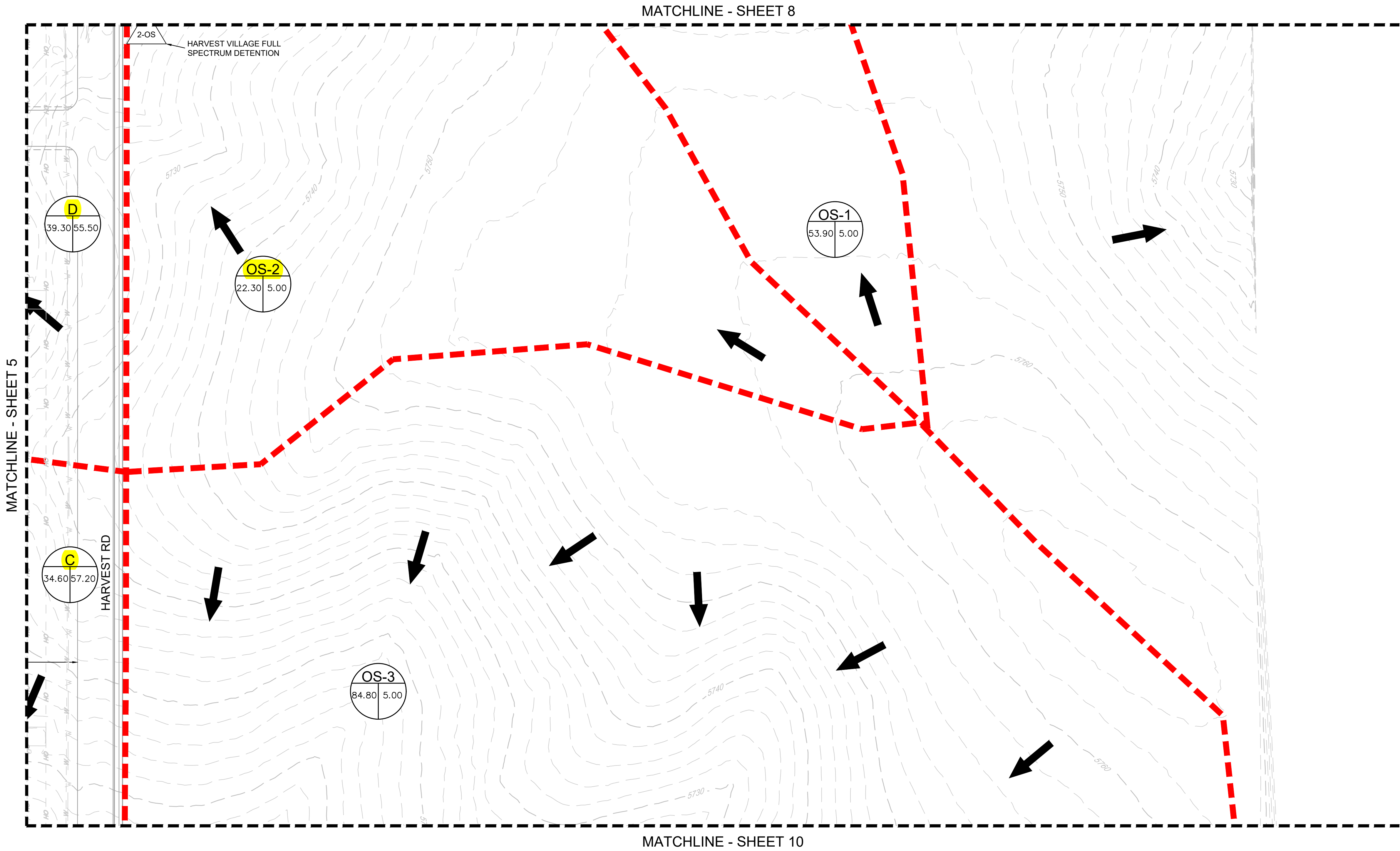
Brian Schaffer
CO PROFESSIONAL ENGINEER
BRIAN SCHAFFER, CO P.E. NO. 37673

11/19/2020
DATE

BENCH MARK
A CITY OF AURORA BENCHMARK KNOWN AS 4S6518SW001 (FORMERLY KNOWN AS M-095) BEING A 3" DIAMETER BRASS CAP IN CONCRETE AT THE NORTH RIGHT OF WAY FENCE LINE OF EAST MISSISSIPPI AVENUE, NEAR THE NORTH QUARTER CORNER OF SECTION 19, TOWNSHIP 4 SOUTH, RANGE 65 WEST, HAVING A PUBLISHED ELEVATION OF 5603.652, NAVD 1988 DATUM.

10333 E. Dry Creek Rd Suite 240 Englewood, CO 80112 Tel: 720-482-9526 CVLINC.NET		No.	Revisions	Date	Init.	Appr.	Date
CML CONSULTANTS		LENNAR CORPORATION 9781 S. MERIDIAN BLVD., SUITE 120 ENGLEWOOD, CO 80112 TEL: (303)754-0600					
MURPHY CREEK EAST (HARVEST RIDGE) FILING NO. 1, 2, 3 & 4 MDR - DRAINAGE MAPS		SCALE: AS SHOWN FILE NO: 8130323701					
DRAWN BY: BTP CHECKED BY: BS DATE: NOVEMBER 2020		PREPARED UNDER THE SUPERVISION OF BRIAN SCHAFFER COLORADO P.E. # 57673					
SHEET NUMBER 8							

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BASIN SUMMARY TABLE					
Basin ID	Design Point	Area	Imperviousness	Q2-Year	Q100-Year
		(acres)	(%)	(cfs)	(cfs)
A	1-A	32.2	58.8	43.00	154.12
B	1-B	38.8	51.7	48.18	166.91
C	1-C	34.6	57.2	28.85	114.28
D	1-D	39.3	55.5	33.59	134.23
E	1-E	24.9	64.6	28.11	99.02
J	1-J	2.0	100.0	3.67	10.70
F7-A	1-F7-A	11.4	55.8	15.04	51.95
F7-B	1-F7-B	3.6	62.2	4.92	17.93
F7-C	1-F7-C	16.4	24.6	13.68	43.84
F7-A1	A1-F7	14.5	47.3	14.42	50.40
F7-B1	B1-F7	13.8	47.8	13.43	48.54
F7-C1	C1-F7	21.9	44.7	19.12	68.66
EMC	1-EMC	43.4	77.7	67.33	236.16
OS-1	1-OS	53.9	5.0	15.42	51.36
OS-2	2-OS	22.3	5.0	8.02	26.70
OS-3	3-OS	84.8	5.0	29.02	96.62
OS-4	4-OS	10.3	5.0	3.75	12.50
OS-J	J-OS	8.0	5.0	6.70	11.70

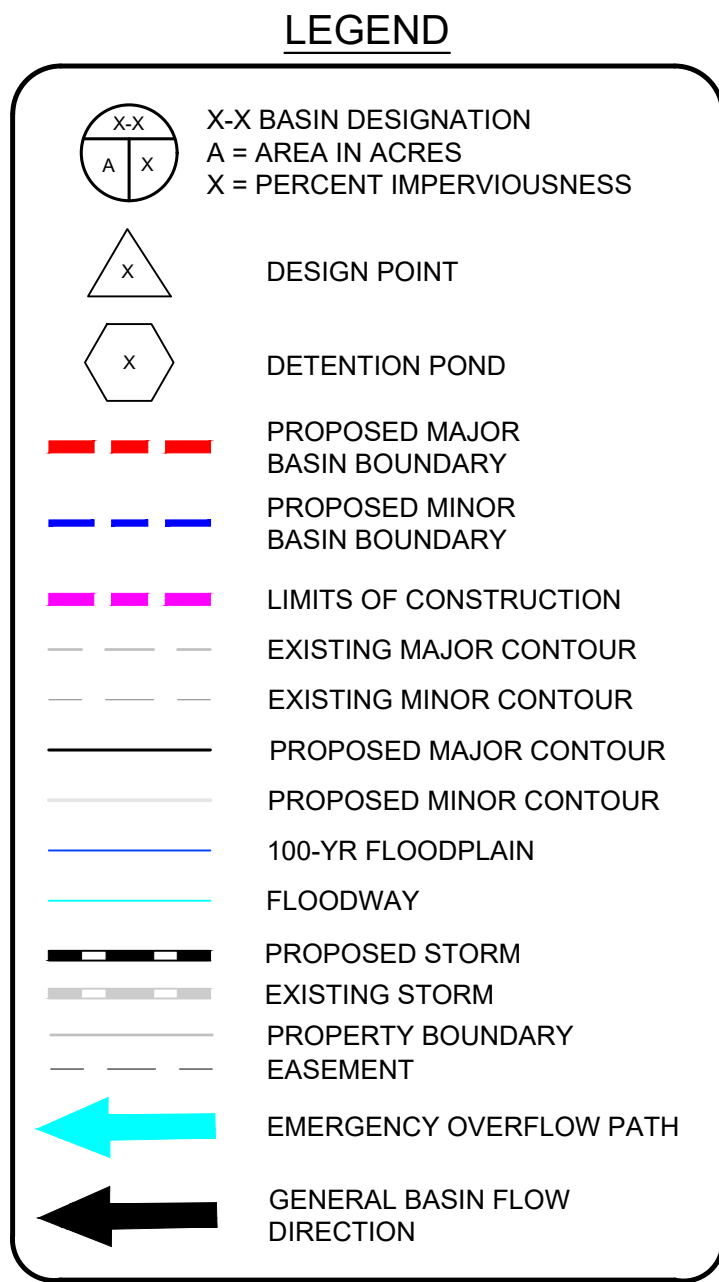
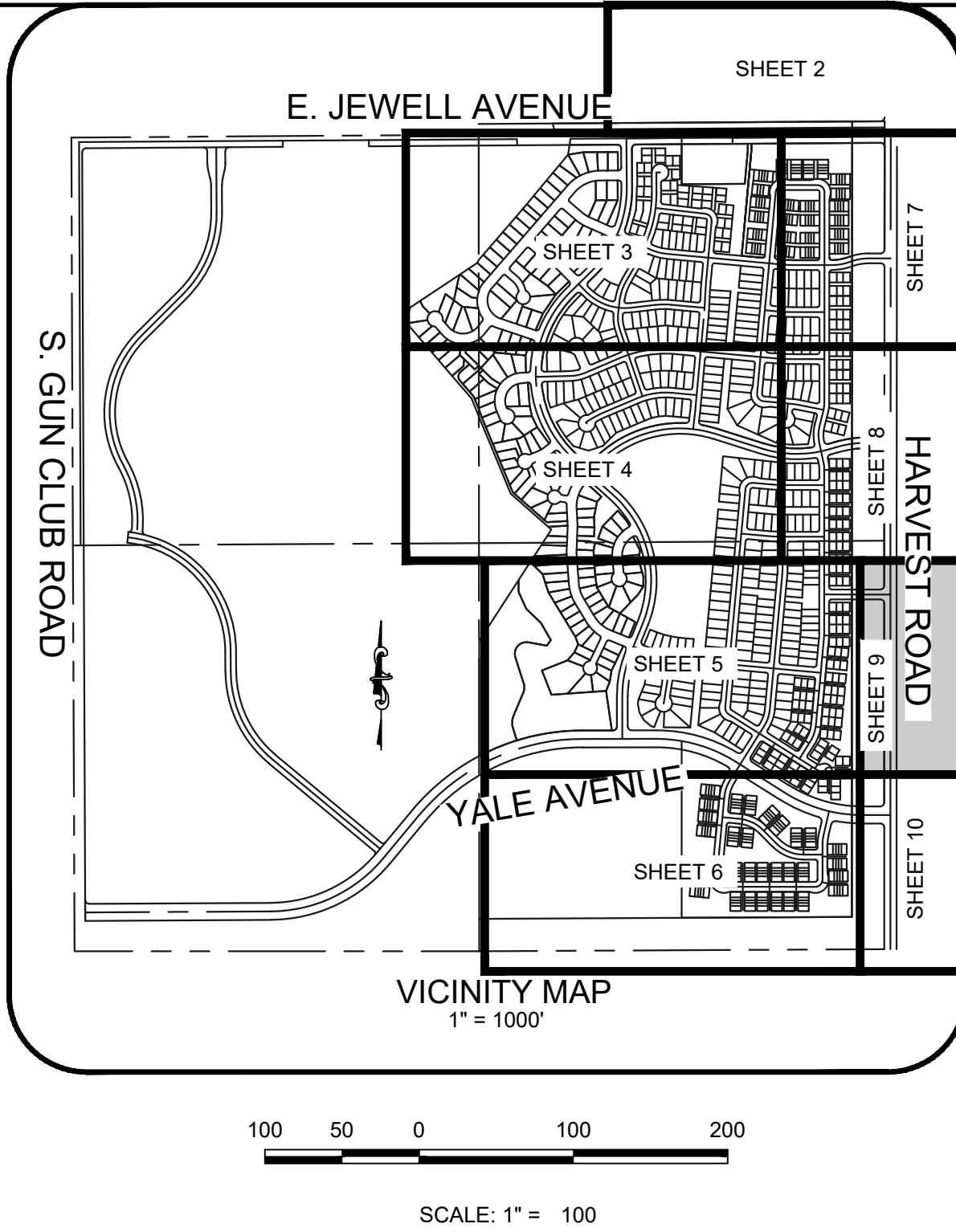
POND SUMMARY TABLE						
Pond ID	Contributing Basins	Tributary Area	Average Impervious	1.2 * WQCV	EURV	Peak Inflow Q
		(ac)	(%)	(ac-ft)	(ac-ft)	(cfs)
Pond A	A	32.2	58.8	0.75	1.82	139.1
Pond B	B	38.8	51.7	0.82	1.90	129.3
Pond C	C	34.6	57.2	0.79	1.89	120.0
Pond D	D & OS-2	61.5	37.3	1.06	2.12	135.9
Pond E	E & OS-4	35.2	47.2	0.70	1.57	117.6
Pond F7-A	F7-A & F7-A1	25.9	51.1	0.54	1.25	71.4
Pond F7-B	F7-B & F7-B1	17.4	50.8	0.36	0.84	23.2
Pond F7-C	F7-C & F7-C1	38.3	36.1	0.65	1.27	39.7
Pond OS 100-20	OS-J & J	10.0	24.2	0.13	0.22	14.8

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CO PROFESSIONAL ENGINEER
BRIAN SCHAFFER, CO P.E. NO. 51673
11/19/2020
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PREPARED UNDER THE
SUPERVISION OF

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MURPHY CREEK EAST (HARVEST RIDGE)
FLING NO. 1, 2, 3 & 4
MDR - DRAINAGE MAPS

SCALE:
AS SHOWN

DRAWN BY:
BTP

CHECKED BY:
BS

DATE:
NOVEMBER 2020

FILE NO:
8130323701

SHEET NUMBER
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No. Revisions Date Init. Appr. Date