

Aurora Water (drainage)
comments in magenta red are
provided by Jared Coleman
(jcoleman@auroragov.org)

PRELIMINARY DRAINAGE REPORT

FOR

CORE Response

Murphy Creek – Zante Street
AURORA, COLORADO
CASE NO. XXXX

Case Number updated.**Prepared for:**

Brian Alpert
9335 E Harvard
Denver, CO 80231
Phone: 303-525-9347

Prepared by:**CORE**

CORE Consultants, Inc.
3473 South Broadway
Englewood, CO 80113
Contact: Jeffrey Killingsworth, PE
Phone: 303-703-4444
CORE Project Number: 21-134

February 19, 2024

Approved For One Year From This Date**Aurora Water - Drainage Division****Date**

Engineer's Statement:

I affirm that this report and plan for the final drainage design of the Murphy Creek – Zante Street Development was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Aurora's Storm Drainage Design and Technical Criteria Manual for the owners thereof. I understand that the City of Aurora does not and will not assume liability for drainage facilities designed by others.

For and On-behalf of CORE Consultants
Jeffrey Killingsworth, PE
Colorado Professional Engineer
License #41217

NOTE: Preliminary Drainage Report approval is required prior to Civil Plan approval.

Table of Contents

A. INTRODUCTION	4
1. Location	4
2. Proposed Development	5
3. Changes to the MDR	5
4. Variances	5
B. HISTORIC DRAINAGE	6
1. Description of Property and Drainage Basin	6
C. DESIGN CRITERIA	7
1. Hydrologic Criteria	7
2. Hydraulic Criteria	9
1. General Concept	10
2. Specific Details	11
E. REFERENCES	19
F. APPENDICES	19

Appendices

Appendix A	General Information
Appendix B	Hydrologic Computations
Appendix C	Hydraulic Computations
Appendix D	Drainage Maps
Appendix E	Reference Documents

A. INTRODUCTION

1. Location

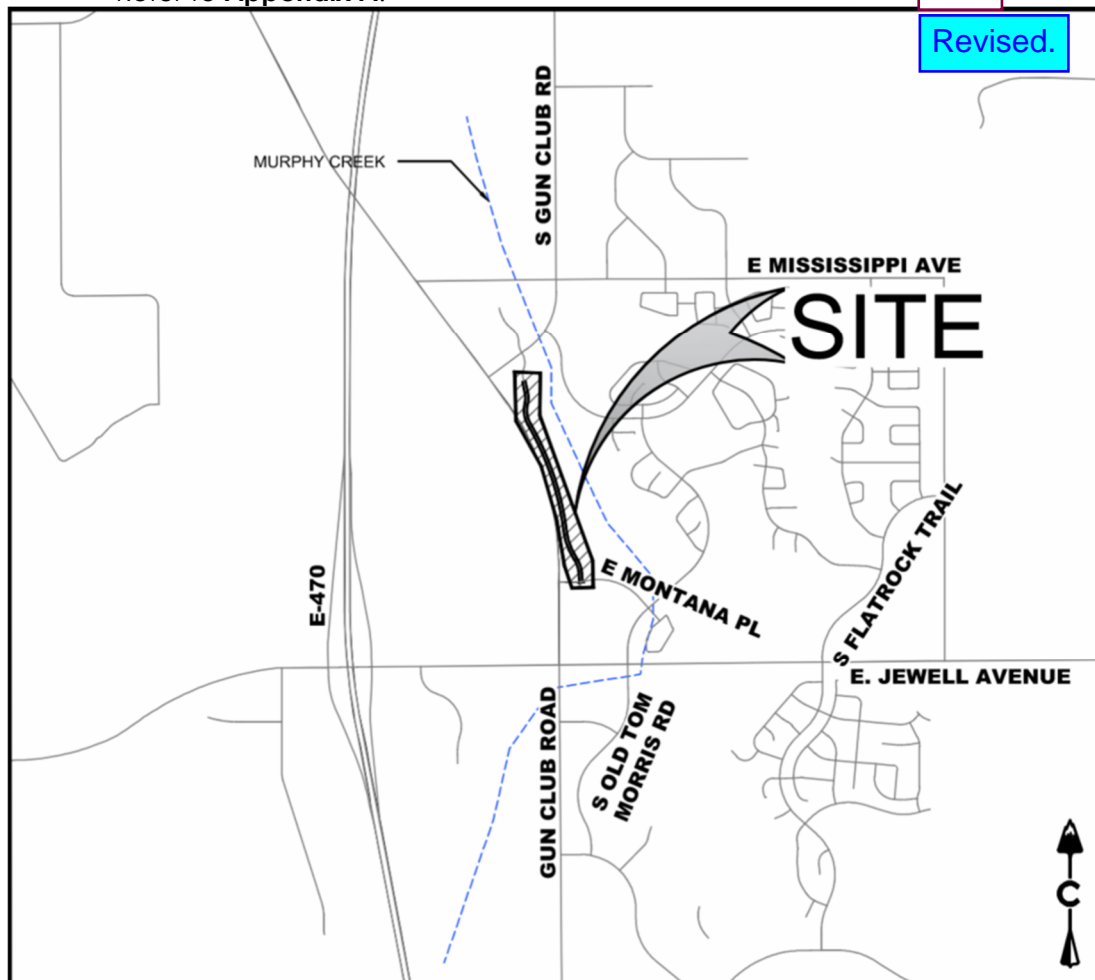
a. Adjacent Streets, Subdivision Name, Lot and Block, Site Plan Name

The proposed project is in the west half Section 19, Township 4 South, Range 65 West of the Sixth Principal Meridian, City of Aurora, County of Arapahoe, and State of Colorado. The project is bounded by E Montana Place to the South, Murphy Creek to the East, S Gun Club Road to the north and Gun Club Road to the west.

This site is surrounded by Gun Club Road ROW to the west (Master Plan 588191), an existing gas station/commercial plot to the north, Murphy Creek and the Murphy Creek Golf Course to the east (Murphy Creek LLC 1977-19-3-00-006 and City of Aurora 1977-19-3-01-001), and the Prose at Murphy Creek Filing 01 development and E Montana Place to the south (RSN 222255).

b. Vicinity Map

Refer to **Appendix A.**



2. Proposed Development

a. Development Description

This project proposes the development of Zante Street stretching from E Montana Place north to the existing Zante Street Stub which extends south from S Gun Club Road, past the existing dead ends. This development of Zante Street, storm sewer development areas (see basins A4 and B8 in the basin description) and detention ponds will be built with this project in anticipation of the future development areas (Commercial Developments) as well as Zante Street itself.

Revised to 2008 Murphy Creek OSP, which is already referenced in the report.

Include in references

Full spectrum detention will be provided for the entire site with these two ponds, Pond A and Pond B. The subject property is approximately 20.9 acres and has a master-planned imperviousness percentage of 45% per the 2009 Murphy Creek Outfall Systems Planning Report. The total acreage intended to be treated in the proposed Full-Spectrum Pond facility is 20.9 acres with an overall imperviousness of 88.5% which incorporates additional roads, buildings, parking stalls, and walks which account for the increase in imperviousness onsite.

3. Changes to the MDR

a. Changes to the MDR

The only change to the MDR (Costin Engineering Consultants, 1996, Murphy Creek MDP) is the anticipated imperviousness of the proposed project site. The MDR anticipated that this site would have an imperviousness of 45%; after initial analysis, it is anticipated that this site will have an imperviousness of approximately 88.5%. The increase in imperviousness will be accounted for and treated within the two proposed detention ponds onsite. Proposed release rates will be less than (90% of) the existing flows to Murphy Creek.

b. MDR Comments

There are no conditional approval comments on the approved MDR or MDR plan sheets.

4. Variances

a. Development Variances

There are no variances requested for this development.

the October 2008 Murphy Creek and Tributaries Watershed OSP. Per the Jewell commons Master Plan, the southernmost 24" culvert is expected to convey 19.3 cfs. These flows will be expected to be passed to the project site and into Murphy Creek, per existing conditions.

Updated.

via?

e. Outfalls from the Site

There are two offsite basins that outfall via 48" and 24" culverts that cross SH30 and release into Murphy Creek. In the proposed condition, there will also be two outfalls from the site, one from each detention pond.

Minor comment
990214 is not a Master
Plan. Revise

f. Major Studies

The following studies were referenced in the creation of the Master Drainage Plan for Murphy Creek, a Final Drainage Report for the

- o Master Drainage Plan for Murphy Creek, a Final Drainage Report for the EDN 980080 and 990214 by Costin Engineering
- o Final Drainage Report Proposed at Murphy Creek Filing No. 1, COA EDN 222255, CORE Consultants, September 2023
- o Murphy Creek Outfall Systems Planning Study, City of Aurora, Urban Drainage and Flood Control District (MHFD), Moser and Associates Engineering, 2005
- o Jewell Commons Parcel Master Drainage Study, Peak Civil Consultants, 2003

Final Drainage Study EDN
990214 reference revised.

C. DESIGN CRITERIA

1. Hydrologic Criteria

a. Rainfall source and P_1 identified (NOAA Atlas 14, used for Rational Method)

The One-Hour Precipitation Depths from the NOAA Atlas 14 for this site (See **Appendix A** for the NOAA Atlas 14 map and rainfall chart) were used for the minor and major storms (2 and 100-year events) in this report. Per Chapter 3.31 of the Aurora Storm Drainage Design & Technical Criteria Manual, the proposed design frequencies analyzed in this report are the 2-yr (minor) and 100-year (major) events based on the street designation. All storm sewer will be designed at a minimum to convey the 100-year event.

b. One-Hour Precipitation Depths

P_1 2-yr rainfall depth = 0.86 in

P_1 100-year rainfall depth = 2.47 in

c. Calculation method(s)

The Rational Method analysis of runoff coefficients was based on the type of proposed development outlined in the City of Aurora Drainage Criteria Manual (MHFD Table 6-3 Imperviousness). Runoff coefficients used in the analysis were weighted according to the existing and proposed land uses in each basin or sub-basin and the time of concentration values have been calculated for each of the basins or sub-basins per City of Aurora Drainage Criteria Manual. Hydrologic calculations can be found in **Appendix B**.

The pond computation methods have been updated to reflect the current Aurora criteria.

d. Detention volume computation method(s)

Per the "Detention/Retention" section of the Aurora Storm Drainage Design & Technical Criteria Manual, the site will be designed Detention based on MHFD's design requirements utilizing design tool.

Ok, however the City no longer evaluates release rates on a cfs/ac basis. Revise to 90% of the pre-development release rate per MHFD-Detention

The three zones of the detention basin are as follows:

Zone 1: WQCV

Zone 2: EURV – Zone 1

Zone 3: 100-year – Zones 1 and 2

In addition, the maximum 100-year release rate, as defined in the Aurora Storm Drainage Design & Technical Criteria Manual, section 6.33, shall be no more than 1 cfs per acre given the type C & D hydrologic soils groups present on the site and shall be 90% of the existing site release flows.

The designed maximum 100-year release rate for Pond A (Basins A1-A4), is 5.9 cfs. This is less than the basin acreage of 8.25 acres at 1.0 cfs/acre. The design maximum 100-year release rate for Basins B1-B9 through Pond B, is 9.6 cfs. This is less than the basin acreage of 12.60 acres at 1.0 cfs/acre. The total resulting maximum 100-year release rate for all proposed onsite basins is 15.5 cfs. This is less than the basin acreage of 20.9 acres at 1.0 cfs/acre.

Additionally, the total runoff from Basins OS1 and OS2 (1.55 cfs, which is being released offsite undetained) has been reduced from the pond allowable release rate, so that the entire developed release does not exceed the pre-development flows. As a result, the total pond release rate is allowed to be 15.6 cfs. In the existing condition, this site creates a total of 18.48 cfs.

EXISTING VS PROPOSED RUNOFF							
Condition	Acres	Total Direct Runoff 100-yr (cfs)	cfs/ Acre	Basins	Detained Release (cfs)	Undetained Release (cfs)	Total Actual Release (cfs)
EXISTING	20.9	18.80	0.90	EX1-3	0	18.80	18.80
PROPOSED	20.9	129.28	6.19	A1-A4, B1-B9, OS1-OS2	15.50	1.55	17.05

Table 1 – Existing vs. Proposed Runoff

Storage and Water Quality Calculations can be found in **Appendix B.**

e. Reference sources other than USDCM

None Utilized.

Inlet sizing is to be evaluated in the FDR

Preliminary inlet sizing has been included in the report for reference. Text has been updated to clarify this and the requested note was added to the inlet calculations in Appendix C.

and inlets, either public or private for the 100-year storm event. Inlets will be sized to utilize a maximum of 12 inches of ponding, if available, to capture the 100-year event. Bypass flow routing has been considered in design and is included in **Appendix C** within the UD-Inlet workbook. Inlet sizing is presented in this PDR, and pipe sizing will be presented in the FDR. No swales are proposed onsite at this time. All detention detention in accordance with

The displayed floodplain linework was not in the correct location. The linework has been updated. No proposed grading is within the floodway.

b. Detention Facility Methodology

Both detention ponds onsite are included in the MHFD UD-Detention workbook. The ponds are both designed and meet all criteria set forth by MHFD and City of Aurora.

See comments above in report and in plans

c. Drainageway Corridor Widths

No drainageway corridors were designed or altered with this project.

d. FEMA Floodplains

According to FEMA Flood Insurance Rate Map, Panels #08005C0204K and #08005C0212K, dated December 2013, the site is located within hazard Zone X. Zone X is defined as a 500-year flood. This site is directly adjacent to the associated floodplain, however no flooding is expected from Murphy Creek are expected, and no CLC

The displayed floodplain linework was not in the correct location. The linework has been updated. No proposed grading is within the floodway.

Murphy Creek is located east of the subject property. There are no are anticipated to impinge upon the existing 100-year floodplain. The closest area of development to the existing floodplain is the north side of Zante Street, which although close in proximity to the published floodplain boundary line, is not close to impacting the published WSEL's of the drainageway. No impact is expected with this development. There are no improvements nor grading proposed within the defined floodplain.

There is currently

e. Public/Private

All storm sewer, detention ponds, and pond outfalls onsite are private, and will be owned and maintained by the property owner.

f. Temporary Proposed Stormwater Infrastructure

There is no proposed temporary stormwater infrastructure onsite.

g. Hydraulic Analysis

StormCAD will be utilized with the FDR to route proposed runoff and size the proposed storm sewer systems onsite. Water surface profiles will be generated and are to be represented in the plans and conform with City of Aurora standards. The 2-year event will not surcharge the system at any point, and the 100-year event surcharging within the pipes will remain 1' below grade. The UD-Detention workbook, UD-Inlet Workbook, and a CORE-standard Rational Method workbook were utilized in sizing the detention ponds, street and inlet capacities, and the hydrologic calculations for the site, respectively.

h. Additional References:

- o Master Drainage Plan for Murphy Creek, a Planned Community, COA EDN 980080 and 990214 by C

References revised to include Final Drainage Study EDN 990214.

See above comments

- o Final Drainage Report Prose at Murphy Creek Filing No. 1, COA EDN 222255, CORE Consultants, September 2023
- o Murphy Creek Outfall Systems Planning Study, City of Aurora, Urban Drainage and Flood Control District (MHFD), Moser and Associates Engineering, 2005
- o Jewell Commons Parcel Master Drainage Study, Peak Civil Consultants, 2003

Reference EDN

EDN added.

D. DRAINAGE PLAN

1. General Concept

a. Drainage Concept and Patterns

The subject property is divided into 2 main basins, Basins A and B. In general, drainage is conveyed to the proposed Full Spectrum Detention ponds via sheet flow, curb and gutter, and underground storm sewer. Proposed drainage patterns are not anticipated to negatively impact historic runoff conditions. It is expected all major drainage infrastructure (pond, trunk storm line, roadway inlets, etc) will be completed in a single phase.

b. Changes to the MDR

The only change to the MDR (Costin Engineering Consultants, 1996, Murphy Creek MDP) is the anticipated imperviousness of the proposed project site. The MDR anticipated that this site would have an imperviousness of 45%; after initial analysis, it is anticipated that this site will have an imperviousness of approximately 88.5%. The increase in imperviousness will be accounted for and treated within the two proposed detention ponds onsite. Proposed release rates will be less than (90% of) the existing flows to Murphy Creek.

c. Changes to the PIP

There are no drainage changes to the PIP.

Flows and references added to plans.

d. Conformance with the Site Plan

This report is being developed in tandem with the Site Plan. Conformance with the Site Plan.

Label in plans along with EDN

e. Offsite Basins and Overflows

Per the 2005 Murphy Creek Outfall Systems Planning Study by Moser and Associates (See Appendix E for excerpts), this site is a portion of Basin 111. Two offsite basins, shown on the Moser & Associates Murphy Creek Study, indirectly impact the site. There are two culverts associated with basin numbers 400 and 380; these will be developed. The northernmost of the culverts is a 48" culvert that will convey 91 cfs per the October 2008 Murphy Creek and OSP. Per the Jewell Commons Master Plan, the south culvert is expected to convey 19.3 cfs. These flows will be conveyed to the ponds through the project site and into the detention ponds. emergency overflows are anticipated.

Ok. But Montana PI is not built yet and your site is dependent on its construction. See notes in plan. Recommend you discuss potential impacts here.

Montana PI is currently being built and design is approved per EDN 222255. No additional information was required from the Prose FDR.

f. Coordination with Surrounding Developments

There are no changes to existing flows. The MDR proposed with this development, so there has been no additional coordination with surrounding developments.

g. Outfalls from the Site

There are two proposed outfalls from this site, one from each of the proposed detention ponds. These two ponds, as discussed earlier in this report, will be

allowed to release at a combined 90% of existing condition flows, minus the two small undetained basins that sheetflow to Murphy Creek. All flows in the proposed condition follow existing drainage patterns and outfall directly to Murphy Creek. There is no offsite infrastructure that these outfalls rely on.

h. Impacts on Neighboring Developments

The development of this site will have no impacts on upstream, downstream, or adjacent developments, as all stormwater release from the site will be at 90% of existing conditions, no offsite flows are barred from entering the site, and there are no emergency overflow routes from this site that would impact a neighboring site.

i. Water Quality

Water quality for the entire site is provided in one of two detention ponds onsite. The A basins are routed via sheet flow and storm sewer to Pond A, where water quality and full detention are provided, and over-detention is provided for Basin OS1. The B basins are routed via sheet flow and storm sewer to Pond B, where water quality and full detention are provided, and over-detention is provided for Basin OS2.

See comments in plans. It's not clear the ultimate fate of this culvert and there looks to be a risk that future development may impact the historic drainage coming from this culvert.

Discussion has been added that future developments must maintain historic flow patterns for both existing culverts.

2. Specific Details

a. Phasing Plan

This project is a single phase, so no phasing plan is necessary.

b. Basin Descriptions

1. Offsite Basin Descriptions

Per the Jewell Commons Master Plan (Appendix A), this site is a portion of Basin 111. Two & Associates Murphy Creek Outfall Planning Study, in which the site is shown as associated with basin numbers 400 and 380; these will bypass the proposed development. The northernmost of the culverts is a 48" culvert expected to convey 91 cfs per the October 2008 Murphy Creek and Tributaries Watershed OSP. Per the Jewell commons Master Plan, the southernmost 24" culvert is expected to convey 19.3 cfs. These flows will be expected to be passed through the project site and into Murphy Creek, per existing conditions.

Include discussion in this report that future development will have to perpetuate the historic drainage pattern of this culvert.

Proposed Basins OS1 & OS2

These basins consist of a portion of the off-site drainage east of the proposed Zante Street and contain landscape area. Runoff generated from these basins will be conveyed to Murphy Creek before traveling north under Gun Club Road culvert. Please note that the detention ponds onsite over-detain for OS1 and OS2 but do not accept flows from these basins.

2. Existing Basin Descriptions

Basin EX1 and EX2

These basins consist of the majority of the project site in the existing condition, which is the undeveloped land between Murphy Creek and the existing State Highway 30 (Gun Club Road). Runoff from this area sheetflows to the east at 4-25% into Murphy Creek.

?? Revised for clarity.

Basin EX3

This basin consists of a small portion of E Montana Place, at the northeast corner of S Gun Club Road and E Montana Place. Runoff from this portion of road sheetflows to the curb and gutter, where the flows will round the corner to proposed Zante Street – in the existing condition, these flows exit the gutter from a mountable curb section and sheetflows into basin EX1.

3. **Onsite Basin Descriptions**

There are two onsite basins associated with the subject property as described below. Basins A and B are divided into a series of subbasins that are serviced by storm infrastructure that conveys flows to the proposed detention ponds onsite and then to Murphy Creek.

Basin A

Basin A is divided into 4 subbasins. Basin A consists of the southern portion of the site containing landscape areas, and Zante Street. All runoff from Basin A is conveyed via sheet flow, curb inlets, and associated storm infrastructure to the detention pond onsite.

Subbasins A2 and A3

These subbasins make up the paved portion of Zante Street along the southern half of the site. All curb inlets along this portion of Zante Street are designed to accommodate the 100-year event flows. Subbasin A3 includes the northern portion of E Montana Place.

The curb inlets and associated storm infrastructure convey flows from this series of subbasins to the detention pond onsite. In the event that all of these inlets become 100% clogged, runoff will continue to sheet flow to the east to subbasin A1 and into the detention pond.

Subbasins A1 and A4

Subbasins A1 and A4 consist of the western and eastern sides of the southern portion of Zante Street. Runoff sheet flows to a curb inlet as described above. In the event that all of these inlets become 100% clogged, runoff will flow over the curb and sheet flow to the east to either the detention pond or directly to Murphy Creek and into the detention Pond A. Subbasin A1 sheet flows directly into the detention Pond A.

Also discuss what the ultimate condition of these basin are anticipated to be.

Updated to include the ultimate condition.

Basin B

Basin B is divided into 9 main subbasins that make up the northern portion of the site containing landscape areas, and Zante Street. All runoff from Basin B is conveyed via sheet flow, or curb inlets with associated storm infrastructure to the detention pond onsite and then to Murphy Creek.

Noted.

Subbasin B2, B3, B4, B5, B6, and B7

These subbasins make up the paved portion of Zante Street along the northern half of the site. All curb inlets along this portion of Zante Street are designed to accommodate the 100-year event flows.

See comment next page

The curb inlets and associated storm infrastructure convey flows from this series of subbasins to the detention pond onsite. In the event that all of these inlets

C

Ok, however all these inlets appear to be on-grade inlets. So, the City would not require a clogged condition analysis. As on-grade inlets, all these inlets would also not flow east before bypassing downstream to the next inlet downstream. Revise

For B7 and B6 however, these inlets should either collect 100% of the minor and major flows or have a discussion where the ultimate collection point is for any bypass flows along with the quantity of flows that bypass and whether that bypass is in conformance with previous studies.

Noted. Inlets B6 and B7 capture 100% of both the minor and major storm. These inlet calculations have been included for reference and will be finalized with the FDR.

The clogged condition analysis has been removed.

% clogged, runoff will flow to detention pond or directly to basin B9 sheet flows directly

consists of one of the landscape areas east of Zante Street. Runoff via sheet flow to Murphy Creek. The grades in this area are minimally modified and will consist of a 4:1 max slope directly adjacent to Zante Street.

Subbasin B8

Subbasin B8 consists of a landscape area to the north of Zante Street and is will sheet flow to subbasin B7 within the limits continue to follow the drainage pattern outlined a

Also discuss what the ultimate condition of these basin are anticipated to be.

Ultimate condition discussed for each basin.

Subbasin B9

Subbasin B9 is a landscape area adjacent to Zante Street that sheet flows to the detention Pond B.

c. Summary Tables

RUNOFF SUMMARY TABLE

DIRECT RUNOFF

DIRECTDESIGN POINT	BASIN	AREA (AC)	2-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)	2-Year C Value	100- Year C Value	% I
A1	A1	4.69	10.26	30.13	0.87	0.89	95.0%
A2	A2	0.71	1.42	4.38	0.70	0.76	77.1%
A3	A3	0.94	1.99	6.15	0.74	0.80	82.1%
A4	A4	1.59	4.02	11.82	0.87	0.89	95.0%
B1	B1	6.57	13.42	39.52	0.89	0.92	97.8%
B2	B2	0.62	1.07	3.32	0.70	0.75	76.5%
B3	B3	0.82	1.08	3.47	0.58	0.65	58.0%
B4	B4	0.57	0.81	2.60	0.59	0.66	59.1%
B5	B5	0.43	0.77	2.39	0.70	0.76	76.7%
B6	B6	0.41	0.80	2.49	0.70	0.76	76.8%
B7	B7	0.46	0.90	2.79	0.71	0.77	78.6%
B8	B8	1.36	3.45	10.14	0.87	0.89	95.0%
B9	B9	1.21	2.84	8.52	0.87	0.91	97.4%
OS1	OS1	0.33	0.24	0.96	0.25	0.35	5.0%
OS2	OS2	0.20	0.15	0.59	0.25	0.35	5.0%
EX1	EX1	8.24	1.65	7.12	0.10	0.15	2.0%
EX2	EX2	12.43	2.34	10.10	0.10	0.15	2.0%
EX3	EX3	0.20	0.41	1.26	0.87	0.93	100.0%

Table 2 – Runoff Summary Table

d. Full Spectrum Detention

See comments in plan

Summary table updated for revised rational calculations.

Two MHFD Full Spectrum Pond facilities are located at the site to attenuate and treat flows with a 48-hour return period (to the Buckley Air Force Base runway). Pond A is designed to treat and attenuate an 8.3 acre developed basin with an imperviousness of 88.4%. The pond overdetains for but does not treat basin OS1, as described above. Pond B is designed to treat and attenuate an 12.6 acre developed basin with an imperviousness of 88.5%. The pond overdetains for but does not treat basin OS1, as described above.

OS2

Updated to OS2.

See comments in above pages of report. This should be 90% of the predevelopment flows per MHFD-Detention spreadsheet. This is also contradictory to discussion on pages 10 and 11

Pond designs updated to 90% of the pre-development flows. Text of report and summary tables updated.

All basins are detained or over-detained for in the ponds, including OS1 and OS2, which are not tributary to either pond. OS1 and OS2 collectively create 1.55 cfs in the 100-year event, which is undetained and not tributary to either pond - however each pond was sized to include the acreage and imperviousness of the two undetained basins. The basins tributary to the ponds include 20.38 'onsite' acres but the ponds were sized for the full 20.9 acres of disturbed site, so the total allowable release rate for the ponds (per MHFD criteria of 1 cfs/acre for C/D soils) would normally be 20.9 cfs. Due to the 1.55 cfs being released undetained, 1.55 cfs fewer will be allowed to release from the pond. This means that the pond will be allowed to release 19.35 cfs. The total release rate including detained and undetained flows is 17.05 cfs, which is less than 1 cfs/acre for all disturbed areas tributary to the pond and is 90% of the historic release rate.

+20% no longer required

Updated.

Pond Summary Table - POND A								
Condition	Required Volume	Provided Volume	Stage (ft)	Allowed Release Rate	Actual Release Rate	Release Orifice	Freeboard to Spillway (ft)	Freeboard to Berm Top (ft)
Micropool	25 cf	134 cf	0	NA	NA	NA	6	8
WQCV (+20%)	0.32 ac-ft	0.32 ac-ft	2.25	>=40 hr	41 hr	Orifice Plate	3.75	5.75
EURV	0.40 ac-ft	0.70 ac-ft	4.42	<48 hr*	47 hr	Orifice Plate	1.58	3.58
Full Spectrum (100-yr)	1.12 ac-ft	1.14 ac-ft	5.94	Ponds A1+B9 +OS1-2 <18.48 cfs	5.9 cfs**	Outlet Pipe	0.06	2.06
Spillway	NA	1.15 ac-ft	6	28.9 cfs (Required)	28.9 cfs (Required)	Emergency Weir	0	2
100-Emergency	NA	NA	6.57	28.9 cfs	28.9 cfs (0.57' depth)	NA	NA	1.43
Berm Top	NA	1.8 ac-ft	8	NA	NA	NA	NA	0
*Due to being in proximity of an airport, the drain time for the entire pond must be less than 48 hours.								
**Pond A+B+ Basin OS1+OS2 = 17.05 cfs which is less than existing condition 18.48 cfs								

Table 3 – Pond A Data Table

Pond Summary Table - POND B								
Condition	Required Volume	Provided Volume	Stage (ft)	Allowed Release Rate	Actual Release Rate	Release Orifice	Freeboard to Spillway (ft)	Freeboard to Berm Top (ft)
Micropool	25 cf	134 cf	0	NA	NA	NA	7.5	9
WQCV (+20%)	0.49 ac-ft	0.49 ac-ft	3.13	>/=40 hr	41 hr	Orifice Plate	4.38	5.88
EURV	0.61 ac-ft	1.10 ac-ft	5.57	<48 hr*	47 hr	Orifice Plate	1.92	3.42
Full Spectrum (100-yr)	1.72 ac-ft	1.72 ac-ft	7.04	Ponds A1+B9 +OS1-2 <18.48 cfs	9.6 cfs**	Outlet Pipe	0.34	1.84
Spillway	NA	1.90 ac-ft	7.5	36.2 cfs (Required)	35.6 cfs (Required)	Emergency Weir	0	1.5
100-Emergency	NA	NA	7.88	36.2 cfs	35.6 cfs (0.38' depth)	NA	NA	1.12
Berm Top	NA	2.70 ac-ft	9	NA	NA	NA	NA	0
*Due to being in proximity of an airport, the drain time for the entire pond must be less than 48 hours. **Pond A+B+Basin OS1+OS2 = 17.05 cfs which is less than existing condition 18.48 cfs								

Table 4 – Pond B Data Table

A concrete trickle channel sloped at 0.5% has been designed to encourage draining of the pond and facilitate pond maintenance. The channel is required to contain 3% of the peak inflow of the 100-year event to the pond at any given inflow point.

A permanent micropool has been designed to promote sediment separation and containment. The micropool has been integrated into the proposed outlet structure. The MHFD requirements (USD CM Volume 3, T-5) for a micropool indicate that it must be at least 2.5' deep with 10 sf of area on the top.

An emergency spillway has been included in the drainage design to mitigate the unlikely event of inundation of the pond beyond the drainage capacity of the outlet structure's 100-yr event peak flow restricted conveyance, or in the case that elements of the outlet structure become clogged or silted in. The bottom of the spillway is elevated above the 100-year water surface ponding elevation of the detention basin. The emergency spillway has been sized to convey the undetained peak inflow of the 100-year event with one foot of freeboard to the top bank of the proposed facility.

The proposed pond outfalls for both ponds are designed to discharge to Murphy Creek via an outlet structure and associated storm pipe and riprap outlet pad.

e. Offsite Water Quality

There is no proposed offsite water quality intended for the treatment of runoff from this site.

f. Proposed Culverts

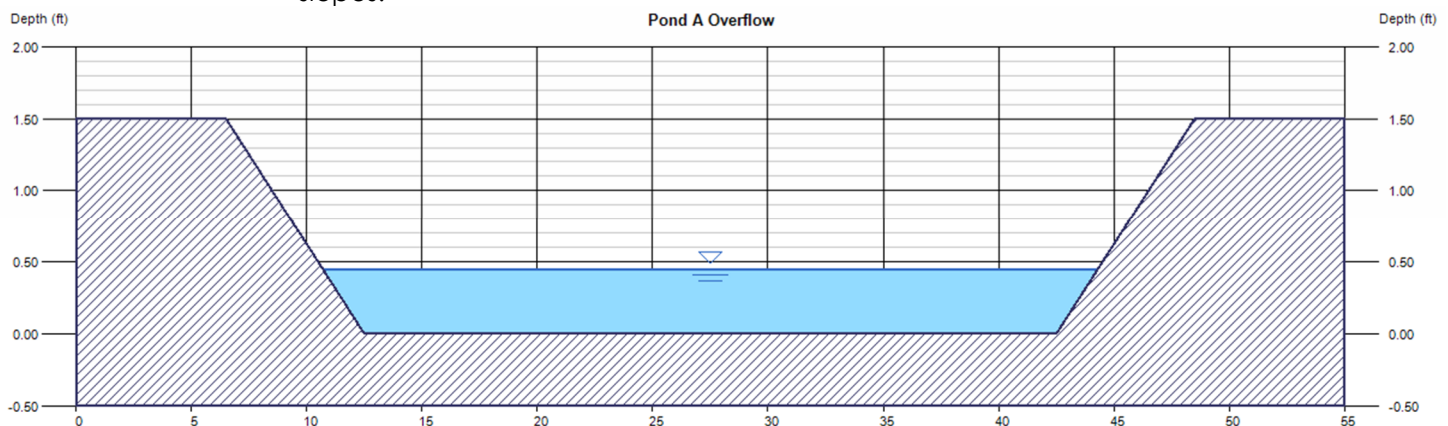
There are no proposed culverts on this site at this time. Storm Sewer will be sized with the Final Drainage Report.

g. Bridges

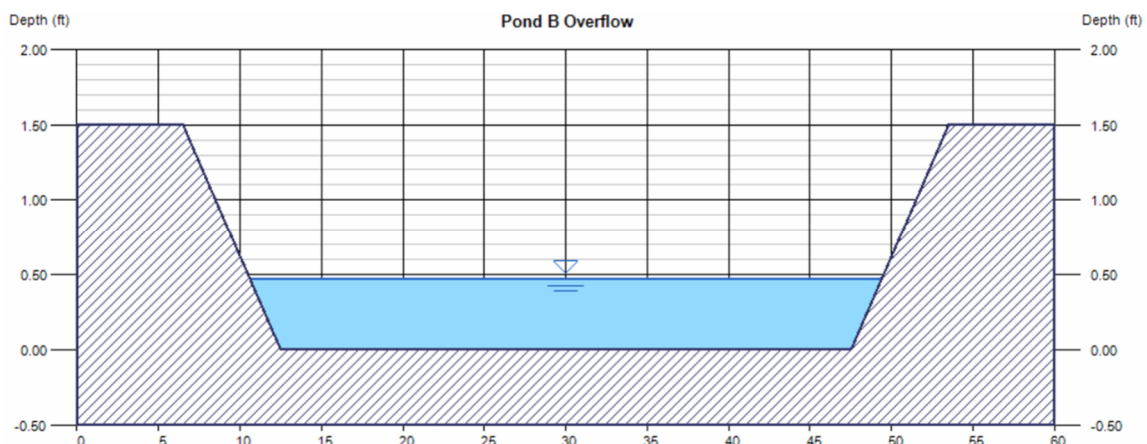
There are no proposed bridges for this site.

h. Emergency Overflows

There are three emergency overflows on this site, one for Pond A, Pond B, and a pair of sump inlets at Design Points A2 and A3. The emergency overflow for Pond A will need to pass the 100-year inflow for the pond, or 28.9 cfs. See below for the weir calculation that shows one foot freeboard as well as the weir passing the required flow. The weir is a 30' long, 1.5' deep weir with 4:1 side slopes.



The emergency overflow for Pond B will be required to pass the 100-year inflow for the pond, or 35.6 cfs. See below for the weir calculation that shows one foot freeboard as well as the weir passing the required flow. The weir is a 35' long, 1.5' deep weir with 4:1 side slopes.



Ok. However, please note that both inlets don't need to be considered clogged, just the one that produces the most-conservative overflow scenario.

Noted. This approach has been maintained for a conservative approach and text has been added to the report for clarity.

clogged condition at the two sump inlets, the overflow for the mass flows from Basins A2-A4, or 22.35 cfs. The cross section for this sump overflow can be found on sheet 1 of the maps, found in Appendix D of this report.

i. Swales, Ditches, and Channels

There are no ditches, channels, or swales currently proposed on this site.

j. Regional Channel

There are no regional channel improvements planned for this site.

k. Street Capacities

The 2-year event is contained within 4" of ponding in the gutter for all streets onsite, and the 100-year event will not pond beyond 12". For depth and spread calculations, please refer to the UD-Inlet workbook in the appendix of this report.

l. Permanent Sediment Control Measures (SCMs)

The only permanent sediment control measure on this site are the two proposed full spectrum detention ponds that provide water quality and sediment control for the entire site.

m. Compliance with MHFD

The drainage design for this site meets or exceeds requirements set forth by the MHFD and the City of Aurora. The detention pond release rates are within regulatory limits, the street spread and ponding depth of runoff flows are within regulation, and the storm sewer that will be designed with the FDR for this site will also be within regulation for both agencies. The drainage design included herein will control damage to existing and proposed structures and infrastructure. The proposed improvements will not negatively affect any upstream or downstream drainage facilities or other structures under both the existing and future buildout conditions.).

n. Other Information

There are no other design issues of note for this project.

E. REFERENCES

- A. City of Aurora Storm Drainage Design and Technical Criteria Manual, November 2023.
- B. Mile High Flood District Urban Storm Drainage Criteria Manual, October 2019.
- C. Web Soil Survey, Soil Survey Staff (Natural Resources Conservation Service), United States Department of Agriculture. Available online at the following link:
<https://websoilsurvey.sc.egov.usda.gov/>. Accessed November 10, 2023.
- D. Flood Insurance Rate Map (FIRM) No. #08005C0204K & 08005C0212K, Federal Emergency Management Agency, Revised March 16, 2016. Available online at the following link:
<https://msc.fema.gov/portal/home>. Accessed November 16, 2021.
- E. Jewell Commons Parcel Master Drainage Study, Peak Civil Consultants, 2003
- F. Murphy Creek and Tributaries Watersheds – Outfall Systems Planning Phase B – Planning Report, Moser & Associates Engineering, Updated March 2021.
- G. Murphy Creek Master Drainage Plan, EDN 980080, Costin Engineering Consultants, Inc, Updated April 14, 1998.
- H. Final Drainage Report for Prose Murphy Creek Filing No. 1, CORE Consultants, Inc, September 2023.

Provide RSN/EDN

EDN provided.

F. APPENDICES

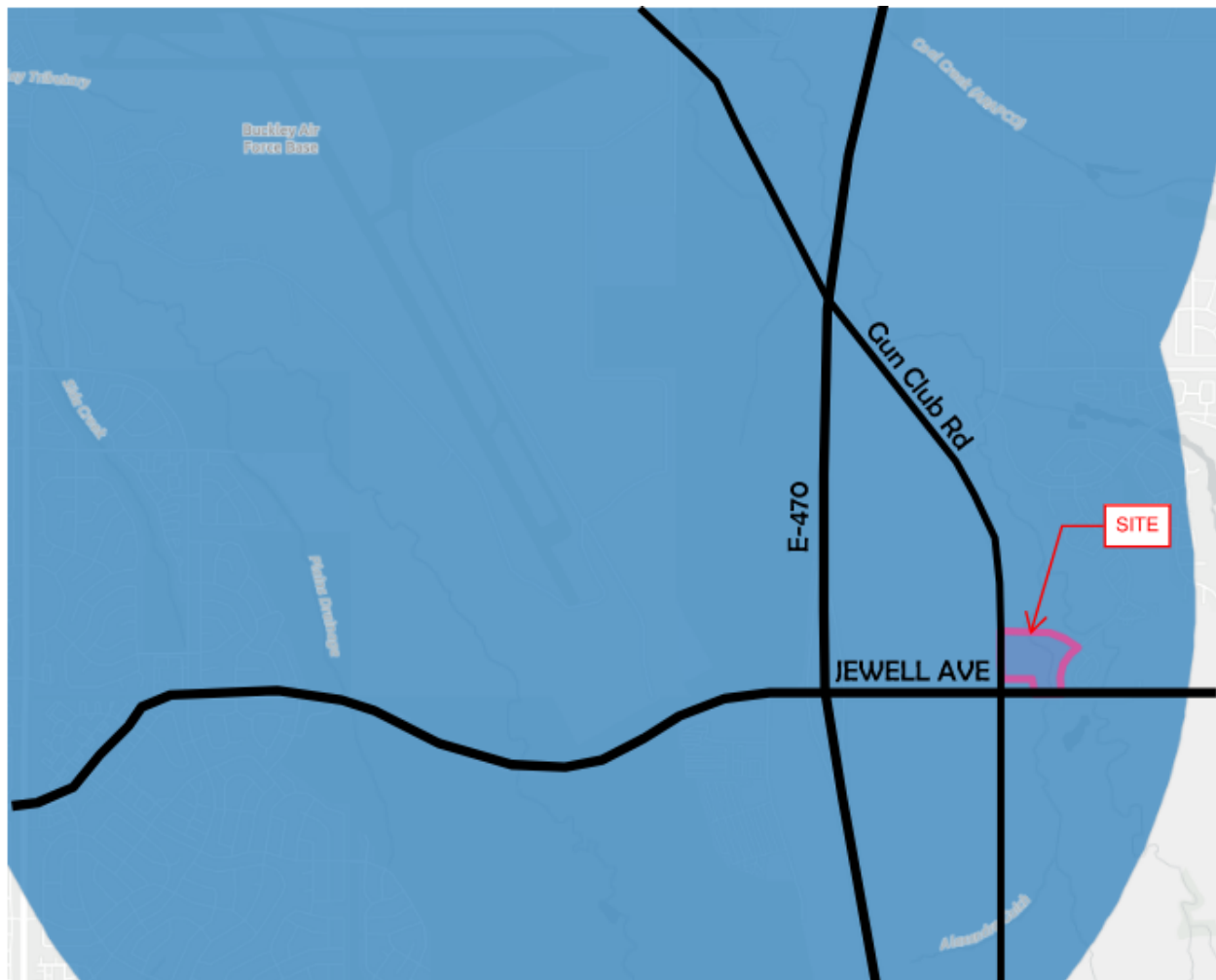
APPENDIX A

General Information

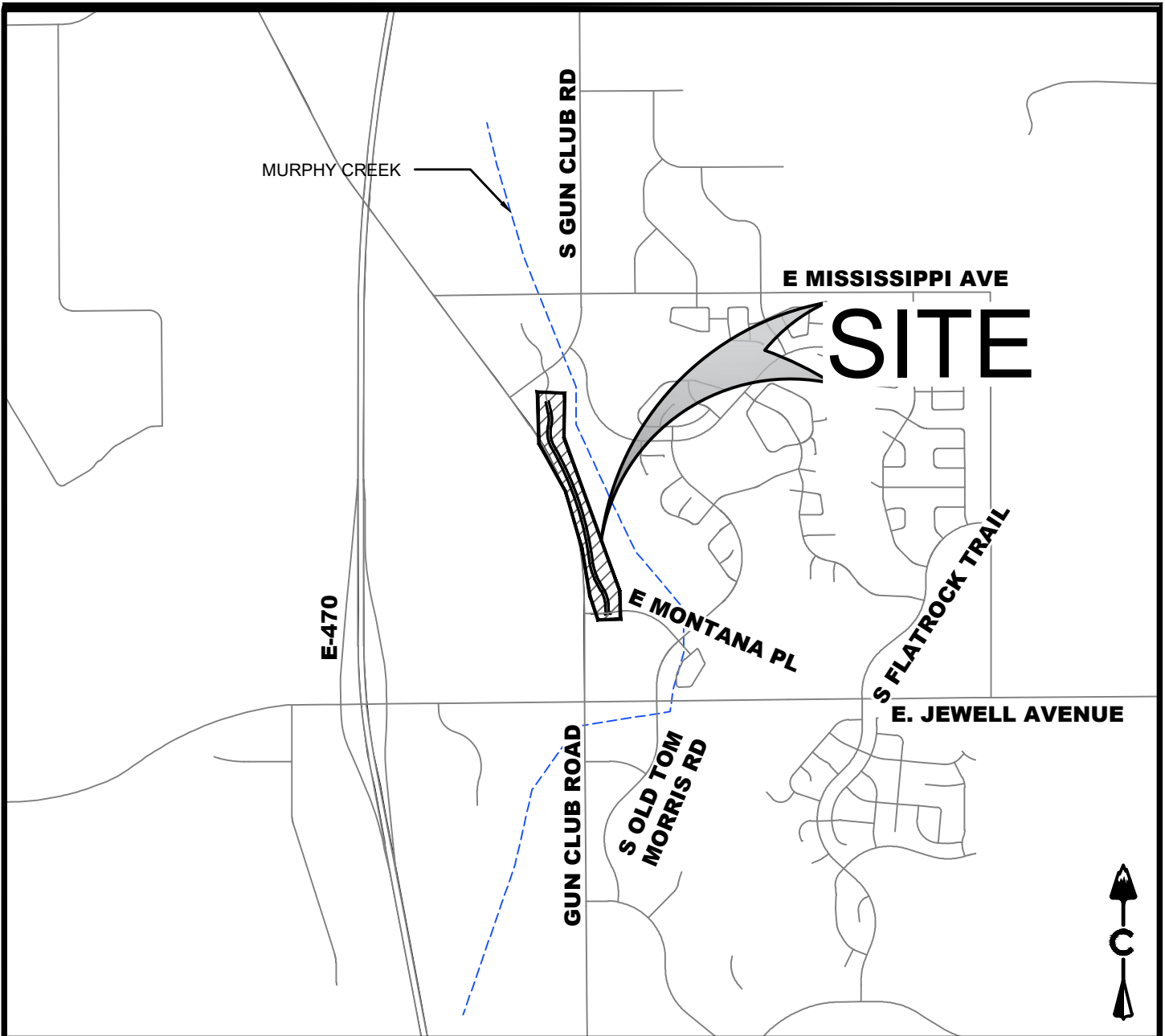
- Vicinity Map
- Airport Detention Pond Buffer Map
- FEMA Firm Map
- Soils Report



Vicinity Map



Airport Detention Pond Buffer Map
Scale: 1" = 2500'



11/10/2023 9:21 AM: X:\21-134 MURPHY CREEK\LOADING\ANSZANTE STREET\MSIP1 COVER.DWG

Soil Map—Arapahoe County, Colorado




MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Arapahoe County, Colorado

Survey Area Data: Version 19, Aug 24, 2023

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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

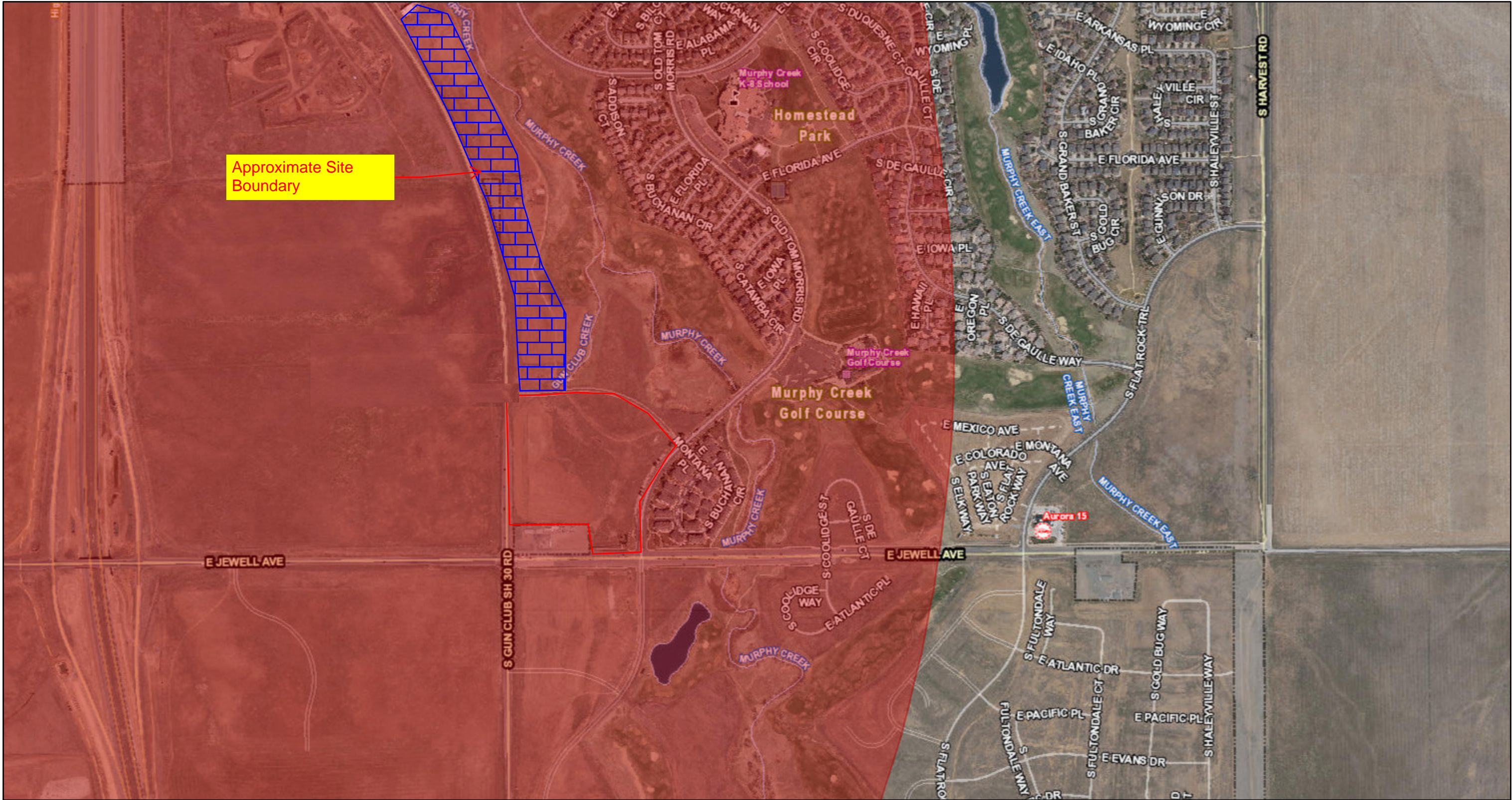
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BvE	Bresser-Truckton sandy loams, 5 to 20 percent slopes	10.6	4.0%
BxC	Buick loam, 3 to 5 percent slopes	13.9	5.2%
BxD	Buick loam, 5 to 9 percent slopes	3.3	1.2%
FdB	Fondis silt loam, 1 to 3 percent slopes	44.0	16.4%
FoC	Fondis-Colby silt loams, 3 to 5 percent slopes	88.5	33.0%
Lv	Loamy alluvial land	8.1	3.0%
NIB	Nunn loam, 1 to 3 percent slopes	61.2	22.8%
Tc	Terrace escarpments	38.2	14.2%
Totals for Area of Interest		267.9	100.0%

Also provide printout showing the soil type results (i.e. what soil type each MUS is)

Soil Maps updated to show hydrologic soil group on map with soil ratings included in the legend.

ArcGIS Web Map



8/2/2022, 10:08:12 AM

 Regional Airport Detention Pond Buffers

1:8,000

NOTES TO USERS

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.7 North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services
NOAA/NNGS12
National Geodetic Survey
SSM-C-3, #2022
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base map information shown on this FIRM was provided by the Arapahoe County and Cities of Aurora and Littleton GIS departments. The coordinate system used for production of the digital FIRM is Universal Transverse Mercator, Zone 13N, referenced to the North American Datum of 1983 and the GRS 80 spheroid, Western Hemisphere.

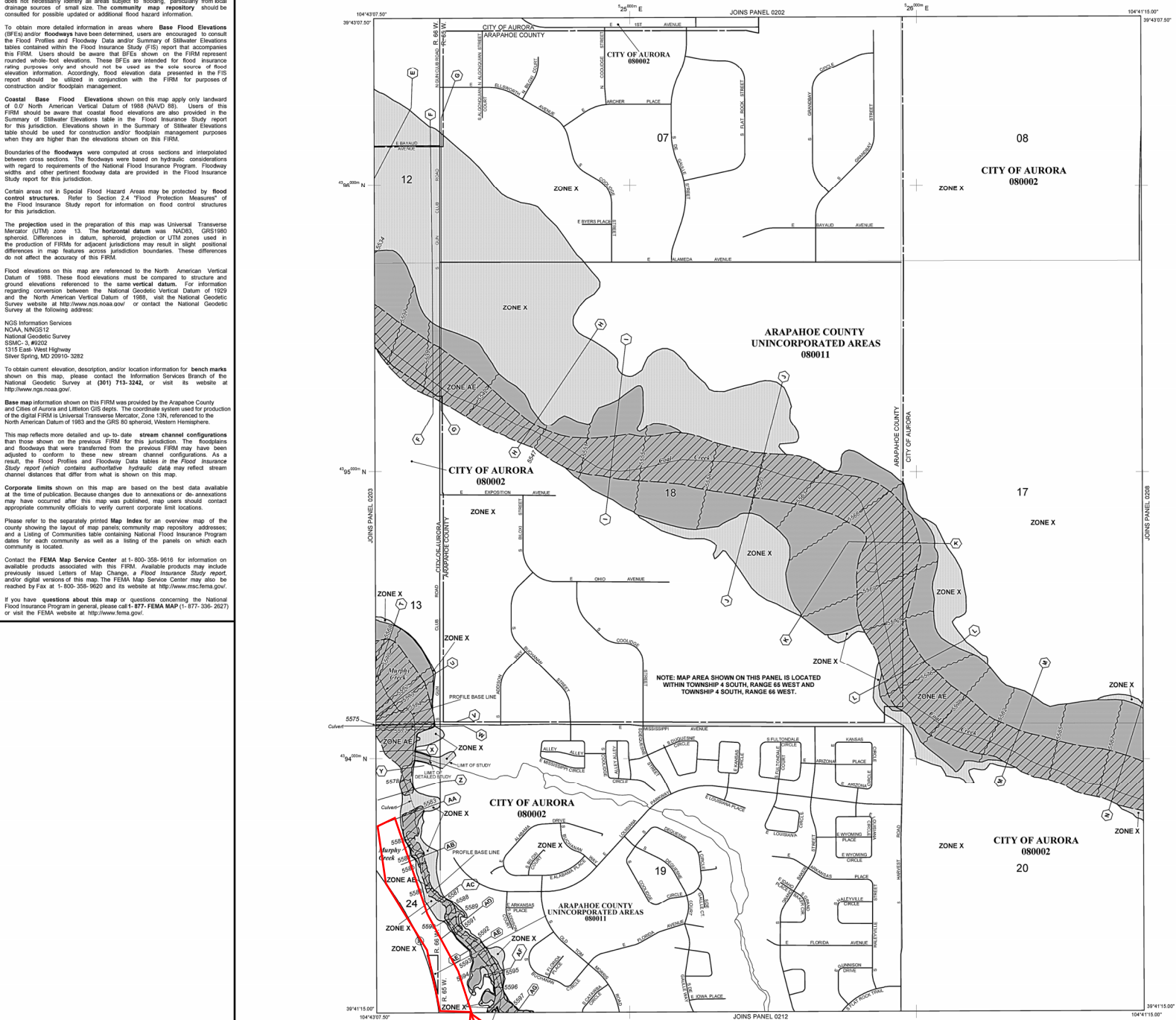
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report reflect contains authoritative hydraulic data may reflect stream channel distances that differ from what is shown on this map.

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

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

Contact the **FEMA Map Service Center** at 1-800-358-5616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2677) or visit the FEMA website at <http://www.fema.gov/>.



Northern Site Limits

Southern Site Limits

NOTES TO USERS

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.27 North American Vertical Datum of 1988 (NAVD 88). Users of this FIRI should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRI.

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

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

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRIs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRI.

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

NGS Information Services
NOAA NINGS12
National Geodetic Survey
SSM-C-3 #2022
1315 East West Highway
Silver Spring, MD 20910-3282

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

Base map information shown on this FIRI was provided by the Arapahoe County and City of Aurora and Littleton GIS departments. The coordinate system used for production of the digital FIRI is Universal Transverse Mercator, Zone 13N, referenced to the North American Datum of 1983 and the GRS 80 spheroid, Western Hemisphere.

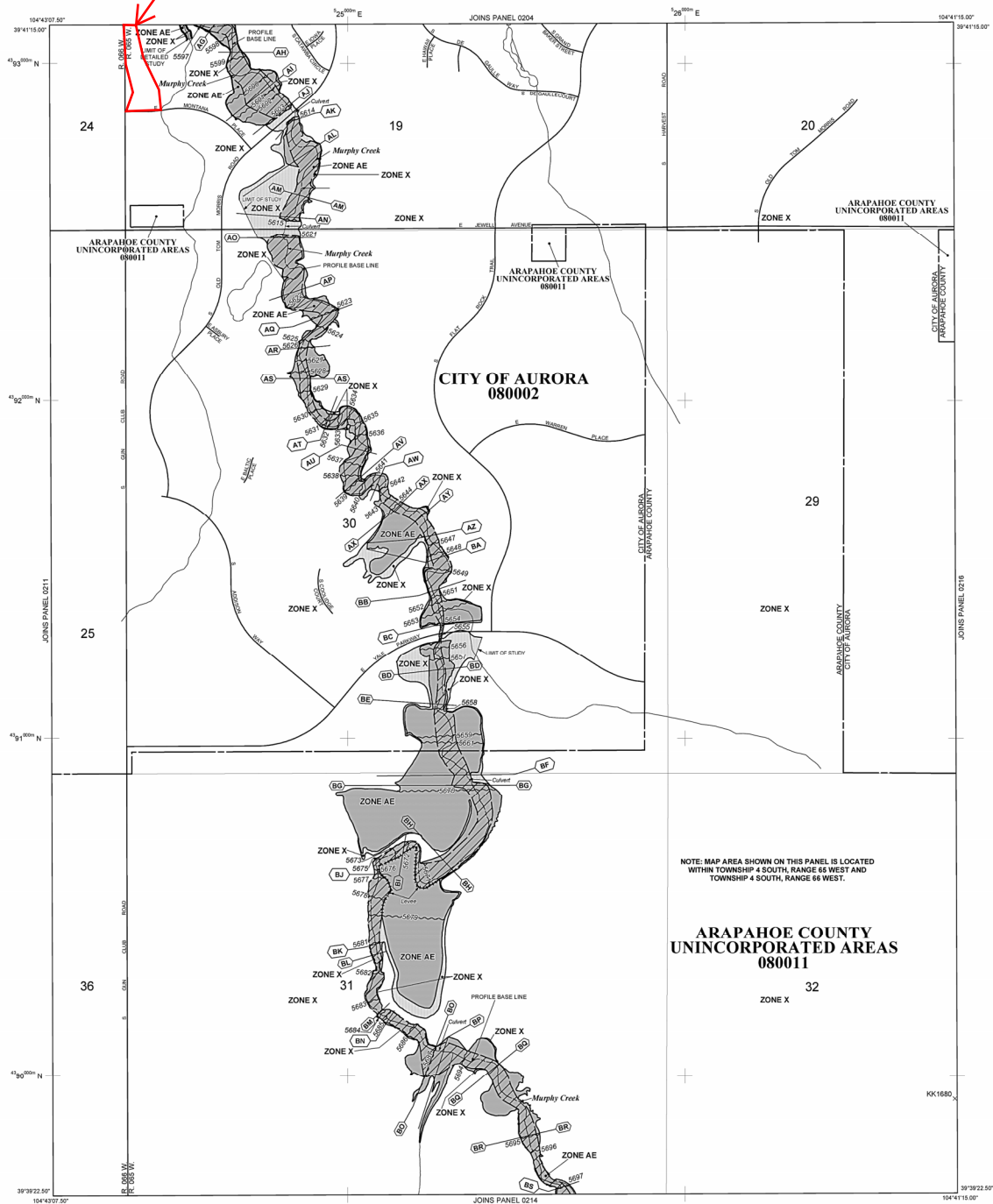
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRI for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRI may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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

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

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRI. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-358-2677) or visit the FEMA website at <http://www.fema.gov/>.





NOAA Atlas 14, Volume 8, Version 2
Location name: ???*
Latitude: 39.6845°, Longitude: -104.7207°
Elevation: 5654.24 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aeriels](#)

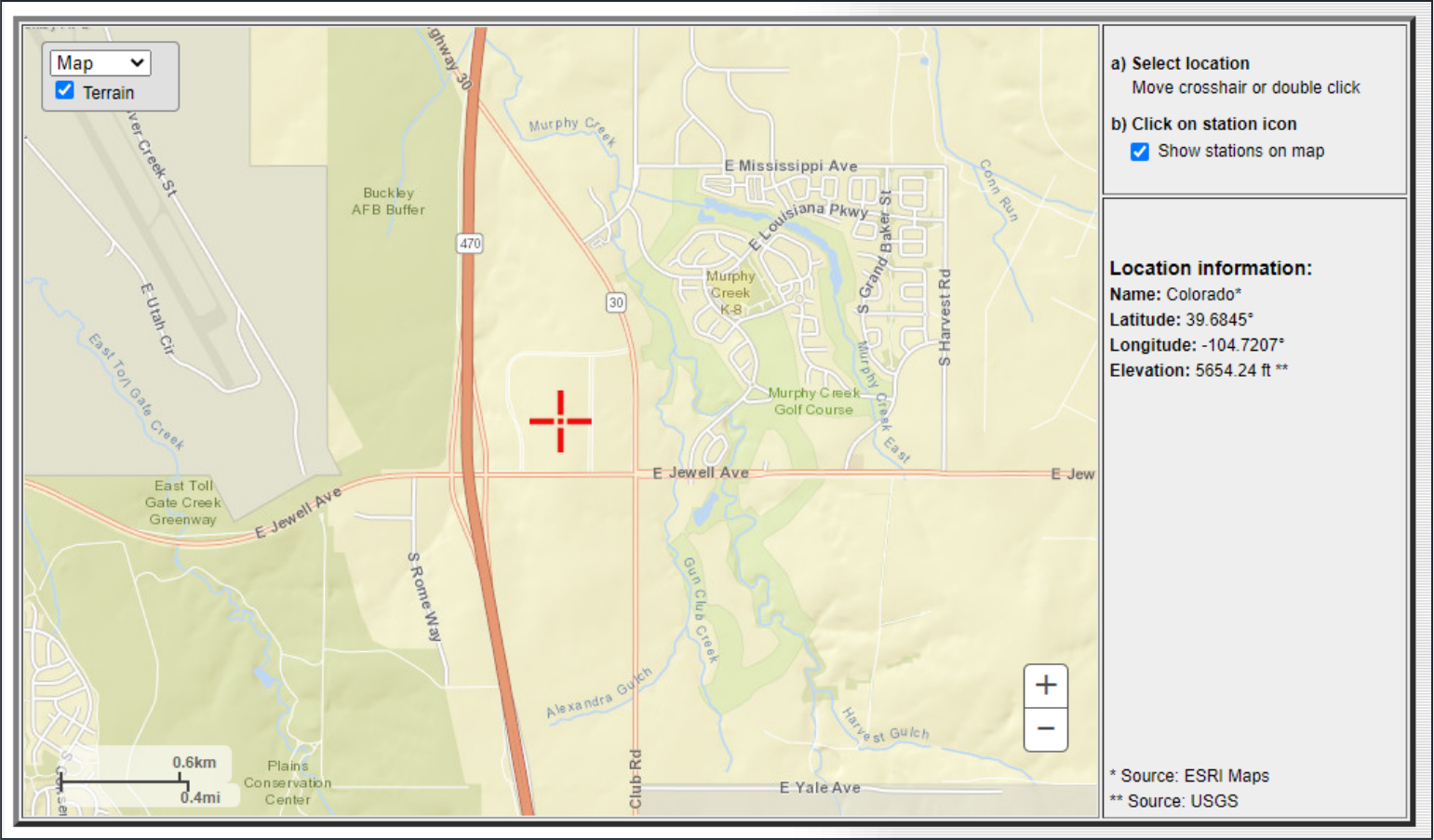
PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.228 (0.184-0.284)	0.283 (0.228-0.352)	0.380 (0.306-0.475)	0.467 (0.374-0.586)	0.598 (0.465-0.785)	0.706 (0.535-0.935)	0.821 (0.600-1.11)	0.945 (0.661-1.31)	1.12 (0.752-1.59)	1.26 (0.821-1.80)
10-min	0.334 (0.269-0.415)	0.414 (0.334-0.516)	0.557 (0.447-0.695)	0.684 (0.547-0.858)	0.875 (0.681-1.15)	1.03 (0.783-1.37)	1.20 (0.878-1.63)	1.38 (0.968-1.92)	1.64 (1.10-2.33)	1.85 (1.20-2.64)
15-min	0.407 (0.329-0.506)	0.505 (0.408-0.629)	0.679 (0.546-0.848)	0.835 (0.667-1.05)	1.07 (0.831-1.40)	1.26 (0.955-1.67)	1.47 (1.07-1.99)	1.69 (1.18-2.34)	2.00 (1.34-2.84)	2.25 (1.47-3.22)
30-min	0.559 (0.451-0.696)	0.692 (0.558-0.862)	0.927 (0.745-1.16)	1.14 (0.910-1.43)	1.45 (1.13-1.91)	1.71 (1.30-2.27)	1.99 (1.46-2.70)	2.29 (1.60-3.18)	2.71 (1.82-3.86)	3.05 (1.99-4.37)
60-min	0.700 (0.565-0.871)	0.860 (0.693-1.07)	1.14 (0.920-1.43)	1.40 (1.12-1.76)	1.79 (1.40-2.36)	2.12 (1.61-2.81)	2.47 (1.80-3.34)	2.84 (1.99-3.95)	3.38 (2.27-4.81)	3.81 (2.48-5.45)
2-hr	0.841 (0.683-1.04)	1.03 (0.834-1.27)	1.36 (1.10-1.69)	1.67 (1.34-2.07)	2.13 (1.67-2.78)	2.52 (1.92-3.32)	2.94 (2.17-3.96)	3.39 (2.40-4.68)	4.04 (2.74-5.70)	4.57 (3.00-6.48)
3-hr	0.928 (0.757-1.14)	1.13 (0.917-1.39)	1.48 (1.20-1.83)	1.81 (1.46-2.25)	2.31 (1.83-3.01)	2.74 (2.10-3.59)	3.19 (2.36-4.28)	3.69 (2.62-5.06)	4.40 (3.00-6.18)	4.97 (3.28-7.02)
6-hr	1.12 (0.917-1.36)	1.35 (1.10-1.64)	1.76 (1.43-2.15)	2.13 (1.73-2.62)	2.70 (2.14-3.48)	3.18 (2.45-4.13)	3.69 (2.75-4.90)	4.25 (3.04-5.77)	5.05 (3.46-7.02)	5.69 (3.78-7.96)
12-hr	1.38 (1.14-1.67)	1.65 (1.36-2.00)	2.13 (1.76-2.59)	2.57 (2.10-3.13)	3.21 (2.56-4.08)	3.74 (2.90-4.80)	4.30 (3.22-5.64)	4.90 (3.52-6.58)	5.75 (3.97-7.91)	6.43 (4.31-8.90)
24-hr	1.68 (1.39-2.01)	2.00 (1.66-2.41)	2.56 (2.12-3.08)	3.04 (2.50-3.68)	3.75 (2.99-4.70)	4.32 (3.37-5.47)	4.91 (3.70-6.36)	5.54 (4.00-7.35)	6.40 (4.45-8.70)	7.08 (4.79-9.73)
2-day	1.99 (1.66-2.37)	2.35 (1.96-2.80)	2.96 (2.46-3.54)	3.48 (2.88-4.18)	4.23 (3.39-5.24)	4.82 (3.78-6.05)	5.44 (4.12-6.97)	6.08 (4.42-7.98)	6.95 (4.87-9.35)	7.64 (5.21-10.4)
3-day	2.16 (1.82-2.57)	2.54 (2.13-3.02)	3.19 (2.66-3.79)	3.73 (3.10-4.46)	4.51 (3.64-5.56)	5.13 (4.04-6.40)	5.77 (4.39-7.35)	6.43 (4.70-8.39)	7.33 (5.16-9.80)	8.03 (5.50-10.9)
4-day	2.30 (1.94-2.72)	2.70 (2.27-3.19)	3.36 (2.82-3.99)	3.93 (3.28-4.68)	4.74 (3.83-5.82)	5.38 (4.25-6.68)	6.03 (4.61-7.66)	6.72 (4.92-8.73)	7.64 (5.39-10.2)	8.36 (5.75-11.3)
7-day	2.63 (2.23-3.10)	3.07 (2.60-3.61)	3.80 (3.20-4.48)	4.42 (3.70-5.23)	5.29 (4.30-6.45)	5.98 (4.75-7.37)	6.68 (5.13-8.41)	7.40 (5.46-9.54)	8.38 (5.96-11.1)	9.14 (6.33-12.2)
10-day	2.93 (2.49-3.44)	3.40 (2.88-3.98)	4.17 (3.53-4.90)	4.83 (4.06-5.69)	5.74 (4.68-6.96)	6.46 (5.14-7.92)	7.19 (5.54-9.00)	7.94 (5.88-10.2)	8.95 (6.39-11.8)	9.73 (6.77-12.9)
20-day	3.81 (3.26-4.43)	4.34 (3.71-5.05)	5.22 (4.44-6.08)	5.96 (5.04-6.96)	6.97 (5.71-8.36)	7.76 (6.22-9.42)	8.55 (6.64-10.6)	9.36 (6.98-11.9)	10.4 (7.50-13.6)	11.3 (7.89-14.8)
30-day	4.53 (3.88-5.23)	5.14 (4.41-5.95)	6.15 (5.25-7.13)	6.97 (5.93-8.11)	8.10 (6.66-9.64)	8.96 (7.21-10.8)	9.81 (7.65-12.1)	10.7 (7.99-13.4)	11.8 (8.52-15.2)	12.6 (8.91-16.6)
45-day	5.40 (4.65-6.22)	6.17 (5.31-7.10)	7.39 (6.34-8.53)	8.38 (7.15-9.70)	9.69 (7.98-11.4)	10.7 (8.61-12.8)	11.6 (9.08-14.2)	12.6 (9.43-15.7)	13.7 (9.96-17.6)	14.6 (10.4-19.0)
60-day	6.14 (5.30-7.03)	7.06 (6.09-8.10)	8.51 (7.32-9.78)	9.66 (8.26-11.1)	11.2 (9.20-13.1)	12.3 (9.91-14.6)	13.3 (10.4-16.2)	14.3 (10.8-17.8)	15.6 (11.3-19.8)	16.5 (11.7-21.4)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical



Use Table 5-6 from COA SDDTC

Table 5-5 can be used for future areas without a reasonable estimate of their land use.

Table 5-6 impervious values have been used for proposed site. Table 5-6 impervious values have been used for basins with ultimate conditions.

Table 6-3. Recommended percentage imperviousness values

Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only):	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	
Heavy areas	
Parks, cemeteries	
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

Impervious tables deleted from Appendix. Table 5-5 and 5-6 referenced in the report text and rational calculations.

APPENDIX B

Hydrologic Computations

Prose Murphy Creek Apartments - Proposed Rational

CORE Project #: 21-164

Prepared By: JNK

IMPERVIOUS & COMPOSITE "C" CALCULATIONS-REFERENCE SDDTC

Update to Table 5-6 and Table 5-7. Rational calcs reviewed superficially

References and calculations updated accordingly.

		Residential & Commercial				Lawns								
		Commercial				Clay (C & D Soils)								
		Commercial	Pond			% Slope	2-7% Slope	>7% Slope						
% Imperv.		95.00%	100.00%	75.00%	100.00%	2.00%	5.00%	5.00%						
C-Values	2-yr	0.87	0.87	0.80	0.87	0.10	0.18	0.25						
	5-yr	0.87	0.88	0.85	0.88	0.11	0.19	0.27						
	10-yr	0.88	0.90	0.90	0.90	0.12	0.20	0.30						
	100-yr	0.89	0.93	0.90	0.93	0.15	0.22	0.35						
Design									Total	Percent	C-Value			
BASIN	Point	Area	Area	Area	Area	Area	Area	Area	Area	Impervious	2-yr	5-yr	10-yr	100-yr
A1	A1	4.69	-	-	-	-	-	-	4.7	95.0%	0.87	0.87	0.88	0.89
A2	A2	-	-	-	0.54	-	0.17	-	0.7	77.1%	0.70	0.71	0.73	0.76
A3	A3	-	-	-	0.76	-	0.17	0.01	0.9	82.1%	0.74	0.75	0.77	0.80
A4	A4	1.59	-	-	-	-	-	-	1.6	95.0%	0.87	0.87	0.88	0.89
B1	B1	6.40	0.34	-	-	-	-	-	6.6	97.8%	0.89	0.89	0.90	0.92
B2	B2	-	-	-	0.47	-	0.15	-	0.6	76.5%	0.70	0.71	0.73	0.75
B3	B3	-	-	-	0.46	-	0.15	0.21	0.8	58.0%	0.58	0.60	0.62	0.65
B4	B4	-	-	-	0.32	-	0.11	0.14	0.6	59.1%	0.59	0.60	0.62	0.66
B5	B5	-	-	-	0.33	-	0.11	-	0.4	76.7%	0.70	0.71	0.73	0.76
B6	B6	-	-	-	0.31	-	0.10	-	0.4	76.8%	0.70	0.71	0.73	0.76
B7	B7	-	-	-	0.36	-	0.10	-	0.5	78.6%	0.71	0.72	0.74	0.77
B8	B8	1.36	-	-	-	-	-	-	1.4	95.0%	0.87	0.87	0.88	0.89
B9	B9	0.63	0.57	-	-	-	-	-	1.2	97.4%	0.87	0.87	0.89	0.91
OS1	OS1	-	-	-	-	-	-	0.33	0.3	5.0%	0.25	0.27	0.30	0.35
OS2	OS2	-	-	-	-	-	-	0.20	0.2	5.0%	0.25	0.27	0.30	0.35
EX1	EX1	-	-	-	-	8.24	-	-	8.2	2.0%	0.10	0.11	0.13	0.15
EX2	EX2	-	-	-	-	12.43	-	-	12.4	2.0%	0.10	0.11	0.13	0.15
EX3	EX3	-	-	-	0.20	-	-	-	0.2	100.0%	0.87	0.88	0.90	0.93
Pond A	Pond A	6.28	-	-	1.30	-	0.34	0.34	8.3	88.4%	0.82	0.82	0.83	0.85
Pond B	Pond B	8.39	0.92	-	2.24	-	0.72	0.55	12.6	88.5%	0.82	0.82	0.83	0.85
Total Proposed Site	Total Proposed Site	14.67	0.92	-	3.54	-	1.06	0.89	20.9	88.5%	0.82	0.82	0.83	0.85
Total Existing Site	Total Existing Site	-	-	-	0.20	20.67	-	-	20.9	2.9%	0.11	0.12	0.14	0.16

Updated C Values per new criteria provided.

Subbasin B1 land use and calculations revised.

This total appears off
 $6.40 + 0.34 = 6.7$

Zante Street - Rational Calculations

CORE Project #: 21-164

Prepared By: JNK

Per MHFD
Vol 1:

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_o^{0.33}}$$

Equation 6-3

$$t_i = \frac{L_i}{60K\sqrt{S_o}} = \frac{L_i}{60V_i}$$

Equation 6-4

TIME OF CONCENTRATION CALCULATIONS

-REFERENCE UDFCD Vol.1 Section 2.4

NRCS Conveyance factors, K -REFERENCE UDFCD Vol.1 RUNOFF Table 6-2

SF-2

Heavy Meadow 2.50 Short Grass Pasture & Lawns 7.00 Grassed Waterway 15.00
Tillage/field 5.00 Nearly Bare Ground 10.00 Paved Area & Shallow Gutter 20.00

SUB-BASIN DATA			INITIAL / OVERLAND TIME			CHANNEL / TRAVEL TIME						T(c) CHECK (URBANIZED BASINS)	FINAL T(c)
DRAIN BASIN	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T@ min	SDDTC Eq. 5.4	min.
A1	4.69	0.87	300	2.0	5.7	410	2.0	20.0	2.8	2.4	8.1	13.9	8.1
A2	0.71	0.71	25	2.0	2.8	520	2.5	20.0	3.2	2.7	5.5	13.0	5.5
A3	0.94	0.75	55	5.0	2.7	490	2.5	20.0	3.2	2.6	5.3	13.0	5.3
A4	1.59	0.87	300	4.2	4.5	50	4.2	20.0	4.1	0.2	4.7	11.9	5.0
B1	6.57	0.89	300	2.0	5.1	1100	3.0	20.0	3.5	5.3	10.4	17.8	10.4
B2	0.62	0.71	30	2.0	3.1	820	1.5	20.0	2.4	5.6	8.7	14.7	8.7
B3	0.82	0.60	50	2.0	5.1	820	1.5	20.0	2.4	5.6	10.7	14.8	10.7
B4	0.57	0.60	45	2.5	4.5	580	1.2	20.0	2.2	4.4	8.9	13.5	8.9
B5	0.43	0.71	45	2.5	3.5	580	1.2	20.0	2.2	4.4	7.9	13.5	7.9
B6	0.41	0.71	40	2.5	3.3	540	3.0	20.0	3.5	2.6	5.9	13.2	5.9
B7	0.46	0.72	50	2.5	3.5	560	3.0	20.0	3.5	2.7	6.2	13.4	6.2
B8	1.36	0.87	250	15.0	2.7	50	2.0	20.0	2.8	0.3	3.0	11.7	5.0
B9	1.21	0.87	300	2.0	5.6	150	2.0	20.0	2.8	0.9	6.5	12.5	6.5
OS1	0.33	0.27	50	25.0	3.7	10	4.0	5.0	1.0	0.2	3.8	10.3	5.0
OS2	0.20	0.27	65	25.0	4.2	15	4.0	5.0	1.0	0.3	4.4	10.4	5.0
EX1	8.24	0.11	300	20.0	11.5	450	10.0	5.0	1.6	4.7	16.3	14.2	14.2
EX2	12.43	0.11	300	20.0	11.5	800	10.0	5.0	1.6	8.4	20.0	16.1	16.1
EX3	0.20	0.88	40	2.0	2.0	215	3.0	20.0	3.5	1.0	3.0	11.4	5.0

Update to new Tc check

Urbanized Tc check updated to USDCM Eq. 6-5

Zante Street - Rational Calculations

CORE Project #: 21-164

Prepared By: JNK

RATIONAL METHOD PEAK RUNOFF

2-Year STORM

Rainfall Depth-Duration-Frequency (1-hr) = **0.86**

SF-3

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATON				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	2yr Runoff COEFF	T(c) min	C x A	I in/hr	Q cfs
A1	A1	4.69	0.87	8.1	4.08	2.51	10.26
A2	A2	0.71	0.70	5.5	0.50	2.84	1.42
A3	A3	0.94	0.74	5.3	0.69	2.87	1.99
A4	A4	1.59	0.87	5.0	1.38	2.92	4.02
B1	B1	6.57	0.89	10.4	5.86	2.29	13.42
B2	B2	0.62	0.70	8.7	0.44	2.46	1.07
B3	B3	0.82	0.58	10.7	0.48	2.26	1.08
B4	B4	0.57	0.59	8.9	0.33	2.44	0.81
B5	B5	0.43	0.70	7.9	0.30	2.54	0.77
B6	B6	0.41	0.70	5.9	0.29	2.79	0.80
B7	B7	0.46	0.71	6.2	0.33	2.74	0.90
B8	B8	1.36	0.87	5.0	1.18	2.92	3.45
B9	B9	1.21	0.87	6.5	1.05	2.71	2.84
OS1	OS1	0.33	0.25	5.0	0.08	2.92	0.24
OS2	OS2	0.20	0.25	5.0	0.05	2.92	0.15
EX1	EX1	8.24	0.10	14.2	0.82	2.01	1.65
EX2	EX2	12.43	0.10	16.1	1.24	1.89	2.34
EX3	EX3	0.20	0.87	5.0	0.18	2.92	0.51

Zante Street - Rational Calculations

CORE Project #: 21-164

Prepared By: JNK

RATIONAL METHOD PEAK RUNOFF

100-YR STORM

SF-3 Rainfall Depth-Duration-Frequency (1-hr) = 2.47

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATION				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	100YR RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs
A1	A1	4.69	0.89	8.1	4.18	7.22	30.13
A2	A2	0.71	0.76	5.5	0.54	8.16	4.38
A3	A3	0.94	0.80	5.3	0.75	8.24	6.15
A4	A4	1.59	0.89	5.0	1.41	8.38	11.82
B1	B1	6.57	0.92	10.4	6.01	6.57	39.52
B2	B2	0.62	0.75	8.7	0.47	7.06	3.32
B3	B3	0.82	0.65	10.7	0.53	6.50	3.47
B4	B4	0.57	0.66	8.9	0.37	7.00	2.60
B5	B5	0.43	0.76	7.9	0.33	7.29	2.39
B6	B6	0.41	0.76	5.9	0.31	8.01	2.49
B7	B7	0.46	0.77	6.2	0.35	7.87	2.79
B8	B8	1.36	0.89	5.0	1.21	8.38	10.14
B9	B9	1.21	0.91	6.5	1.10	7.78	8.52
OS1	OS1	0.33	0.35	5.0	0.11	8.38	0.96
OS2	OS2	0.20	0.35	5.0	0.07	8.38	0.59
EX1	EX1	8.24	0.15	14.2	1.24	5.76	7.12
EX2	EX2	12.43	0.15	16.1	1.86	5.42	10.10
EX3	EX3	0.20	0.93	5.0	0.19	8.38	1.57

[illegible]

Pond Summary Table - POND A								
Condition	Required Volume	Provided Volume	Stage (ft)	Allowed Release Rate	Actual Release Rate	Release Orifice	Freeboard to Spillway (ft)	Freeboard to Berm Top (ft)
Micropool	25 cf	134 cf	0	NA	NA	NA	6	8
WQCV (+20%)	0.32 ac-ft	0.32 ac-ft	2.25	>/=40 hr	41 hr	Orifice Plate	3.75	5.75
EURV	0.40 ac-ft	0.70 ac-ft	4.42	<48 hr*	47 hr	Orifice Plate	1.58	3.58
Full Spectrum (100-yr)	1.12 ac-ft	1.14 ac-ft	5.94	Ponds A1+B9 +OS1-2 <18.48 cfs	5.9 cfs**	Outlet Pipe	0.06	2.06
Spillway	NA	1.15 ac-ft	6	28.9 cfs (Required)	28.9 cfs (Required)	Emergency Weir	0	2
100-Emergency	NA	NA	6.57	28.9 cfs	28.9 cfs (0.57' depth)	NA	NA	1.43
Berm Top	NA	1.8 ac-ft	8	NA	NA	NA	NA	0

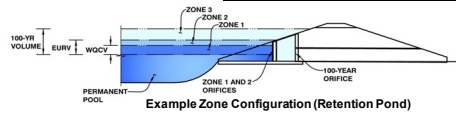
Pond Summary Table - POND B								
Condition	Required Volume	Provided Volume	Stage (ft)	Allowed Release Rate	Actual Release Rate	Release Orifice	Freeboard to Spillway (ft)	Freeboard to Berm Top (ft)
Micropool	25 cf	134 cf	0	NA	NA	NA	7.5	9
WQCV (+20%)	0.49 ac-ft	0.49 ac-ft	3.13	>/=40 hr	41 hr	Orifice Plate	4.37	5.87
EURV	0.61 ac-ft	1.10 ac-ft	5.57	<48 hr*	47 hr	Orifice Plate	1.93	3.43
Full Spectrum (100-yr)	1.72 ac-ft	1.72 ac-ft	7.04	Ponds A1+B9 +OS1-2 <18.48 cfs	9.6 cfs**	Outlet Pipe	0.46	1.96
Spillway	NA	1.90 ac-ft	7.5	36.2 cfs (Required)	35.6 cfs (Required)	Emergency Weir	0	1.5
100-Emergency	NA	NA	7.88	36.2 cfs	35.6 cfs (0.38' depth)	NA	NA	1.12
Berm Top	NA	2.70 ac-ft	9	NA	NA	NA	NA	0

MHFD-Detention, Ve

Preliminary elevations added.

Project: Zante Street

Basin ID: Pond A1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	8.25	acres
Watershed Length =	900	ft
Watershed Length to Centroid =	450	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	88.40%	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 = User Input		

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

Water Quality Capture Volume (WQCV) =	0.267	acre-feet
Excess Urban Runoff Volume (EURV) =	0.722	acre-feet
2-yr Runoff Volume ($P1 = 0.86$ in.) =	0.482	acre-feet
5-yr Runoff Volume ($P1 = 1.14$ in.) =	0.670	acre-feet
10-yr Runoff Volume ($P1 = 1.41$ in.) =	0.851	acre-feet
25-yr Runoff Volume ($P1 = 1.69$ in.) =	1.060	acre-feet
50-yr Runoff Volume ($P1 = 1.99$ in.) =	1.272	acre-feet
100-yr Runoff Volume ($P1 = 2.47$ in.) =	1.618	acre-feet
500-yr Runoff Volume ($P1 = 3.14$ in.) =	2.095	acre-feet
Approximate 2-yr Detention Volume =	0.475	acre-feet
Approximate 5-yr Detention Volume =	0.668	acre-feet
Approximate 10-yr Detention Volume =	0.815	acre-feet
Approximate 25-yr Detention Volume =	0.910	acre-feet
Approximate 50-yr Detention Volume =	0.973	acre-feet
Approximate 100-yr Detention Volume =	1.122	acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (User Defined) =	0.320	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.402	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.400	acre-feet
Total Detention Basin Volume =	1.122	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{Main}) =	user	H/V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{SV}) =	user	ft ²
Surcharge Volume Length (L_{SV}) =	user	ft
Surcharge Volume Width (W_{SV}) =	user	ft
Depth of Basin Floor (H_{FL00R}) =	user	ft
Length of Basin Floor (L_{FL00R}) =	user	ft
Width of Basin Floor (W_{FL00R}) =	user	ft
Area of Basin Floor (A_{FL00R}) =	user	ft ²
Volume of Basin Floor (V_{FL00R}) =	user	ft ³
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft ²
Volume of Main Basin (V_{MAIN}) =	user	ft ³
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

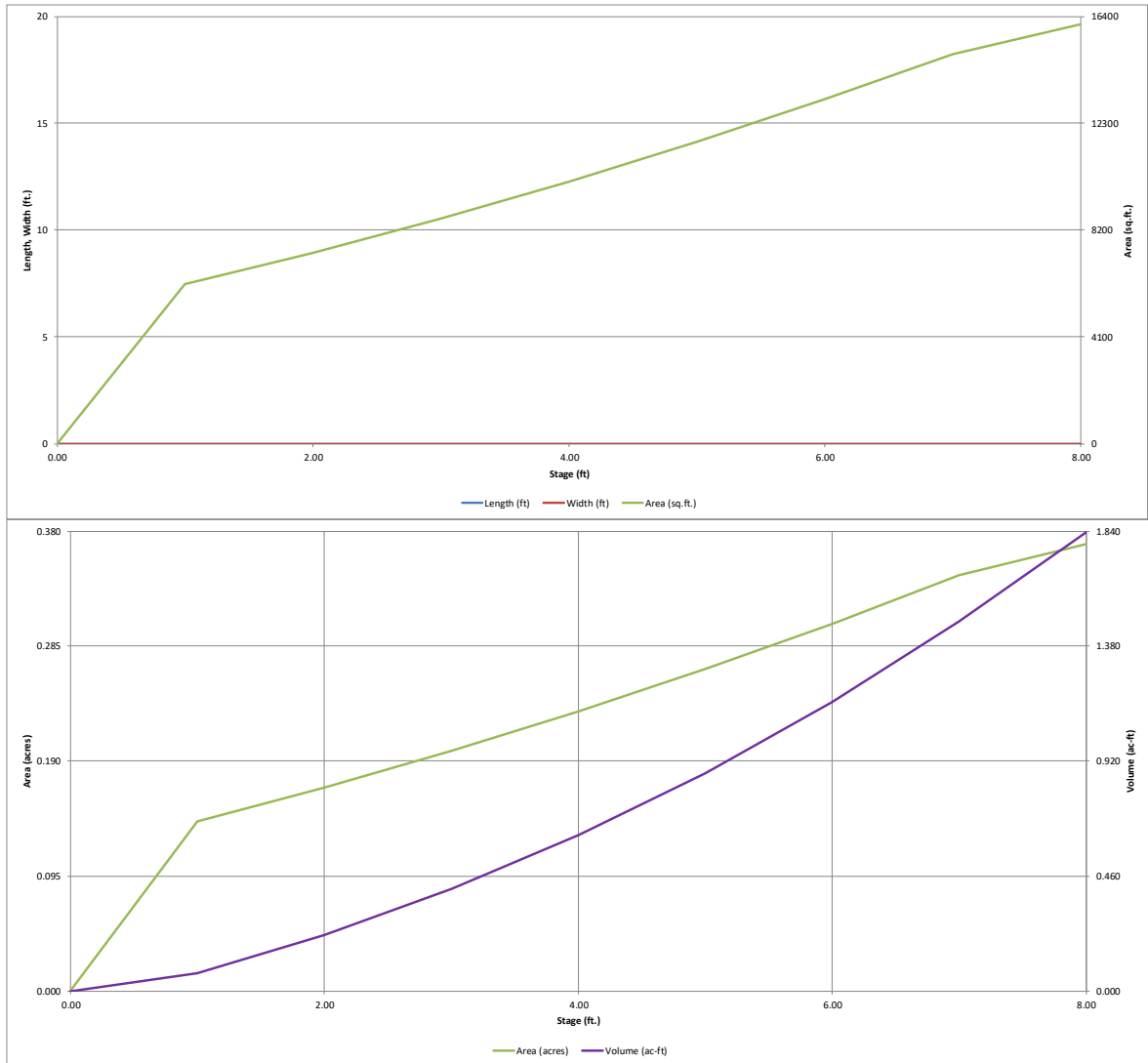
Optional User Overrides

	acre-feet
	acre-feet
0.86	inches
1.14	inches
1.40	inches
	inches
	inches
2.47	inches
	inches

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

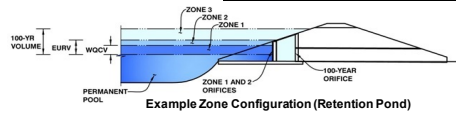
MHFD-Detention, Version 4.06 (July 2022)



MHFD-Detention, Ve

Preliminary elevations added.

Project: Zante Street

Basin ID: Pond B

Example Zone Configuration (Retention Pond)

Selected BMP Type =	EDB	
Watershed Area =	12.60	acres
Watershed Length =	1,850	ft
Watershed Length to Centroid =	925	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	88.50%	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 = User Input		

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

Water Quality Capture Volume (WQCV) =	0.408	acre-feet
Excess Urban Runoff Volume (EURV) =	1.104	acre-feet
2-yr Runoff Volume ($P1 = 0.86$ in.) =	0.768	acre-feet
5-yr Runoff Volume ($P1 = 1.14$ in.) =	1.068	acre-feet
10-yr Runoff Volume ($P1 = 1.41$ in.) =	1.355	acre-feet
25-yr Runoff Volume ($P1 = 1.69$ in.) =	1.687	acre-feet
50-yr Runoff Volume ($P1 = 1.99$ in.) =	2.026	acre-feet
100-yr Runoff Volume ($P1 = 2.47$ in.) =	2.576	acre-feet
500-yr Runoff Volume ($P1 = 3.14$ in.) =	3.335	acre-feet
Approximate 2-yr Detention Volume =	0.726	acre-feet
Approximate 5-yr Detention Volume =	1.022	acre-feet
Approximate 10-yr Detention Volume =	1.246	acre-feet
Approximate 25-yr Detention Volume =	1.392	acre-feet
Approximate 50-yr Detention Volume =	1.488	acre-feet
Approximate 100-yr Detention Volume =	1.715	acre-feet

Zone 1 Volume (User Defined) =	0.490	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.614	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.611	acre-feet
Total Detention Basin Volume =	1.715	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{S1})	=	user	ft ²
Surcharge Volume Length (L_{S1})	=	user	ft
Surcharge Volume Width (W_{S1})	=	user	ft
Depth of Basin Floor (H_{FLOOR})	=	user	ft
Length of Basin Floor (L_{FLOOR})	=	user	ft
Width of Basin Floor (W_{FLOOR})	=	user	ft
Area of Basin Floor (A_{FLOOR})	=	user	ft ²
Volume of Basin Floor (V_{FLOOR})	=	user	ft ³
Depth of Main Basin (H_{MAIN})	=	user	ft
Length of Main Basin (L_{MAIN})	=	user	ft
Width of Main Basin (W_{MAIN})	=	user	ft
Area of Main Basin (A_{MAIN})	=	user	ft ²
Volume of Main Basin (V_{MAIN})	=	user	ft ³
Calculated Total Basin Volume (V_{TOTAL})	=	user	acre-feet

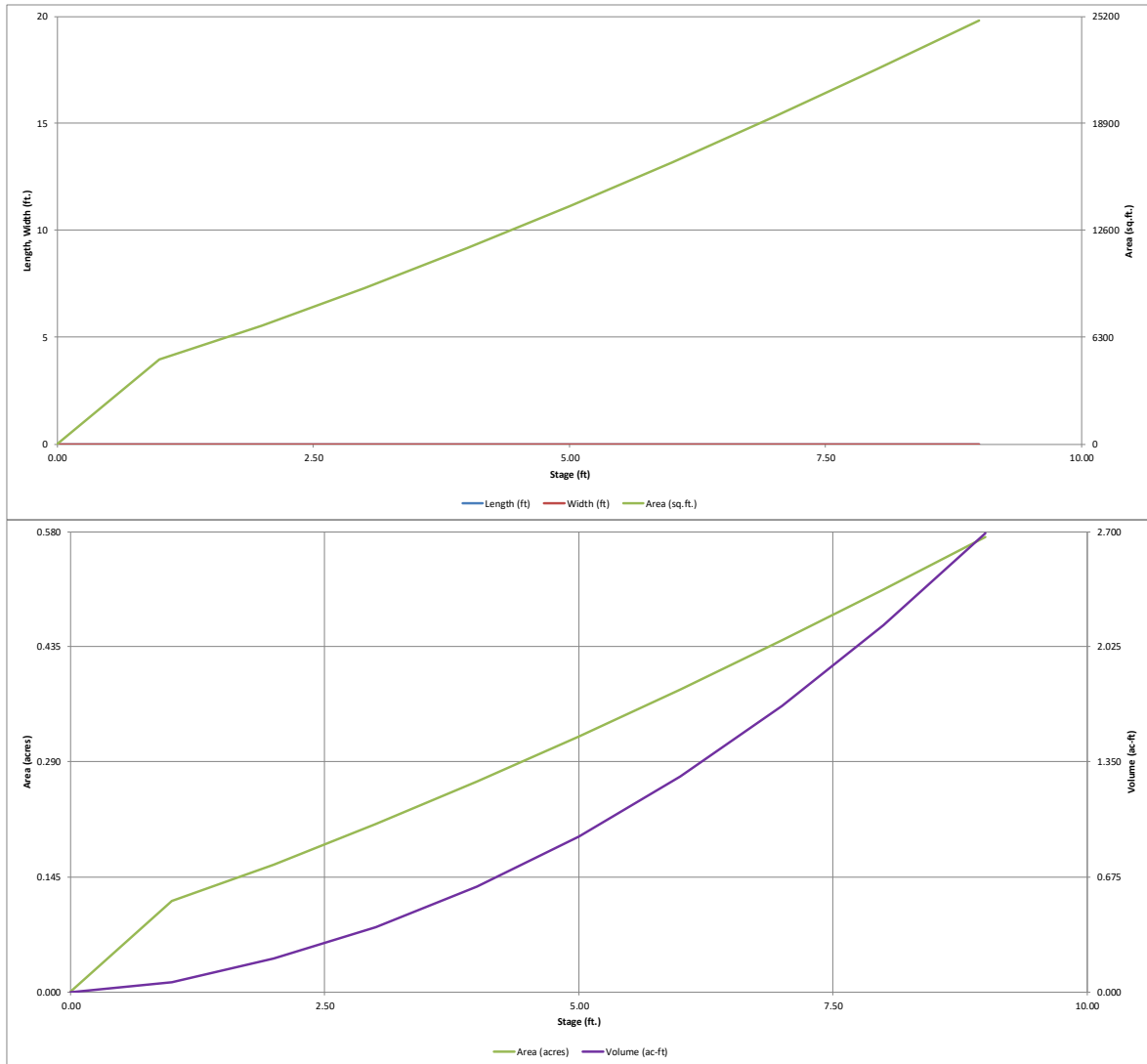
Optional User Overrides

	acre-feet
	acre-feet
0.86	inches
1.14	inches
1.40	inches
	inches
	inches
2.47	inches
	inches

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



APPENDIX C

Hydraulic Computations

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

Remove or...

Add Note in large font: "For reference only.
See the Civil Plans for Design Information."

These can remain if
specifically used for street
flow depth and spread. If
so, add note to right

INLET NAME	Inlet A2	Inlet A3	Inlet A4
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

Inlet calculations have been included
for street capacity and preliminary inlet
sizing. The requested note has been
added to all inlet size spreadsheets.

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.4	2.0	1.1
Major Q_{Known} (cfs)	4.4	6.2	3.3

Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.4	2.0	1.1
Major Total Design Peak Flow, Q (cfs)	4.4	6.2	3.3
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet B3	Inlet B5	Inlet B4
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{known} (cfs)	1.1	0.8	0.8
Major Q_{known} (cfs)	3.5	2.4	2.6

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	Inlet B2	Inlet B3
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.1	0.8	0.8
Major Total Design Peak Flow, Q (cfs)	3.5	2.4	2.6
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet B6	Inlet B7
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{known} (cfs)	0.8	0.9
Major Q_{known} (cfs)	2.5	2.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Inlet B5	Inlet B4
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

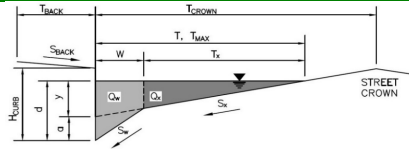
Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.8	0.9
Major Total Design Peak Flow, Q (cfs)	2.5	2.8
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0

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

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

Project: **Zante Street**Inlet ID: **Inlet A2****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

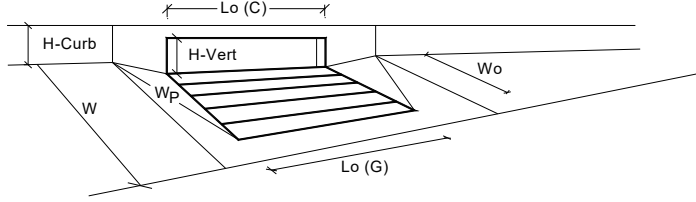
H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.000	ft/ft
n_{STREET}	=	0.016	

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

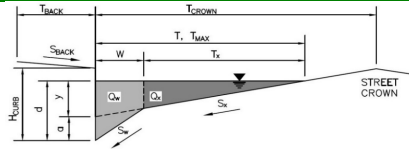
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	3.9	5.6	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$ =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$ =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.16	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q_a =	1.8	4.6	cfs
		$Q_{PEAK REQUIRED}$ =	1.4	4.4	cfs

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

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

Project: **Zante Street**Inlet ID: **Inlet A3****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor & Major Storm

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

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

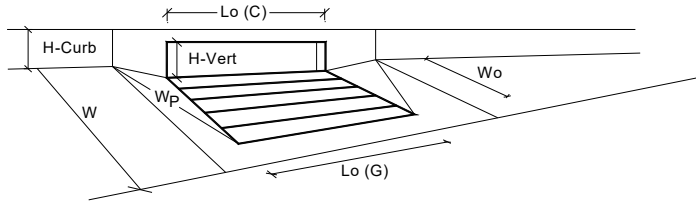
H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.000	ft/ft
n_{STREET}	=	0.016	

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



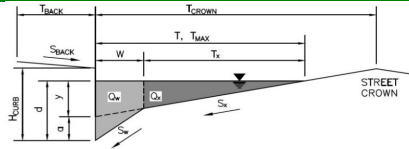
Clogging factors have been updated.

Update per Table 6-4 of the SDDTC

Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2		
Water Depth at Flowline (outside of local depression)		Ponding Depth =	3.9	5.6	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.16	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.78	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _a =	2.3	6.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	2.0	6.2	cfs

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

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

Project: **Zante Street**Inlet ID: **Inlet B2****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.010	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Spread Criterion

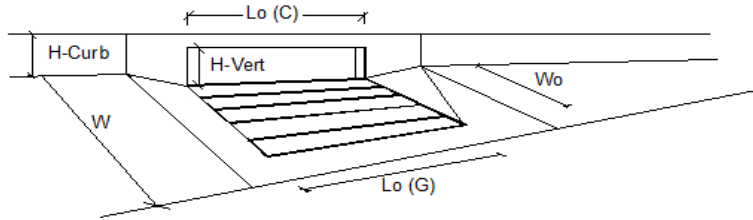
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	3.1	10.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.07 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.32 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



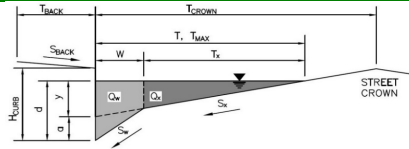
Clogging factors have been updated.

Update per table 6-4 of the SDDTC

Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL} =$	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o =$	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o =$	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o =$	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G) =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C) =$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		$Q =$	1.1	3.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_o =$	0.0	0.0	cfs
Capture Percentage = Q_o/Q_s		$C\% =$	100	100	%

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

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

Project: **Zante Street**Inlet ID: **Inlet B3****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.010	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Spread Criterion

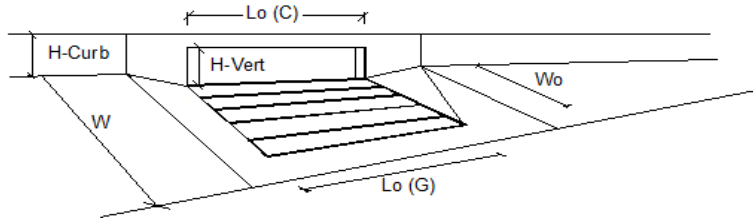
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	3.1	10.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.07 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.47 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



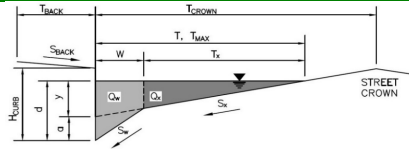
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL} =$	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o =$	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o =$	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o =$	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G) =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C) =$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR	
Total Inlet Interception Capacity		$Q =$	1.1	3.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_o =$	0.0	0.0	cfs
Capture Percentage = Q_o/Q_s		$C\% =$	100	100	%

typ

Clogging factors have been updated.

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

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

Project: **Zante Street**Inlet ID: **Inlet B5****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.010	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Spread Criterion

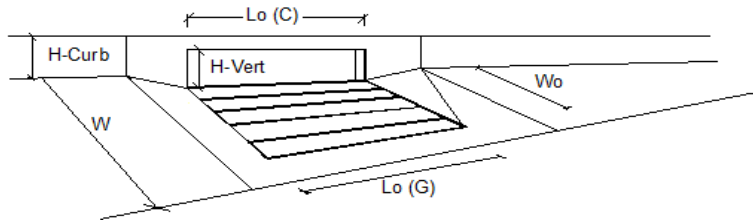
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	3.1	10.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.77 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.39 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

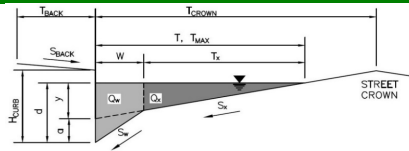
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$ =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$			MINOR		MAJOR
Total Inlet Interception Capacity		Q =	0.8	2.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o =	0.0	0.0	cfs
Capture Percentage = Q_o/Q_s		$C\%$ =	100	100	%

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

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

Project: **Zante Street**Inlet ID: **Inlet B4****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_D	=	0.010	ft/ft
n_{STREET}	=	0.016	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Spread Criterion

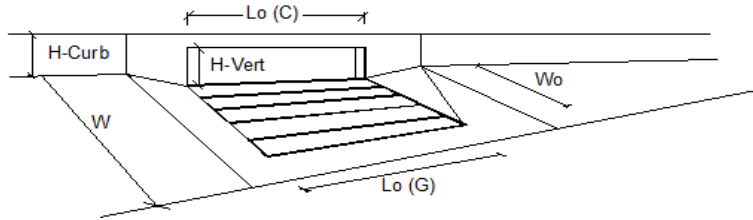
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	3.1	10.9	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.81 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.60 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

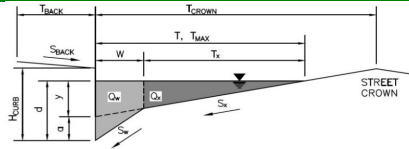
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL}	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR	
Total Inlet Interception Capacity		Q	0.8	2.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o	0.0	0.0	cfs
Capture Percentage = Q_o/Q_s		$C\%$	100	100	%

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

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

Project: **Zante Street**Inlet ID: **Inlet B6****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_0	=	0.010	ft/ft
n_{STREET}	=	0.018	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Spread Criterion

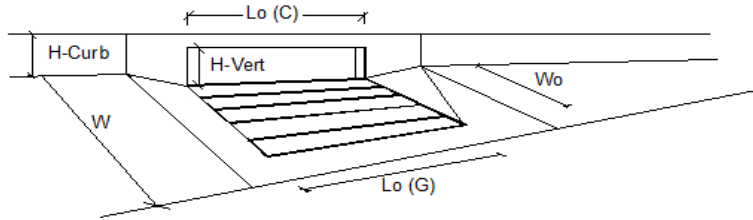
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	2.8	9.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.80 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.49 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

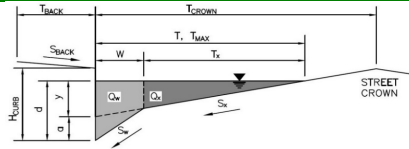
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$			MINOR		MAJOR
Total Inlet Interception Capacity		Q =	0.8	2.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o =	0.0	0.0	cfs
Capture Percentage = Q_o/Q_s		$C\%$ =	100	100	%

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

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

Project: **Zante Street**Inlet ID: **Inlet B7****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.018	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	17.0	ft
W	=	2.00	ft
S_X	=	0.020	ft/ft
S_W	=	0.083	ft/ft
S_D	=	0.010	ft/ft
n_{STREET}	=	0.018	

Max. Allowable Spread for Minor & Major Storm

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

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

	Minor Storm	Major Storm	
T_{MAX}	10.0	17.0	ft
d_{MAX}	6.0	6.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

MINOR STORM Allowable Capacity is based on Spread Criterion

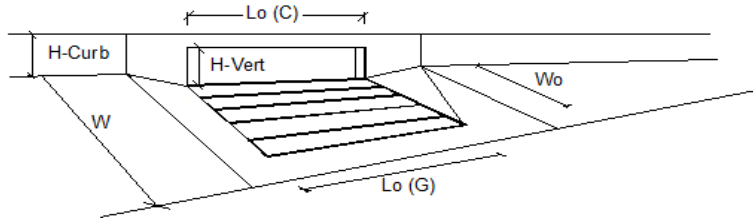
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow}	2.8	9.7	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.90 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.79 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL}	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		N_o	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_f (G)$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_f (C)$	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$		MINOR		MAJOR	
Total Inlet Interception Capacity		Q	0.9	2.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_o	0.0	0.0	cfs
Capture Percentage = Q_o/Q_s		$C\%$	100	100	%

APPENDIX D

Drainage Maps

EXISTING VS PROPOSED RUNOFF							
Condition	Acres	Total Direct Runoff 100-yr (cfs)	cfs/Acre	Basins	Detained Release (cfs)	Undetained Release	Total Actual Release
EXISTING	20.9	18.80	0.90	EX1-3	0	18.80	18.80
PROPOSED	20.9	129.28	6.19	A1-A4 B1-B9 OS1-OS2	15.50	1.55	17.05

Pond Summary Table - POND A							
Condition	Required Volume	Provided Volume	Stage (ft)	Allowed Release Rate	Actual Release Rate	Release Orifice	Freeboard to Spillway
Micropond	25 cf	134 cf	0	NA	NA	NA	6
WQCV (+20%)	32 ac-ft	0.32 ac-ft	2.25	>=40 hr	41 hr	Orifice Plate	3.75
EURV	0.40 ac-ft	0.70 ac-ft	4.42	<48 hr**	47 hr	Orifice Plate	1.58
Fall Spectrum (100-yr)	1.12 ac-ft	1.14 ac-ft	5.94	Ponds A1-B9+OS1-2<1848 cfs	5.9 cfs**	Orifice Plate	0.06
Spillway	NA	1.15 ac-ft	6	28.9 cfs (Required)	28.9 cfs (Required)	Emergency Weir	0
100-Emergency	NA	NA	6.57	28.9 cfs	28.9 cfs (0.57 depth)	NA	1.43
Berm Top	NA	1.8 ac-ft	8	NA	NA	NA	0

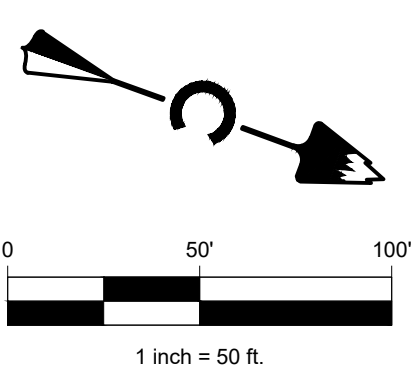
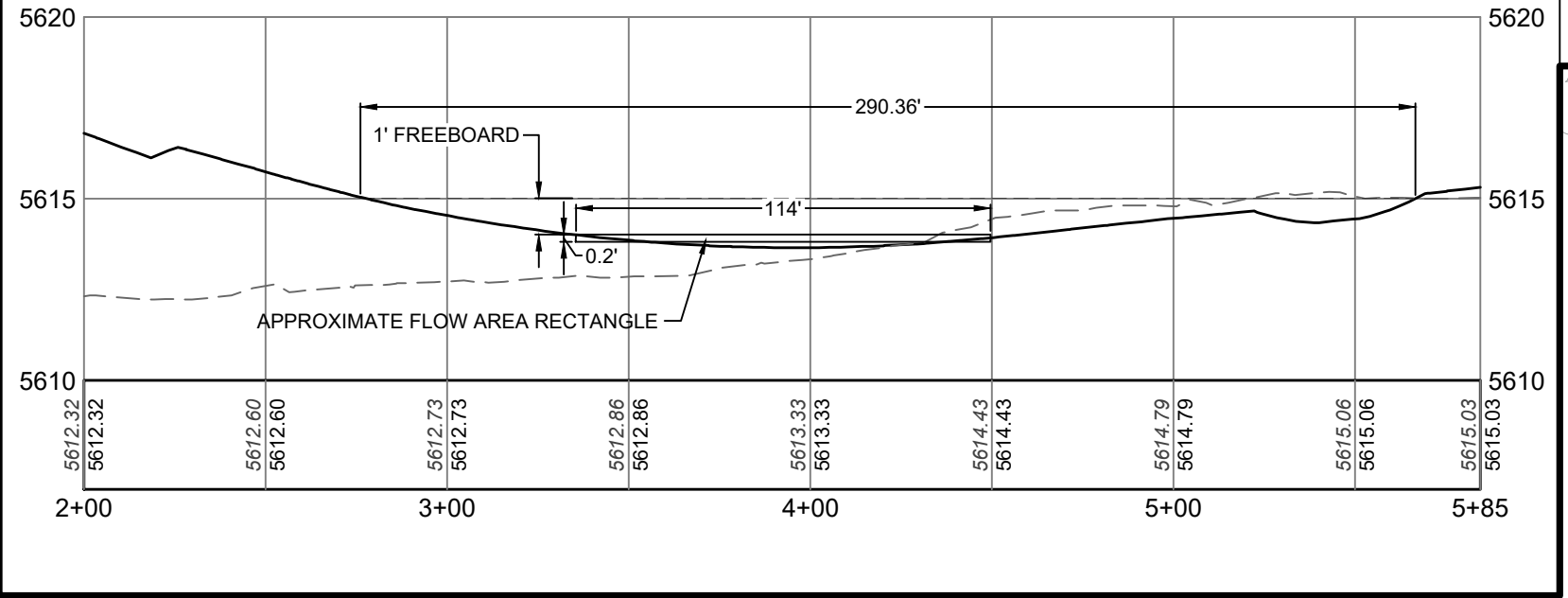
*Due to being in proximity of an airport, the drain time for the entire pond must be less than 48 hours. **Pond A1-B9+ Basin OS1-OS2 = 17.15 cfs which is less than existing condition 18.48 cfs

Pond Summary Table - POND B							
Condition	Required Volume	Provided Volume	Stage (ft)	Allowed Release Rate	Actual Release Rate	Release Orifice	Freeboard to Spillway
Micropond	25 cf	134 cf	0	NA	NA	NA	7.5
WQCV (+20%)	0.49 ac-ft	0.49 ac-ft	3.12	>=40 hr	41 hr	Orifice Plate	4.38
EURV	0.61 ac-ft	1.10 ac-ft	5.55	<48 hr**	47 hr	Orifice Plate	1.92
Fall Spectrum (100-yr)	1.72 ac-ft	1.72 ac-ft	7.16	Ponds A1-B9+OS1-2<1848 cfs	9.6 cfs**	Orifice Plate	0.34
Spillway	NA	1.90 ac-ft	7.5	36.2 cfs (Required)	35.6 cfs (Required)	Emergency Weir	0
100-Emergency	NA	NA	7.88	36.2 cfs	35.6 cfs (0.38 depth)	NA	1.12
Berm Top	NA	2.70 ac-ft	9	NA	NA	NA	0

*Due to being in proximity of an airport, the drain time for the entire pond must be less than 48 hours. **Pond A1-B9+ Basin OS1-OS2 = 17.15 cfs which is less than existing condition 18.48 cfs

SUMP EMERGENCY OVERFLOW I

(2+00-5+85)



EXISTING

PROPOSED

AREA XX'X

AREA XX'X

0.45

0.45

0.60

0.60

BASIN DESIGNATION

2 YEAR COEFFICIENTS

100 YEAR COEFFICIENTS

DESIGN POINT

DIRECTIONAL FLOW ARROW

EMERGENCY OVERFLOW ROUTE

PROPOSED DRAINAGE BASIN

EXISTING DRAINAGE BASIN

PROPOSED MAJOR CONTOUR

PROPOSED MINOR CONTOUR

EXISTING MAJOR CONTOUR

EXISTING MINOR CONTOUR

PROPOSED STORM & STUB OUT

EXISTING STORM & STUB OUT

STORM MANHOLES

STORM INLETS

FES, FOREBAY, & TRICKLE CHANNEL

CRUSHER BINES

MAINTENANCE ACCESS

EASEMENT

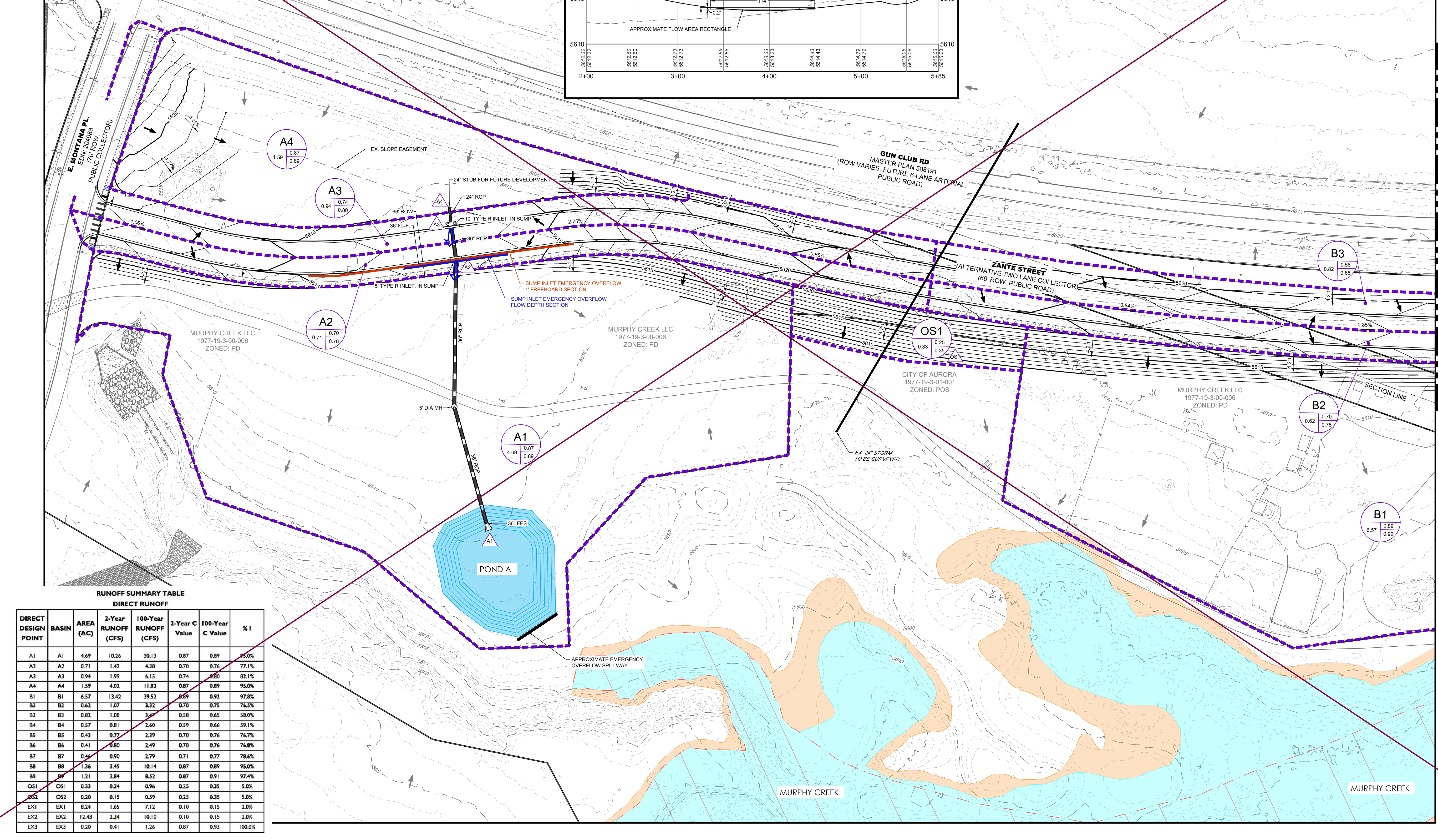
RIGHT OF WAY (R.O.W.)

CENTERLINE

PROJECT BOUNDARY

EX. 100 YR FLOODPLAIN ZONE X

EX. 100 YR FLOODPLAIN ZONE AE



RUNOFF SUMMARY TABLE						
DIRECT RUNOFF						
DIRECT DESIGN POINT	BASIN	AREA (AC)	2-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)	2-Year C Value	100-Year C Value
A1	A1	4.69	10.26	30.13	0.87	0.89
A2	A2	0.71	1.42	4.38	0.70	0.76
A3	A3	0.94	1.99	6.15	0.74	0.80
A4	A4	1.59	4.02	11.82	0.87	0.89
B1	B1	6.57	13.42	39.52	0.89	0.92
B2	B2	0.62	1.07	3.32	0.70	0.75
B3	B3	0.82	1.08	3.47	0.58	0.65
B4	B4	0.57	0.81	2.60	0.59	0.66
B5	B5	0.43	0.77	2.39	0.70	0.76
B6	B6	0.41	0.80	2.49	0.70	0.76
B7	B7	0.44	0.90	2.79	0.71	0.77
B8	B8	1.36	3.45	10.14	0.87	0.89
B9	B9	1.21	2.84	8.52	0.87	0.91
OS1	OS1	0.33	0.24	0.96	0.25	0.35
OS2	OS2	0.20	0.15	0.59	0.25	0.35
EX1	EX1	8.24	1.65	7.12	0.10	0.15
EX2	EX2	12.43	2.34	10.10	0.10	0.15
EX3	EX3	0.20	0.41	1.26	0.87	0.93

LAND DEVELOPMENT

ENERGY

PUBLIC INFRASTRUCTURE

CORE CONSULTANTS, INC.

3473 S. BROADWAY

AURORA, CO 80013

303.703.4444

LIVEYOURCORE.COM

811

Know what's below.

Call before you dig.

#

REVISION DESCRIPTION

DATE

BY

MURPHY CREEK - ZANTE STREET

AURORA, COLORADO

INFRASTRUCTURE SITE PLAN

PROPOSED DRAINAGE PLAN 1

NOT FOR CONSTRUCTION

DESIGNED BY: GP

DRAWN BY: GP

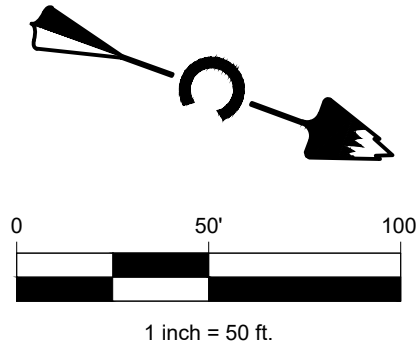
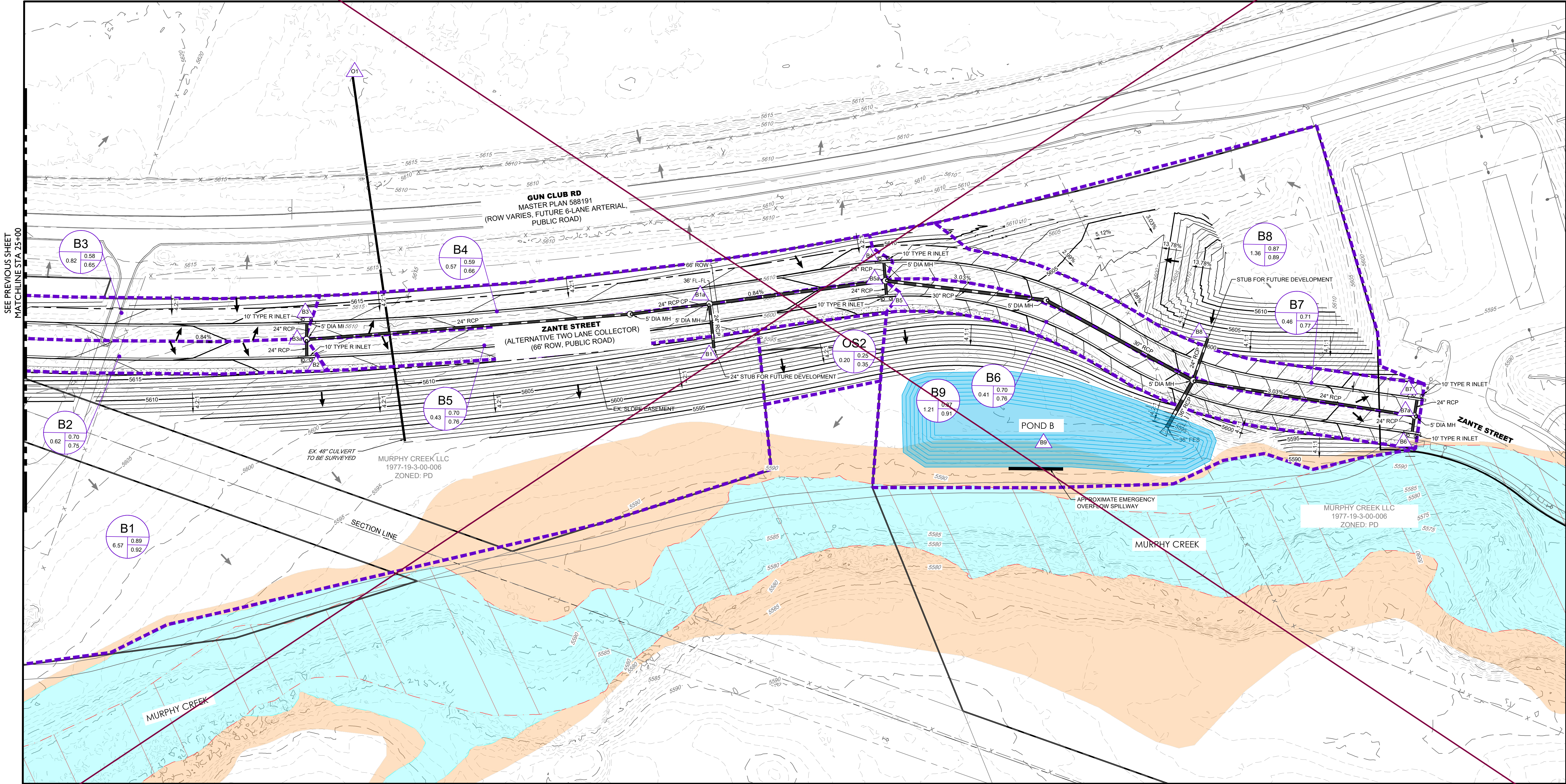
CHECKED BY: JK

JOB NO.

21-134

SHEET

1 OF 1



LEGEND

<p>EXISTING</p> <p>AREA XX.X 0.45 0.60</p> <p>PROPOSED</p> <p>AREA XX.X 0.45 0.60</p> <p>BASIN DESIGNATION</p> <p>2 YEAR COEFFICIENTS</p> <p>100 YEAR COEFFICIENTS</p> <p>DESIGN POINT</p> <p>DIRECTIONAL FLOW ARROW</p> <p>EMERGENCY OVERFLOW ROUTE</p> <p>PROPOSED DRAINAGE BASIN</p> <p>EXISTING DRAINAGE BASIN</p> <p>5280</p> <p>5279</p> <p>5280</p> <p>5279</p>	<p>PROPOSED STORM & STUB OUT</p> <p>EXISTING STORM & STUB OUT</p> <p>EXISTING STORM TO BE SURVEYED</p> <p>STORM MANHOLES</p> <p>STORM INLETS</p> <p>FES, FOREBAY, & TRICKLE CHANNEL</p> <p>CRUSHER PILES</p> <p>MAINTENANCE ACCESS</p> <p>BURRAP</p> <p>EASEMENT</p> <p>RIGHT OF WAY (R.O.W.)</p> <p>CENTERLINE</p> <p>PROJECT BOUNDARY</p> <p>EX. 100 YR FLOODPLAIN ZONE X</p> <p>EX. 100 YR FLOODPLAIN ZONE AE</p>
--	---

#	REVISION DESCRIPTION	DATE	BY

MURPHY CREEK - ZANTE STREET
AURORA, COLORADO
INFRASTRUCTURE SITE PLAN
PROPOSED DRAINAGE PLAN 2

NOT FOR CONSTRUCTION

DESIGNED BY: GP
DRAWN BY: GP
CHECKED BY: JK

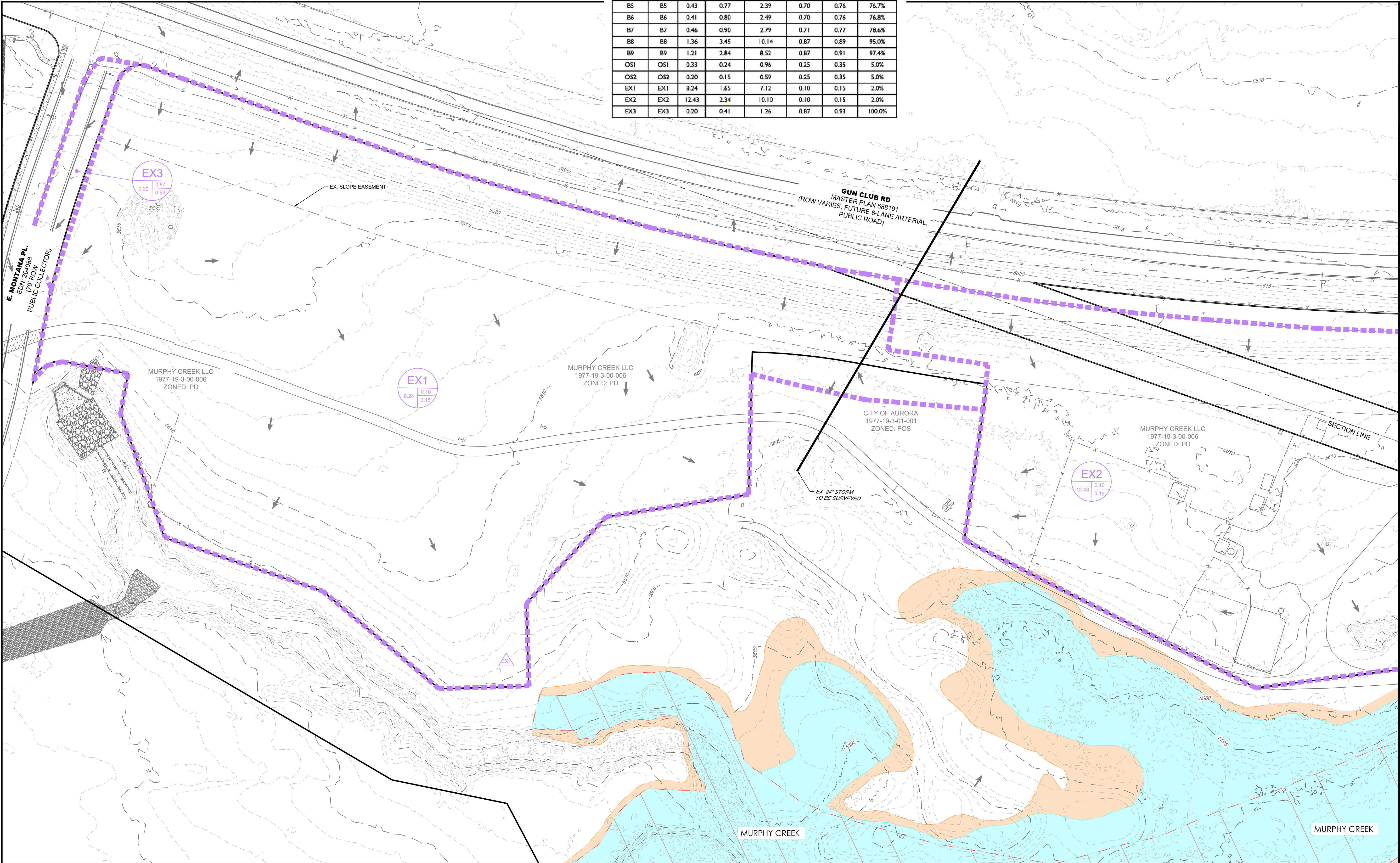
JOB NO.
21-134
SHEET
2 OF 4

CORE

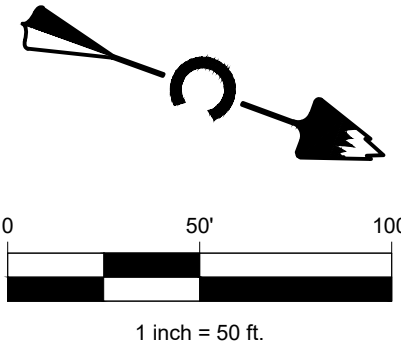
CORE CONSULTANTS, INC.
3473 S. BROADWAY
SUITE 200
DENVER, CO 80113
303.703.4444
LIVEYOURCORE.COM

LAND DEVELOPMENT
ENERGY
PUBLIC INFRASTRUCTURE

Resized to 11x17
Resize to 11x17 max



RUNOFF SUMMARY TABLE						
DIRECT RUNOFF						
DIRECT DESIGN POINT	BASIN	AREA (AC)	2-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)	2-Year C Value	100-Year C Value
A1	A1	4.69	10.26	30.13	0.87	0.89
A2	A2	0.71	1.42	4.38	0.70	0.76
A3	A3	0.94	1.99	6.15	0.74	0.80
A4	A4	1.59	4.02	11.82	0.87	0.89
B1	B1	6.57	13.42	39.52	0.89	0.92
B2	B2	0.62	1.07	3.32	0.70	0.75
B3	B3	0.82	1.08	3.47	0.58	0.65
B4	B4	0.57	0.81	2.60	0.59	0.66
B5	B5	0.43	0.77	2.39	0.70	0.76
B6	B6	0.41	0.80	2.49	0.70	0.76
B7	B7	0.46	0.90	2.79	0.71	0.77
B8	B8	1.36	3.45	10.14	0.87	0.89
B9	B9	1.21	2.84	8.52	0.87	0.91
OS1	OS1	0.33	0.24	0.96	0.25	0.35
OS2	OS2	0.20	0.15	0.59	0.25	0.35
EX1	EX1	8.24	1.65	7.12	0.10	0.15
EX2	EX2	12.43	2.34	10.10	0.10	0.15
EX3	EX3	0.20	0.41	1.26	0.87	0.93



EXISTING

PROPOSED

AREA 0.45 0.60

AREA 0.45 0.60

X

X

BASIN DESIGNATION

2 YEAR COEFFICIENTS

100 YEAR COEFFICIENTS

DESIGN POINT

DIRECTIONAL FLOW ARROW

EMERGENCY OVERFLOW ROUTE

PROPOSED DRAINAGE BASIN

EXISTING DRAINAGE BASIN

PROPOSED MAJOR CONTOUR

PROPOSED MINOR CONTOUR

EXISTING MAJOR CONTOUR

EXISTING MINOR CONTOUR

LEGEND

PROPOSED STORM & STUB OUT

EXISTING STORM & STUB OUT

EXISTING STORM TO BE SURVEYED

STORM MANHOLES

STORM INLETS

FES, FOREBAY, & TRICKLE CHANNEL

CRUSHER FINES

MAINTENANCE ACCESS

RIPRAP

EASEMENT

RIGHT OF WAY (R.O.W.)

CENTERLINE

PROJECT BOUNDARY

EX. 100 YR FLOODPLAIN ZONE X

EX. 100 YR FLOODPLAIN ZONE AE

DESIGNED BY: GP

DRAWN BY: GP

CHECKED BY: JK

JOB NO.

21-134

SHEET

3 OF 4

MURPHY CREEK - ZANTE STREET

AURORA, COLORADO

INFRASTRUCTURE SITE PLAN

EXISTING DRAINAGE PLAN 1

NOT FOR CONSTRUCTION

#

REVISION DESCRIPTION

DATE

BY

Know what's below.

Call before you dig.

811

CORE

CORE CONSULTANTS, INC.

3473 S. BROADWAY

AURORA, CO 80113

303.703.4444

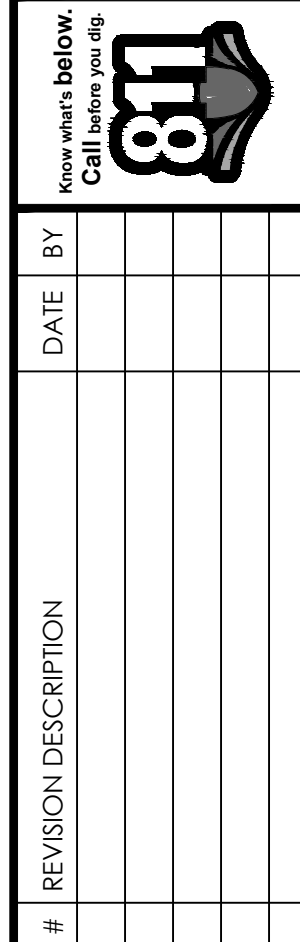
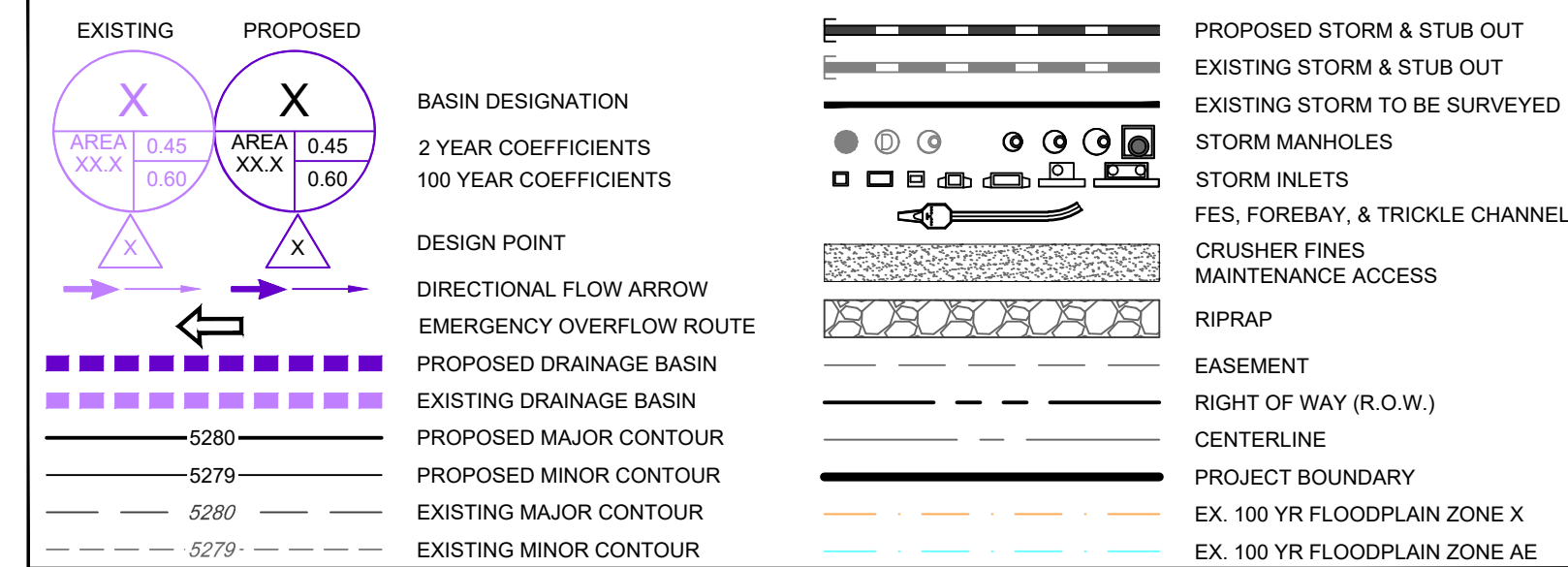
LIVE@YOURCORE.COM

LAND DEVELOPMENT

ENERGY

PUBLIC INFRASTRUCTURE

2021-09-11 (4:30 PM) X:\21-134 Murphy Creek\Civil\CAD\Plans\Zante Street\Drainage Ex Drainage Basins.dwg



MURPHY CREEK - ZANTE STREET
AURORA, COLORADO

INFRASTRUCTURE SITE PLAN
EXISTING DRAINAGE PLAN 2

NOT FOR
CONSTRUCTION

DESIGNED BY: GP
DRAWN BY: GP
CHECKED BY: JK

JOB NO.
21-134

SHEET
4 OF 4

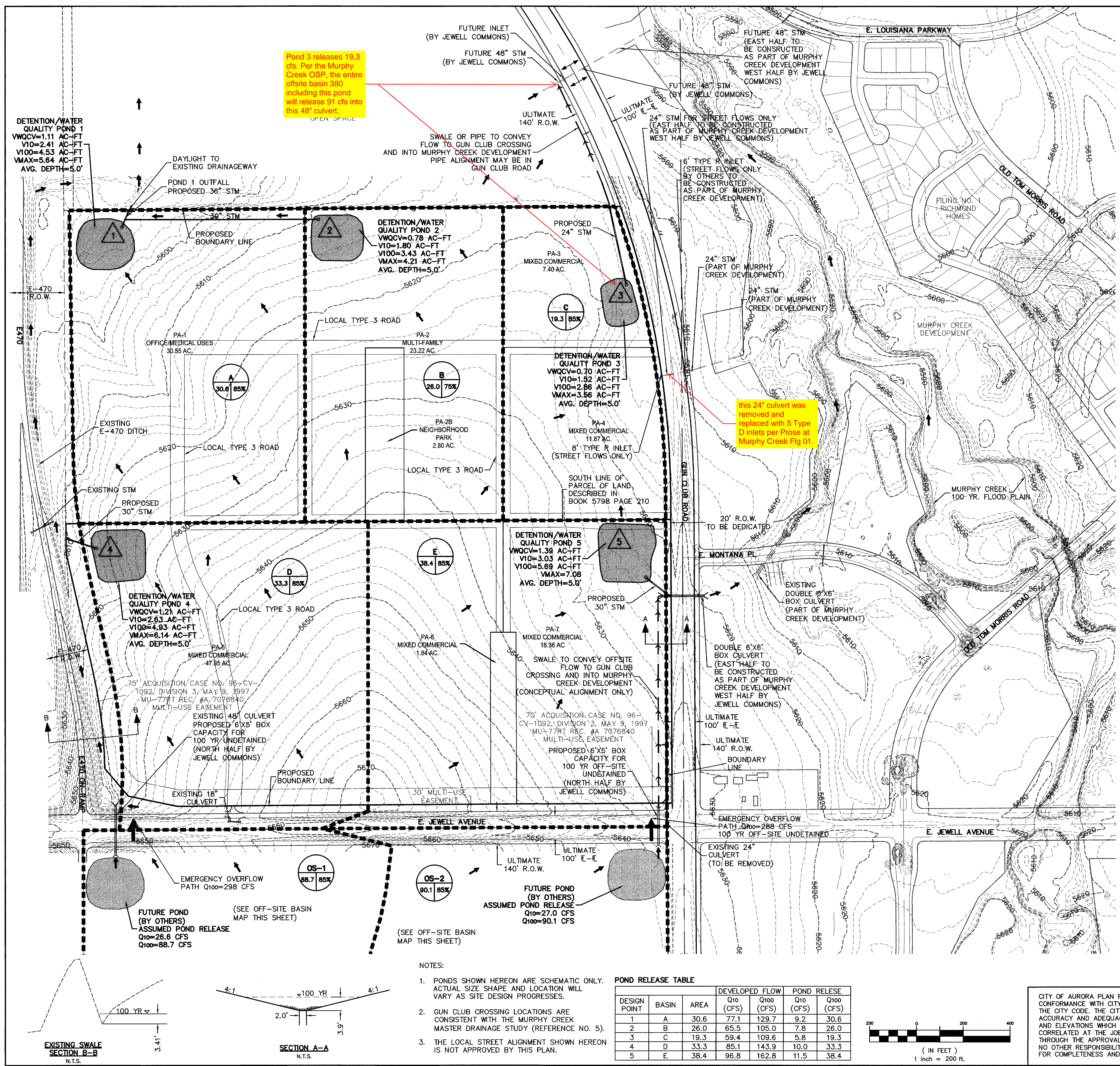
CORE CONSULTANTS, INC.
3473 S. BROADWAY
ENGLEWOOD, CO 80113
303.703.4444
LIVEYOURCORE.COM

CORE

APPENDIX E

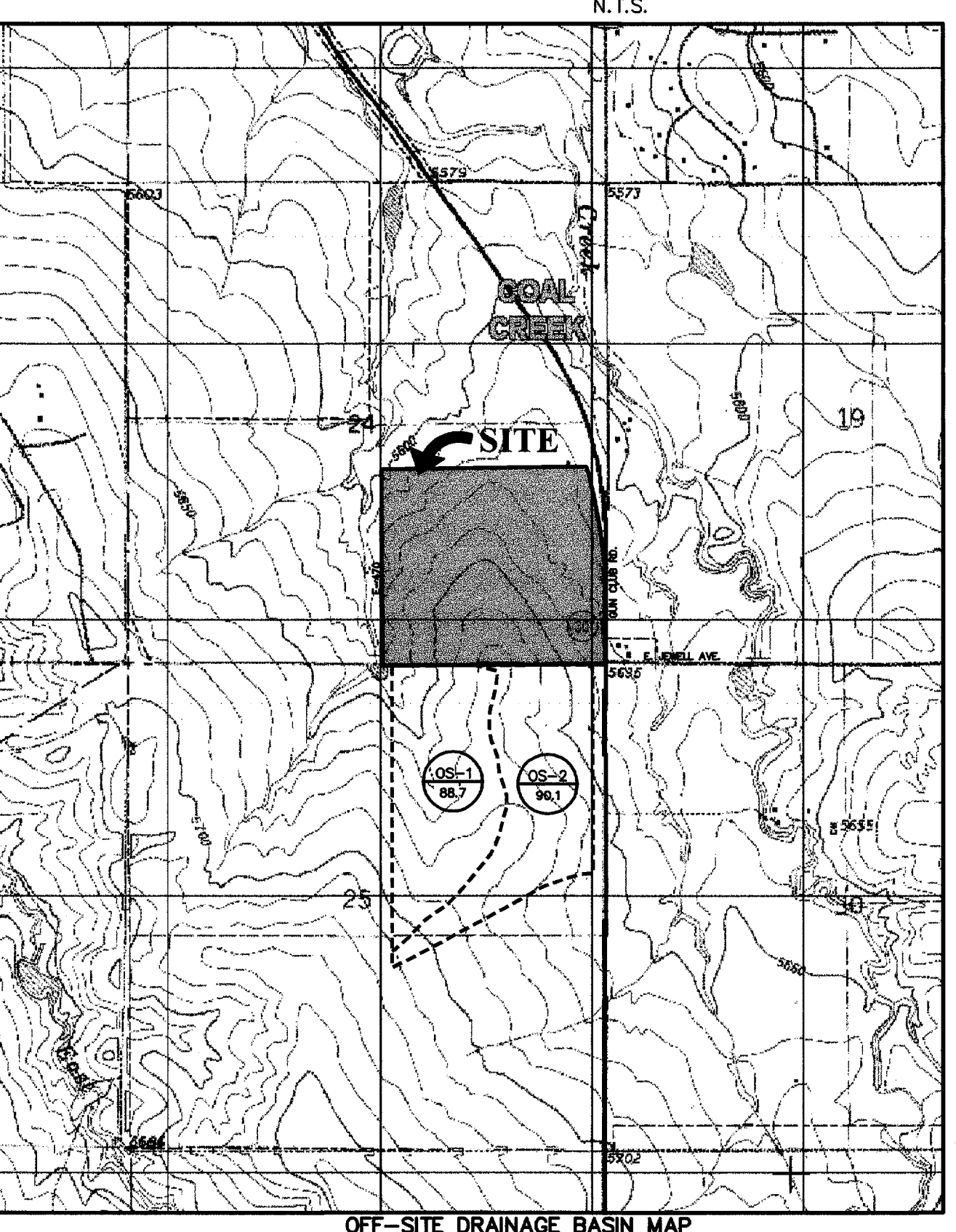
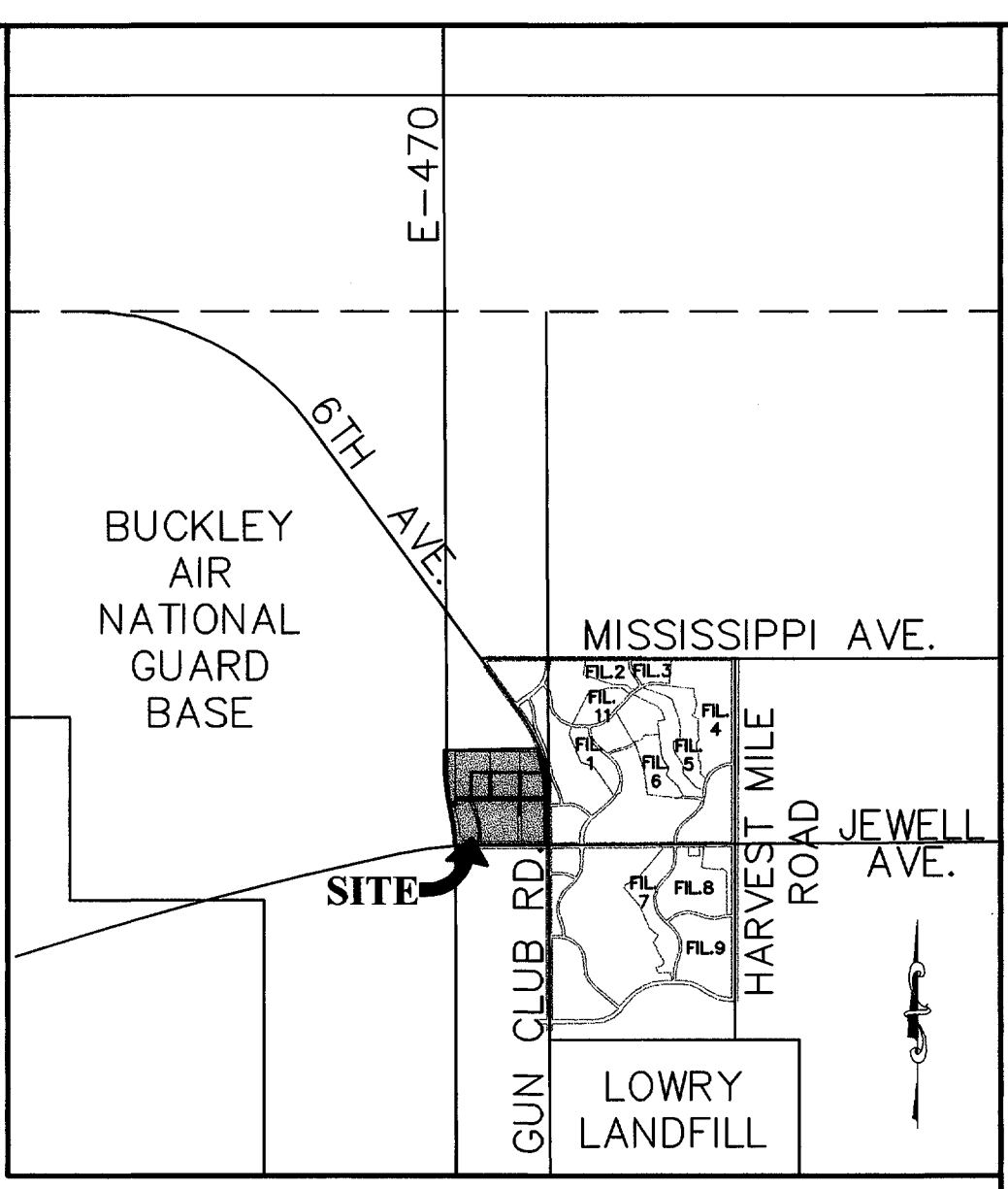
Reference Documents

204181



Pond 3 releases 19.3 cfs. For the Murphy Creek OSP, the entire offsite basin 380 including this pond will release 91 cfs into this 48" culvert.

this 24" culvert was removed and replaced with 5 Type D inlets per Prose at Murphy Creek Fig 01.



LEGEND

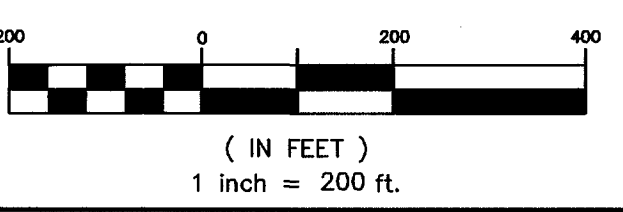
- PROPERTY BOUNDARY
- PROPOSED RIGHT OF WAY
- CONCEPTUAL PARCEL BOUNDARY
- BASIN DESIGNATION
- BASIN IMPERVIOUS PERCENT
- BASIN AREA IN ACRES
- DESIGN POINT
- MAJOR DRAINAGE BASIN BOUNDARY
- CONCEPTUAL STORM SEWER
- EXISTING CONTOUR
- FLOW DIRECTION

Approved for One Year From this Date
8-18-04

Jeff French
City Engineer
8-11-04
Date

- NOTES:
- PONDS SHOWN HEREON ARE SCHEMATIC ONLY. ACTUAL SIZE SHAPE AND LOCATION WILL VARY AS SITE DESIGN PROGRESSES.
 - GUN CLUB CROSSING LOCATIONS ARE CONSISTENT WITH THE MURPHY CREEK MASTER DRAINAGE STUDY (REFERENCE NO. 5).
 - THE LOCAL STREET ALIGNMENT SHOWN HEREON IS NOT APPROVED BY THIS PLAN.

		POND RELEASE TABLE			
DESIGN POINT	BASIN	AREA	DEVELOPED FLOW Q10 (CFS)	Q100 (CFS)	POND RELEASE Q10 (CFS)
1	A	30.6	77.1	129.7	9.2
2	B	26.0	65.5	105.0	7.8
3	C	19.3	59.4	109.6	5.8
4	D	33.3	85.1	143.9	10.0
5	E	38.4	96.8	162.8	11.5



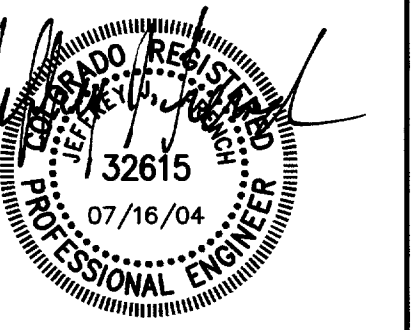
CITY OF AURORA PLAN REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH CITY OF AURORA DESIGN CRITERIA AND THE CITY CODE. THE CITY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, OF DIMENSIONS, AND ELEVATIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOBSITE. THE CITY OF AURORA THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO OTHER RESPONSIBILITY OTHER THAN AS STATED ABOVE FOR COMPLETENESS AND/OR ACCURACY.

NO.	REVISION	DATE	BY
1	PER CITY COMMENTS	03/23/04	BJ
2	PER CITY COMMENTS	06/08/04	RD

JEWELL COMMONS PARCEL MASTER DRAINAGE MAP

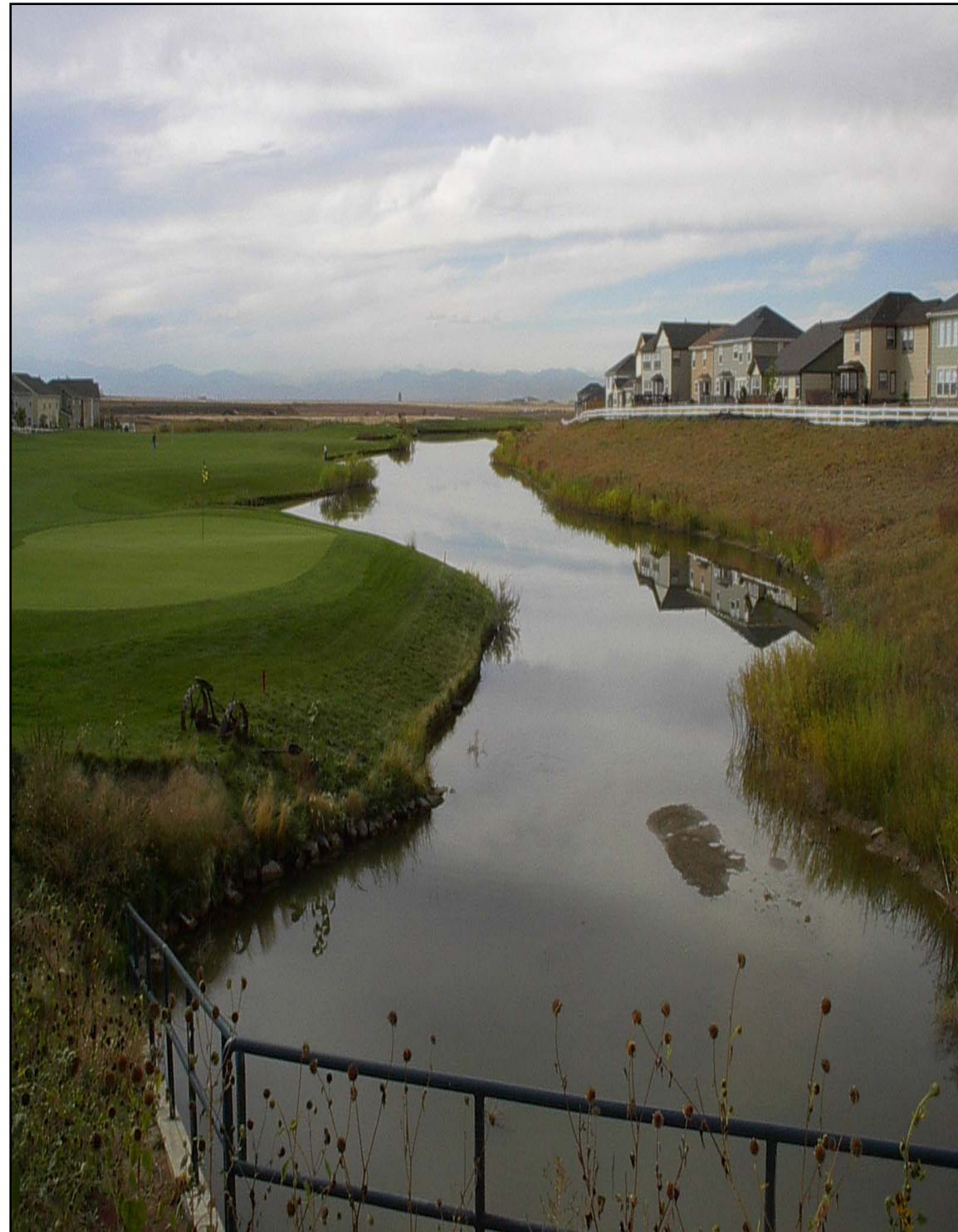
DEVELOPER
RONCAR, LLC
6708 S. WOLFF CT.
LITTLETON, COLORADO
(303) 770-0200
(303) 220-8027 fax
CONTACT: MICHAEL SHELTON

PEAK CIVIL CONSULTANTS
CIVIL ENGINEERING & LAND DEVELOPMENT SERVICES
2828 SPEER BLVD., SUITE 201
DENVER, COLORADO 80211
(720) 855-5555
CONTACT: JEFF FRENCH
Email: jfrench@peakcivil.com



DATE: 07/22/03
JOB NO: 03.06
DRAWN BY: RD
APPROVED: *Jeff French*
CADD FILE: 03.06/.../MAST-DRAIN

SCALE 1" = 300'



MURPHY CREEK AND TRIBUTARIES WATERSHEDS

OUTFALL SYSTEMS PLANNING PHASE B – PLANNING REPORT

Project Sponsors:



URBAN DRAINAGE AND FLOOD CONTROL DISTRICT



CITY OF AURORA

Prepared by:



720 South Colorado Boulevard
Suite 410 S
Denver, Colorado 80246
phone (303) 757-3655

UPDATED 03/2021:

A Fluvial Hazard Zone (FHZ) Mapping Analysis was completed in January 2021 for Murphy Creek from Yale Avenue to the Sand Creek Confluence. This analysis was accompanied by a conceptual design for the area between approximately Jewell Avenue and Yale Avenue. This correlates to approximately Station 215+00 through 312+00 of Reach 6 in this OSP. The Conceptual Design section and Appendices F and G of this OSP have been updated with the pertinent information from the conceptual design.

October 2008

TABLE B-5 Continued
Future Land-Use Conditions
Peak Flow Summary

Conduit Element	Location	Peak Flows (cfs)						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	100-Yr MP*
1606re		304	573	760	1272	1573	1948	1948
1625re		273	502	658	1073	1338	1631	1631
1635re		276	470	595	904	1145	1351	1351
1636re		249	423	535	794	989	1480	1480
1637re		229	375	466	667	824	978	978
1655re		152	255	320	463	574	684	684
1665re		40	66	83	120	149	177	177
2045re		427	695	855	1232	1520	1815	1660
2046re		352	552	669	939	1149	1360	1282
2075re		281	437	527	724	882	1036	1016
2085re		190	291	349	464	561	651	651
2095re		65	98	116	151	181	211	211
2205re		90	159	198	289	362	427	300
2305re		93	151	185	255	316	371	304
3105re		38	70	89	137	173	208	208
3205re		12	19	23	32	38	45	45
3315re		173	266	322	444	534	639	202
3325re		81	123	147	202	244	284	262
3505re		89	180	241	390	501	627	560
3515re		80	159	209	333	425	525	483
3516re		75	143	185	291	368	452	418
3545re		5	15	21	37	48	60	60
3555re		63	108	134	200	249	299	278
3565re		59	94	113	156	189	222	209
3805re		28	41	49	65	78	91	91
4005re		55	83	99	129	156	181	339
4305re		65	103	123	167	209	241	67
4315re		57	86	102	133	177	177	194
4405re		110	202	259	387	484	592	583
4415re		50	76	91	126	153	179	166

* MP = Master Plan peak flows

Conduit Element	Location	Peak Flows (cfs)						
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	100-Yr MP*
4425re		52	100	125	190	238	292	292
4435re		47	77	88	117	143	168	168
4515re		7	40	59	110	147	184	173
4705re		4	28	47	93	128	168	168
4715re		3	20	30	57	77	97	97
5025re		3	22	37	72	99	131	131
5035re		3	17	26	49	66	85	85
5115re		2	24	38	75	102	130	129
5125re		10	79	123	232	312	398	396
5315re		5	42	63	117	156	196	196
5505re		27	160	251	470	633	804	804
5515re		1	13	19	36	48	60	60
5525re		23	108	162	303	406	516	516
5535re		3	39	64	122	165	212	212
5545re		2	18	29	56	75	96	96
5555re		21	86	126	231	308	388	388
5565re		19	39	50	76	96	115	115
6005re		5	58	92	183	249	321	321
6015re		4	39	61	116	156	197	197
6205re		3	30	47	90	122	154	154
6305re		3	23	35	64	83	104	104
6505re		4	24	37	68	91	114	114
7015re		26	101	148	272	362	457	457
7025re		32	100	142	243	317	393	393
7035re		26	69	93	151	195	238	238
7105re		5	20	30	58	78	98	98
7205re		0	32	54	116	158	201	201
7515re		23	30	34	58	85	116	116
7525re		139	210	255	340	413	480	480
7615re		27	53	71	115	147	179	179
7705re		105	170	214	305	379	446	446