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**Mayor's Office : Council Agenda Item Request Form**  
*This form and supporting documents (if applicable) are due the Wednesday  
before the COW meeting by noon.*

<b>Date Received</b> (office use)	
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<b>Date of Request</b>	09/13/2017
<b>Requesting Staff Member</b>	Tamaran Woodland
<b>Requested Council Date</b>	09/19/2017
<b>Topic/Discussion Title</b>	A Resolution of the Salt Lake County Council Approving Execution of an Interlocal Cooperation Agreement with Herriman City for the Improvements to Copper Creek Channel within Herriman Boundaries Project.
<b>Description</b>	Copper Creek Improvements Project. In December 2014, the County adopted a Copper Creek Drainage System Master Plan that included the work being done by this project. By partnering with the City, the County is saving money on a project that the County would have done in the future. City to contract with a qualified firm to complete the work and realign Copper Creek. City and County to coordinate during work. County to reimburse the City up to \$700,000.
<b>Requested Action<sup>1</sup></b>	Approval of Resolution
<b>Presenter(s)</b>	Tamaran Woodland
<b>Time Needed<sup>2</sup></b>	5 minutes
<b>Time Sensitive<sup>3</sup></b>	No
<b>Specific Time(s)<sup>4</sup></b>	N/A
<b>Contact Name &amp; Phone</b>	Tamaran Woodland, 385-468-6632
<b>Please attach the supporting documentation you plan to provide for the packets to this form. While not ideal, if supporting documents are not yet ready, you can still submit them by 10 am the Friday morning prior to the COW agenda. Items without documentation may be taken off for consideration at that COW meeting.</b>	

**Mayor or Designee approval:**



- <sup>1</sup> What you will ask the Council to do (e.g., discussion only, appropriate money, adopt policy/ordinance) – in specific terms.  
<sup>2</sup> Assumed to be 10 minutes unless otherwise specified.  
<sup>3</sup> Urgency that the topic to scheduled on the requested date.  
<sup>4</sup> If important to schedule at a specific time, list a few preferred times.

**CONTRACT COVER PAGE**

<b>Contract Number:</b> PP17120C <b>Version:</b> 1 <b>Desc:</b> FCE Copper Creek Improvements
<b>Supplier Name:</b> HERRIMAN CITY
<b>Comments:</b> FCE-Interlocal- City to make the Copper Creek Improvements according to Section 8 of Exhibit A. County to pay City \$700,000.00 upon completion of the improvements after the work has been inspected and approved. After the improvements, County will be responsible for all operation and maintenance and the County will be the owners. No term specified (put out 10 years).
<b>Contract Amount:</b> \$700,000.00
<b>Agency Name:</b> Flood Control Projects
<b>Period Performance from</b> 8/23/2017    to    8/22/2027
<b>Procurement Type:</b> EXI Exempt Interlocal <b>Reason Code:</b>
<b>Buyer:</b> KEldridge

RESOLUTION NO. \_\_\_\_\_, 2017

A RESOLUTION OF THE SALT LAKE COUNTY COUNCIL APPROVING  
EXECUTION OF AN INTERLOCAL COOPERATION AGREEMENT WITH  
HERRIMAN CITY FOR THE COPPER CREEK CHANNEL IMPROVEMENTS  
PROJECT.

W I T N E S S E T H

WHEREAS, the Parties are local governmental units and "public agencies" that are therefore authorized by the Utah Interlocal Cooperation Act, Section 11-13-101, *et seq.*, Utah Code Annotated (the "Interlocal Act"), to enter into agreements with each other for joint and cooperative action to make the most efficient use of their powers on a basis of mutual advantage; and

WHEREAS, the County through its Department of Public Works Flood Control and Engineering Division operates a Flood Control system in Salt Lake County ("County System"); and

WHEREAS, in December 2014, as part of the County System the County adopted a Copper Creek Drainage System Master Plan ("Copper Creek Plan"); and

WHEREAS, the Copper Creek Plan contemplated various improvements to the Copper Creek Channel ("Copper Creek Channel Improvements"); and

WHEREAS, the Copper Creek Plan estimates the cost of the Copper Creek Channel Improvements to be \$1,644,709; and

WHEREAS, Herriman City ("the City") desires to complete a portion of the Copper Creek Channel Improvements and the County desires to contribute funding, as set forth in the Agreement, to the City to make these Copper Creek Improvements; and

WHEREAS, it has been determined that the best interests of the County and the general public will be served by the execution of the attached Interlocal Cooperation Agreement and by participating as required therein.

R E S O L U T I O N

NOW, THEREFORE, IT IS HEREBY RESOLVED by the County Council of Salt Lake County that the attached Interlocal Cooperation Agreement is approved; and the Mayor is authorized to execute said agreement, a copy of which is attached as Exhibit 1 and by this reference made a part of this Resolution.

APPROVED and ADOPTED this \_\_\_\_ day of \_\_\_\_\_, 2017.

SALT LAKE COUNTY COUNCIL:

By: \_\_\_\_\_  
Steve DeBry, Chair

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

ATTEST:

\_\_\_\_\_  
Sherrie Swensen  
Salt Lake County Clerk

APPROVED AS TO FORM:

Angela Lane  
\_\_\_\_\_  
Angela Lane  
Deputy District Attorney

Date: 09/07/17

Council Member Bradley voting	_____
Council Member Bradshaw voting	_____
Council Member Burdick voting	_____
Council Member DeBry voting	_____
Council Member Granato voting	_____
Council Member Jensen voting	_____
Council Member Newton voting	_____
Council Member Snelgrove voting	_____
Council Member Wilson voting	_____

**EXHIBIT 1**  
**INTERLOCAL AGREEMENT**

INTERLOCAL COOPERATION AGREEMENT

Between

SALT LAKE COUNTY

And

HERRIMAN CITY

FOR IMPROVEMENTS TO COPPER CREEK CHANNEL WITHIN HERRIMAN  
BOUNDARIES

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THIS INTERLOCAL COOPERATION AGREEMENT ("Agreement") is made and entered into this \_\_\_ day of \_\_\_\_\_, 2017, between SALT LAKE COUNTY, a body corporate and politic of the State of Utah ("County"), and the HERRIMAN CITY, a municipal corporation of the State of Utah ("City"). The County and City are collectively referred to herein as the "Parties."

WITNESSETH:

WHEREAS, Utah Code Ann. § 11-13-101, et seq. (the "Interlocal Cooperation Act"), authorizes public agencies to enter into joint agreements with each other to do what each agency is authorized by law to perform; and

WHEREAS, the County through its Department of Public Works Flood Control and Engineering Division operates a Flood Control system in Salt Lake County ("County System");

WHEREAS, in December 2014, as part of the County System the County adopted a Copper Creek Drainage System Master Plan ("Copper Creek Plan");

WHEREAS, the Copper Creek Plan contemplated various improvements to the Copper Creek Channel ("Copper Creek Channel Improvements");

WHEREAS, the Copper Creek Plan estimates the cost of the Copper Creek Channel Improvements to be \$1,644,709;

WHEREAS, the City desires to complete a portion of the Copper Creek Channel Improvements and the County desires to provide funding to the City to make these Copper Creek Improvements;

WHEREAS, County and City desire to enter into this interlocal cooperation agreement to set forth the obligations and responsibilities of both parties in City's completion of these improvements.

AGREEMENT:

NOW, THEREFORE, the Parties mutually agree as follows:

1. Copper Creek Improvements Project. The City shall make the Copper Creek Improvements or cause the Copper Creek Improvement to be made as set forth in the Copper Creek Plan Section 8, attached hereto as Exhibit A of this Agreement and incorporated by reference, and as set forth in Salt Lake County Flood Control Permit No. 3326, attached hereto as Exhibit B and incorporated by reference.

2. County Payment. Upon substantial completion of the Copper Creek Improvements, County shall have an opportunity to inspect and approve the improvements. If upon this inspection the County discovers any defects, the County will notify the City. After County has inspected and approved the improvements, County shall send to City written notice of its completed inspection and approval, and County shall pay to the City Seven Hundred Thousand Dollars (\$700,000.00). Under no circumstances will County be obligated to provide more than Seven Hundred Thousand Dollars (\$700,000.00), regardless of actual cost.

3. Use of Flood Control Funds. City acknowledges that the funds are flood control funds that must be used for a valid flood control projects. The City hereby agrees to use these funds in the completion of Copper Creek Improvements as set forth in Exhibits A and B, which the County has approved as a valid flood control purpose. Any other use of these funds must first be submitted to County to determine if the project is a valid flood control project, and subsequently approved in writing. Funds not used for valid flood control projects will be not reimbursed by County.

3. Operation and Maintenance of Copper Creek Improvements. After acceptance of the Copper Creek Improvements, the County shall be responsible for all operation and maintenance costs related to the Copper Creek Improvements as set forth in Exhibit B.

4. Ownership. Upon County's payment under Paragraph 2 to the City, the City shall convey to the County the Copper Creek Improvements and associated real property including a 20 foot access road adjacent to the channel as set forth in Exhibit B.

5. Miscellaneous Provisions. The following provisions are also an integral part of this Agreement:

A. Binding Agreement. This Agreement shall be binding upon and shall inure to the benefit of the successors and assigns of the respective parties hereto.

B. Captions. The headings used in this Agreement are inserted for reference purposes only and shall not be deemed to define, limit, extend, describe, or affect in any way the meaning, scope or interpretation of any of the terms or provisions of this Agreement or the intent thereof.

C. Counterparts. This Agreement may be signed in any number of counterparts with the same effect as if the signatures upon any counterpart were upon the same instrument. All signed counterparts shall be deemed to be one original.

D. Liability and Indemnification. The Parties are both governmental entities under the "Utah Governmental Immunity Act" (Utah Code Ann. § 63-30-1, et seq.) (the "Act"). Consistent with the terms of the Act, and as provided herein, it is mutually agreed that each party is responsible and liable for its own wrongful or negligent acts which are committed by it or by its agents, officials, or employees. Neither party waives any defenses otherwise available under the Act nor does any party waive any limits of liability currently provided by the Act.

City shall defend, indemnify, save and hold harmless County, including its elected and appointed officers, and employees, from and against any and all demands, liabilities, claims, damages, actions, and/or proceedings, in law or equity, including reasonable attorney's fees and costs of suit, relating to or arising from the planning, installation, and construction of the Copper Creek Improvements, except where such demands, claims, actions or proceedings result from the negligence or misconduct of County, its elected or appointed officers or employees.

E. Severability. The provisions of this Agreement are severable, and should any provision hereof be void, voidable, unenforceable or invalid, such void, voidable, unenforceable or invalid provision shall not affect the other provisions of this Agreement.

F. Waiver of Breach. Any waiver by either party of any breach of any kind or character whatsoever by the other, whether such be direct or implied, shall not be construed as a continuing waiver of, or consent to any subsequent breach of this Agreement.

G. Amendment. This Agreement may not be modified except by an instrument in writing signed by the parties hereto.

H. Interpretation. This Agreement shall be interpreted, construed and enforced according to the substantive laws of the state of Utah. This Agreement is the result of arms-length negotiations between the parties, and both City and County have had substantive input regarding the various provisions of this Agreement. Accordingly, each of the parties affirms its desire that this Agreement be interpreted in an absolutely neutral fashion with no regard to any rule of interpretation (or the like) requiring that the provisions of this Agreement be construed to favor one party (such as, for example, the party that did not draft this Agreement) over the other.

I. Notice. Any notice required or permitted to be given hereunder shall be deemed sufficient if given by an communication in writing and shall be deemed to have been received (a) upon personal delivery or actual receipt thereof, or (b) within two days after such notice is deposited in the United States Mail, postage prepaid, and certified and addressed to the Parties as set forth below:



County: Salt Lake County Flood Control Division Director  
2001 South State Street N3-120  
Salt Lake City, UT 84190

City: Herriman City  
13011 South Pioneer Street  
Herriman, UT 84096

Copy to: John Brems  
2798 West Matterhorn Drive  
Taylorsville, UT 84129

J. Time of Essence. Time is the essence of this Agreement.

K. Delegation. Neither party may assign its rights or delegate its duties under this Agreement to any other person(s) or entity(ies) without written consent of the other party.

L. Survival. All of the parties' respective representations, covenants and warranties and obligations (including, without limitation, any obligation to indemnify) set forth herein shall survive the Closing and the delivery of any deeds, bills of sale or the like contemplated herein.

M. Exhibits and Recitals. The recitals set forth above and all exhibits to this Agreement are incorporated herein to the same extent as if such items were set forth herein in their entirety within the body of this Agreement.

N. Interlocal Cooperation Act. In satisfaction of the requirements of the Interlocal Act, and in connection with this Agreement, the Parties agree as follows:

- (a) This Agreement shall be approved by each Party pursuant to Section 11-13-202.5 of the Interlocal Act;
- (b) This Agreement shall be reviewed as to proper form and compliance with applicable law by a duly authorized attorney on behalf of each Party, pursuant to Section 11-13-202.5 of the Interlocal Act;
- (c) A duly executed original counterpart of this Agreement shall be filed with keeper of records of each Party, pursuant to Section 11-13-209 of the Interlocal Act;
- (d) Except as otherwise specifically provided herein, each Party shall be responsible for its own costs of any action taken pursuant to this Agreement, and for any financing of such costs; and
- (e) No separate legal entity is created by the terms of this Agreement. To the extent that this Agreement requires administration other than as set forth herein, it shall be administered by a joint board of the public works directors of the City and the County, or their designees. No real or personal property shall be acquired jointly by the Parties as a result of this Agreement. To the extent that a Party acquires, holds or disposes of any real or personal property for use in the joint or cooperative undertaking contemplated by

this Agreement, such Party shall do so in the same manner that it deals with other property of such Party.

O. Protection of the Scrivener. No provision of this Agreement, nor any ambiguities that may be contained within this Agreement, shall be construed against any party on the grounds such Party or Party's counsel drafted the provision at issue or that the provision at issue contains a covert, representation or warranty of such Party.

[Signature Page to Follow]

IN WITNESS WHEREOF, the City, by resolution duly adopted by its council, a copy of which is attached hereto, caused this Agreement to be signed by its City Manager and attested by its Recorder; and the County, by resolution of its council, a copy of which is attached hereto, caused this Agreement to be signed by the Mayor, or his designee on the date first stated above.

SALT LAKE COUNTY

By: \_\_\_\_\_  
Mayor or Designee

Administrative Approval

By: Kade Moncur Digitally signed by Kade Moncur  
Date: 2017.08.18 08:49:29 -06'00'  
Kade Moncur,  
Division Director

Approved as to Form

By: Angela Lane  
Angela Lane,  
Deputy District Attorney

Date: 07/06/17

HERRIMAN CITY

Brett Wood  
Brett Wood, City Manager

Attest:

Jackie Nostrom  
Jackie Nostrom, City Recorder



Approved as to Form

By: [Signature]  
Herriman City Attorney



all Lake County - Copper Creek - Basin 6

Reach 1 - Shallow Flow Segment				Reach 2 - Shallow Concentrated Flow Segment				Reach 3 - Open Channel Flow Segment				Reach 4 - Open Channel Flow Segment			
Length	L = 100 ft			Length	L = 495 ft			Length	L = 1,644 ft			Length	L = 2,982 ft		
Reach Start Elevation	Elev= 5,485.0 ft			Reach Start Elevation	Elev= 5,480.0 ft			Reach Start Elevation	Elev= 5,445.0 ft			Reach Start Elevation	Elev= 5,358.0 ft		
Reach End Elevation	Elev= 5,480.0 ft			Reach End Elevation	Elev= 5,445.0 ft			Reach End Elevation	Elev= 5,445.0 ft			Reach End Elevation	Elev= 5,358.0 ft		
Average Slope	S <sub>a</sub> = 0.0501 ft/ft			Average Slope	S <sub>a</sub> = 0.0706 ft/ft			Average Slope	S <sub>a</sub> = 0.0529 ft/ft			Average Slope	S <sub>a</sub> = 0.0389 ft/ft		
Manning's roughness	n = 0.240			Paved or unpaved?	UNPAVED			Manning's roughness	n = 0.045			Manning's roughness	n = 0.045		
24-hr rainfall depth	p = 1.370 in.			Manning's Coefficient	16.1345			Channel side slope (z:1 => H:V)	z = 6			Channel side slope (z:1 => H:V)	z = 7		
Travel Time	t <sub>L</sub> = 15.07 min.			Average velocity	v = 4.29 ft/s			Channel base width	b = 0 ft			Channel base width	b = 0 ft		
				Travel Time	t <sub>L</sub> = 1.93 min.			Channel depth	y = 1.00 ft			Channel depth	y = 1.50 ft		

$$t_r = 60 \left( \frac{0.007 (nL)^{0.84}}{(P)^{0.5} S^{0.64}} \right)$$

$$t_r = \left( \frac{L}{3600 v_r} \right) 60$$

where,

v<sub>r</sub> = (20.3282/S)<sup>0.5</sup> for paved surfaces, or,

v<sub>r</sub> = (16.1345/S)<sup>0.5</sup> for unpaved surfaces

$$t_r = \left( \frac{L}{3600 v_r} \right) 60$$

Reach 5 - Open Channel Flow Segment				Reach 6 - Open Channel Flow Segment				Reach 7 - Open Channel Flow Segment				Reach 8 - Open Channel Flow Segment			
Length	L = 2,874 ft			Length	L = 2,894 ft			Length	L = 1,696 ft			Length	L = 2,356 ft		
Reach Start Elevation	Elev= 5,242.0 ft			Reach Start Elevation	Elev= 5,142.0 ft			Reach Start Elevation	Elev= 5,089.0 ft			Reach Start Elevation	Elev= 5,029.0 ft		
Reach End Elevation	Elev= 5,142.0 ft			Reach End Elevation	Elev= 5,069.0 ft			Reach End Elevation	Elev= 5,029.0 ft			Reach End Elevation	Elev= 4,975.0 ft		
Average Slope	S <sub>a</sub> = 0.0348 ft/ft			Average Slope	S <sub>a</sub> = 0.0252 ft/ft			Average Slope	S <sub>a</sub> = 0.0236 ft/ft			Average Slope	S <sub>a</sub> = 0.0225 ft/ft		
Manning's roughness	n = 0.045			Manning's roughness	n = 0.045			Manning's roughness	n = 0.045			Manning's roughness	n = 0.045		
Channel side slope (z:1 => H:V)	z = 5			Channel side slope (z:1 => H:V)	z = 5			Channel side slope (z:1 => H:V)	z = 20			Channel side slope (z:1 => H:V)	z = 3		
Channel base width	b = 0 ft			Channel base width	b = 0 ft			Channel base width	b = 0 ft			Channel base width	b = 0 ft		
Channel depth	y = 2.00 ft			Channel depth	y = 2.50 ft			Channel depth	y = 1.50 ft			Channel depth	y = 3.00 ft		
Cross-sectional area	A = 20.00 ft <sup>2</sup>			Cross-sectional area	A = 31.25 ft <sup>2</sup>			Cross-sectional area	A = 45.00 ft <sup>2</sup>			Cross-sectional area	A = 27.00 ft <sup>2</sup>		
Wetted Perimeter	P <sub>w</sub> = 20.40 ft			Wetted Perimeter	P <sub>w</sub> = 25.50 ft			Wetted Perimeter	P <sub>w</sub> = 60.07 ft			Wetted Perimeter	P <sub>w</sub> = 18.97 ft		
Hydraulic radius	R <sub>h</sub> = 0.98 ft			Hydraulic radius	R <sub>h</sub> = 1.23 ft			Hydraulic radius	R <sub>h</sub> = 0.75 ft			Hydraulic radius	R <sub>h</sub> = 1.42 ft		
Velocity	v = 6.08 ft/s			Velocity	v = 6.01 ft/s			Velocity	v = 4.78 ft/s			Velocity	v = 6.27 ft/s		
Travel Time	t <sub>L</sub> = 7.88 min.			Travel Time	t <sub>L</sub> = 8.03 min.			Travel Time	t <sub>L</sub> = 6.76 min.			Travel Time	t <sub>L</sub> = 6.26 min.		

$$= \left( \frac{L}{3600 v_r} \right) 60$$

$$t_r = \left( \frac{L}{3600 v_r} \right) 60$$

$$t_r = \left( \frac{L}{3600 v_r} \right) 60$$

$$t_r = \left( \frac{L}{3600 v_r} \right) 60$$

Time of Concentration = 61 minutes

1.017 hours

ag time (0.6tc)

37

Salt Lake County - Copper Creek - Basin 6A

Reach 1 - Shof Flow Segment				Reach 2 - Shallow Concentrated Flow Segment				Reach 3 - Open Channel Flow Segment				Reach 4 - Open Channel Flow Segment			
Length	L = 100 ft	Reach Start Elevation	Elev = 5,494.0 ft	Length	L = 1,800 ft	Reach Start Elevation	Elev = 5,490.0 ft	Length	L = 3,950 ft	Reach Start Elevation	Elev = 5,400.0 ft	Length	L = 2,432 ft	Reach Start Elevation	Elev = 5,234.0 ft
Reach End Elevation	Elev = 5,490.0 ft	Reach End Elevation	Elev = 5,490.0 ft	Reach End Elevation	Elev = 5,400.0 ft	Reach End Elevation	Elev = 5,234.0 ft	Reach End Elevation	Elev = 5,234.0 ft	Reach End Elevation	Elev = 5,032.0 ft	Reach End Elevation	Elev = 5,032.0 ft	Reach End Elevation	Elev = 5,032.0 ft
Average slope	S <sub>a</sub> = 0.0401 ft/ft	Average Slope	S <sub>a</sub> = 0.0563 ft/ft	Average Slope	S <sub>a</sub> = 0.0563 ft/ft	Average Slope	S <sub>a</sub> = 0.0563 ft/ft	Average Slope	S <sub>a</sub> = 0.0420 ft/ft	Average Slope	S <sub>a</sub> = 0.0420 ft/ft	Average Slope	S <sub>a</sub> = 0.0831 ft/ft	Average Slope	S <sub>a</sub> = 0.0831 ft/ft
Manning's roughness	n = 0.240	Manning's Coefficient	n = 0.240	Manning's Coefficient	n = 0.240	Manning's Coefficient	n = 0.240	Manning's roughness	n = 0.045	Manning's roughness	n = 0.045	Manning's roughness	n = 0.045	Manning's roughness	n = 0.045
2-yr. 24-hr rainfall depth	p = 1.370 in.	Paved or unpaved?	UNPAVED	Paved or unpaved?	UNPAVED	Paved or unpaved?	UNPAVED	Channel side slope (z:1 => H:V)	z = 6	Channel side slope (z:1 => H:V)	z = 6	Channel side slope (z:1 => H:V)	z = 2	Channel side slope (z:1 => H:V)	z = 2
Travel Time	t <sub>t</sub> = 16.48 min.	Average velocity	v = 3.83 ft/s	Average velocity	v = 3.83 ft/s	Average velocity	v = 3.83 ft/s	Channel base width	b = 0 ft	Channel base width	b = 0 ft	Channel base width	b = 10 ft	Channel base width	b = 10 ft
								Channel depth	y = 1.00 ft	Channel depth	y = 1.00 ft	Channel depth	y = 1.50 ft	Channel depth	y = 1.50 ft
								Cross-sectional area	A = 6.00 ft <sup>2</sup>	Cross-sectional area	A = 6.00 ft <sup>2</sup>	Cross-sectional area	A = 19.50 ft <sup>2</sup>	Cross-sectional area	A = 19.50 ft <sup>2</sup>
								Wetted Perimeter	P <sub>w</sub> = 12.17 ft	Wetted Perimeter	P <sub>w</sub> = 12.17 ft	Wetted Perimeter	P <sub>w</sub> = 16.71 ft	Wetted Perimeter	P <sub>w</sub> = 16.71 ft
								Hydraulic radius	R <sub>h</sub> = 0.49 ft	Hydraulic radius	R <sub>h</sub> = 0.49 ft	Hydraulic radius	R <sub>h</sub> = 1.17 ft	Hydraulic radius	R <sub>h</sub> = 1.17 ft
								Velocity	v = 4.23 ft/s	Velocity	v = 4.23 ft/s	Velocity	v = 10.55 ft/s	Velocity	v = 10.55 ft/s
								Travel Time	t <sub>t</sub> = 15.58 min.	Travel Time	t <sub>t</sub> = 15.58 min.	Travel Time	t <sub>t</sub> = 3.84 min.	Travel Time	t <sub>t</sub> = 3.84 min.

$$t_t = 60 \left( \frac{0.007 (nL)^{0.5}}{(P)^{0.5} S^{0.4}} \right)$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

where,

v<sub>t</sub> = (20.3282/S)<sup>0.5</sup> for paved surfaces, or,

v<sub>t</sub> = (16.1345/S)<sup>0.5</sup> for unpaved surfaces

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

Time of Concentration = 43 minutes

0.714 hours

26

Lag time (0.6tc)

Salt Lake County - Copper Creek - Basin 6B

Reach 1 - Sheet Flow Segment									
Length	L = 100 ft								
Reach Start Elevation	Elev = 5,485.0 ft								
Reach End Elevation	Elev = 5,480.0 ft								
Average Slope	S <sub>a</sub> = 0.0501 ft/ft								
Manning's roughness	n = 0.240								
2-yr, 24-hr rainfall depth	P = 1.370 in.								
Travel Time	t <sub>t</sub> = 15.07 min.								
Reach 2 - Shallow Concentrated Flow Segment									
Length	L = 495 ft								
Reach Start Elevation	Elev = 5,480.0 ft								
Reach End Elevation	Elev = 5,445.0 ft								
Average Slope	S <sub>a</sub> = 0.0706 ft/ft								
Paved or unpaved?	UNPAVED								
Manning's Coefficient	n = 0.045								
Average velocity	v = 4.29 ft/s								
Travel Time	t <sub>t</sub> = 1.93 min.								
Reach 3 - Open Channel Flow Segment									
Length	L = 1,644 ft								
Reach Start Elevation	Elev = 5,445.0 ft								
Reach End Elevation	Elev = 5,358.0 ft								
Average Slope	S <sub>a</sub> = 0.0529 ft/ft								
Manning's roughness	n = 0.045								
Channel side slope (z:1 => H:V)	z = 6								
Channel base width	b = 0 ft								
Channel depth	y = 1.00 ft								
Cross-sectional area	A = 6.00 ft <sup>2</sup>								
Wetted Perimeter	P <sub>w</sub> = 12.17 ft								
Hydraulic radius	R <sub>h</sub> = 0.49 ft								
Velocity	v = 4.74 ft/s								
Travel Time	t <sub>t</sub> = 5.78 min.								
Reach 4 - Open Channel Flow Segment									
Length	L = 1,644 ft								
Reach Start Elevation	Elev = 5,445.0 ft								
Reach End Elevation	Elev = 5,358.0 ft								
Average Slope	S <sub>a</sub> = 0.0529 ft/ft								
Manning's roughness	n = 0.045								
Channel side slope (z:1 => H:V)	z = 6								
Channel base width	b = 0 ft								
Channel depth	y = 1.00 ft								
Cross-sectional area	A = 6.00 ft <sup>2</sup>								
Wetted Perimeter	P <sub>w</sub> = 12.17 ft								
Hydraulic radius	R <sub>h</sub> = 0.49 ft								
Velocity	v = 4.74 ft/s								
Travel Time	t <sub>t</sub> = 5.78 min.								

$$t_t = 60 \left( \frac{0.007 (nL)^{0.85}}{(P)^{0.5} S_a^{0.85}} \right)$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

where,

v<sub>t</sub> = (20.3282)S<sub>a</sub><sup>0.5</sup> for paved surfaces, or,

v<sub>t</sub> = (16.1345)S<sub>a</sub><sup>0.5</sup> for unpaved surfaces

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

Reach 5 - Open Channel Flow Segment									
Length	L = 2,874 ft								
Reach Start Elevation	Elev = 5,242.0 ft								
Reach End Elevation	Elev = 5,142.0 ft								
Average Slope	S <sub>a</sub> = 0.0348 ft/ft								
Manning's roughness	n = 0.045								
Channel side slope (z:1 => H:V)	z = 5								
Channel base width	b = 0 ft								
Channel depth	y = 2.00 ft								
Cross-sectional area	A = 20.00 ft <sup>2</sup>								
Wetted Perimeter	P <sub>w</sub> = 20.40 ft								
Hydraulic radius	R <sub>h</sub> = 0.98 ft								
Velocity	v = 6.08 ft/s								
Travel Time	t <sub>t</sub> = 7.68 min.								
Reach 6 - Open Channel Flow Segment									
Length	L = 2,894 ft								
Reach Start Elevation	Elev = 5,142.0 ft								
Reach End Elevation	Elev = 5,069.0 ft								
Average Slope	S <sub>a</sub> = 0.0252 ft/ft								
Manning's roughness	n = 0.045								
Channel side slope (z:1 => H:V)	z = 5								
Channel base width	b = 0 ft								
Channel depth	y = 2.50 ft								
Cross-sectional area	A = 31.25 ft <sup>2</sup>								
Wetted Perimeter	P <sub>w</sub> = 25.50 ft								
Hydraulic radius	R <sub>h</sub> = 1.23 ft								
Velocity	v = 6.01 ft/s								
Travel Time	t <sub>t</sub> = 8.03 min.								
Reach 7 - Open Channel Flow Segment									
Length	L = 939 ft								
Reach Start Elevation	Elev = 5,069.0 ft								
Reach End Elevation	Elev = 5,050.0 ft								
Average Slope	S <sub>a</sub> = 0.0202 ft/ft								
Manning's roughness	n = 0.045								
Channel side slope (z:1 => H:V)	z = 20								
Channel base width	b = 0 ft								
Channel depth	y = 1.50 ft								
Cross-sectional area	A = 45.00 ft <sup>2</sup>								
Wetted Perimeter	P <sub>w</sub> = 60.07 ft								
Hydraulic radius	R <sub>h</sub> = 0.75 ft								
Velocity	v = 3.87 ft/s								
Travel Time	t <sub>t</sub> = 4.04 min.								
Reach 8 - Open Channel Flow Segment									
Length	L = 912 ft								
Reach Start Elevation	Elev = 5,050.0 ft								
Reach End Elevation	Elev = 5,030.0 ft								
Average Slope	S <sub>a</sub> = 0.0219 ft/ft								
Manning's roughness	n = 0.045								
Channel side slope (z:1 => H:V)	z = 2								
Channel base width	b = 10 ft								
Channel depth	y = 3.00 ft								
Cross-sectional area	A = 48.00 ft <sup>2</sup>								
Wetted Perimeter	P <sub>w</sub> = 23.42 ft								
Hydraulic radius	R <sub>h</sub> = 2.05 ft								
Velocity	v = 7.89 ft/s								
Travel Time	t <sub>t</sub> = 1.93 min.								

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

Time of Concentration = 54 minutes

0.899 hours

32

Lag time (0.6tc)

12/13/2014

TR55\_Easting\_Tc\_modified.xls

Salt Lake County - Copper Creek - Basin 6C

Reach 1 - Street Flow Segment				Reach 2 - Shallow Concentrated Flow Segment				Reach 3 - Open Channel Flow Segment			
Length	L = 100 ft			Length	L = 4,626 ft			Length	L = 610 ft		
Reach Start Elevation	Elev= 5,112.0 ft			Reach Start Elevation	Elev= 5,108.0 ft			Reach Start Elevation	Elev= 5,004.0 ft		
Reach End Elevation	Elev= 5,108.0 ft			Reach End Elevation	Elev= 5,004.0 ft			Reach End Elevation	Elev= 4,991.0 ft		
Average slope	S <sub>o</sub> = 0.0401 ft/ft			Average Slope	S <sub>o</sub> = 0.0225 ft/ft			Average Slope	S <sub>o</sub> = 0.0213 ft/ft		
Manning's roughness	n = 0.240			Paved or unpaved?	UNPAVED			Manning's roughness	n = 0.045		
2-yr, 24-hr rainfall depth	P = 1.370 in.			Manning's Coefficient	16.1345			Channel side slope (z:1 => H:V)	z = 2		
Travel Time	t <sub>1</sub> = 16.48 min.			Average velocity	v = 2.42 ft/s			Channel base width	b = 10 ft		
				Travel Time	t <sub>1</sub> = 31.87 min.			Channel depth	y = 3.00 ft		
								Cross-sectional area	A = 48.00 ft <sup>2</sup>		
								Wetted Perimeter	P <sub>w</sub> = 23.42 ft		
								Hydraulic radius	R <sub>h</sub> = 2.05 ft		
								Velocity	v = 7.78 ft/s		
								Travel Time	t <sub>1</sub> = 1.31 min.		

$$t_r = 60 \left( \frac{0.007 (nL)^{0.8}}{(P)^{0.5} S^{0.4}} \right)$$

$$t_r = \left( \frac{L}{(3600 v_r)} \right) 60$$

where,

$v_r = (20.3282)S^{0.5}$  for paved surfaces, or,

$v_r = (16.1345)S^{0.5}$  for unpaved surfaces

$$t_r = \left( \frac{L}{(3600 v_r)} \right) 60$$

Time of Concentration = 50 minutes

0.828 hours

30

Lag time (0.6tc)



Salt Lake County - Copper Creek - Basin 6D

Reach 1 - Sheet Flow Segment					Reach 2 - Shallow Concentrated Flow Segment					Reach 3 - Open Channel Flow Segment				
Length	L =	100	ft		Length	L =	2,886	ft		Length	L =	588	ft	
Reach Start Elevation	Elev=	5,058.0	ft		Reach Start Elevation	Elev=	5,055.0	ft		Reach Start Elevation	Elev=	4,978.0	ft	
Reach End Elevation	Elev=	5,055.0	ft		Reach End Elevation	Elev=	4,978.0	ft		Reach End Elevation	Elev=	4,976.0	ft	
Average slope	S <sub>o</sub> =	0.0301	ft/ft		Average Slope	S <sub>o</sub> =	0.0267	ft/ft		Average Slope	S <sub>o</sub> =	0.0034	ft/ft	
Manning's roughness	n =	0.240			Paved or unpaved?	UNPAVED				Manning's roughness	n =	0.045		
2-yr. 24-hr rainfall depth	P =	1.370	in.		Manning's Coefficient	16.1345				Channel side slope (z:1 => H:V)	z =	5		
Travel Time	t <sub>t</sub> =	18.49	min.		Average velocity	v =	2.64	ft/s		Channel base width	b =	10	ft	
					Travel Time	t <sub>t</sub> =	18.25	min.		Channel depth	y =	2.00	ft	

$$t_t = 60 \left( \frac{0.007 (nL)^{0.8}}{(P)^{0.5} S^{0.4}} \right)$$

$$t_t = \left( \frac{L}{(3600 v_x)} \right) 60$$

where,

$v_x = (20.3282) S^{0.5}$  for paved surfaces, or,

$v_x = (16.1345) S^{0.5}$  for unpaved surfaces

$$t_t = \left( \frac{L}{(3600 v_x)} \right) 60$$

Time of Concentration =	41	minutes
	0.683	hours
Lag time (0.6tc)	25	

Salt Lake County - Copper Creek - Basin 7

Reach 1 - Sheet Flow Segment				Reach 2 - Shallow Concentrated Flow Segment				Reach 3 - Open Channel Flow Segment				Reach 4 - Open Channel Flow Segment			
Length	L = 92 ft			Length	L = 453 ft			Length	L = 3,592 ft			Length	L = 1,066 ft		
Reach Start Elevation	Elev = 5,004.0 ft			Reach Start Elevation	Elev = 5,002.0 ft			Reach Start Elevation	Elev = 4,992.0 ft			Reach Start Elevation	Elev = 4,915.0 ft		
Reach End Elevation	Elev = 5,002.0 ft			Reach End Elevation	Elev = 4,992.0 ft			Reach End Elevation	Elev = 4,915.0 ft			Reach End Elevation	Elev = 4,912.0 ft		
Average Slope	S <sub>o</sub> = 0.0218 ft/ft			Average Slope	S <sub>o</sub> = 0.0221 ft/ft			Average Slope	S <sub>o</sub> = 0.0214 ft/ft			Average Slope	S <sub>o</sub> = 0.0028 ft/ft		
Manning's roughness	n = 0.240			Paved or unpaved?	UNPAVED			Manning's roughness	n = 0.045			Manning's roughness	n = 0.045		
2-yr. 24-hr rainfall depth	P = 1.370 in.			Manning's Coefficient	16.1345			Channel side slope (z:1 => H:V)	z = 50			Channel side slope (z:1 => H:V)	z = 6		
Travel Time	t <sub>t</sub> = 19.70 min.			Average velocity	v = 2.40 ft/s			Channel base width	b = 0 ft			Channel base width	b = 0 ft		
				Travel Time	t <sub>t</sub> = 3.15 min.			Channel depth	y = 1.00 ft			Channel depth	y = 1.00 ft		
								Cross-sectional area	A = 49.74 ft <sup>2</sup>			Cross-sectional area	A = 5.97 ft <sup>2</sup>		
								Wetted Perimeter	P <sub>w</sub> = 99.76 ft			Wetted Perimeter	P <sub>w</sub> = 12.13 ft		
								Hydraulic radius	R <sub>h</sub> = 0.50 ft			Hydraulic radius	R <sub>h</sub> = 0.49 ft		
								Velocity	v = 3.04 ft/s			Velocity	v = 1.09 ft/s		
								Travel Time	t <sub>t</sub> = 19.70 min.			Travel Time	t <sub>t</sub> = 16.28 min.		

$$t_t = 60 \left( \frac{0.007 (nL)^{1.49}}{(V^{0.58} S^{0.48})} \right)$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

where,

v<sub>t</sub> = (20.3282) S<sub>o</sub><sup>0.5</sup> for paved surfaces, or,

v<sub>t</sub> = (16.1345) S<sub>o</sub><sup>0.5</sup> for unpaved surfaces

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

$$t_t = \left( \frac{L}{(3600 v_t)} \right) 60$$

Time of Concentration = 59 minutes

0.980 hours

Lag time (0.6tc)

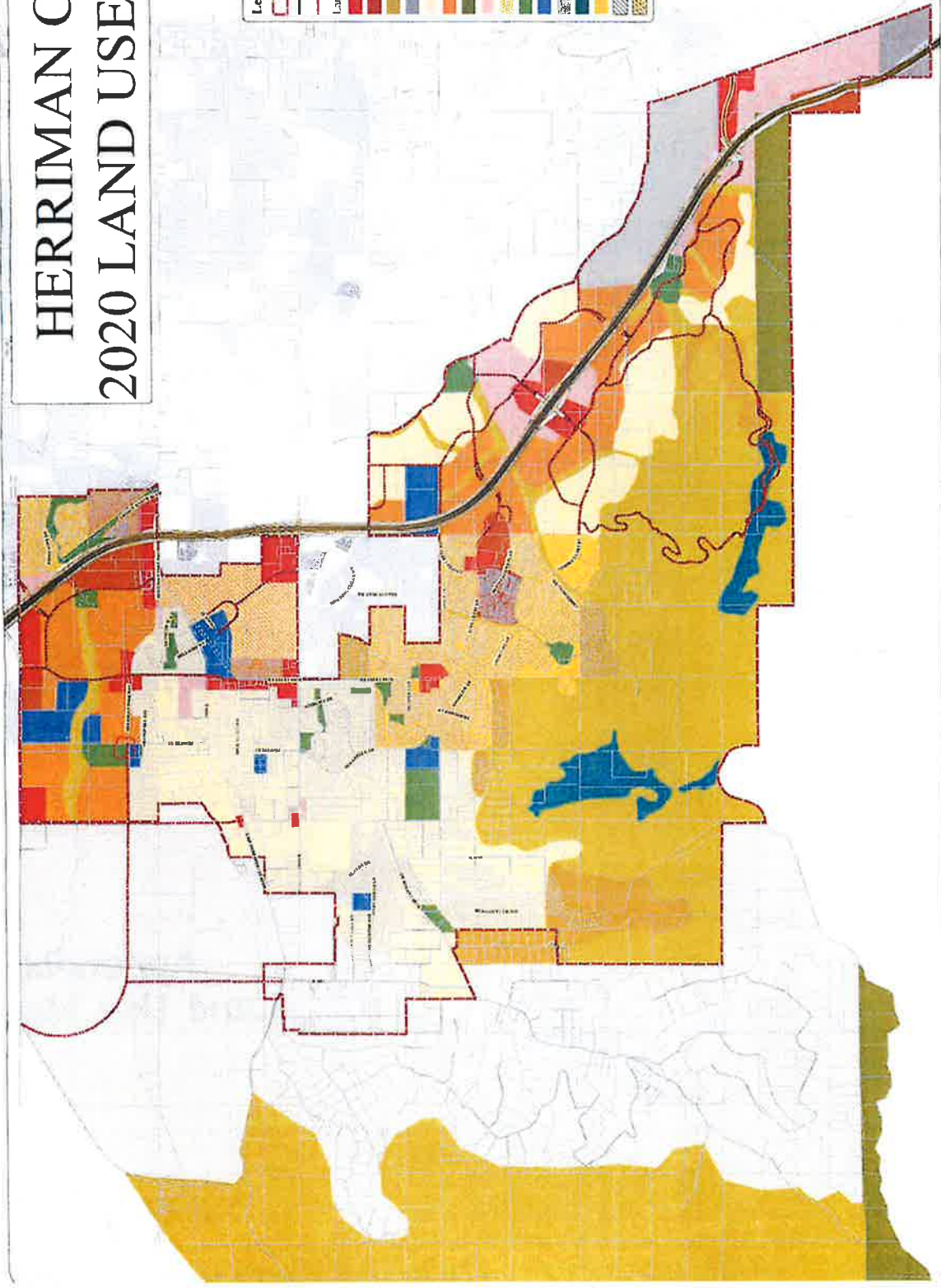
35

## **Appendix C**

### **Land Use Maps**

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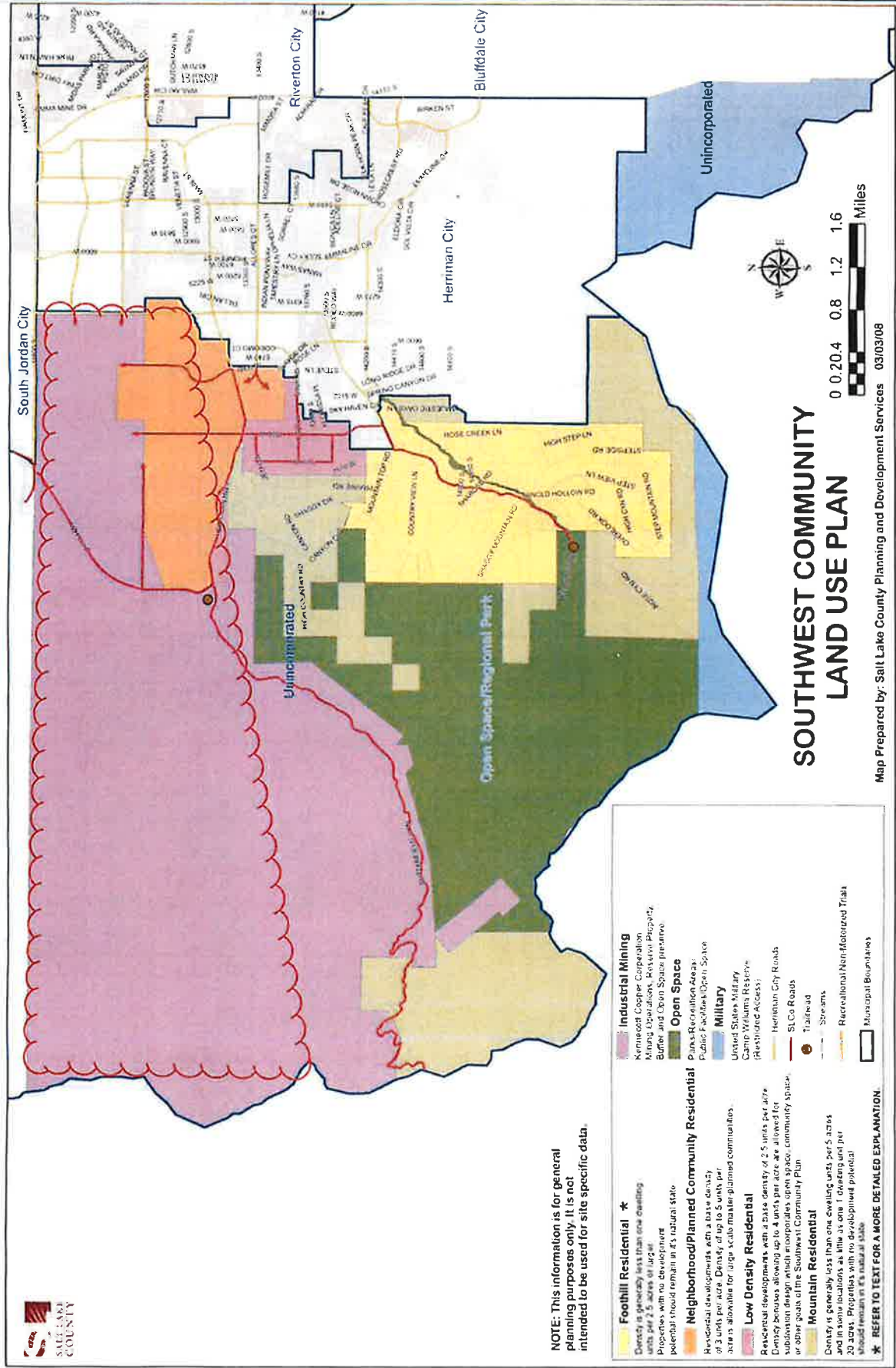
# HERRIMAN CITY 2020 LAND USE PLAN



**Legend**

	City Limit
	Mountain View Corridor
	Future Roads
	Land Use
	Commercial
	High Density Residential
	Hillside Residential
	Industrial
	Low Density Residential
	Medium Density Residential
	Military Operation
	Mixed Use
	Open Space
	Park
	Public
	Quasi-Public
	Recreation/Recreational
	Single Family Residential
	Southwest Plan
	Town Center

Map 1: Southwest Community Plan





## **Appendix D**

### **Hydraulic Calculations**

---

# Hydraulic Analysis Report

## Project Data

Project Title:

Designer:

Project Date: Wednesday, June 25, 2014

Project Units: U.S. Customary Units

Notes:

## Channel Lining Analysis: Channel Lining Design Analysis - Channel A

Notes:

## Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 1 ft

Riprap Specific Weight: 165 lb/ft<sup>3</sup>

Water Specific Weight: 62.4 lb/ft<sup>3</sup>

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.20093

## Lining Results

Angle of Repose: 41.7 degrees

Relative Flow Depth: 0.982516

Manning's n method: Bathurst

Manning's n: 0.0660686

## Channel Bottom Shear Results

V\*: 1.26871

Reynold's Number: 104249

Shield's Parameter: 0.08836

shear stress on channel bottom: 3.11925 lb/ft<sup>2</sup>

Permissible shear stress for channel bottom: 9.06574 lb/ft<sup>2</sup>

channel bottom is stable

Stable D50: 0.413205 ft

## Channel Side Shear Results

K1: 0.802

K2: 0.740307

Kb: 0

shear stress on side of channel:  $3.11925 \text{ lb/ft}^2$

Permissible shear stress for side of channel:  $6.71143 \text{ lb/ft}^2$

Stable Side D50:  $0.447639 \text{ lb/ft}^2$

side of channel is stable



## **Channel Lining Stability Results**

the channel is stable

## **Channel Summary**

## **Report for channel**

## **Channel Analysis: Channel Analysis**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width: 5.0000 ft

Longitudinal Slope: 0.0378 ft/ft

Manning's n: 0.0661

Flow: 42.0000 cfs

### **Result Parameters**

Depth: 1.3224 ft

Area of Flow: 10.1098 ft<sup>2</sup>

Wetted Perimeter: 10.9141 ft

Average Velocity: 4.1544 ft/s

Top Width: 10.2897 ft

Froude Number: 0.7386

Critical Depth: 1.1117 ft

Critical Velocity: 5.2303 ft/s

Critical Slope: 0.0722 ft/ft

Critical Top Width: 9.4468 ft

Calculated Max Shear Stress: 3.1193 lb/ft<sup>2</sup>

Calculated Avg Shear Stress: 2.1849 lb/ft<sup>2</sup>

## **Channel Lining Analysis: Channel Lining Design Analysis - Channel C**

Notes:

### **Lining Input Parameters**

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 1 ft

Riprap Specific Weight: 165 lb/ft<sup>3</sup>

Water Specific Weight: 62.4 lb/ft<sup>3</sup>

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.24891

### **Lining Results**

Angle of Repose: 41.7 degrees

Relative Flow Depth: 2.03783

Manning's n method: Blodgett

Manning's n: 0.0762887

### **Channel Bottom Shear Results**

V\*: 1.45554

Reynold's Number: 119601

Shield's Parameter: 0.0982429

shear stress on channel bottom: 4.1056 lb/ft<sup>2</sup>

Permissible shear stress for channel bottom: 10.0797 lb/ft<sup>2</sup>

channel bottom is stable

Stable D50: 0.508696 ft

### **Channel Side Shear Results**

K1: 0.802

K2: 0.740307

Kb: 0

shear stress on side of channel: 4.1056 lb/ft<sup>2</sup>

Permissible shear stress for side of channel: 7.46209 lb/ft<sup>2</sup>

Stable Side D50: 0.551088 lb/ft<sup>2</sup>

side of channel is stable

## **Channel Lining Stability Results**

the channel is stable

## **Channel Summary**

### **Report for channel**

## **Channel Analysis: Channel Analysis**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width: 5.0000 ft

Longitudinal Slope: 0.0207 ft/ft

Manning's n: 0.0763

Flow: 154.0000 cfs

### **Result Parameters**

Depth: 3.1785 ft

Area of Flow: 36.0982 ft<sup>2</sup>

Wetted Perimeter: 19.2147 ft

Average Velocity: 4.2661 ft/s

Top Width: 17.7140 ft

Froude Number: 0.5267

Critical Depth: 2.2834 ft

Critical Velocity: 7.0496 ft/s

Critical Slope: 0.0808 ft/ft

Critical Top Width: 14.1337 ft

Calculated Max Shear Stress: 4.1056 lb/ft<sup>2</sup>

Calculated Avg Shear Stress: 2.4267 lb/ft<sup>2</sup>

## **Channel Lining Analysis: Channel Lining Design Analysis - Channel D**

Notes:

### **Lining Input Parameters**

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 1 ft

Riprap Specific Weight: 165 lb/ft<sup>3</sup>

Water Specific Weight: 62.4 lb/ft<sup>3</sup>

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.19647

### **Lining Results**

Angle of Repose: 41.7 degrees

Relative Flow Depth: 2.40174

Manning's n method: Blodgett

Manning's n: 0.0715058

### **Channel Bottom Shear Results**

V\*: 1.25132

Reynold's Number: 102820

Shield's Parameter: 0.0874402

shear stress on channel bottom: 3.03433 lb/ft<sup>2</sup>

Permissible shear stress for channel bottom: 8.97137 lb/ft<sup>2</sup>

channel bottom is stable

Stable D50: 0.404674 ft

### **Channel Side Shear Results**

K1: 0.802

K2: 0.740307

Kb: 0

shear stress on side of channel: 3.03433 lb/ft<sup>2</sup>

Permissible shear stress for side of channel: 6.64157 lb/ft<sup>2</sup>

Stable Side D50: 0.438397 lb/ft<sup>2</sup>

side of channel is stable

## **Channel Lining Stability Results**

the channel is stable

## **Channel Summary**

### **Report for channel**

## **Channel Analysis: Channel Analysis**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width: 5.0000 ft

Longitudinal Slope: 0.0126 ft/ft

Manning's n: 0.0715

Flow: 194.0000 cfs

### **Result Parameters**

Depth: 3.8593 ft

Area of Flow: 49.0848 ft<sup>2</sup>

Wetted Perimeter: 22.2593 ft

Average Velocity: 3.9523 ft/s

Top Width: 20.4372 ft

Froude Number: 0.4494

Critical Depth: 2.5774 ft

Critical Velocity: 7.4123 ft/s

Critical Slope: 0.0689 ft/ft

Critical Top Width: 15.3095 ft

Calculated Max Shear Stress: 3.0343 lb/ft<sup>2</sup>

Calculated Avg Shear Stress: 1.7338 lb/ft<sup>2</sup>

## **Channel Lining Analysis: Channel Lining Design Analysis - Channel B**

Notes:

### **Lining Input Parameters**

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 0.5 ft

Riprap Specific Weight: 165 lb/ft<sup>3</sup>

Water Specific Weight: 62.4 lb/ft<sup>3</sup>

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.00016

### **Lining Results**

Angle of Repose: 41.15 degrees

Relative Flow Depth: 2.36996

Manning's n method: Blodgett

Manning's n: 0.0640199

### **Channel Bottom Shear Results**

V\*: 0.894716

Reynold's Number: 36759.1

Shield's Parameter: 0.047

shear stress on channel bottom: 1.55131 lb/ft<sup>2</sup>

Permissible shear stress for channel bottom: 2.4111 lb/ft<sup>2</sup>

channel bottom is stable

Stable D50: 0.321752 ft

### **Channel Side Shear Results**

K1: 0.802

K2: 0.733562

Kb: 0

shear stress on side of channel: 1.55131 lb/ft<sup>2</sup>

Permissible shear stress for side of channel: 1.76869 lb/ft<sup>2</sup>

Stable Side D50: 0.35177 lb/ft<sup>2</sup>

side of channel is stable

## **Channel Lining Stability Results**

the channel is stable

## **Channel Summary**

### **Report for channel**

## **Channel Analysis: Channel Analysis**

Notes:

### **Input Parameters**

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width: 5.0000 ft

Longitudinal Slope: 0.0150 ft/ft

Manning's n: 0.0640

Flow: 42.0000 cfs

### **Result Parameters**

Depth: 1.6574 ft

Area of Flow: 13.7808 ft<sup>2</sup>

Wetted Perimeter: 12.4121 ft

Average Velocity: 3.0477 ft/s

Top Width: 11.6295 ft

Froude Number: 0.4934

Critical Depth: 1.1119 ft

Critical Velocity: 5.2288 ft/s

Critical Slope: 0.0677 ft/ft

Critical Top Width: 9.4477 ft

Calculated Max Shear Stress: 1.5513 lb/ft<sup>2</sup>

Calculated Avg Shear Stress: 1.0392 lb/ft<sup>2</sup>

**Selected Profile: FHWA Profile (read-only)**

**Culvert Assessment Profiles**

**Culvert Assessment Profile Name: Standard (read-only)**

**Maximum Excavation Depth: 20 ft**

**Maximum Shallow Cover: 4 ft**

**Maximum Small Pipe Size: 36 in**

**Minimum Manned Entry Size: 48 in**



## **Riprap Classes**

### **Riprap Name: CLASS I**

Riprap Class: I

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 12 in

d85: 9 in

d50: 6.5 in

d15: 4.5 in

### **Riprap Name: CLASS II**

Riprap Class: II

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 18 in

d85: 13 in

d50: 9.5 in

d15: 7 in

### **Riprap Name: CLASS III**

Riprap Class: III

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 24 in

d85: 17 in

d50: 12.5 in

d15: 9 in

### **Riprap Name: CLASS IV**

Riprap Class: IV

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 30 in

d85: 21 in

d50: 15.5 in

d15: 10.5 in

### **Riprap Name: CLASS V**

Riprap Class: V

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 36 in

d85: 25.5 in

d50: 18.5 in

d15: 13 in

**Riprap Name: CLASS VI**

Riprap Class: VI

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 42 in

d85: 30 in

d50: 21.5 in

d15: 15 in

**Riprap Name: CLASS VII**

Riprap Class: VII

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 49.5 in

d85: 35 in

d50: 25.5 in

d15: 17.5 in

**Riprap Name: CLASS VIII**

Riprap Class: VIII

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 60 in

d85: 42.5 in

d50: 31.5 in

d15: 22 in

**Riprap Name: CLASS IX**

Riprap Class: IX

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 72 in

d85: 51 in

d50: 38 in

d15: 26 in

**Riprap Name: CLASS X**

Riprap Class: X

The following values are an 'average' of the size fraction range for the selected riprap class.

d100: 84 in

d85: 59.5 in

d50: 44.5 in

d15: 31 in



4246 S. Riverboat Road, Ste. 210  
Taylorsville, Utah 84123  
385-474-8500  
[www.ch2mhill.com](http://www.ch2mhill.com)



Exhibit B.

PERMIT # 3326

**SALT LAKE COUNTY PUBLIC WORKS DEPARTMENT  
ENGINEERING & FLOOD CONTROL DIVISION**

2001 SOUTH STATE STREET, SUITE N3100  
POST OFFICE BOX 144575  
SALT LAKE CITY, UTAH 84114-4575  
385-468-6600

RECEIVED  
DEC 13 2016

**FLOOD CONTROL PERMIT  
USE OF RIGHT-OF-WAY  
RIGHT-OF-ENTRY  
OR  
INSTALLATION OF STRUCTURES**

APPROVED  
JAN 12 2017  
SALT LAKE COUNTY  
FLOOD CONTROL

Permission is hereby granted by Salt Lake County (Grantor) to:

<u>Herriman City</u>	<u>13011 South Pioneer Street, Herriman, UT 84096</u>
(Name of Firm or Individual)	(Address)

Phone: 801-446-5323 Contact: Kameron Ballentine, Bowen Collins and Associates, Draper UT, 801-495-2224

TO: (Describe in these spaces the proposal, including kind and type of construction, purpose intended, location by stationing. Indicate passageway provided by means of gates, etc. Use separate sheets if necessary, identifying each by reference herein. Provide all engineering calculations. Attach drawings and sketches as required.)

See Appendix A

Provided that: Basin #: 1900, BUTTERFIELD CANYON Flood Control #: 20, COPPER CREEK

Upon termination or expiration of this permit (whether by voluntary relinquishment by the grantee, by revocation by the Grantor or otherwise) the Grantee shall remove all improvements which may have been erected or constructed under this permit, and shall repair or replace any portion of the flood control facility or right-of-way which may have been damaged by applicant's operation (including grading and seeding, or sodding, if necessary) to the satisfaction of the Grantor.

The structure or operation for which this permit is issued shall be maintained by the Grantee in such manner as shall not injure or damage the flood protection structure, or interfere with its operation and maintenance in accordance with Title 17 of the Ordinances of Salt Lake County.

The structure or operation covered by this permit may be stopped, removed, damaged or destroyed by the Grantor in time of flood emergency if such action is determined by the Grantor to be necessary in order to preserve life or property or prevent damage and the Grantor shall not be liable to the grantee for such damage or destruction.

LAT.: 40.527143

LONG.: -112.052582

APPROX. ADDRESS:  
6800W 12400S  
HERRIMAN, UT  
84096

Unless otherwise specifically provided herein, this permit may be canceled at any time by the Grantor upon 10 days written notice mailed to the address shown above. During such 10 day period (or such other period as may be provided herein), the grantee shall be obligated to remove any improvements installed under this permit, and to repair or replace any damage to the flood protection right-of-way or structures resulting from Grantee's use or operations. If Grantee fails to remove improvements installed under this permit or to repair or replace any damages to the flood protection right-of-way or structures during such period of time, the Grantor shall have the right to possess and dispose of any such improvements remaining upon its right-of-way, and may proceed to repair or replace any such damage, and the Grantee herein shall be liable to the Grantor for the full cost of such repairs or replacements.

The construction, installation and maintenance of the improvements covered by this permit shall be subject to inspection by representatives of the Grantor at all reasonable times.

In the event the work covered by this permit consists of or includes major construction, the cost of inspection thereof by the Grantor shall be paid by the Grantee.

Grantee agrees that it will not use the area or facilities covered by this permit, or permit such area to be used, for any purpose other than is specifically covered by this permit. By signing this permit, Grantee agrees to accept responsibility for this project as long as the improvements installed under this permit remain in place.

Grantee agrees to defend and indemnify Grantor, its employees and agents from all injuries, damages or claims that may occur from Grantee's installation repair or maintenance of improvements pursuant to this permit.

**After The Permit Is Approved, Contact Salt Lake County Engineering  
24 Hours Before Starting Construction, 385-468-6600.**

This space for County use only for special conditions applicable to this permit.

Must meet any other applicable local, state and federal requirements. Must meet the requirements of Utah Stream  
Alteration Permit No. . Herriman City will own, operate, maintain, repair and replace the cut-ditch from Station 100  
+00 to 116+25 (see attached drawing). Salt lake County will operate and maintain the channel from Stations 116+25 to  
137+19. The restored section and diverted section of Copper Creek will now be the Copper Creek Drainage facility.

THIS PERMIT SHALL NOT BE VALID UNTIL APPROVED BY THE DIRECTOR OF SALT LAKE COUNTY  
ENGINEERING DIVISION OR AUTHORIZED REPRESENTATIVE.

Terms of this permit are hereby accepted.

Signature (Grantee)

12/8/2016

Date

Jonathan Bowers

Printed Name

Assistant City Engineer

Title

APPROVED:

for Director

Date

Approval/Nonapproval Recommended:

Salt Lake County Permit Specialist  
ENGINEER

1/11/2017

Date

Salt Lake County Flood Operations

1-11-17

Date

Canal President

Date

DATE: DECEMBER 2018  
DRAWING NO: G-04  
SHEET 4 OF 12

DESIGN: J. BEAN  
CHECKED: K. BALENTINE  
REVIEW: [REDACTED]  
APPROVED: B. ABEL

PROJECT: CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS  
SHEET: 4 OF 12

KEY SHEET

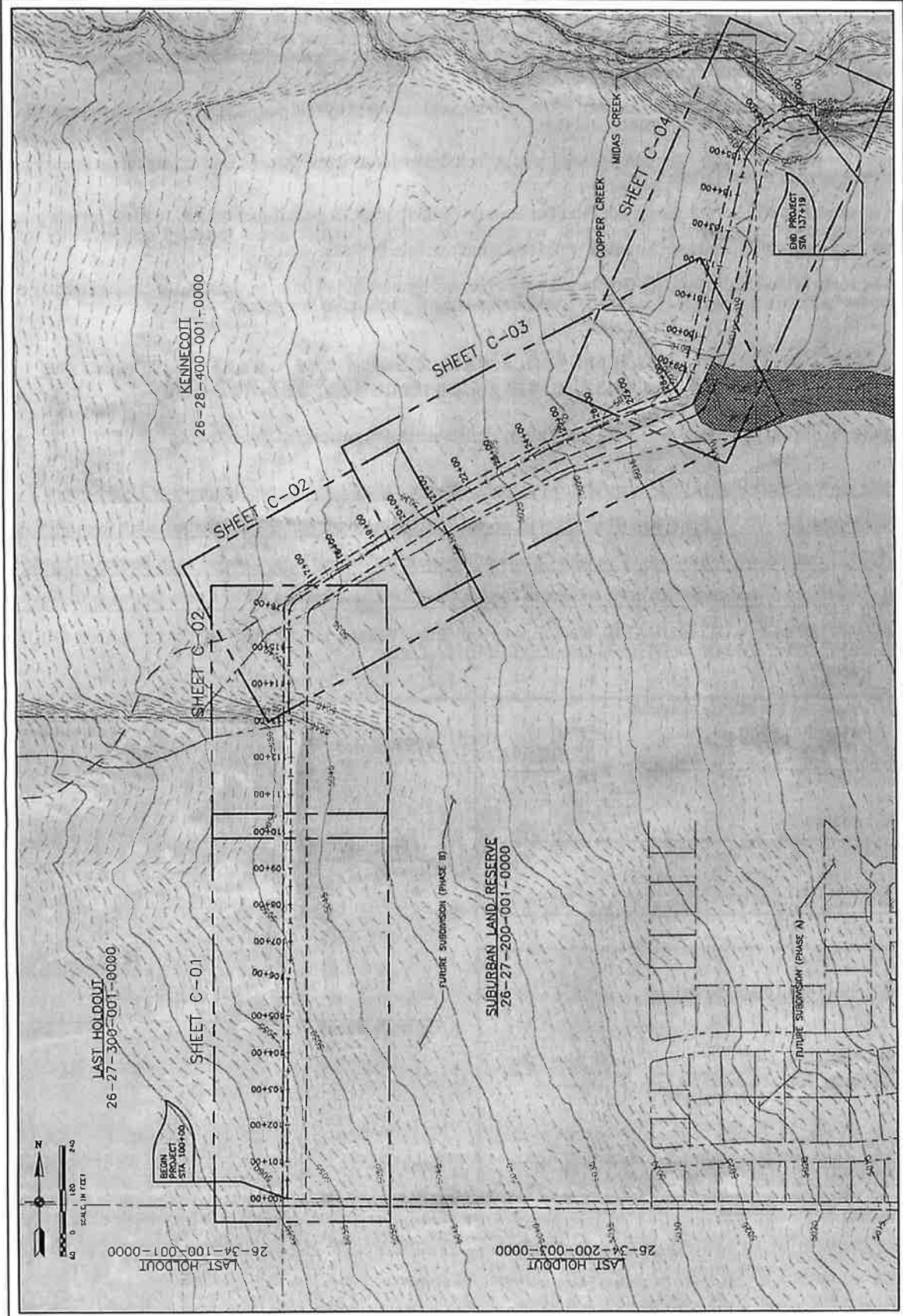
REVISIONS

NO.	DATE	BY	DESCRIPTION

VERIFY SCALE: 1" = 100'

90% REVIEW

BOVEN COLLINS & ASSOCIATES, INC.

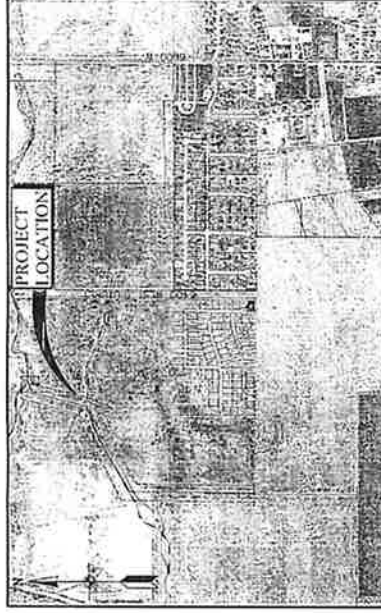




# DRAWINGS FOR CONSTRUCTION OF THE CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS SUBURBAN LAND RESERVE



PROJECT LOCATION MAP  
NTS



PROJECT VICINITY MAP  
NTS

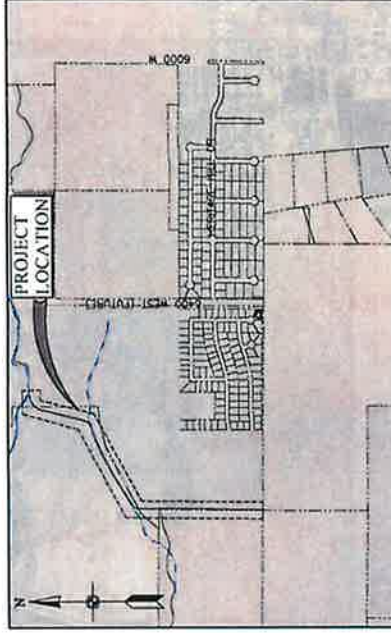
**APPROVED**  
JAN 12 2017  
SALT LAKE COUNTY  
FLOOD CONTROL

<b>PROJECT LOCATION MAP AND VICINITY MAP</b> DATE: DECEMBER 2016 DRAWN BY: J. BEAN CHECKED BY: J. BEAN DESIGNED BY: J. BEAN PROJECT: CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS SHEET: 1 OF 12		REVIEWED BY: J. BEAN DATE: DECEMBER 2016 PROJECT: CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS SHEET: 1 OF 12
BOWEN COLLINS & ASSOCIATES, INC. 2002 REVIEW		

# DRAWINGS FOR CONSTRUCTION OF THE CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS SUBURBAN LAND RESERVE



PROJECT LOCATION MAP  
NTS



PROJECT VICINITY MAP  
NTS

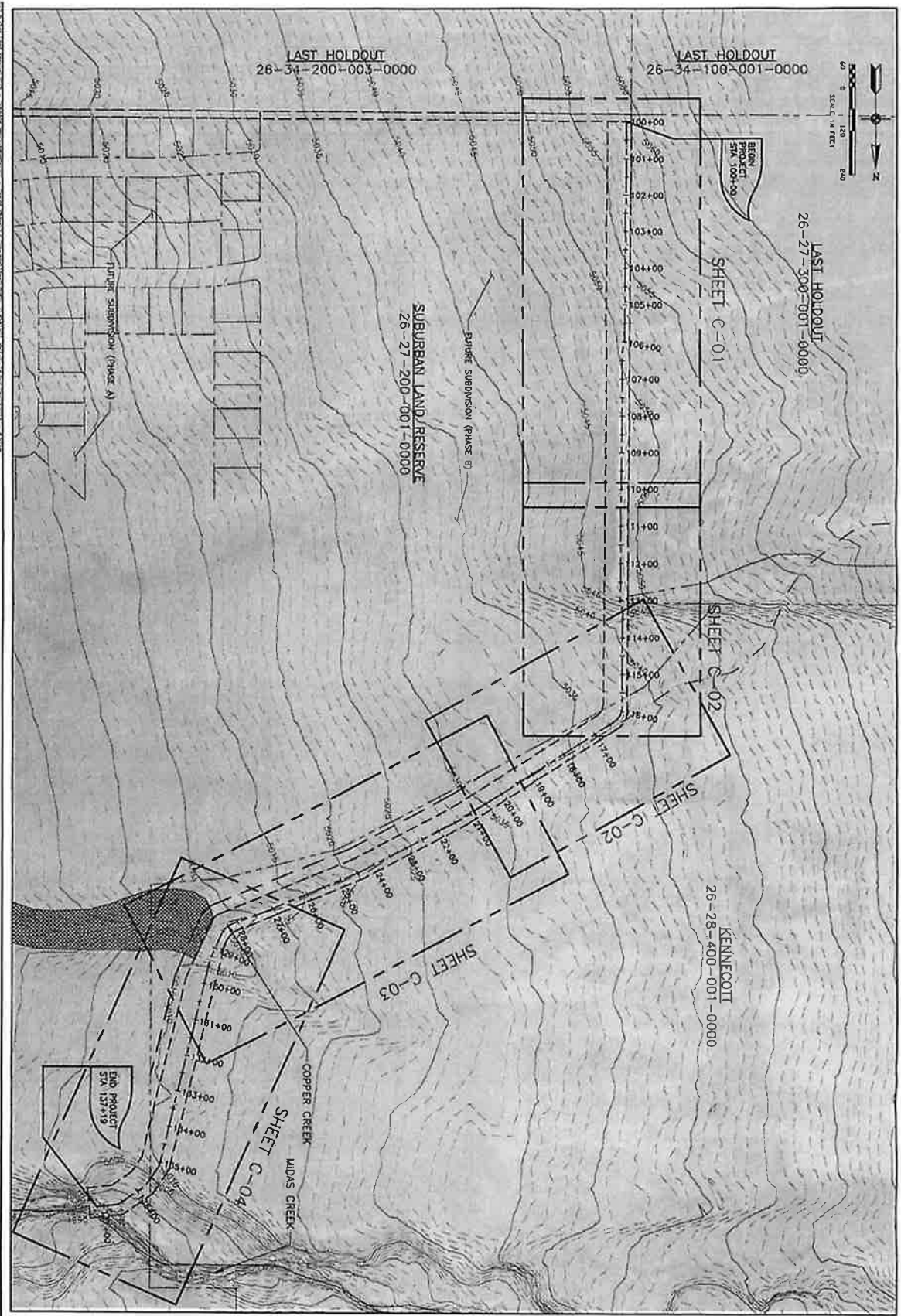
<b>PROJECT LOCATION MAP</b> PROJECT NUMBER: 424-16-01 DATE: DECEMBER 2016 SHEET: 1 OF 12		DESIGN: J. BEAN CHECKED: K. BAILEY DRAWN: C. BAILEY SCALE: 1" = 100'		REVIEW: K. BAILEY DATE: 12/16/16 BY: K. BAILEY		SUBURBAN LAND RESERVE CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS																									
90% REVIEW Bowen Collins & Associates, Inc. CONSULTING ENGINEERS		REVISIONS <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>BY</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>						NO.	DATE	BY	DESCRIPTION																				
NO.	DATE	BY	DESCRIPTION																												





15. CONTRACTOR SHALL PLACE ENDS OF RAYMONDED PILES WITH CONCRETE.
16. CONTRACTOR SHALL UPLIFT WEAPONS DURING CONSTRUCTION THAT WILL PRESENT HAZARD TO THE PUBLIC AND SHALL BE REMOVED FROM THE PROJECT AREA.
17. CONNECTOR SHALL PLASTER ON THE PAPER ADJACENT TO PEE AS BOND BRACKER WHERE WHICH CONSTRUCTION UNWARRANTS CONTRACTOR SHALL MAINTAIN SLOPES THROUGH UNWARRANTS SLOPE TO SLOPES OF THE UNWARRANT PEE.
18. IF IT IS THE CONTRACTORS RESPONSIBILITY TO PROTECT IN PLACE, OR REPLACE TO THE SATISFACTION OF THE UTILITY OWNER, ALL UTILITY LATERALS ENCOUNTERED DURING CONSTRUCTION, DURING OR AFTER THE PROJECT, AND REPAIR OR REPLACE IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE UTILITY RELOCATIONS SUCH AS GAS, FIBER OPTIC AND TELEPHONE WITH THE APPROPRIATE UTILITY OWNERS.
20. CONTRACTOR SHALL DESIGN THE OPERATION OF EXISTING INFRASTRUCTURE, SPECIAL POLYMER, AND OTHER UTILITY SYSTEMS, AND SHALL BE RESPONSIBLE FOR THE PROTECTION, MAINTENANCE, CONSTRUCTION, REPAIR, IF IT IS NECESSARY TO REPLACE, AND REPLACE OR TO RELocate UTILITY OR SERVICE LATERALS IN ORDER TO PROSECUTE THE WORK, THEY SHALL BE RELOCATED, MAINTAINED, AND REPAIRMENT SUPPLIED BY THE CONTRACTOR. IF THE CONTRACTORS ARE TO THE SATISFACTION OF THE UTILITY OWNER.

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFORMANCE TO STANDARD SPECIFICATIONS, THEIR ADDS TO THE APPLICABLE STANDARD SPECIFICATIONS, AND THE STANDARD SPECIFICATIONS FOR THE APPLICABLE STANDARD SPECIFICATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE STANDARD SPECIFICATIONS TO BE USED AS A REFERENCE TO THE ATTACHED CONSTRUCTION DRAWINGS. STANDARD SPECIFICATIONS SHALL BE CONSIDERED PART OF THE ORIGINAL PROJECT DESIGN AND CONSTRUCTION DOCUMENTS BY DESIGN PROFESSIONAL.
2. CONSTRUCTION SHALL OBTAIN ALL NECESSARY PERMITS AND COMPLY WITH THE STANDARDS, REGULATIONS AND GENERAL REQUIREMENTS IDENTIFIED BY EACH AFFECTED AGENCY.
3. **DAMAGE.**  
IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR CONSTRUCTION AS PER THE REQUIREMENTS OF THE AFFECTED AGENCIES. IF DAMAGE IS CAUSED SHALL FIRST MEET WITH THE APPROVAL OF THE DIRECTOR AND THE OWNER.
4. **STANDARD LITIGATION.** AND PER USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE PLANS, WHEREVER APPLICABLE. NOT ALL OF THE VARIOUS PLANS COMPONENTS ARE NECESSARILY USED OR SHOWN IN THE PROJECT.
5. **EXISTING UTILITIES.**  
THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES.
6. **EXISTING UTILITIES.**  
THE CONTRACTOR SHALL BE RESPONSIBLE TO KEEP ALL CONSTRUCTION ACTIVITIES WITHIN THE ESTABLISHED RIGHTS-OF-WAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES.
7. **UTILITY LOCATIONS.**  
THE CONTRACTOR SHALL BE RESPONSIBLE TO KEEP ALL CONSTRUCTION ACTIVITIES WITHIN THE ESTABLISHED RIGHTS-OF-WAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL UTILITIES AND SUBSTRUCTURES.
8. **CONSTRUCTION LIMITS.**  
CONSTRUCTION LIMITS SHOWN IN THE DETAILS ARE GRAPHICAL REPRESENTATIONS ONLY, AND DO NOT REPRESENT EXACT EXCAVATION LIMITS OR EXACT REPRESENTATIONS OF CONFORMANCE WITH LOCAL AND FEDERAL CODES GOVERNING SHORING AND BRACING OF EXCAVATIONS AND TRENCHES, AND FOR PROTECTION OF WORKERS. TRENCH DEPTHS TO BE IN ACCORDANCE WITH OSHA SAFETY AND HEALTH STANDARDS FOR CONSTRUCTION (29 CFR 1926).
9. **TRENCH DEPTHS.**  
TRENCH DEPTHS SHOWN ON THE DRAWINGS ARE CENTRALITY OF CROWN. PROTECT SURFACES EXPOSED TO THE DEPTHS OR GRADE LINE AS SPECIFIED ON THE PLANS OR REQUIRED TO EXCEED 100 FEET VERTICAL OVERLAP APPROVED BY THE DIRECTOR. THE TAIL NOT EXCEED 100 FEET VERTICAL OVERLAP APPROVED BY THE DIRECTOR.
10. **STANDARDS.**  
STANDARDS AND METHODS SHOWN ON THE DRAWINGS ARE CENTRALITY OF CROWN. PROTECT SURFACES EXPOSED TO THE DEPTHS OR GRADE LINE AS SPECIFIED ON THE PLANS OR REQUIRED TO EXCEED 100 FEET VERTICAL OVERLAP APPROVED BY THE DIRECTOR. THE TAIL NOT EXCEED 100 FEET VERTICAL OVERLAP APPROVED BY THE DIRECTOR.
11. **OPERATIONAL POINT.**  
CONSTRUCTION SHALL COMPLY WITH SAFETY REQUIREMENTS AS REQUIRED FOR OPERATING CONSTRUCTION EQUIPMENT EXCEPT HIGH VOLTAGE POWER LINES.
12. **CONSTRUCTION SHALL OBTAIN AND MAINTAIN APPROVED WRITTEN NOTICE OF CONSTRUCTION FOR ALL AREAS LOCATED IN THE CONSTRUCTION AREA AT LEAST 72 HOURS PRIOR TO CONSTRUCTION.** WRITTEN NOTICE TO BE APPROVED BY THE METROPLEX CITY ENGINEERING DEPARTMENT.
13. **CONSTRUCTION SHALL OBTAIN AND MAINTAIN APPROVED WRITTEN NOTICE OF CONSTRUCTION FOR ALL AREAS LOCATED IN THE CONSTRUCTION AREA AT LEAST 72 HOURS PRIOR TO CONSTRUCTION.** WRITTEN NOTICE TO BE APPROVED BY THE METROPLEX CITY ENGINEERING DEPARTMENT.
14. **CONSTRUCTION SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF SERVICE LINES FOR SEWER, WATER AND OTHER UTILITIES, AND REPAIRING ANY DAMAGE TO SUCH LINES AS A RESULT OF THE CONSTRUCTION ACTIVITIES.**



SHEET 4 OF 12 6-04	KEY SHEET		SUBURBAN LAND RESERVE CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS HENRIAN, UTAH		VERIFY SCALE BAR IS ONE INCH ON ORIGINAL DRAWING		REVISIONS
	DESIGN J. BEAN	REVIEW K. BALLENTINE	DATE: DECEMBER 2016		PROJECT NUMBER: 454-16-01		
	CHECKED D. ABEL	APPROVED BAGLEY	DATE: 12/15/16		DRAWN BY:		
	BOX REVIEW		BOWEN COLLINS & ASSOCIATES, INC. 4700 SOUTH 1000 WEST, SUITE 100, SALT LAKE CITY, UT 84143				



DATE: OCTOBER 2016  
PROJECT: CREEK WEST SIDE  
SHEET: 6 OF 12

PLAN AND PROFILE  
STA 110+00 TO STA 120+00

DESIGN: J. BEAN  
CHECK: B. ABEL  
DRAWN: B. ABEL

REVISIONS

NO.	DATE	DESCRIPTION
1		

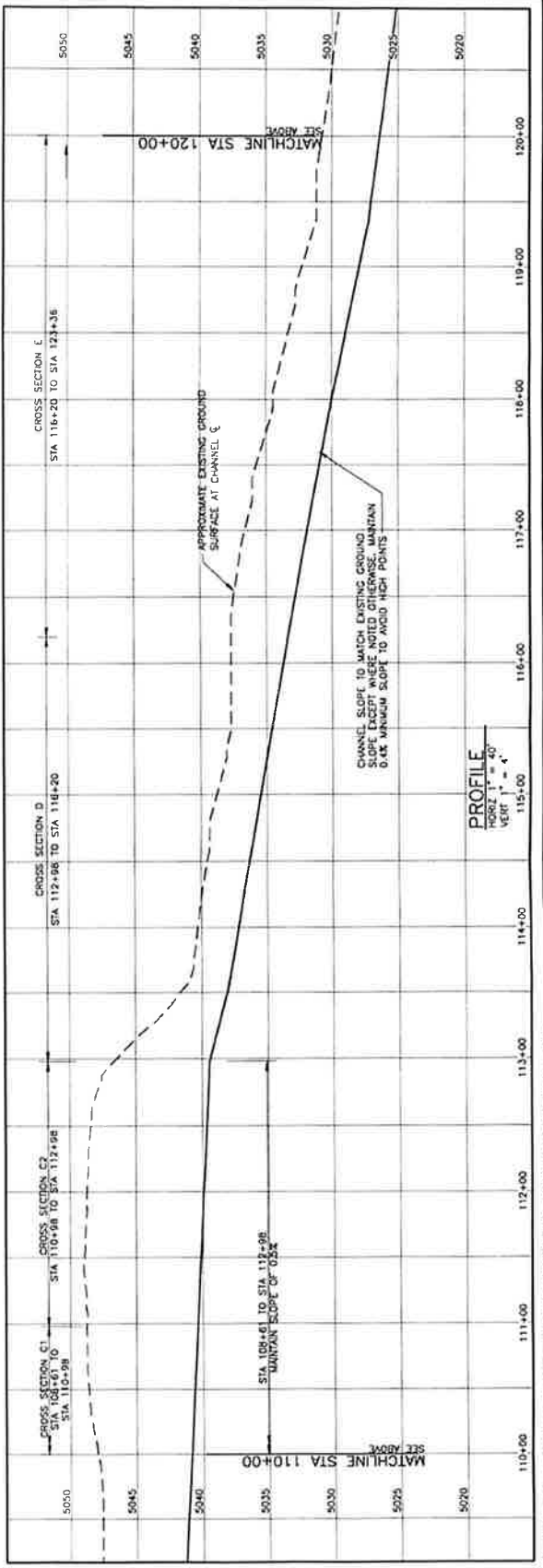
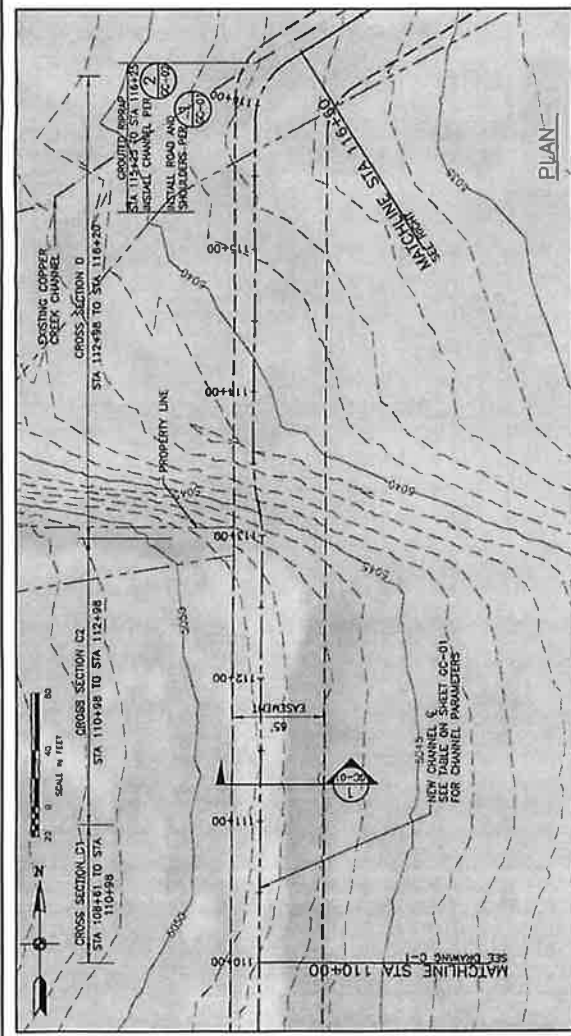
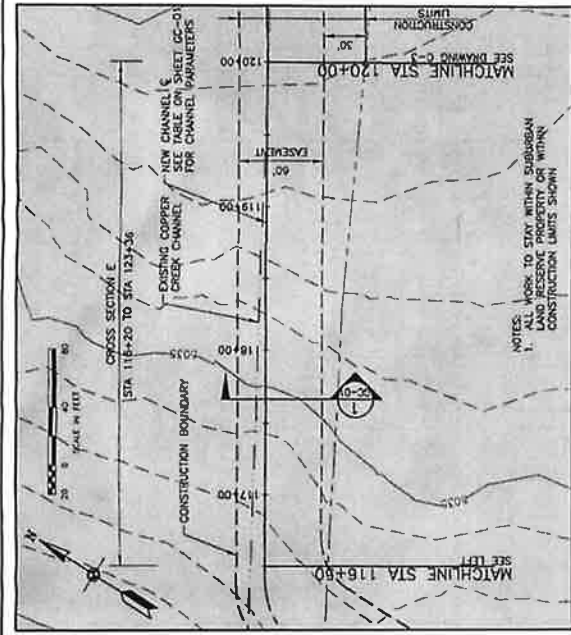
VERIFIED SCALE  
1" = 40'

CREEK RIDGE WEST SIDE  
DRAINAGE IMPROVEMENTS

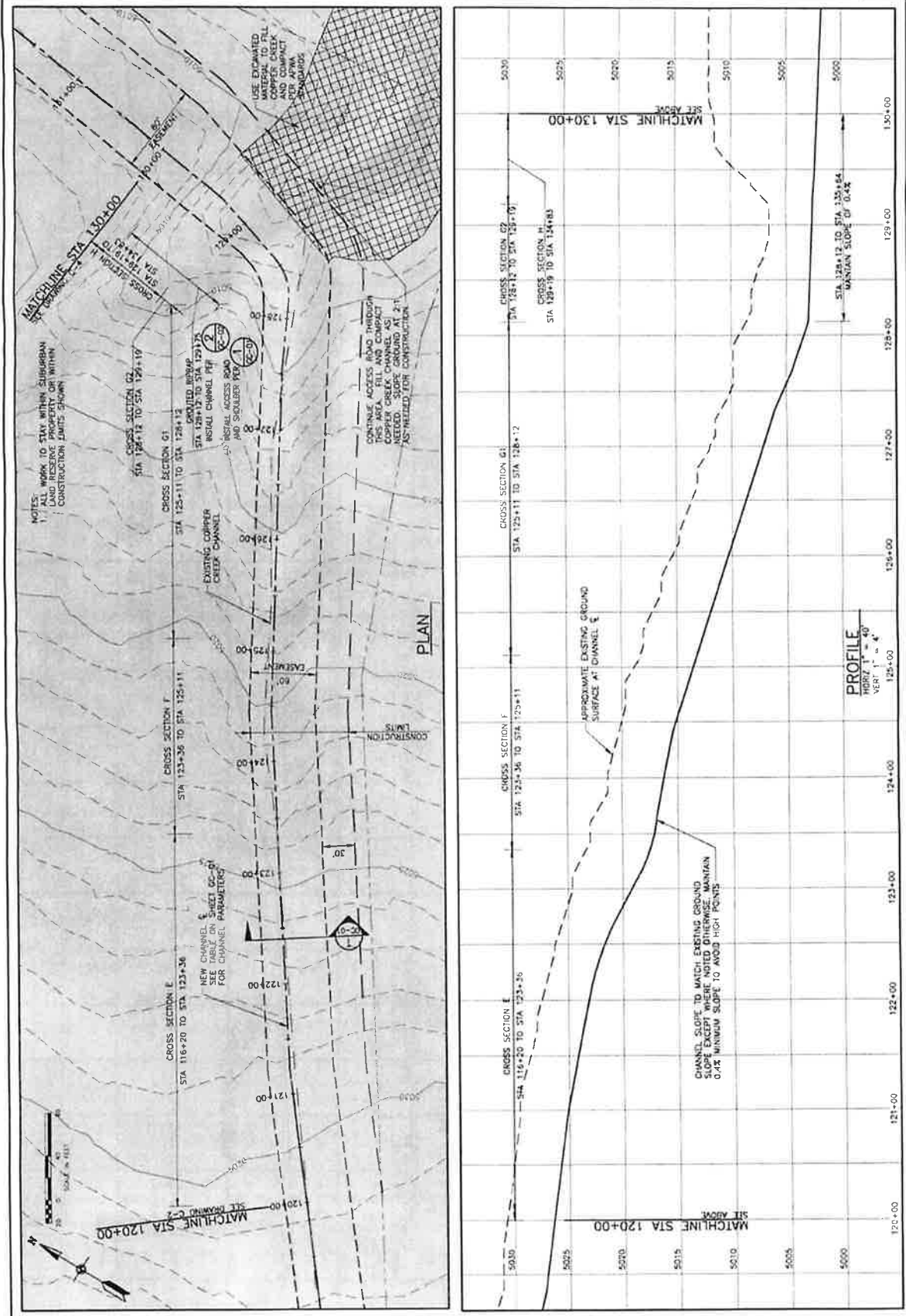
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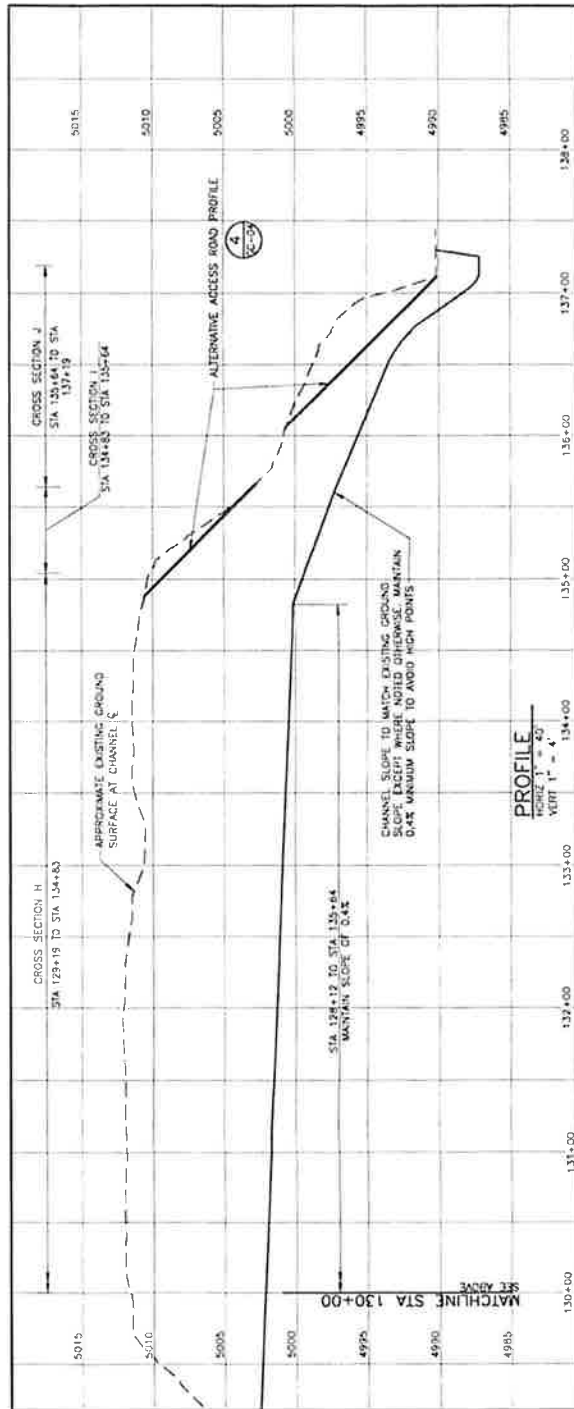
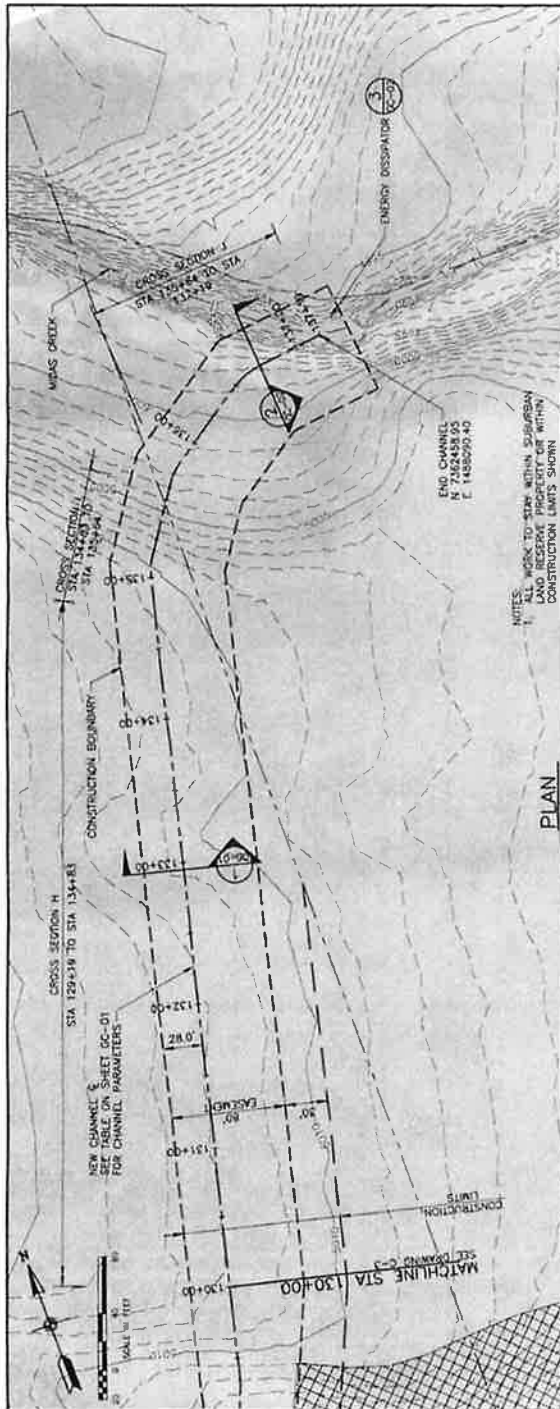
REVISIONS

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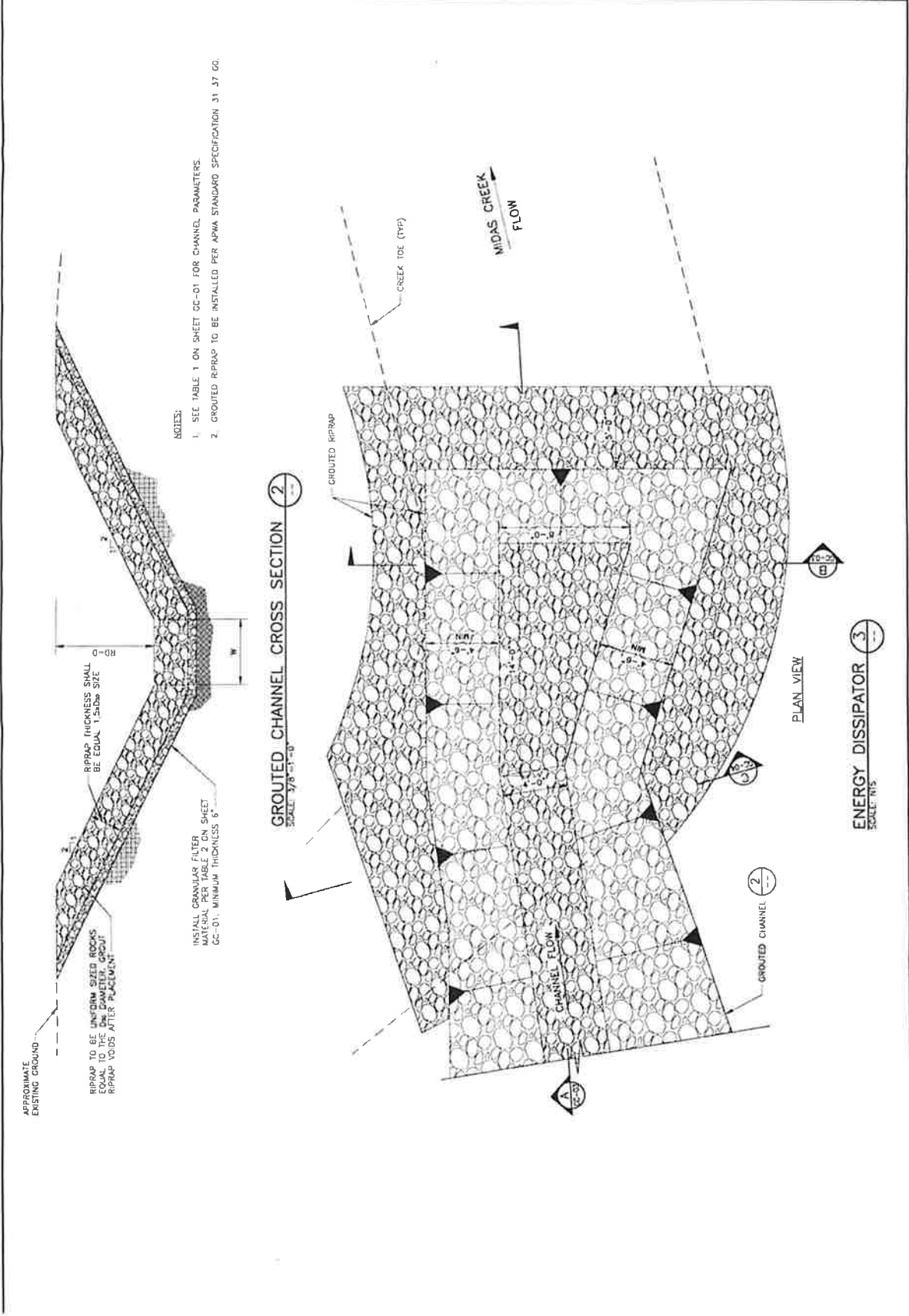


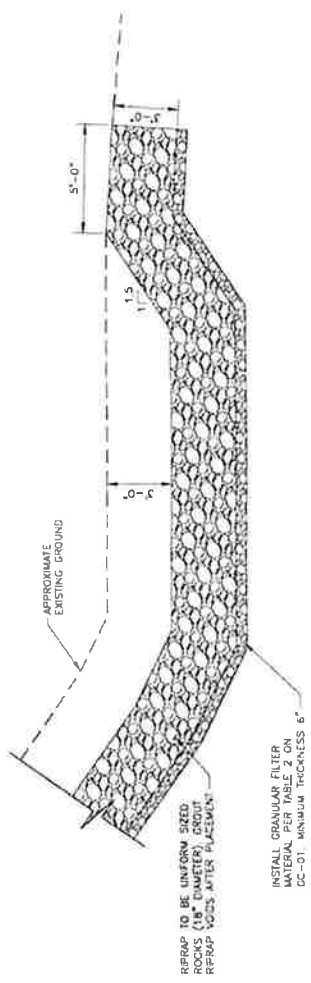




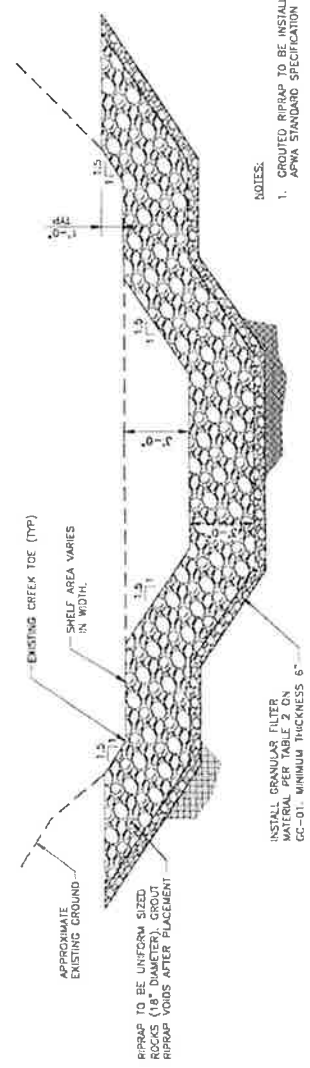


<b>CREEK RIDGE WEST SIDE DRAINAGE IMPROVEMENTS</b> DESIGN AND CONSTRUCTION		DATE: DECEMBER 2015 PROJECT: GC-02 SHEET: 19 OF 12	
DESIGN: J. DEAN CHECKED: B. ABEL REVIEWED: C. BULLING DRAWN BY: C. BULLING	PROJECT NO.: 15-01-01 SHEET NO.: 19 OF 12	DATE: DECEMBER 2015 PROJECT: GC-02 SHEET: 19 OF 12	





**SECTION A**  
SCALE NTS



**SECTION B**  
SCALE NTS

- NOTES:
1. GROUTED RIPRAP TO BE INSTALLED PER ARAA STANDARD SPECIFICATION 31.37.00.

