



**TOWN OF ERIE**

Community Development Department – Planning Division  
645 Holbrook Street – PO Box 750 – Erie, CO 80516  
Tel: 303.926.2770 – Fax: 303.926.2706 – Web: [www.erieco.gov](http://www.erieco.gov)

**LAND USE APPLICATION**

*Please fill in this form completely. Incomplete applications will not be processed.*

STAFF USE ONLY		
FILE NAME:		
FILE NO:	DATE SUBMITTED:	FEES PAID:

**PROJECT/BUSINESS NAME:** Canyon Creek Duplexes

**PROJECT ADDRESS:** Meller Street and Erie Parkway

**PROJECT DESCRIPTION:** Site Plan

**LEGAL DESCRIPTION** *(attach legal description if Metes & Bounds)*

Subdivision Name: Canyon Creek

Filing #: 5      Lot #: Tract B      Block #:      Section: S 1/2 of 24      Township: 1 North      Range: 69

**OWNER** *(attach separate sheets if multiple)*

Name/Company: Heshmat Properties LLC

Contact Person: Yasi Taylor

Address: 5385 Lookout Ridge Drive

City/State/Zip: Boulder, CO 80301

Phone: 303.669.6384

Fax:

E-mail: [yasitaylor@msn.com](mailto:yasitaylor@msn.com)

**AUTHORIZED REPRESENTATIVE**

Company/Firm: Bowman Consulting

Contact Person: Bradley Reiner

Address: 603 Park Point Drive, Suite 100

City/State/Zip: Golden, CO 80401

Phone: 303-674-7355

Fax:

E-mail: [breiner@bowmanconsulting.com](mailto:breiner@bowmanconsulting.com)

**MINERAL RIGHTS OWNER** *(attach separate sheets if multiple)*

Name/Company: James S'Haley, Trustee

Address:

City/State/Zip: Longmont CO

**MINERAL LEASE HOLDER** *(attach separate sheets if multiple)*

Name/Company:

Address:

City/State/Zip:

**LAND-USE & SUMMARY INFORMATION**

Present Zoning: PD/Daycare/Medium Density Residential

Proposed Zoning: Medium Residential

Gross Acreage: 1.84 AC

Gross Site Density (du/ac): 6.5

# Lots/Units Proposed: 12

Gross Floor Area: 20,988 SF (26,832 SF with garages)

**SERVICE PROVIDERS**

Electric: Xcel

Metro District: N/A

Water *(if other than Town):*

Gas: Xcel

Fire District: Mountain View Fire District

Sewer *(if other than Town):*

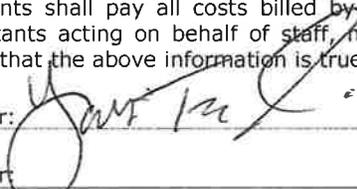
**PAGE TWO MUST BE SIGNED AND NOTARIZED**

## DEVELOPMENT REVIEW FEES

ANNEXATION		SUBDIVISION	
<input type="checkbox"/> Major (10+ acres)	\$ 4000.00	<input type="checkbox"/> Sketch Plan	\$ 1000.00 + 10.00 per lot
<input type="checkbox"/> Minor (less than 10 acres)	\$ 2000.00	<input type="checkbox"/> Preliminary Plat	\$ 2000.00 + 40.00 per lot
<input type="checkbox"/> Deannexation	\$ 1000.00	<input type="checkbox"/> Final Plat	\$ 2000.00 + 20.00 per lot
COMPREHENSIVE PLAN AMENDMENT		<input type="checkbox"/> Minor Subdivision Plat	\$ 2000.00
<input type="checkbox"/> Major	\$ 3000.00	<input type="checkbox"/> Minor Amendment Plat	\$ 1000.00 + 10.00 per lot
<input type="checkbox"/> Minor	\$ 1200.00	<input type="checkbox"/> Road Vacation (constructed)	\$ 1000.00
ZONING/REZONING		<input type="checkbox"/> Road Vacation (paper)	\$ 100.00
<input type="checkbox"/> Rezoning	\$ 1700.00 + 10.00 per acre	SITE PLAN	
<input type="checkbox"/> PUD Rezoning	\$ 1700.00 + 10.00 per acre	<input checked="" type="checkbox"/> Residential	\$ 1400.00 + 10.00 per unit
<input type="checkbox"/> PUD Amendment	\$ 1700.00 + 10.00 per acre	<input type="checkbox"/> Non-Resi. (>10,000 sq. ft.)	\$ 2200.00
<input type="checkbox"/> Major PD Amendment	\$ 3700.00 + 10.00 per acre	<input type="checkbox"/> Non-Resi. (>2,000 sq. ft.)	\$ 1000.00
<input type="checkbox"/> Minor PD Amendment	\$ 500.00	<input type="checkbox"/> Non-Resi. (<2,000 sq. ft.)	\$ 200.00
SPECIAL REVIEW USE		<input type="checkbox"/> Amendment (major)	\$ 1100.00
<input type="checkbox"/> Major	\$ 1000.00	<input type="checkbox"/> Amendment (minor)	\$ 350.00
<input type="checkbox"/> Minor	\$ 400.00	VARIANCE	
<input type="checkbox"/> Oil & Gas	\$ 1200.00		\$ 600.00
		SERVICE PLAN	
			\$ 10,000.00

All fees **include** both Town of Erie Planning & Engineering review. These fees **do not include** referral agency review fees, outside consultant review fees, or review fees incurred by consultants acting on behalf of staff. See Town of Erie Municipal Code, Title 2-10-5 for all COMMUNITY DEVELOPMENT FEES.

The undersigned is fully aware of the request/proposal being made and the actions being initiated on the referenced property. The undersigned understand that the application must be found to be complete by the Town of Erie before the request can officially be accepted and the development review process initiated. The undersigned is aware that the applicant is fully responsible for all reasonable costs associated with the review of the application/request being made to the Town of Erie. Pursuant to Chapter 7 (Section 7.2.B.5) of the Unified Development Code (UDC) of the Town of Erie, applicants shall pay all costs billed by the Town for legal, engineering and planning costs incurred by staff, including consultants acting on behalf of staff, necessary for project review. By this acknowledgement, the undersigned hereby certify that the above information is true and correct.

Owner: 

Date: 6/17/16

Owner: \_\_\_\_\_

Date: \_\_\_\_\_

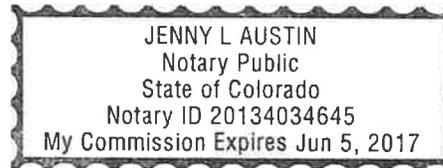
Applicant: \_\_\_\_\_

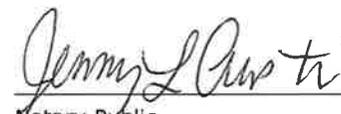
Date: \_\_\_\_\_

STATE OF COLORADO )  
County of Boulder ) ss.

The foregoing instrument was acknowledged before me this 17<sup>th</sup> day of June, 2016, by Yasaman Taylor.

My commission expires: June 05 2017  
Witness my hand and official seal.



  
Notary Public



July 21, 2016

Deborah Bachelder, Senior Planner  
Town of Erie, Colorado  
Community Development Department – Planning Division  
645 Holbrook Street  
Erie, CO, 80516

RE: Canyon Creek Site Plan Submittal Narrative

Dear Deborah:

On behalf of Yasi Taylor with Heshmat Properties, LLC, we respectfully submit our Site Plan to the Town of Erie for review. This submittal includes all required items per the Site Plan Review User's Guide, and it reflects a different approach to the architecture per the new owner as opposed to the previous submission for this property. The biggest change is the style of architecture, and the buildings now have a second story and no basement. Site Plan drawings reflect updated floor plans and elevations, revised landscaping, revised site grading and revised utility services locations.

**General Description**

The Canyon Creek project is a 1.84 acre parcel located at the southeast corner of Erie Parkway and Meller Street and within the Canyon Creek PD. This development intends to create 12 alley loaded, paired-housing or duplex units. Six of the units will be Visitable per State of Colorado Title 9 Statutes. Access to the alley will be from Meller Street, and it is anticipated to be constructed in one phase.

**Approval Criteria**

The Site Plan is consistent with the Town of Erie Comprehensive Master Plan. This project is located within the Canyon Creek PD, which has been approved by the Town and complies with the approved land uses allowed in the PD. A variety of models will be provided with a central common area for the community. Pedestrian walkways along Erie Parkway and Meller Street will be provided from the development to allow for connectivity with adjacent neighborhoods.

The Site Plan is consistent with the Canyon Creek PD. The PD allows for either Medium Density Residential with a maximum of 13 units or Day Care on this Tract, and this Site Plan proposes 12 paired-housing units which meets the approved land use and density of the PD.

The Site Plan complies with all applicable development and design standards set forth in the Municipal Code.

No significant adverse impacts are anticipated as a result of this development.

## **Site Description**

### **BACKGROUND:**

Canyon Creek is a development of six buildings with twelve two-story units located in the center of Erie and defined by Meller Street and Erie Parkway. Our design intent is to introduce a different architectural style within the Town of Erie's existing housing stock that supports more housing diversity. The contemporary aesthetic coupled with energy efficiency and low building maintenance is intended to attract young families and millennials to further encourage more diverse demographics. The buildings do not have basements due to high ground water, but the units are generously sized with two-bedrooms on the second level, two and one-half baths, a large two-car garage and the option of having a main level master suite or a home office.

The site layout embraces a New Urban concept with alley-loaded parking, front porches and a majority of the units facing a common courtyard. This arrangement provides for casual neighbor interactions and allows for a Jane Jacobs "eyes on the street" approach to neighborhood safety. The common areas will be beautifully landscaped with water-wise plantings that flourish within and compliment Colorado's semi-arid climate. Each unit will also have fenced, private, landscaped yards with a back patio for grilling or entertaining friends in addition to the front porch. The contemporary architectural style is purposely simple in form to reflect the underlying efficiency of the structures, and the design hints at a single-family home rather than paired units. Three of the buildings will have a flat roof and the other three will have a butterfly roof for variety.

This cluster of dwellings will relate to the surrounding land uses as a dense reflection of its neighboring land uses. The adjacent parcels are occupied by larger homes that represent a Western Suburban House where families grow together. The Canyon Creek homes reflect that same scale and ideal.

The building facades are primarily stucco with unifying elements such as a brick accent on the Brattice and a decorative wood band on the Outcrop. The Outcrop will also have a trellis in the front and rear as well as at the rooftop deck. In short, Canyon Creek will offer highly livable homes with open floor plans, durable and low-maintenance finishes, energy efficiency and all in a convenient location within a desirable community.

### **MATERIALS AND FINISHES:**

The following is a break-down of typical materials and assemblies:

- Exterior Wall Construction: 2x6 DF w/ 7/16" exterior sheathing and a colored stucco finish. 2" closed cell foam and blown cellulose insulation
- Demising Wall Construction: 2 HR rated DF wall assembly continuous from foundation to underside of roof sheathing
- Garage / Living Space Walls: 1 HR rated 2x6 DF wall assembly per code
- Window System: Direct set and casement fiberglass windows, specs TBD
- Door Systems: 1 HR Rated between garage and living space, insulated metal garage doors and full lite front doors

- Typical Roof System: Black EPDM over densdeck over tapered foam at flat roofs over ¾" sheathing over 11 7/8" i-joists with min. 8" closed cell foam
- Floor Finishes: Engineered wood floors at main level, carpet in Master Suite and tile in bathrooms; Carpet throughout upper level save for tile in the bathroom and laundry closet
- Kitchen Finishes: Mid-grade cabinetry, composite counter tops, stainless steel appliances, specs TBD

### **Schedule and Project Data**

It is anticipated that construction will start March 2017 and be completed by March 2018.  
The Site and Building development costs (excluding land value) are estimated at \$4,389,800.

### **Ownership and Maintenance**

All area outside the building footprints will be maintained by Home Owners Association that will be created for this development. No special conditions or covenants are proposed at this time.

### **Mineral Rights/Leases**

There is an existing gas main on the north side of the site within a 30' landscape easement.

We believe that we have addressed all submittal requirements for the Site Plan submittal. On behalf of the Developer, we thank you for your support and assistance on this new project.

Sincerely,



Bradley Reiner, PE  
Project Manager

CC: Yasi Taylor, Heshmat Properties, LLC  
Stephen Sparn AIA, Sopher Sparn Architects

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
 NORTH, RANGE 69 WEST OF THE 6th P.M.  
 TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
 1.84 ACRES - 12 LOTS, 3 TRACTS  
 SP-000800-2016

**LEGAL DESCRIPTION:**

LOTS 1-12; TRACTS B-1, H AND I, CANYON CREEK SUBDIVISION FILING NO. 5, 1ST AMENDMENT

**GENERAL NOTES:**

1. THE SITE IS NOT WITHIN THE 100-YEAR FLOODPLAIN.



STREET ADDRESSES	
LOT 1	
LOT 2	
LOT 3	
LOT 4	
LOT 5	
LOT 6	
LOT 7	
LOT 8	
LOT 9	
LOT 10	
LOT 11	
LOT 12	

**SHEET INDEX**

COVER SHEET	1
SITE PLAN	2
LANDSCAPE PLAN - MASTER PLAN	3
LANDSCAPE PLAN: NORTH ENLARGEMENT	4
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LANDSCAPE NOTES AND DETAILS	6
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UTILITY PLAN	8
GRADING PLAN	9
IRRIGATION PLAN - NORTH	10
IRRIGATION PLAN - SOUTH	11
IRRIGATION DETAILS	12

**SITE PLAN APPROVAL CERTIFICATE**

THIS SITE PLAN HAS BEEN REVIEWED AND FOUND TO BE COMPLETE AND IN ACCORDANCE WITH APPLICABLE TOWN OF ERIE REGULATIONS.

DIRECTOR OF PLANNING AND DEVELOPMENT \_\_\_\_\_ DATE \_\_\_\_\_

PLANNING COMMISSION CHAIR \_\_\_\_\_ DATE \_\_\_\_\_

THE UNDERSIGNED AS THE OWNER OR OWNER'S REPRESENTATIVE OF THE LANDS DESCRIBED HEREIN, HEREBY AGREES ON BEHALF OF HIMSELF/HERSELF, THEIR HEIRS, SUCCESSORS, AND ASSIGNS TO DEVELOP AND MAINTAIN THE PROPERTY DESCRIBED HEREON IN ACCORDANCE WITH THIS APPROVED SITE PLAN AND IN COMPLIANCE WITH THE TOWN OF ERIE UNIFIED DEVELOPMENT CODE AND MUNICIPAL CODE.

OWNER SIGNATURE \_\_\_\_\_ OWNER NAME PRINTED \_\_\_\_\_

ACKNOWLEDGED BEFORE ME THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_

BY \_\_\_\_\_ AS \_\_\_\_\_

WITNESS MY HAND AND OFFICIAL SEAL

NOTARY PUBLIC \_\_\_\_\_

MY COMMISSION EXPIRES: \_\_\_\_\_

**SITE DATA SUMMARY CHART**

ZONE DISTRICT: PD

ITEM	SQUARE FOOTAGE	% OF GROSS SITE
GROSS SITE AREA	80,279 S.F.	100.00
BUILDING FOOTPRINT	21,112 S.F.	26.3
PARKING/ROADS	16,172 S.F.	20.1
HARDSCAPE TOTAL	37,284 S.F.	46.44
PLANTED AREAS	39,198 S.F.	41.73
TRAILS AND SIDEWALKS	3,797 S.F.	4.73
LANDSCAPE TOTAL	42,995 S.F.	53.56
PARKING		
TOTAL REQUIRED (2 PER D.U. PLUS 1 GUEST SPACE PER 3 D.U.)	28	
PROVIDED	32	
BIKE PARKING		
TOTAL REQUIRED	2	
PROVIDED	2	

**DEVELOPER**

HESHMAT PROPERTIES LLC  
 5385 LOOKOUT RIDGE DRIVE  
 BOULDER CO 80301  
 CONTACT: YASI TAYLOR

**Bowman**  
 CONSULTING

603 Park Point Drive, Suite 100 Phone: (303) 674-7355  
 Golden, CO 80401 Fax: (303) 674-3263  
 www.bowmanconsulting.com

Cover Sheet		SHEET 1 OF 12	
06/01/18	5	SITE PLAN SUBMITTAL # 4	CLP
03/22/18	4	SITE PLAN SUBMITTAL # 3	CLP
12/21/17	3	SITE PLAN SUBMITTAL # 2	CLP
09/20/16	2	SITE PLAN SUBMITTAL	BAR
07/21/16	1	SITE PLAN COMPLETENESS SUBMITTAL	BAR
DATE	NO.	REVISIONS	BY
DATE: 02/15/16	JOB NO. 020282	CHECKED BY: LIT	

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ZONING DISTRICT: LOW D  
LAND USE: LOW C

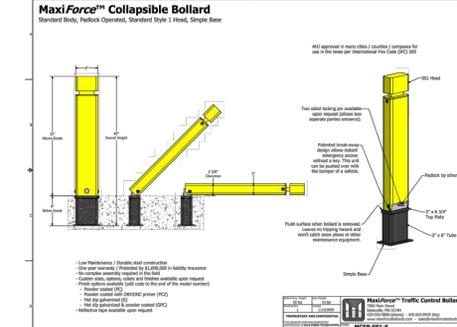
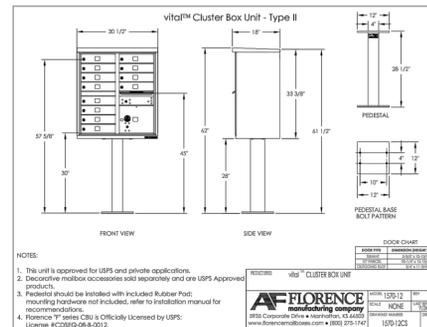
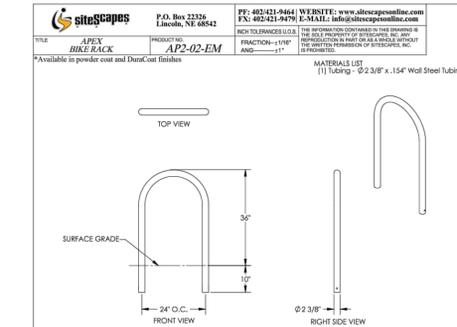
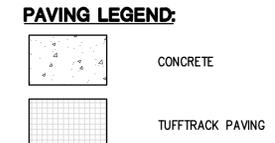
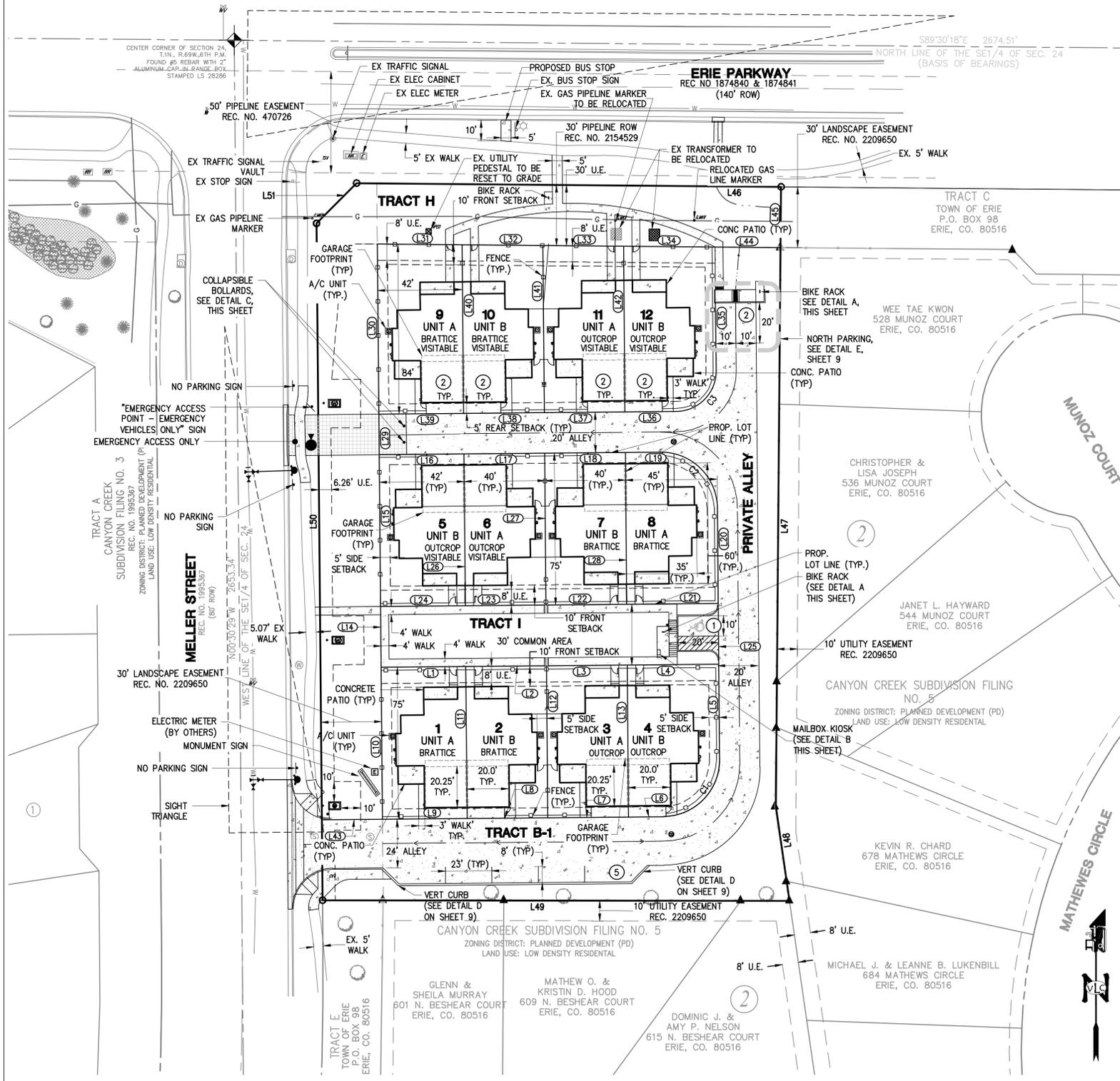
LINE	LENGTH	BEARING
L1	42.00	N89°29'31"E
L2	40.00	N89°29'31"E
L3	40.00	N89°29'31"E
L4	45.32	N89°29'31"E
L5	47.00	N0°30'29"W
L6	17.32	N89°29'31"E
L7	40.00	N89°29'31"E
L8	40.00	N89°29'31"E
L9	42.00	N89°29'31"E
L10	75.00	N0°30'29"W
L11	75.00	N0°30'29"W
L12	75.00	N0°30'29"W
L13	75.00	N0°30'29"W
L14	30.00	N0°30'29"W
L15	75.00	N0°30'29"W
L16	42.00	N89°29'31"E
L17	40.00	N89°29'31"E
L18	40.00	N89°29'31"E
L19	17.32	N89°29'31"E
L20	47.00	N0°30'29"W

LINE	LENGTH	BEARING
L21	45.32	N89°29'31"E
L22	40.00	N89°29'31"E
L23	40.00	N89°29'31"E
L24	42.00	N89°29'31"E
L25	30.00	N0°30'29"W
L26	75.00	N0°30'29"W
L27	75.00	N0°30'29"W
L28	75.00	N0°30'29"W
L29	20.00	N0°30'29"W
L30	83.99	N0°30'29"W
L31	42.01	N89°30'18"W
L32	40.01	N89°30'18"W
L33	40.01	N89°30'18"W
L34	45.33	N89°30'18"W
L35	61.06	N0°30'29"W
L36	25.32	N89°29'31"E
L37	40.00	N89°29'31"E
L38	40.00	N89°29'31"E
L39	42.00	N89°29'31"E
L40	83.26	S0°30'29"E

LINE	LENGTH	BEARING
L41	82.56	N0°30'29"W
L42	81.86	N0°30'29"W
L43	30.00	N89°30'18"W
L44	32.50	N89°30'18"W
L45	30.00	S0°29'42"W

CURVE	LENGTH	RADIUS	DELTA
C1	43.98	28.00	90°00'00"
C2	43.98	28.00	90°00'00"
C3	31.42	20.00	90°00'00"

LINE	LENGTH	BEARING
L46	210.37	S89°30'18"E
L47	305.90	S0°29'42"W
L48	47.14	S81°6'38"E
L49	231.38	N89°55'05"W
L50	334.21	N0°30'29"W
L51	28.05	N44°59'38"E



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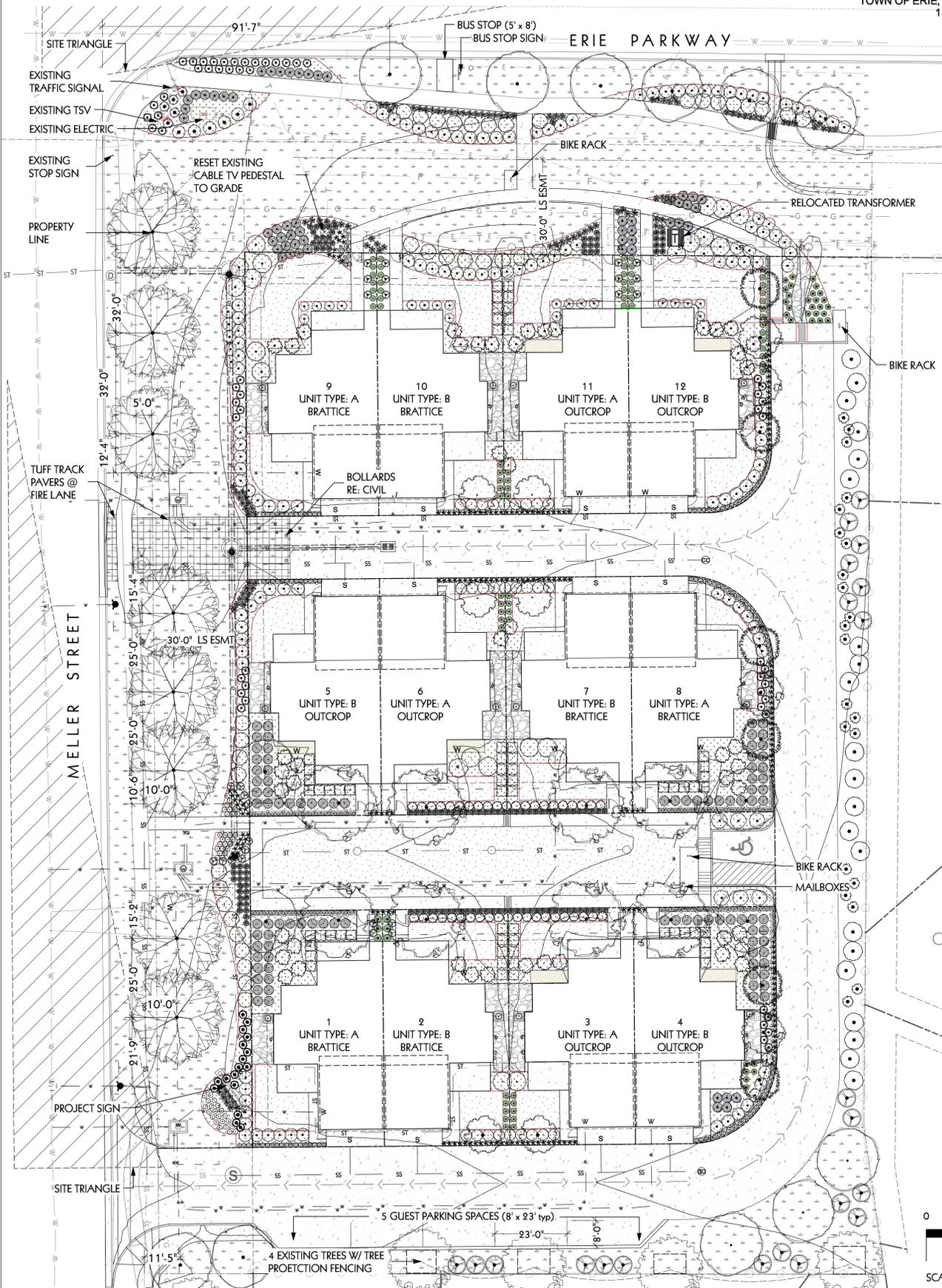
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DATE	NO.	REVISIONS	BY
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## LANDSCAPE REQUIREMENTS: 06/19/18

REQUIREMENT REFERENCE	REQUIREMENT	QUANTITY	LANDSCAPE AREA REQUIRED	LANDSCAPE AREA PROVIDED	TREES REQUIRED	TREES PROVIDED	TREES EXISTING	SHRUBS REQUIRED	SHRUBS PROVIDED	SHRUBS EXISTING
10-6-4.E.1.a	One deciduous or ornamental street tree for every fourth (40) linear feet of street frontage or portion thereof	Erie Pkwy - 224.4 Meller St - 348.24			6 9	6 9	0 0	N/A	N/A	N/A
10-6-4.E.6.a	Install trees on site, a minimum of one tree per one thousand (1,000) square feet of landscaped area, distributed on the site	47,110			47	74	4			
10-6-4.E.6.b	Install a minimum of one shrub per one hundred fifty (150) square feet of landscape area	47,110						314	694	0
10-6-4.E.6.g	Provide a minimum of fifteen percent (15%) of the entire site with landscaping of live plant materials	80,278	12,042	47,110						

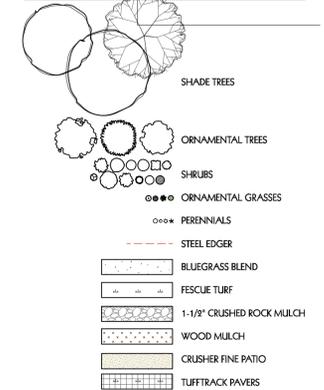
## PLANT MATERIALS MAINTENANCE

### NOTE:

LANDSCAPING SHALL BE PLANTED AND MAINTAINED IN A NEAT, CLEAN AND HEALTHY CONDITIONS BY THE OWNER. THIS SHALL INCLUDE PROPER PRUNING, MOWING, AND AERATION OF LAWN, REPLACEMENT OF MULCH, WEEDING, REMOVAL OF LITTER AND THE REGULAR WATERING OF ALL PLANTS. IRRIGATION SHALL BE MAINTAINED TO MINIMIZE WATER CONSUMPTION. SHOULD ANY PLANT MATERIAL DIE, THE OWNER, SUCCESSOR, OR ASSIGNS SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF PLANT(S) WITHIN ONE PLANTING SEASON. REPLACEMENT OF PLANT MATERIALS SHALL OCCUR AT THE FOLLOWING RATE.

TYPE:	PLANT REPLACE WITHIN	
	1 YEAR	2+ YEARS
TREE - DECIDUOUS	INCREASE CALIPER BY 1"	INCREASE CALIPER BY 1.5"
TREE-CONIFEROUS	INCREASE HEIGHT BY 1.5'	INCREASE HEIGHT BY 2'
SHRUB	REPLACE WITH PLANTS OF AT LEAST 1/2 MATURE SIZE	REPLACE WITH PLANTS OF AT LEAST 1/2 MATURE SIZE

## LEGEND:



YMBOL	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING
<b>HADE TREES</b>					
O	8	Quercus macrocarpa	Burr Oak	2" CAL.	AS SHOWN
FSM	2	Acer saccharum 'Flashfire'	Flashfire Sugar Maple	2" CAL.	AS SHOWN
F	5	Conylus columna	Turkish Filbert	2" CAL.	AS SHOWN
OTAL:	23				
<b>VERGREEN TREES</b>					
J	27	Juniperus chinensis 'Spartan'	Spartan Juniper	6' HT.	AS SHOWN
OTAL:	27				
<b>ORNAMENTAL TREES</b>					
P	6	Pyrus calleryana 'Glen's Form'	Chanticleer Flowering Pear	1-1/2" CAL.	AS SHOWN
RC	6	Malus 'Prairie Rose'	Prairie Rose Crabapple	1-1/2" CAL.	AS SHOWN
SC	12	Malus x 'Spring Snow'	Spring Snow Crabapple	1-1/2" CAL.	AS SHOWN
OTAL:	24				
<b>SHRUBS</b>					
WS	148	Spiraea x bumalda 'Anthony Waterer'	Anthony Waterer Spiraea	5 gallon	3.5' o.c.
MS	22	Blue Mist Spiraea	Caryopteris x clandonensis 'Dark Knight'	5 gallon	4' o.c.
SR	27	Rosa Carefree Sunshine	Carefree Sunshine Rose	5 gallon	4' o.c.
N	134	Physocarpus opulifolius 'Nanus'	Dwarf Ninebark	5 gallon	4' o.c.
ILFS	43	Rhus aromatica 'Gro-Low'	Gro-Low Fragrant Sumac	5 gallon	6' o.c.
DP	20	Ligustrum wilgare 'Lodense'	Lodense Privet	5 gallon	3.5' o.c.
KL	62	Syringa patula 'Miss Kim'	Miss Kim Lilac	5 gallon	3.5' o.c.
IWR	47	Rosa x 'Nearly Wild'	Nearly Wild Rose (Floribunda)	5 gallon	3' o.c.
BB	33	Buddleja davidii 'nanhoensis' 'Pette Plum'	Compact Purple Butterfly Bush	5 gallon	5' o.c.
KOR	74	Rosa x 'Rainbow'	Rainbow Knock Out Rose	5 gallon	3' o.c.
TD	44	Cornus alba 'Regenza'	Red Gnome (tm) Dogwood	5 gallon	6' o.c.
MBBS	26	Picea pungens 'St. Mary's Broom'	St. Mary's Broom Colorado Blue Spruce	5 gallon	4' o.c.
VBB	14	Buddleja davidii 'Nanho White'	Nanho White Butterfly Bush	5 gallon	5' o.c.
OTAL:	624				
<b>ORNAMENTAL GRASSES</b>					
VFG	107	Calamagrostis acutiflora 'Avalanche'	Avalanche Feather Reed Grass	1 gallon	2' o.c.
AG	114	Helictotrichon sempervirens	Blue Avena Grass	1 gallon	18" o.c.
FG	120	Pennisetum alopecuroides 'Hameln'	Dwarf Fountain Grass	1 gallon	18" o.c.
OTAL:	341				
<b>PERENNIALS</b>					
C	49	Ceranium sanguineum	Bloody Cranesbill	1 gallon	18" o.c.
SD	197	Leucanthemum x superbum 'Silver Princess'	Compact Shasta Daisy	1 gallon	18" o.c.
L	130	Lavandula angustifolia 'Munstead'	English Lavender	1 gallon	18" o.c.
IL	195	Lavandula angustifolia 'Hidcote'	Deep Blue Lavender	1 gallon	15" o.c.
OTAL:	571				

## GENERAL NOTES:

1. TRANSFORMERS, GROUND MOUNTED HVAC EQUIPMENT, UTILITY PEDESTALS, ETC. ARE NOT SHOWN ON THE LANDSCAPE PLAN. ADDITIONAL LANDSCAPING AND ASSOCIATED IRRIGATION WILL BE REQUIRED BASED UPON FIELD CONDITIONS IN ORDER TO SCREEN ABOVE GROUND UTILITY FACILITIES. THE ADDITIONAL LANDSCAPING OF THE ABOVE GROUND UTILITY FACILITIES SHALL BE INSTALLED PRIOR TO INSPECTION BY THE LANDSCAPE ARCHITECT. THE COMPLIANCE STATEMENT SUBMITTED FOR INITIAL ACCEPTANCE OF THE LANDSCAPING SHALL INCLUDE A DECLARATION THAT THE UTILITY FACILITIES HAVE BEEN LANDSCAPED AS REQUIRED.

0 20 40 FT

SCALE: 1"=20'-0"

## DEVELOPER

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



landscape architecture +  
urban design +  
planning

## LANDSCAPE PLAN - MASTER PLAN SHEET 3 OF 12

DATE	NO.	REVISIONS	BY
06/19/18	6	SITE PLAN REVIEW SUBMITTAL #6	SG
06/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	SG
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
12/21/17	3	SITE PLAN REVIEW SUBMITTAL #3	SG
09/20/18	2	SITE PLAN REVIEW SUBMITTAL #2	SG
07/21/18	1	SITE PLAN COMPLETENESS SUBMITTAL	SG

DATE: 07/21/18 JOB NO. 16180 CHECKED BY: CSLA

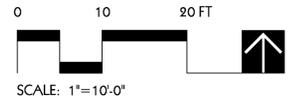
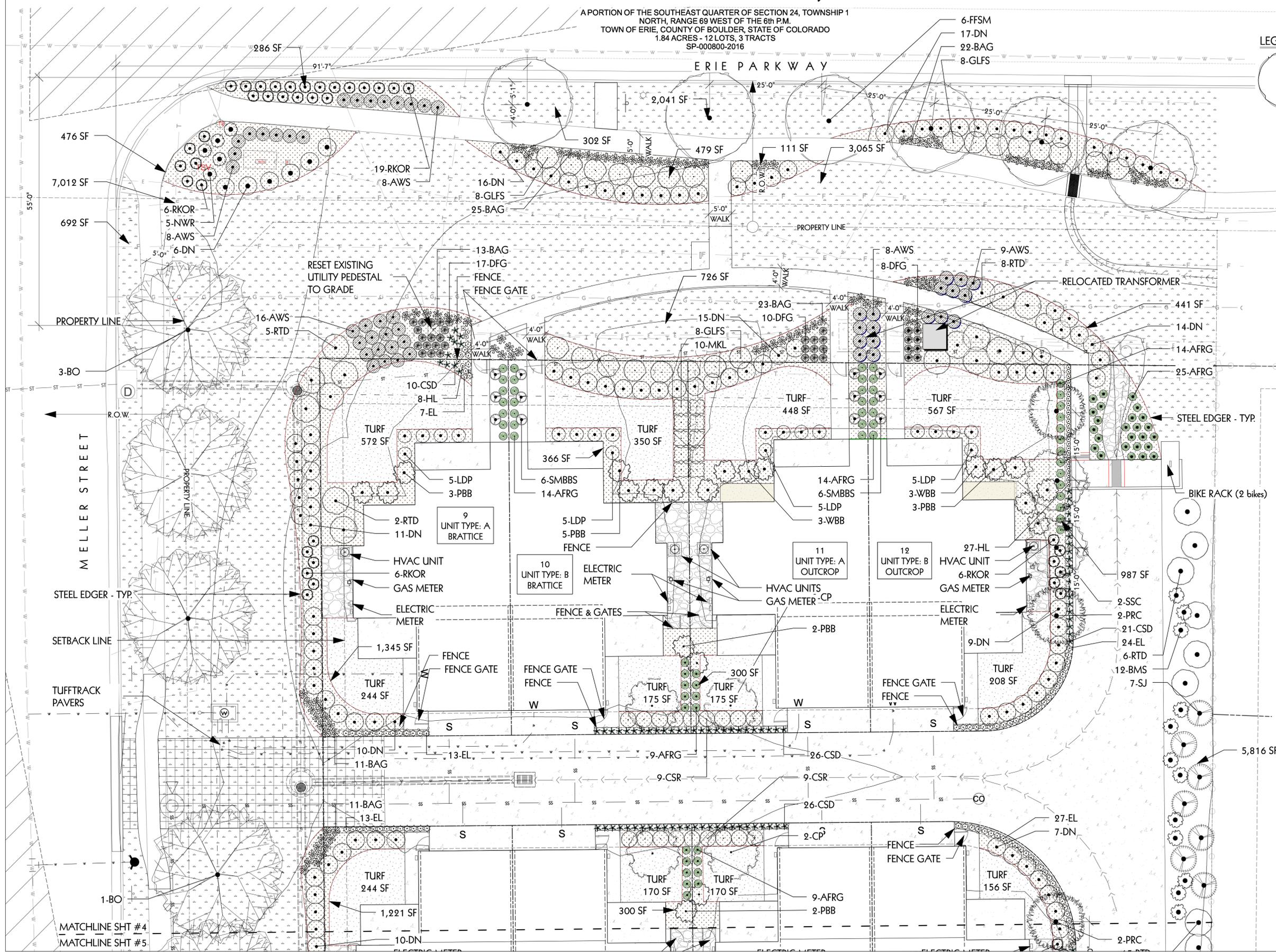
# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016

ERIE PARKWAY

LEGEND:

- SHADE TREES
- ORNAMENTAL TREES
- SHRUBS
- ORNAMENTAL GRASSES
- PERENNIALS
- STEEL EDGER
- BLUEGRASS BLEND
- FESCUE TURF
- 1-1/2" CRUSHED ROCK MULCH
- WOOD MULCH
- CRUSHER FINE PATIO
- TUFFTRACK PAVERS



**DEVELOPER**  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



LANDSCAPE PLAN - NORTH		SHEET 4 OF 12	
06/19/18	6	SITE PLAN REVIEW SUBMITTAL #6	SG
05/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	SG
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
12/21/17	3	SITE PLAN REVIEW SUBMITTAL #3	SG
09/20/18	2	SITE PLAN REVIEW SUBMITTAL #2	SG
07/21/18	1	SITE PLAN COMPLETENESS SUBMITTAL	SG
DATE	NO.	REVISIONS	BY
DATE: 07/21/18	JOB NO. 16180	CHECKED BY: CSLA	

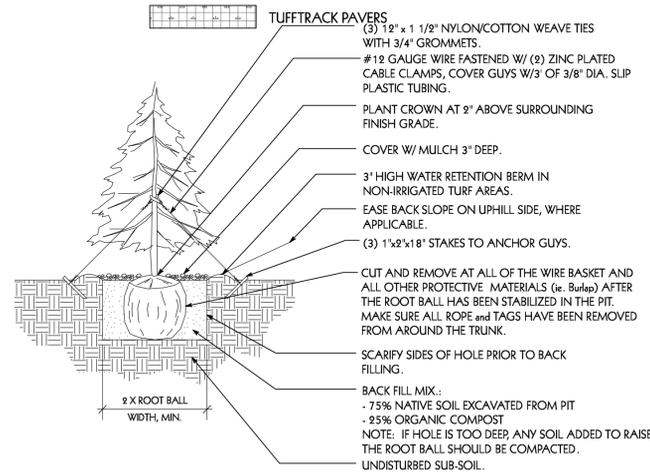


# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

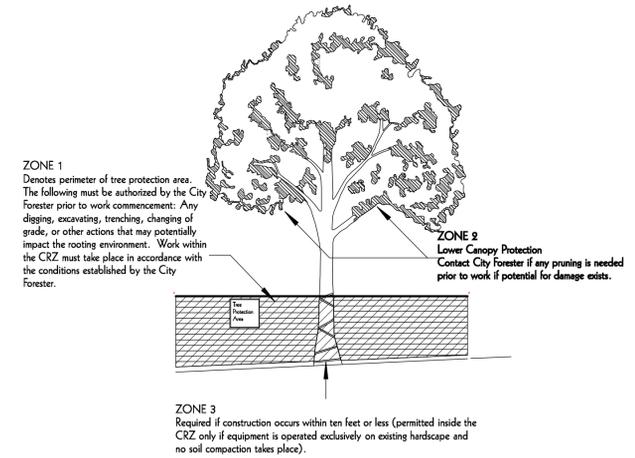
A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016

## PLANT NOTES:

- All plant material shall meet specifications of the American Association of Nurserymen (AAN) for number one grade. All trees shall be balled and burlapped or equivalent. All plant materials shall have all wire, twine or other containment materials, except for burlap, removed from trunk and root ball of the plant prior to planting.
- Trees shall not be planted closer 10 feet to any sewer or water line. Tree planting shall be coordinated with Xcel Energy Company. Locations of all utilities shall be verified in the field prior to planting.
- All shrubs shall be planted no less than 3' from any sidewalk or curb.
- Grades shall be set to allow for proper drainage away from structures. Grades shall maintain smooth profiles and be free of surface debris, bumps, and depressions.
- Developers shall ensure that the landscape plan is coordinated with the plans done by other consultants so that the proposed grading, storm drainage, or other constructions does not conflict nor preclude installation and maintenance of landscape elements on this plan.
- All shrub bed areas shall be mulched with a 4" layer of wood bark mulch. Perennials and groundcover areas shall be mulched with a 4" layer of shredded bark mulch. **No fabric to be installed in any ornamental grass, perennial or groundcover areas.**
- Prior to installation of plant materials, areas that have been compacted or disturbed by construction activity shall be thoroughly loosened, organic soil amendments shall be incorporated at the rate of at least three (3) cubic yards per 1000 square feet of landscape area in all turf and shrub beds. Incorporate only 1.5 CY in seed areas.
- All perimeter areas will be sodded with a fescue blend. Manicured turf shall be sodded with Drought Tolerant Bluegrass Blend.
- All landscape (plant materials and grass) will be irrigated with an automatic system. Turf areas will have a spray zone. Plants with like water requirements are shown together in order to have an efficient use of water. See Irrigation Plans for detailed information.
- Contractor shall verify all material quantities prior to installation. Actual number of plant symbols shall have priority over the quantity designated.
- Refer to the Town of Erie Design and Construction Streetscaping Standards for all work within public areas, including tree protection standards. The developer will make every effort possible to protect trees within the site using the same standards.
- Refer to the Civil Engineer Drawings for Grading and Utility information.
- This plan meets or exceeds Town of Erie landscape code requirements.



**TREE PROTECTION AREA**  
The area inside a perimeter established at the Critical Root Zone (CRZ). The CRZ is equal to the drip-line, furthest extent of tree canopy, or is equal to one foot radially from the tree for every one inch of trunk diameter at breast height (DBH = 4.5' above soil line), or whichever is greater.

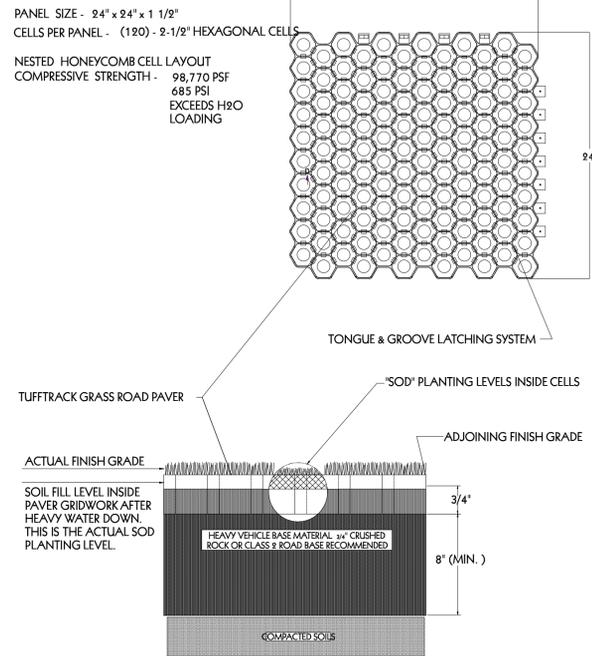
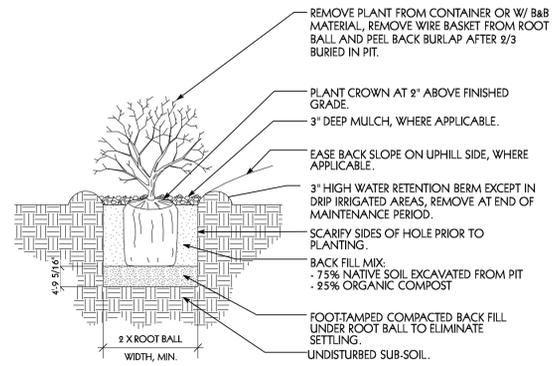
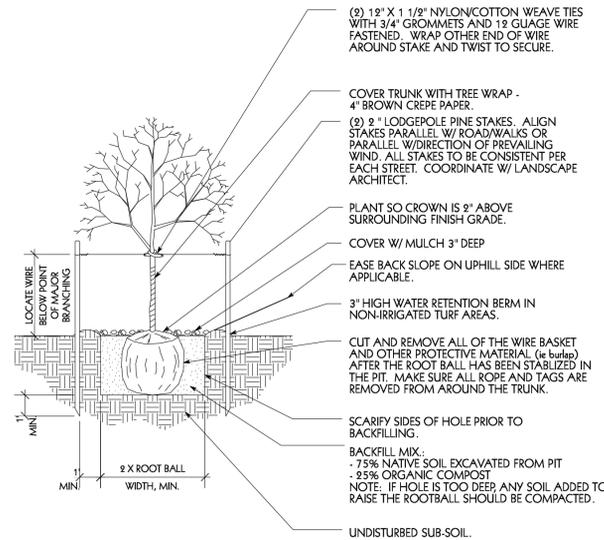


## NOTES

- Tree Retention and Protection Specifications shall be followed throughout duration of project.
- The Tree Protection Area shall not be modified or removed prior to consent of the City Forester.
- Materials, debris, equipment, and site amenities shall not be stored within the Tree Protection Area.
- Zone One Tree Protection Area fencing shall be "orange safety fencing," min. 48" in height, top secured to metal T-posts with 14-gauge wire woven through top of fencing for entire length.
- T-posts shall be placed so that wire & fence are taut.
- Chain link fencing is also acceptable.

## TREE PROTECTION FENCING

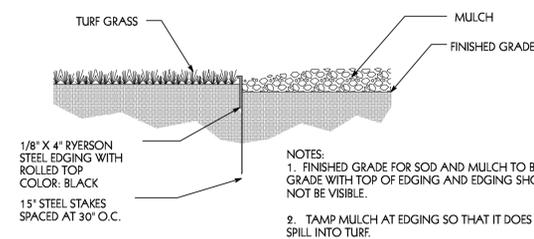
SCALE: NTS



**NOTE:**  
EXISTING SOILS SHOULD BE EVALUATED TO ENSURE PROPER STRUCTURAL AND PERMEABILITY PROPERTIES.

## EDGING

SCALE: NTS



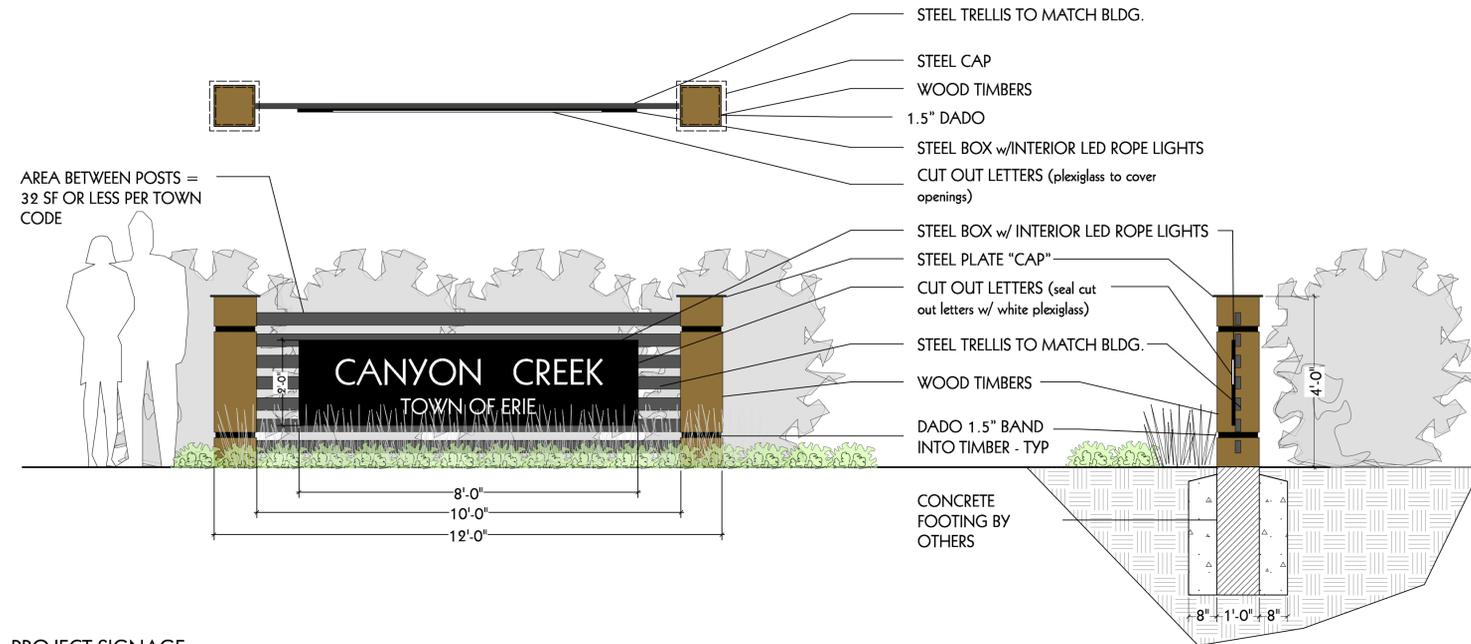
**DEVELOPER**  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



LANDSCAPE DETAILS		SHEET 6 OF 12	
06/19/18	6	SITE PLAN REVIEW SUBMITTAL #6	SG
05/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	SG
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
12/21/17	3	SITE PLAN REVIEW SUBMITTAL #3	SG
09/20/18	2	SITE PLAN REVIEW SUBMITTAL #2	SG
07/21/18	1	SITE PLAN COMPLETENESS SUBMITTAL	SG
DATE	NO.	REVISIONS	BY
DATE: 07/21/18		JOB NO. 16180.	CHECKED BY: CSLA

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
 NORTH, RANGE 69 WEST OF THE 6th P.M.  
 TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
 1.84 ACRES - 12 LOTS, 3 TRACTS  
 SP-000800-2016



PROJECT SIGNAGE  
 SCALE: 1/2" = 1'-0"

**DEVELOPER**  
 HESHMAT PROPERTIES LLC  
 5385 LOOKOUT RIDGE DRIVE  
 BOULDER CO 80301  
 CONTACT: YASI TAYLOR



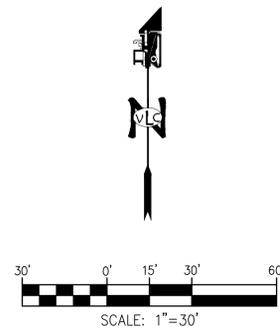
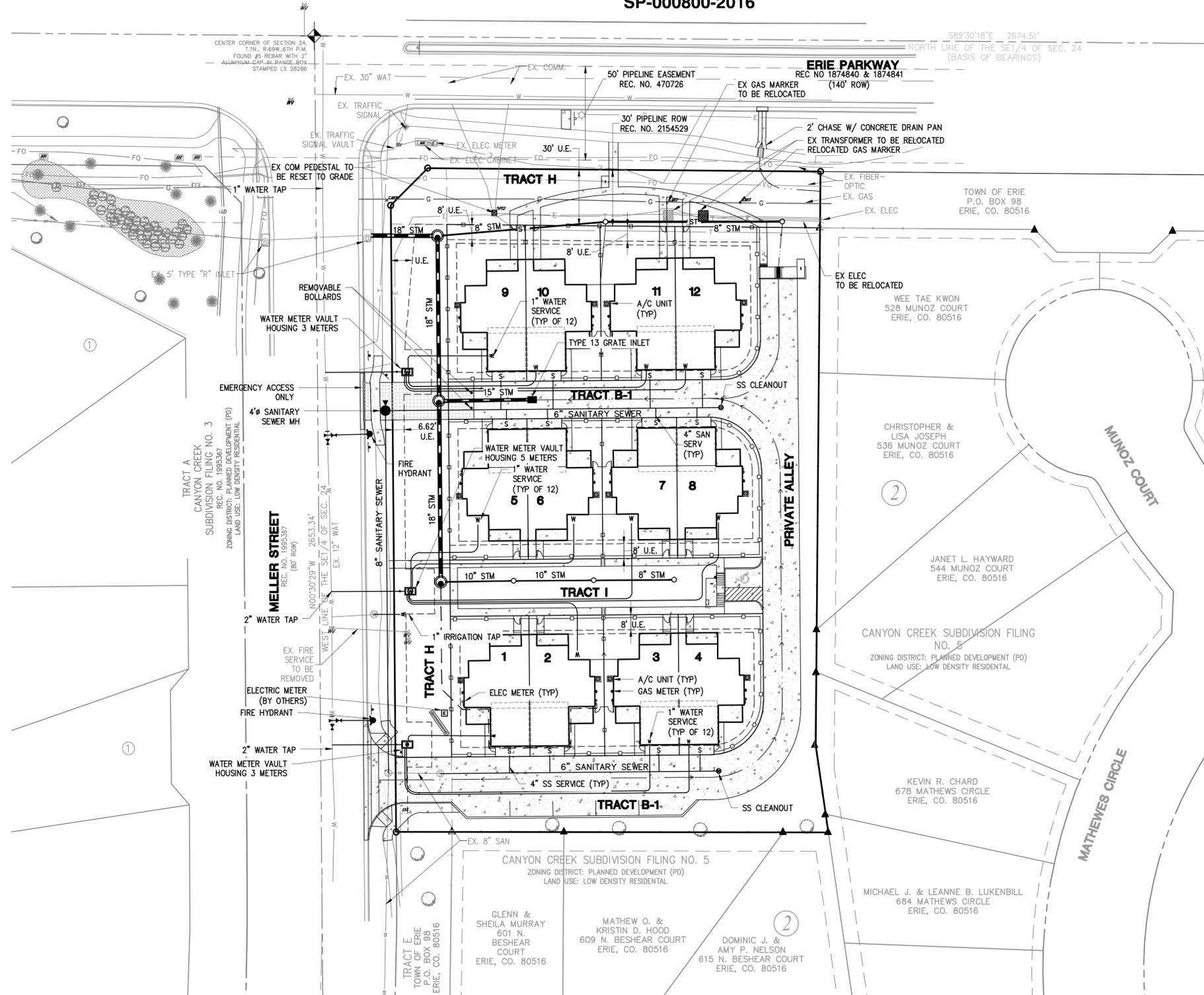
SIGN DETAILS		SHEET 7 OF 12	
DATE	NO.	REVISIONS	BY
06/19/18	6	SITE PLAN REVIEW SUBMITTAL #6	SG
05/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	SG
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
12/21/17	3	SITE PLAN REVIEW SUBMITTAL #3	SG
09/20/16	2	SITE PLAN REVIEW SUBMITTAL #2	SG
07/21/16	1	SITE PLAN COMPLETENESS SUBMITTAL	SG
DATE	NO.	REVISIONS	BY
DATE: 07/21/16	JOB NO. 15180	CHECKED BY: CSLA	

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
 NORTH, RANGE 69 WEST OF THE 6th P.M.  
 TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
 1.84 ACRES - 12 LOTS, 3 TRACTS  
 SP-000800-2016

## LEGEND:

- SS — EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- - - EXISTING STORM SEWER
- ⊙ EXISTING STORM MANHOLE
- ⊞ EXISTING STORM INLET
- W — EXISTING WATER LINE
- ⊙ EXISTING FIRE HYDRANT
- ⊙ EXISTING WATER VALVE
- E — EXISTING POWER LINE
- ⊙ EXISTING LIGHT POLE
- ⊞ EXISTING ELECTRIC BOX
- T — EXISTING COMMUNICATIONS LINE
- ⊞ EXISTING TELEPHONE PEDESTAL
- G — EXISTING GAS LINE
- P — PROPERTY BOUNDARY
- B — PROPOSED BUILDING
- O — PROPOSED BUILDING OVERHANG
- SS — PROPOSED SANITARY SEWER
- S — PROPOSED STORM SEWER
- ⊙ EXISTING STORM MANHOLE
- ⊞ EXISTING STORM INLET (TYPE 16)
- B — PROPOSED BIOSWALE
- W — PROPOSED WATER LINE
- ⊞ EXISTING FIRE HYDRANT
- ⊞ EXISTING WATER TEE
- ⊞ EXISTING WATER GATE VALVE
- ⊞ EXISTING WATER CURB STOP
- ⊞ EXISTING WATER METER



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DEVELOPER  
 HESHMAT PROPERTIES LLC  
 5385 LOOKOUT RIDGE DRIVE  
 BOULDER CO 80301  
 CONTACT: YASI TAYLOR

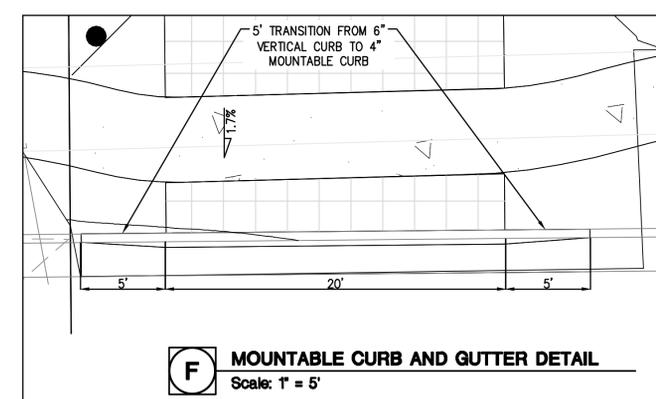
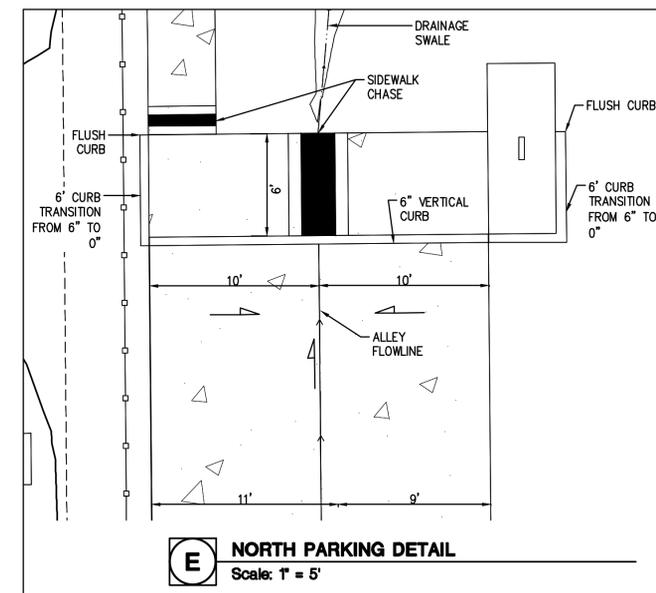
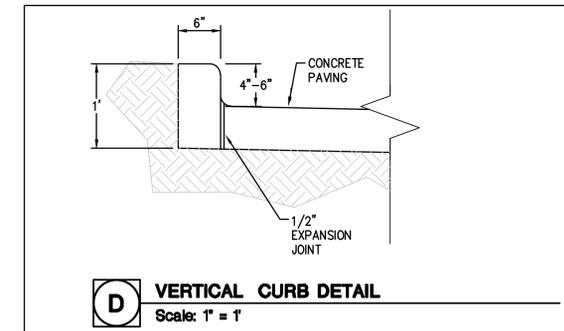
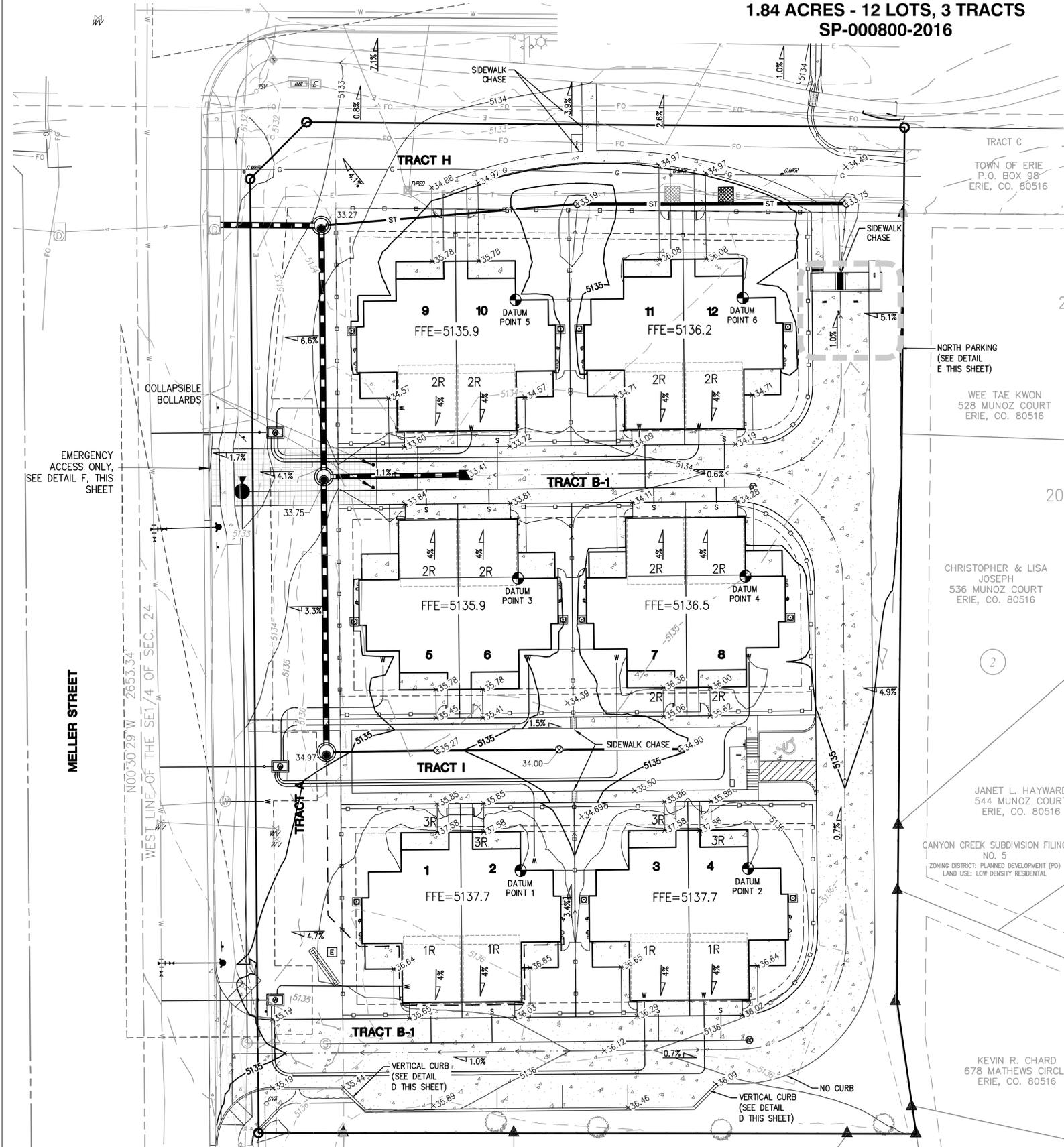
UTILITY PLAN		SHEET 8 OF 12	
06/01/18	5	SITE PLAN SUBMITTAL # 4	CLP
03/22/18	4	SITE PLAN SUBMITTAL # 3	CLP
12/21/17	3	SITE PLAN SUBMITTAL # 2	CLP
09/20/16	2	SITE PLAN SUBMITTAL	BAR
07/21/16	1	SITE PLAN COMPLETENESS SUBMITTAL	BAR
DATE	NO.	REVISIONS	BY
DATE: 02/15/16	JOB NO. 020232	CHECKED BY	LIT

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
 NORTH, RANGE 69 WEST OF THE 6th P.M.  
 TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
 1.84 ACRES - 12 LOTS, 3 TRACTS  
 SP-000800-2016

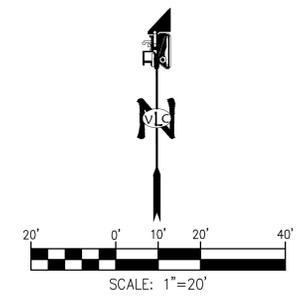
BUILDING HEIGHT CALCULATIONS						
DATUM POINT	UNIT #	ELEVATION	FF ELEV	UNIT TYPE	STRUCTURE HEIGHT	MEASURED HEIGHT
DP1	1 & 2	5137.20	5137.70	BRATTICE	21.99	22.49
DP2	3 & 4	5137.20	5137.70	OUTCROP	22.84	23.34
DP3	5 & 6	5135.40	5135.90	OUTCROP	22.84	23.34
DP4	7 & 8	5136.00	5136.50	BRATTICE	21.99	22.49
DP5	9 & 10	5135.40	5135.90	BRATTICE	21.99	22.49
DP6	11 & 12	5135.70	5136.20	OUTCROP	22.84	22.49

UNDER NO CIRCUMSTANCES SHALL THE FINISHED GRADE AROUND EACH BUILDING BE HIGHER THAN 6-INCHES BELOW THE FINISHED FLOOR (FF) ELEVATION.



- LEGEND:**
- EXISTING MAJOR CONTOUR
  - EXISTING MINOR CONTOUR
  - SS EXISTING SANITARY SEWER
  - EXISTING SANITARY MANHOLE
  - EXISTING STORM SEWER
  - EXISTING STORM MANHOLE
  - EXISTING STORM INLET
  - W EXISTING WATER LINE
  - EXISTING FIRE HYDRANT
  - EXISTING WATER VALVE
  - E EXISTING POWER LINE
  - EXISTING LIGHT POLE
  - EXISTING ELECTRIC BOX
  - EXISTING COMMUNICATIONS LINE
  - EXISTING TELEPHONE PEDESTAL
  - EXISTING GAS LINE
  - ZONE LOT LINE (PROPERTY BOUNDARY)
  - 5320 PROPOSED MAJOR CONTOUR
  - 5321 PROPOSED MINOR CONTOUR
  - PROPOSED BUILDING
  - PROPOSED BUILDING OVERHANG
  - SS PROPOSED SANITARY SEWER
  - PROPOSED STORM SEWER
  - PROPOSED STORM MANHOLE
  - PROPOSED STORM INLET (TYPE 16)
  - PROPOSED BIOSWALE
  - W PROPOSED WATER LINE
  - PROPOSED FIRE HYDRANT
  - PROPOSED WATER TEE
  - PROPOSED WATER GATE VALVE
  - PROPOSED WATER CURB STOP
  - PROPOSED WATER METER
  - 1R # OF GARAGE STEPS

- ABBREVIATIONS:**
- FFE FINISH FLOOR ELEVATION



**DEVELOPER**  
 HESHMAT PROPERTIES LLC  
 5385 LOOKOUT RIDGE DRIVE  
 BOULDER CO 80301  
 CONTACT: YASI TAYLOR

GRADING PLAN		SHEET 9 OF 12	
06/01/18	5	SITE PLAN SUBMITTAL # 4	CLP
03/22/18	4	SITE PLAN SUBMITTAL # 3	CLP
12/21/17	3	SITE PLAN SUBMITTAL # 2	CLP
09/20/16	2	SITE PLAN SUBMITTAL	BAR
07/21/16	1	SITE PLAN COMPLETENESS SUBMITTAL	BAR
DATE	NO.	REVISIONS	BY
DATE	NO.	REVISIONS	BY

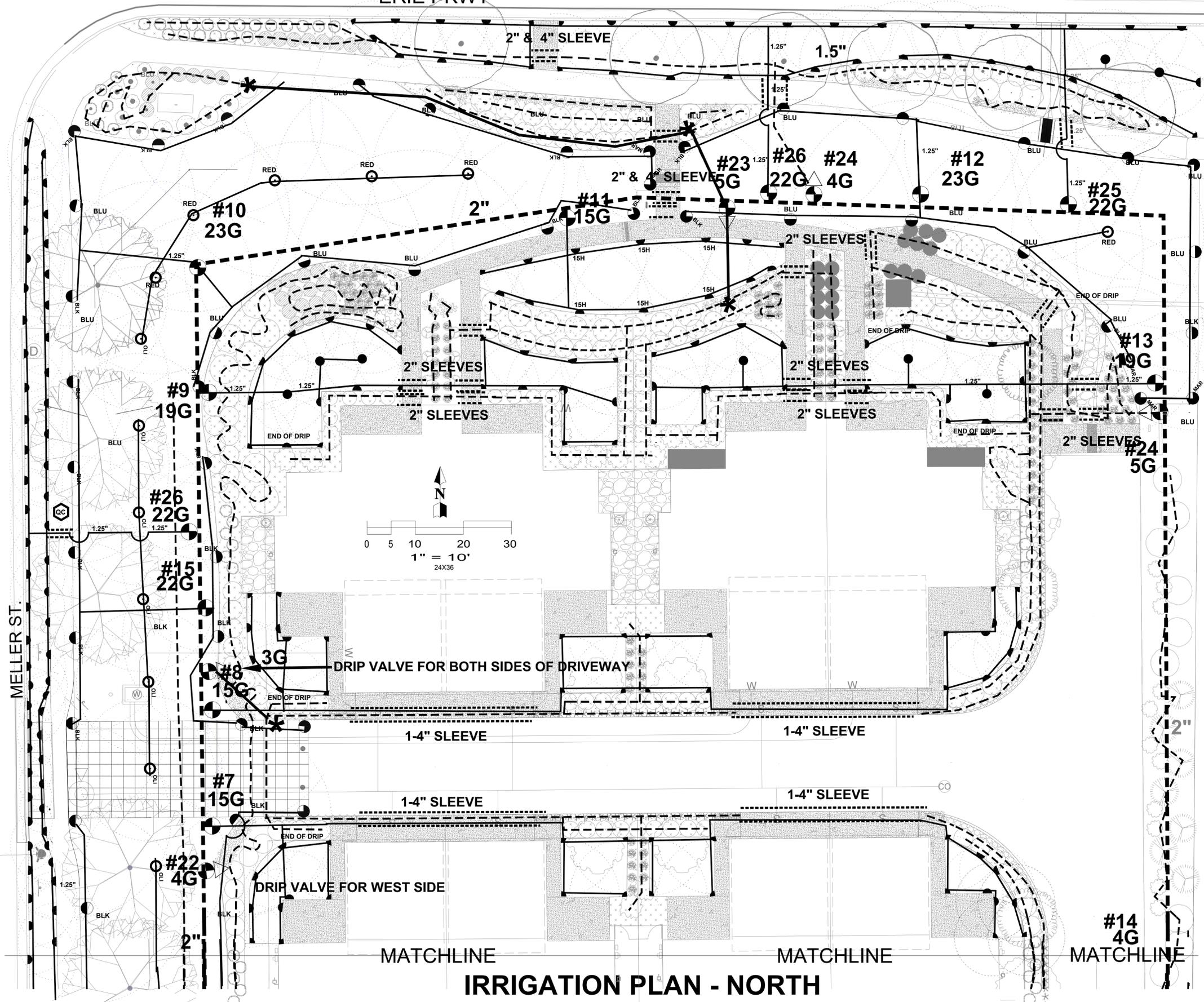
**Bowman CONSULTING**  
 603 Park Point Drive, Suite 100 Golden, CO 80401  
 Phone: (303) 674-7355 Fax: (303) 674-3263  
 www.bowmanconsulting.com

DATE: 02/15/16 JOB NO.: 020282 CHECKED BY: LIT

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
NORTH, RANGE 69 WEST OF THE 6th P.M.  
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1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016

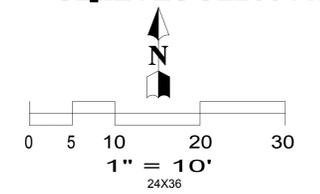
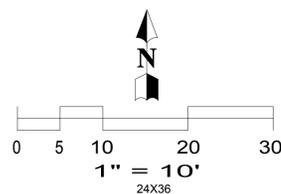
ERIE PKWY



"there will be no interconnection  
to any existing irrigation systems."

## IRRIGATION LEGEND

- | Symbol | Description                                      |
|--------|--|
| ●●●●   | HUNTER PROS-04-PRS30                             |
| ●●●●   | HUNTER MP ROTATORS W/<br>HUNTER PROS-06-PRS40-CV |
| ⊗      | FEBCO 825YA 1" RP BACK<br>FLOW W/ENCLOSURE       |
| ⊕      | RAINBIRD 100-DV                                  |
| ⊕      | Rain Bird XCZ-075<br>PRF DRIP VALVE              |
| ⊗      | RAINBIRD #33<br>QUICK COUPLER                    |
| ⊗      | RAINBIRD ESP-LXME 30                             |
| ⊗      | HUNTER WIRELESS<br>RAIN/FREEZE ON ROOF           |
| N/S    | DRIP END FLUSH ASSEMBLY                          |
| ⋈      | DRIP 3/4" UV POLY                                |
| ---    | MAINLINE 2" CL 200 PVC                           |
| —      | 1" CL200 PVC LATERAL<br>FOR DRIP                 |
| —      | LATERAL CL 200 PVC<br>1" UNLESS NOTED            |
| ⋯      | SLEEVES CL200 AS NOTED                           |



SEE SHEET 12 FOR IRRIGATION NOTES

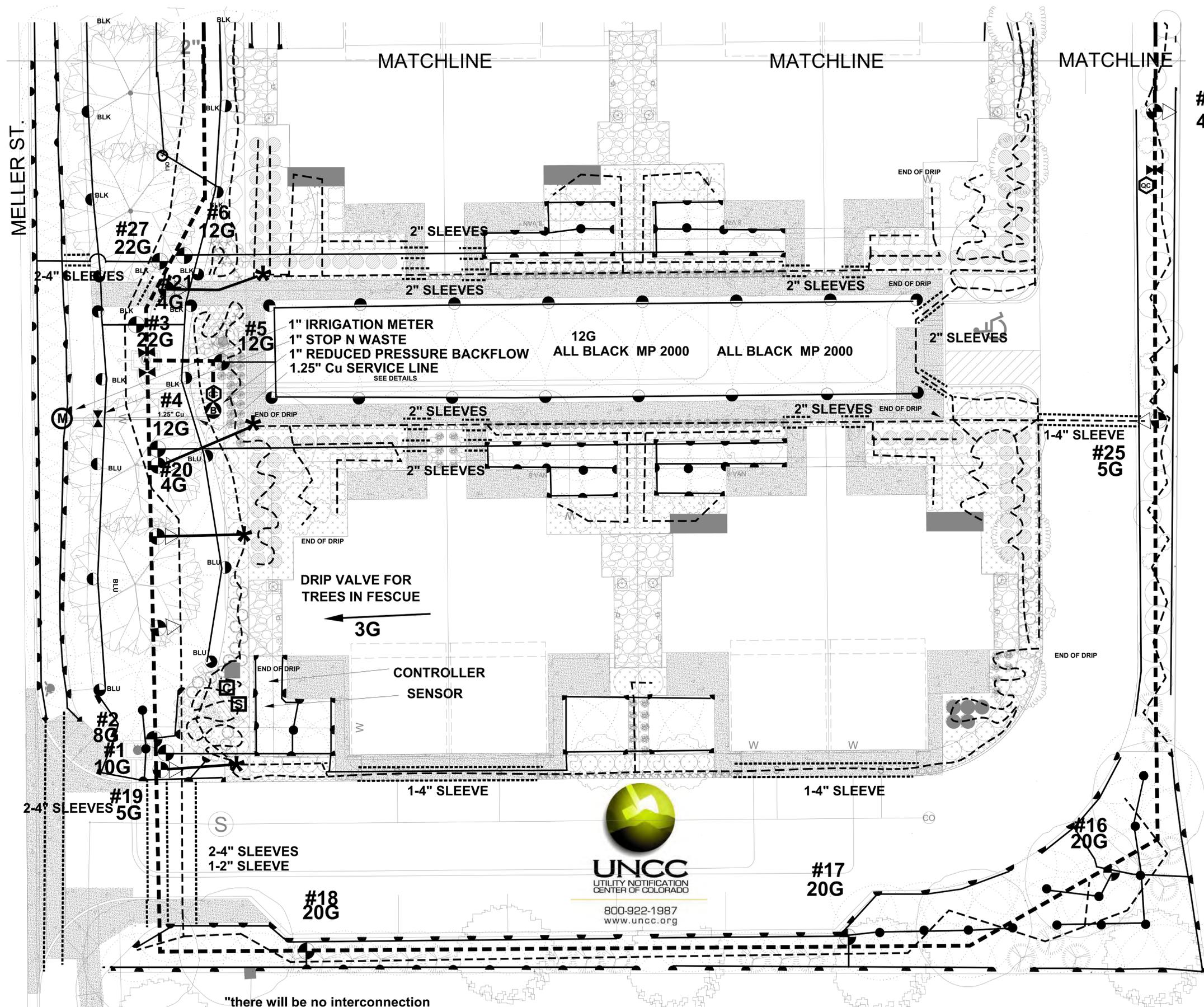
DEVELOPER  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR

WATER ENGINEERING, INC  
17337 W. 53RD DR.  
GOLDEN, COLORADO 80403  
(303) 618-6307  
CONTACT: TOM CARROLL  
carrollt@mail@aol.com



IRRIGATION PLAN - NORTH		SHEET 10 OF 12	
05/30/18	6	SITE PLAN REVIEW SUBMITTAL #6	TC
05/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	TC
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
12/21/17	3	SITE PLAN REVIEW SUBMITTAL #3	SG
09/20/16	2	SITE PLAN REVIEW SUBMITTAL #2	SG
07/21/16	1	SITE PLAN COMPLETENESS SUBMITTAL	SG
DATE	NO.	REVISIONS	BY
DATE: 07/21/16	JOB NO.: 15180	CHECKED BY: WE	

## IRRIGATION PLAN - NORTH

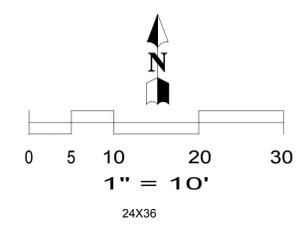


### IRRIGATION LEGEND

- | Symbol | Description                                      |
|--------|--|
| ●---●  | HUNTER PROS-04-PRS30                             |
| ●---●  | HUNTER MP ROTATORS W/<br>HUNTER PROS-06-PRS40-CV |
| ⊗      | FEBCO 825YA 1" RP BACK<br>FLOW W/ENCLOSURE       |
| ⊙      | RAINBIRD 100-DV                                  |
| ⊕      | Rain Bird X CZ-075<br>PRF DRIP VALVE             |
| ⊗      | RAINBIRD #33<br>QUICK COUPLER                    |
| ⊠      | RAINBIRD ESP-LXME 30                             |
| ⊞      | HUNTER WIRELESS<br>RAIN/FREEZE ON ROOF           |
| N/S    | DRIP END FLUSH ASSEMBLY                          |
| ⋈      | DRIP 3/4" UV POLY                                |
| ---    | MAINLINE 2" CL 200 PVC                           |
| ---    | 1" CL200 PVC LATERAL<br>FOR DRIP                 |
| ---    | LATERAL CL 200 PVC<br>1" UNLESS NOTED            |
| ----   | SLEEVES CL200 AS NOTED                           |

#14  
4G

#25  
5G



SEE SHEET 12 FOR IRRIGATION NOTES



800-922-1987  
www.uncc.org

"there will be no interconnection  
to any existing irrigation systems."

## IRRIGATION PLAN -SOUTH

WATER ENGINEERING, INC  
17337 W. 53RD DR.  
GOLDEN, COLORADO 80403  
(303) 618-6307  
CONTACT: TOM CARROLL  
carrollemail@aol.com



DEVELOPER  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR

IRRIGATION PLAN - SOUTH		SHEET 11 OF 12	
05/30/18	6	SITE PLAN REVIEW SUBMITTAL #6	TC
05/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	TC
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
12/21/17	3	SITE PLAN REVIEW SUBMITTAL #3	SG
09/20/16	2	SITE PLAN REVIEW SUBMITTAL #2	SG
07/21/16	1	SITE PLAN COMPLETENESS SUBMITTAL	SG
DATE	NO.	REVISIONS	BY
DATE 07/21/16	JOB NO. 15180	CHECKED BY	WE

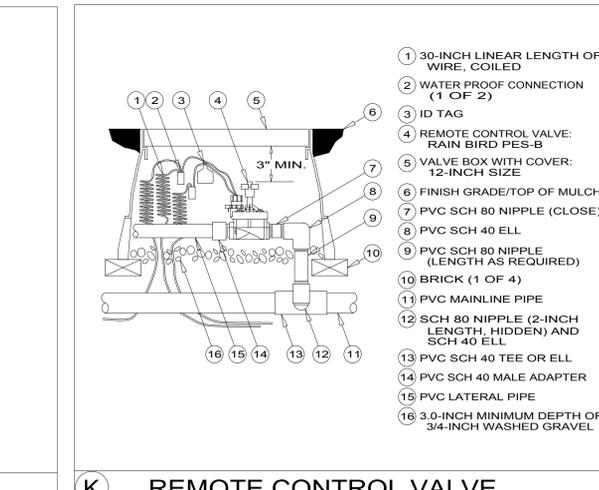
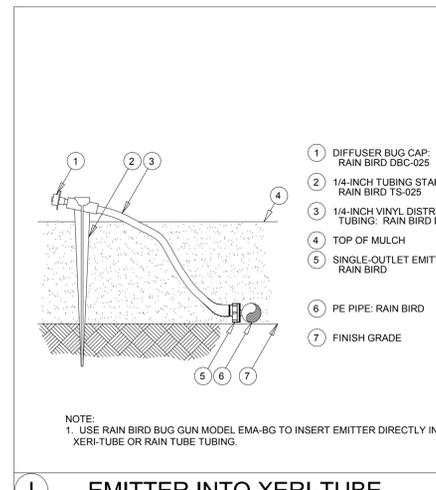
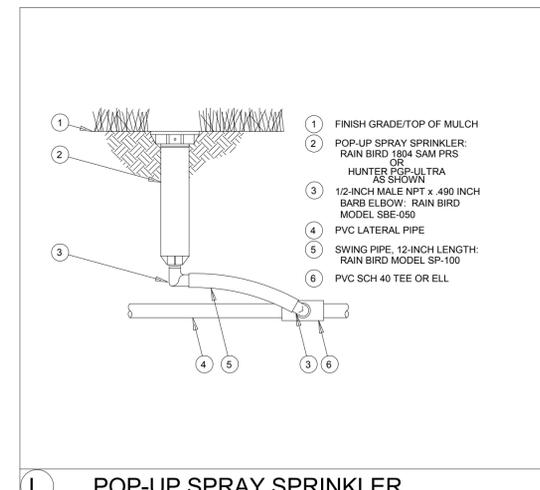
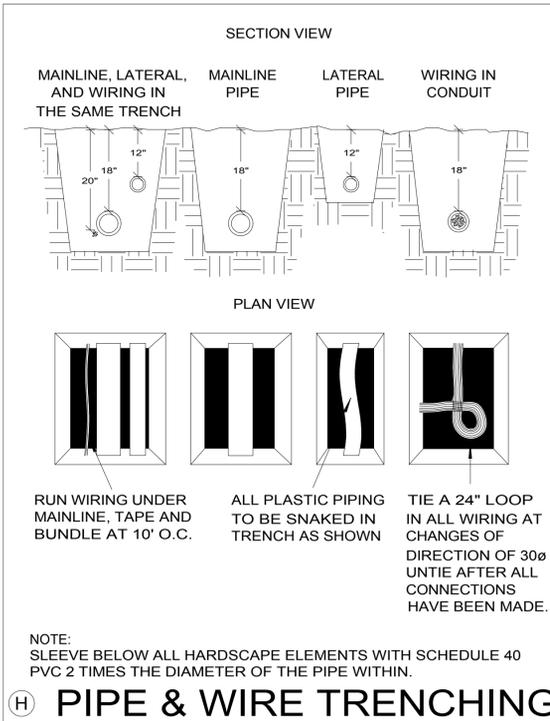
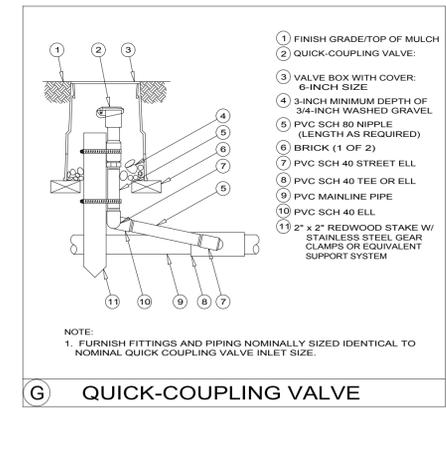
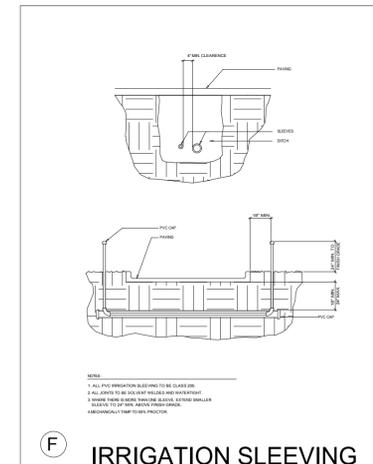
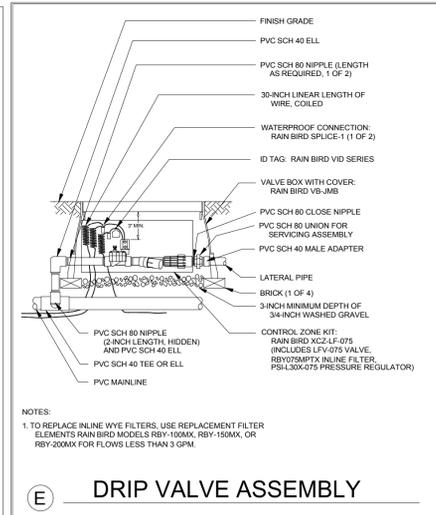
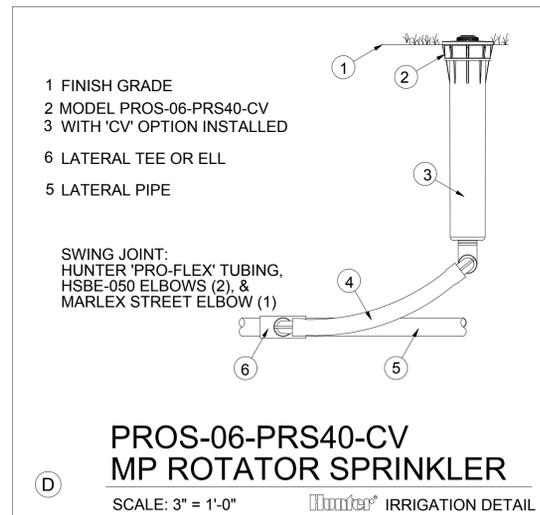
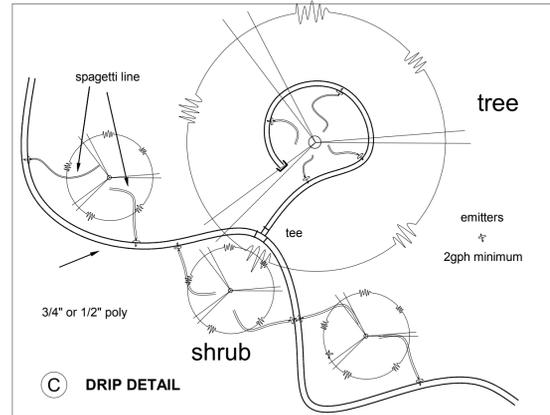
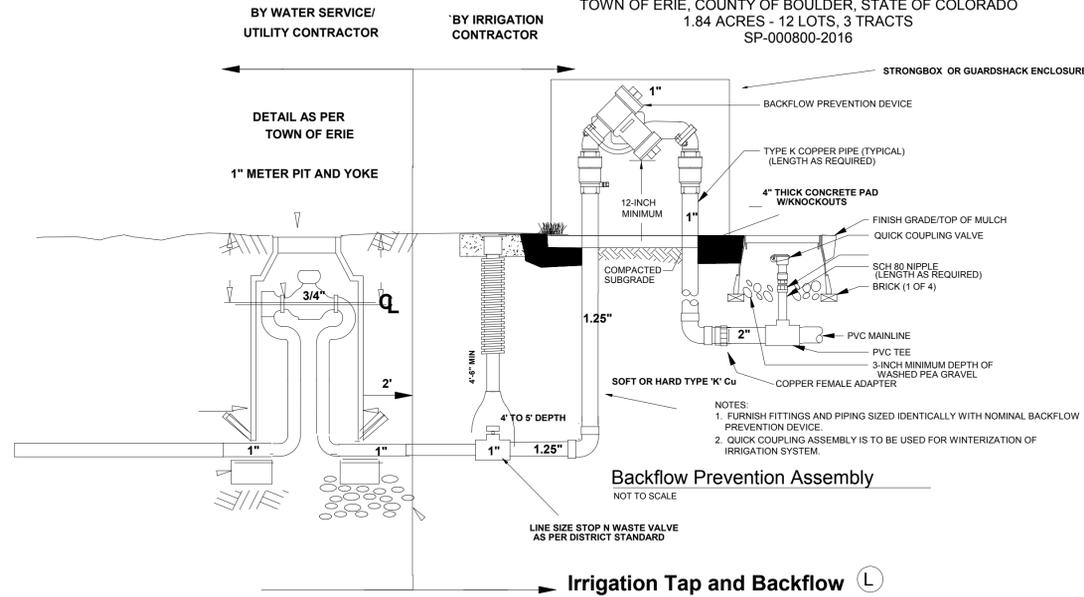
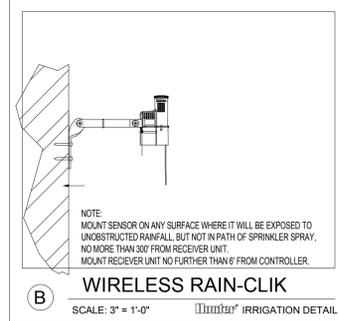
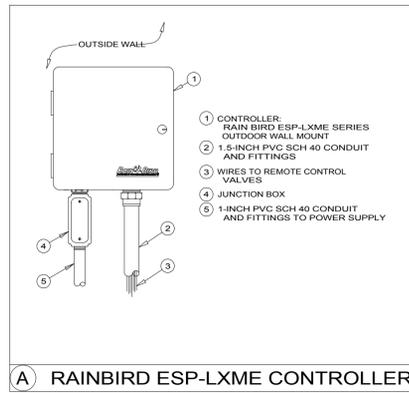


# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1  
NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016

## IRRIGATION NOTES

1. THE IRRIGATION SYSTEM UTILIZES POPUP MP ROTATORS AND SPRAYS FOR TURF, AND A DRIP SYSTEM FOR PLANTINGS.
2. IRRIGATION WATER IS SUPPLIED BY A STAND ALONE 1" WATER METER.
3. THE BACKFLOW PREVENTER SHALL BE OF THE REDUCED PRESSURE TYPE.
4. MAINLINE SHALL BE DRAINABLE AND THE ENTIRE SYSTEM SHALL BE BLOWNOUT PRIOR TO WINTER TEMPERATURES.
5. THE MAXIMUM ZONE SHALL NOT EXCEED 23 GALLONS PER MINUTE(GPM) AND IS THE LARGEST ZONE.
6. SYSTEM IS DESIGNED FOR 80PSI. PRESSURE IS REPORTED TO BE 83 PSI AS PER SCOTT SUAK UTILITY DEPT. ANY DEVIATION TO REPORTED PRESSURE SHALL BE REPORTED TO THE CONSULTANT PRIOR TO ONSET OF CONSTRUCTION.
7. SYSTEM SHALL UTILIZE A RAIN/FREEZE SENSOR CAPABLE OF ADJUSTING AND/OR OVERRIDING REGULAR PROGRAMMING OF THE CONTROLLER.
8. SYSTEM UTILIZES A RAINBIRD ESP-LXME CONTROLLER. SYSTEM SHALL BE EQUIPPED WITH RAIN/MOISTURE/FREEZE SENSORS.
9. THE DRIP SYSTEM SHALL CONSIST OF ONE 1 GALLON PER HOUR(GPH) EMITTER PER 1 GALLON SHRUB, TWO 1 GALLON EMITTERS FOR EACH 5 GALLON SHRUB AND FOUR TO SIX 1 GPH EMITTERS FOR EACH TREE DEPENDING ON SIZE AND TYPE.
10. REFER TOTOWN OF ERIE DESIGN AND CONSTRUCTION STREETSCAPING STANDARDS.
11. REFER TO THE CIVIL ENGINEER DRAWINGS FOR GRADING AND UTILITY INFORMATION.
12. THERE WILL BE NO INTERCONNECTION TO ANY EXISTING IRRIGATION SYSTEMS.



**WATER ENGINEERING, INC**  
17337 W. 53RD DR.  
GOLDEN, COLORADO 80403  
(303) 618-6307  
CONTACT: TOM CARROLL  
carroll@mail.com



**DEVELOPER**  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR

IRRIGATION DETAILS		SHEET 12 OF 12	
05/30/18	6	SITE PLAN REVIEW SUBMITTAL #6	TC
05/14/18	5	SITE PLAN REVIEW SUBMITTAL #5	TC
03/30/18	4	SITE PLAN REVIEW SUBMITTAL #4	SG
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DATE	NO.	REVISIONS	BY
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# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
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CONCEPTUAL VIEW ALONG ERIE PARKWAY

## SHEET INDEX

1. COVER SHEET
2. GROUND FLOOR PLAN - OUTCROP
3. SECOND FLOOR PLAN - OUTCROP
4. ROOF PLAN - OUTCROP
5. GROUND FLOOR PLAN - BRATTICE
6. SECOND FLOOR PLAN - BRATTICE
7. ROOF PLAN - BRATTICE
8. COLOR SCHEMES AND MATERIALS CHART
9. COLORED FRONT ELEVATIONS
10. FRONT and LEFT SIDE ELEVATIONS - OUTCROP
11. REAR and RIGHT SIDE ELEVATIONS - OUTCROP
12. FRONT and LEFT SIDE ELEVATIONS - BRATTICE
13. REAR and RIGHT SIDE ELEVATIONS - BRATTICE
14. ARCHITECTURAL DETAILS

## DEVELOPER

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



DATE	NO.	REVISIONS	BY
2018.03.30	4	Site Plan Revised Submittal	RSS
2017.12.21	3	Site Plan Revised Submittal	RSS
2016.09.20	2	Site Plan Review Submittal	RSS
2016.07.21	1	Site Plan Completeness Submittal	RSS

DATE	NO.	REVISIONS	BY
DATE	NO.	REVISIONS	BY
DATE	NO.	REVISIONS	BY

DATE: 03/30/18 JOB NO: 15180 CHECKED BY: Scott

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

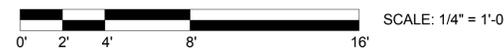
A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016



UNIT A

UNIT B

1 Ground Floor Plan - Outcrop  
1/4" = 1'-0"



### Square Footage Calculations

Unit A	
Ground Floor:	988 sq. ft.
Second Floor:	813.5 sq. ft.
<b>Total:</b>	<b>1801.5 sq. ft.</b>
Garage:	487 sq. ft.
Unit B	
Ground Floor:	988 sq. ft.
Second Floor:	813.5 sq. ft.
<b>Total:</b>	<b>1801.5 sq. ft.</b>
Garage:	487 sq. ft.
<b>Total Building Sq. Ft.</b>	<b>3603 sq. ft. (does not include garages)</b>
<b>Gross Floor Area For All Six Buildings:</b>	<b>21,618 sq. ft. (not including garages)</b>
	<b>27,462 sq. ft. (including garages)</b>

Note: Square footage calculations are based on the definition of floor area per 2017 Town of Erie Unified Development Code, Chapter 11, Definitions

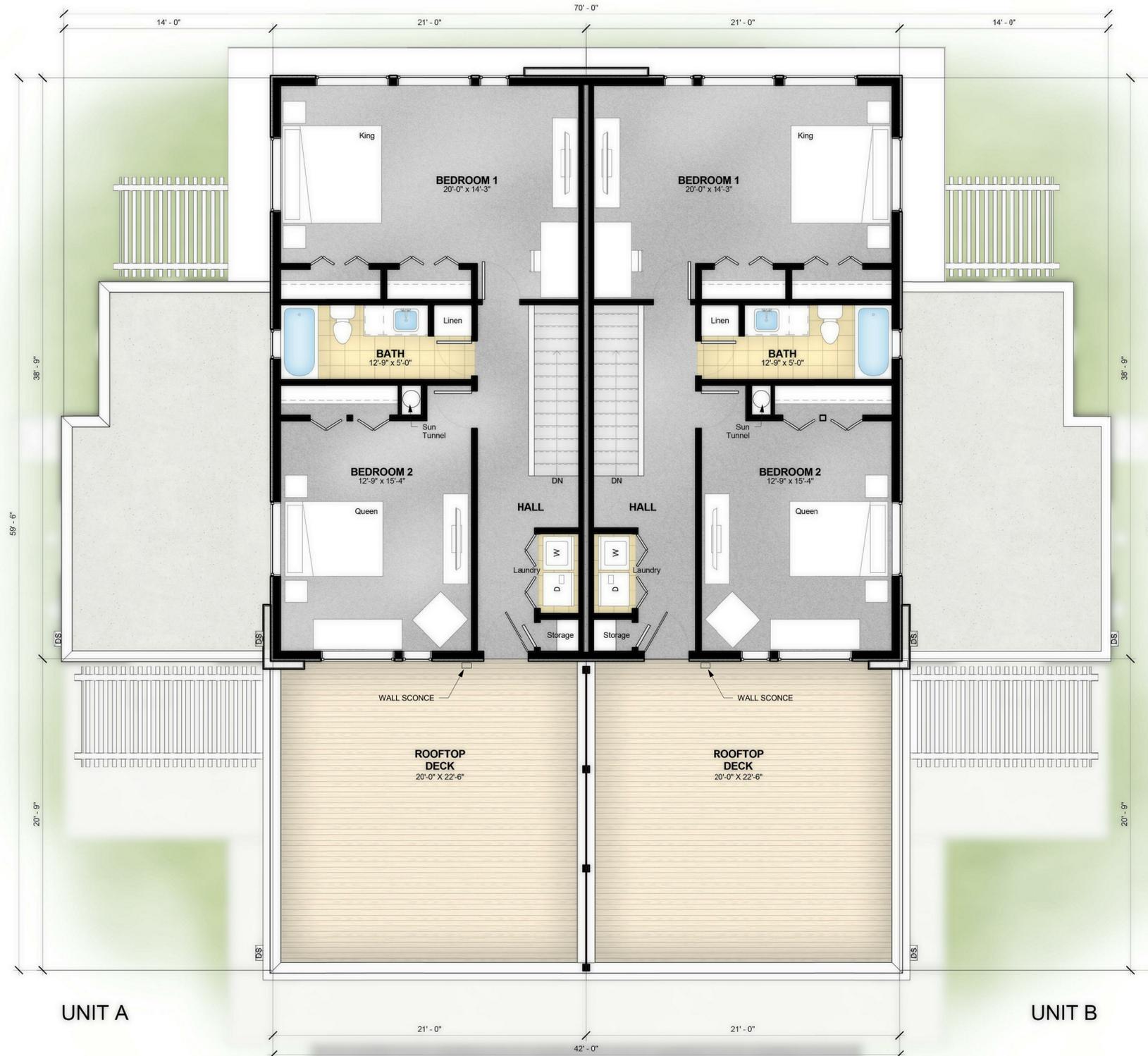
DEVELOPER  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Ground Floor Plan - Outcrop				SHEET 2 OF 14	
2018.03.30	4	Site Plan Revised Submittal			RSS
2017.12.21	3	Site Plan Revised Submittal			RSS
2016.09.20	2	Site Plan Review Submittal			RSS
2016.07.21	1	Site Plan Completeness Submittal			RSS
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TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
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### Square Footage Calculations

Unit A	
Ground Floor:	988 sq.ft.
Second Floor:	813.5 sq.ft.
<b>Total:</b>	<b>1801.5 sq.ft.</b>
Garage:	487 sq.ft.
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Ground Floor:	988 sq.ft.
Second Floor:	813.5 sq.ft.
<b>Total:</b>	<b>1801.5 sq.ft.</b>
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### DEVELOPER

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Second Floor Plan - Outcrop SHEET 3 OF 14

DATE	NO.	REVISIONS	BY
2018.03.30	4	Site Plan Revised Submittal	RSS
2017.12.21	3	Site Plan Revised Submittal	RSS
2016.09.20	2	Site Plan Review Submittal	RSS
2016.07.21	1	Site Plan Completeness Submittal	RSS

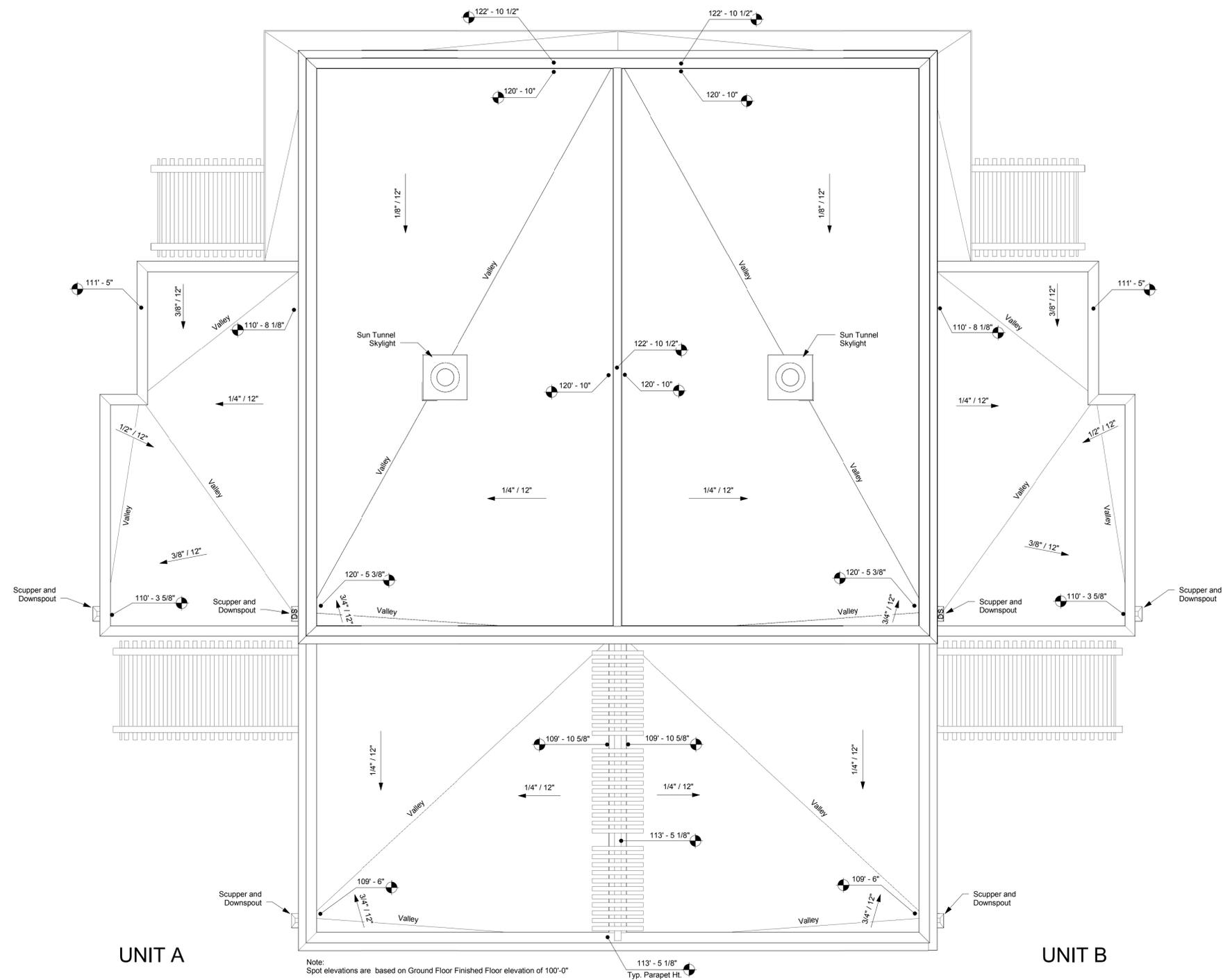
DATE: 03/30/18 JOB NO: 15180 CHECKED BY: Scott

1 Second Floor Plan - Outcrop  
1/4" = 1'-0"



# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016



UNIT A

UNIT B

1 Roof Plan - Outcrop  
1/4" = 1'-0"



SCALE: 1/4" = 1'-0"

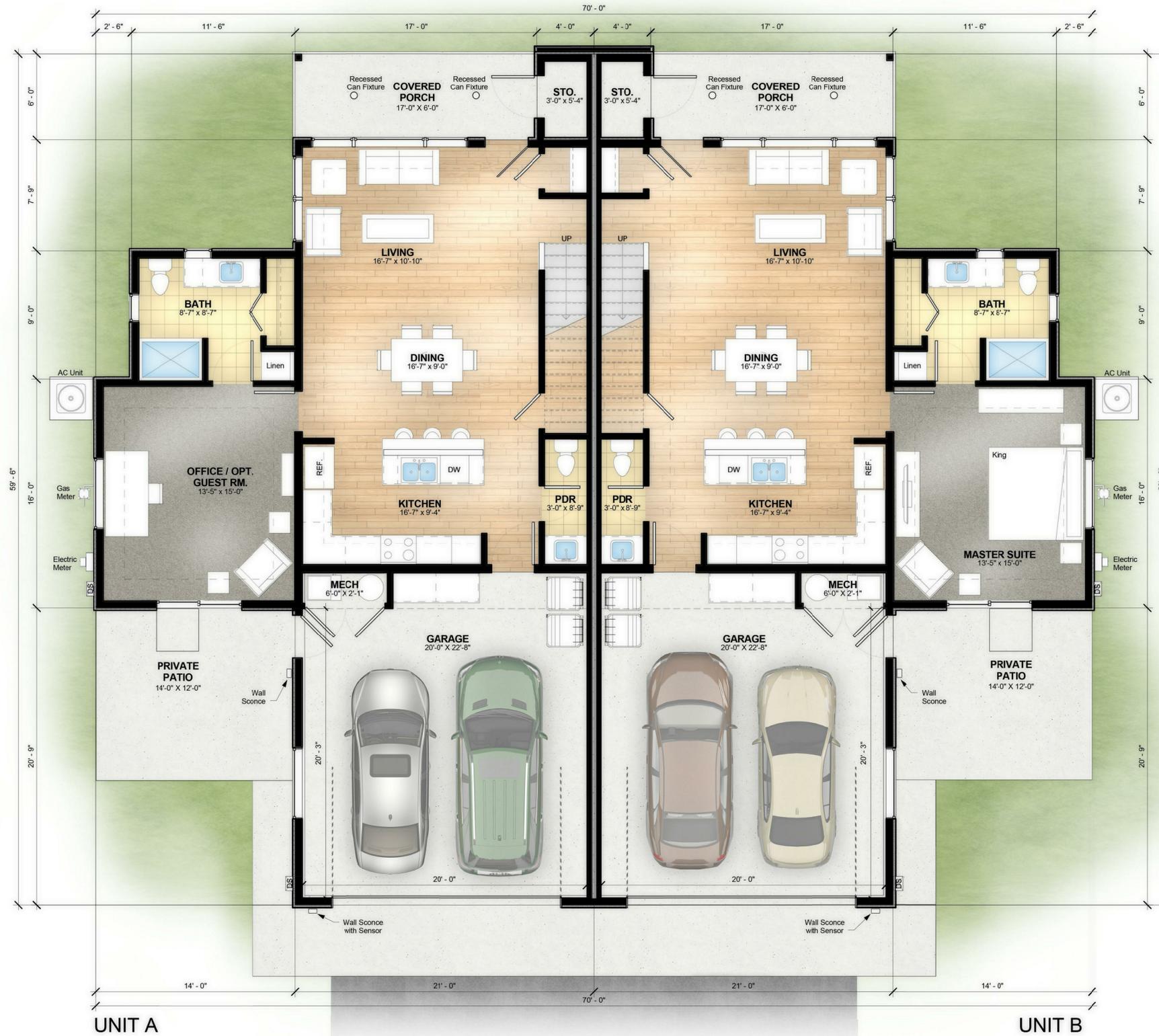
DEVELOPER  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Roof Plan - Outcrop		SHEET 4 OF 14	
2018.03.30	4	Site Plan Revised Submittal	RSS
2017.12.21	3	Site Plan Revised Submittal	RSS
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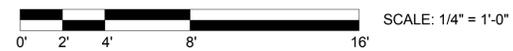
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UNIT A

UNIT B

1 Ground Floor Plan - Brattice  
1/4" = 1'-0"



### Square Footage Calculations

Unit A	
Ground Floor:	988 sq. ft.
Second Floor:	813.5 sq. ft.
<b>Total:</b>	<b>1801.5 sq. ft.</b>
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Second Floor:	813.5 sq. ft.
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Note: Square footage calculations are based on the definition of floor area per 2017 Town of Erie Unified Development Code, Chapter 11, Definitions

### DEVELOPER

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Ground Floor Plan - Brattice				SHEET 5 OF 14	
2018.03.30	4	Site Plan Revised Submittal			RSS
2017.12.21	3	Site Plan Revised Submittal			RSS
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1.84 ACRES - 12 LOTS, 3 TRACTS  
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### Square Footage Calculations

<b>Unit A</b>	
Ground Floor:	988 sq.ft.
Second Floor:	813.5 sq.ft.
<b>Total:</b>	<b>1801.5 sq.ft.</b>
Garage:	487 sq.ft.
<b>Unit B</b>	
Ground Floor:	988 sq.ft.
Second Floor:	813.5 sq.ft.
<b>Total:</b>	<b>1801.5 sq.ft.</b>
Garage:	487 sq.ft.
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### DEVELOPER

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5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Second Floor Plan - Brattice SHEET 6 OF 14

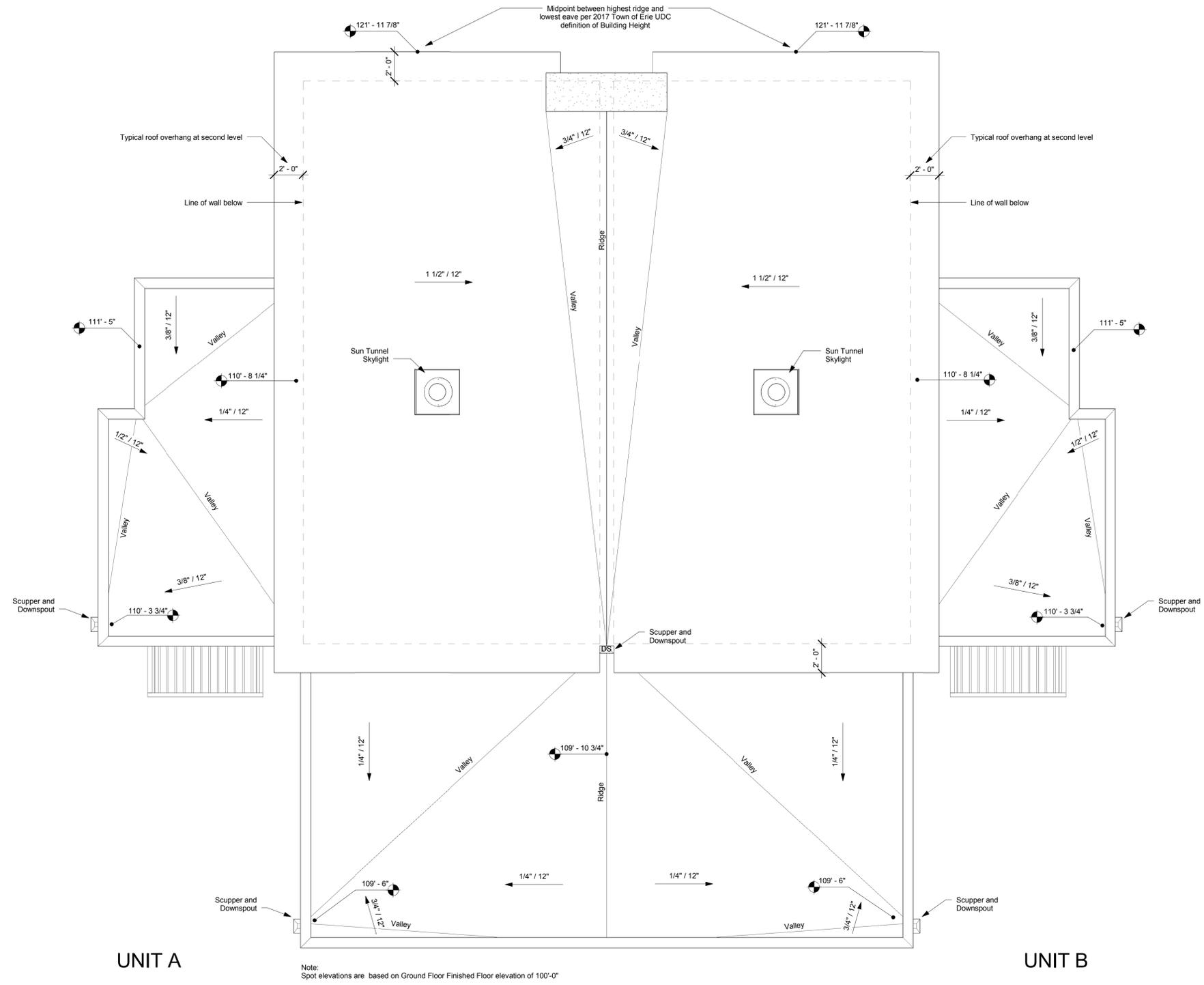
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1 Second Floor Plan - Brattice  
1/4" = 1'-0"



# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

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UNIT A

UNIT B

Note:  
Spot elevations are based on Ground Floor Finished Floor elevation of 100'-0"

1 Roof Plan - Brattice  
1/4" = 1'-0"

SCALE: 1/4" = 1'-0"  
0' 2' 4' 8' 16'

DEVELOPER  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Roof Plan - Brattice		SHEET 7 OF 14	
DATE	NO.	REVISIONS	BY
2018.03.30	4	Site Plan Revised Submittal	RSS
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SCHEME	BODY 1 MATERIAL: 2-COAT SMOOTH STUCCO	BODY 2 MATERIAL: 2-COAT SMOOTH STUCCO	ACCENT MATERIAL: FIBER CEMENT SOFFIT PANEL, EXT. DOORS AND GARAGE DOOR	BRICK MATERIAL: GENERAL SHALE THIN VENEER STACKED BOND BRICK	WOOD STAIN MATERIAL: 1x6 T&G CEDAR WITH CABOT SEMI-SOLID STAIN	WOOD BROW MATERIAL: CEDAR BROW MEMBERS WITH CABOT SEMI-SOLID STAIN	WOOD TRELLIS MATERIAL: CEDAR TRELLIS MEMBERS WITH CABOT SEMI-SOLID STAIN	METAL MATERIAL: SCUPPERS, DOWNSPOUTS AND PARAPET CAPS	TRIM MATERIAL: FIBER CEMENT FASCIA BOARD
1	SHERWIN WILLIAMS SW 7627 - WHITE HERON	SHERWIN WILLIAMS SW 6250 - GRANITE PEAK	SHERWIN WILLIAMS SW 6241 - ALEUTIAN			CABOT SEMI-SOLID DARK SLATE		BLACK MATTE	SHERWIN WILLIAMS SW 6992 - INKWELL
2	SHERWIN WILLIAMS SW 9089 - LLAMA WOOL	SHERWIN WILLIAMS SW 6364 - EGGWHITE	SHERWIN WILLIAMS SW 6002 - ESSENTIAL GREY			CABOT SEMI-SOLID DARK SLATE		BLACK MATTE	SHERWIN WILLIAMS SW 6992 - INKWELL
3	SHERWIN WILLIAMS SW 7683 - BUFF	SHERWIN WILLIAMS SW 7068 - GRIZZLE GRAY	SHERWIN WILLIAMS SW 6080 - UTTERLY BEIGE			CABOT SEMI-SOLID DARK SLATE		BLACK MATTE	SHERWIN WILLIAMS SW 6992 - INKWELL
4	SHERWIN WILLIAMS SW 7628 - WINDFRESH WHITE	SHERWIN WILLIAMS SW 9171 - FELTED WOOL	SHERWIN WILLIAMS SW 6243 - DISTANCE		CABOT SEMI-SOLID CORDOVAN BROWN		CABOT SEMI-SOLID DARK SLATE	BLACK MATTE	SHERWIN WILLIAMS SW 6992 - INKWELL
5	SHERWIN WILLIAMS SW 6162 - ANCIENT MARBLE	SHERWIN WILLIAMS SW 9164 - ILLUSIVE GREEN	SHERWIN WILLIAMS SW 7674 - PEPPERCORN		CABOT SEMI-SOLID CORDOVAN BROWN		CABOT SEMI-SOLID DARK SLATE	BLACK MATTE	SHERWIN WILLIAMS SW 6992 - INKWELL
6	SHERWIN WILLIAMS SW 9170 - ACIER	SHERWIN WILLIAMS SW 7004 - SNOWBOUND	SHERWIN WILLIAMS SW 7122 - LEMON DROP		CABOT SEMI-SOLID CORDOVAN BROWN		CABOT SEMI-SOLID DARK SLATE	BLACK MATTE	SHERWIN WILLIAMS SW 6992 - INKWELL

UNIT #s	COLOR SCHEME
1 AND 2:	2
3 AND 4:	5
5 AND 6:	6
7 AND 8:	3
9 AND 10:	1
11 AND 12:	4

DEVELOPER  
HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Color Schemes and Materials Chart				SHEET 8 OF 14
2018.03.30	4	Site Plan Revised Submittal	RSS	
2017.12.21	3	Site Plan Revised Submittal	RSS	
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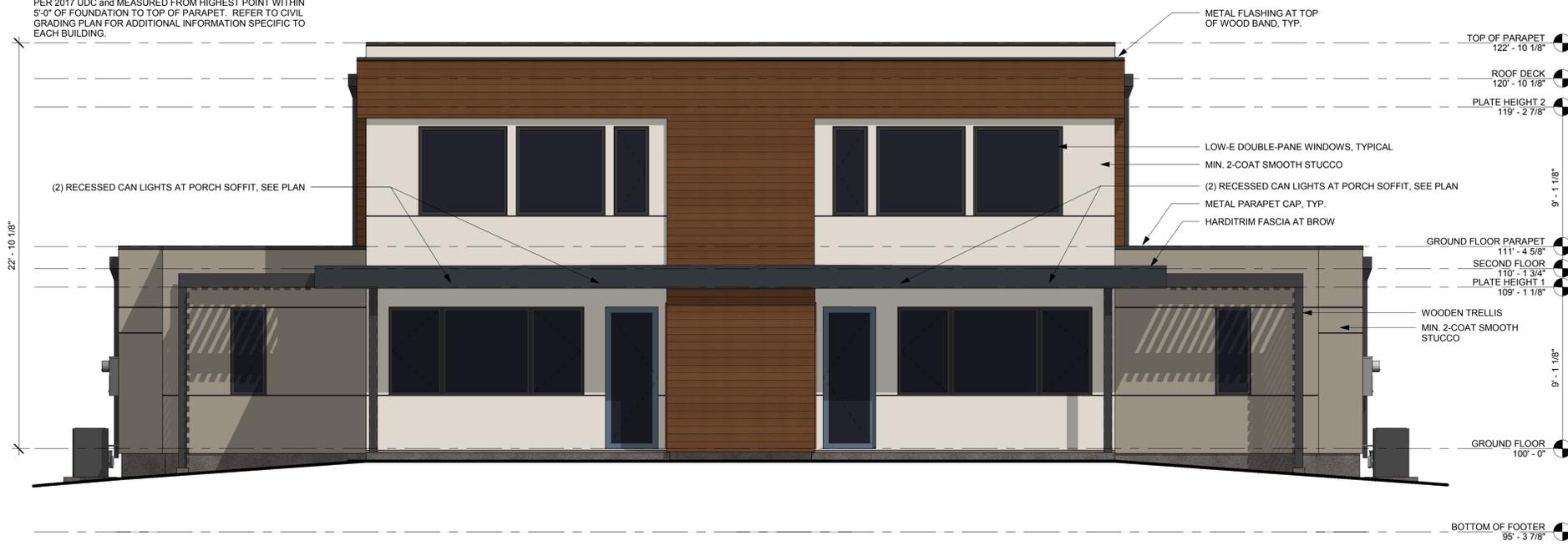
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THE BUILDING ELEVATIONS SHOWN AND APPROVED HEREON ARE INTENDED TO DEMONSTRATE HOW ALL HVAC AND OTHER MECHANICAL EQUIPMENT SHALL BE SCREENED ACCORDING TO TOWN OF ERIE, UNIFIED DEVELOPMENT CODE REQUIREMENTS. IT IS THE APPLICANT'S RESPONSIBILITY TO ENSURE THAT THIS APPROVED SCREENING OCCURS IN THE FIELD AS DEMONSTRATED BY THESE PLANS, REGARDLESS OF CURB REQUIREMENTS, MECHANICAL PLAN CHANGES OR OTHER CIRCUMSTANCES. FAILURE TO PROVIDE APPROVED SCREENING MAY RESULT IN THE DELAY OF FINAL INSPECTIONS AND/OR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.



**1 LEFT SIDE ELEVATION - OUTCROP**  
1/4" = 1'-0"

MAX. BUILDING HEIGHT = 25'-0"  
PER 2017 UDC and MEASURED FROM HIGHEST POINT WITHIN 5'-0" OF FOUNDATION TO TOP OF PARAPET. REFER TO CIVIL GRADING PLAN FOR ADDITIONAL INFORMATION SPECIFIC TO EACH BUILDING.



**2 FRONT ELEVATION - OUTCROP**  
1/4" = 1'-0"

**NOTE**  
ARTICULATION ELEMENTS INCLUDE THE FOLLOWING:  
1. INSERTS OR OTHER RELIEF IN THE WALL PLANE  
2. VARIATIONS IN MATERIALS  
3. PORCHES



**TUBE** - model: WS-W2609, WS-W2610  
LED Wall Mount

**WAC LIGHTING**  
Responsible Lighting®



Fixture Type:   
Catalog Number:   
Project:   
Location:

**PRODUCT DESCRIPTION**

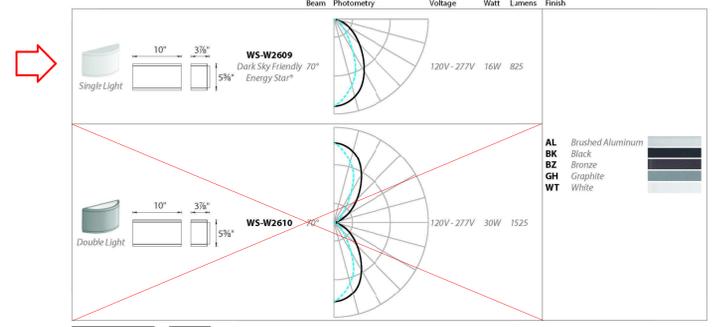
A curved contemporary look with impactful style. Perfect for illuminating the parameter of a home or creating a safe entryway to a building, the modern, minimalist TUBE wall mount features a crescent profile. Crafted of aluminum with etched glass, this LED luminaire is offered in five handsome finishes and two energy efficient LED configurations. Mounts upward or downward to suit nearly any exterior design scheme.

**FEATURES**

- Energy Star® rated
- CEC Title 24 Compliant
- IP65 Rated, ETL & cETL Wet Location Listed
- Mounts up or down
- Die-Cast Aluminum Construction
- Universal Voltage Input (120V - 277V)
- Dimming: ELV (120V) or 0-10V
- ADA Compliant

**SPECIFICATIONS**

**Construction:** Aluminum with etched glass.  
**Power:** Integral driver in luminaire. 120V - 277V input.  
**Light Source:** High output LED  
**Mounting:** Mounts directly to junction box  
**Dimming:** 0-10V Dimming; 100%-15% ELV Dimming; 100%-15% (120V only)  
**Finish:** Brushed Aluminum (AL), Black (BK), Bronze (BZ), Graphite (GH), White (WT)  
**Color Temp:** 3000K  
**CR:** 90  
**Rated Life:** 70,000 hours  
**Standards:** Energy Star® rated, IP65 Rated, ETL & cETL Wet Location Listed, CEC Title 24 Compliant, Dark Sky Friendly.



Example: WS-W2609-WT  
wacighting.com Phone: (800) 526-2588 Fax: (800) 526-2585  
Headquarters/Eastern Distribution Center 44 Harbor Park Drive Port Washington, NY 11050  
Central Distribution Center 1600 Distribution Ct Lithia Springs, GA 30122  
Western Distribution Center 1750 Archibald Avenue Ontario, CA 91760  
WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. FEB 2015

**TYPICAL WALL SCENCE FOR SIDE AND REAR ELEVATIONS**  
COLOR VARIES PER COLOR SCHEME

**DEVELOPER**

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



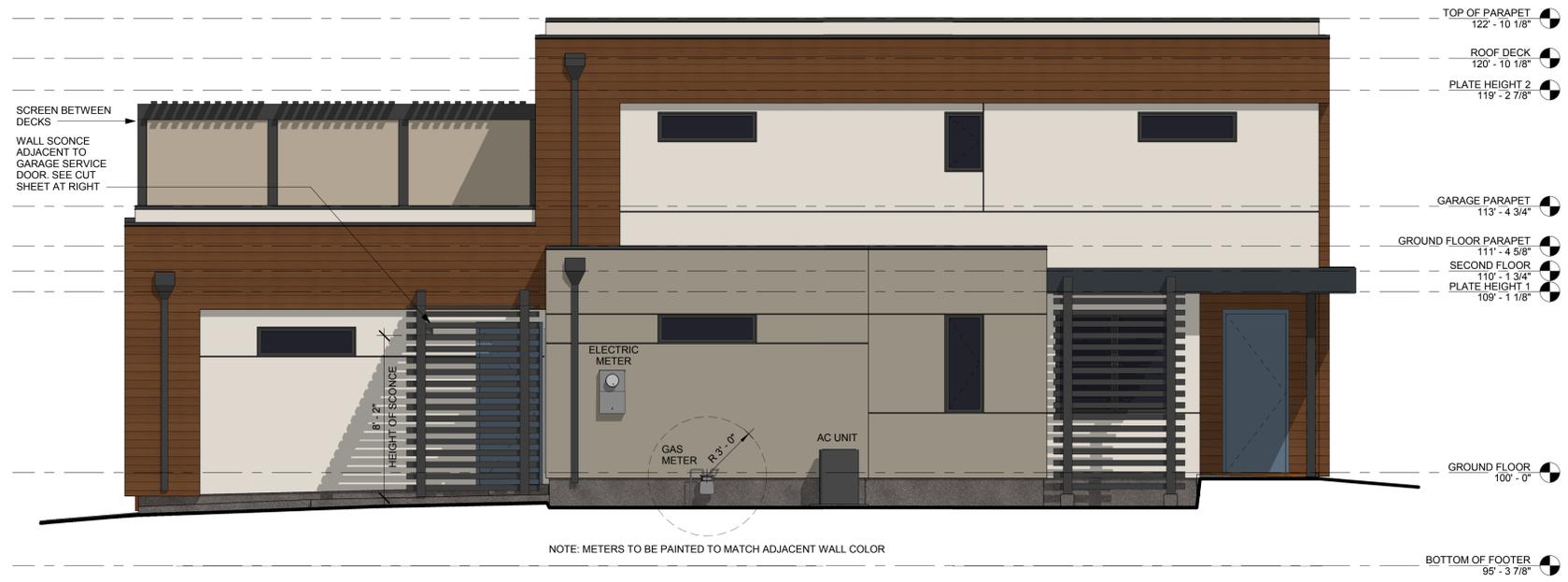
DATE	NO.	REVISIONS	BY
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2016.09.20	2	Site Plan Review Submittal	RSS
2016.07.21	1	Site Plan Completeness Submittal	RSS

DATE: 03/30/18 JOB NO.: 15180 CHECKED BY: Scott

# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

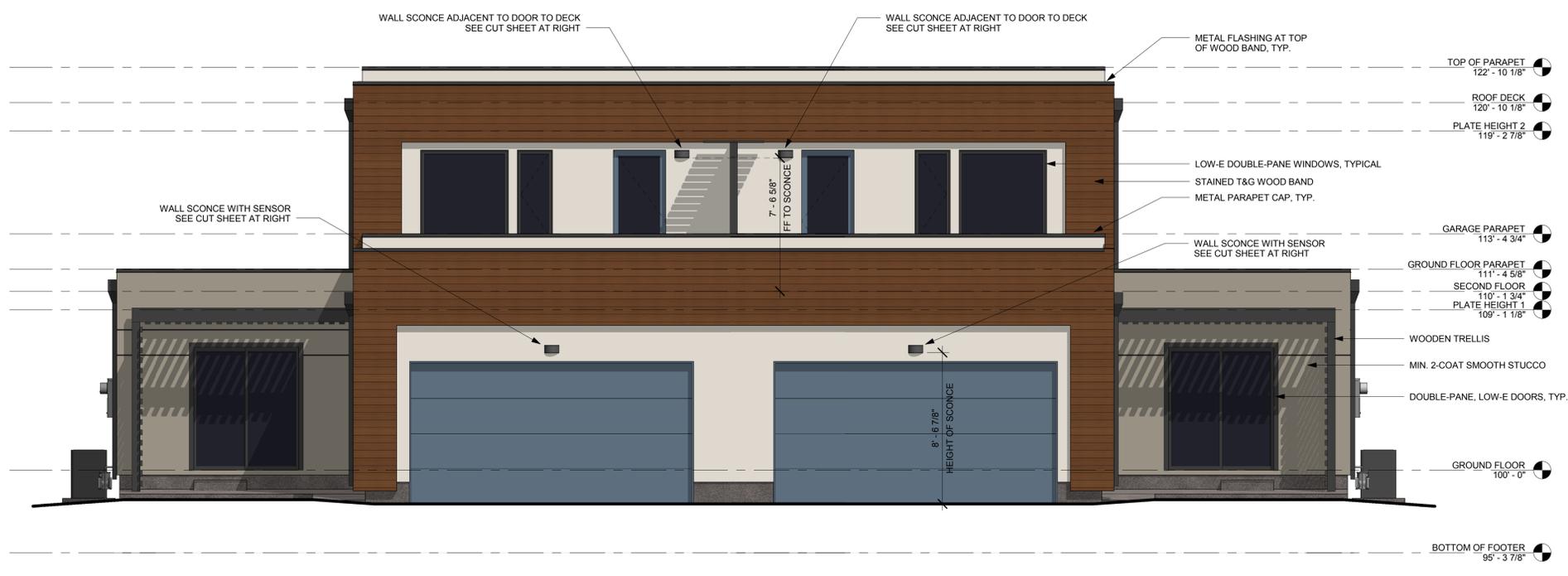
A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016

THE BUILDING ELEVATIONS SHOWN AND APPROVED HEREON ARE INTENDED TO DEMONSTRATE HOW ALL HVAC AND OTHER MECHANICAL EQUIPMENT SHALL BE SCREENED ACCORDING TO TOWN OF ERIE, UNIFIED DEVELOPMENT CODE REQUIREMENTS. IT IS THE APPLICANT'S RESPONSIBILITY TO ENSURE THAT THIS APPROVED SCREENING OCCURS IN THE FIELD AS DEMONSTRATED BY THESE PLANS, REGARDLESS OF CURB REQUIREMENTS, MECHANICAL PLAN CHANGES OR OTHER CIRCUMSTANCES. FAILURE TO PROVIDE APPROVED SCREENING MAY RESULT IN THE DELAY OF FINAL INSPECTIONS AND/OR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.



NOTE: METERS TO BE PAINTED TO MATCH ADJACENT WALL COLOR

**2 RIGHT SIDE ELEVATION - OUTCROP**  
1/4" = 1'-0"



**1 REAR ELEVATION - OUTCROP**  
1/4" = 1'-0"

**NOTE**  
ARTICULATION ELEMENTS INCLUDE THE FOLLOWING:  
1. INSERTS OR OTHER RELIEF IN THE WALL PLANE  
2. VARIATIONS IN MATERIALS



**TUBE** - model: WS-W2609, WS-W2610  
LED Wall Mount

**WAC LIGHTING**  
Responsible Lighting®



Fixture Type:   
Catalog Number:   
Project:   
Location:

**PRODUCT DESCRIPTION**

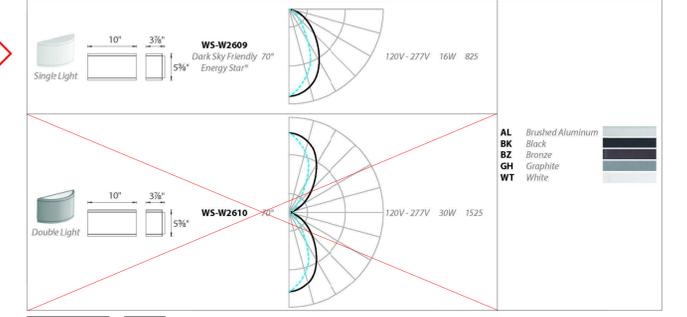
A curved contemporary look with impactful style. Perfect for illuminating the perimeter of a home or creating a safe entryway to a building, the modern, minimalist TUBE wall mount features a crescent profile. Crafted of aluminum with etched glass, this LED luminaire is offered in five handsome finishes and two energy efficient LED configurations. Mounts upward or downward to suit nearly any exterior design scheme.

**FEATURES**

- Energy Star® rated
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- IP65 Rated, ETL & cETL Wet Location Listed
- Mounts up or down
- Die-Cast Aluminum Construction
- Universal Voltage Input (120V - 277V)
- Dimming: ELV (120V) or 0-10V
- ADA Compliant

**SPECIFICATIONS**

**Construction:** Aluminum with etched glass.  
**Power:** Integral driver in luminaire. 120V - 277V input.  
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**Dimming:** 0-10V Dimming; 100%-15% (120V only)  
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**Finish:** Brushed Aluminum (AL), Black (BK), Bronze (BZ), Graphite (GH), White (WT)  
**Color Temp:** 3000K  
**CR:** 90  
**Rated Life:** 70,000 hours  
**Standards:** Energy Star® rated, IP65 Rated, ETL & cETL Wet Location Listed, CEC Title 24 Compliant, Dark Sky Friendly.



Example: WS-W2609-WT  
wacighting.com Phone: (800) 526-2588 Fax: (800) 526-2585  
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Western Distribution Center 1750 Archibald Avenue Ontario, CA 91760  
WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. FEB 2015

**TYPICAL WALL SCONCE FOR SIDE AND REAR ELEVATIONS**  
COLOR VARIES PER COLOR SCHEME

**DEVELOPER**

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Rear/Right Side Elevation - Outcrop SHEET 11 OF 14

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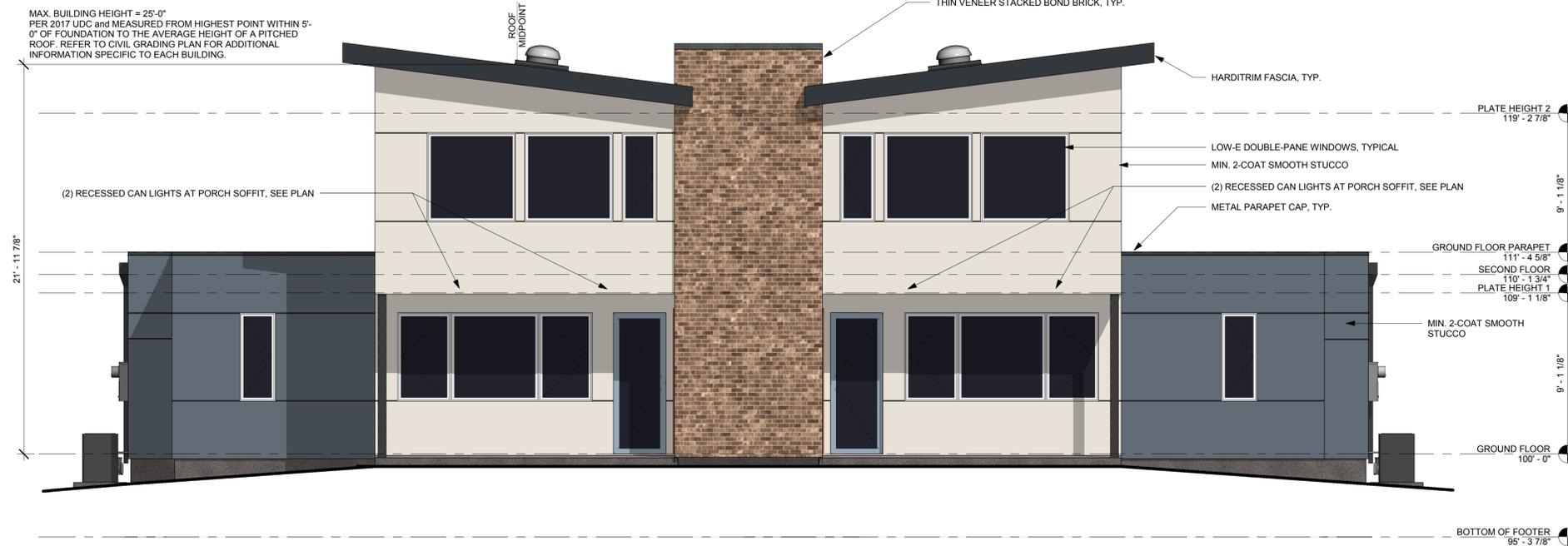
# CANYON CREEK FILING NO. 5, 1ST AMENDMENT

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6th P.M.  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
SP-000800-2016

THE BUILDING ELEVATIONS SHOWN AND APPROVED HEREON ARE INTENDED TO DEMONSTRATE HOW ALL HVAC AND OTHER MECHANICAL EQUIPMENT SHALL BE SCREENED ACCORDING TO TOWN OF ERIE, UNIFIED DEVELOPMENT CODE REQUIREMENTS. IT IS THE APPLICANT'S RESPONSIBILITY TO ENSURE THAT THIS APPROVED SCREENING OCCURS IN THE FIELD AS DEMONSTRATED BY THESE PLANS, REGARDLESS OF CURB REQUIREMENTS, MECHANICAL PLAN CHANGES OR OTHER CIRCUMSTANCES. FAILURE TO PROVIDE APPROVED SCREENING MAY RESULT IN THE DELAY OF FINAL INSPECTIONS AND/OR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.



**1 LEFT SIDE ELEVATION - BRATTICE**  
1/4" = 1'-0"



**2 FRONT ELEVATION - BRATTICE**  
1/4" = 1'-0"

**NOTE**  
ARTICULATION ELEMENTS INCLUDE THE FOLLOWING:  
1. INSERTS OR OTHER RELIEF IN THE WALL PLANE  
2. VARIATIONS IN MATERIALS  
3. VARIATIONS IN ROOF FORMS  
4. PORCHES



**TUBE** - model: WS-W2609, WS-W2610  
LED Wall Mount



**PRODUCT DESCRIPTION**

A curved contemporary look with impactful style. Perfect for illuminating the parameter of a home or creating a safe entryway to a building, the modern, minimalist TUBE wall mount features a crescent profile. Crafted of aluminum with etched glass, this LED luminaire is offered in five handsome finishes and two energy efficient LED configurations. Mounts upward or downward to suit nearly any exterior design scheme.

**FEATURES**

- Energy Star<sup>®</sup> rated
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- IP65 Rated, ETL & cETL Wet Location Listed
- Mounts up or down
- Die-Cast Aluminum Construction
- Universal Voltage Input (120V - 277V)
- Dimming: ELV (120V) or 0-10V
- ADA Compliant

**WAC LIGHTING**  
Responsible Lighting<sup>®</sup>

Fixture Type:

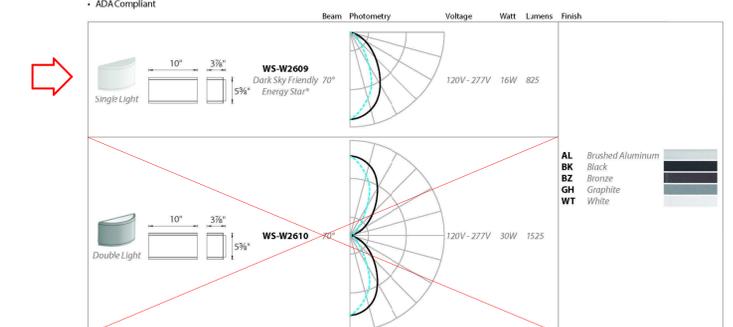
Catalog Number:

Project:

Location:

**SPECIFICATIONS**

**Construction:** Aluminum with etched glass.  
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**Light Source:** High output LED  
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**Finish:** Brushed Aluminum (AL), Black (BK), Bronze (BZ), Graphite (GH), White (WT)  
**Color Temp:** 3000K  
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**Rated Life:** 70,000 hours  
**Standards:** Energy Star<sup>®</sup> rated, IP65 Rated, ETL & cETL Wet Location Listed, CEC Title 24 Compliant, Dark Sky Friendly.



**Example: WS-W2609-WT**

wacighting.com  
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**TYPICAL WALL SCONCE FOR SIDE AND REAR ELEVATIONS**  
COLOR VARIES PER COLOR SCHEME

**DEVELOPER**  
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5385 LOOKOUT RIDGE DRIVE  
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CONTACT: YASI TAYLOR



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Front/Left Side Elevation - Brattice SHEET 12 OF 14

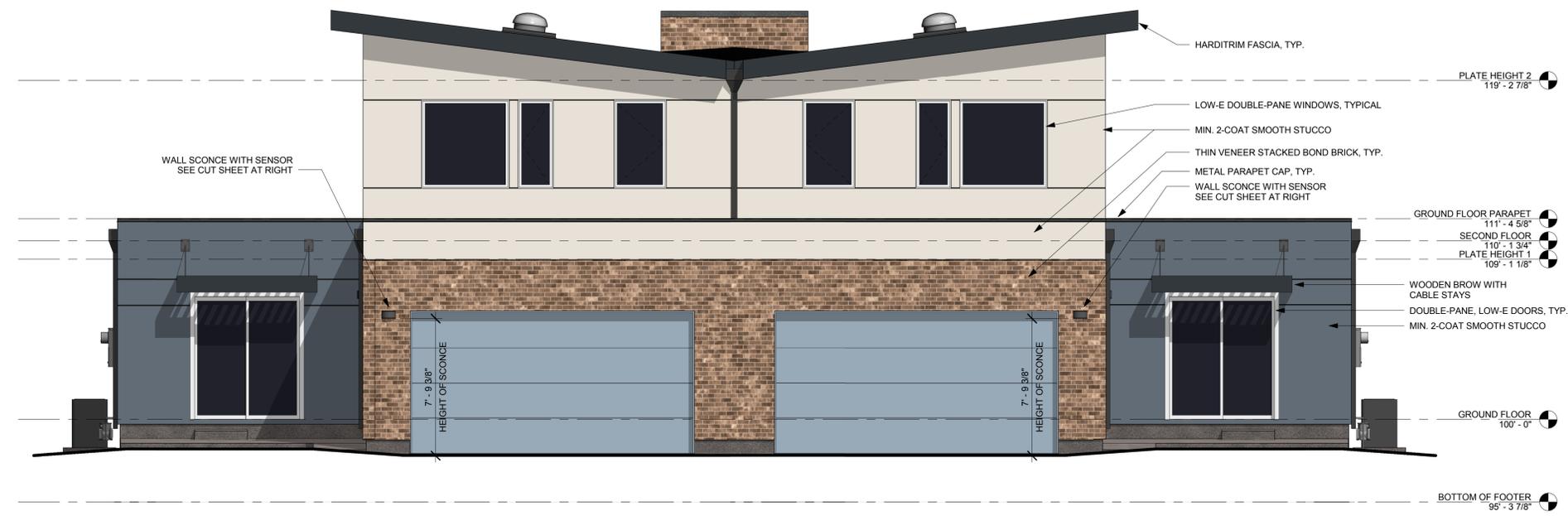
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**2 RIGHT SIDE ELEVATION - BRATTICE**  
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**WAC LIGHTING**  
Responsible Lighting®

Fixture Type:

Catalog Number:

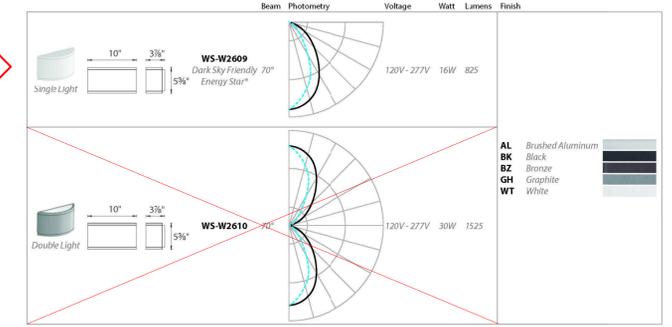
Project:

Location:

**SPECIFICATIONS**

**Construction:** Aluminum with etched glass.  
**Power:** Integral driver in luminaire. 120V - 277V input.  
**Light Source:** High output LED  
**Mounting:** Mounts directly to junction box  
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**DEVELOPER**  
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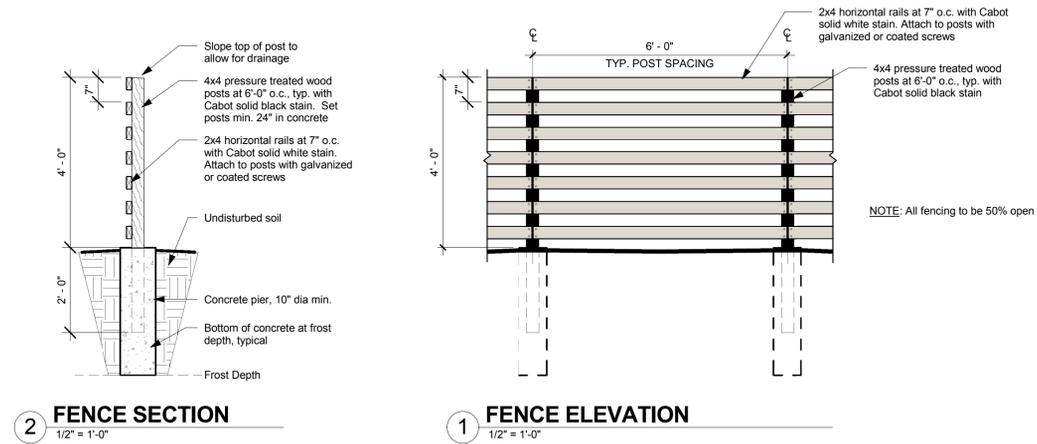


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TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO  
1.84 ACRES - 12 LOTS, 3 TRACTS  
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**DEVELOPER**

HESHMAT PROPERTIES LLC  
5385 LOOKOUT RIDGE DRIVE  
BOULDER CO 80301  
CONTACT: YASI TAYLOR



Architectural Details		SHEET 14 OF 14	
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## CANYON CREEK DUPLEXES

WARRANTY INFORMATION FOR EXTERIOR MATERIALS



The warranty information contained in the following pages are for the exterior materials used in the Canyon Creek Duplexes project. They represent the best warranties that are offered for the proposed materials which are as follows:

1. Cedar T&G Siding
2. General Shale Thin Brick Veneer
3. HardieTrim Fiber Cement Trim
4. Sto Stucco

## **CEDAR T&G SIDING**

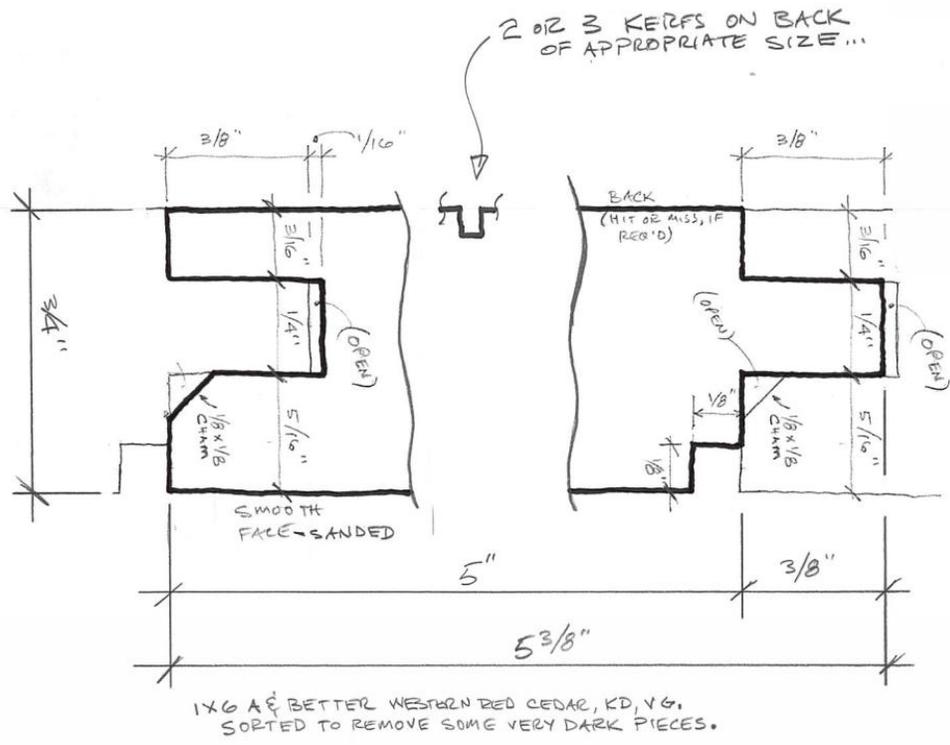
# BURKE BUILDERS

303.817.8316 burkebuildersco.com

## SUBMITTAL COVER SHEET

<b>PROJECT</b>	Canyon Creek Duplexes
<b>TO</b>	
<b>SUBMITTED BY</b>	
<b>SUBMITTAL #</b>	
<b>SUBMITTAL DATE</b>	
<b>RESPONSE DUE DATE</b>	

Item #	Item	Manufacturer, Model #, Etc.	Comments
1	Wood siding	1x6 cedar T&G (profile per Sopher Sparr, see below), Three coats of factory applied semi-solid stain	Location: Wood band and soffit.



Response (check one):

<input type="checkbox"/> Approved	<input type="checkbox"/> Approved with noted exceptions	<input type="checkbox"/> Revise and re-submit	<input type="checkbox"/> Rejected
-----------------------------------	---	---	-----------------------------------

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



# WARRANTY

CABOT® FACTORY FINISH™

## 5/15/25 YEAR EXTENDIBLE LIMITED WARRANTY

Excellent results can be obtained by the factory application of coatings to lumber, siding, fiber-cement board and appearance-grade construction materials. Factory-finished lumber, when coated on all sides, stabilizes the moisture content of the lumber, thereby reducing excessive shrinking and swelling of the material. Factory finishing assures a longer lasting and higher quality job than traditional "on-site" applications because proper spread rates are maintained for maximum coverage protection. This ensures more complete protection from nature's elements. Failure to read and follow installation instructions will void the warranty.

Cabot hereby warrants that, for a period of 25 Years, when three coats\* (15 years when two coats or 5 years when one coat) of Cabot **FACTORY FINISH** is applied per label instructions under a factory-controlled setting of a Cabot Authorized Factory Finisher to all sides of clean, dry (15% moisture content or less) lumber, this product will:

- **NOT** crack, peel or blister,
- **NOT** erode and expose the substrate,
- **NOT** become damaged when dirt is rinsed-off.
- **NOT** chalk so as to discolor surfaces below,
- **NOT** yellow with age,

Upon lumber installation, exposed butt ends of the lumber must be coated or a field-applied coat of PRO.V.T. Solid Color Stain or The Finish by Cabot must be applied. If within the warranty period, measured from the date of installation, and upon notification and validation of the complaint by Cabot, Cabot confirms this product has failed in any of the above ways due to normal exposure, Cabot will, at its option, either fully compensate the homeowner for the paint required to repair the siding involved, supply such materials to the homeowner, or refund the purchase price of the originally installed paint products found to be defective. Only those affected areas validated by Cabot will be covered. This non-prorated warranty is for material only, and does not include labor or cost of labor for the application of the product or installation of the siding. Any costs and expenses beyond Cabot's above-stated liability shall be the responsibility of the owner(s).

**TERMS AND CONDITIONS:** Cabot Factory Finish warranty (hereafter referred to as "Warranty") contained herein is in effect for 25 Years, when three coats\* (15 years when two coats or 5 years when one coat is applied) from date of siding installation and is subject to the terms and conditions, exclusions and limitations, requirements and legal rights stated in this document. This Warranty remains in effect for the owner(s) of the property to which the siding was originally applied. This Warranty is transferable by the original property owner to a first transferee. In the event of a Warranty claim, the Warranty period shall be not longer than 25 years from the date of original siding installation.

Cabot's (hereafter referred to as the "Warrantor") obligations under this Warranty shall in no event exceed the purchase price of the original Factory Finish products. **Any product found to be unsatisfactory, prior to installation, for any reason, must not be installed and should be returned to the dealer where it was purchased for replacement product.** The Warrantor will not be responsible in any way for labor or material if defective or unacceptable product is installed. The Warrantor shall not be liable for any consequential or special damages, or for other expenses such as accessories (building paper, sheathing, fasteners, caulking, etc.) which may arise in connection with this Warranty. This Warranty does not cover cracking, peeling, or blistering which may result due to inadequate ventilation or improper construction techniques, and specifically excludes cracking, peeling and blistering on wood knots. This Warranty does not apply to damage or failure caused by excessive warping, cupping, splitting, checking, and shrinkage of the siding material (as defined by industry standards); breakdown of the underlying substrate; falling objects; faulty or improper storage and installation; lack of proper maintenance; accidental damage; structural defects; fire, lightning, hurricane, tornado, windstorm, earthquake, hail, or other acts of God; harmful chemicals (including harmful cleaning compounds); surface deterioration due to air pollution; misuse; abuse; vandalism; mildew accumulation; scratching, abrading, or misuse/abuse of the factory-finished product after application. Depending upon exposure or wear, evaluate recoating needs every 8-10 years.

**Extend your original Warranty for 15 years by refinishing with two (2) coats of PRO.V.T. Solid Color Stain or The Finish by Cabot before the end of the original Warranty period.**

**EXTRACTIVE BLEEDING, MILDEW AND COLOR APPEARANCE ARE NOT MANUFACTURING DEFECTS AND ARE NOT COVERED BY THIS WARRANTY.**

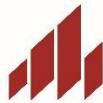
This Warranty is expressly made in lieu of any and all other warranties, expressed or implied, including merchantability and fitness for a particular purpose. This Warranty gives you specific legal rights, and you may also have other rights which vary due to local jurisdiction of claim.

**CLAIM PROCEDURE:** Contact the Cabot Technical Service Department to file claim. **You must have a completed Cabot Factory Application Warranty Certificate issued by Cabot to file a claim.** Upon discovery of a possible defect or failure, a claim must be filed immediately, and under no circumstances more than 30 days after discovery. The covered person must allow Cabot or their agents to enter the property and structure where the product is installed and examine, photograph, and take samples of the warranted product. To obtain a Cabot Factory Application Warranty Certificate, complete the registration form enclosed with the siding or contact Cabot. Any questions? Please call or write Cabot's Factory Finish Division, Technical Service Department at **1-800-STAIN-60 (782-4660).**

**Cabot Factory Finish Division • 100 Hale Street • Newburyport, MA 01950 USA**

\* Three coat application is application of three coats of Cabot Factory Finish; or one coat of Cabot Factory Finish Primer or Problem-Solver\* Primer and two coats of Cabot Factory Finish.

## GENERAL SHALE THIN BRICK VENEER



# General Shale

Product Warranty\*

## Our Warranty To You...

ANY IMPLIED WARRANTIES ARE EXPRESSLY EXCLUDED

### WHAT THIS WARRANTY COVERS

General Shale warrants its clay brick products against deterioration due to product defects only for the life of the building, provided the products have been erected and used according to the approved masonry standards, within guidelines of local building codes as recommended by the manufacturer.

All products are to be inspected by the customer prior to installation. Any damaged, chipped or broken products, or any aesthetically unsatisfactory materials are to be brought to the attention of General Shale (or affiliated distributor) prior to installation. At such time, the manufacturer will provide sufficient replacement material. Placement of material in the wall constitutes acceptance of the product for all purposes including color and texture.

*\*The warranty provided hereunder is the sole warranty provided by General Shale with respect to the products sold, and such warranty replaces all other warranties of any nature, be they contractual, legal or otherwise.*

### WHAT THIS WARRANTY DOES NOT COVER

General Shale will not be responsible for product failure resulting from poor workmanship, construction deficiencies or improper design. This warranty is null and void if the integrity of the structure is not maintained after its completion.

This warranty may not be enlarged or extended by sales, dealer, or other General Shale personnel. Liability of General Shale under this warranty shall be limited to the re-supply of the product found to be defective.

### HOW TO GET ASSISANCE

General Shale | PO Box 3547 | Johnson City, TN 37602 |  
Tel: 1-800-414-4661 | Fax: 1-423-952-4104 | Web: [www.GeneralShale.com](http://www.GeneralShale.com)





## Technical Bulletin

### Thin Veneer Installation Guide – Exterior Commercial with Continuous Insulation (IECC/ASRAE 90.1)



#### Step 1: Inspect/Install Wall Substrate

Inspect existing or install exterior grade sheathing.

#### Step 2: Install Weep Screed

Install pre-formed weep screed above openings and at base of walls.

#### Step 3: Install Weather Resistant Barrier (WRB)

Install a good quality WRB. Lap seams and prepare window openings in accordance with WRB manufacturing. Apply flashing tape around windows as recommended by house wrap manufacturer.

#### Step 4: Install XPS Insulation and Drainage Layer

Install XPS rigid insulation per manufactures recommendations R-value per IECC climate zone.

#### Step 5: Install Cement Board

Install Perma Base cement board by National Gypsum (or equal) as per manufacturer's instructions. Fastener schedule per *Foam Coalition Tech Matters* or TRUFast Elevation Report # TRU11O910-21 *\*To upgrade to the Laticrete 15 year System Warranty you can substitute the weather resistant barrier in Step 3 and drainage layer in step 4 with two coats of Laticrete Air & Water Barrier, applied over cement board. Follow manufacturer's instructions.*

#### Step 6: Apply Polymer Modified Thin-Set Mortar

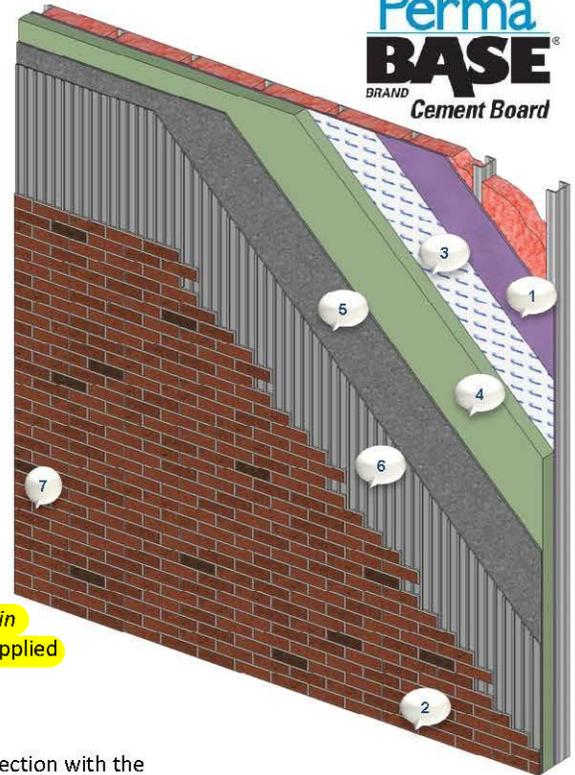
Using a trowel, spread *Laticrete Thin Brick Mortar* across substrate in an upwards direction with the flat side of the trowel. Run notched side of the trowel across mortar to create a grooved finish. Apply only a workable area of mortar that will allow veneer to be properly set before surface drying occurs. This area will vary depending on site environmental conditions. **NOTE: Do not substitute Laticrete with any other product or material.**

#### Step 7: Install Thin Veneer Units (Thin Brick, Natural Thin Rock or Manufactured Concrete Veneer)

Clean unit backs of any dust, laitance, loose material and any excess film that could impede bond. With a trowel "back-butter" the veneer units, if required to fill any surface irregularities or to ensure 100% coverage. Beginning with the corner pieces, work either from the top-down, or bottom-up. Press the corner piece onto the wall, rotating back and forth slightly, and forcing some of the mortar to "squeeze out". Remove this excess mortar with a square flat trowel and use the excess on the next piece of veneer. Remove excess mortar from around or on the veneer units with a stiff brush. Check for 100% mortar coverage by removing two stone units from the wall per bag of mortar used. Grout the joints using *Laticrete Pointing Mortar* using a grout bag. Tool joints when thumbprint hard using a metal jointing tool.

#### Additional Information

1. As building codes vary by region, it is important to check local building codes for proper installation guidelines.
2. This Installation Guide serves as reference only and is not meant to act as a substitute for professional advice.
3. Considerations must be made for hot & cold weather construction. For additional information on hot & cold weather construction, refer to TMS 602-11/ACI 530.1-11/ASCE 6-11, Specification for Masonry Structures, Sections 1.8C and 1.8D.
4. Laticrete 15-year system warranty available if optional coating of Laticrete Air and Water Barrier (AWB) is applied over cement board.



# THIN VENEER

(Thin Brick Veneer, Thin Rock Veneer, Adhered Concrete Veneer)

## EXTERIOR FRAMED INSTALLATION GUIDE USING THE 'LATICRETE® MVIS™ SYSTEM'

### Step 1: Inspect/Install Wall Substrate

Inspect existing or install exterior grade sheathing.

### Step 2: Install Weep Screed

Install pre-formed weep screed above openings and at base of walls.

### Step 3: Install Weather Resistant Barrier (WRB)

Install a good quality WRB or house wrap. Lap seams and prepare window openings in accordance with house wrap manufacturer. Apply flashing tape around windows as recommended by house wrap manufacturer.

### Step 4: Install Drainage Layer

Install a Pactiv DC-14 drainage mat (or equal). There are other products and systems available that will provide a drainage cavity behind the thin-adhered veneer system. The manufacturer's instructions should be followed for the installation of the specific product chosen.

### Step 5: Install Cement Board

Install Perma Base cement board by National Gypsum (or equal) as per manufacturer's instructions.

*\*To upgrade to the Laticrete 15 year System Warranty you can substitute the weather resistant barrier in Step 2 with two coats of Laticrete Air & Water Barrier. Follow manufacturer's instructions.*

### Step 6: Apply Polymer Modified Thin-Set Mortar

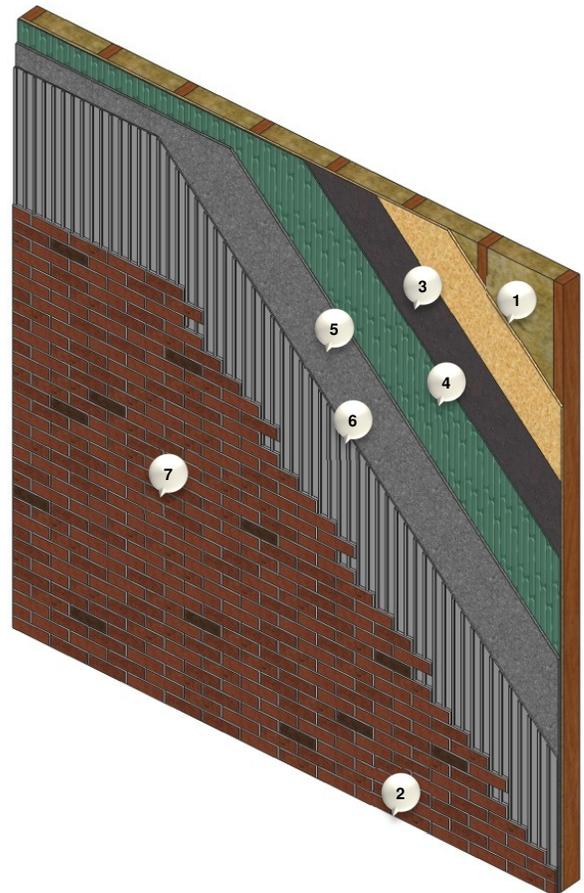
Using a trowel, spread [Laticrete Thin Brick Mortar](#) across substrate in an upwards direction with the flat side of the trowel. Run notched side of the trowel across mortar to create a grooved finish. Apply only a workable area of mortar that will allow veneer to be properly set before surface drying occurs. This area will vary depending on site environmental conditions.

**NOTE: Do not substitute Laticrete with any other product or material.**

### Step 7: Install Thin Veneer Units (Thin Brick, Natural Thin Rock or Manufactured Concrete Veneer)

Clean unit backs of any dust, laitance, loose material and any excess film that could impede bond. With a trowel "back-butter" the veneer units, if required to fill any surface irregularities or to ensure 100% coverage. Beginning with the corner pieces, work either from the top-down, or bottom-up. Press the corner piece onto the wall, rotating back and forth slightly, and forcing some of the mortar to "squeeze out". Remove this excess mortar with a square flat trowel and use the

excess on the next piece of veneer. Remove excess mortar from around or on the veneer units with a stiff brush. Check for 100% mortar coverage by removing two stone units from the wall per bag of mortar used. Grout the joints using [Laticrete Pointing Mortar](#) using a grout bag. Tool joints when thumbprint hard using a metal jointing tool.



### Additional Information

1. As building codes vary by region, it is important to check local building codes for proper installation guidelines.
2. This Installation Guide serves as reference only and is not meant to act as a substitute for professional advice.
3. Considerations must be made for hot & cold weather construction. For additional information on hot & cold weather construction, refer to TMS 602-11/ACI 530.1-11/ASCE 6-11, Specification for Masonry Structures, Sections 1.8C and 1.8D.
4. Laticrete 15-year system warranty available if optional coating of Laticrete Air and Water Barrier (AWB) is applied over cement board.

# HARDIETRIM FIBER CEMENT TRIM



# HardieTrim® **HZ**™

Includes HardieTrim® HZ® Boards, HardieTrim® HZ® Crown Mouldings and HardieTrim™ HZ™ Mouldings

*Effective July 2014*



**1. LIMITED WARRANTY.** James Hardie Building Products, Inc (“Hardie”) warrants, for a period of fifteen (15) years (the “Limited Warranty Period”) that when manufactured, the Hardie Fiber-Cement HardieTrim HZ boards (“Fibercement”) complies with ASTM C1186, and such purchased Fibercement product and HardieTrim™ HZ Moulding (collectively, the “Product”), will resist damage caused by hail or termite attacks, and is free from defects in material and workmanship. This Limited Warranty extends only to (i) the first retail purchaser of the Product and the first transferee; or (ii) the first owner of the structure to which the Product is applied and the first transferee (each a “Covered Person”).

**2. LIMITED WARRANTY COVERAGE AREA.** In the United States, only the states of: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, and WY. For Canada, only the province of British Columbia.

**3. WHAT WE WILL DO.** If during the Limited Warranty Period, the Product is defective in material and workmanship, Hardie will, in its sole discretion, either repair or replace the defective portion of the Product, or, during the first (1st) through the fifteenth (15th) year, reimburse the Covered Person for up to twice the original retail cost of the defective portion of the Product. After the 15th year, this Limited Warranty will expire and shall no longer be applicable. If the original retail cost cannot be established by the Covered Person to Hardie’s reasonable satisfaction, the cost shall be determined by Hardie in its sole and reasonable discretion. Hardie’s repair or replacement of the defective portion of the Product or reimbursement pursuant to Section 3 of this Limited Warranty is the exclusive remedy for the Covered Person for any warranty claim under Section 1.

**4. WHAT YOU MUST DO/CONDITIONS OF LIMITED WARRANTY.** Warranty coverage under this Limited Warranty shall be subject to the following terms and conditions:

- a) A Covered Person must provide written notice to Hardie within thirty (30) days after discovery of any claimed defect covered by this Limited Warranty. The notice must describe the location and details of the claimed defect and any additional information necessary for Hardie to investigate the claim. Photos of the Product, showing the claimed defect must accompany the notice. A claimant under this Limited Warranty must provide proof to Hardie that such claimant is a Covered Person as defined in Section 1 above.
- b) The Product must be installed according to Hardie’s printed installation instructions and must comply with all building codes adopted by federal, state or local governments or government agencies applicable to the installation.
- c) Upon discovery of a claimed defect, a Covered Person must immediately, and at a Covered Person’s own expense, provide for protection of all property that could be affected until the claimed defect is remedied, if applicable. Before any permanent repair to the Product, a Covered Person must allow Hardie or Hardie’s authorized agent to enter the property and structure where the Product is installed, if applicable, and examine, photograph and take samples of the Product. Any repairs initiated by or on behalf of a Covered person without prior authorization from Hardie may void the warranty.

## Homeowner Care and Maintenance Tips

### PATCHING

Fill dents, chips and cracks using a good quality cement patching compound (acrylic mortar patch), which can be found at your local Home Center or Hardware Store.

### PRODUCT REPLACEMENT

Replace siding and trim products in accordance with James Hardie's written installation instructions.

### CAULK REPLACEMENT

When caulk is in need of replacing, carefully remove existing caulk and replace with a high quality, paintable latex caulk. For best results, use a latex caulk that complies with ASTM C834 or better. Caulking should be applied in accordance with the caulking manufacturer's written application instructions.

### PAINT MAINTENANCE

Remove any damaged, chipped or cracked paint. Prior to repainting, make sure that the surface area is properly cleaned and sanded. Repaint immediately using a good quality 100% acrylic paint. For best results, please refer to your paint manufacturer's written specifications for application rates and required topcoats.

Call 1-800-9-HARDIE or visit [www.HardieInstallation.com](http://www.HardieInstallation.com) to obtain written installation requirements or for more detailed technical information.

**5. WHAT IS NOT COVERED.** This Limited Warranty does not cover damage or defects resulting from or in any way attributable to: (a) The improper storage, shipping, handling or installation of the Product (including, without limitation, failure of the Product to be installed in strict compliance with the Conditions of Limited Warranty set forth in Section 4 of this Limited Warranty) and/or improper installation of studs or other accessories; (b) Further processing, modification or alteration of the Product after shipping from Hardie; (c) Neglect, abuse, or misuse; (d) Repair or alteration; (e) Settlement or structural movement and/or movement of materials to which the Product is attached; (f) Damage from incorrect design of the structure; (g) Damage resulting from water infiltration; (h) Exceeding the maximum designed wind loads; (i) Acts of God including, but not limited to, tornados, hurricanes, floods, earthquakes, severe weather or other natural phenomena, (including, but not limited to, unusual climate conditions); (j) Efflorescence, peeling or performance of any third party paints, stains and/or coatings; (k) Growth of mold, mildew, fungi, bacteria, or any organism on any surface of the Product (whether on the exposed or unexposed surfaces); (l) Lack of proper maintenance; and/or (m) Any cause other than material or manufacturing defects attributable to Hardie.

**6. LIMITATION OF WARRANTY.** THE ABOVE LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY FOR THE PRODUCT. HARDIE DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR OTHERWISE. In the event that applicable consumer law prohibits the disclaimer of an implied warranty, the above Limited Warranty shall not extend the time period of any such implied warranty. Some states do not allow limitations for consumers on how long an implied warranty lasts, so the above limitation may not apply to you. This Limited Warranty gives you specific legal rights, and you may have additional rights, which vary from state to state.

**7. LIMITATION OF LIABILITY.** IN NO EVENT SHALL HARDIE BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO, ANY CLAIMS OF PROPERTY DAMAGE, BASED UPON BREACH OF WARRANTY, BREACH OF CONTRACT, TORT, OR ANY OTHER LEGAL THEORY. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.

**8. NO WAIVER.** Hardie may, in its sole discretion, extend benefits beyond what is covered under this Limited Warranty. Any such extension shall apply only to the specific instance in which it is granted, and shall not constitute a waiver of Hardie's right to strictly enforce the exclusions, disclaimers, and limitations set forth herein for any or all other circumstances.

**9. ENTIRE AGREEMENT.** This Limited Warranty contains and represents the only warranty extended by Hardie for the Product. No employee or agent of Hardie or any other party is authorized to make any other warranty in addition to those made in this Limited Warranty. This Limited Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

**10. MODIFICATION OR DISCONTINUATION OF PRODUCT.** Hardie reserves the right to discontinue or modify the Product at any time without notice. In the event that repair or replacement of the Product pursuant to this Limited Warranty is not possible, Hardie will fulfill any repair or replacement obligation under this Limited Warranty with a product of equal or greater value.

**11. HOW TO OBTAIN LIMITED WARRANTY SERVICE.** For warranty services, call 866-375-8603 or write Warranty Department, James Hardie Building Products, Inc., 10901 Elm Avenue, Fontana, California 92337.

### COMPLETE AND SAVE FOR YOUR OWN RECORDS

Name of Owner \_\_\_\_\_  
Installation Address \_\_\_\_\_  
Name of Installing Contractor \_\_\_\_\_  
Date Installed \_\_\_\_\_ Contractor Phone Number \_\_\_\_\_



# STO STUCCO



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 Tel: 404-346-3666  
 Toll Free: 1-800-221-2397  
 Fax: 404-346-3119

## Sto EIFS and Stucco Systems Warranty Schedule

<b>StoTherm NEXt® Systems (EIFS Moisture Protection Limited Labor &amp; Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term</b>			
StoTherm Lotusan NEXt®	L100G	15			
StoTherm Classic NEXt®	A100G	12			
StoTherm Essence NEXt®	E100G	10			
<b>StoTherm® Systems (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term</b>			
StoTherm® Lotusan®	L100	10			
StoTherm® Classic	A100	7			
StoTherm® Essence	E100	5			
<b>StoQuik® Silver Cement Board Stucco Systems (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term</b>			
StoQuik® Silver NEXt DrainScreen™	QS 200 DS	11			
StoQuik® Silver NEXt	QS 200E	10			
StoQuik® Silver I	QS 200	5			
StoQuik® Silver II	QS 100	5			
<b>StoPowerwall™ EnergyGuard (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term*</b>			
		<b>w / Armor Coat</b>		<b>no primer</b>	
		<b>primer</b>	<b>no primer</b>	<b>primer</b>	<b>no primer</b>
StoPowerwall® w Sto Powerflex® Silco or Stolit® Lotusan® Finish	S 507	15	12	10	8
StoPowerwall® w StoPowerwall®, Sto Powerflex®, or Stolit® Finish	S 507	12	9	7	5
StoPowerwall® w Sto Powercryn® or Sto Essence DPR Finish	S 507	10	7	5	3
<b>StoPowerwall NEXt™ DrainScreen™ (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term*</b>			
		<b>w / Armor Coat</b>		<b>no primer</b>	
		<b>primer</b>	<b>no primer</b>	<b>primer</b>	<b>no primer</b>
StoPowerwall® NEXt Drainscreen w Sto Powerflex® Silco or Stolit® Lotusan® Finish	S 505	15	12	10	8
StoPowerwall® NEXt Drainscreen w StoPowerwall®, Sto Powerflex®, or Stolit® Finish	S 505	12	9	7	5
StoPowerwall® NEXt Drainscreen w Sto Powercryn® or Sto Essence DPR Finish	S 505	10	7	5	3
<b>StoPowerwall NEXt™ (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term*</b>			
		<b>w / Armor Coat</b>		<b>no primer</b>	
		<b>primer</b>	<b>no primer</b>	<b>primer</b>	<b>no primer</b>
StoPowerwall® NEXt w Sto Powerflex® Silco or Stolit® Lotusan® Finish	S 504	13	10	8	6
StoPowerwall® NEXt w StoPowerwall®, Sto Powerflex®, or Stolit® Finish	S 504	10	7	5	3
StoPowerwall® NEXt w Sto Powercryn® or Sto Essence DPR Finish	S 504	8	5	3	1
<b>StoPowerwall™ Insulated (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term*</b>			
		<b>w / Armor Coat</b>		<b>no primer</b>	
		<b>primer</b>	<b>no primer</b>	<b>primer</b>	<b>no primer</b>
StoPowerwall® w Sto Powerflex® Silco or Stolit® Lotusan® Finish	S 503	11	9	8	6
StoPowerwall® w StoPowerwall®, Sto Powerflex®, or Stolit® Finish	S 503	8	6	5	3
StoPowerwall® w Sto Powercryn® or Sto Essence DPR Finish	S 503	6	4	3	1
<b>StoPowerwall® (Limited Materials Warranty)</b>	<b>Specification</b>	<b>Warranty Term*</b>			
		<b>w / Armor Coat</b>		<b>no primer</b>	
		<b>primer</b>	<b>no primer</b>	<b>primer</b>	<b>no primer</b>
StoPowerwall® w Sto Powerflex® Silco or Stolit® Lotusan® Finish	S 501	10	9	8	6
StoPowerwall® w StoPowerwall®, Sto Powerflex®, or Stolit® Finish	S 501	7	6	5	3
StoPowerwall® w Sto Powercryn® or Sto Essence DPR Finish	S 501	5	4	3	1



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 Toll Free: 1-800-221-2397  
 Fax: 404-346-3119

StoPowerwall® Direct Applications to Concrete or CMU with Sto ExtraSeal  (Limited Materials Warranty)	Specification	Warranty Term*			
		w / Armor Coat		primer	no primer
		primer	no primer		
StoPowerwall® w ExtraSeal and Sto Powerflex® Silco or Stolit® Lotusan® Finish	S 739	12	11	10	8
StoPowerwall® w ExtraSeal and StoPowerwall®, Sto Powerflex®, or Stolit® Finish	S 739	9	8	7	5
StoPowerwall® w ExtraSeal and Sto Powercryn® or Sto Essence DPR Finish	S 739	7	6	5	3

**\*Armor Coat includes Sto Base Coat with embedded Sto Mesh. Priming is always recommended for best performance. Stucco must cure the full 28 days before applying Sto finishes unless Sto Hot Prime is used (requires minimum 7 day stucco cure before application of finish).**

**IMPORTANT! WARRANTIES DO NOT APPLY unless StoPowerwall Base Stucco is used (103 StoPowerwall Stucco or 108 Powerwall Scratch & Brown) or other stucco base materials listed by Sto Corp.: BMI 690, EZ Concentrate, EZ Scratch & Brown, IPC Scratch & Brown, Quikrete 1139, Quikrete 1200, Western 1-Kote Concentrate, Western 1-Kote Premium Sanded**



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**Sto Guide Specification S504**  
**StoPowerwall® with Metal Plaster Base on Concrete,**  
**Concrete Masonry (CMU), and **Frame Wall Construction****

**Section 09 24 23**  
**Portland Cement Stucco**

*This guide specification is intended for use by the design/construction professional and any user of Sto products to assist in developing project specifications for a stucco wall assembly applied to code compliant concrete, concrete masonry, and frame wall construction. The stucco assembly incorporates a fluid applied air/moisture barrier, code compliant paper or felt water-resistive barrier (WRB), code compliant metal plaster base and portland cement stucco, and Sto primers and finishes. The assembly complies with the IBC and IRC building code requirements for use on on all Types (I-V) of construction. It has been evaluated against NFPA 285 criteria and meets requirements for use on noncombustible construction. Refer to this specification, Sto Guide Details, and ICC ESR 1233 for more complete information. Notes in Italics, such as this one, are explanatory and intended to guide the design/construction professional and user in the proper selection and use of materials.*

*StoGuard, the air/moisture barrier, functions in tandem with other compatible air barrier and flashing components of the building envelope to resist air and water infiltration. Code compliant asphalt saturated felt or paper WRB is applied over StoGuard in wood or steel frame wall construction and similarly functions in tandem with flashing to resist water infiltration. StoPowerwall and Sto listed stuccos are ICC ES listed or ASTM C 926 compliant portland cement stuccos. Sto exterior primers and finishes complete the exterior stucco wall assembly and are applied over the properly cured stucco base.*

*Like all building materials, portland cement stucco has limitations. For example, efflorescence is a normal occurrence in portland cement based products and can affect final appearance of finish products installed over stucco. Some degree of cracking is normal in portland cement stucco and should be expected. Cracking is generally not caused by a material defect in the stucco and can be minimized by following sound design and construction practice such as: proper installation of lath, proper incorporation of stress relief joints in the construction, properly graded sand for field mixed stucco, proper proportioning of stucco mix ingredients, use of the minimum amount of water in the stucco mix for placement and avoiding the use of excess water, moist curing of the stucco after it has been applied, and proper sequencing of construction to avoid stresses in the freshly placed stucco. Surface alkalinity (pH) is an important consideration for stucco surfaces that will receive acrylic or acrylic elastomeric finishes and should be checked to verify pH less than 10 before primer or finish is applied. StoPrime Hot is the preferred primer for use on stucco surfaces to “mask” surface alkalinity. Refer to Sto Tech Hotline No. 1202-CF, Alkaline Substrates and Polymeric Finishes.*

*StoPowerwall , as with any exterior wall assembly, requires proper design detailing and integration with other components, in particular flashing and air barrier transition materials, to provide a wall assembly that resists air and water infiltration. The weather protection afforded by StoPowerwall DrainScreen should be evaluated by the design/construction professional in relation to building design, height, orientation, climate zone, and any other factors that affect the severity of exposure to rain and water infiltration. Refer to Sto Tech Hotline Nos. 0403-BSc, Critical Detail Checklist for Wall Assemblies, and 0603-BSc, Moisture Control Principles for Design and Construction of Wall Assemblies. Modifications should be made to this specification as deemed necessary by the design/construction professional to ensure a watertight building envelope without water entry or*

*accumulation anywhere within the wall assembly, an airtight building envelope, and control of condensation from water vapor diffusion. For complete technical information on Sto components and other reference materials, refer to product bulletins, guide details, and other technical information available at [www.stocorp.com](http://www.stocorp.com).*

*Notes in italics, such as this one, are explanatory and intended to guide the design/construction professional and user in the proper selection and use of materials. This specification should be modified where necessary to accommodate individual project conditions.*

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## PART 1 GENERAL

### 1.1 SUMMARY

- A. Materials and installation of exterior stucco wall covering backed with air/moisture barrier and WRB.

### 1.2 RELATED SECTIONS

(add/delete, depending on specific project requirements)

- |    |                  |   |
|----|------------------|---|
| A. | Section 03 30 00 | Cast-In-Place Concrete                    |
| B. | Section 04 20 00 | Unit Masonry                              |
| C. | Section 06 16 00 | Sheathing                                 |
| D. | Section 07 26 00 | Vapor Retarders                           |
| E. | Section 07 27 00 | Air Barriers                              |
| F. | Section 07 50 00 | Membrane Roofing                          |
| G. | Section 07 62 00 | Sheet Metal Flashing and Trim             |
| H. | Section 07 92 00 | Joint Sealants                            |
| I. | Section 08 40 00 | Entrances, Storefronts, and Curtain Walls |
| J. | Section 08 50 00 | Windows                                   |

### 1.3 REFERENCED DOCUMENTS

(add/delete depending on specific project requirements)

- |    |                 |   |
|----|-----------------|---|
| A. | ASTM Standards: |   |
|    | A 641           | Standard Specification for Zinc-Coated (Galvanized ) Carbon Steel Wire                            |
|    | A 653           | Specification for Sheet Steel Zinc coated (Galvanized) by the Hot-Dip Process, Commercial Quality |
|    | B 69            | Specification for Rolled Zinc   |
|    | C 144           | Specification for Aggregate for Masonry Mortar  |
|    | C 297           | Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions                      |
|    | C 578           | Specification for Preformed, Cellular Polystyrene Thermal Insulation                              |
|    | C 847           | Standard Specification for Metal Lath   |
|    | C 897           | Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters                 |
|    | C 926           | Standard Specification for Application of Portland Cement-Based Plaster                           |
|    | C 1063          | Standard Specification for Installation of Lathing and Furring for Portland Cement Plaster        |

- C 1177 Specification for Glass Mat Gypsum for Use as Sheathing
  - C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
  - D 226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
  - D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
  - D 4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
  - E 84 Test Method for Surface Burning Characteristics of Building Materials
  - E 96 Standard Test Methods for Water Vapor Transmission of Materials
  - E 283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
  - E 330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
  - E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
  - E 783 Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
  - E 2178 Standard Test Method for Air Permeance of Building Materials
  - E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
  - E 2430 Standard Specification for Expanded Polystyrene (“EPS”) Thermal Insulation Boards For Use in Exterior Insulation and Finish Systems (“EIFS”)
  - G 154 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials
- B. AISI (American Iron and Steel Institute)
- AISI S200-2007 North American Standard for Cold-Formed Steel Framing-General Provisions
- C. APA Engineered Wood Association
- PS 1 Voluntary Product Standard, Structural Plywood
  - PS 2 Performance Standard for Wood-Based Structural-Use Panels
  - E 30 APA Engineered Wood Construction Guide
- D. ICC (International Code Council)
- 2012 and 2015 IBC (International Building Code)
- E. ICC ES (International Code Council Evaluation Service)
- 1. AC 11 Acceptance Criteria for Cementitious Exterior Wall Coatings
  - 2. AC 212 Acceptance Criteria for Water-resistive Coatings used as Water-resistive Barriers over Exterior Sheathing
  - 3. ICC ESR 1233 StoGuard with Gold Coat, StoGuard with EmeraldCoat, and StoGuard VaporSeal Water-Resistive Barriers, and StoEnergy Guard

ICC ESR 2323      StoPowerwall and StoPowerwall NExT Stucco Systems

- F. National Fire Protection Association (NFPA) Standards
  - NFPA 285      Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
- G. South Coast Air Quality Management District (SCAQMD)
  - Rule 1113 (2007)      Architectural Coatings
- H. Sto Corp.
  - Addendum      Addendum to Sto Stucco Specifications
- I. US EPA (United States Environmental Protection Agency)
  - 40 CFR Part 59      (Code of Federal Regulations Title 40 Part 59 – National Volatile Organic Compound Emission Standards for Consumer and Commercial Products)

## 1.4 DESIGN REQUIREMENTS

- A. Structural (wind and axial loads)
  - 1. Design for maximum allowable deflection, normal to the plane of the wall of L/360.
  - 2. Design for wind load in conformance with building code requirements.
  - 3. Refer to applicable ICC ESR for wind load limitations that may apply.
- B. Moisture Control
  - 1. Prevent the accumulation of water into or behind the stucco, either by condensation or leakage into the wall construction, in the design and detailing of the wall assembly:
    - a. Provide corrosion resistant flashing to protect exposed elements and to direct water to the exterior, including, above window and door heads, beneath window and door sills, at floor lines, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.
    - b. Air Leakage Prevention – prevent excess air leakage in the design and detailing of the wall assembly. Provide continuity between air barrier components in the wall assembly.
    - c. Vapor Diffusion and Condensation – perform a dew point analysis and/or dynamic hygrothermal modeling of the wall assembly to determine the potential for accumulation of moisture in the wall assembly as a result of water vapor diffusion and condensation. Adjust wall assembly components accordingly to minimize the risk of condensation. Avoid the use of vapor retarders on the interior side of the wall in warm, humid climates.
    - d. Provide StoGuard Air/Moisture Barrier over sheathing, concrete and masonry.
    - e. At through wall expansion joints and at joints formed with back-to-back casing beads, back joints with StoGuard Transition Membrane. Refer to Sto Guide Details at [www.stocorp.com](http://www.stocorp.com).

- f. Seal stucco terminations and accessory butt joints with appropriate sealant. Seal all penetrations through the stucco wall assembly with appropriate sealant, or backer rod and sealant, as dictated by joint type.
- C. Grade Condition
1. Do not specify stucco for use below grade or on surfaces subject to continuous or intermittent water immersion or hydrostatic pressure. Provide minimum 4 inch (100 mm) clearance above earth grade, minimum 2 inch (51 mm) clearance above finished grade (pavers/sidewalk). Provide increased clearance in freeze/thaw climate zones.
- D. Sloped surfaces, including Foam Trim and Projecting Architectural Features Attached to Stucco.
1. Avoid the use of stucco on build-outs or weather exposed sloped and horizontal surfaces (refer to 2 and 3 below).
  2. Build out trim and projecting architectural features from the stucco wall surface with code compliant EPS foam. All foam trim and projecting architectural features must have a minimum 1:2 [27°] slope along their top surface. All foam horizontal reveals must have a minimum 1:2 [27°] slope along their bottom surface. Increase slope for northern climates to prevent accumulation of ice/snow and water on surface. Where trim/feature or bottom surface of reveal projects more than 2 inches (51 mm) from the face of the wall plane, protect the top surface with waterproof base coat. Limit foam thickness to a maximum of 4 inches (102 mm). Periodic inspections and increased maintenance may be required to maintain surface integrity of finishes on weather exposed sloped surfaces. Limit projecting features to easily accessible areas and limit total area to facilitate maintenance and to minimize maintenance burden. Refer to Sto Guide Details at [www.stocorp.com](http://www.stocorp.com)
  3. Do not use EPS foam on weather exposed projecting ledges, sills, or other projecting features unless supported by framing or other structural support and protected with metal coping or flashing. Refer to Sto Guide Details at [www.stocorp.com](http://www.stocorp.com)
- E. Joints and Accessories
1. Provide two piece expansion joints in the stucco assembly where building movement is anticipated: at joints in the substrate or supporting construction, where the system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas.
  2. Provide one piece expansion joints every 144 ft<sup>2</sup> (13 m<sup>2</sup>). Cut and wire tie lath to the expansion joint accessory so lath is discontinuous at or beneath the accessory. Do not exceed length to width ratio of 2-1/2:1 in expansion joint layout and do not exceed more than 18 feet (5.5 m) in any direction without an expansion joint. Where casing bead is used back-to-back as the expansion joint, back the joint with StoGuard Transition Membrane.
  3. Provide one piece expansion joints at through wall penetrations, for example, above and below doors or windows.
  4. Provide minimum 3/8 inch (9 mm) wide joints where the system abuts windows, doors and other through wall penetrations.
  5. Provide appropriate accessories at stucco terminations and joints.
  6. Avoid the use of channel reveal accessories which can interfere with proper drainage and proper stress relief.
  7. Provide appropriate sealant at stucco terminations and at stucco accessory butt joints.

8. Indicate location of joints, accessories and accessory type on architectural drawings.

F. Fire Protection

1. Noncombustible Type Construction: provide full width firestops at floor lines, typically 4 pcf ( $64 \text{ kg/m}^3$ ) semi-rigid mineral wool, where metal framing runs continuously past floor line and provide minimum  $\frac{3}{4}$  inch (19 mm) uniform stucco thickness.
2. Fire Resistance Rated Non-load Bearing Wall Assembly: provide  $\frac{7}{8}$  inch (22 mm) uniform stucco thickness. Refer to Sto Guide Details for a one hour rated non-load bearing fire-resistive rated wall assembly.

G. Solid Substrates ( concrete and CMU)

1. Provide surface plane tolerance not to exceed  $\frac{1}{4}$  inch in 10 feet (6 mm in 3.0 m).
2. Concrete Masonry – provide open texture concrete masonry units with flush joints.
3. Do not install air/moisture barrier materials over efflorescence, weak surface conditions, painted, coated, non-absorbent, salt-contaminated, or any concrete or CMU substrate where adhesion is in question. Proof test adhesion to prepared poured-in-place or pre-cast concrete surfaces and impose a regimen of quality control tests to verify adhesion throughout the project.

H. Stucco Thickness (does not include primer or textured finish coat)

1. Application to Metal Plaster Bases: stucco thickness shall be uniform  $\frac{3}{4}$  inch or  $\frac{7}{8}$  inch (19 or 22 mm). Stucco thickness shall not exceed  $\frac{7}{8}$  inch (22 mm).
2. Stucco shall be applied in 2 coats, scratch and brown coat, to achieve the prescribed thickness.
3. Thickness shall be uniform throughout the wall area.

## 1.5 PERFORMANCE REQUIREMENTS

A. Air/Moisture Barrier

1. Compliant with ICC ES Acceptance Criteria AC 212 (ICC ESR 1233)
2. Material Air Leakage Resistance, ASTM E 2178: less than  $0.02 \text{ L/s}\cdot\text{m}^2$  at 75 Pa (0.004  $\text{cfm/ft}^2$  at 1.57 psf)
3. Assembly Air Leakage Resistance, ASTM E 2357: less than  $0.2 \text{ L/s}\cdot\text{m}^2$  (0.04  $\text{cfm/ft}^2$  at 1.57 psf)
4. Water Vapor Permeance, ASTM E 96, Method B: greater than 10 perms [ $573 \text{ ng}/(\text{Pa}\cdot\text{s}\cdot\text{m}^2)$ ]
5. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A Building Material
6. Tensile Adhesion, ASTM C 297:
  - a. Gypsum Sheathing, exceeds strength of substrate
  - b. Plywood, > 85 psi (590 kPa)
  - c. OSB, > 30 psi (206 kPa)
7. VOC, calculation:
  - a. Less than 100 g/L

- b. Compliant with US EPA 40 CFR 59 for waterproofing/sealer
  - c. Compliant with South Coast AQMD Rule 1113 for waterproofing/sealer
- B. Stucco Base (*select one*)
- 1. Stucco scratch and brown coat material in compliance with ASTM C 926 and manufactured or listed by Sto Corp. (see Addendum)
  - 2. One coat stucco material in compliance with ICC AC 11, listed by ICC ES, and manufactured or listed by Sto Corp. (see Addendum)
- C. Primers (*select one*)
- 1. Alkaline Resistant Primer for freshly placed (minimum 4 day old) stucco surfaces:
    - a. Resistant to alkaline surfaces with pH of 13 or less
    - b. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
    - c. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
  - 2. Acrylic Primer for fully cured (minimum 28 day old or pH less than 10) stucco surfaces:
    - a. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
    - b. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
- D. Finishes (*select one*)
- 1. Lotus-Effect Technology Finish (Stolit Lotusan)
    - a. Super-hydrophobic textured finish with Lotus-Effect Technology
    - b. Accelerated Weathering, ASTM G 154: 2500 hours, no blistering, checking cracking, crazing, or other deleterious effects
    - c. Water Vapor Permeability, ASTM E 96, Method B: > 30 perms [(1172 ng/(Pa·s·m<sup>2</sup>))]
    - d. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
    - e. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
  - 2. Silicone Enhanced Elastomeric Finish (Sto Powerflex Silco)
    - a. Accelerated Weathering, ASTM G 154: 2000 hours, no blistering, checking cracking, crazing, or other deleterious effects
    - b. Water Vapor Permeability, ASTM E 96, Method B: > 10 perms [(574 ng/(Pa·s·m<sup>2</sup>))]
    - c. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
    - d. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
  - 3. Elastomeric Finish (Sto Powerflex)

- a. Accelerated Weathering, ASTM G 154: 2000 hours, no blistering, checking cracking, crazing, or other deleterious effects
  - b. Water Vapor Permeability, ASTM E 96, Method B: > 5 perms [(287 ng/(Pa·s·m<sup>2</sup>))]
  - c. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
  - d. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
4. Flexible Acrylic Finish (Sto Powerwall)
- a. Accelerated Weathering, ASTM G 154: 2000 hours, no blistering, checking cracking, crazing, or other deleterious effects
  - b. Water Vapor Permeability, ASTM E 96, Method B: > 15 perms [(861 ng/(Pa·s·m<sup>2</sup>))]
  - c. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
  - d. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings
5. Acrylic Finish (Stolit, Stolit X, Sto Essence DPR, Sto Powercyl)
- a. Accelerated Weathering, ASTM G 154 or G 155: 2000 hours, no blistering, checking cracking, crazing, or other deleterious effects
  - b. Water Vapor Permeability, ASTM E 96, Method B: > 10 perms [572 ng/(Pa·s·m<sup>2</sup>)]
  - c. Surface Burning, ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A building material
  - d. VOC: less than 50 g/L, compliant with South Coast AQMD Rule 1113 for architectural coatings

## 1.6 SUBMITTALS

- A. Manufacturer's specifications, details, installation instructions and product data
- B. Manufacturer's code compliance report for air barrier and water-resistive barrier
- C. Manufacturer's code compliance report for stucco where ICC listed one coat stucco is used
- D. EPS board manufacturer's certificate of compliance with ASTM E 2430-05
- E. Manufacturer's NFPA 285 assembly report or ICC ESR indicating compliance of air/moisture barrier with requirements of NFPA 285 for use on Types I, II, III, and IV construction
- F. Manufacturer's standard warranty
- G. Samples for approval as directed by architect or owner
- H. Fastener manufacturer's pull-out or withdrawal capacity testing for frame and solid substrates
- I. Prepare and submit project-specific details (when required by contract documents)

## 1.7 QUALITY ASSURANCE

- A. Manufacturer requirements

1. Stucco and air barrier products manufacturer for a minimum of twenty (20) years.
  2. Stucco finish products and air barrier products manufactured under ISO 9001:2008 Quality System and 14001:2004 Environmental Management System.
- B. Contractor requirements
1. Licensed, insured and engaged in application of portland cement stucco for a minimum of three (3) years.
  2. Knowledgeable in the proper use and handling of Sto materials.
  3. Employ skilled mechanics who are experienced and knowledgeable in portland cement stucco application, and familiar with the requirements of the specified work.
  4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
  5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with Sto's published specifications and details and the project plans and specifications.
- C. Insulation board manufacturer requirements
1. Listed by an approved agency. Label insulation board with information required by Sto, the approved listing agency, and the applicable building code.
- D. Testing
1. Construct full-scale mock-up of typical stucco/window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E 283, ASTM E 331 and ASTM E 330, respectively, through independent laboratory. Mock-up shall comply with requirements of project specifications. Where mock-up is tested at job site maintain approved mock-up at site as reference standard. If tested off-site accurately record construction detailing and sequencing of approved mock-up for replication during construction.
  2. Conduct air barrier adhesion testing in accordance with ASTM D 4541.
  3. Conduct air barrier assembly testing in accordance with ASTM E 783.
  4. Conduct pull-out or withdrawal capacity testing of proposed fasteners for lath attachment into concrete or masonry and verify adequacy with respect to negative design wind pressure. Conduct sufficient tests such that reliable and predictable pull-out values are obtained. Verify adequacy of pull-out or withdrawal capacity of fasteners used for frame construction with manufacturer in relation to negative design wind pressures.
  5. Conduct pH testing to check stucco surface alkalinity before application of primer or finish materials. Where alkaline resistant primer is used pH testing may be waived.
  6. Conduct wet sealant adhesion testing in accordance with sealant manufacturer's field quality control test procedure.
  7. Notify design professional minimum 7 days prior to testing.
- E. Inspections
1. Provide independent third party inspection where required by code or contract documents.
  2. Conduct inspections in accordance with code requirements and contract documents.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect EPS insulation materials from prolonged UV exposure, keep away from sources of heat, sparks, flame, flammable or volatile materials. Store on a clean, flat surface, off the ground in a dry area.
- C. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32° C). Store away from direct sunlight.
- D. Protect portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.
- E. Handle all products as directed on labeling.

## 1.9 PROJECT/SITE CONDITIONS

*(Weather conditions affect application, drying time and curing requirements. Hot or dry conditions limit working time and accelerate drying and may require adjustments in application, scheduling and curing to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing).*

- A. Maintain ambient and surface temperatures above 40°F (4°C) during application and for 24 hours after set of stucco, and after application of air/moisture barrier and finish materials.
- B. Provide supplementary heat for installation in temperatures less than 40°F (4°C) such that material temperatures are maintained as in 1.09A. Prevent concentration of heat on uncured stucco and vent fumes and other products of combustion to the outside to prevent contact with stucco.
- C. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather. For installation under any of these conditions provide special measures to properly moist cure the stucco. Do not install stucco if ambient temperatures are expected to rise above 100°F (38°C) within a 24 hour period.
- D. Provide protection of surrounding areas and adjacent surfaces from application of materials.

## 1.10 COORDINATION/SCHEDULING

*(The work in this section requires close coordination with related sections and trades. Sequence work to provide protection of construction materials from weather deterioration and from damage from trades)*

- A. Protect sheathing from climatic conditions to prevent weather damage until the installation of the air/moisture barrier.
- B. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.
- C. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier and continuous moisture protection. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashing. Coordinate installation of air/moisture barrier

components with window and door installation to provide weather proofing of the structure and to prevent moisture infiltration and excess air infiltration.

- D. Install window and door head flashing immediately after windows and doors are installed.
- E. Protect air/moisture barrier with stucco cladding within 180 days of installation.
- F. Commence the stucco installation after completion of all floor, roof construction and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the stucco.
- G. Sequence interior work such as drywall installation prior to stucco installation to prevent stud distortion (and potential cracking) of the stucco.
- H. Provide site grading such that the stucco terminates above earth grade minimum 4 inches (100 mm) and above finished grade (pavers/sidewalk) minimum 2 inches (51 mm). Provide increased clearance in freeze/thaw climate zones.
- I. Install copings and sealant immediately after installation of the stucco and when finish coatings are dry.
- J. Attach penetrations through stucco to structural support and provide air tight and water tight seals at penetrations.

#### 1.11 **WARRANTY**

- A. **Provide manufacturer's standard warranty.** See attached warranty information

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Air/Moisture Barrier, Portland Cement Stucco, Stucco Primers, and Stucco Finishes
  - 1. Sto Corp., 3800 Camp Creek Parkway, Building 1400, Suite 120. Atlanta, GA 30331

*NOTE: Other sources for portland cement stucco may be permissible – refer to Addendum.*

### 2.2 AIR/MOISTURE BARRIER

- A. StoGuard-- fluid applied air/moisture barrier for sheathing, concrete, and concrete masonry substrates consisting of multiple compatible components:
  - 1. Sto Gold Fill -- ready mixed acrylic based flexible joint treatment for rough opening protection, joint treatment of wall sheathing, CMU crack repair, and detail component for shiplap connections with flashing, weep screed, and similar ship lap details.
  - 2. Sto EmeraldCoat -- ready mixed flexible waterproof coating for wall sheathing, concrete and CMU wall surfaces
  - 3. StoGuard Mesh-- nominal 4.2 oz/yd<sup>2</sup> (142 g/m<sup>2</sup>), self-adhesive, flexible, symmetrical, interlaced glass fiber mesh, with alkaline resistant coating for compatibility with Sto materials, used with Sto Gold Fill to reinforce rough openings, inside and outside corners, sheathing joints, and detail component for shiplap connections with flashing, weep screed, and similar ship lap details

4. StoGuard Fabric – nonwoven cloth reinforcement used with Sto EmeraldCoat for rough opening protection, joint treatment of wall sheathing, and detail component for shiplap connections with flashing, weep screed, and similar ship lap details
5. StoGuard RediCorner – a preformed fabric piece used in the corners of rough openings in tandem with StoGuard Fabric for quicker installation
6. StoGuard Tape – self adhering rubberized asphalt tape for rough opening protection in wood or metal frame construction
7. StoGuard Primer – primer for use with StoGuard Tape
8. StoGuard Transition Membrane – flexible air barrier membrane for continuity at transitions: sheathing to foundation, dissimilar materials (CMU to frame wall), wall to balcony floor slab or ceiling, flashing shingle lap transitions, floor line deflection joints, masonry control joints, and through wall joints in masonry or frame construction.
9. StoGuard RapidSeal – one component quick drying waterproof air barrier material for rough opening protection, sheathing joints (with StoGuard Mesh), CMU crack repair, and for sealing fish mouths, wrinkles, seams, gaps, holes, or other voids in StoGuard air barrier materials
10. StoGuard RapidFill – one component rapid drying gun-applied joint treatment for sheathing. Also used at static transition joints or seams in construction and to seal fish mouths, wrinkles, seams, gaps, holes, or other voids in StoGuard air barrier materials. Also used as a detail component for shiplap connections to flashing, weep screed, and similar ship lap details

### 2.3 WATER-RESISTIVE BARRIER

*(supplied by others)*

- A. Minimum No. 15 asphalt saturated felt complying with ASTM D 226, Type 1, or one layer of Grade D kraft building paper, or paper-backed stucco lath conforming to 2.04.

### 2.4 LATH

*(supplied by others)*

- A. Minimum 2.5 lb./yd<sup>2</sup> (1.4 kg/m<sup>2</sup>) self-furred galvanized steel diamond mesh metal lath in compliance with ASTM C 847

**NOTE:** *Metal lath is susceptible to corrosion in coastal environments. Provide weather protection to prevent moisture entry into wall construction as outlined in Design Requirements Section 1.04B. Consider the use of stainless steel lath for coastal environments. Exercise care when attaching metal lath and accessories through the water-resistive barrier so that fasteners go into [not between] framing supports. Do not use power, powder-actuated or other fastening tools/methods that can damage the air/moisture barrier barrier, water-resistive barrier, or substrate).*

### 2.5 MECHANICAL FASTENERS

*(supplied by others)*

- A. Non-corroding fasteners in compliance with AISI S200 – 2007 and ASTM C 1513:

1. Wood Framing--minimum 11 gauge, 7/16 inch (11 mm) diameter head galvanized roofing nails with minimum ¾ inch (19mm) penetration into studs or minimum #8 Type S wafer head fully threaded corrosion resistant screws with minimum ¾ inch (19 mm) penetration into studs.
2. Steel Framing – minimum #8 Type S or S-12 wafer head fully threaded corrosion resistant screws with minimum 3/8 inch (10 mm) and three thread penetration into studs.
3. Concrete or Masonry – minimum # 8 wafer head fully threaded corrosion resistant screws for masonry with minimum 1 inch (25 mm) penetration into substrate.

**NOTE:** *Pull-out or withdrawal capacity of the selected fastener must be verified with respect to anticipated wind load, desired safety factor and building code requirements. Consult applicable code compliance report for specific assemblies and fastening schedules or conduct project specific testing to verify compliance with design wind pressure requirements.*

- B. Tie Wire – 18 gauge galvanized and annealed low-carbon steel in compliance with ASTM A 641 with Class I coating.

## 2.6 ACCESSORIES

*(supplied by others)*

- A. Weep screed, casing bead, corner bead, corner lath, expansion and control joint accessories. All accessories shall meet the requirements of ASTM C 1063 and its referenced documents
  1. PVC plastic in compliance with ASTM D 1784, cell classification 13244C.
  2. Zinc in compliance with ASTM B 69.
  3. Galvanized metal in compliance with ASTM A 653 with G60 coating.
- B. All accessories shall have perforated or expanded flanges and shall be designed with grounds for the specified thickness of stucco.

**NOTE:** *Metal accessories are susceptible to corrosion in coastal environments. Consider the use of zinc alloy or PVC accessories in these environments. Metal corner beads with solid metal noses are susceptible to corrosion in exposed exterior applications. Consider the use of several layers of woven-wire mesh or other corner accessories in lieu of corner bead and completely encase the metal in stucco. Care must be taken when attaching metal lath or other wall assembly components so that fasteners go into [not between] framing supports. Powder actuated or other fastening devices that can damage the water-resistive barrier or sheathing should be avoided. CAUTION: AVOID THE USE OF CHANNEL REVEAL ACCESSORIES THAT INTERFERE WITH PROPER DRAINAGE AND STRESS RELIEF.*

## 2.7 JOB MIXED INGREDIENTS

*(supplied by others)*

- A. Water: clean and potable.

- B. Sand: in compliance with ASTM C 897 or ASTM C 144, for use with one coat and ASTM C 926 stucco concentrates

## 2.8 STUCCO

*(refer to Addendum for other stucco products that may apply)*

- A. 102 StoPowerwall Stucco Pre-Blended: fiber reinforced one coat portland cement stucco pre-blended with graded sand, and in compliance with ICC AC 11. See ICC ESR 2323.
- B. 103 StoPowerwall Stucco: fiber reinforced one coat portland cement stucco concentrate in compliance with ICC AC 11. See ICC ESR 2323.
- C. 108 StoPowerwall Scratch & Brown: portland cement-based stucco concentrate in compliance with ASTM C 926.
- D. Other code compliant portland cement stucco as listed by Sto Corp. (refer to Addendum)

## 2.9 FOAM TRIM AND BUILD-OUTS

- A. Adhesive and Base Coat *(select one)*
  1. Sto BTS Xtra – light weight one component polymer modified cement-based extra high build base coat material
  2. Sto BTS Plus – one component polymer modified cement-based high build base coat material
  3. Sto Primer/Adhesive-B – one component polymer modified cement-based base coat material
  4. Sto Primer/Adhesive – two component acrylic based base coat material field mixed with portland cement
  5. Sto RFP – ready mixed non-cementitious fiber reinforced base coat material
  6. Sto Flexyl – two component fiber reinforced acrylic based waterproof base coat material field mixed with portland cement (for use as a waterproof base coat to waterproof foundations, parapets, splash areas, trim and other projecting architectural features).
- B. Foam Insulation Board for Trim
  1. Sto EPS Insulation Board--nominal 1.0 lb/ft<sup>3</sup> (16 kg/m<sup>3</sup>) Expanded Polystyrene (EPS) Insulation Board in compliance with ASTM C 578 Type I requirements, and ASTM E 2430 *(Note: minimum required thickness is 1 inch [25 mm] and maximum allowable thickness is typically 4 inches [102 mm] for noncombustible type construction unless thicker dimensions are approved by the code official).*
- C. Reinforcing Mesh
  1. Sto Mesh--nominal 4.5 oz./yd<sup>2</sup> (153 g/m<sup>2</sup>), symmetrical, interlaced open-weave glass fiber mesh treated with alkaline resistant coating for compatibility with Sto materials (achieves Standard Impact Classification over foam insulation board).
  2. Sto Detail Mesh--nominal 4.2 oz./yd<sup>2</sup> (143 g/m<sup>2</sup>), flexible, symmetrical, interlaced open-weave glass fiber fabric treated with alkaline resistant coating for compatibility with Sto materials (used for standard foam backwrapping and aesthetic detailing).

## 2.10 CRACK DEFENSE

*(optional components for added crack resistance)*

### A. Base Coat (*select one*)

1. Sto BTS Xtra – light weight one component polymer modified cement-based extra high build base coat material
2. Sto BTS Plus – one component polymer modified cement-based high build base coat material
3. Sto Primer/Adhesive-B – one component polymer modified cement-based base coat material
4. Sto Primer/Adhesive – two component acrylic based base coat material field mixed with portland cement
5. Sto RFP – ready mixed non-cementitious fiber reinforced base coat material
6. Sto Flexyl – two component fiber reinforced acrylic based waterproof base coat material field mixed with portland cement (for use as a waterproof base coat to waterproof foundations, parapets, splash areas, trim and other projecting architectural features).

### B. Reinforcing Mesh

1. Sto Mesh – nominal 4.5 oz./yd<sup>2</sup> (153 g/m<sup>2</sup>), symmetrical, interlaced open-weave glass fiber mesh made with alkaline resistant coating for compatibility with Sto materials

## 2.11 PRIMER

*(select one)*

- A. StoPrime Hot – acrylic based primer/sealer for freshly placed (minimum 4 day old) and high pH stucco surfaces.
- B. StoPrime Sand – acrylic based tinted, sanded primer for fully cured (minimum 28 day old or pH less than 10) stucco surfaces.
- C. StoPrime -- acrylic based tinted primer for fully cured (minimum 28 day old or pH less than 10) stucco surfaces

**NOTE:** *Priming is recommended to provide uniform substrate absorption and finish color, to improve adhesion and water resistance. StoPrime Hot may be applied 48 hours after moist curing the brown coat. Other Sto primers require 28 days curing of brown coat or pH less than 10 before application.*

## 2.12 FINISH COAT

*(select one)*

- A. Stolit Lotusan Finish – integrally colored, factory blended textured Lotus-Effect Technology wall finish with graded marble aggregate
- B. Sto Powerflex Silco Finish – integrally colored, factory blended, silicone enhanced elastomeric textured wall finish with graded marble aggregate

- C. Sto Powerflex Finish – integrally colored, factory blended, elastomeric textured wall finish with graded marble aggregate
- D. StoPowerwall Finish – integrally colored, factory blended, flexible acrylic textured wall finish with graded marble aggregate.
- E. Stolit Finish – integrally colored, factory blended, acrylic textured wall finish with graded marble aggregate
- F. Stolit X – acrylic based textured wall finish with graded marble aggregate and enhanced polymer technology for easy spread and float application
- G. Sto Essence DPR Finish – integrally colored, factory blended, acrylic textured wall finish with graded marble aggregate
- H. Sto Powercryn Finish – integrally colored, factory blended, acrylic textured wall finish with graded marble aggregate

## 2.13 MIXING

- A. StoGuard
  - 1. Sto Gold Fill – mix with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin, or dilute with water.
  - 2. Sto EmeraldCoat – mix with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin, or dilute with water.
- B. StoPowerwall Stucco
  - 1. Refer to mix instructions on packaging. USE ONLY THE AMOUNT OF WATER NECESSARY FOR A WORKABLE MIX. Use of excess water is detrimental to performance.
- C. Adhesive and Base Coats for Sto Crack Defense and Foam Build-outs:
  - 1. Refer to applicable Sto [Product Bulletin](#) for selected adhesive/base coat material(s).
- D. Primer--mix with a clean, rust-free high speed mixer to a uniform consistency.
- E. Finish--mix with a clean, rust-free high speed mixer to a uniform consistency. A small amount of water (up to 12 ounces [0.4 L]) may be added to adjust workability. Limit addition of water to amount needed to achieve the finish texture.
- F. Mix only as much material as can readily be used.
- G. Do not add lime, anti-freeze compounds, or other additives to any of the materials.

## PART 3 EXECUTION

### 3.1 ACCEPTABLE INSTALLERS

- A. Pre-qualify under Quality Assurance requirements of this specification (section 1.07.B).

### 3.2 EXAMINATION

- A. Inspect surfaces for:
1. Contamination – algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
  2. Surface absorption and chalkiness.
  3. Crack – measure crack width and record location of cracks.
  4. Damage and deterioration.
  5. Moisture damage – record any areas of moisture damage.
- B. Inspect sheathing application for compliance with applicable requirement:
1. Glass Mat Faced Gypsum Sheathing in compliance with ASTM C 1177 – refer to manufacturer's instructions and/or ICC evaluation report
  2. Exterior Grade and Exposure 1 wood based sheathing – APA Engineered Wood Association E 30.

*NOTE: Sheathing attachment can determine ultimate wind load resistance. Verify attachment in conformance with design wind pressure requirements as determined by building code requirements and/or project specific testing. Wood-based sheathing must be gapped 1/8 inch (3mm) at edge and end joints to prevent cracking in the stucco.*

- C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air/moisture barrier or stucco installation to the General Contractor. Do not proceed with air/moisture barrier or stucco installation until deviations are corrected.

### 3.3 SURFACE PREPARATION

- A. Concrete and Concrete Masonry (CMU)
1. Remove surface contamination such as oil, grease, dust, dirt, algae, mildew, salts, paint or coatings. Correct weak surface conditions such as laitance. Use chemical cleaners such as TSP (trisodium phosphate) detergent to remove oil and grease and rinse with potable water. Use chemical cleaners to remove efflorescence or other surface contamination in accordance with manufacturer's written instructions. Use mechanical methods such as waterblasting, sandblasting, and wire brushing to remove weak surface conditions.
  2. Repair cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply joint treatment material over crack, embed reinforcement (where applicable), and smooth joint treatment material with a trowel, drywall or putty knife to cover the reinforcement.
  3. Remove projecting fins, ridges, and mortar by mechanical means.
  4. Fill honeycombs, aggregate pockets, holes and other voids with Sto patching material.
  5. Where the surface is excessively "rough" or out of plane, skim coat the wall surface with Sto base coat material to provide a smooth, level surface.
- B. Sheathing
1. Remove surface contaminants and replace damaged sheathing.

2. All sheathing must be handled and installed in compliance with applicable building code and/or manufacturer requirements. Installed sheathing must be clean, dry and free from damage, frost, and all bond-inhibiting materials. Abut gypsum sheathing joints. Gap wood sheathing 1/8 inch (3 mm) at joints. Should gaps exceed 1/8 inch (3 mm) up to 1/2 inch (13 mm) wide, use StoGuard RapidFill to fill joints, or apply low expanding urethane foam into joints and rasp or shave flush with sheathing surface in preparation for installation of StoGuard joint treatment.
3. Spot surface defects in sheathing with joint treatment (Sto Gold Fill, StoGuard RapidSeal, StoGuard RapidFill, or Sto EmeraldCoat).

### 3.4 AIR/MOISTURE BARRIER INSTALLATION

*(refer to Sto Guide Details as needed)*

**NOTE:** *The air/moisture barrier installation described below is one component of the air barrier assembly for the building envelope and the moisture protection of the wall construction. Installation of the air/moisture barrier must be integrated with other air and moisture barrier components in the construction. This requires coordination with other trades to ensure proper sequencing of work, to achieve air barrier continuity, and to direct rain water to the exterior, not into the wall assembly. Always protect rough openings in wall construction BEFORE installing windows, doors, louvers, etc. Where water is likely to penetrate the wall assembly, such as windows, flashing must be installed to direct water to the exterior at the leak source.*

The following instructions are applicable to:

- Exterior or Exposure I Plywood in compliance with PS-1
- OSB (Oriented Strand Board) in compliance with PS-1 or PS-2
- Glass Mat Faced Gypsum Sheathing in compliance with ASTM C 1177
- Concrete and Concrete Masonry surfaces

#### A. Transition Detailing with StoGuard Transition Membrane

At floor line deflection joints up to 1 inch (25 mm) wide, stucco expansion joints formed with back-to-back casing beads, and static joints and transitions such as: sheathing to foundation, dissimilar materials (i.e., CMU to frame wall), flashing shingle-lap transitions, and wall to balcony floor slab or ceiling:

1. Apply waterproof coating (Sto EmeraldCoat) liberally to properly prepared surfaces with brush, roller, or spray.
2. Place pre-cut lengths of StoGuard Transition Membrane centered over the transition in the wet coating. At changes in plane crease the membrane and similarly place the membrane material in the wet coating. At floor line deflection joints achieve a slightly concave profile (recessed into the joint) of the membrane.
3. Immediately top coat the membrane with additional coating and apply pressure with brush or roller to fully embed the membrane in the coating and achieve a smooth and wrinkle-free surface without gaps or voids.

4. Apply coating liberally along all top horizontal edges on walls and along all edges on balcony floor slabs to fully seal the edges.
5. Overlap minimum 2 inches (51 mm) at ends and adhere lap seams together with coating. Shingle lap vertical seams and vertical to horizontal intersections with minimum 2 inch (51 mm) overlap.

At movement joints up to 1 inch (25 mm) wide with up to + 50% movement such as masonry control joints, and through wall joints in masonry or frame construction:

1. Insert backer rod sized to friction fit in the joint (diameter 25% greater than joint width).
2. Recess the backer rod ½ inch (13 mm).
3. Apply the waterproof coating liberally to properly prepared surfaces with brush, roller, or spray along the outer surface on each side of the joint (not in the joint).
4. Immediately place the membrane by looping it into the joint against the backer rod surface to provide slack.
5. Embed the membrane in the wet coating along the outer surface on the sides of the joint by top coating with additional coating material and applying pressure with a brush or roller.

For all applications, after the membrane installation is complete and the waterproof coating is dry:

1. Apply a final liberal coat of the waterproof coating to all top horizontal edges on walls to ensure waterproofing integrity. Similarly apply coating at all edges on balcony floor slabs.
2. Inspect the installed membrane for fish mouths, wrinkles, gaps, holes or other deficiencies. Correct fish mouths or wrinkles by cutting, then embedding the area with additional coating applied under and over the membrane.
3. Seal gaps, holes, and complex geometries at three dimensional corners with StoGuard RapidFill or StoGuard RapidSeal.

#### B. Transition Detailing with StoGuard RapidFill

At flashing shingle laps, and through wall penetrations such as pipes, electrical boxes, and scupper penetrations:

1. Flashing leg or penetration flange must be seated flat against the wall surface without gaps. Apply StoGuard RapidFill liberally with a caulking gun in a zig-zag pattern across the flashing leg or flange/wall surface seam and spread to a thickness that covers the flange and fastener penetrations and directs water away from the wall. Extend application minimum 1 inch (25 mm) onto both surfaces (flashing leg/flange and wall surface).
2. At through wall penetrations without flanges ensure the penetrating element (i.e., pipe or scupper) is fitted snug against abutting wall surfaces. Apply a fillet bead with a caulking gun around the penetration and tool against both surfaces (penetration and wall surface) to create a bead profile that directs water away from the penetration. Extend application minimum 1 inch (25 mm) onto both surfaces.

#### C. Rough Opening Protection (*select 1, 2, or 3 for frame construction; for concrete or concrete masonry rough openings with wood bucks and similar openings with complex 3-dimensional geometry, select no. 3, StoGuard RapidSeal*):

1. Sto Gold Fill with StoGuard Mesh: apply 9 inch (229 mm) wide StoGuard Mesh at rough openings. Immediately apply Sto Gold Fill by spray or trowel over the mesh and spread

with a trowel to create a smooth surface that completely covers the mesh (refer to Sto Detail 20.20M).

2. Sto EmeraldCoat with StoGuard Fabric: apply Sto EmeraldCoat liberally by spray or roller to corners of openings, immediately place StoGuard RediCorners in the wet coating, and apply additional coating over the RediCorners to completely embed them. After all corners have been completed apply Sto EmeraldCoat liberally to the entire rough opening, immediately place StoGuard Fabric in the wet coating, smooth any wrinkles with a brush or roller, and apply additional coating over the fabric to completely embed it. Overlap all seams minimum 2 inches (51 mm). Once completed top coat with additional coating as needed to completely seal the surface. Allow to dry and inspect for pinholes or voids. If pinholes or voids are present, seal with additional coating or StoGuard RapidSeal (refer to Sto Detail 20.20F).
3. StoGuard RapidSeal: apply a generous bead of StoGuard RapidSeal with a caulking gun in a zig-zag pattern along the inside and outside surface of the rough opening. Spread with a 6 inch (152 mm) wide plastic drywall knife all the way around the opening (refer to Sto Details 20.20R and 21.20R)

D. Sheathing Joint Treatment (*select one*)

1. Sto Gold Fill with StoGuard Mesh: place 4 inch (102 mm) wide mesh centered along sheathing joints and minimum 9 inch (229 mm) wide mesh centered and folded at inside and outside corners. Immediately apply Sto Gold Fill by spray or trowel and spread with a trowel to create a smooth surface that completely covers the mesh.
2. Sto EmeraldCoat with StoGuard Fabric: apply Sto EmeraldCoat liberally by spray or roller along sheathing joints and immediately place 4 inch (102 mm) wide fabric centered over the joints into the wet coating, and 6 inch (152 mm) wide fabric centered and folded at inside and outside corners into the wet coating. Smooth any wrinkles with a brush or roller and apply additional coating to completely embed the fabric. Overlap seams minimum 2 inches (51 mm).
3. StoGuard RapidFill: apply a thick bead of StoGuard RapidFill with a caulking gun along sheathing joints, or apply in a zig-zag pattern across and down the joints. Spread to a uniform thickness of 20-30 mils (0.5-0.6 mm). Spread 1 inch (25 mm) beyond the sheathing joint on each side. Follow the same procedure for inside and outside corners.

E. Air/Moisture Barrier Coating Installation

1. Plywood and Gypsum Sheathing: apply waterproof coating by spray or roller over sheathing surface, including the dry joint treatment, rough opening protection, and transition areas, to a uniform wet mil thickness of 10 mils in one coat. Use ½ inch (13 mm) nap roller for plywood. Use ¾ inch (19 mm) nap roller for glass mat faced gypsum sheathing. Protect from weather until dry.
2. OSB Sheathing: apply waterproof coating by spray or with a ¾ inch (19 mm) nap roller to sheathing surface to a uniform wet mil thickness of 10 mils. Allow to dry, inspect surface for raised wood stands, and touch up these areas with a second coat.
3. CMU Surfaces:
  - a. Repair static cracks up to 1/2 inch (13 mm) wide with StoGuard RapidFill. Rake the crack with a sharp tool to remove loose or friable material and blow clean with oil-free compressed air. Apply the crack filler with a trowel or putty knife over the crack and tool the surface smooth. (*Note: For moving cracks or cracks larger than ½ inch [13mm], consult with a structural engineer for repair method*). Protect repair from weather until dry.

- b. Liberally apply two coats of Sto EmeraldCoat to the surface with a ¾ inch nap roller or spray equipment to a minimum wet thickness of 10 – 30 mils each, depending on surface condition. Additional coats may be necessary to provide a void and pinhole free surface. Protect from weather until dry.

**IMPORTANT:** *Sto EmeraldCoat functions as an air and moisture barrier on normal weight concrete masonry wall construction with flush (struck flush with the surface of the CMU) or concave joints when minimum two liberal coats are applied. Additional coats may be necessary depending on the condition of the CMU wall surface, CMU porosity, joint profile, and other variables that may exist. For "rough" CMU wall surfaces, skim coat the entire surface with one of Sto's cementitious levelers (Sto BTS Plus or Sto BTS Xtra) before application of Sto EmeraldCoat. A VOID AND PINHOLE FREE SURFACE must be achieved for Sto EmeraldCoat to properly function as an air and moisture barrier on CMU wall surfaces.*

- F. Air /Moisture Barrier Connections and Shingle Laps
  1. Coordinate installation of connecting air barrier components with other trades to provide a continuous air tight membrane.
  2. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks (windows, doors and similar penetrations through the wall assembly).
  3. Splice-in head flashings above windows, doors, floor lines, roof/sidewall step flashing, and similar locations with StoGuard detail component to achieve shingle lap of the air/moisture barrier such that water is directed to the exterior.

**NOTE:** *Windows and doors are typically installed immediately following installation of the air/moisture barrier and work should be sequenced accordingly. Consult with window manufacturer for installation requirements to maintain air barrier continuity and for head, jamb, sill flashing and perimeter sealant requirements needed to prevent leaks into the wall assembly).*

**NOTE:** *DO NOT ALLOW WATERPROOF AIR BARRIER INSTALLATION TO REMAIN EXPOSED MORE THAN 180 DAYS. PROTECT WITH STUCCO WALL COVERING PROMPTLY AFTER INSTALLATION.*

### 3.5 SHEET WATER-RESISTIVE BARRIER INSTALLATION

- A. Install in compliance with the applicable building code requirements for building paper. Lap paper over foundation weep screed attachment flange, floor line flashing, and window/door head flashings. Refer to Sto Guide Details at [www.stocorp.com](http://www.stocorp.com)

**NOTE:** *Code requirements may vary. Always consult the applicable code and the manufacturer's code compliance report. Typically building paper in compliance with the code is attached directly to sheathing and lapped shingle style, upper courses over lower courses, by minimum 2 inches (51 mm), with vertical laps of minimum 6 inches (150 mm). Courses are staggered so that vertical joints do not align. Care must be taken to prevent tears in the paper and to limit penetrations to only those required for attachment. Flashing must be in place and properly*

*integrated with the sheet WRB at sills, above windows and doors, at floor lines, decks and at roof/wall intersections such that water is directed to the exterior.*

### 3.6 STUCCO INSTALLATION

*(refer to Sto Guide Details as needed)*

Apply the stucco in discrete panels without interruption to avoid cold joints and differences in appearance. Abut wet stucco to set stucco at natural or architectural breaks in the wall such as expansion joints, pilasters, terminations, or changes in plane. Hot or dry conditions accelerate drying and moisture loss from stucco which can diminish strength and resistance to cracking. Under these conditions adjustments in the application, scheduling and curing of stucco to prevent rapid loss of moisture are necessary to achieve a satisfactory stucco installation. Cold temperatures retard drying and strength gain and adjustments may have to be made in the application, scheduling and curing of stucco to prevent damage from frost and other trades. Do not install stucco during extremely hot, dry and/or windy conditions. Do not install stucco during freezing conditions or on frozen substrates. Do not install stucco onto grounds of accessories. Completely embed lath and flanges of accessories and completely cover fastener attachments with stucco. Moist cure stucco minimum 48 hours for optimum strength gain and resistance to cracking. Allow final stucco application to completely dry (28 days) before applying primer or finish (except in the case of StoPrime Hot which can be applied 48 hours after completing moist cure of stucco). The finished installation must be true, plumb and square. Should stucco get into control or expansion joints, remove the stucco from within the joint before the stucco sets.

After satisfactory inspection of surfaces and correction of any deviations from specification requirements commence the stucco installation as described below:

- A. Installation over StoGuard with Paper or Felt WRB
  1. Weep Screed Installation *(may also be done in conjunction with flashing and waterproof air barrier installation to facilitate shingle lapping of components at base of wall)*
    - a. Install foundation weep screed at the base of the wall securely to solid substrate or framing with the appropriate fastener. Locate foundation weep screed so that it overlaps the joint between the foundation and framing by a minimum of 1 inch (25 mm). Locate the foundation weep screed nosing minimum 4 inches (100 mm) above earth grade, 2 inches (51 mm) above finished grade (paved surfaces, for example). Lap waterproof air barrier, sheet water-resistive barrier, and drainage mat over the weep screed attachment flange.
  2. Casing Bead and Two Piece Expansion Joint Installation
    - a. Install casing beads at stucco terminations – doors, windows and other through wall penetrations. Install two piece expansion joints (or back-to-back casing beads) at building expansion joints, thru-wall joints in concrete or CMU, where the stucco is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, columns, and cantilevered areas. Install full accessory pieces where possible and avoid small pieces. Seal adjoining pieces by embedding ends in sealant. Abut horizontal into vertical joint accessories (except where horizontal movement joints exist that prevent continuous vertical runs of accessories). Attach at no more than 7 inches (178 mm) into solid substrate/framing with appropriate fasteners.

*NOTE: Refer to architectural drawings for joint locations and accessory type. Air barrier and moisture protection must be continuous behind joints and accessories – refer to Sto Guide Details*

### 3. Lath Installation

- a. Diamond Mesh Metal Lath – conform to ASTM C 1063
  - i. General – install metal lath with the long dimension at right angles to structural framing (horizontally on solid substrates). Terminate lath at expansion joints. Do not install continuously at joints.
  - ii. Seams/Overlaps--overlap side seams minimum 1/2 inch (13 mm) and end seams minimum 1 inch (25 mm). Stagger end seams. Overlap casing beads and expansion joints minimum 1 inch (25 mm) over narrow wing accessories, minimum 2 inches (51 mm) over expanded flange accessories. Do not install lath continuously beneath expansion joints.
  - iii. Attachment--fasten securely into solid substrates or through sheathing into structural framing at 7 inches (178 mm) on center maximum vertically and 16 inches (406 mm) on center horizontally\*. Wire tie at no more than 9 inches (225 mm) on center at: side laps, accessory overlaps, and where end laps occur between supports.
- b. Paper-backed lath – follow installation as for diamond mesh metal lath. Lap lath over lath, not paper to lath overlap. For horizontal overlaps the paper backing must lap shingle style behind the lath to lath overlap.

*\*NOTE: The type fastener selected, its layout and pullout or withdrawal value from the supporting construction must be verified and approved by the project engineer/architect with respect to design wind load and local building code requirements. Exercise care when attaching metal lath and accessories through the water-resistive barrier so that fasteners go into [not between] framing supports. Do not use power, powder-actuated or other fastening tools/methods that can damage the air/moisture barrier, water-resistive barrier or substrate.*

### 4. One Piece Expansion Joint Installation

- a. Install one piece expansion joints at through wall penetrations, for example, above and below doors and windows. Install one piece expansion joints at every 144 ft<sup>2</sup> (13 m<sup>2</sup>). Wire tie one piece expansion joints to lath at no more than 7 inches (178 mm) on center. Seal adjoining pieces by embedding ends in sealant. Make certain lath is DISCONTINUOUS at or beneath joints.

### 5. Inside and Outside Corners

- a. Install corner lath at inside corners and corner bead at outside corners over lath. Attach through lath into solid substrate or framing at no more than 7 inches (178 mm) on center with appropriate fasteners.

### 6. Stucco Installation

- a. Scratch Coat: apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, 3/8 or 1/2 inch (9 or 12 mm), to cover the metal lath and to permit scoring the surface. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
- b. Brown Coat: as soon as the first coat is firm enough to receive the second coat without damage, apply the second coat. Alternatively, moist cure the first coat up to

48 hours and dampen the scratched surface with water immediately before applying the second coat. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be uniform throughout the wall area and shall be either 3/4 inch or 7/8 inch (19 or 22 mm), and shall not exceed 7/8 inch (22 mm).

- c. After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface. The proper time to float is when the wood float no longer sticks to the surface of the stucco.
- d. Moist cure after the stucco has set by lightly fogging for at least 48 hours. Fog as frequently as required during the 48 hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist curing can be diminished.

#### B. Foam Trim and Build-Outs

1. Where foam build-outs terminate at a dissimilar material such as a window, door or other non-stucco surface, backwrap the foam build-out by installing detail mesh onto the terminating edge of the stucco. Embed the mesh in the foam adhesive. Allow the mesh to dangle until the backwrapping procedure is completed (B4).
2. Install foam build-outs directly over hardened stucco with foam trim adhesive. Apply adhesive with the appropriate size notched trowel to the back of the insulation board and immediately place build-out in the proper location on the wall. Press firmly into place and trim or tool excess adhesive from ends and edges of foam trim for a smooth void-free connection to the stucco substrate.
3. After the adhesive has cured sufficiently to hold the build-out firmly in place, rasp the entire foam surface smooth.
4. Complete the backwrapping procedure by applying the foam trim base coat to the exposed edges of the foam build-out and minimum 2-1/2 inches (64 mm) onto the face. Pull the backwrap mesh around the foam build-out and fully embed it into the base coat. Use a corner trowel for neat straight corners.
5. Apply the cementitious base coat to the foam build-out and approximately 3 inches (76 mm) onto the adjacent stucco surfaces to an approximate thickness of 1/8 inch (3 mm). Immediately embed the reinforcing mesh in the wet base coat. Trowel from the center to the edges of the mesh to avoid wrinkles and remove excess base coat. Overlap mesh seams minimum 2-1/2 inches (64 mm). Overlap mesh onto adjacent stucco wall surfaces minimum 2-1/2 inches (64 mm) at terminations of the foam build-out and feather onto the stucco wall surface. Alternatively, if Crack Defense is used apply Crack Defense with its reinforcing mesh continuously from the stucco wall surface over foam build-outs (refer to 3.07 C).

**NOTE:** *Do not install foam build-outs over joints in the stucco wall assembly. Terminate foam build-outs and backwrap in accordance with instructions above).*

#### C. Crack Defense

**NOTE:** *Crack Defense is optional. It provides additional crack resistance to the stucco wall surface*

1. Apply base coat over the moist cured stucco (and foam build-outs if not already reinforced with mesh) with appropriate spray equipment or a stainless steel trowel to a uniform thickness of approximately  $\frac{1}{8}$  inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2- $\frac{1}{2}$  inches (64 mm) at mesh seams and at overlaps of detail mesh. Feather seams and edges. Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through the base coat when it is dry. Re-skim with additional base coat if mesh color is visible. Do not install base coat or mesh over joints or accessories in the stucco wall assembly.

#### D. Primer Installation

1. StoPrime Hot – Moist cure stucco for a minimum of 48 hours. Allow stucco to dry an additional 48 hours, then apply primer evenly with brush, roller or proper spray equipment over the clean, dry stucco and foam build-outs, and allow to dry. Final age of primed stucco application must be minimum 7 days before application of finish.
2. StoPrime Sand – Moist cure stucco for a minimum of 48 hours. Wait until stucco is 28 days old or the pH level of the surface is below 10 before applying primer. Final age of primed stucco application must be minimum 28 days before application of finish or pH must be below 10.
3. StoPrime – Moist cure stucco for a minimum of 48 hours. Wait until stucco is 28 days old or the pH level of the surface is below 10 before applying primer. Final age of primed stucco application must be minimum 28 days before application of finish or pH must be below 10.

#### E. Finish Installation

1. Apply finish to minimum 28 day old stucco or primed stucco and foam build-outs, or apply when pH of stucco surface is less than 10. If StoPrime Hot is used as the primer the primed stucco/foam build-out surfaces need only be minimum 7 days old. Apply finish by spraying or troweling with a stainless steel trowel, depending on the finish specified. Follow these general rules for application of finish:
  - a. Avoid application in direct sunlight.
  - b. Apply finish in a continuous application, and work a wet edge towards the unfinished wall area. Work to an architectural break in the wall before stopping to avoid cold joints.
  - c. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
  - d. Float “R” (rilled or swirl texture) finishes with a plastic float to achieve their rilled texture
  - e. Do not install separate batches of finish side-by-side.
  - f. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
  - g. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

- h. Do not install finish over high pH ( $\geq 10$ ) stucco surfaces or surfaces that have not been fully cured.

### 3.7 PROTECTION

- A. Provide protection of installed materials from water infiltration into or behind them.
- B. Provide protection of installed stucco from dust, dirt, precipitation, and freezing.
- C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.
- D. Provide sealant and backer material at stucco terminations and at fixture penetrations through the stucco to protect against air, water and insect infiltration. Provide weeps at floor lines, window and door heads, and other areas to conduct water to the exterior.

### 3.8 CLEANING, REPAIR AND MAINTENANCE

- A. Clean and maintain the stucco finish for a fresh appearance and to prevent water entry into and behind the stucco. Repair cracks, impact damage, spalls or delamination promptly.
- B. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into the wall assembly.
- C. Refer to Sto reStore Repair and Maintenance Guide ([reStore Program](#)) for detailed information on stucco restoration – cleaning, repairs, recoating, resurfacing and refinishing, or re-cladding.

#### ATTENTION

Sto products are intended for use by qualified professional contractors, not consumers, as a component of a larger construction assembly as specified by a qualified design professional, general contractor or builder. They should be installed in accordance with those specifications and Sto's instructions. Sto Corp. disclaims all, and assumes no, liability for on-site inspections, for its products applied improperly, or by unqualified persons or entities, or as part of an improperly designed or constructed building, for the nonperformance of adjacent building components or assemblies, or for other construction activities beyond Sto's control. Improper use of Sto products or use as part of an improperly designed or constructed larger assembly or building may result in serious damage to Sto products, and to the structure of the building or its components. **STO CORP. DISCLAIMS ALL WARRANTIES EXPRESS OR IMPLIED EXCEPT FOR EXPLICIT LIMITED WRITTEN WARRANTIES ISSUED TO AND ACCEPTED BY BUILDING OWNERS IN ACCORDANCE WITH STO'S WARRANTY PROGRAMS WHICH ARE SUBJECT TO CHANGE FROM TIME TO TIME.** For the fullest, most current information on proper application, clean-up, mixing and other specifications and warranties, cautions and disclaimers, please refer to the Sto Corp. website, [www.stocorp.com](http://www.stocorp.com).

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# **Phase III Drainage Report**

## **Canyon Creek Duplexes**

### **Erie, Colorado**

**September 20<sup>th</sup>, 2016**

**Revised December 20<sup>th</sup>, 2017**

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**Project No. 020282**

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Appendix B – Hydraulic Calculations

Appendix C – Reference Material

Appendix D – Final Drainage Map

**Engineer's Certification**

"I hereby certify that this Phase III Drainage Report for the design of Canyon Creek Duplexes was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Erie Standards and Specifications for Design and Construction for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report."

Christopher Perdue  
Registered Professional Engineer  
State of Colorado No. 50745  
(Affix Seal)

**Town Acceptance**

This report has been reviewed and found to be in general compliance with the Town of Erie Standards and Specifications for Design and Construction and other Town requirements. THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.

Accepted by: \_\_\_\_\_  
Town Engineer Date

## **1.0 General Location and Description**

This Phase III Drainage Report summarizes the concept for managing stormwater for the proposed Canyon Creek development located in the Town of Erie, Colorado. This Report is intended to support the Final Plat and Final Site Plan submittals to the Town.

### **1.1 Location**

The development is located in the Town of Erie, Boulder County, Colorado and is located within Tract B, Canyon Creek Subdivision Filing No. 5 Subdivision (Site). The Site is bounded by Meller Street on the west, Erie Parkway on the north, and single-family homes on the south and east. The Site is bounded by the Canyon Creek Filing No. 3 Subdivision on the west, and Sunset Subdivision is to the north. The site is in Section 24, Township 1 North, Range 69 West of the 6<sup>th</sup> Principal Meridian.

### **1.2 Description of Property**

The Site is a 1.84 acre proposed attached single-family development. The site is currently undeveloped and is vegetated with short grasses and four trees along the southern portion of the site. According to the NRCS Soil Survey of Boulder County Area, Colorado, the soils on-site consist completely of Ascalon Sandy Loam, which is a Hydrologic Soil Group B soil. No major drainage ways or irrigation facilities are currently located within or adjacent to the site. At final buildout, the development will consist of single family attached homes and accompanying infrastructure.

## **2.0 Drainage Basins**

### **2.1 Major Basin Description**

The site falls within the Coal Creek watershed. Love & Associates prepared an OSP in 2001 for Erie and Adjacent Areas which included the Canyon Creek filings. The Meller Street Estates project is located within Basin 475, as shown on the attached excerpts for the OSP in Appendix C, which has a calculated imperviousness of 57.7% for future conditions. The OSP identifies the site being tributary to a regional pond on the south side of Erie Parkway between Meller Street and N. 119<sup>th</sup> Street.

The site also falls within Basin C of the Final Drainage Report for Canyon Creek Filing No's 4, 5, 6, 7, 8 and 9 prepared by S.A. Miro, Inc. dated January 9, 2001 (reference Appendix C). The 42.55-acre basin has a 100-yr c-coefficient of 0.60, which corresponds to an impervious value of approximately 65% with 2001 Urban Drainage Calculations. Basin C drains to the Detention Pond within Basin B.

There is no FEMA regulatory floodplain mapped on the property per the included FIRM panel 08013C0437J, revised December, 2012.

## **3.0 Drainage Design Criteria**

### **3.1 Regulations**

This drainage report was prepared in accordance with the Town of Erie Standards and Specifications for Design and Construction of Public Improvements (TOE Standards and Specifications) and the Urban Drainage and Flood Control District (UDFCD) Drainage Criteria Manuals.

There currently are no adaptations requested at this time.

### **3.2 Hydrology**

The Rational Method was used to calculate the storm runoff associated with the proposed development. The one-hour depths for the 2- and 100-year storms are 1.01 and 2.70 inches, respectively. Runoff coefficients were calculated for each on-site basin using values obtained in the most recent version of UDFCD. The developed time of concentrations for the basins were calculated in accordance with the procedures established by UDFCD. The initial overland flow time was calculated using UDFCD's Equation 6-3. Overland travel times were calculated using Equation 6-4 of the UDFCD Drainage Criteria Manuals and a conveyance coefficient of 20 for concrete swales and 7 for grass swales. Rainfall intensity was calculated using Equation 5-1 from UDFCD.

As the Rational Method tends "to overestimate the actual flow" when subcatchments come together and "provides no means or methodology to create a hydrograph", the Colorado Urban Hydrograph Procedure (CUHP) was also used to calculate a peak flow during the major storm for the overall basin area that will be detained in the existing storm system (UDFCD Criteria Manual Volume 1, Chapter 3, Section 2.3).

The storm sewer and inlet sizing are based upon the major storm event. The minor storm was calculated for the 2-year recurrence interval. The major storm was calculated at the 100-year recurrence interval.

## **4.0 Drainage Facility Design**

### **4.1 General Concept**

Stormwater detention and water quality will be provided by the existing regional pond located on the west side of Canyon Creek Filing No. 3. Per the S.A. Miro, Inc. drainage report, runoff from the Site flows west to this detention pond. Per the Final Drainage Report for Canyon Creek Subdivision Filing No. 3 prepared by JR Engineering, LTD., this detention pond was sized for a developed area of 234.00 acres and a 100-year runoff coefficient of 0.58 (63% imperviousness).

After reviewing this JR Engineering Report, multiple inadequacies within the existing system were discovered by Bowman Consulting which allowed for a unique drainage

solution to capture the runoff on-site. See attached Memorandum by Bowman Consulting send to Chad Schroeder dated September 11, 2017. This memo explained how the two 5' Type R inlets installed just south of the intersection of Erie Parkway and Meller Street do not have adequate capacity to collect and convey 100% of the existing surface flow draining to them. Bowman's detailed analysis of these two inlets suggests that this deficiency with respect to inlet capture capacity will result in available capacity within the existing 18-inch and 24-inch pipe that the proposed Canyon Creek Duplex storm system will ultimately discharge in to. The undetained runoff discharge from the Site will be less than the discharge leaving the site in the existing condition. No drainage issues have currently been reported within the existing drainage system.

Per the attached Canyon Creek Filing 3 Historic and Developed Basins map, the Site is within Basin C which is part of the overall 113.50 acres tributary to the regional detention facility which is 65% impervious. It is also in Basin 475 in the Love and Associates report, which as an impervious value of 57.7%. The post-development impervious for the Site is 54%, which is less than the Filing 3 and the Love and Associates value; therefore, the pond should have adequate capacity for the new development and not require any modifications. Furthermore, with the reduction in surface flow leaving the Canyon Creek Duplex Site compared to the existing condition in addition to the restricted orifice flow into the existing 18-inch to ensure adequate pipe capacity, the proposed development will not affect the downstream infrastructure.

## **5.0 Drainage Plan**

Stormwater from the Site will either surface flow to Meller Street and be collected in an existing street inlet at the southeast corner of Erie Parkway intersection and conveyed to the regional pond or be collected by a series of storm sewers, swales onsite and eventually be conveyed via underground conduit to the existing Meller Street inlet where it will outfall into the regional pond.

As shown on the Canyon Creek Filing No's 4, 5, 6, 7, 8 and 9 Final Drainage Plan, a small amount of off-site flows enters the site from the adjacent single-family home lots to the south and east of the site. This off-site flow from the rear yards of these lots has been accounted for in the rational method routing and CUHP calculation for all the detained basins.

While the existing Meller Street inlet that the Site is tributary to does not have the capacity for the proposed development, there is available capacity within the 18-inch RCP connecting these inlets. Based on available information, the maximum ponding depth available to the eastern inlet on Meller Street is 0.40 feet before the crown of the road is overtopped. The western inlet will pond to depth of approximately 0.55 feet before the flow will overtop a highpoint along the curb return. Using flow depths of 0.40 and 0.55 feet in conjunction with Figure 903 as previously used by JR Engineering to size the inlets, the interception capacity of the inlets was determined to be 4.0 and 6.0 cfs for the east and west inlets, respectively.

Expanding upon the same accepted methodology JR engineering utilized, it can reasonably be assumed that an additional 5.39 cfs of capacity is available within the existing 18-inch and 24-inch RCP closed conduit system without being surcharged. As previously discussed, the eastern inlet has an interception capacity of 4 cfs and the western inlet has an interception capacity of 6 cfs. To be conservative, these flows were added to the flow exiting the Site from Design Point 4 in the StormCAD model. In the minor event, the existing 18-inch and 24-inch RCP has more than adequate capacity to convey the proposed minor storm runoff and well as the added flow from the Meller Street inlets. In the major event, with both the CUHP Method and Rational Method calculations, this detained flow will be surcharged, but contained within the existing system. Using the CUHP method for the detained basin, the runoff in the existing system will be able to maintain an HGL at a minimum 1 foot below the finished grade (Reference the StormCAD calculations in Appendix B for profiles of HGLs). The Town of Erie code defaults to Urban Drainage regarding pipe capacity calculations. According to Urban Drainage and Flood Control District, during the major event, storm drains may surcharge, and this system has been evaluated and designed to maintain public safety and minimize flood damages (UDFCD Criteria Manual Volume 1, Chapter 7, Section 1.4). Research from neighboring municipalities was done to emphasize the adequacy of this surcharged system. See table below for the HGL criteria in different municipalities:

<b>Municipality</b>	<b>HGL Criteria</b>	<b>Location</b>
City of Thornton	“the 100 year HGL must be contained within the overall drainage system but cannot encroach onto any lots”	Standards and Specifications for the Design and Construction of Public and Private Improvements for the City of Thornton, October 2012 (Section 402.7)
City and County of Denver	“In pipes designed to convey up to the major storm, the hydraulic grade line (HGL) is allowed to rise above the top of the storm sewer, but shall be kept at least 1.0 foot below manhole lids, inlet grates and inlet curb openings.”	City and County of Denver Storm Drainage Design and Technical Criteria, Amended November 2013 (Chapter 9, Section 2.2)
City of Aurora	“100-year capacity storm sewers shall be designed with maximum surcharging to be a minimum of one-foot below proposed grade.”	City of Aurora Storm Drainage Design and Technical Criteria, October 2010 (Chapter 6, Section 44)
Boulder County	“If the 100-year HGL is above any manhole or inlet cover, or if the manhole or inlet is located in a floodplain, manhole and inlet covers shall be bolted down.”	Boulder County Storm Drainage Criteria Manual, November, 2016 (Section 802.6)

The tailwater condition assumed for the outfall of the existing 24-inch pipe into the pond is the 100-year water surface for the downstream pond at 5123.96 (reference S.A. Miro report).

To prepare the most conservative design possible based on existing knowledge of the site, the peak runoff was calculated from the project site in the existing or current condition to ensure that the undetained flow in the proposed condition is less than the existing condition. It should be noted that a regional pond to the west was constructed in accordance with Urban Drainage and Town requirements to provide water quantity and quality treatment and therefore this proposed design solution is solely for regulating flows as required to utilize the existing 24-inch outfall. The analysis of the existing hydrologic conditions of the Site (see attached Pre-Development Drainage Map On-site) demonstrates that the existing runoff from the site and contributing off-site area (totaling 2.99 acres) is 0.38 and 5.48 cfs in the 2-year and 100-year storm, respectively. The chosen methodology will honor the predeveloped condition. Therefore, we have designed the Canyon Creek Duplexes to discharge 0.38 and 2.72 cfs of undetained surface runoff in the in the 2-year and 100-year storm, respectively. In conclusion, there will not be an increase in surface flow traveling to Design point 9E from the developed site. Again, it is assumed that water quality and historic release rates will be accomplished within the existing regional detention pond west of the site, which was designed to accommodate the development of the Canyon Creek Duplex site.

Therefore, based on this analysis, the proposed Canyon Creek Development drainage solution would honor the pre-development surface drainage patterns without proposing any off-site improvements. During the 100-year storm, only 3.72 cfs of surface runoff (including offsite basin OU2) compared to 5.48 cfs in the existing condition, would be discharged to design point 9E. A total of 8.31 cfs of detained flow calculated with CUHP (9.49 cfs with Rational Method) will be released into the existing 18-inch in the 100-year condition, which will maintain an HGL more than 1' below the finished grade in these existing pipes. These HGL calculations done in StormCAD are included in the appendix for the 100-yr CUHP and 2-yr and 100-yr Rational Method calculations.

Emergency overflow paths will be incorporated in the development. During events in exceedance of the 100-year storm or if a failure occurs in the stormwater system, runoff will flow to the north and west into Meller Street or Erie Parkway.

## **5.1 Sub-Basin Description**

The site is not within a defined sub-basin in either the Filing 3 or Filing No's 4, 5, 6, 7, 8 and 9 Final Drainage Reports. For this report, on-site pre-development basins have been designated with "EX", the on-site post-development basins have been designated "A" and the undetained post-development basins have been designated as "U" sub-basins. The off-site detained basins have been designated with "OD" and the off-site undetained basins that drain into the Site have been designated with "OU". The table below provides a summary of sub-basins:

Canyon Creek Duplexes Basin Summary				
Sub-basin	Area (ac)	Imperviousness	Q2 (cfs)	Q100 (cfs)
EX1	2.99	15%	0.38	5.48
A1	0.37	50%	0.47	2.24
A2	0.80	72%	1.57	5.60
A3	0.08	30%	0.06	0.42
A4	0.05	2%	0.001	0.20
OD1	0.08	40%	0.08	0.45
OD2	0.57	40%	0.43	2.46
OD3	0.07	40%	0.05	0.30
U1	0.54	28%	0.27	2.12
OU1	0.14	40%	0.11	0.60
OU2	0.29	28%	0.39	1.04

**Basin EX1 (2.99 ac)** encompasses the entire Site and some contributing off-site drainage to the east and south in the pre-development condition. Land use type includes open space and some existing roof. Runoff surface flows into Meller Street and is captured by the existing curb inlet at the southeast corner of Meller Street and Erie Parkway intersection (design point 9E).

**Basin A1 (0.37 ac)** is in the middle portion of the Site. Land use types include roof, landscaping and sidewalks. Runoff will be captured by a series of area drains and conveyed by storm sewer (design point 1) to the existing 18-inch pipe that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin A2 (0.80 ac)** is in the eastern portion of the Site. Land use types include roof, alley and landscaping. Runoff will be conveyed by the alley to an area inlet at the end of the alley where it will be captured and conveyed by storm sewer to the existing 18-inch pipe (design point 2) that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin A3 (0.08 ac)** is located along the northeastern corner of the Site. Land use types include alley and landscaping. Runoff will surface flow to an area inlet within the alley Meller Street and be captured by conveyed by storm sewer to the existing 18-inch pipe (design point 4) that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin A4 (0.05 ac)** is located along the northern boundary of the Site. Land use type is landscaping. Runoff will surface flow to an area inlet (design point 3) and be captured by conveyed by storm sewer to the existing 18-inch pipe (design point 4) that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin OD1 (0.08 ac)** is located off-site near southeast boundary of the Site. Land use type is single-family residential. Runoff will surface flow on-site into Basin A2 and be

captured by conveyed by storm sewer to the existing 18-inch pipe (design point 2) that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin OD2 (0.08 ac)** is located offsite along the eastern boundary of the Site. Land use type is single-family residential. Runoff will surface flow on-site into Basin A2 and be captured by conveyed by storm sewer to existing 18-inch pipe (design point 2) that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin OD3 (0.07 ac)** is located offsite along the eastern boundary of the Site. Land use type is single-family residential. Runoff will surface flow on-site into Basin A3 and be captured by conveyed by storm sewer to the proposed 18-inch pipe (design point 4) that will eventually discharge to the southeast corner of Meller Street and Erie Parkway intersection.

**Basin U1 (0.54 ac)** is located along the eastern and northern boundary of the Site. Land use type includes sidewalk, roadway, and landscaping. The undetained runoff surface flows into Meller Street and is captured by the existing curb inlet at the southeast corner of Meller Street and Erie Parkway intersection (Design Point 9E).

**Basin OU1 (0.14 ac)** is located offsite along the eastern boundary of the Site. Land use type is single-family residential. Runoff will surface flow on-site into Basin U1. The undetained runoff surface flows into Meller Street and is captured by the existing curb inlet at the southeast corner of Meller Street and Erie Parkway intersection (Design Point 9E).

**Basin OU2 (0.29 ac)** is located offsite along the northeastern boundary of the Site. Land use type is single-family residential. Runoff will surface flow through a proposed 2' sidewalk chase underneath the existing sidewalk to the north of the Site. The undetained runoff surface flows into Meller Street and is captured by the existing curb inlet at the southeast corner of Meller Street and Erie Parkway intersection (Design Point 9E).

## **6.0 Summary**

The plan for managing stormwater for the Canyon Creek Duplexes will comply with the Town of Erie Standards, UDFCD criteria, and the previous final drainage reports.

## 7.0 References

1. JR Engineering, LTD. January 04, 2000. *Final Drainage Report for Canyon Creek Subdivision Filing No. 3.*
2. Town of Erie. June 2016. *Standards and Specifications for Design and Construction of Public Improvements.*
3. S.A. Miro, Inc. January 9, 2001. *Final Drainage Report for Canyon Creek Filing No's 4, 5, 6, 7, 8 and 9.*
4. Love & Associates, Inc. May 2001. *Erie Outfall Systems Planning Preliminary Design Erie and Adjacent Boulder and Weld Count Areas.*
5. Urban Drainage and Flood Control District. January 2016. *Urban Storm Drainage and Technical Criteria Manual, Volume I and II.*
6. Urban Drainage and Flood Control District. November 2010. *Urban Storm Drainage and Technical Criteria Manual, Volume III.*

**Appendix A – Hydrology Calculations**

**PROJECT:** Canyon Creek Duplexes  
**SUBJECT:** Pre-development - Impervious Cover Calculations

**JOB #:** 020282  
**DATE:** 03/14/2018  
**BY:** JAH

		% Imp (1)														
Landscaping		2														
Streets		100														
Walks		90														
Roofs		90														
Subbasin	Total Area (acres)	Land Use Area per Sub-Basin								% Check	Composite Imperviousness	Runoff Coefficients (2)				
		Landscaping		Walks		Streets		Roofs				2-year	5-year	10-year	50-year	100-year
		Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%							
EX1	2.99	2.55	85.3%	0.04	1.3%	0.00	0.0%	0.40	13.4%	100.00%	15%	0.09	0.11	0.18	0.41	0.50

1. From Table 6-3 in the UDFCD  
 2. Runoff Coefficients based on Table 6-4 in the UDFCD

PROJECT: Canyon Creek Duplexes  
SUBJECT: Pre-development - Impervious Cover Calculations

JOB #: 020282  
DATE: 03/14/2018  
BY: JAH

Revised

Basin No.	Area (acres)	5Yr. co-eff.	INITIAL/OVERLAND TIME (Ti) [Max. 300'] (1)					TRAVEL TIME (Tt) (2,3)					Tc CHECK (Urbanized Basins)			FINAL Tc	Remarks		
			Elevations		Dist. (ft)	Slope (%)	Ti (min)	Elevations		Dist. (ft)	Slope (%)	Vel. (fps)	Tt (min)	Tc	Length (ft)	Tc (min)		(min)	
			U/S	D/S				U/S	D/S										
EX1	2.99	0.11	5136.00	5134.00	300	1.00	31.46	5134.00	5131.00	247	1.21	0.77	5.3	36.8	547.00	13.0	36.8		

1. Ti calculated using Equation 6-3, Urban Storm Drainage Criteria Manual
2. Tt calculated using Equation 6-4, Urban Storm Drainage Criteria Manual
3. Travel time velocity calculated based on NRCS Conveyance factors, K from Table 6-2, Urban Storm Drainage Criteria Manual (K=7)

STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: JAH  
DATE: 3/14/2018  
CHECKED BY: CP

P1= 1.01 in

JOB NO: 020282  
PROJECT: Canyon Creek Duplex  
DESIGN STORM: 2 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	AREA DESIG.	DIRECT RUNOFF					TOTAL RUNOFF				STREET	PIPE				TRAVEL TIME		REMARKS		
			AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour) (2.)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps) (1)	Tt (min)
	EX1		2.99	0.09	36.8	0.27	1.40	0.38													

STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: JAH P1= 2.70 in  
DATE: 3/14/2018  
CHECKED BY: CP

JOB NO: 020282  
PROJECT: Canyon Creek Duplex  
DESIGN STORM: 100 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET	PIPE				TRAVEL TIME		REMARKS	
		AREA DESIG.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour) (Σ)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps) (1)
	EX1	2.99	0.50	36.8	1.48	3.74	5.56													

PROJECT: Canyon Creek Duplexes  
 SUBJECT: Post Development - Impervious Cover Calculations

JOB #: 020282  
 DATE: 03/13/18  
 BY: JAH

Updated Revised

	% Imp (1)
Landscaping	2
Streets	100
Walks	90
Roofs	90

Subbasin	Total Area (acres)	Land Use Area per Sub-Basin								% Check	Composite Imperviousness	Runoff Coefficients (2)				
		Landscaping		Walks		Streets		Roofs				2-year	5-year	10-year	50-year	100-year
		Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%							
A1	0.37	0.17	45.9%	0.07	18.9%	0.00	0.0%	0.13	35.1%	100.00%	50%	0.37	0.40	0.46	0.61	0.66
A2	0.80	0.20	24.5%	0.06	8.0%	0.26	32.5%	0.28	35.0%	100.00%	72%	0.57	0.60	0.64	0.73	0.76
A3	0.08	0.06	70.6%	0.00	4.4%	0.02	25.0%	0.00	0.0%	100.00%	30%	0.21	0.23	0.30	0.50	0.57
A4	0.05	0.05	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	2%	0.01	0.01	0.07	0.34	0.44
<b>Detained On-Site Total</b>	<b>1.30</b>										60%	0.47	0.50	0.55	0.67	0.71
OD1	0.08										40%	0.29	0.32	0.38	0.55	0.61
OD2	0.57										40%	0.29	0.32	0.38	0.55	0.61
OD3	0.07										40%	0.29	0.32	0.38	0.55	0.61
<b>Detained Total</b>	<b>2.02</b>										53%	0.40	0.43	0.49	0.63	0.68
U1	0.54	0.39	72.2%	0.05	9.3%	0.10	18.5%	0.00	0.0%	100.00%	28%	0.19	0.22	0.28	0.48	0.56
OU1	0.14										40%	0.29	0.32	0.38	0.55	0.61
OU2	0.29	0.29	100.0%	0.05	17.2%	0.10	34.5%	0.00	0.0%	151.72%	52%	0.39	0.42	0.48	0.62	0.67
<b>Undetained Total</b>	<b>0.97</b>										37%	0.26	0.29	0.36	0.53	0.60
<b>On-Site Total (Detained and Undetained)</b>	<b>1.84</b>										62%	0.48	0.51	0.56	0.68	0.72

1. From Table 6-3 in the UDFCD
2. Runoff Coefficients based on Table 6-4 in the UDFCD

PROJECT: Canyon Creek Duplexes  
 SUBJECT: Site Improvements - Time of Concentration

JOB #: 020282  
 DATE: 03/14/18  
 BY: JAH

Basin No.	Area (acres)	5Yr. co-eff.	INITIAL/OVERLAND TIME (Ti) [Max. 300'] (1)					TRAVEL TIME (Tt) (2,3)						Tc CHECK (Urbanized Basins)			FINAL Tc	Remarks
			Elevations		Dist. (ft)	Slope (%)	Ti (min)	Elevations		Dist. (ft)	Slope (%)	Vel. (fps)	Tt (min)	Tc	Length (ft)	Tc (min)	(min)	
			U/S	D/S				U/S	D/S									
A1	0.37	0.40												0.0	0.00	10.0	5.0	
A2	0.80	0.60												0.0	0.00	10.0	5.0	
A3	0.08	0.23												0.0	0.00	10.0	5.0	
A4	0.05	0.01												0.0	0.00	10.0	5.0	
U1	0.54	0.22	5134.00	5133.40	50	1.20	10.79	5133.40	5131.00	201.61	1.19	2.18	1.5	12.3	251.61	11.4	11.0	
OD1	0.08	0.32	5141.00	5137.50	45	7.78	4.86							4.9	45.00	10.3	5.0	
OD2	0.57	0.32	5141.00	5136.00	135	3.70	10.78							10.8	135.00	10.8	11.0	
OD3	0.07	0.32	5139.00	5136.00	115	2.61	11.18							11.2	115.00	10.6	11.0	
OU1	0.14	0.32	5141.00	5137.50	120	2.92	11.00							11.0	120.00	10.7	11.0	
OU2	0.29	0.42	5138.00	5133.50	274	1.64	17.44							17.4	284.00	11.6	12.0	

1. Ti calculated using Equation 6-3, Urban Storm Drainage Criteria Manual
2. Tt calculated using Equation 6-4, Urban Storm Drainage Criteria Manual
3. Travel time velocity calculated based on NRCS Conveyance factors, K from Table 6-2, Urban Storm Drainage Criteria Manual

**STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)**

**CALCULATED BY:**  
**DATE:**  
**CHECKED BY:**

**JAH**  
**3/14/2018**  
**CP**

**P1= 1.01 in**

**JOB NO:**  
**PROJECT:**  
**DESIGN STORM:**

**020282**  
**Canyon Creek Duplex**  
**2 Year**

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		REMARKS	
		AREA DESIG.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)(2.)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps) (1)
A1	1	A1	0.37	0.37	5.0	0.14	3.43	<b>0.47</b>												
		OD1	0.08	0.29	5.0	0.02	3.43	<b>0.08</b>												
		OD2	0.57	0.29	11.0	0.16	2.63	<b>0.43</b>												
		A2	0.80	0.57	5.0	0.46	3.43	<b>1.57</b>												
A1, A2, OD1, OD2	2								11.0	0.78	2.63	<b>2.06</b>			1.6	0.30%	42	45	3.4	0.2
		OD3	0.07	0.29	11.0	0.02	2.63	<b>0.05</b>							2.1	0.30%	42	87	3.7	0.4
		A3	0.08	0.21	5.0	0.02	3.43	<b>0.06</b>							0.1	0.50%	12	95	1.8	0.9
		A4	0.05	0.01	5.0	0.00	3.43	<b>0.00</b>												
A3,A4, OD3	3								11.0	0.04	2.63	<b>0.10</b>			0.1	0.50%	12	90	1.8	0.8
A1,A2,A3, A4, OD1,OD2,OD3	4								11.8	0.82	2.55	<b>2.09</b>								
		OU2	0.29	0.39	12.0	0.11	2.54	<b>0.29</b>												
		OU1	0.14	0.29	11.0	0.04	2.63	<b>0.11</b>												
		U1	0.54	0.19	11.0	0.10	2.63	<b>0.27</b>												
OU1, U1, OU2	9E								11.0	0.14	2.63	<b>0.38</b>								

STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: JAH P1= 2.70 in  
DATE: 3/14/2018  
CHECKED BY: CP

JOB NO: 020282  
PROJECT: Canyon Creek Duplex  
DESIGN STORM: 100 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		REMARKS		
		AREA DESIG.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour) (2.)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps) (1)	Tt (min)
		A1	0.37	0.66	5.0	0.24	9.16	<b>2.24</b>													
A1	1								5.2	0.24	9.06	<b>2.22</b>			2.2	1.00%	12	71	5.5	0.2	Travel To DP1
		OD1	0.08	0.61	5.0	0.05	9.16	<b>0.45</b>							2.2	0.30%	42	100	3.4	0.5	Travel DP1 to DP2
		OD2	0.57	0.61	11.0	0.35	7.03	<b>2.46</b>													
		A2	0.80	0.76	5.0	0.61	9.16	<b>5.60</b>							5.6	0.30%	42	45	4.5	0.2	Travel to DP2
A1, A2	2								11.0	1.26	7.03	<b>8.82</b>			8.8	0.30%	42	87	4.9	0.3	Travel DP2 To DP4
		OD3	0.07	0.61	11.0	0.04	7.03	<b>0.30</b>													
		A3	0.08	0.57	5.0	0.05	9.16	<b>0.42</b>							0.4	0.50%	12	95	2.8	0.6	Travel to DP3
		A4	0.05	0.44	5.0	0.02	9.16	<b>0.20</b>													
A3,A4	3								11.0	0.11	7.03	<b>0.77</b>			0.8	0.50%	12	90	5.3	0.3	Travel DP3 To DP4
A1,A2,A3, A4, OD1,OD2,OD3	4								11.3	1.37	6.95	<b>9.49</b>									
		OU2	0.29	0.39	12.0	0.11	9.16	<b>1.04</b>													
		OU1	0.14	0.61	11.0	0.09	7.03	<b>0.60</b>													
		U1	0.54	0.56	11.0	0.30	7.03	<b>2.12</b>													
OU1, U1	9E								11.0	0.39	7.03	<b>2.72</b>									

# CUHP SUBCATCHMENTS

Columns with this color heading are for required user-input  
 Columns with this color heading are for optional override values  
 Columns with this color heading are for program-calculated values

Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi <sup>2</sup> )	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousnes	Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
								Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
Detained	1	100-yr	0.0031563	0.027083333	0.0662879	0.02	53	0.4	0.1	4.5	0.6	0.0018	0

**Printouts for Storm Hydrographs**

flow in cfs

time in minutes	Detained
1	0.00
2	0.00
3	0.00
4	0.00
5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.02
11	0.11
12	0.19
13	0.27
14	0.35
15	0.43
16	0.56
17	0.72
18	0.90
19	1.07
20	1.34
21	1.86
22	2.37
23	2.86
24	3.32
25	3.76
26	4.60
27	5.43
28	6.22
29	6.96
30	7.67
31	7.87
32	8.02
33	8.13
34	8.22
35	8.31
36	8.14
37	7.97
38	7.80
39	7.63
40	7.47
41	7.25
42	7.04
43	6.84
44	6.65
45	6.46
46	6.24
47	6.02
48	5.82
49	5.63
50	5.45
51	5.25
52	5.06
53	4.89
54	4.73
55	4.58
56	4.44
57	4.31
58	4.18
59	4.06
60	3.95
61	3.83
62	3.72
63	3.62
64	3.51
65	3.41
66	3.24
67	3.06
68	2.90
69	2.74
70	2.59
71	2.45
72	2.33
73	2.22
74	2.13
75	2.04
76	1.93
77	1.83
78	1.73
79	1.65

80	1.57
81	1.49
82	1.43
83	1.37
84	1.31
85	1.26
86	1.21
87	1.17
88	1.13
89	1.10
90	1.07
91	1.04
92	1.01
93	0.99
94	0.96
95	0.94
96	0.92
97	0.90
98	0.89
99	0.87
100	0.86
101	0.84
102	0.83
103	0.82
104	0.81
105	0.80
106	0.80
107	0.79
108	0.78
109	0.78
110	0.78
111	0.77
112	0.77
113	0.77
114	0.77
115	0.77
116	0.76
117	0.76
118	0.76
119	0.76
120	0.76
121	0.71
122	0.66
123	0.62
124	0.57
125	0.53
126	0.48
127	0.45
128	0.41
129	0.38
130	0.35
131	0.32
132	0.30
133	0.27
134	0.25
135	0.23
136	0.21
137	0.19
138	0.17
139	0.16
140	0.14
141	0.13
142	0.12
143	0.11
144	0.10
145	0.09
146	0.08
147	0.07
148	0.06
149	0.06
150	0.05
151	0.04
152	0.04
153	0.03
154	0.03
155	0.02
156	0.02
157	0.01
158	0.01
159	0.01
160	0.01
161	0.00
162	0.00
163	0.00
164	0.00
165	0.00

**Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)**

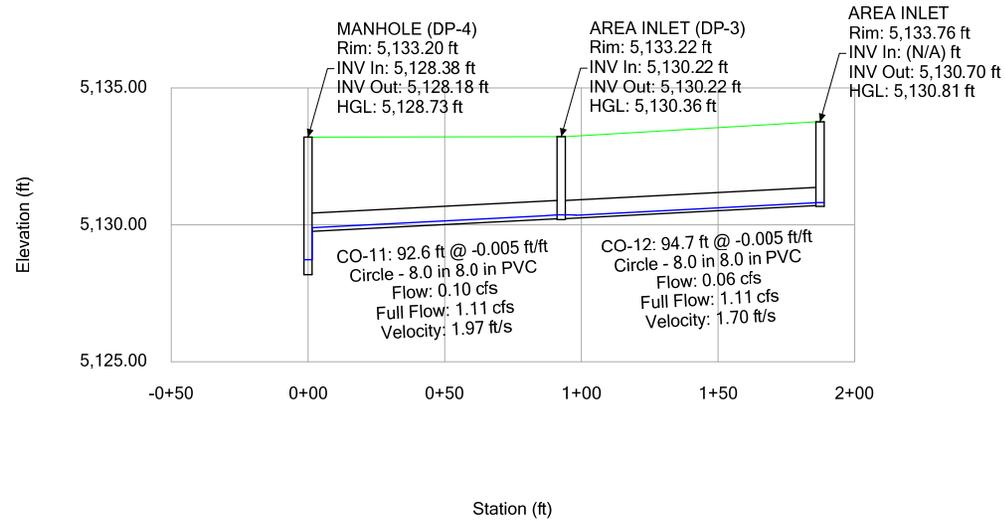
Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
Detained		0.087	0.042	11.9	0.68	6.2	0.48	1.1	8	7,333	2.77	20,336	35.0	8	20,283	4.11

**Appendix B – Hydraulic Calculations**

# Profile Report

## Engineering Profile - 8" NORTH SYSTEM (020282-PipeFlow.stsw)

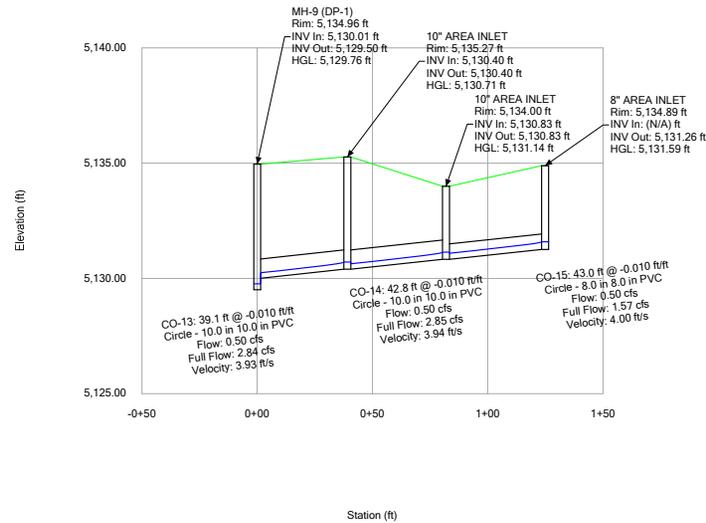
### Active Scenario: 2-YEAR



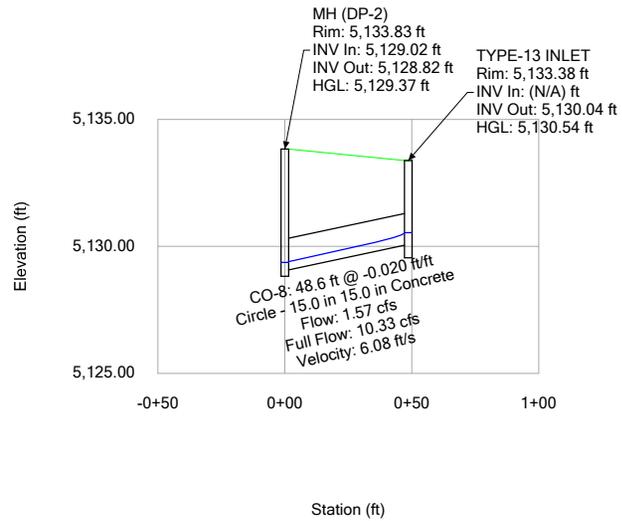
# Profile Report

## Engineering Profile - 10" SOUTH SYSTEM (020282-PipeFlow.stsw)

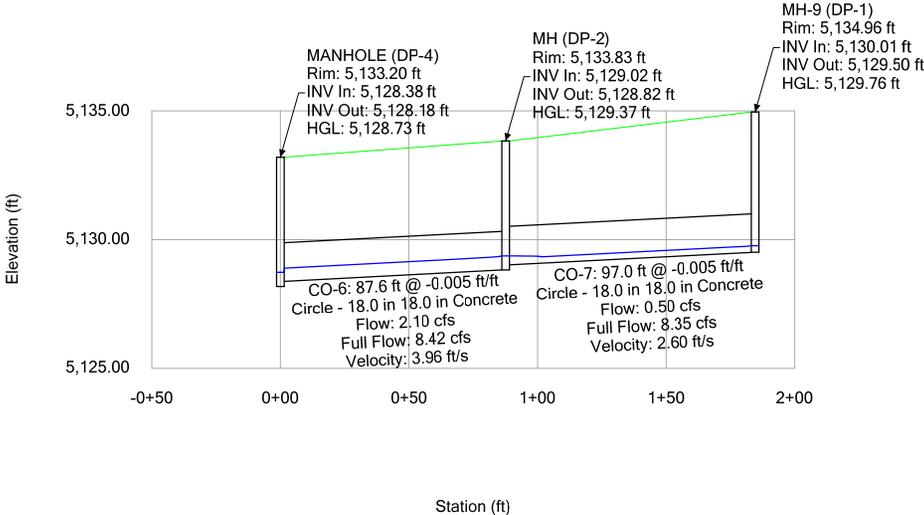
Active Scenario: 2-YEAR



Profile Report  
 Engineering Profile - 15" STUB (020282-PipeFlow.stsw)  
 Active Scenario: 2-YEAR



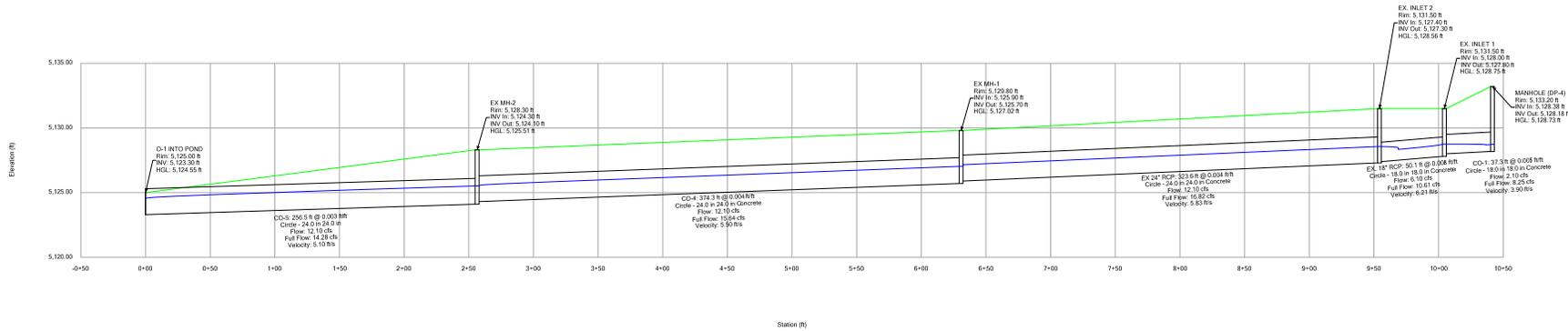
Profile Report  
 Engineering Profile - 18" N-S SYSTEM (020282-PipeFlow.stsw)  
 Active Scenario: 2-YEAR



# Profile Report

## Engineering Profile - PROFILE OFF-SITE (020282-PipeFlow.stsw)

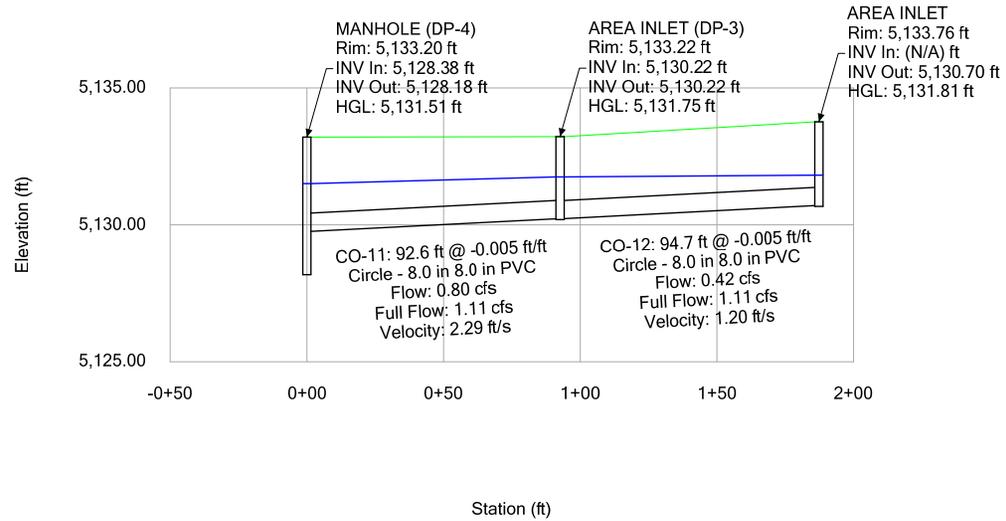
### Active Scenario: 2-YEAR



# Profile Report

## Engineering Profile - 8" NORTH SYSTEM (020282-PipeFlow.stsw)

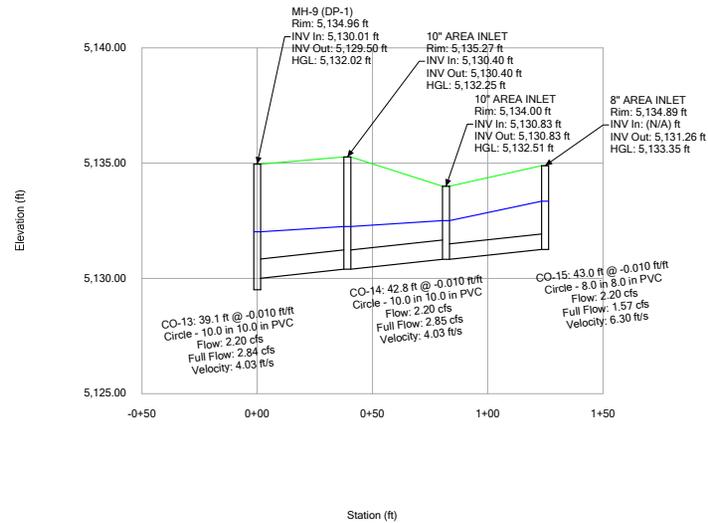
### Active Scenario: 100-YEAR



# Profile Report

## Engineering Profile - 10" SOUTH SYSTEM (020282-PipeFlow.stsw)

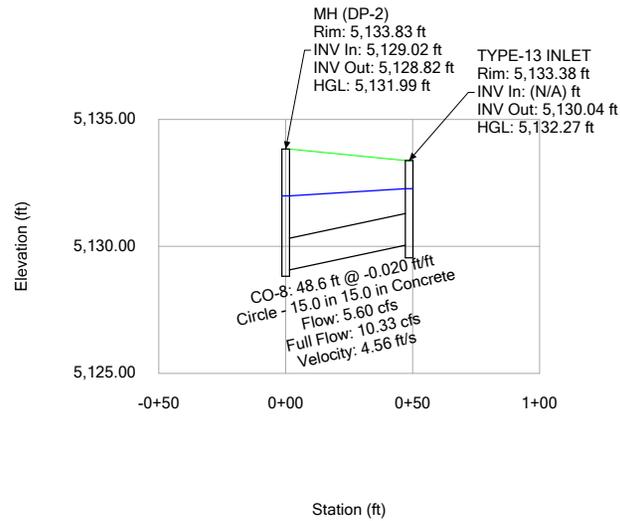
Active Scenario: 100-YEAR



# Profile Report

## Engineering Profile - 15" STUB (020282-PipeFlow.stsw)

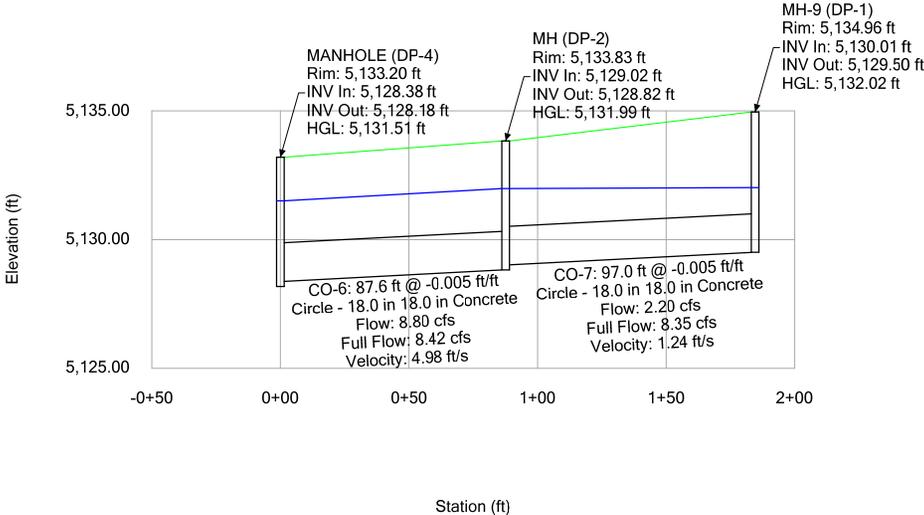
### Active Scenario: 100-YEAR



# Profile Report

## Engineering Profile - 18" N-S SYSTEM (020282-PipeFlow.stsw)

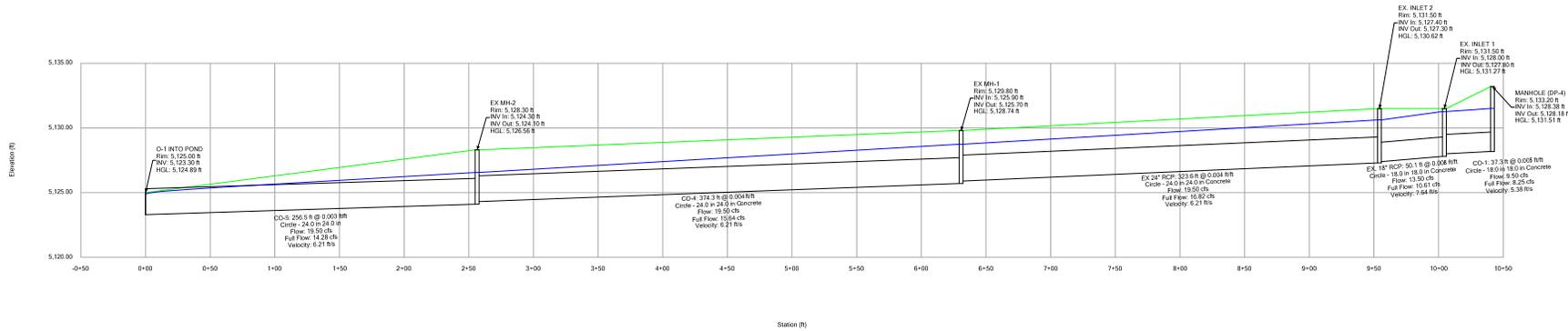
### Active Scenario: 100-YEAR



# Profile Report

## Engineering Profile - PROFILE OFF-SITE (020282-PipeFlow.stsw)

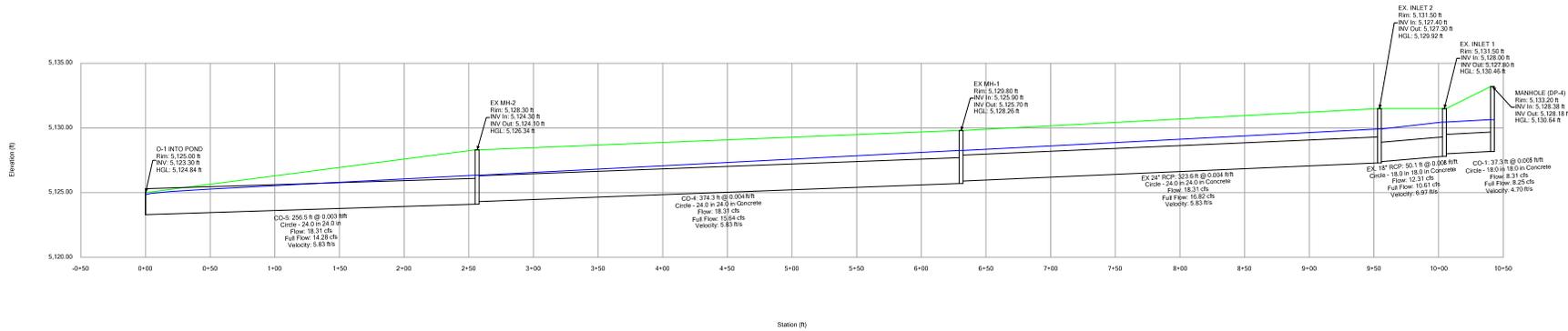
### Active Scenario: 100-YEAR



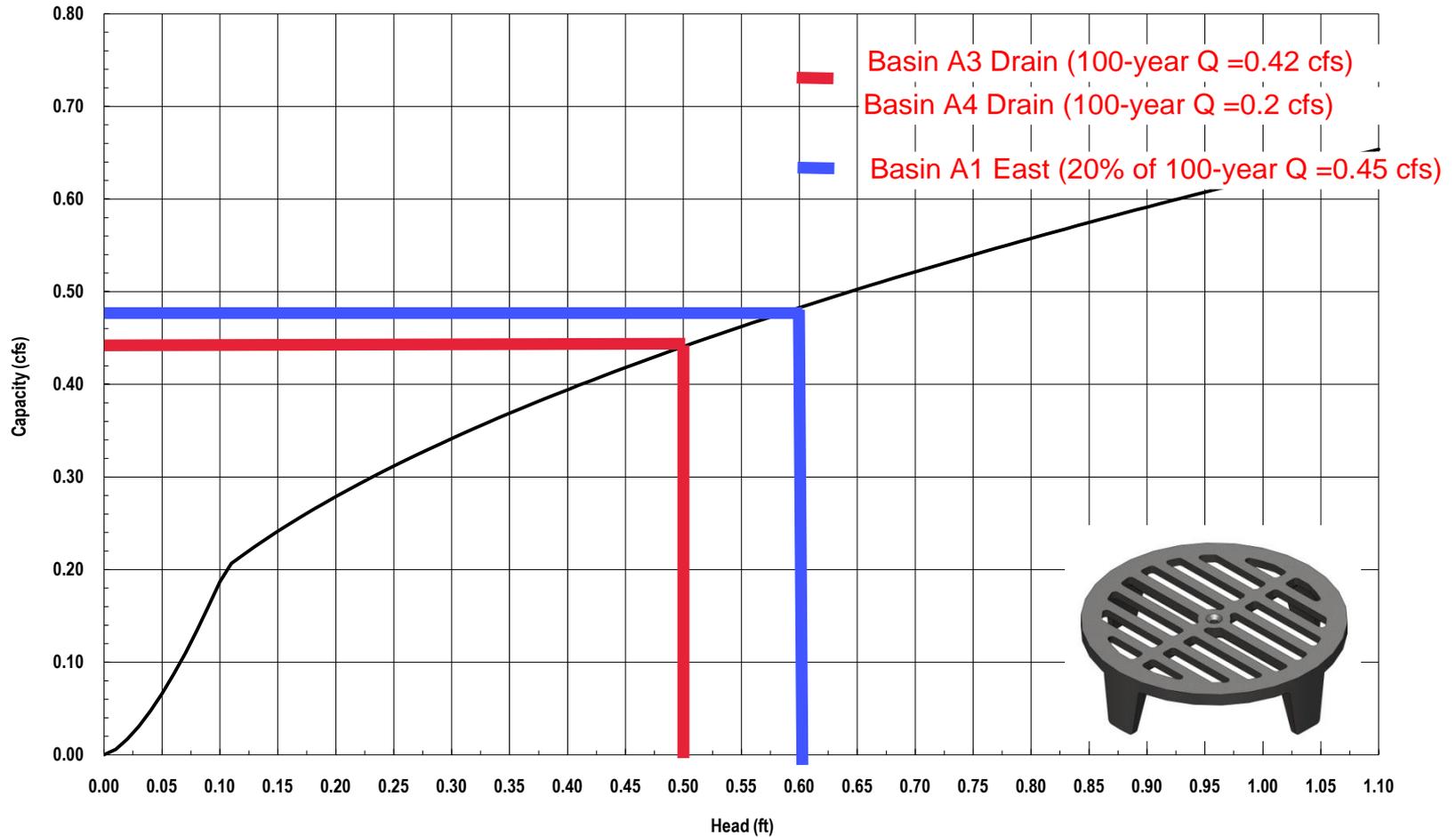
# Profile Report

## Engineering Profile - PROFILE OFF-SITE (020282-PipeFlow.stsw)

### Active Scenario: 100-YEAR CUHP



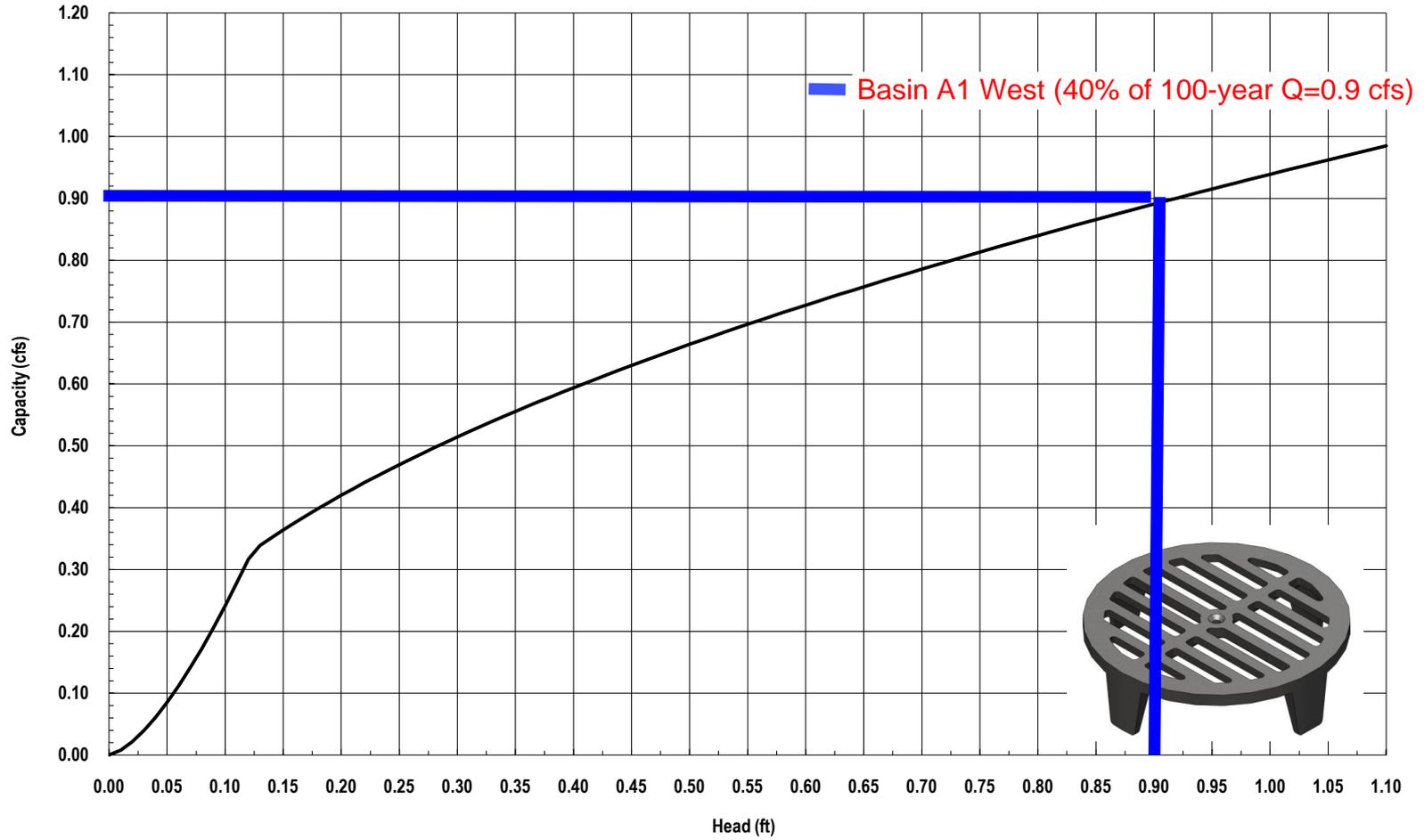
### Nyloplast 8" Standard Grate Inlet Capacity Chart



**Nyloplast**<sup>®</sup>

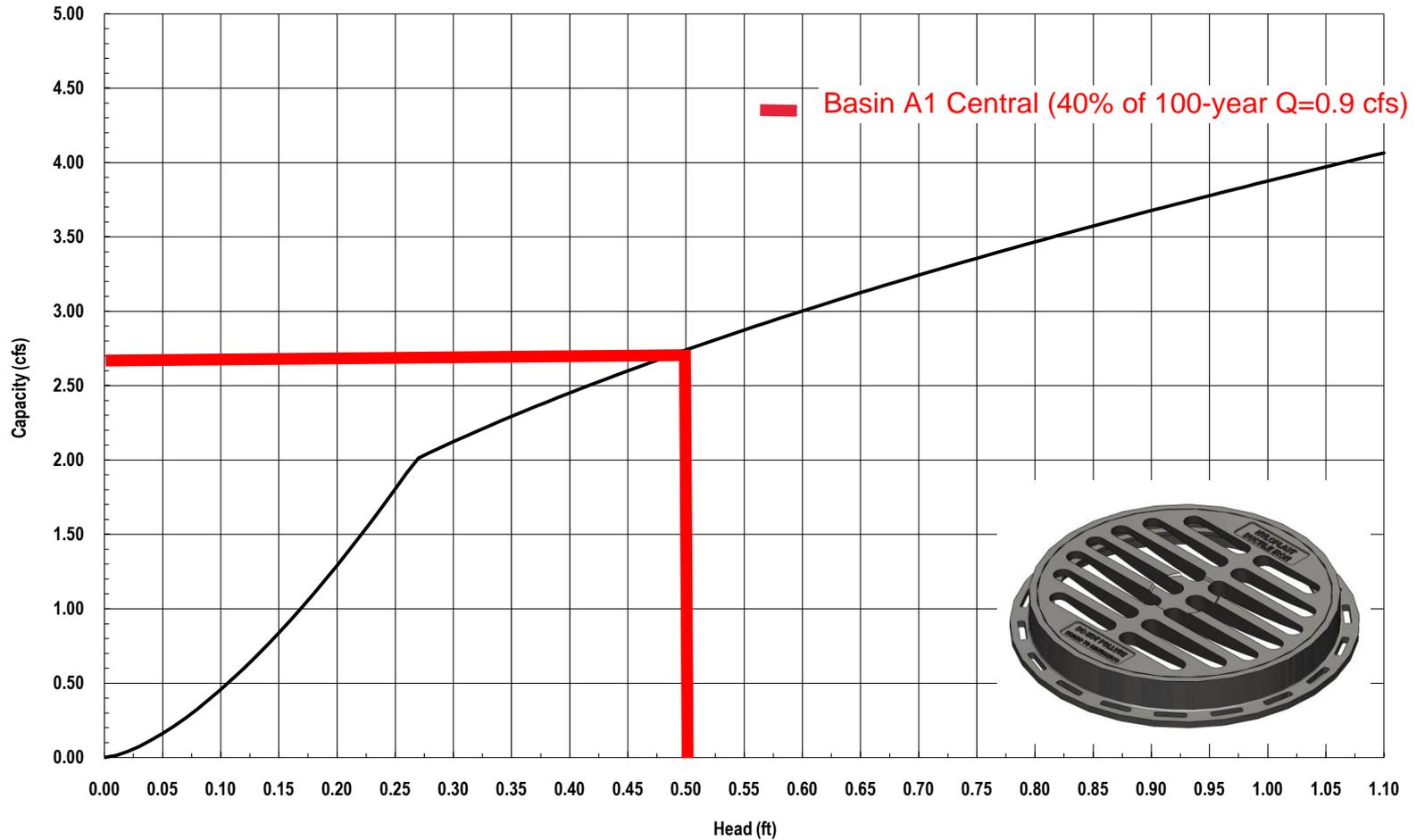
3130 Verona Avenue • Buford, GA 30518  
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490  
© Nyloplast Inlet Capacity Charts June 2012

# Nyloplast 10" Standard Grate Inlet Capacity Chart



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© Nyloplast Inlet Capacity Charts June 2012

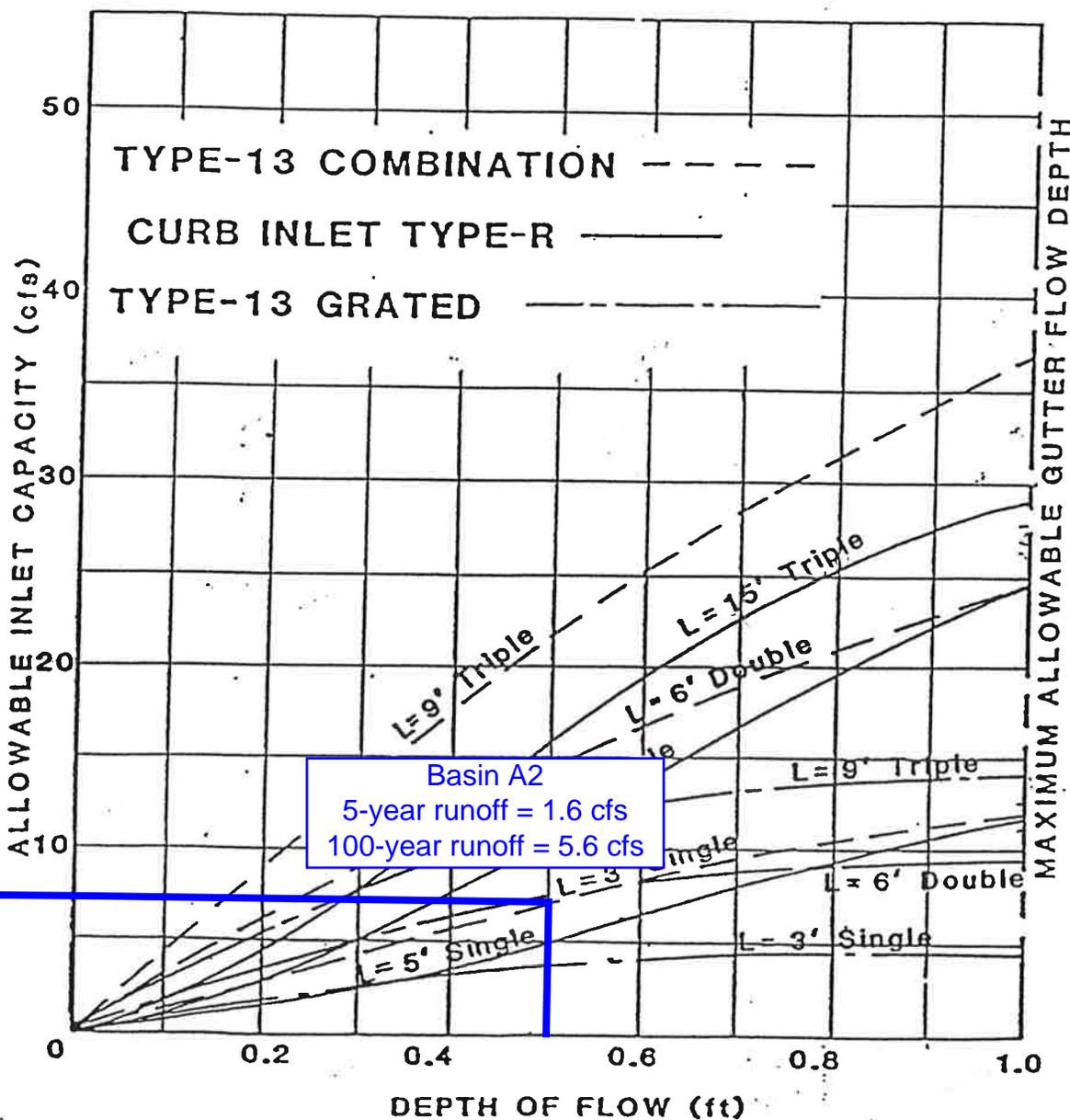
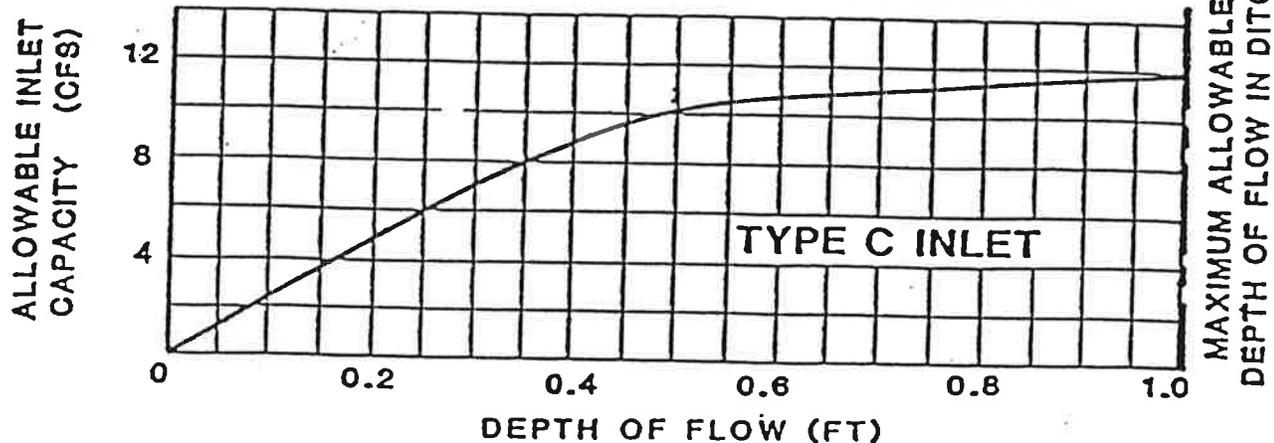
### Nyloplast 18" Standard Grate Inlet Capacity Chart



**Nyloplast**<sup>®</sup>

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ALLOWABLE INLET CAPACITY  
SUMP CONDITIONS - ALL INLETS



Date: 05/02/2018  
rev:

REFERENCE: Canyon Creek Duplexes - STM4, Single Type-13 Inlet

## Worksheet for Capacity of all 1' Sidewalk Chase

### Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	0.33	ft
Height	0.33	ft
Bottom Width	1.00	ft
Discharge	1.33	ft <sup>3</sup> /s <span style="color: red;">MAX FLOW TRAVELING TO =0.42 CFS (A3)</span>

### Results

Flow Area	0.33	ft <sup>2</sup>
Wetted Perimeter	2.66	ft
Hydraulic Radius	0.12	ft
Top Width	1.00	ft
Critical Depth	0.38	ft
Percent Full	100.0	%
Critical Slope	0.00722	ft/ft
Velocity	4.02	ft/s
Velocity Head	0.25	ft
Specific Energy	0.58	ft
Froude Number	1.23	
Discharge Full	1.33	ft <sup>3</sup> /s
Slope Full	0.02000	ft/ft
Flow Type	Supercritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

---

## Worksheet for Capacity of all 1' Sidewalk Chase

---

### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.38	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00722	ft/ft

## Worksheet for Capacity of all 2' Sidewalk Chase

### Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	0.33	ft
Height	0.33	ft
Bottom Width	2.00	ft
Discharge	2.90	ft <sup>3</sup> /s <b>MAX FLOW TRAVELING TO =1.04 CFS (OU2)</b>

### Results

Flow Area	0.66	ft <sup>2</sup>
Wetted Perimeter	4.66	ft
Hydraulic Radius	0.14	ft
Top Width	2.00	ft
Critical Depth	0.40	ft
Percent Full	100.0	%
Critical Slope	0.00524	ft/ft
Velocity	4.39	ft/s
Velocity Head	0.30	ft
Specific Energy	0.63	ft
Froude Number	1.35	
Discharge Full	2.90	ft <sup>3</sup> /s
Slope Full	0.02000	ft/ft
Flow Type	Supercritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

---

## Worksheet for Capacity of all 2' Sidewalk Chase

---

### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.40	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00524	ft/ft



---

## Concrete Drain Pan - NE Corner

---

### Results

Velocity Head	0.06	ft
Specific Energy	0.36	ft
Froude Number	0.92	
Flow Type	Subcritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.29	ft
Critical Depth	0.28	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00481	ft/ft

## Worksheet for Basin A2 Alley (100-year condition)

### Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00700	ft/ft
Left Side Slope	50.00	ft/ft (H:V)
Right Side Slope	50.00	ft/ft (H:V)
Discharge	5.60	ft <sup>3</sup> /s

### Results

Normal Depth	0.22	ft	100-year flow will be contained within alley. This is the worst case condition.
Flow Area	2.52	ft <sup>2</sup>	
Wetted Perimeter	22.45	ft	
Hydraulic Radius	0.11	ft	
Top Width	22.44	ft	
Critical Depth	0.24	ft	
Critical Slope	0.00500	ft/ft	
Velocity	2.22	ft/s	
Velocity Head	0.08	ft	
Specific Energy	0.30	ft	
Froude Number	1.17		
Flow Type	Supercritical		

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.22	ft
Critical Depth	0.24	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00500	ft/ft

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

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

Project: Canyon Creek Duplexes  
 Inlet ID: Meller St East

**Q2= 2.6 CFS**  
**Q100=17.3 CFS**

<b>Gutter Geometry (Enter data in the blue cells)</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} =$ <input style="width: 60px;" type="text"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} =$ <input style="width: 60px;" type="text"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} =$ <input style="width: 60px;" type="text"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} =$ <input style="width: 60px; text-align: center;" type="text"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} =$ <input style="width: 60px; text-align: center;" type="text"/> ft												
Gutter Width	$W =$ <input style="width: 60px; text-align: center;" type="text"/> ft												
Street Transverse Slope	$S_X =$ <input style="width: 60px; text-align: center;" type="text"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W =$ <input style="width: 60px; text-align: center;" type="text"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_O =$ <input style="width: 60px; text-align: center;" type="text"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} =$ <input style="width: 60px; text-align: center;" type="text"/>												
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%;">Minor Storm</th> <th style="width: 25%;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td><input style="width: 40px; text-align: center;" type="text"/></td> <td><input style="width: 40px; text-align: center;" type="text"/></td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td><input style="width: 40px; text-align: center;" type="text"/></td> <td><input style="width: 40px; text-align: center;" type="text"/></td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	<input style="width: 40px; text-align: center;" type="text"/>	<input style="width: 40px; text-align: center;" type="text"/>	ft	$d_{MAX} =$	<input style="width: 40px; text-align: center;" type="text"/>	<input style="width: 40px; text-align: center;" type="text"/>	inches
	Minor Storm	Major Storm											
$T_{MAX} =$	<input style="width: 40px; text-align: center;" type="text"/>	<input style="width: 40px; text-align: center;" type="text"/>	ft										
$d_{MAX} =$	<input style="width: 40px; text-align: center;" type="text"/>	<input style="width: 40px; text-align: center;" type="text"/>	inches										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<table style="width: 100%;"> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: right;">check = yes</td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>	check = yes									
<input type="checkbox"/>	<input type="checkbox"/>	check = yes											
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>													
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	Minor Storm	Major Storm											
$Q_{allow} =$	<input style="width: 40px; text-align: center;" type="text"/>	<input style="width: 40px; text-align: center;" type="text"/>	cfs										

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

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

Project: Canyon Creek Duplexes  
 Inlet ID: Meller St West

**Q2= 2.6 CFS**  
**Q100=11.9 CFS**

<b>Gutter Geometry (Enter data in the blue cells)</b>																	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} =$ <input style="width: 60px;" type="text"/> ft																
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} =$ <input style="width: 60px;" type="text"/> ft/ft																
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} =$ <input style="width: 60px;" type="text"/>																
Height of Curb at Gutter Flow Line	$H_{CURB} =$ <input style="width: 60px; text-align: center;" type="text"/> inches																
Distance from Curb Face to Street Crown	$T_{CROWN} =$ <input style="width: 60px; text-align: center;" type="text"/> ft																
Gutter Width	$W =$ <input style="width: 60px; text-align: center;" type="text"/> ft																
Street Transverse Slope	$S_X =$ <input style="width: 60px; text-align: center;" type="text"/> ft/ft																
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W =$ <input style="width: 60px; text-align: center;" type="text"/> ft/ft																
Street Longitudinal Slope - Enter 0 for sump condition	$S_O =$ <input style="width: 60px; text-align: center;" type="text"/> ft/ft																
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} =$ <input style="width: 60px; text-align: center;" type="text"/>																
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	Minor Storm	Major Storm															
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	Minor Storm	Major Storm															
	3.7	54.4	cfs														
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'																	

**Appendix C – Reference Material**

# Memorandum

**To:** Chad Schroeder, P.E.

**CC:** Stephen Sparn, Scott Schigur, Yasi Taylor, Hannah Hippely, Deb Bachelder, Matthew Wiederspahn, Russell Pennington, Marty Ostholthoff

**From:** Christopher Perdue, P.E., M.B.A.

**Date:** 9/11/2017

**Re:** 020282 - Canyon Creek Duplexes – Off Site Drainage Improvements

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## Purpose

The purpose of this memo is to evaluate the adequacy of existing off-site drainage infrastructure located due west of the proposed Canyon Creek Duplexes development on the southeast corner of the intersection of Erie Parkway and Meller Street. In the existing condition, two 5' Type R inlets are located adjacent to the site; one on the east side and one on the west side of Meller Street situate just south of the curb returns. Currently, stormwater runoff from the subject property and the surrounding areas directly to the north, east and south drain to the inlet on the east side of Meller Street. Portions of the Canyon Creek Filing No. 3 development and Erie Parkway flow into the inlet on the west side of the street in addition to any carryover flow from then eastern inlet. Once collected, runoff is conveyed west through a 24" reinforced concrete pipe (RCP) to a regional detention facility designed and constructed as part of the Canyon Creek Filing No. 3 Project. In addition to evaluating these two drainage areas and inlets, a 10' Type R inlet located on the south side of Erie Parkway, west of the subject site was also examined. This inlet is relevant because runoff exceeding the capture capacity of the two 5' Type R inlets will flow west along Erie Parkway once the high point along the western Meller Street curb return is topped and will eventually be captured by the 10' Type R inlet on the south side of Erie Parkway. Runoff captured by this inlet flows north to a detention facility designed as part of the Canyon Creek Filing No. 2 Project.

## Summary of Analysis

Our capacity analysis of the existing system began with an analysis of the drainage areas to each inlet. A detailed review of the Final Drainage Plan prepared by JR Engineering dated May 19, 1999 yields some concern regarding the delineated drainage areas to each of the 5' Type R inlets.

The Final Drainage Plan fails to include drainage from the subject property as well as any drainage conveyed west along Erie Parkway. According to their calculations, the total flow at Design Point 9 is 3.6 cfs and 14.8 cfs<sup>1</sup> for the 2-year and 100-year events, respectively. This data was again referred to in the Road Capacity, Inlet Capacity Calculation Spreadsheet for the Minor and Major Storm provided later in the Report. JR Engineering states that the inlet on the east side of Meller Street will collect one-third of the runoff while the west side inlet collects the remainder. The note section of the spreadsheet also outlines that each inlet is in a sump condition and capacities are based on a 1.0-foot depth of flow. Assuming a 1.0-foot depth of flow, Figure 903 was used to determine an inlet capacity of 12.0 cfs (each). Based on this analysis, the system appears to function as intended with no hydraulic issues.

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<sup>1</sup> The calculated flow rates are based upon a total drainage area of 4.37 acres to Design Point 9. Total flows were generated using Standard Form SF-2 and SF-3

As part of Bowman's on-going efforts to resolve off-site drainage issues resulting from what was thought to be a capacity issue within the 24-inch RCP closed conduit system, our team has completed our own analysis of the system which conflicts with the design prepared by JR Engineering.

Our initial step was to download current available topographic information for the watershed our project is located within so we may better delineate the drainage divides to each of the three inlets described herein. As shown on the attached "Offsite Drainage Map", the total drainage area contributing to JR Engineering's Design Point 9 is 9.1 acres. 5.29 acres drain to easternmost inlet and 3.81 acres drain to the western. Contrasting back to the JR Engineering Report; the difference is significant at Design Point 9, 4.37 cfs versus 9.1 cfs. Using current UDFCD criteria, 9.1 acres of drainage area translates to 3.0 cfs and 29.2 cfs<sup>2</sup> for the 2-year and 10-year events, again respectively.

Having developed new flow rates at Design Point 9, our next step was to analyze the capacity of the two 5' Type R inlets based on previously used and current criteria. As part of the design process for this project, Bowman has field surveyed the subject property as well as the Meller Street/Erie Parkway intersection. Our review of the existing topography suggests that the 1-foot flow depth assumed by JR Engineering was incorrect. Based on available information, the maximum ponding depth available to the eastern inlet is 0.40 feet before the crown of the road is overtopped. The western inlet will pond to a depth of approximately 0.55 feet before flows will overtop a highpoint along the curb return and relieve to the west to the true sump inlet on Erie Parkway. Using 0.40 and 0.55 feet of flow depth in conjunction with Figure 903, the capacity of the inlets are determined to be 4.0 and 6.0 cfs for the east and west inlets. Therefore, using the same methodology as JR Engineering we can safely anticipate that an additional 4.31 cfs of capacity if available within the 24-inch RCP closed conduit system<sup>3</sup>.

Shifting our methodology from JR Engineering's to current UDFCD criteria, we determine that the capture capacity of the two 5' Type R inlets are 1.1 cfs each for a total of 2.2 cfs. In our experience, the UDFCD criteria is terribly conservative with respect to inlets in sump conditions<sup>4</sup>; however, it is a Town requirement and therefore our analysis was prepared accordingly. Should the UDFCD spreadsheet reflect real world conditions, that means that 2.2 cfs is conveyed by the 24-inch RCP (*leaving 12.31 cfs of excess capacity for the proposed development*) closed conduit system and approximately 27 cfs of flow bypasses these two inlets during the 100-year event and drains west to the true sump on Erie Parkway. UDFCD criteria was used to determine the inlet at that locations capacity as 1.4 cfs compared to Figure 903 at 10 cfs and 24.5 cfs at 6-inch and 1-foot of ponding depth.

Therefore; based on our analysis, a reasonable assumption can be made that the existing system is in-adequate per current criteria and an understanding of the correct information. Using the same criteria as that approved for Filing No. 3 suggests the system could be adequate to serve the proposed development had the system been sized using the correct drainage area(s).

## Concluding Thoughts

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Based on the information presented herein and attached, it is Bowman's opinion that a collaborative effort should be undertaken by the Town of Erie and our development team to resolve these issues. Our analysis suggests that the Town's system as designed previously by JR Engineering is inadequate and I don't feel as though the sole burden of resolving this issue should be the developer's responsibility. This Project has been stalled for quite some time now and I feel as though the most productive course of action is to work hand in hand with Town Staff to develop a solution that best meets the needs of both parties involved. I again request

---

<sup>2</sup> The actual value will vary slightly if the basins were routed properly. For comparative purposes Bowman simply added the two flow rates together based on similar T<sub>c</sub>'s (14.0 and 18.0 minutes)

<sup>3</sup> As-built information for the existing 24" RCP determined that the average slope within the system is 0.40% and therefore the full flow capacity of the system is 14.31 cfs. Subtracting the 10.0 cfs inlet capture capacity from the pipe capacity yields 4.31 cfs.

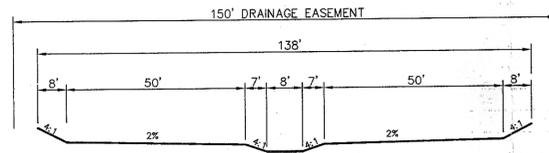
<sup>4</sup> We also calculated the inlet capacity using Bentley's FlowMaster v8i and attached hereto for comparative purposes

*September 11, 2017*

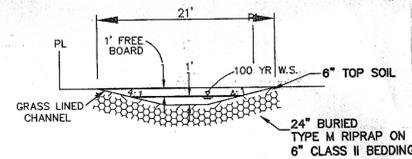
that a meeting be set up with Public Works, Planning Staff and our team to discuss viable alternatives for addressing the Town's capacity issue resulting from poor engineering design prepared by others. Our team will be prepared to discuss viable options during the meeting.

# FINAL DRAINAGE PLAN CANYON CREEK FILING NO. 3

LOCATED IN THE SOUTH ONE-HALF OF SECTION 24,  
TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN,  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO



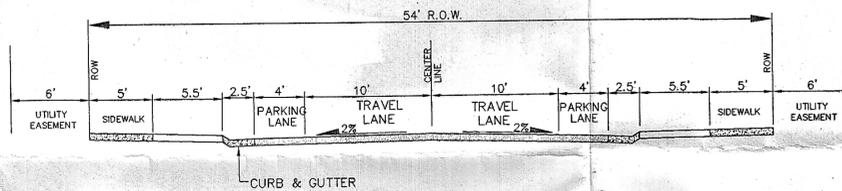
**TYPICAL CHANNEL SECTION**



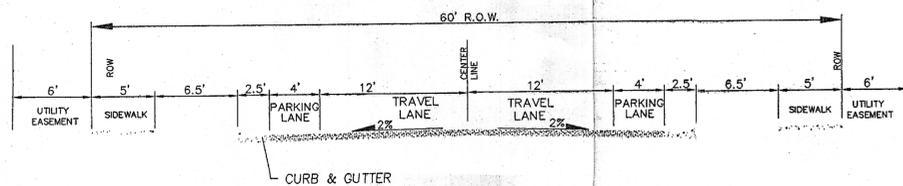
**SECTION A-A**  
HORIZONTAL SCALE: 1" = 10'  
VERTICAL SCALE: 1" = 10'  
DRAINAGE SWALE FROM  
DESIGN POINT B  
Q<sub>100</sub> = 77.3 cfs  
S<sub>0</sub> = 1.0%  
VEL = 8.57 FT/S  
FROUDE NO. = 1.81

**RUNOFF TABLE**

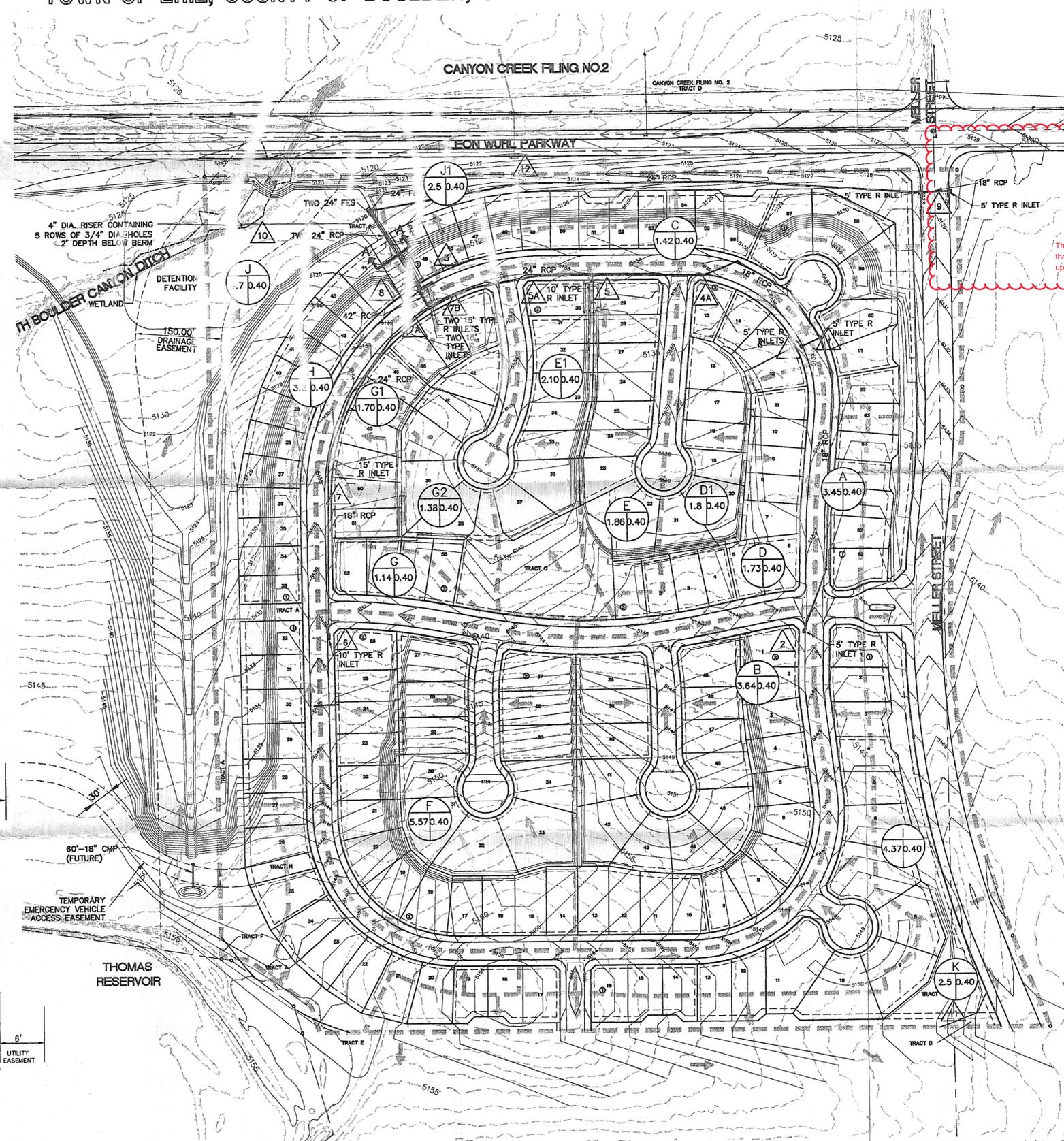
DESIGN POINT	BASIN (acres)	BASIN		CONTRIBUTING BASIN (acres)	CUMULATIVE	
		Q <sub>100</sub> cfs	Q <sub>100</sub> cfs		Q <sub>100</sub> cfs	Q <sub>100</sub> cfs
1	3.45	3.1	12.4	8.82	5.1	7.9
2	3.64	3.4	13.7	3.64	3.4	13.7
3	1.42	1.2	4.9	10.24	4.1	16.7
4	1.73	1.6	6.5	1.73	1.6	6.5
4A	1.80	1.8	7.0	10.62	6.1	9.1
5	1.86	1.8	7.0	12.48	7.5	12.3
5A	2.10	2.0	8.1	14.58	2.0	8.1
6	5.57	5.3	21.0	5.57	5.3	21.0
7	1.10	1.2	4.6	6.71	6.1	12.5
7A	1.70	1.6	6.5	8.41	7.5	30.0
7B	1.38	1.4	5.5	15.96	17.0	64.6
8	3.20	2.6	10.7	27.57	23.8	90.3
9	4.37	3.6	14.8	4.37	3.6	14.8
10	4.7	4.1	16.6	27.57	27.6	117.3
11	2.52	2.7	10.7	2.52	2.7	10.7
12	2.5	2.4	9.4	2.50	2.4	9.4



**TYPICAL SECTION (54' ROW)**  
N.T.S.



**TYPICAL SECTION (60' ROW)**  
N.T.S.



There is additional drainage area here that is not accounted for. See Bowman's updated Drainage Plan/Map attached.

**LEGEND**

- A = BASIN DESIGNATION  
B = AREA IN ACRES  
C = 2 YEAR RUNOFF COEFFICIENT
- DESIGN POINT
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SUB-BASIN BOUNDARY
- PROPOSED STORM SEWER
- PROPOSED TYPE R INLET
- DRAINAGE FLOW DIRECTION
- EXISTING STORM SEWER
- 8" CROSS PAN

**NOTES:**

1. SEE SHEET GR2 FOR 150' OVERFLOW CHANNEL DETAIL.

**ENGINEERS STATEMENT**

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS FOR CANYON CREEK FILING NO. 3 WERE PREPARED UNDER MY DIRECT SUPERVISION IN ACCORDANCE WITH THE ROADWAY DESIGN AND CONSTRUCTION STANDARDS AND THE STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA OF THE TOWN OF ERIE.

*James T. Jones*  
JAMES T. JONES, P.L.L.C.  
COLORADO NO. 19606  
FOR AND BEHALF OF JR ENGINEERING, LTD.

FINAL DRAINAGE PLAN  
CANYON CREEK FILING NO. 3  
JOB NUMBER: 3592.03  
DATE: MAY 19, 1999  
SHEET DR1 OF 1

**JR Engineering, Ltd.**  
6020 Greenwood Plaza Blvd.  
Englewood, Colorado 80111  
Tel. (303) 740-9393  
FAX (303) 721-9019

ENGINEERING/PLANNING/SURVEYING

REV. 7/13/99 REV. 9/7/99 REV. 9/23/99 REV. 11/1/99 REV. 12/30/99 REV. 1/13/00

## STANDARD FORM SF-2 TIME OF CONCENTRATION

Subdivision CANYON CREEK 3  
 Location \_\_\_\_\_

Project Name: CANYON CREEK  
 Project No. 3592.03  
 Calculated By: KDM  
 Checked By: \_\_\_\_\_  
 Date: 9/7/99

SUB-BASIN			INITIAL/OVERLAND			TRAVEL TIME				T <sub>c</sub> CHECK			FINAL
DATA			(T <sub>i</sub> )			(T <sub>i</sub> )				(URBANIZED BASINS)			
BASIN ID	D.A. (AC)	C <sub>s</sub>	L (FT)	S (%)	T <sub>i</sub> (MIN)	L (FT)	S (%)	VEL. (FPS)	T <sub>i</sub> (MIN)	COMP. T <sub>c</sub> (MIN)	TOTAL LENGTH(FT)	MIN. T <sub>c</sub> (MIN)	T <sub>c</sub> (MIN)
A	3.45	0.45	65	1.6	8.0	1000	1.3	2.3	7.2	15.3	1065.0	15.9	15.3
B	3.64	0.45	180	1.7	13.2	550	1.7	2.7	3.4	16.5	730.0	14.1	14.1
C	1.42	0.45	65	2.0	7.5	1200	1.0	2.0	10.0	17.5	1265.0	17.0	17.0
D	1.73	0.45	100	2.5	8.6	650	1.0	2.0	5.4	14.0	750.0	14.2	14.0
D1	1.80	0.45	100	2.0	9.3	400	0.9	1.9	3.5	12.8	500.0	12.8	12.8
E	1.86	0.45	150	2.0	11.4	550	0.9	1.9	4.8	16.2	700.0	13.9	13.9
E1	2.10	0.45	150	2.0	11.4	480	0.9	1.9	4.2	15.6	630.0	13.5	13.5
F	5.57	0.45	180	2.0	12.5	550	1.4	2.4	3.8	16.3	730.0	14.1	14.1
G	1.1	0.45	50	2.0	6.6	650	1.35	2.3	4.7	11.3	700.0	13.9	11.3
G1	1.70	0.45	150	1.7	12.0	520	1.7	2.7	3.2	15.2	670.0	13.7	13.7
G2	1.38	0.45	150	2.0	11.4	310	2.0	2.8	1.8	13.2	460.0	12.6	12.6
H	3.20	0.45	200	2.0	13.1	1210	1.9	2.8	7.2	20.3	1410.0	17.8	17.8
I	4.37	0.45	100	2.0	9.3	1250	1.0	2.0	10.4	19.7	1350.0	17.5	17.5
J	7.19	0.45	200	2.0	13.1	860	3.5	3.7	3.9	17.0	1060.0	15.9	15.9
K	2.52	0.45	200	2.0	13.1				13.1	26.2	200.0	11.1	11.1

**NOTES:**

$$T_i = (1.8 * (1.1 - C_s) * (L)^{0.5}) / (S^{0.33})$$

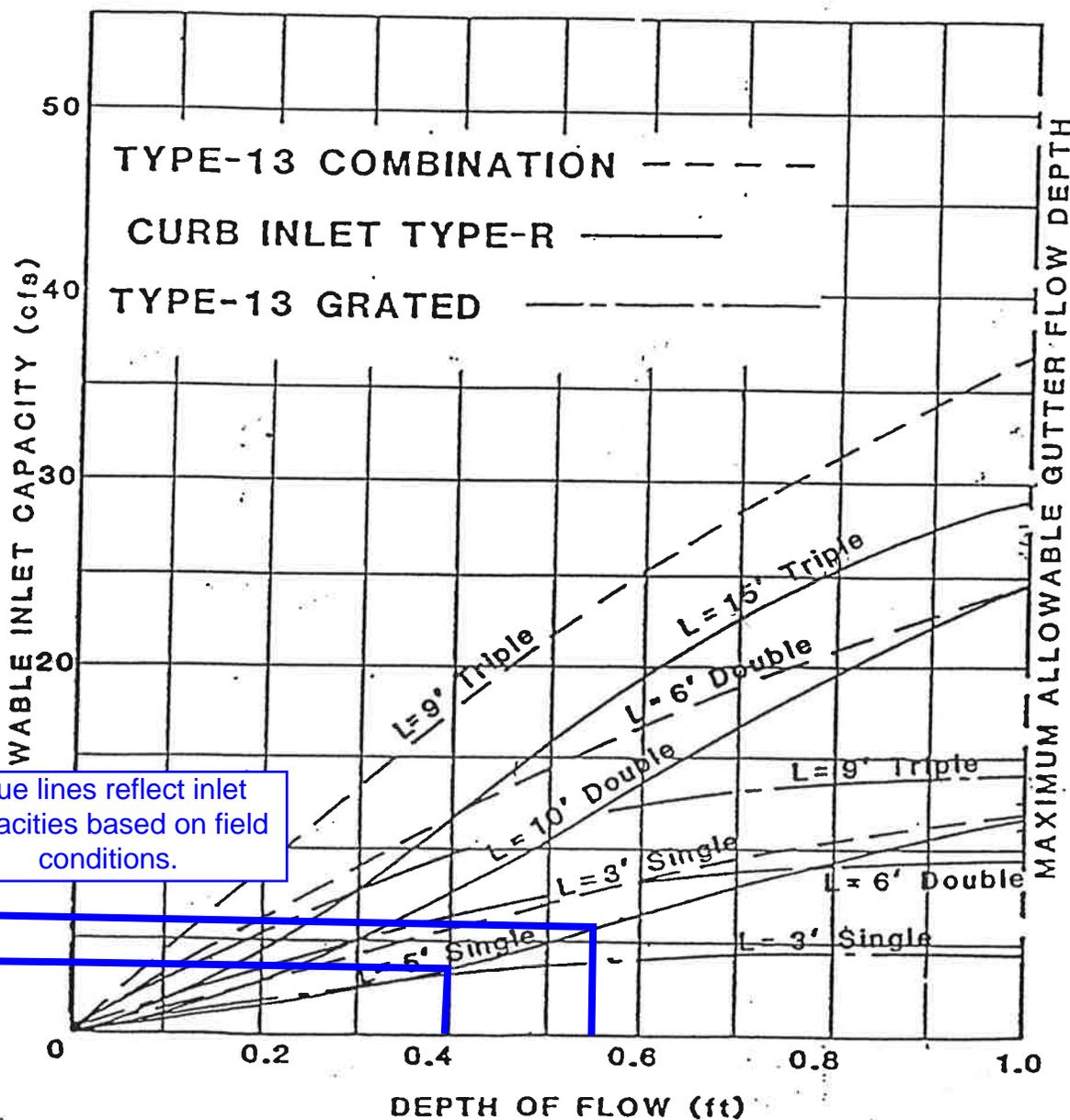
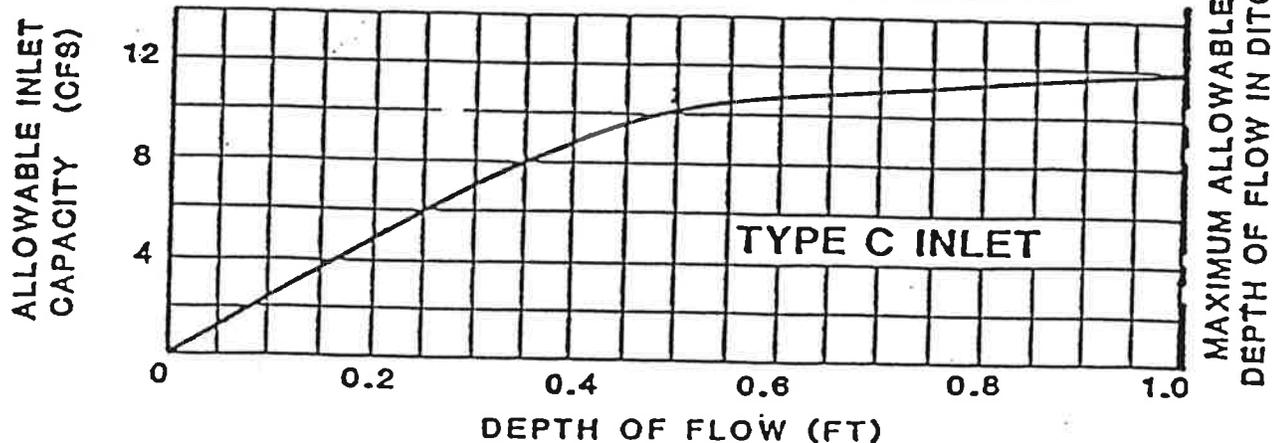
$$T_i = L / 60V \text{ (Velocity From Fig. 3-2)}$$

$$T_c \text{ Check} = 10 + L / 180$$

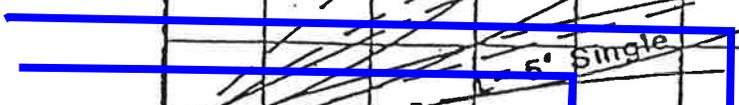




ALLOWABLE INLET CAPACITY  
SUMP CONDITIONS - ALL INLETS



Blue lines reflect inlet capacities based on field conditions.



**ROAD CAPACITY, INLET CAPACITY CALCULATION SHEET - MINOR STORM**

Dsn pt	Q (cfs)	S (%)	inlet size (ft)	inlet capacity	road capacity	R	Qint	Qcarry	Comments
DP 1	3.1	1.3	R-5	2.7	4.2	0.646	2.0	1.1	Qcarry to DP 3
DP 2	3.4	1.7	R-5	2.8	4.8	0.60	2.0	1.4	Qcarry to DP 4
DP 4	3.0	1.0	R-5	2.6	3.6	0.717	2.1	0.8	Qcarry to DP 4A
DP 4A	2.6	0.9	R-5	2.6	3.5	0.745	2.0	0.7	Qcarry to DP 5
DP 5	2.6	0.9	R-10	4.2	3.5	1.206	2.6	0.0	Qcarry to DP 5A
DP 5A	2.0	0.9	none				0.0	2.0	No Inlet, Qcarry to 7A & 7B
DP 6	5.3	1.9	R-10	5.3	5.0	1.058	5.3	0.0	Qcarry to DP 7
DP 7	1.2	1.3	R-15	5.4	5.3	1.00	1.2	0.0	Qcarry to DP 7A + 7B
DP 7A + DP 7B	5.0		R-15 (2)	42.0		1.00	5.0	0.0	*
DP 8 & DP 3	4.9		R-15 (2)	42.0		1.00	4.9	0.0	*
DP 9	1.2		R-5	12.0		1.00	1.2	0.0	*East Side of Road, Collects ~1/3 of Q @ DP 9
DP 9	2.4		R-5	12.0		1.00	2.4	0.0	*West Side of Road, Collects ~2/3 of Q @ DP 9

See pages 3 and 4 of 5 for inlet and road capacity calculations.

**NOTES:**

\* Signifies a low point-sump conditions in effect.

>DP 9 Calculations are based on 1.0' depth of flow.

>Figure 902 of Boulder County Storm Drainage Manual was referenced for allowable gutter capacity for a minor storm (using 0.33' for depth of flow value).

>Figure 903 of Boulder County Storm Drainage Manual was referenced for allowable gutter capacity for a major storm (using 0.63' for depth of flow value).

>Figure 805 of Boulder County Storm Drainage Manual was referenced for allowable inlet capacity on a continuous grade (using 0.33' for depth of flow value).

>Figure 903 of the Storm Drainage Design Manual was referenced for allowable inlet capacity in sump conditions (using 0.63' for depth of flow value).

**ROAD CAPACITY, INLET CAPACITY CALCULATION SHEET - MAJOR STORM**

Dsn pt	Q (cfs)	S (%)	inlet size (ft)	inlet capacity	road capacity	R	Qint	Qcarry	Comments
DP 1	12.4	1.3	R-5	5.2	20.5	0.254	3.1	9.3	Qcarry to DP 3
DP 2	13.7	1.7	R-5	5.6	22.0	0.255	3.5	10.2	Qcarry to DP 4
DP 4	15.1	1.0	R-5	5.0	19.5	0.256	3.9	11.2	Qcarry to DP 4A
DP 4A	18.2	0.9	R-5	5.0	18.5	0.270	4.9	13.3	Qcarry to DP 5
DP 5	20.3	0.9	R-10	10.3	18.5	0.557	11.3	9.0	Qcarry to DP 5A
DP 5A	17.1	0.9	none					17.1	No Inlet, Qcarry to 7A & 7B
DP 6	21.0	1.8	R-10	12.5	24.5	0.510	10.7	10.3	Qcarry to DP 7
DP 7	14.9	1.3	R-15	11.0	20.5	0.537	8.0	6.9	Qcarry to DP 7A + 7B
DP 7A + DP 7B	36.0	1.2	R-15 (2)	42.0		1.000	36.0	0.0	*
DP 8 & DP 3:	24.9		R-15 (2)	42.0		1.000	24.9	0.0	*
DP 9	4.9	1.3	R-5	12.0		1.000	4.9	0.0	*East Side of Road, Collects ~1/3 of Q @ DP 9
DP 9	9.9	1.3	R-5	12.0		1.000	9.9	0.0	*West Side of Road, Collects ~2/3 of Q @ DP 9

See page 5 of 5 for inlet and road capacity calculations.

**NOTES:**

\* Signifies a low point-sump conditions in effect.

>DP 9 Calculations are based on 1.0' depth of flow.

>Figure 902 of Boulder County Storm Drainage Manual was referenced for allowable gutter capacity for a minor storm (using 0.33' for depth of flow value).

>Figure 903 of Boulder County Storm Drainage Manual was referenced for allowable gutter capacity for a major storm (using 0.63' for depth of flow value).

>Figure 805 of Boulder County Storm Drainage Manual was referenced for allowable inlet capacity on a continuous grade (using 0.33' for depth of flow value).

>Figure 903 of the Storm Drainage Design Manual was referenced for allowable inlet capacity in sump conditions (using 0.63' for depth of flow value).

# JR Engineering

Ft. Collins Job Name Road & Inlet Calculations Job No. 3592.03  
 Denver Subject \_\_\_\_\_  
 Colorado Springs Source \_\_\_\_\_ Telephone \_\_\_\_\_ Meeting Date \_\_\_\_\_  
 Pueblo With \_\_\_\_\_

DP #5:  $Q_g = 0.8(0.56 \cdot \frac{5\%}{0.016} (0.009)^{\frac{1}{2}} (0.33)^{\frac{2}{3}}) / 2 \Rightarrow Q_g = 3.45 \text{ cfs} \leftarrow$

$\frac{Q_{in}}{5.5} = \frac{0.33}{0.43} \Rightarrow Q_{in} = 4.22 \text{ cfs (10' Inlet)} \leftarrow$

DP #6:  $Q_g = 0.8(0.56 \cdot \frac{5\%}{0.016} (0.019)^{\frac{1}{2}} (0.33)^{\frac{2}{3}}) / 2 \Rightarrow Q_g = 5.02 \text{ cfs} \leftarrow$

$\frac{Q_{in}}{6.9} = \frac{0.33}{0.43} \Rightarrow Q_{in} = 5.29 \text{ cfs (10' Inlet)} \leftarrow$

DP #7:  $Q_g = 0.8(0.56 \cdot \frac{5\%}{0.016} (0.013)^{\frac{1}{2}} (0.33)^{\frac{2}{3}}) / 2 \Rightarrow Q_g = 4.15 \text{ cfs} \leftarrow$

$Q_{in}/7 = \frac{0.33}{0.43} = 5.37 \text{ cfs} \leftarrow$

DP #8+1:  $Q_{in} = 21.0 \text{ cfs (0.63' flow depth)}$   
 2-15' Inlets

DP #8+3:

$Q_{in} = 21.0 \text{ cfs (0.63' flow depth)}$

$\therefore$  2-15' Inlets  $\leftarrow$

DP #9 (East): Sump Conditions (using 1.0' flow depth)

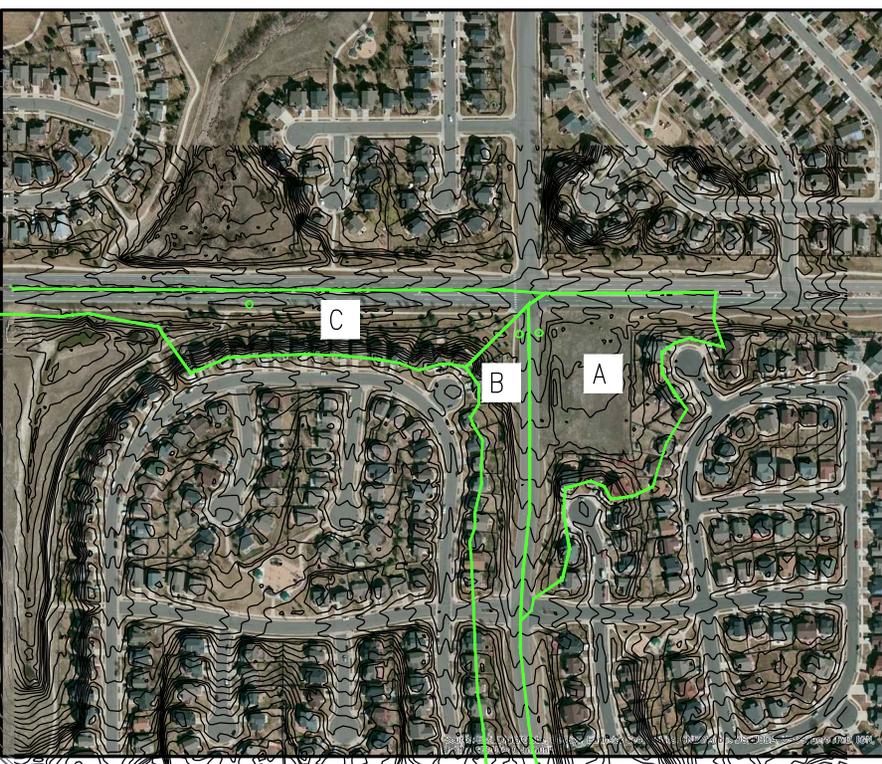
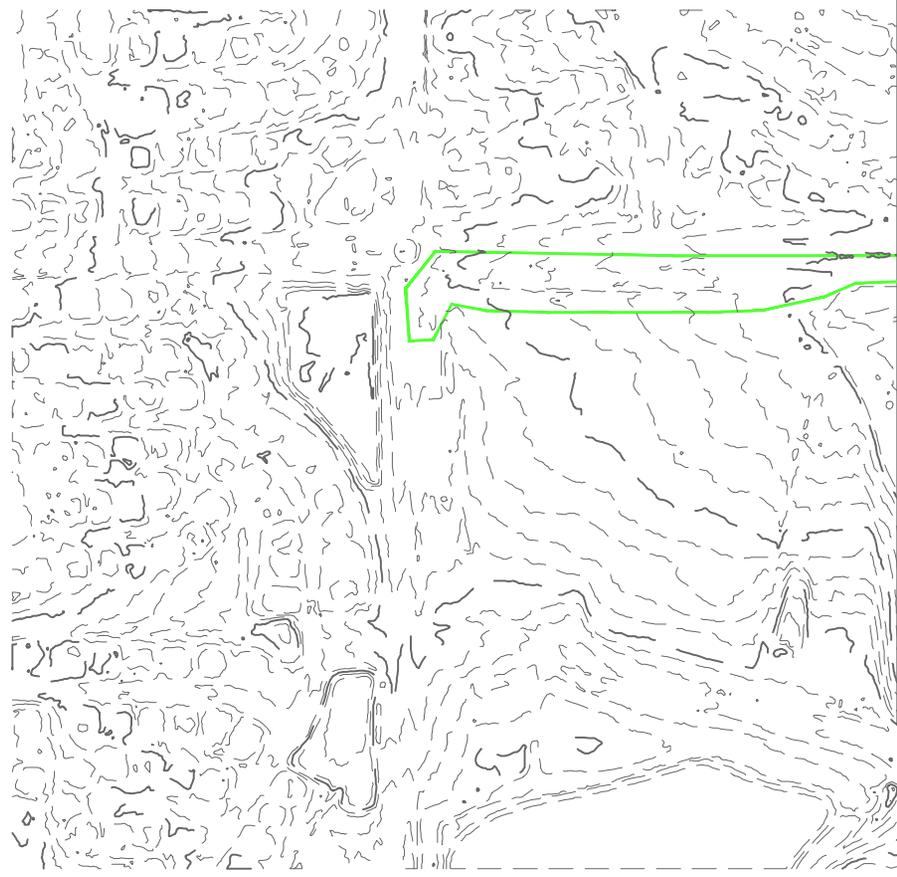
$Q_{in} = 12 \text{ cfs (5' Inlet)} \leftarrow$

DP #9 (West): (using flow depth = 0.5')

$Q_{in} = 6.3 \text{ cfs (10' Inlet)} \leftarrow$

$Q_g = 13.5 \text{ cfs} \leftarrow$

A 5' Inlet was constructed here? Also, assumed depths are inconsistent throughout.



SUMMARY OF DRAINAGE BASINS		
	NAME	AREA (ACRES)
A	EAST MELLER	5.29
B	WEST MELLER	3.81
C	SOUTH ERIE PKWY	8.61

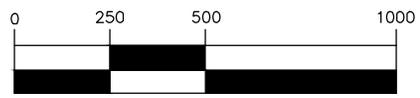
○ - INLET LOCATION

**Bowman**  
CONSULTING

603 Park Point Drive, Suite 100  
Golden, CO 80401

Phone: (303) 674-7355  
Fax: (303) 674-3263  
[www.bowmanconsulting.com](http://www.bowmanconsulting.com)

GRAPHIC SCALE



( IN FEET )  
1 inch = 500 ft.

OFFSITE DRAINAGE MAP

020282-01-001 - CANYON CREEK CUPLEXES  
ERIE, CO

**PROJECT:** Canyon Creek Duplexes  
**SUBJECT:** Site Improvements - Impervious Cover Calculations

**JOB #:** 020282  
**DATE:** 11/21/13  
**BY:** LJT

**Updated** **Revised**  
 9/15/2016 9/7/2017  
 CMG CAV

	% Imp (1)	2-year (1)	5-year (1)	10-year (1)	50-year(1)	100-year (1)
Lanscaping	2	0.01	0.01	0.07	0.34	0.44
Streets	100	0.84	0.86	0.86	0.89	0.89
Walks	90	0.74	0.76	0.78	0.83	0.84
Roofs	90	0.74	0.76	0.78	0.83	0.84

Subbasin	Total Area (acres)	Land Use Area per Sub-Basin								% Check	Composite Imperviousness	Runoff Coefficients (2)				
		Lanscaping		Walks		Streets		Roofs				2-year	5-year	10-year	50-year	100-year
		Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%							
East Meller	5.29	4.34	82.0%	0.09	1.7%	0.86	16.3%	0.00	0.0%	100.00%	19%	0.12	0.14	0.21	0.43	0.52
West Meller	3.81	2.78	73.0%	0.16	4.2%	0.87	22.8%	0.00	0.0%	100.00%	28%	0.19	0.22	0.28	0.48	0.56
South Erie Pkwy	8.61	7.09	82.3%	0.16	1.9%	1.36	15.8%	0.00	0.0%	100.00%	19%	0.12	0.14	0.21	0.43	0.52

1. From Table 6-5 in UDFCD
2. Runoff Coefficients based on equation RO-6 and RO-7 in the UDFCD

Table 1 - Calculation of runoff coefficients for each drainage area.

PROJECT: Canyon Creek Duplexes  
 SUBJECT: Site Improvements - Time of Concentration

**Revised**  
 JOB #: 020282  
 DATE: 10/10/13 9/7/2017  
 BY: LJT CAV

Basin No.	Area (acres)	5Yr. co-eff.	INITIAL/OVERLAND TIME (Ti) [Max. 300'] (1)					TRAVEL TIME (Tt) (2,3)					Tc CHECK (Urbanized Basins)			FINAL Tc	Remarks	
			Elevations		Dist. (ft)	Slope (%)	Ti (min)	Elevations		Dist. (ft)	Slope (%)	Vel. (fps)	Tt (min)	Tc	Length (ft)	Tc (min)		Tc (min)
			U/S	D/S				U/S	D/S									
East Meller	5.29	0.14	5139.00	5136.50	150	1.67	18.16	5136.50	5131.50	616	0.81	1.80	5.7	23.9	766.00	14.3	14.0	
West Meller	3.81	0.22	5154.80	5150.00	120	4.00	11.19	5150.00	5132.00	1358	1.33	2.30	9.8	21.0	1478.00	18.2	18.0	
South Erie Pkwy	8.61	0.14	5142.00	5138.00	150	2.67	15.53	5138.00	5124.50	1700	0.79	1.78	15.9	31.4	1850.00	20.3	20.0	

1. Ti calculated using Equation 6-3, Urban Storm Drainage Criteria Manual
2. Tt calculated using Equation 6-4, Urban Storm Drainage Criteria Manual
3. Travel time velocity calculated based on NRCS Conveyance factors, K from Table 6-2, Urban Storm Drainage Criteria Manual

Table 2 - Calculation of time of concentration for each drainage area.

**STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)**

**CALCULATED BY:** LJT    **CMG**    **CAV**    **P1=**    1.01 in  
**DATE:** 11/21/13    9/15/2016    9/7/2017  
**CHECKED BY:** LJT    **BAR**

**JOB NO:** 020282  
**PROJECT:** Canyon Creek Duplex  
**DESIGN STORM:** 2 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	AREA DESIG.	DIRECT RUNOFF					TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		REMARKS	
			AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps)
East Meller		East Meller	5.29	0.12	14.0	0.64	2.37	1.5												
West Meller		West Meller	3.81	0.19	18.0	0.72	2.10	1.5												
South Erie Pkwy		South Erie Pkwy	8.61	0.12	20.0	1.04	1.99	2.1 <sup>1</sup>												
								2.9 <sup>2</sup>												
								2.5 <sup>3</sup>												

<sup>1</sup> Total Flow that directly flows into South Erie Pkwy inlet

<sup>2</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from the UDFCD UD-Inlet spreadsheet

<sup>3</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from Bentley FlowMaster v8i

Table 3 - Calculation of stormwater runoff flows for a 2 year storm.

**STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)**

**CALCULATED BY:** LJT    **CMG**    **CAV**    **P1=**    1.73 in  
**DATE:** 11/21/13    9/15/2016    9/7/2017  
**CHECKED BY:** LJT    **BAR**

**JOB NO:** 020282  
**PROJECT:** Canyon Creek Duplex  
**DESIGN STORM:** 10 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	AREA DESIG.	DIRECT RUNOFF					TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		REMARKS	
			AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps)
East Meller		East Meller	5.29	0.12	14.0	0.64	4.06	2.6												
West Meller		West Meller	3.81	0.19	18.0	0.72	3.59	2.6												
South Erie Pkwy		South Erie Pkwy	8.61	0.12	20.0	1.04	3.40	3.5 <sup>1</sup>												
								6.5 <sup>2</sup>												
								6.1 <sup>3</sup>												

<sup>1</sup> Total Flow that directly flows into South Erie Pkwy inlet

<sup>2</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from the UDFCD UD-Inlet spreadsheet

<sup>3</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from Bentley FlowMaster v8i

Table 4 - Calculation of stormwater runoff flows for a 10 year storm.

**STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)**

**CALCULATED BY:** LJT    **CMG**    **CAV**    **P1=**    **2.40 in**  
**DATE:** 10/21/13    9/15/2016    9/7/2017  
**CHECKED BY:** LJT    **BAR**

**JOB NO:** 020282  
**PROJECT:** Canyon Creek Duplex  
**DESIGN STORM:** 50 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	AREA DESIG.	DIRECT RUNOFF					TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		REMARKS	
			AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps)
East Meller		East Meller	5.29	0.43	14.0	2.30	5.63	12.9												
West Meller		West Meller	3.81	0.48	18.0	1.85	4.98	9.2												
South Erie Pkwy		South Erie Pkwy	8.61	0.43	20.0	3.74	4.72	17.7 <sup>1</sup>												
								37.6 <sup>2</sup>												
								37.2 <sup>3</sup>												

<sup>1</sup> Total Flow that directly flows into South Erie Pkwy inlet

<sup>2</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from the UDFCD UD-Inlet spreadsheet

<sup>3</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from Bentley FlowMaster v8i

Table 5 - Calculation of stormwater runoff flows for a 50 year storm.

STANDARD FORM SF-2  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

CALCULATED BY: LJT CMG CAV P1= 2.70 in  
DATE: 11/21/13 9/15/2016 9/7/2017  
CHECKED BY: LJT BAR

JOB NO: 020282  
PROJECT: Canyon Creek Duplex  
DESIGN STORM: 100 Year

STREET/BASIN AREAS CONTRIBUTING TO DESIGN POINT	DESIGN POINT	AREA DESIG.	DIRECT RUNOFF					TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME		REMARKS	
			AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	DESIGN FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)		VELOCITY (fps)
East Meller		East Meller	5.29	0.52	14.0	2.73	6.33	17.3												
West Meller		West Meller	3.81	0.56	18.0	2.12	5.61	11.9												
South Erie Pkwy		South Erie Pkwy	8.61	0.52	20.0	4.44	5.31	23.6 <sup>1</sup>												
								50.5 <sup>2</sup>												
								50.1 <sup>3</sup>												

<sup>1</sup> Total Flow that directly flows into South Erie Pkwy inlet

<sup>2</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from the UDFCD UD-Inlet spreadsheet

<sup>3</sup> Total Flow after adding uncaptured quantities from East and West Meller Inlets using capacities from Bentley FlowMaster v8i

Table 6 - Calculation of stormwater runoff flows for a 100 year storm.



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## Erie Parkway - Cross Section

---

### Results

Critical Depth	0.72	ft
Critical Slope	0.00502	ft/ft
Velocity	4.17	ft/s
Velocity Head	0.27	ft
Specific Energy	0.90	ft
Froude Number	1.57	
Flow Type	Supercritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.72	ft
Channel Slope	0.01300	ft/ft
Critical Slope	0.00502	ft/ft

---

## Cross Section for Erie Parkway

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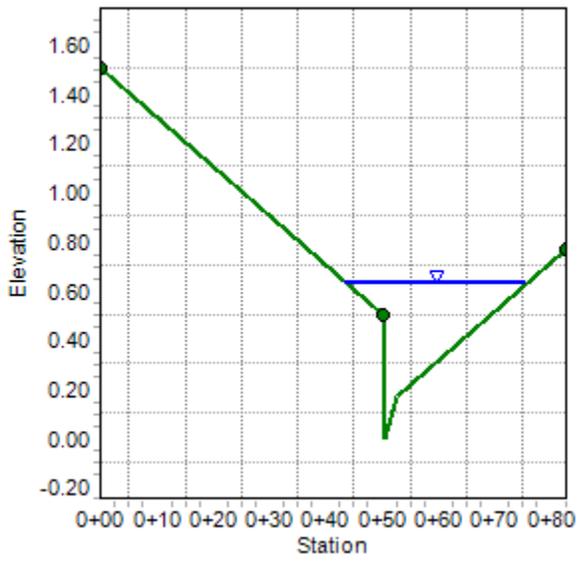
### Project Description

Friction Method                      Manning Formula  
Solve For                                Normal Depth

### Input Data

Channel Slope	0.01300	ft/ft
Normal Depth	0.63	ft
Discharge	29.20	ft <sup>3</sup> /s

### Cross Section Image



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

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

Project: Canyon Creek Duplexes  
 Inlet ID: Meller St East

Gutter Geometry (Enter data in the blue cells)							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} =$ <input type="text"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} =$ <input type="text"/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} =$ <input type="text"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} =$ <input type="text"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} =$ <input type="text"/> ft						
Gutter Width	$W =$ <input type="text"/> ft						
Street Transverse Slope	$S_x =$ <input type="text"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w =$ <input type="text"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_D =$ <input type="text"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} =$ <input type="text"/>						
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="width: 100%; text-align: center;"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><math>T_{MAX} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> <tr> <td colspan="2">ft</td> </tr> </table>	Minor Storm	Major Storm	$T_{MAX} =$ <input type="text"/>	<input type="text"/>	ft	
Minor Storm	Major Storm						
$T_{MAX} =$ <input type="text"/>	<input type="text"/>						
ft							
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1" style="width: 100%; text-align: center;"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><math>d_{MAX} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> <tr> <td colspan="2">inches</td> </tr> </table>	Minor Storm	Major Storm	$d_{MAX} =$ <input type="text"/>	<input type="text"/>	inches	
Minor Storm	Major Storm						
$d_{MAX} =$ <input type="text"/>	<input type="text"/>						
inches							
Check boxes are not applicable in SUMP conditions							
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>							
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>							
Warning 02	<table border="1" style="width: 100%; text-align: center;"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><math>Q_{allow} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> <tr> <td colspan="2">SUMP cfs</td> </tr> </table>	Minor Storm	Major Storm	$Q_{allow} =$ <input type="text"/>	<input type="text"/>	SUMP cfs	
Minor Storm	Major Storm						
$Q_{allow} =$ <input type="text"/>	<input type="text"/>						
SUMP cfs							

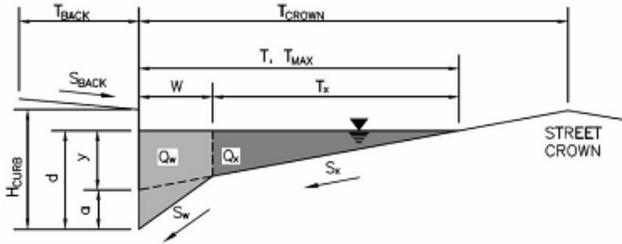
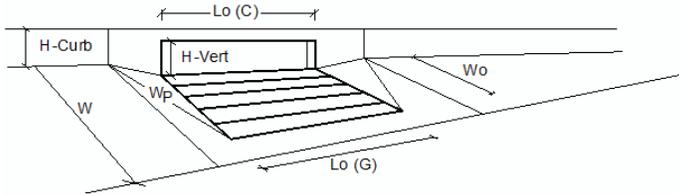


Table 7 - East Meller Street geometry using Urban Drainage Criteria.

## INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	MINOR		MAJOR	
Type of Inlet	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 =	3.4	3.4	inches
<b>Grate Information</b>	MINOR		MAJOR	
Length of a Unit Grate	$L_g (G)$ =	N/A	N/A	feet
Width of a Unit Grate	$W_o$ =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio}$ =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o (G)$ =	N/A	N/A	
<b>Curb Opening Information</b>	MINOR		MAJOR	
Length of a Unit Curb Opening	$L_c (C)$ =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	$H_{vert}$ =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	$H_{throat}$ =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p$ =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f (C)$ =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w (C)$ =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o (C)$ =	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR		MAJOR	
Depth for Grate Midwidth	$d_{grate}$ =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	$d_{curb}$ =	0.12	0.12	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{combination}$ =	0.44	0.44	
Curb Opening Performance Reduction Factor for Long Inlets	$RF_{curb}$ =	0.98	0.98	
Grated Inlet Performance Reduction Factor for Long Inlets	$RF_{grate}$ =	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR		MAJOR	
	$Q_a$ =	1.1	1.1	cfs
<b>WARNING: Inlet Capacity less than Q Peak for Minor and Major Storms</b>	$Q_{PEAK REQUIRED}$ =	2.6	17.3	cfs

Table 8 - East Meller Street inlet capacity using Urban Drainage Criteria.

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

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

Project: Canyon Creek Duplexes  
 Inlet ID: Meller St West

Gutter Geometry (Enter data in the blue cells)									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} =$ <input type="text"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} =$ <input type="text"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} =$ <input type="text"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} =$ <input type="text"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} =$ <input type="text"/> ft								
Gutter Width	$W =$ <input type="text"/> ft								
Street Transverse Slope	$S_x =$ <input type="text"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w =$ <input type="text"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_D =$ <input type="text"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} =$ <input type="text"/>								
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><math>T_{MAX} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> <tr> <td><math>d_{MAX} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Minor Storm	Major Storm	$T_{MAX} =$ <input type="text"/>	<input type="text"/>	$d_{MAX} =$ <input type="text"/>	<input type="text"/>		
Minor Storm	Major Storm								
$T_{MAX} =$ <input type="text"/>	<input type="text"/>								
$d_{MAX} =$ <input type="text"/>	<input type="text"/>								
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><math>d_{MAX} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Minor Storm	Major Storm	$d_{MAX} =$ <input type="text"/>	<input type="text"/>				
Minor Storm	Major Storm								
$d_{MAX} =$ <input type="text"/>	<input type="text"/>								
Check boxes are not applicable in SUMP conditions									
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b> <b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>									
<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><math>Q_{allow} =</math> <input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Minor Storm	Major Storm	$Q_{allow} =$ <input type="text"/>	<input type="text"/>	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Minor Storm	Major Storm	<input type="text"/>	<input type="text"/>
Minor Storm	Major Storm								
$Q_{allow} =$ <input type="text"/>	<input type="text"/>								
Minor Storm	Major Storm								
<input type="text"/>	<input type="text"/>								
<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>		Minor Storm	Major Storm	<input type="text"/>	<input type="text"/>				
Minor Storm	Major Storm								
<input type="text"/>	<input type="text"/>								

Warning 02

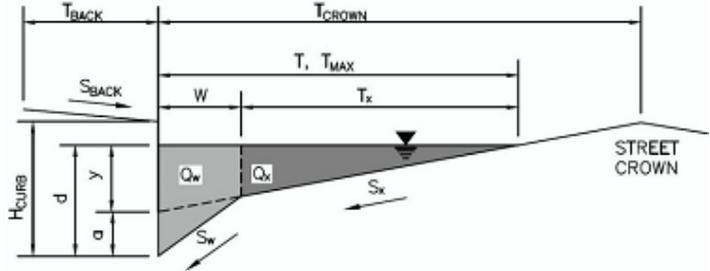
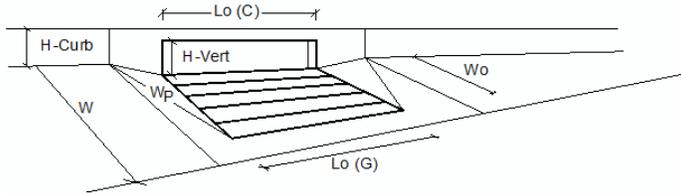


Table 9 - West Meller Street geometry using Urban Drainage Criteria.

## INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



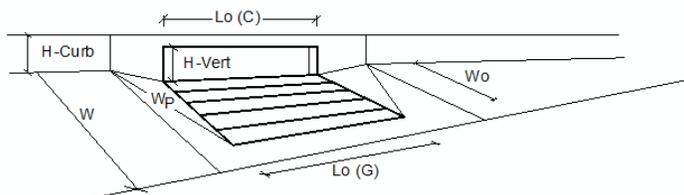
<b>Design Information (Input)</b>	MINOR      MAJOR		
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	3.4	3.4	inches
<b>Grate Information</b>	MINOR      MAJOR		
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR      MAJOR		
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR      MAJOR		
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.12	0.12	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.44	0.44	
Curb Opening Performance Reduction Factor for Long Inlets	0.98	0.98	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR      MAJOR		
<b>WARNING: Inlet Capacity less than Q Peak for Minor and Major Storms</b>	1.1	1.1	cfs
<b>Q<sub>PEAK REQUIRED</sub></b>	2.6	11.9	cfs

Table 10 - West Meller Street inlet capacity using Urban Drainage Criteria.



## INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



### Design Information (Input)

Type of Inlet  
 Local Depression (additional to continuous gutter depression 'a' from above)  
 Number of Unit Inlets (Grate or Curb Opening)  
 Water Depth at Flowline (outside of local depression)

### Grate Information

Length of a Unit Grate  
 Width of a Unit Grate  
 Area Opening Ratio for a Grate (typical values 0.15-0.90)  
 Clogging Factor for a Single Grate (typical value 0.50 - 0.70)  
 Grate Weir Coefficient (typical value 2.15 - 3.60)  
 Grate Orifice Coefficient (typical value 0.60 - 0.80)

### Curb Opening Information

Length of a Unit Curb Opening  
 Height of Vertical Curb Opening in Inches  
 Height of Curb Orifice Throat in Inches  
 Angle of Throat (see USDCM Figure ST-5)  
 Side Width for Depression Pan (typically the gutter width of 2 feet)  
 Clogging Factor for a Single Curb Opening (typical value 0.10)  
 Curb Opening Weir Coefficient (typical value 2.3-3.7)  
 Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

### Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth  
 Depth for Curb Opening Weir Equation  
 Combination Inlet Performance Reduction Factor for Long Inlets  
 Curb Opening Performance Reduction Factor for Long Inlets  
 Grated Inlet Performance Reduction Factor for Long Inlets

### Total Inlet Interception Capacity (assumes clogged condition)

**WARNING: Inlet Capacity less than Q Peak for Minor and Major Storms**

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
$\phi_{local}$ =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	3.4	3.4	inches
	MINOR	MAJOR	
$L_g (G)$ =	N/A	N/A	feet
$W_o$ =	N/A	N/A	feet
$A_{ratio}$ =	N/A	N/A	
$C_f (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_c (C)$ =	10.00	10.00	feet
$H_{vert}$ =	6.00	6.00	inches
$H_{throat}$ =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
$W_p$ =	2.00	2.00	feet
$C_f (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
$d_{grate}$ =	N/A	N/A	ft
$d_{curb}$ =	0.12	0.12	ft
$RF_{combination}$ =	0.32	0.32	
$RF_{curb}$ =	0.73	0.73	
$RF_{grate}$ =	N/A	N/A	
	MINOR	MAJOR	
$Q_a$ =	1.4	1.4	cfs
$Q_{PEAK REQUIRED}$ =	6.5	50.5	cfs

Table 12 - South Erie Parkway inlet capacity using Urban Drainage Criteria.





## 24" RCP Capacity

### Project Description

Friction Method	Manning Formula
Solve For	Discharge

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00400	ft/ft
Normal Depth	2.00	ft
Diameter	2.00	ft

### Results

Discharge	14.31	ft <sup>3</sup> /s
Flow Area	3.14	ft <sup>2</sup>
Wetted Perimeter	6.28	ft
Hydraulic Radius	0.50	ft
Top Width	0.00	ft
Critical Depth	1.36	ft
Percent Full	100.0	%
Critical Slope	0.00613	ft/ft
Velocity	4.55	ft/s
Velocity Head	0.32	ft
Specific Energy	2.32	ft
Froude Number	0.00	
Maximum Discharge	15.39	ft <sup>3</sup> /s
Discharge Full	14.31	ft <sup>3</sup> /s
Slope Full	0.00400	ft/ft
Flow Type	SubCritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

**Table 15 - 24" RCP capacity using Bentley FlowMaster V8i.**

---

## 24" RCP Capacity

---

### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.00	ft
Critical Depth	1.36	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00613	ft/ft

Table 15 (cont.) - 24" RCP capacity using Bentley FlowMaster V8i.

---

## 18" RCP Capacity

---

### Project Description

Friction Method	Manning Formula
Solve For	Discharge

### Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00400	ft/ft
Normal Depth	1.50	ft
Diameter	1.50	ft

### Results

Discharge	6.64	ft <sup>3</sup> /s
Flow Area	1.77	ft <sup>2</sup>
Wetted Perimeter	4.71	ft
Hydraulic Radius	0.38	ft
Top Width	0.00	ft
Critical Depth	1.00	ft
Percent Full	100.0	%
Critical Slope	0.00656	ft/ft
Velocity	3.76	ft/s
Velocity Head	0.22	ft
Specific Energy	1.72	ft
Froude Number	0.00	
Maximum Discharge	7.15	ft <sup>3</sup> /s
Discharge Full	6.64	ft <sup>3</sup> /s
Slope Full	0.00400	ft/ft
Flow Type	SubCritical	

### GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

### GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

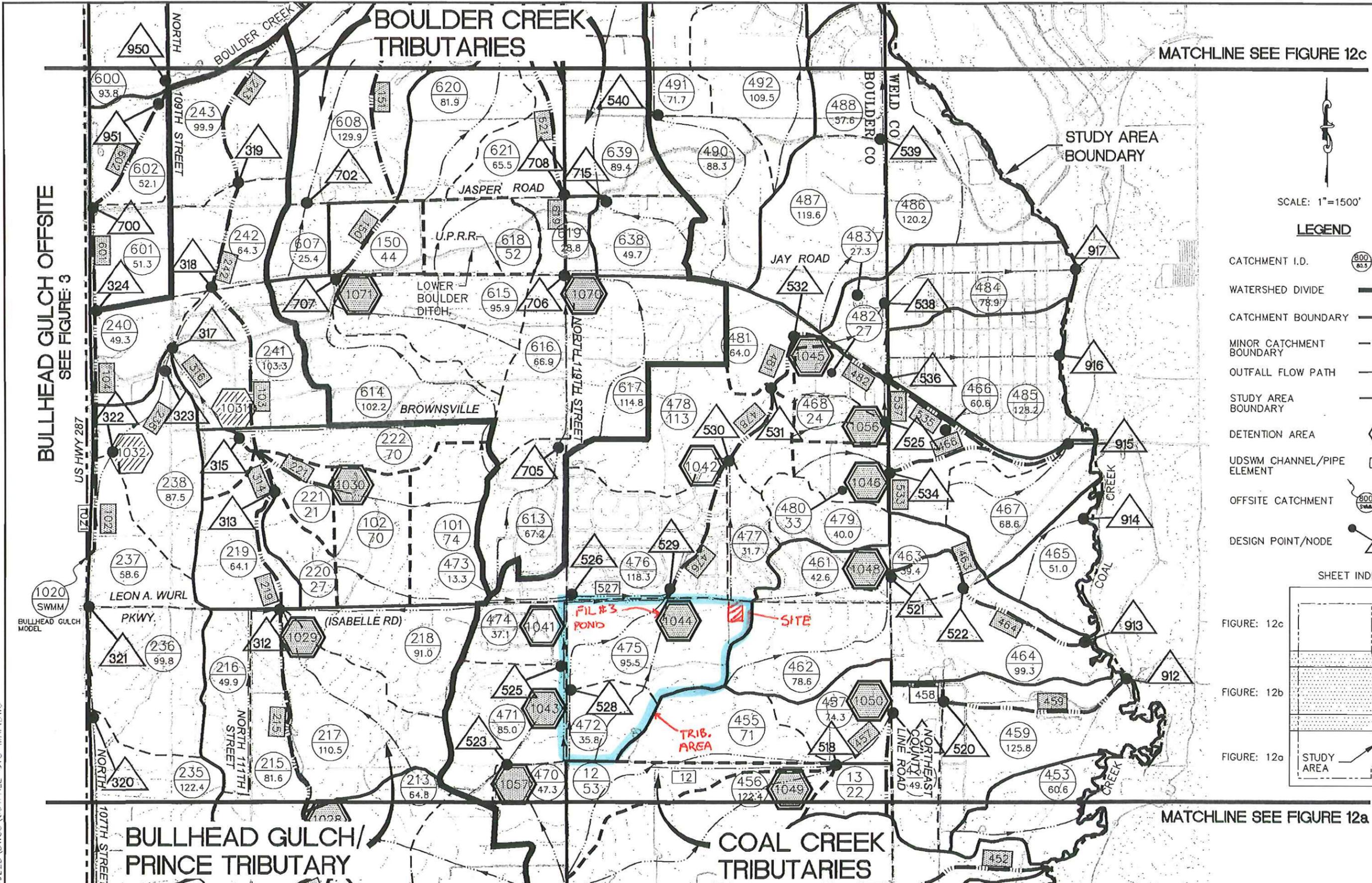
---

## 18" RCP Capacity

---

### GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	1.00	ft
Channel Slope	0.00400	ft/ft
Critical Slope	0.00656	ft/ft



MATCHLINE SEE FIGURE 12c

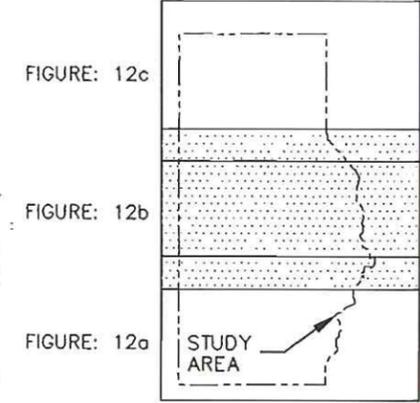
MATCHLINE SEE FIGURE 12a

SCALE: 1"=1500'

**LEGEND**

- CATCHMENT I.D. CATCHMENT ACRE
- WATERSHED DIVIDE
- CATCHMENT BOUNDARY
- MINOR CATCHMENT BOUNDARY
- OUTFALL FLOW PATH
- STUDY AREA BOUNDARY
- DETENTION AREA
- UDSWM CHANNEL/PIPE ELEMENT
- OFFSITE CATCHMENT CATCHMENT SOURCE
- DESIGN POINT/NODE

**SHEET INDEX**



BULLHEAD GULCH OFFSITE  
SEE FIGURE 3

**BULLHEAD GULCH/  
PRINCE TRIBUTARY**

**COAL CREEK  
TRIBUTARIES**

**BOULDER CREEK  
TRIBUTARIES**

DATE: FEBRUARY 2, 2001  
C:\PROJECTS\9922B\DWGS\OUTFALL-SYS-MAP.DWG

**Zone & Associates, Inc.**  
water resource consultants  
841 Front Street  
Louisville, Colorado 80027-1849  
Phone: 303-873-9795  
Fax: 303-673-9796

DESIGNED: RJP  
DRAWN: DM  
CHECKED: DJL  
DATE: 02-01

TOWN OF ERIE  
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

ERIE AND ADJACENT AREAS  
OUTFALL SYSTEMS PLANNING

OUTFALL SYSTEMS MAP

Figure 12b  
Page V - 4

Table A1. On-Site Areas - UDSWM Basin and Conveyance Parameters, Existing Conditions (con.)

Boulder Creek Tributaries, Existing Conditions (con.)

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES		MANNING N	OVERBANK/SURCHARGE				
								HORIZ L	TO VERT R		DEPTH (FT)	JK			
619	708	0	4	CHANNEL	8.0	1285.	.0260	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	1285.	.0260	20.0	20.0	.044	10.00	0			
620	709	0	4	CHANNEL	5.0	3615.	.0060	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3615.	.0060	20.0	20.0	.056	10.00	0			
621	709	0	4	CHANNEL	10.0	4465.	.0040	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	4465.	.0040	20.0	20.0	.056	10.00	0			
622	710	0	4	CHANNEL	10.0	2265.	.0050	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	2265.	.0050	20.0	20.0	.056	10.00	0			
623	958	0	4	CHANNEL	10.0	1090.	.0070	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	1090.	.0070	20.0	20.0	.056	10.00	0			
624	959	0	4	CHANNEL	8.0	4630.	.0060	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	4630.	.0060	20.0	20.0	.044	10.00	0			
627	712	0	4	CHANNEL	10.0	1900.	.0050	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	1900.	.0050	20.0	20.0	.056	10.00	0			
628	711	0	4	CHANNEL	8.0	3140.	.0060	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	3140.	.0060	20.0	20.0	.044	10.00	0			
629	713	0	4	CHANNEL	10.0	1735.	.0230	3.0	3.0	.038	3.00	0			
				OVERFLOW	28.0	1735.	.0230	20.0	20.0	.056	10.00	0			
630	713	0	4	CHANNEL	5.0	4785.	.0110	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	4785.	.0110	20.0	20.0	.056	10.00	0			
631	713	0	4	CHANNEL	5.0	3055.	.0120	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3055.	.0120	20.0	20.0	.056	10.00	0			
633	714	0	4	CHANNEL	10.0	2415.	.0110	3.0	3.0	.038	3.00	0			
				OVERFLOW	28.0	2415.	.0110	20.0	20.0	.056	10.00	0			
634	960	0	4	CHANNEL	10.0	2340.	.0090	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	2340.	.0090	20.0	20.0	.056	10.00	0			
638	715	0	4	CHANNEL	5.0	1780.	.0180	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	1780.	.0180	20.0	20.0	.056	10.00	0			
639	716	0	4	CHANNEL	8.0	2640.	.0090	3.0	3.0	.044	3.00	0			
				OVERFLOW	26.0	2640.	.0090	20.0	20.0	.056	10.00	0			
640	717	0	4	CHANNEL	10.0	2780.	.0090	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	2780.	.0090	20.0	20.0	.056	10.00	0			
641	961	0	4	CHANNEL	10.0	1885.	.0020	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	1885.	.0020	20.0	20.0	.056	10.00	0			
645	718	0	4	CHANNEL	5.0	3320.	.0280	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3320.	.0280	20.0	20.0	.056	10.00	0			
646	719	0	4	CHANNEL	8.0	745.	.0050	3.0	3.0	.044	3.00	0			
				OVERFLOW	26.0	745.	.0050	20.0	20.0	.056	10.00	0			
647	962	0	4	CHANNEL	10.0	2525.	.0060	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	2525.	.0060	20.0	20.0	.056	10.00	0			
648	963	0	4	CHANNEL	5.0	3255.	.0020	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3255.	.0020	20.0	20.0	.056	10.00	0			
650	720	0	4	CHANNEL	5.0	3905.	.0190	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3905.	.0190	20.0	20.0	.056	10.00	0			
651	721	0	4	CHANNEL	8.0	2045.	.0220	3.0	3.0	.044	3.00	0			
				OVERFLOW	26.0	2045.	.0220	20.0	20.0	.056	10.00	0			
652	964	0	4	CHANNEL	10.0	2210.	.0030	3.0	3.0	.044	3.00	0			
				OVERFLOW	28.0	2210.	.0030	20.0	20.0	.056	10.00	0			
655	965	0	4	CHANNEL	5.0	3915.	.0080	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3915.	.0080	20.0	20.0	.056	10.00	0			
658	999	0	4	CHANNEL	8.0	3360.	.0060	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	3360.	.0060	20.0	20.0	.044	10.00	0			
659	722	0	4	CHANNEL	8.0	5685.	.0180	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	5685.	.0180	20.0	20.0	.044	10.00	0			
660	968	0	4	CHANNEL	5.0	3255.	.0040	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	3255.	.0040	20.0	20.0	.056	10.00	0			
661	969	0	4	CHANNEL	8.0	4900.	.0040	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	4900.	.0040	20.0	20.0	.044	10.00	0			
711	712	0	4	CHANNEL	5.0	1815.	.0120	3.0	3.0	.044	3.00	0			
				OVERFLOW	23.0	1815.	.0120	20.0	20.0	.056	10.00	0			
723	968	0	4	CHANNEL	8.0	1925.	.0050	3.0	3.0	.020	.50	0			
				OVERFLOW	11.0	1925.	.0050	20.0	20.0	.044	10.00	0			
1060	750	17	3		.0	0.	.0001	.0	.0	.001	.01	-1			
				TIME IN HRS VS INFLOW IN CFS											
				.0	.0	.4	1.2	.5	58.6	.8	646.5	1.0	1240.4	1.2	1421.0
				1.3	1439.7	1.3	1414.2	1.8	1071.6	2.0	856.3	2.5	557.3	3.0	365.2
				3.5	239.4	4.0	157.0	5.0	67.5	6.0	29.0	8.0	.0		

Table A2. On-Site Areas - UDSWM Basin and Conveyance Parameters, Future Conditions

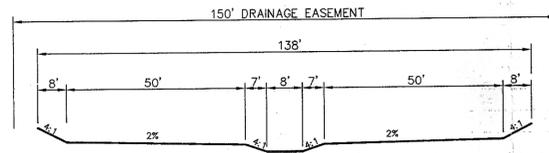
Coal Creek Tributaries, Future Conditions

SUBAREA NUMBER	GUTTER OR MANHOLE	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR		SURFACE STORAGE (IN)		INFILTRATION RATE (IN/HR)		GAGE NO	
						IMPERV.	PERV.	IMPERV.	PERV.	MAXIMUM	MINIMUM		DECAY RATE
410	410	10546.	156.9	60.0	.0180	.020	.200	.100	.300	4.14	.58	.00180	1
411	411	9029.	89.9	42.4	.0200	.020	.200	.100	.300	3.54	.54	.00180	1
412	412	10238.	87.3	30.8	.0330	.020	.200	.100	.300	3.90	.56	.00180	1
413	413	9364.	29.5	50.0	.0270	.020	.200	.100	.300	4.50	.60	.00180	1
414	414	12312.	84.1	50.0	.0220	.020	.200	.100	.300	4.50	.60	.00180	1
415	415	9450.	80.1	38.0	.0310	.020	.200	.100	.300	4.02	.57	.00180	1
416	416	8712.	89.7	59.0	.0130	.020	.200	.100	.300	4.50	.60	.00180	1
417	417	9428.	40.3	95.0	.0210	.020	.200	.100	.300	4.25	.58	.00180	1
418	418	9482.	58.2	24.6	.0140	.020	.200	.100	.300	4.01	.57	.00180	1
424	424	11286.	64.3	49.0	.0240	.020	.200	.100	.300	4.50	.60	.00180	1
425	425	16459.	127.2	9.4	.0130	.020	.200	.100	.300	4.35	.59	.00180	1
426	426	11844.	76.8	38.4	.0980	.020	.200	.100	.300	4.14	.58	.00180	1
427	427	3132.	45.5	57.8	.0120	.020	.200	.100	.300	4.25	.58	.00180	1
428	428	2142.	4.9	2.0	.0130	.020	.200	.100	.300	4.47	.60	.00180	1
430	430	11016.	110.9	17.4	.0240	.020	.200	.100	.300	4.50	.60	.00180	1
431	431	11858.	106.5	2.0	.0140	.020	.200	.100	.300	4.50	.60	.00180	1
432	432	6950.	67.0	57.8	.0070	.020	.200	.100	.300	4.50	.60	.00180	1
433	433	4194.	18.9	57.8	.0190	.020	.200	.100	.300	4.50	.60	.00180	1
435	435	10350.	56.0	2.0	.020	.020	.200	.100	.300	4.50	.60	.00180	1
436	436	14200.	127.5	21.5	.0140	.020	.200	.100	.300	4.50	.60	.00180	1
437	437	2860.	27.7	48.5	.0280	.020	.200	.100	.300	4.50	.60	.00180	1
440	440	5330.	67.1	9.2	.0150	.020	.200	.100	.300	4.50	.60	.00180	1
441	441	5864.	41.8	2.0	.0180	.020	.200	.100	.300	4.50	.60	.00180	1
442	442	12636.	98.7	6.7	.0200	.020	.200	.100	.300	4.50	.60	.00180	1
443	443	6448.	20.9	2.9	.0230	.020	.200	.100	.300	4.50	.60	.00180	1
444	444	6338.	60.7	89.4	.0100	.020	.200	.100	.300	4.50	.60	.00180	1
445	445	3096.	13.8	83.8	.0330	.020	.200	.100	.300	4.50	.60	.00180	1
446	446	16200.	118.8	74.5	.0220	.020	.200	.100	.300	4.50	.60	.00180	1
447	447	4410.	16.6	81.1	.0240	.020	.200	.100	.300	4.50	.60	.00180	1
450	450	9738.	42.1	23.3	.0260	.020	.200	.100	.300	4.50	.60	.00180	1
451	451	6941.	113.6	91.3	.0220	.020	.200	.100	.300	4.50	.60	.00180	1
452	452	7402.	65.6	83.8	.0110	.020	.200	.100	.300	4.05	.57	.00180	1
453	453	6062.	60.6	48.5	.0150	.020	.200	.100	.300	4.50	.60	.00180	1
455	455	17917.	123.6	47.6	.0220	.020	.200	.100	.300	4.50	.60	.00180	1
456	456	18216.	122.4	49.4	.0250	.020	.200	.100	.300	4.50	.60	.00180	1
457	457	4464.	74.3	40.7	.0150	.020	.200	.100	.300	4.50	.60	.00180	1
458	458	2230.	49.8	95.0	.0140	.020	.200	.100	.300	4.50	.60	.00180	1
459	459	8190.	125.8	46.5	.0080	.020	.200	.100	.300	4.29	.59	.00180	1
461	461	5998.	42.6	78.8	.0290	.020	.200	.100	.300	4.50	.60	.00180	1
462	462	10676.	78.6	67.5	.0240	.020	.200	.100	.300	4.50	.60	.00180	1
463	463	2750.	39.4	80.1	.0150	.020	.200	.100	.300	4.50	.60	.00180	1
464													

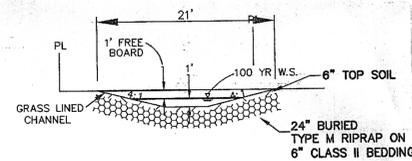


# FINAL DRAINAGE PLAN CANYON CREEK FILING NO. 3

LOCATED IN THE SOUTH ONE-HALF OF SECTION 24,  
TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN,  
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO



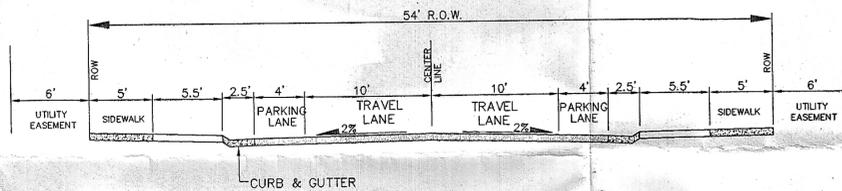
**TYPICAL CHANNEL SECTION**



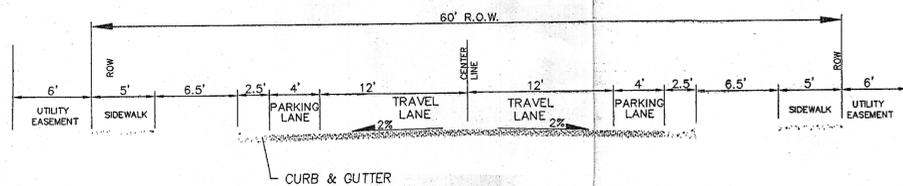
**SECTION A-A**  
HORIZONTAL SCALE: 1" = 10'  
VERTICAL SCALE: 1" = 10'  
DRAINAGE SWALE FROM  
DESIGN POINT B  
 $Q_{100} = 77.3$  cfs  
 $S_o = 1.0\%$   
VEL. = 8.57 FT/S  
FROUDE NO. = 1.81

**RUNOFF TABLE**

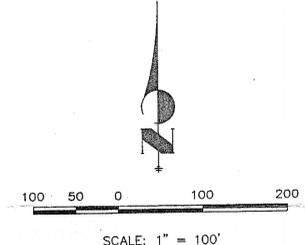
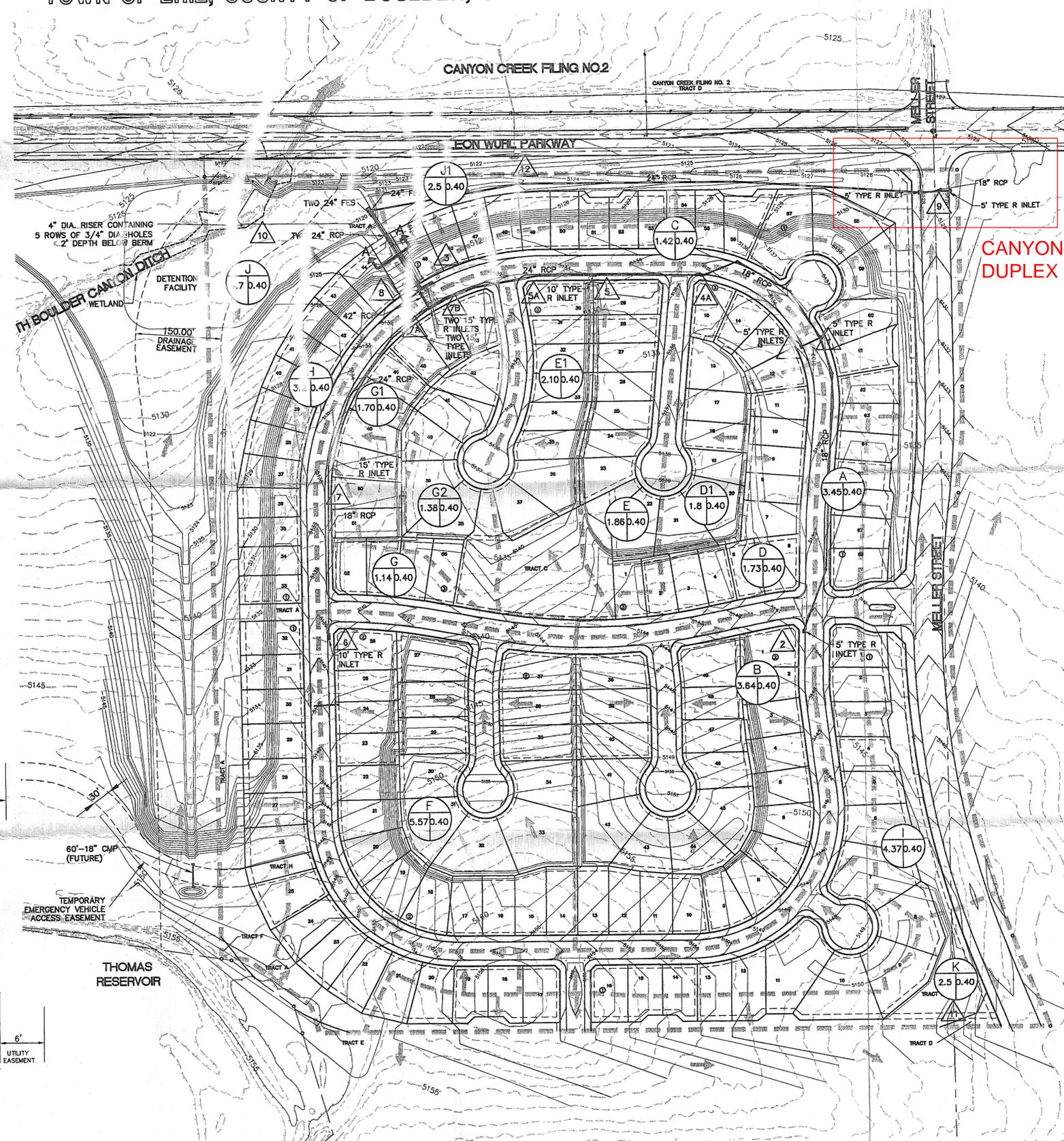
DESIGN POINT	BASIN (acres)	BASIN		CONTRIBUTING BASIN (acres)	CUMULATIVE	
		$Q_2$ cfs	$Q_{100}$ cfs		$Q_2$ cfs	$Q_{100}$ cfs
1	3.45	3.1	12.4	8.82	5.1	7.9
2	3.64	3.4	13.7	3.64	3.4	13.7
3	1.42	1.2	4.9	10.24	4.1	16.7
4	1.73	1.6	6.5	1.73	1.6	6.5
4A	1.80	1.8	7.0	10.62	6.1	9.1
5	1.86	1.8	7.0	12.48	7.5	12.3
5A	2.10	2.0	8.1	14.58	2.0	8.1
6	5.57	5.3	21.0	5.57	5.3	21.0
7	1.10	1.2	4.6	6.71	6.1	12.5
7A	1.70	1.6	6.5	8.41	7.5	30.0
7B	1.38	1.4	5.5	15.96	17.0	64.6
8	3.20	2.6	10.7	27.57	23.8	90.3
9	4.37	3.6	14.8	4.37	3.6	14.8
10	4.7	4.1	16.6	27.57	27.6	117.3
11	2.52	2.7	10.7	2.52	2.7	10.7
12	2.5	2.4	9.4	2.50	2.4	9.4



**TYPICAL SECTION (54' ROW)**  
N.T.S.



**TYPICAL SECTION (60' ROW)**  
N.T.S.



- LEGEND**
- A = BASIN DESIGNATION  
B = AREA IN ACRES  
C = 2 YEAR RUNOFF COEFFICIENT
  - DESIGN POINT
  - EXISTING CONTOUR
  - PROPOSED CONTOUR
  - SUB-BASIN BOUNDARY
  - PROPOSED STORM SEWER
  - PROPOSED TYPE R INLET
  - DRAINAGE FLOW DIRECTION
  - EXISTING STORM SEWER
  - 8" CROSS PAN

**NOTES:**  
1. SEE SHEET GR2 FOR 150' OVERFLOW CHANNEL DETAIL.

**ENGINEERS STATEMENT**

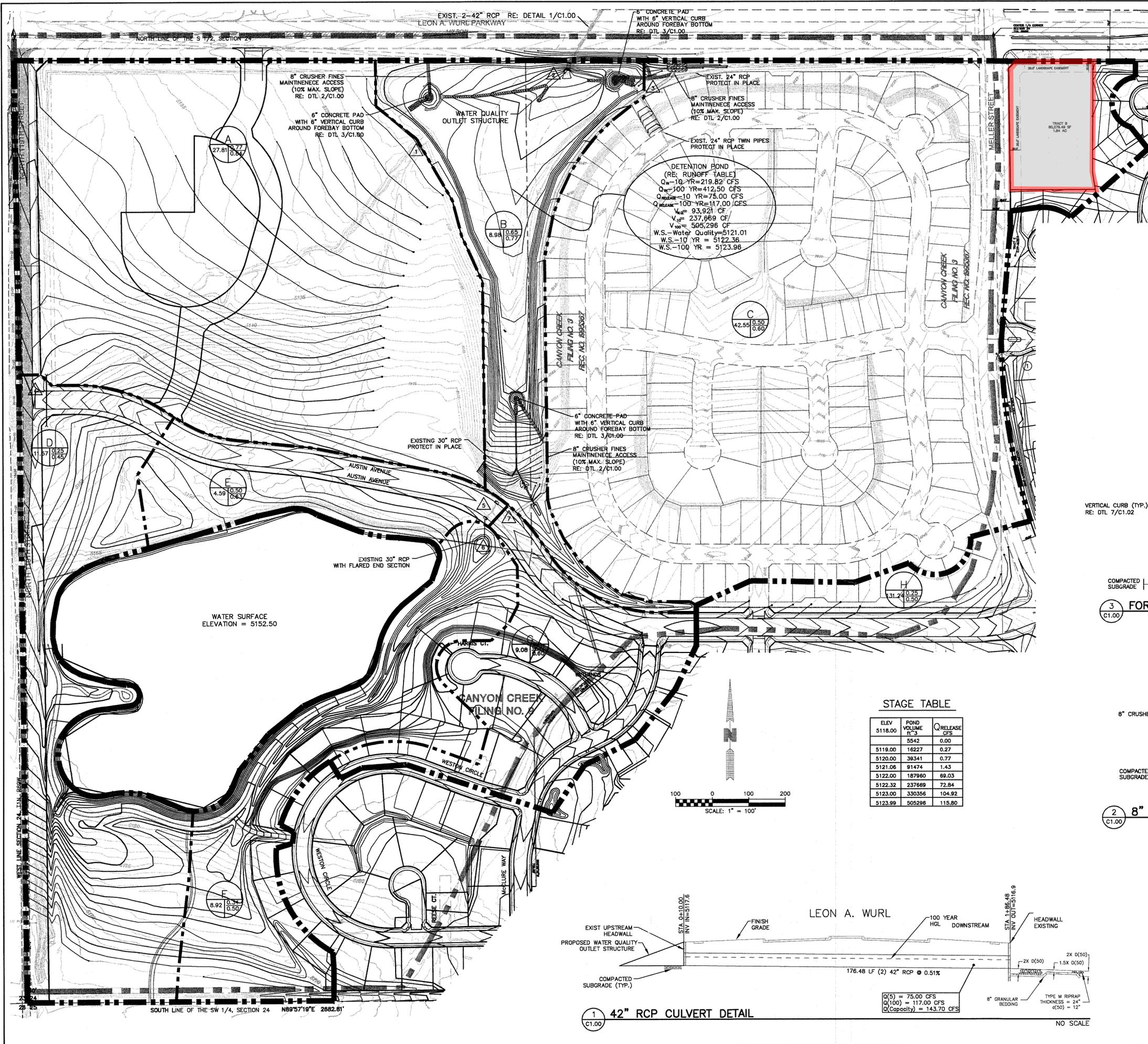
I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS FOR CANYON CREEK FILING NO. 3 WERE PREPARED UNDER MY DIRECT SUPERVISION IN ACCORDANCE WITH THE ROADWAY DESIGN AND CONSTRUCTION STANDARDS AND THE STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA OF THE TOWN OF ERIE.

*James T. Jones*  
JAMES T. JONES, P.L.L.C.  
COLORADO NO. 19606  
FOR AND BEHALF OF JR ENGINEERING, LTD.

FINAL DRAINAGE PLAN  
CANYON CREEK FILING NO. 3  
JOB NUMBER: 3592.03  
DATE: MAY 19, 1999  
SHEET DR1 OF 1

**JR Engineering, Ltd.**  
6020 Greenwood Plaza Blvd.  
Englewood, Colorado 80111  
Tel. (303) 740-9393  
FAX (303) 721-9019

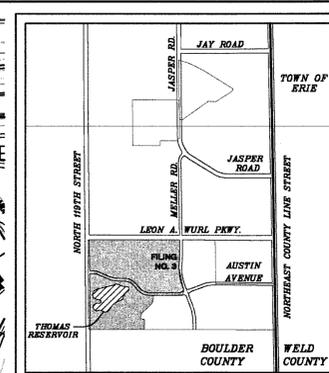
X: 359203 \ACAD\003603.dwg Thu Jan 20 12:11:28 2000



**RUNOFF TABLE**

BASINS TRIBUTARY TO FILING 3 DETENTION POND

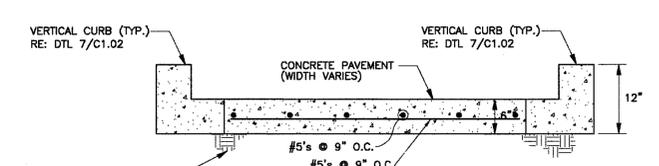
DESIGN POINT	DESIGN	AREA (ACRES)	Q10 CFS	Q100 CFS	
1	A	27.81	82.66	139.50	
2	B	8.98	19.82	36.80	
3	C	42.56	72.33	138.58	
4	D	11.57	9.83	27.85	
5	E	4.59	8.79	17.42	
6	F	8.82	10.75	24.93	
7	G	9.08	15.64	29.42	
TOTAL			113.50	219.82	412.50
HISTORIC (H)			131.24		



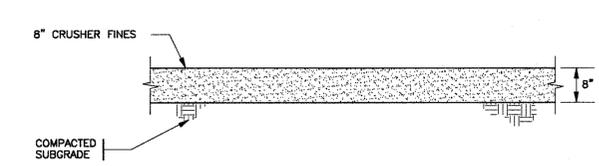
- LEGEND:**
- EXIST. INTERMEDIATE CONTOURS
  - EXIST. INDEX CONTOURS
  - PROPOSED INTERMEDIATE CONTOURS
  - PROPOSED INDEX CONTOURS
  - DEVELOPED BASIN BOUNDARY
  - HISTORIC BASIN BOUNDARY
  - FLOW ARROW
  - △ DESIGN POINT DESIGNATION
  - BASIN DESIGNATION
  - BASIN AREA (ACRES) / 10 YEAR COMPOSITE C / 100 YEAR COMPOSITE C
  - 100 YEAR OVER FLOW PATH
  - PROPOSED STORM SEWER
  - PROPOSED STORM INLET

**NOTES:**

- TRENCH AND EMBANKMENT BACKFILL SHALL BE COMPACTED TO 95% OF THE MAXIMUM DRY DENSITY BASED ON ASTM D-698 AT 2% OF OPTIMUM MOISTURE CONTENT.
- THE PLACEMENT AND COMPACTION OF TRENCH AND EMBANKMENT BACKFILL SHALL BE OBSERVED AND TESTED BY A GEOTECHNICAL ENGINEER DURING CONSTRUCTION.



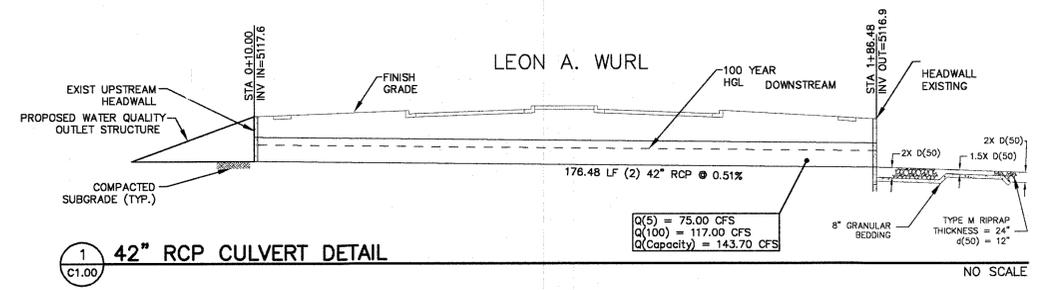
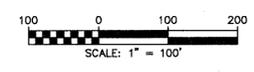
3 FOREBAY CONCRETE PAVEMENT SECTION  
NO SCALE



2 8" CRUSHER FINES MAINTINENCE DRIVE  
NO SCALE

**STAGE TABLE**

ELEV	POND VOLUME FT <sup>3</sup>	Q <sub>RELEASE</sub> CFS
5118.00	8542	0.00
5119.00	18227	0.27
5120.00	38341	0.77
5121.06	91474	1.43
5122.00	187980	89.03
5122.32	237669	72.84
5123.00	330356	104.92
5123.99	505296	115.80



1 42" RCP CULVERT DETAIL  
NO SCALE

**S.A. MIRO, INC. CONSULTING ENGINEERS**  
4582 S. ULSTER ST. PKWY, SUITE 1501 DENVER, COLORADO 80237 (303) 741-3737

NO.	DATE	NAME
1	12/31/01	PBR
2	2/20/02	PBR
3	5/16/02	BLJ
4	8/18/02	FJS
5	10/18/02	PBR

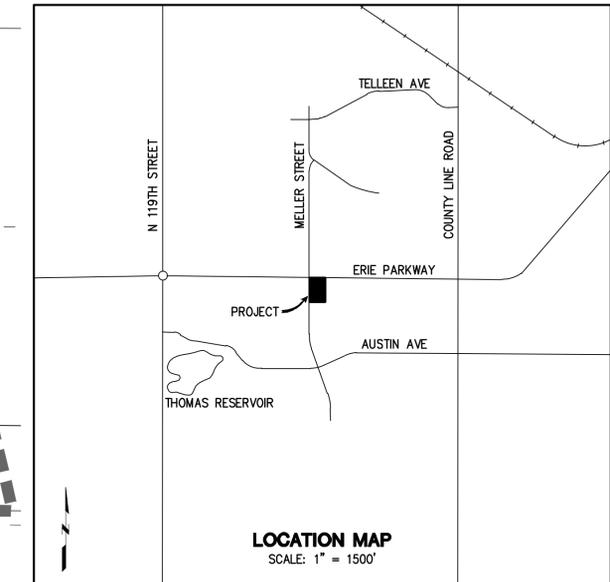
**CANYON CREEK FILING 3**

HISTORIC AND DEVELOPED BASINS

DATE: 10/04/01  
DRAWN BY: PBR  
DESIGNED BY: SAC  
CHECKED BY: JCA

SCALE: AS SHOWN  
SHEET NO. C1.00  
JOB NO. 99219

**Appendix D – Final Drainage Map**



**LEGEND**

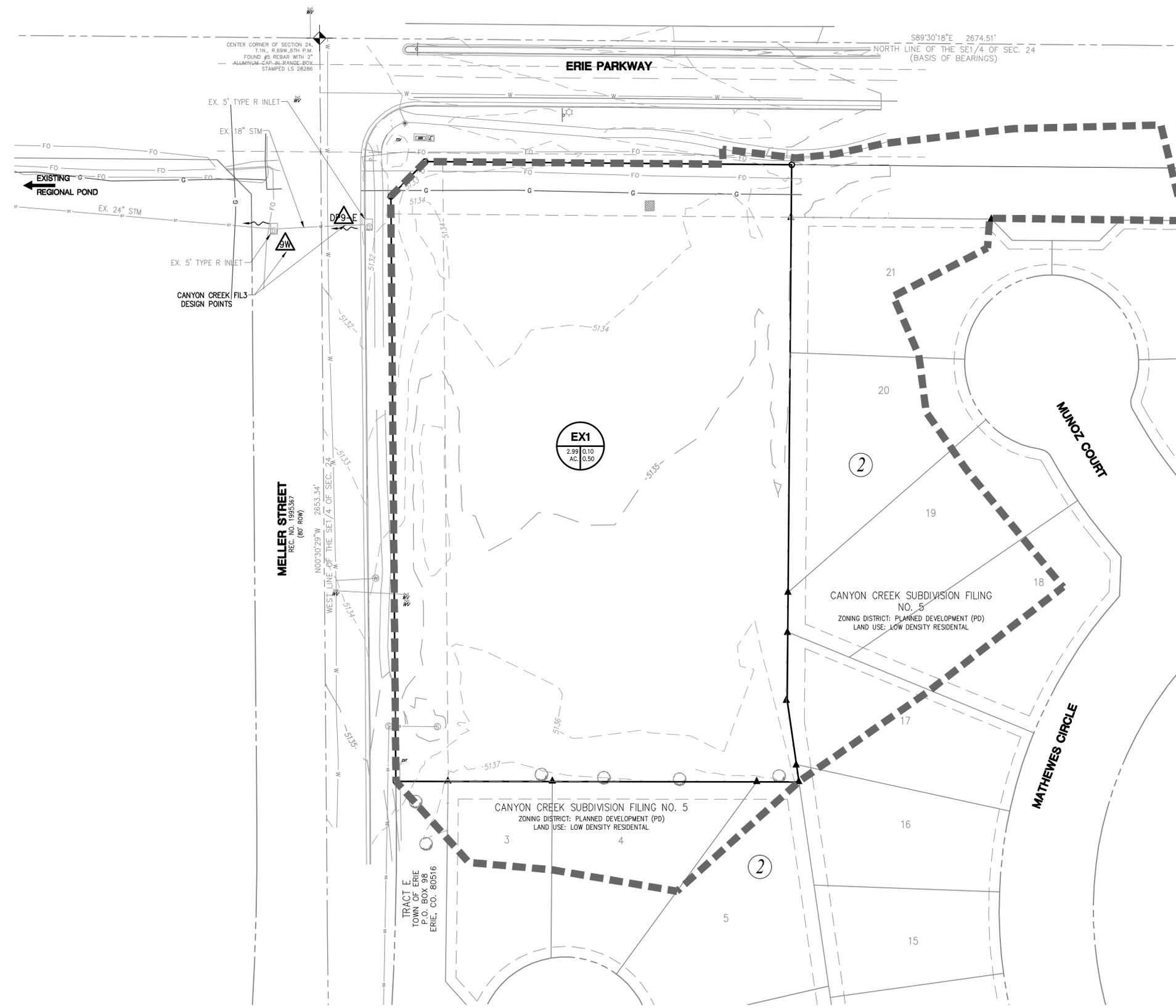
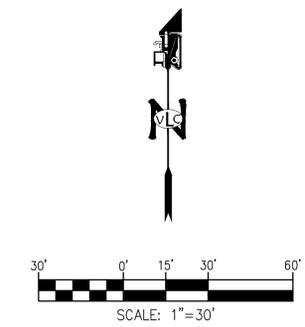
- 5400 EXISTING CONTOUR INDEX
- 5400 EXISTING CONTOUR
- 5400 PROPOSED CONTOUR INDEX
- 5400 PROPOSED CONTOUR
- EXISTING PROPERTY LINE
- EXISTING FENCE
- PROPOSED DRAINAGE BASIN BOUNDARY
- BASIN DESIGNATION
- BASIN AREA IN ACRES
- 2 YEAR RUNOFF COEFFICIENT
- 100 YEAR RUNOFF COEFFICIENT
- EXISTING STORM SEWER LINE
- PROPOSED STORM SEWER LINE
- PROPOSED DRAINAGE SWALE
- DESIGN POINT
- EMERGENCY OVERTFLOW PATH

**HYDROLOGY SUMMARY TABLE**

BASIN	AREA	IMP	Q2 (CFS)	Q100 (CFS)
EX1	2.99 AC	15%	0.38	5.48

**DESIGN POINT SUMMARY TABLE**

DP	AREA	Q2 (CFS)	Q100 (CFS)
9E	2.99	0.38	5.48



**Bowman**  
CONSULTING

Bowman Consulting  
603 Park Point Drive  
Suite 100  
Golden, CO 80401  
Phone: (303) 674-7355  
Fax: (303) 674-9263  
www.bowmanconsulting.com  
Bowman Consulting Group, Ltd.

PRE-DEVELOPMENT DRAINAGE MAP ON-SITE  
**CANYON CREEK DUPLEXES**  
BOULDER COUNTY, COLORADO  
TOWN OF ERIE

PRELIMINARY  
NOT FOR  
CONSTRUCTION

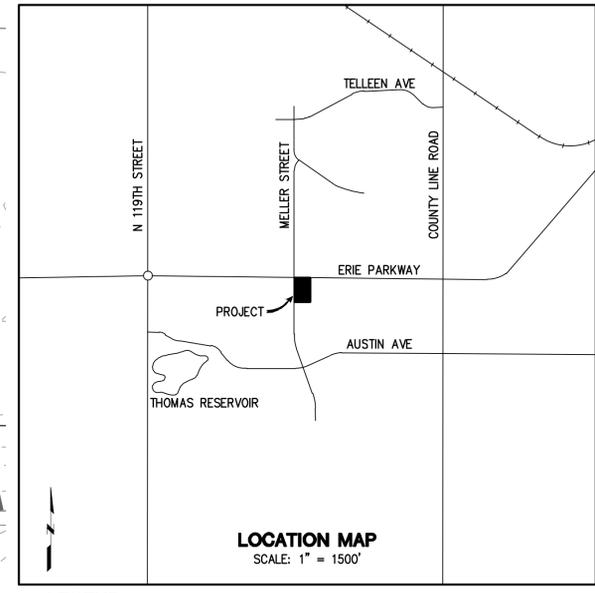
**PLAN STATUS**

9/20/16	FINAL PLAT REVIEW SUBMITTAL
2/15/17	FINAL PLAT 2ND SUBMITTAL
12/21/17	FINAL PLAT 3RD SUBMITTAL
03/30/18	FINAL PLAT 4RD SUBMITTAL

DATE	DESCRIPTION
BAR DESIGN	JAH DRAWN CJP CHKD
SCALE	H: 1"=30' V: 1"=3'
JOB No.	020282-01-001
DATE	03/30/2018
FILE No.	SHEET DM-PRE

PLAN STATUS	
9/20/16	FINAL PLAT REVIEW SUBMITTAL
2/15/17	FINAL PLAT 2ND SUBMITTAL
12/21/17	FINAL PLAT 3RD SUBMITTAL
03/30/18	FINAL PLAT 4RD SUBMITTAL

DATE	DESCRIPTION
BAR DESIGN	JAH CLP
DRAWN	CHKD
SCALE	H: 1" = 30' V: 1" = 3'
JOB No.	020282-01-001
DATE :	03/30/2018
FILE No.	
SHEET	
DM- POST	

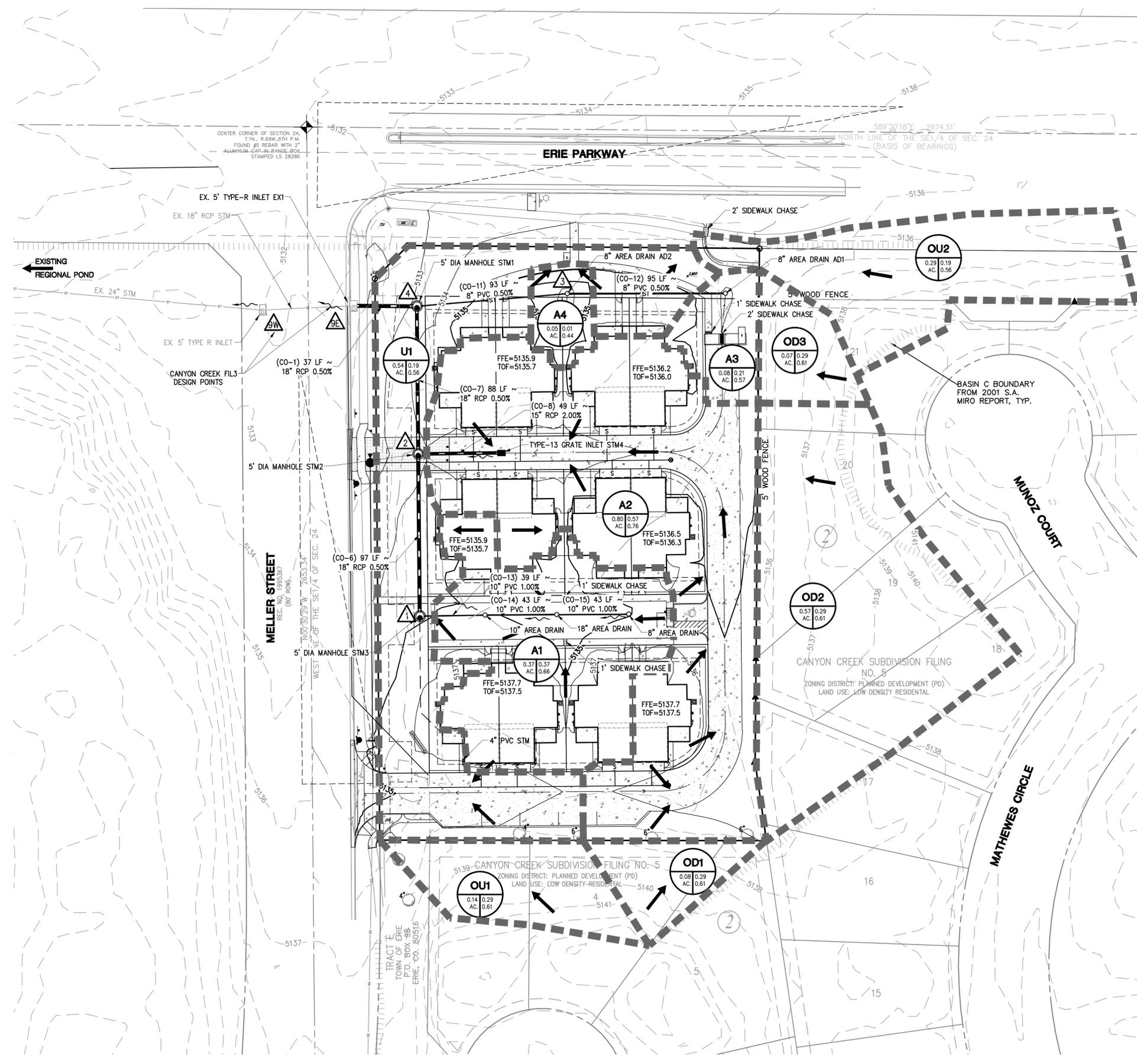
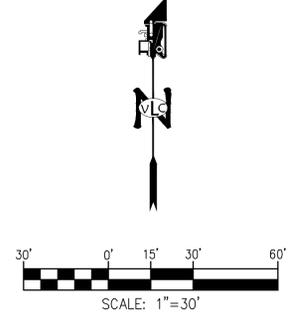


### LEGEND

- 5400 --- EXISTING CONTOUR INDEX
- 5400 --- EXISTING CONTOUR
- 5400 --- PROPOSED CONTOUR INDEX
- 5400 --- PROPOSED CONTOUR
- --- EXISTING PROPERTY LINE
- --- EXISTING FENCE
- --- PROPOSED DRAINAGE BASIN BOUNDARY
- C-2** BASIN DESIGNATION
- C-2** BASIN AREA IN ACRES
- C-2** 2 YEAR RUNOFF COEFFICIENT
- C-2** 100 YEAR RUNOFF COEFFICIENT
- ST --- EXISTING STORM SEWER LINE
- 12"ST --- PROPOSED STORM SEWER LINE
- --- PROPOSED DRAINAGE SWALE
- ▲** DESIGN POINT
- ▲** EMERGENCY OVERTFLOW PATH

HYDROLOGY SUMMARY TABLE					
BASIN	AREA	IMP	Q2 (CFS)	Q100 (CFS)	
A1	0.37 AC	50%	0.47	2.24	
A2	0.80 AC	72%	1.57	5.60	
A3	0.08 AC	30%	0.06	0.42	
A4	0.05 AC	2%	0.00	0.20	
U1	0.55 AC	28%	0.27	2.12	
OD1	0.08 AC	40%	0.08	0.45	
OD2	0.57 AC	40%	0.43	2.46	
OD3	0.07 AC	40%	0.05	0.30	
OU1	0.14 AC	40%	0.11	0.60	
OU2	0.29 AC	28%	0.39	1.04	

DESIGN POINT SUMMARY TABLE			
DP	AREA	Q2 (CFS)	Q100 (CFS)
1	0.37 AC	0.46	2.22
2	1.82 AC	2.06	8.82
3	0.20 AC	0.10	0.77
4	2.02 AC	2.09	9.49
9E (SURFACE FLOW FROM SITE)	0.69 AC	0.38	2.72





4643 South Ulster Street, Suite 500  
Denver, CO 80237  
Phone: (303) 889-8200  
Fax: (303) 633-1986

[Heshmat Properties, LLC](#)

0 Meller Street,  
Erie, CO 80516

Date: November 13, 2015

File Number: 592-F0528473-158-CMN  
Property Address: 0 Meller Street, Erie, CO 80516  
Policy Number: CO-FSTG-IMP-27306-1-15-F0528473

Dear New Property Owner:

Congratulations on your real estate purchase. Enclosed is your Policy of Title Insurance. This policy contains important information about your real estate transaction, and it insures you against certain risks to your ownership. Please read it and retain it with your other valuable papers.

In the event you sell your property or borrow money from a mortgage lender you may be entitled to a discount rate if you order your title insurance through this company.

We appreciate the opportunity of serving you and will be happy to assist you in any way in regard to your future title service needs.

Sincerely,

Fidelity National Title Company



## OWNER'S POLICY OF TITLE INSURANCE

*Issued by*

**Fidelity National Title Insurance Company**

**Any notice of claim and any other notice or statement in writing required to be given the Company under this Policy must be given to the Company at the address shown in Section 18 of the Conditions.**

### COVERED RISKS

SUBJECT TO THE EXCLUSIONS FROM COVERAGE, THE EXCEPTIONS FROM COVERAGE CONTAINED IN SCHEDULE B, AND THE CONDITIONS, FIDELITY NATIONAL TITLE INSURANCE COMPANY, a California corporation (the "Company") insures, as of Date of Policy and, to the extent stated in Covered Risks 9 and 10, after Date of Policy, against loss or damage, not exceeding the Amount of Insurance, sustained or incurred by the Insured by reason of:

1. Title being vested other than as stated in Schedule A.
2. Any defect in or lien or encumbrance on the Title. This Covered Risk includes but is not limited to insurance against loss from
  - (a) A defect in the Title caused by
    - (i) forgery, fraud, undue influence, duress, incompetency, incapacity, or impersonation;
    - (ii) failure of any person or Entity to have authorized a transfer or conveyance;
    - (iii) a document affecting Title not properly created, executed, witnessed, sealed, acknowledged, notarized, or delivered;
    - (iv) failure to perform those acts necessary to create a document by electronic means authorized by law;
    - (v) a document executed under a falsified, expired, or otherwise invalid power of attorney;
    - (vi) a document not properly filed, recorded, or indexed in the Public Records including failure to perform those acts by electronic means authorized by law; or
    - (vii) a defective judicial or administrative proceeding.
  - (b) The lien of real estate taxes or assessments imposed on the Title by a governmental authority due or payable, but unpaid.
  - (c) Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land. The term "encroachment" includes encroachments of existing improvements located on the Land onto adjoining land, and encroachments onto the Land of existing improvements located on adjoining land.
3. Unmarketable Title.
4. No right of access to and from the Land.
5. The violation or enforcement of any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to
  - (a) the occupancy, use, or enjoyment of the Land;
  - (b) the character, dimensions, or location of any improvement erected on the Land;

- (c) the subdivision of land; or
- (d) environmental protection

if a notice, describing any part of the Land, is recorded in the Public Records setting forth the violation or intention to enforce, but only to the extent of the violation or enforcement referred to in that notice.

- 6. An enforcement action based on the exercise of a governmental police power not covered by Covered Risk 5 if a notice of the enforcement action, describing any part of the Land, is recorded in the Public Records, but only to the extent of the enforcement referred to in that notice.
- 7. The exercise of the rights of eminent domain if a notice of the exercise, describing any part of the Land, is recorded in the Public Records.
- 8. Any taking by a governmental body that has occurred and is binding on the rights of a purchaser for value without Knowledge.
- 9. Title being vested other than as stated Schedule A or being defective
  - (a) as a result of the avoidance in whole or in part, or from a court order providing an alternative remedy, of a transfer of all or any part of the title to or any interest in the Land occurring prior to the transaction vesting Title as shown in Schedule A because that prior transfer constituted a fraudulent or preferential transfer under federal bankruptcy, state insolvency, or similar creditors' rights laws; or
  - (b) because the instrument of transfer vesting Title as shown in Schedule A constitutes a preferential transfer under federal bankruptcy, state insolvency, or similar creditors' rights laws by reason of the failure of its recording in the Public Records
    - (i) to be timely, or
    - (ii) to impart notice of its existence to a purchaser for value or to a judgment or lien creditor.
- 10. Any defect in or lien or encumbrance on the Title or other matter included in Covered Risks 1 through 9 that has been created or attached or has been filed or recorded in the Public Records subsequent to Date of Policy and prior to the recording of the deed or other instrument of transfer in the Public Records that vests Title as shown in Schedule A.

The Company will also pay the costs, attorneys' fees, and expenses incurred in defense of any matter insured against by this Policy, but only to the extent provided in the Conditions.

IN WITNESS WHEREOF, FIDELITY NATIONAL TITLE INSURANCE COMPANY has caused this policy to be signed and sealed by its duly authorized officers.

**Fidelity National Title Insurance Company**

Countersigned by:

  
 Authorized Signature



By:   
 Randy Quirk, President

Attest:   
 Michael Gravelle, Secretary



### EXCLUSIONS FROM COVERAGE

The following matters are expressly excluded from the coverage of this policy, and the Company will not pay loss or damage, costs, attorneys' fees, or expenses that arise by reason of:

1. (a) Any law, ordinance, permit, or governmental regulation (including those relating to building and zoning) restricting, regulating, prohibiting, or relating to
  - (i) the occupancy, use, or enjoyment of the Land;
  - (ii) the character, dimensions or location of any improvement erected on the Land;
  - (iii) the subdivision of land; or
  - (iv) environmental protection;
 or the effect of any violation of these laws, ordinances, or governmental regulations. This Exclusion 1(a) does not modify or limit the coverage provided under Covered Risk 5.
- (b) Any governmental police power. This Exclusion 1(b) does not modify or limit the coverage provided under Covered Risk 6.
2. Rights of eminent domain. This Exclusion does not modify or limit the coverage provided under Covered Risk 7 or 8.
3. Defects, liens, encumbrances, adverse claims, or other matters:
  - (a) created, suffered, assumed, or agreed to by the Insured Claimant;
  - (b) not Known to the Company, not recorded in the Public Records at Date of Policy, but Known to the Insured Claimant and not disclosed in writing to the Company by the Insured Claimant prior to the date the Insured Claimant became an Insured under this policy;
  - (c) resulting in no loss or damage to the Insured Claimant;
  - (d) attaching or created subsequent to Date of Policy (however, this does not modify or limit the coverage provided under Covered Risk 9 and 10); or
  - (e) resulting in loss or damage that would not have been sustained if the Insured Claimant had paid value for the Title.
4. Any claim, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that the transaction vesting the Title as shown in Schedule A, is
  - (a) a fraudulent conveyance or fraudulent transfer; or
  - (b) a preferential transfer for any reason not stated in Covered Risk 9 of this policy.
5. Any lien on the Title for real estate taxes or assessments imposed by governmental authority and created or attaching between Date of Policy and the date of recording of the deed or other instrument of transfer in the Public Records that vests Title as shown in Schedule A.

### CONDITIONS

#### 1. DEFINITION OF TERMS

The following terms when used in this policy mean:

(a) "Amount of Insurance": The amount stated in Schedule A, as may be increased or decreased by endorsement to this policy, increased by Section 8(b), or decreased by Sections 10 and 11 of these Conditions.

(b) "Date of Policy": The date designated as "Date of Policy" in Schedule A.

(c) "Entity": A corporation, partnership, trust, limited liability company, or other similar legal entity.

(d) "Insured": The Insured named in Schedule A.

(i) The term "Insured" also includes

(A) successors to the Title of the Insured by operation of law as distinguished from purchase, including heirs, devisees, survivors, personal representatives, or next of kin;

(B) successors to an Insured by dissolution, merger, consolidation, distribution, or reorganization;

(C) successors to an Insured by its conversion to another kind of Entity;

(D) a grantee of an Insured under a deed delivered without payment of actual valuable consideration conveying the Title

(1) if the stock, shares, memberships, or other equity interests of the grantee are wholly-owned by the named Insured,

(2) if the grantee wholly owns the named Insured,

(3) if the grantee is wholly-owned by an affiliated Entity of the named Insured, provided the affiliated Entity and the named Insured are both wholly-owned by the same person or Entity, or

(4) if the grantee is a trustee or beneficiary of a trust created by a written

instrument established by the Insured named in Schedule A for estate planning purposes.

(ii) With regard to (A), (B), (C), and (D) reserving, however, all rights and defenses as to any successor that the Company would have had against any predecessor Insured.

(e) "Insured Claimant": An Insured claiming loss or damage.

(f) "Knowledge" or "Known": Actual knowledge, not constructive knowledge or notice that may be imputed to an Insured by reason of the Public Records or any other records that impart constructive notice of matters affecting the Title.

(g) "Land": The land described in Schedule A, and affixed improvements that by law constitute real property. The term "Land" does not include any property beyond the lines of the area described in Schedule A, nor any right, title, interest, estate, or easement in abutting streets, roads, avenues, alleys, lanes, ways, or waterways, but this does not modify or limit the extent that a right of access to and from the Land is insured by this policy.

(h) "Mortgage": Mortgage, deed of trust, trust deed, or other security instrument, including one evidenced by electronic means authorized by law.

(i) "Public Records": Records established under state statutes at Date of Policy for the purpose of imparting constructive notice of matters relating to real property to purchasers for value and without Knowledge. With respect to Covered Risk 5(d), "Public Records" shall also include environmental protection liens filed in the records of the clerk of the United States District Court for the district where the Land is located.

(j) "Title": The estate or interest described in Schedule A.

(k) "Unmarketable Title": Title affected by an alleged or apparent matter that would permit a prospective purchaser or lessee of the Title or lender on the Title to be released from the obligation to

purchase, lease, or lend if there is a contractual condition requiring the delivery of marketable title.

#### 2. CONTINUATION OF INSURANCE

The coverage of this policy shall continue in force as of Date of Policy in favor of an Insured, but only so long as the Insured retains an estate or interest in the Land, or holds an obligation secured by a purchase money Mortgage given by a purchaser from the Insured, or only so long as the Insured shall have liability by reason of warranties in any transfer or conveyance of the Title. This policy shall not continue in force in favor of any purchaser from the Insured of either (i) an estate or interest in the Land, or (ii) an obligation secured by a purchase money Mortgage given to the Insured.

#### 3. NOTICE OF CLAIM TO BE GIVEN BY INSURED CLAIMANT

The Insured shall notify the Company promptly in writing (i) in case of any litigation as set forth in Section 5(a) of these Conditions, (ii) in case Knowledge shall come to an Insured hereunder of any claim of title or interest that is adverse to the Title, as insured, and that might cause loss or damage for which the Company may be liable by virtue of this policy, or (iii) if the Title, as insured, is rejected as Unmarketable Title. If the Company is prejudiced by the failure of the Insured Claimant to provide prompt notice, the Company's liability to the Insured Claimant under the policy shall be reduced to the extent of the prejudice.

#### 4. PROOF OF LOSS

In the event the Company is unable to determine the amount of loss or damage, the Company may, at its option, require as a condition of payment that the Insured Claimant furnish a signed proof of loss. The proof of loss must describe the defect, lien, encumbrance, or other matter insured against by this policy that constitutes the basis of loss or damage and shall state, to the extent possible, the basis of calculating the amount of the loss or damage.

## 5. DEFENSE AND PROSECUTION OF ACTIONS

(a) Upon written request by the Insured, and subject to the options contained in Section 7 of these Conditions, the Company, at its own cost and without unreasonable delay, shall provide for the defense of an Insured in litigation in which any third party asserts a claim covered by this policy adverse to the Insured. This obligation is limited to only those stated causes of action alleging matters insured against by this policy. The Company shall have the right to select counsel of its choice (subject to the right of the Insured to object for reasonable cause) to represent the Insured as to those stated causes of action. It shall not be liable for and will not pay the fees of any other counsel. The Company will not pay any fees, costs, or expenses incurred by the Insured in the defense of those causes of action that allege matters not insured against by this policy.

(b) The Company shall have the right, in addition to the options contained in Section 7 of these Conditions, at its own cost, to institute and prosecute any action or proceeding or to do any other act that in its opinion may be necessary or desirable to establish the Title, as insured, or to prevent or reduce loss or damage to the Insured. The Company may take any appropriate action under the terms of this policy, whether or not it shall be liable to the Insured. The exercise of these rights shall not be an admission of liability or waiver of any provision of this policy. If the Company exercises its rights under this subsection, it must do so diligently.

(c) Whenever the Company brings an action or asserts a defense as required or permitted by this policy, the Company may pursue the litigation to a final determination by a court of competent jurisdiction, and it expressly reserves the right, in its sole discretion, to appeal from any adverse judgment or order.

## 6. DUTY OF INSURED CLAIMANT TO COOPERATE

(a) In all cases where this policy permits or requires the Company to prosecute or provide for the defense of any action or proceeding and any appeals, the Insured shall secure to the Company the right to so prosecute or provide defense in the action or proceeding, including the right to use, at its option, the name of the Insured for this purpose. Whenever requested by the Company, the Insured, at the Company's expense, shall give the Company all reasonable aid (i) in securing evidence, obtaining witnesses, prosecuting or defending the action or proceeding, or effecting settlement, and (ii) in any other lawful act that in the opinion of the Company may be necessary or desirable to establish the Title or any other matter as insured. If the Company is prejudiced by the failure of the Insured to furnish the required cooperation, the Company's obligations to the Insured under the policy shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation, with regard to the matter or matters requiring such cooperation.

(b) The Company may reasonably require the Insured Claimant to submit to examination under oath by any authorized representative of the Company and to produce for examination, inspection, and copying, at such reasonable times and places as may be designated by the authorized representative of the Company, all records, in whatever medium

maintained, including books, ledgers, checks, memoranda, correspondence, reports, e-mails, disks, tapes, and videos whether bearing a date before or after Date of Policy, that reasonably pertain to the loss or damage. Further, if requested by any authorized representative of the Company, the Insured Claimant shall grant its permission, in writing, for any authorized representative of the Company to examine, inspect, and copy all of these records in the custody or control of a third party that reasonably pertain to the loss or damage. All information designated as confidential by the Insured Claimant provided to the Company pursuant to this Section shall not be disclosed to others unless, in the reasonable judgment of the Company, it is necessary in the administration of the claim. Failure of the Insured Claimant to submit for examination under oath, produce any reasonably requested information, or grant permission to secure reasonably necessary information from third parties as required in this subsection, unless prohibited by law or governmental regulation, shall terminate any liability of the Company under this policy as to that claim.

## 7. OPTIONS TO PAY OR OTHERWISE SETTLE CLAIMS; TERMINATION OF LIABILITY

In case of a claim under this policy, the Company shall have the following additional options:

### (a) To Pay or Tender Payment of the Amount of Insurance.

To pay or tender payment of the Amount of Insurance under this policy together with any costs, attorneys' fees, and expenses incurred by the Insured Claimant that were authorized by the Company up to the time of payment or tender of payment and that the Company is obligated to pay.

Upon the exercise by the Company of this option, all liability and obligations of the Company to the Insured under this policy, other than to make the payment required in this subsection, shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation.

### (b) To Pay or Otherwise Settle With Parties Other Than the Insured or With the Insured Claimant.

(i) To pay or otherwise settle with other parties for or in the name of an Insured Claimant any claim insured against under this policy. In addition, the Company will pay any costs, attorneys' fees, and expenses incurred by the Insured Claimant that were authorized by the Company up to the time of payment and that the Company is obligated to pay;

(ii) To pay or otherwise settle with the Insured Claimant the loss or damage provided for under this policy, together with any costs, attorneys' fees, and expenses incurred by the Insured Claimant that were authorized by the Company up to the time of payment and that the Company is obligated to pay.

Upon the exercise by the Company of either of the options provided for in subsections (b)(i) or (ii), the Company's obligations to the Insured under this policy for the claimed loss or damage, other than the payments required to be made, shall terminate, including any liability or obligation to defend, prosecute, or continue any litigation.

## 8. DETERMINATION AND EXTENT OF LIABILITY

This policy is a contract of indemnity against actual monetary loss or damage sustained or incurred

by the Insured Claimant who has suffered loss or damage by reason of matters insured against by this policy.

(a) The extent of liability of the Company for loss or damage under this policy shall not exceed the lesser of

(i) the Amount of Insurance; or

(ii) the difference between the value of the Title as insured and the value of the Title subject to the risk insured against by this policy.

(b) If the Company pursues its rights under Section 5 of these Conditions and is unsuccessful in establishing the Title, as insured,

(i) the Amount of Insurance shall be increased by 10%, and

(ii) the Insured Claimant shall have the right to have the loss or damage determined either as of the date the claim was made by the Insured Claimant or as of the date it is settled and paid.

(c) In addition to the extent of liability under (a) and (b), the Company will also pay those costs, attorneys' fees, and expenses incurred in accordance with Sections 5 and 7 of these Conditions.

## 9. LIMITATION OF LIABILITY

(a) If the Company establishes the Title, or removes the alleged defect, lien or encumbrance, or cures the lack of a right of access to or from the Land, or cures the claim of Unmarketable Title, all as insured, in a reasonably diligent manner by any method, including litigation and the completion of any appeals, it shall have fully performed its obligations with respect to that matter and shall not be liable for any loss or damage caused to the Insured.

(b) In the event of any litigation, including litigation by the Company or with the Company's consent, the Company shall have no liability for loss or damage until there has been a final determination by a court of competent jurisdiction, and disposition of all appeals, adverse to the Title, as insured.

(c) The Company shall not be liable for loss or damage to the Insured for liability voluntarily assumed by the Insured in settling any claim or suit without the prior written consent of the Company.

## 10. REDUCTION OF INSURANCE; REDUCTION OR TERMINATION OF LIABILITY

All payments under this policy, except payments made for costs, attorneys' fees, and expenses, shall reduce the Amount of Insurance by the amount of the payment.

## 11. LIABILITY NONCUMULATIVE

The Amount of Insurance shall be reduced by any amount the Company pays under any policy insuring a Mortgage to which exception is taken in Schedule B or to which the Insured has agreed, assumed, or taken subject, or which is executed by an Insured after Date of Policy and which is a charge or lien on the Title, and the amount so paid shall be deemed a payment to the Insured under this policy.

## 12. PAYMENT OF LOSS

When liability and the extent of loss or damage have been definitely fixed in accordance with these Conditions, the payment shall be made within 30 days.

## 13. RIGHTS OF RECOVERY UPON PAYMENT OR SETTLEMENT

(a) Whenever the Company shall have settled and paid a claim under this policy, it shall be

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subrogated and entitled to the rights of the Insured Claimant in the Title and all other rights and remedies in respect to the claim that the Insured Claimant has against any person or property, to the extent of the amount of any loss, costs, attorneys' fees, and expenses paid by the Company. If requested by the Company, the Insured Claimant shall execute documents to evidence the transfer to the Company of these rights and remedies. The Insured Claimant shall permit the Company to sue, compromise, or settle in the name of the Insured Claimant and to use the name of the Insured Claimant in any transaction or litigation involving these rights and remedies.

If a payment on account of a claim does not fully cover the loss of the Insured Claimant, the Company shall defer the exercise of its right to recover until after the Insured Claimant shall have recovered its loss.

(b) The Company's right of subrogation includes the rights of the Insured to indemnities, guaranties, other policies of insurance, or bonds, notwithstanding any terms or conditions contained in those instruments that address subrogation rights.

#### 14. ARBITRATION

Either the Company or the Insured may demand that the claim or controversy shall be submitted to arbitration pursuant to the Title Insurance Arbitration Rules of the American Land Title Association ("Rules"). Except as provided in the Rules, there shall be no joinder or consolidation with claims or controversies of other persons. Arbitrable matters may include, but are not limited to, any controversy or claim between the Company and the Insured arising out of or relating to this policy, any service in connection with its issuance or the breach of a policy

provision, or to any other controversy or claim arising out of the transaction giving rise to this policy. All arbitrable matters when the Amount of Insurance is \$2,000,000 or less shall be arbitrated at the option of either the Company or the Insured. All arbitrable matters when the Amount of Insurance is in excess of \$2,000,000 shall be arbitrated only when agreed to by both the Company and the Insured. Arbitration pursuant to this policy and under the Rules shall be binding upon the parties. Judgment upon the award rendered by the Arbitrator(s) may be entered in any court of competent jurisdiction.

#### 15. LIABILITY LIMITED TO THIS POLICY; POLICY ENTIRE CONTRACT

(a) This policy together with all endorsements, if any, attached to it by the Company is the entire policy and contract between the Insured and the Company. In interpreting any provision of this policy, this policy shall be construed as a whole.

(b) Any claim of loss or damage that arises out of the status of the Title or by any action asserting such claim shall be restricted to this policy.

(c) Any amendment of or endorsement to this policy must be in writing and authenticated by an authorized person, or expressly incorporated by Schedule A of this policy.

(d) Each endorsement to this policy issued at any time is made a part of this policy and is subject to all of its terms and provisions. Except as the endorsement expressly states, it does not (i) modify any of the terms and provisions of the policy, (ii) modify any prior endorsement, (iii) extend the Date of Policy, or (iv) increase the Amount of Insurance.

#### 16. SEVERABILITY

In the event any provision of this policy, in whole or in part, is held invalid or unenforceable under applicable law, the policy shall be deemed not to include that provision or such part held to be invalid, but all other provisions shall remain in full force and effect.

#### 17. CHOICE OF LAW; FORUM

(a) Choice of Law: The Insured acknowledges the Company has underwritten the risks covered by this policy and determined the premium charged therefor in reliance upon the law affecting interests in real property and applicable to the interpretation, rights, remedies, or enforcement of policies of title insurance of the jurisdiction where the Land is located.

Therefore, the court or an arbitrator shall apply the law of the jurisdiction where the Land is located to determine the validity of claims against the Title that are adverse to the Insured and to interpret and enforce the terms of this policy. In neither case shall the court or arbitrator apply its conflicts of law principles to determine the applicable law.

(b) Choice of Forum: Any litigation or other proceeding brought by the Insured against the Company must be filed only in a state or federal court within the United States of America or its territories having appropriate jurisdiction.

#### 18. NOTICES, WHERE SENT

Any notice of claim and any other notice or statement in writing required to be given to the Company under this policy must be given to the Company at Fidelity National Title Insurance Company, Attn: Claims Department, Post Office Box 45023, Jacksonville, Florida 32232-5023.

## NOTICE CONCERNING FRAUDULENT INSURANCE ACTS

**(This Notice is Permanently Affixed Hereto)**

**It is unlawful to knowingly provide false, incomplete, or misleading facts or information to an insurance company for the purpose of defrauding or attempting to defraud the company. Penalties may include imprisonment, fines, denial of insurance, and civil damages. Any insurance company or agent of an insurance company who knowingly provides false, incomplete, or misleading facts or information to a policyholder or claimant for the purpose of defrauding or attempting to defraud the policyholder or claimant with regard to a settlement or award payable from insurance proceeds shall be reported to the Colorado Division of Insurance within the department of regulatory agencies.**

**C. R. S. A. § 10-1-128 (6)(a).**

## Fidelity National Title Insurance Company

### SCHEDULE A

Name and Address of Title Insurance Company: **Fidelity National Title Company**  
**4643 South Ulster Street, Suite 500**  
**Denver, CO 80237**

Policy No.: **CO-FSTG-IMP-27306-1-15-F0528473**

Order No.: **F0528473-158-CMN**

Address Reference: **0 Meller Street, Erie, CO 80516**

Amount of Insurance: **\$410,000.00**

Date of Policy: **November 2, 2015 at 6:00 PM**

1. Name of Insured:

[Heshmat Properties, LLC](#)

2. The estate or interest in the Land that is insured by this policy is:

**Fee Simple**

3. Title is vested in:

[Heshmat Properties, LLC](#)

4. The Land referred to in this policy is described as follows:

**See Exhibit A attached hereto and made a part hereof.**

**EXHIBIT A**  
**LEGAL DESCRIPTION**

**THE LAND REFERRED TO IN THIS POLICY IS DESCRIBED AS FOLLOWS:**

**Tract B,  
Canyon Creek Subdivision Filing No. 5,  
County of Boulder,  
State of Colorado.**

**SCHEDULE B**  
**EXCEPTIONS FROM COVERAGE**

This policy does not insure against loss or damage, and the Company will not pay costs, attorneys' fees, or expenses that arise by reason of:

1. Water rights, claims of title to water, whether or not shown by the Public Records.
2. All taxes and assessments for the year 2015 and subsequent years, a lien but not yet due or payable.
3. The right of proprietor of a vein or lode to extract or remove his ore should the same be found to penetrate or intersect the premises thereby granted as reserved in United States patent recorded September 7, 1874 in [Book 31 at Page 52](#); and any and all assignments thereof or interest therein.
4. Any and all interest in all coal, oil, gas and other minerals as reserved by Carl A. Miller, Fern Miller Wikstrand and Helen Miller in the Warranty Deed recorded June 2, 1958 in [Book 1076 at Page 265](#), and any and all assignments thereof or interests therein. Waiver of Surface Rights recorded November 16, 2001 at [Reception No. 2220515](#).
5. Any and all interest in all coal, oil, gas and other minerals as reserved by James S. Haley, Trustee in the Warranty Deed recorded December 30, 1969 at [Reception No. 932667](#), and any and all assignments thereof or interests therein.
6. Oil and Gas Leases to J. Michael McGhee, as Lessee recorded September 30, 1981 at [Reception No. 466151](#) and [Reception No. 466152](#), and [Reception No. 466153](#) and [Reception No. 466154](#), and any and all assignments thereof or interests therein. Production Affidavit recorded December 12, 1985 at [Reception No. 730940](#) given in connection with the above Oil and Gas Leases.
7. Right-of-Way for a pipe line and incidental purposes granted to Panhandle Eastern Pipeline Company by the instrument recorded October 30, 1981 at [Reception No. 470726](#) insofar as the same may affect subject property. The exact location of said easement was not defined or specified therein.
8. Terms, conditions, provisions, agreements and obligations contained in Ordinance No. 733 of the Town of Erie, Colorado recorded April 26, 2001 at [Reception No. 2142188](#) and in Canyon Creek PD Development Plan an Amendment of the Homestake PUD recorded July 9, 2001 at [Reception No. 2171024](#).
9. Terms, conditions, provisions, agreements and obligations contained in Ordinance No. 740 of the Town of Erie, Colorado recorded May 29, 2001 at [Reception No. 2154224](#), in Ordinance No. 753 of the Town of Erie, Colorado recorded August 29, 2001 at [Reception No. 2190499](#) and in Ordinance No. 762 of the Town of Erie, Colorado recorded November 15, 2001 at [Reception No. 2219656](#).
10. Terms, conditions, provisions, agreements and obligations contained in the Canyon Creek Filing No. 5 Development Agreement recorded October 19, 2001 at [Reception No. 2209649](#) and in First Amendment with respect thereto recorded February 28, 2002 at [Reception No. 2259497](#)

27306B (6/06)

ALTA Owner's Policy (6/17/06)

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**SCHEDULE B**  
**(Continued)**

- 11. Covenants, conditions and restrictions but omitting any covenants or restrictions, if any, including but not limited to those based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, source of income, gender, gender identity, gender expression, medical condition or genetic information, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth in the document, and any and all amendments and supplements thereto

Recording Date: July 26, 2001  
 Recording No: [Reception No. 2177513](#)

- 12. All reservations, notes and exceptions as shown on Special Warranty Deed recorded November 16, 2011 at [Reception No. 2220516](#).

- 13. Terms, conditions, provisions, agreements and obligations contained in the Use Agreement as set forth below:

Recording Date: November 16, 2001  
 Recording No.: [Reception No. 2220517](#)

- 14. The effect of the Map for Canyon Creek PD Amendment No. 3 recorded February 13, 2008 at [Reception No. 2909751](#).

- 15. An oil and gas lease for the term therein provided with certain covenants, conditions and provisions, together with easements, if any, as set forth therein, and any and all assignments thereof or interests therein.

Recording Date: July 2, 2008  
 Recording No: [Reception No. 2941007](#)

- 16. The effect of the Map for Canyon Creek PD Amendment No. 6 recorded October 11, 2012 at [Reception No. 3258805](#).

- 17. The effect of the Map for Canyon Creek PD Amendment No. 7 recorded July 23, 2015 at [Reception No. 3461707](#).



**SCHEDULE B**  
**(Continued)**

18. Terms, conditions, restrictions, provisions, notes and easements but omitting any covenants or restrictions, if any, including but not limited to those based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, or source of income, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth on the Plat(s) of said subdivision set forth below:  
Recording Date: October 19, 2001  
Recording No: Plat [Book R552 at Page 44](#)