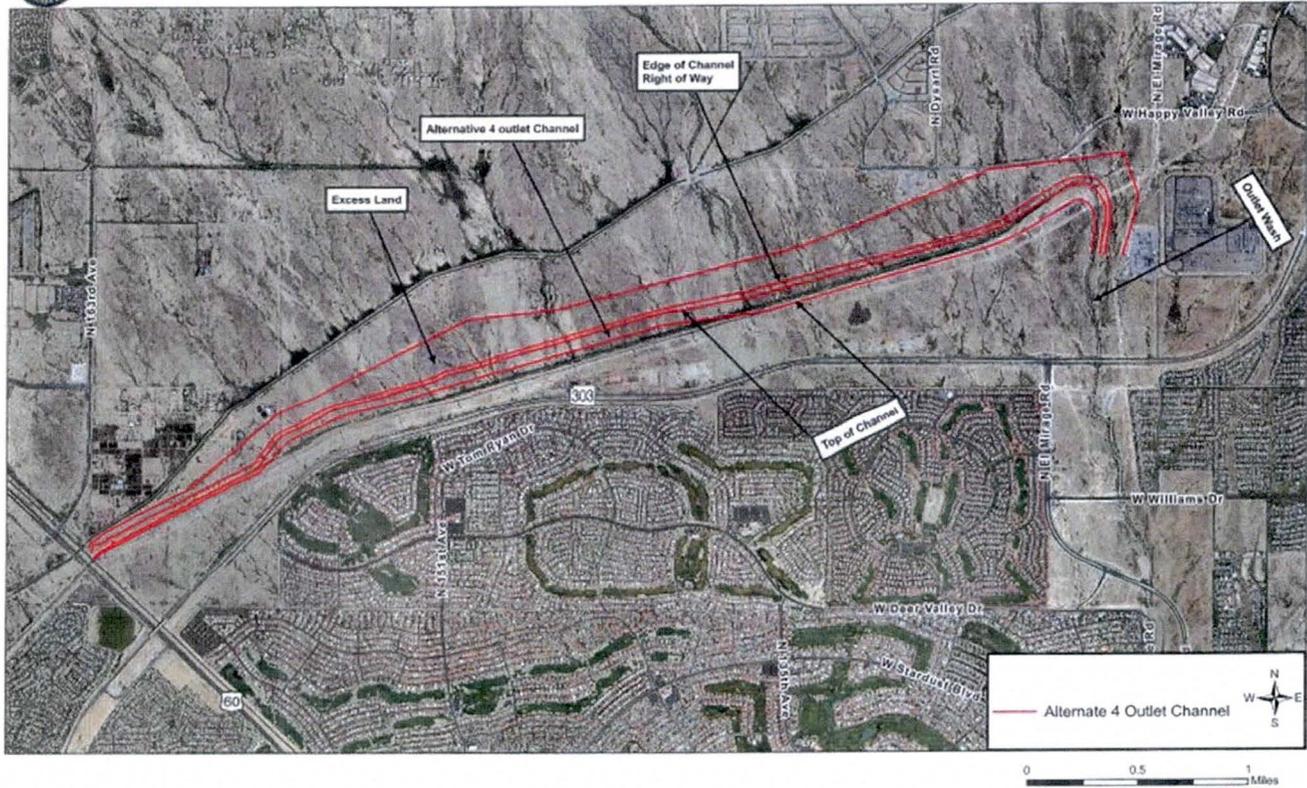




## McMicken Dam Outlet Channel - Alternative 4



### FINAL Value Analysis Study Report Flood Control District of Maricopa County McMicken Dam Outlet Channel Project October 2014

Contact : Renee L. Hoekstra, CVS  
RHA, LLC  
(602) 493-1947 Office Phone  
(623) 764-7490 Cellular Phone  
Renee@TeamRHA.com





*Guiding Teams – Building Success*

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November 4, 2014

Ms. Bobbie Ohler, Project Manager  
Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, Arizona 85009

**RE: McMicken Dam Outlet Channel Project  
Value Analysis Study–Final VA Report**

Dear Bobbie:

Transmitted herewith is the electronic version of the Final Value Analysis Study Report for the above referenced project.

The team appreciates your assistance and cooperation as well as that from the design team personnel and all other stakeholders. Should you have any questions please telephone me at (602) 493-1947.

Sincerely,

**RHA, LLC.**

Renee L. Hoekstra, CVS  
Managing Partner

2255 N 44<sup>th</sup> Street, Suite 170, Phoenix, AZ 85008  
(602) 493-1947 (800) 480-1401 (602) 275-2972 Fax



**Value Analysis Study  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project**

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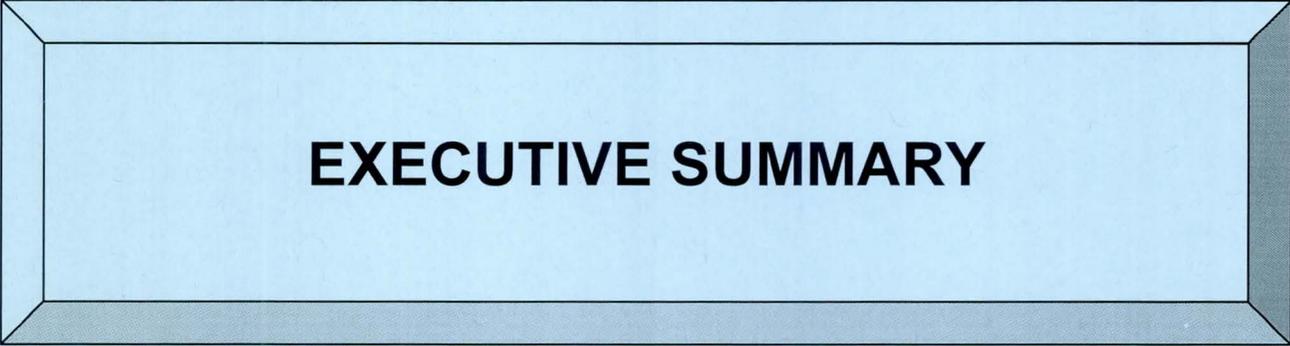
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**EXECUTIVE SUMMARY**



**Value Analysis Study  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project**

## **Executive Summary**

### **Background**

A Value Analysis (VA) study was conducted for the Flood Control District of Maricopa County (District) McMicken Dam Outlet Channel Project on October 14-16, 2014 at District offices for the project described below.

### **Project Goals**

Overall project goals were discussed in order to educate the VA study team on the important elements within the project. They include the following:

- Reduce cost
- Integrate aesthetics

### **Workshop Objectives**

In addition, workshop objectives were identified at the start of the workshop which included:

- Optimize channel configuration
- Determine potential uses for the excess dirt
- Explore alternative treatments at the outlet/east end of the channel
- Explore options for design of the west end of the channel
- Consider aesthetic treatments related to the north and south buffer areas
- Preserve vegetation
- Provide input on appropriate hydrology for different elements of the channel

### **Project Description**

The McMicken Dam Project was constructed by the U.S. Army Corps of Engineers (USACOE) in 1954 and 1955 to protect Luke Air Force Base, Litchfield Park Naval Air Facility, and agricultural activities in the area from flooding. The McMicken Dam Project is now owned, operated and maintained by the Flood Control District of Maricopa County (District) and currently provides flood protection for significant portions of the cities of Surprise, El Mirage, Sun City Grand, and Litchfield Park, as well as unincorporated areas of Maricopa County. Critical public infrastructure such as hospitals, schools, police and fire stations, freeways and other public roadways, railroads and canals such as Beardsley Canal also benefit from the flood protection provided by the McMicken Dam Project. The ability of the McMicken Dam Project to maintain the current level of protection in the long-term for the benefit of the public in an increasingly urbanized environment is in question due to significant concerns regarding aging infrastructure, land subsidence, earth fissuring, urbanization encroachment and current dam safety standards. These issues have led the District to determine that an overall rehabilitation of the dam and outlet channel is required.

The primary project goals as defined by the District are to prepare a design for the Outlet Channel that will mitigate current deficiencies, lower risk, and meet District requirements for flood protection, for the 100-year flood. A secondary project goal is to identify landscaping, aesthetics, and multi-use opportunities



## Value Analysis Study Flood Control District of Maricopa County McMicken Dam Outlet Channel Project

within the project area that are compatible with the safe and proper function, operation, and maintenance of the McMicken Dam Outlet Channel.

An Alternatives Analysis was conducted by URS Corporation (completed September 2014) which looked at four alternatives for replacement of the existing channel, two levee options and two incised channel options. Alternative 4, an incised channel option was recommended from the Alternatives Analysis and approved by FCD management. An in-house team further revised the recommended alternative, and the current concept is for the new channel to be north of the WAPA power lines; then the channel will move south to be adjacent to the levee east of the location that the WAPA power lines leave the area. The distance from toe of levee to start of channel excavation for this eastern reach has not been determined (0 feet to 100 feet buffer area was discussed).

The western-most reach of the channel is constrained by the WAPA power lines and utilities within the City of Surprise access road. This reach, with a minimal bed excavation, is common to all four design alternatives. The goal for this reach is to avoid a FEMA levee condition, if possible, and accommodate the higher design flows including the 100-year flows. The channel is to convey 4800 cfs from the dam and the 100-year flood from the north. These flows are not considered to be additive since it is highly unlikely they would occur at the same time.

Landscape/aesthetics should be considered as an important component of the design. The buffer area to the south is undetermined; the buffer area to the north has been proposed to be 100 feet. The buffer area to the north will include the Operations and Maintenance road, plus the Maricopa Trail.

### Description of the Study

The study was conducted in accordance with the SAVE International® Value Methodology, found in the support data section of this report. The VA team consisted of the Flood Control District of Maricopa County project manager, staff from different departments, and design consultant Gannett Fleming who provided expertise in related disciplines.

The summary of alternatives is found in the study results section of this report. This summarizes the ideas brainstormed and developed during the study, indicating the areas of opportunity for improving the value, performance or functions of the project. A complete list of all of the ideas is located in the Support Data section of this report.

### Summary of Results

The VA team brainstormed 58 ideas. Of those, 14 ideas were identified for further development into VA proposals, including cost impacts. For alternatives development, the VA team broke into three teams as follows:

- Team 1: Frank Brown, Mike Stanley, Harry Cooper, Richard Waskowsky
- Team 2: Valerie Swick, Nasir Raza, Shimin Li, Mike Duncan
- Team 3: Gary Wesch, Gary Shapiro, Bing Zhao, Bobbie Ohler

These team members may be consulted for additional information.

The description and further discussion of these alternatives are included in the study results section of this report. The content of the VA report evaluates the alternatives developed and the cost impact, as necessary. The ideas developed are listed under the functions: **Drain Dam** (Hydrology and Hydraulics), **Manage**



**Value Analysis Study  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project**

**Erosion/Deposition, and Miscellaneous.** The costs shown in parenthesis represent an additional cost to the project. Those shown as positive numbers represent a savings. During the alternatives development, three of the alternatives were dropped by the VA team from further consideration. The VA team had limited time and resources to evaluate the alternative ideas. It is important that the District and its design consultant further vet the ideas that have been suggested for further consideration by performing more technical, cost and other appropriate analyses. The Alternatives were formally developed by the three teams as shown above, however, all VA team members reviewed each Alternative and provided additional comments and information as necessary. The team that developed the Alternative is shown to the left of each Alternative in the table below.

Team No.	No.	Description	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
	<b>DD</b>	<b>Drain Dam (Hydrology &amp; Hydraulics)</b>			
3	DD-01	Reduce bed slope to 0.10%	\$1,218,968		\$1,218,968
2	DD-04	Move the eastern half of the channel next to the Loop 303 (all flows)	(\$6,425,000)		(\$6,425,000)
3	DD-05	Use concrete at the outlet in lieu of the curve	\$44,592		\$44,592
3	DD-06	Use boulders to dissipate energy at the outlet in lieu of the curve	\$353,592		\$353,592
3	DD-07	Use a drop structure at the outlet in lieu of the curve	\$292,592		\$292,592
3	DD-12	Vary the channel cross-section to protect existing trees - use a low flow channel	\$932,000		\$932,000
1	DD-13	Dispose of spoil north of the channel for future building pads	NOT COSTED		
2	DD-15	Buy the ranch on the west end to use the existing area as a basin to reduce flows - remove levee at the west end	DROPPED		
1	DD-16	Use basins on the north end to reduce flows for tributaries	\$2,024,659		\$2,024,659
2	DD-17	Install a supplemental channel along Loop 303	(\$3,887,360)		(\$3,887,360)
2	DD-26	Start Alternative 4 immediately after the road to eliminate possible levee conditions	DROPPED		
	<b>ME</b>	<b>Manage Erosion/Deposition</b>			
1	ME-03	Use rock mulch for side slopes	(\$1,877,336)		(\$1,877,336)
1	ME-06	Provide buffer areas to accommodate lateral migration	DROPPED		



**Value Analysis Study  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project**

Team No.	No.	Description	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
	<b>M</b>	<b>Miscellaneous</b>			
2	M-15	Define the 80-foot buffer zone on the south side	(\$196,000)		(\$196,000)

Additionally, the VA team identified 26 Design Suggestions (DS). These are recommendations to the design team and District and have not been developed further in this report. The District and the design team should review each of these to determine if they should be included in the design. The Design Suggestions are listed below:

No.	Description	Score
<b>DD</b>	<b>Drain Dam (Hydrology &amp; Hydraulics)</b>	
DD-11	Use vegetation as channel liner in lieu of earth	DS
DD-14	Reduce design flows	DS
DD-18	Design a more sinuous approach to the channel to reduce flows	DS
DD-19	Create a sinuous low flow channel	DS
DD-24	Use FLO-2D analysis to reduce flow	DS
DD-30	Use a range of Manning's roughness N-values	DS
<b>ME</b>	<b>Manage Erosion/Deposition</b>	
ME-01	Utilize bio-engineering erosion control techniques (ECT) for site stability - long term	DS
ME-05	Use bio-engineering for outlets - use natural approaches	DS
ME-08	Use natural existing cemented material for erosion protection	DS
ME-09	Use gabions with existing (natural) materials	DS
ME-10	Change slopes to 8:1 in lieu of 4:1	DS
ME-11	Use vegetation on side slopes	DS
ME-12	Salvage existing trees and use for landscape	DS
ME-13	Use Beardsley Canal or WWTP for irrigation of vegetation	DS
<b>M</b>	<b>Miscellaneous</b>	
M-02	Breach and regrade levee	DS
M-04	Use the outlet wash as a natural corridor for the community	DS
M-05	Evaluate how the stockpile areas will be established to ensure future use	DS
M-06	Ensure that the gas line location is properly identified	DS
M-07	Ensure all elements are adequately covered for power lines	DS
M-08	Consider construction areas adequately (access, laydown, etc.)	DS
M-09	More soil borings to be in the centerline of the work related to conditions	DS
M-10	Complete soil tests during design for vegetation uses	DS



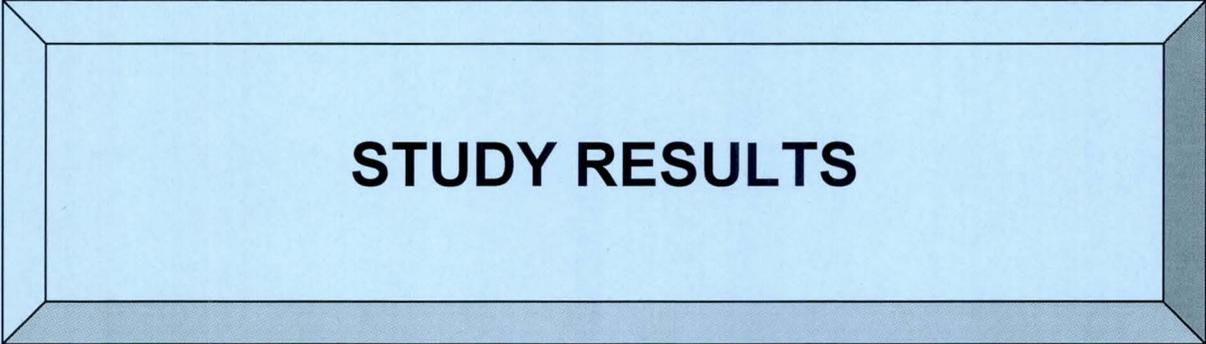
**Value Analysis Study  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project**

No.	Description	Score
M-11	Use CMAR delivery	DS
M-12	Accommodate wildlife corridor	DS
M-13	Provide interim (during construction) stormwater management information in the specials	DS
M-14	Analyze the hydrology and hydraulics between the Beardsley Canal and the channel	DS

Details of the VA alternatives can be found in the VA Workbooks section of this report. A presentation of the VA study recommendations and findings was given to Flood Control District of Maricopa County management team on October 16, 2014.

**VA Study Team**

- Bobbie Ohler, FCDMC – Project Manager
- Nasir Raza, Gannett Fleming – Designer
- Valerie Swick, FCDMC
- Mike Duncan, FCDMC
- Gary Wesch, FCDMC
- Richard Waskowsky, FCDMC
- Harry Cooper, FCDMC
- Frank Brown, FCDMC
- Shimin Li, FCDMC
- Mike Stanley, FCDMC
- Gary Shapiro, FCDMC
- Bing Zhao, FCDMC
- Renee Hoekstra, CVS, RHA, LLC – VA Team Leader
- Patrice Miller, AVS, RHA, LLC – Assistant VA Team Leader



**STUDY RESULTS**



## Value Analysis Study Flood Control District of Maricopa County McMicken Dam Outlet Channel Project

### Study Results

#### Introduction

The VA team developed 14 ideas as full alternatives. Descriptions of the completed alternatives immediately follow this page. The alternatives were developed and include, as needed, the following information:

- Original Concept
- Alternative Concept
- Advantages and Disadvantages of the Proposed Alternative
- Discussion / Justification
- Implementation Considerations
- Drawings for Baseline and Proposed Conditions

The following pages comprise the Workbooks that were completed for those ideas that were evaluated and selected from the Creative Idea list for further development. The full Creative Idea list can be found in the Support Data section of this report.

#### Selection of Ideas

The selection of ideas was completed in a two-step process. The first step was to identify those ideas that were the following:

DS = Design Suggestions (No Workbook Completed) – these are defined as additional comments to the project team for consideration in the design.

FF = Fatal Flaw – these alternatives are defined as not implementable.

OS = Out of Scope – these alternatives are defined as ideas that are not included in this scope of work.

ABC = Already Being Considered – these alternatives are defined as ideas that are currently being considered in the design approach.

The second step in the idea selection process was for the VA team to work upon a value index technique using the project goals, performance attributes and the workshop goals as a guide to rank the ideas that each VA team member thought provided the best value for the project. The complete discussion of the evaluation criteria is included in the Support Data section of this report.

VA WORKBOOKS:  
DRAIN DAM (HYDROLOGY & DRAINAGE)



**VALUE ENGINEERING PROPOSAL DD-01**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Reduce bed slope to 0.10%			
<b>FUNCTION:</b>		Drain Dam	
<b>BASELINE ASSUMPTION:</b>			
Current design uses an invert bed slope of 0.12%.			
<b>PROPOSED ALTERNATIVE:</b>			
Use an invert bed slope of 0.10% and eliminate the curve between stations 300+00 and 325+00.			
<b>BENEFITS</b>		<b>RISKS/CHALLENGES</b>	
<ul style="list-style-type: none"> <li>Eliminates the curve reducing the channel length by 500 ft.</li> </ul>		<ul style="list-style-type: none"> <li>Results in hydraulic drop at outlet to the wash needs approval by FCDMC engineering</li> </ul>	
<ul style="list-style-type: none"> <li>Results in reduced excavation quantity</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li>Results in reduced excavation into "hard dig" caliche</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li>Reduces erosion potential</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<b>COST SUMMARY</b>		<b>Initial Costs</b>	<b>O&amp;M Costs</b>
<b>BASELINE ASSUMPTION:</b>		\$ 9,365,196	\$ -
<b>PROPOSED ALTERNATIVE:</b>		\$ 8,146,228	\$ -
<b>TOTAL (Baseline less Proposed)</b>		\$ 1,218,968	\$ -
		<b>SAVINGS</b>	



**VALUE ENGINEERING PROPOSAL DD-01**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Reduce bed slope to 0.10%

**DISCUSSION/JUSTIFICATION:**

Alternative 3/4 hybrid design uses a 0.12% bed slope. Excavation depths range from 10 to over 12 feet deep, but normal depth required is only 6.7 to 7.27 feet and a freeboard of 2 feet. Deeper excavation may require more "hard dig" into caliche layers at a higher cost. Alternative 3/4 hybrid uses a wide curve to confluence with the existing wash, extending the length of the channel 500 feet. A milder slope of 0.10% is, by experience, non-erosive for most soils and reduces scour and sediment transport issues. Hydraulic analysis indicates that the same channel geometry can be used with the same bottom widths, but slightly higher flow depths (8 feet instead of 7 feet) while reducing excavation quantities as well as potentially reducing "hard dig" quantities. The milder grade allows for use of a 4-foot hydraulic drop at the outlet to the wash to dissipate energy and momentum while turning the flows 90 degrees.

**IMPLEMENTATION CONSIDERATIONS:**

There will be a need to add aesthetic treatments to the hydraulic drop.

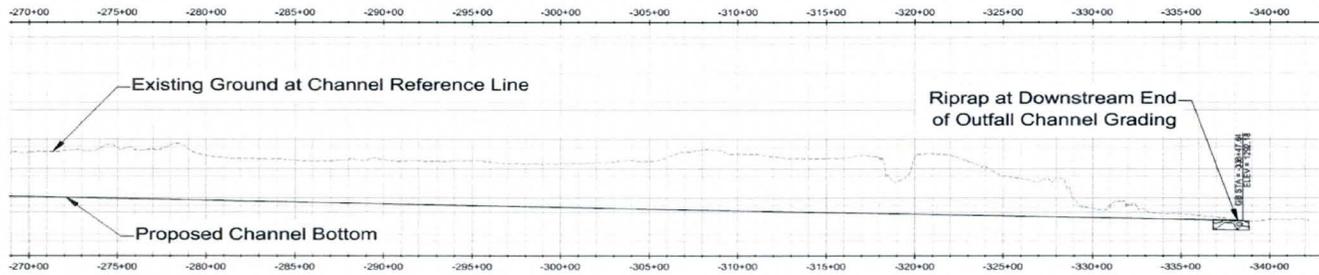
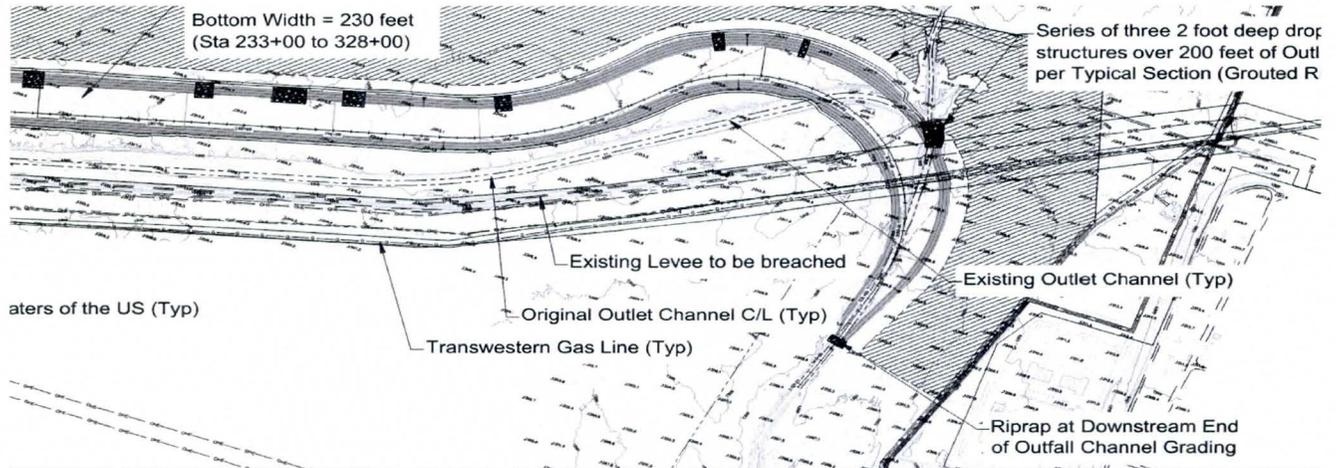




**VALUE ENGINEERING PROPOSAL DD-01**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Reduce bed slope to 0.10%

**SKETCH OF BASELINE**





**VALUE ENGINEERING PROPOSAL DD-01**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

TITLE: Reduce bed slope to 0.10%

SKETCH OF PROPOSED ALTERNATIVE

DD-01 (PROPOSED)	S=0.0012 BASELINE BW	$V_n$	Excavated dept.	S=0.001	BW	$V_n$	10	4:1
4450	100	7.27	12.5'-ft	100	8	10	4:1	
7025	170	7.18	12.5'	170	8	10	4:1	
9090	250	6.70	10	250	8	10	4:1	



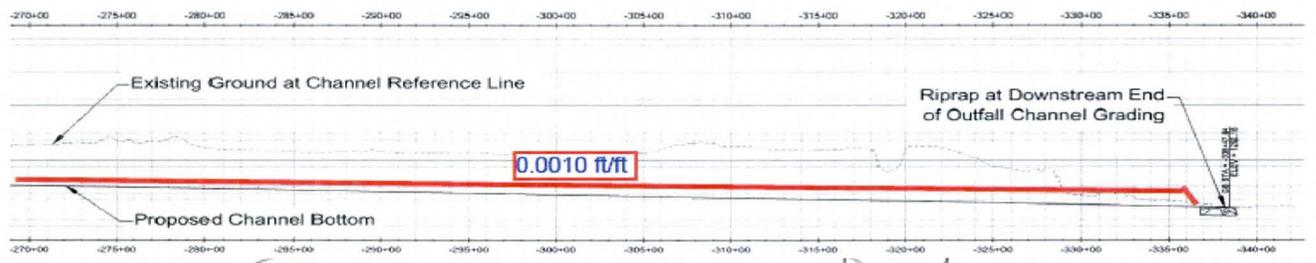
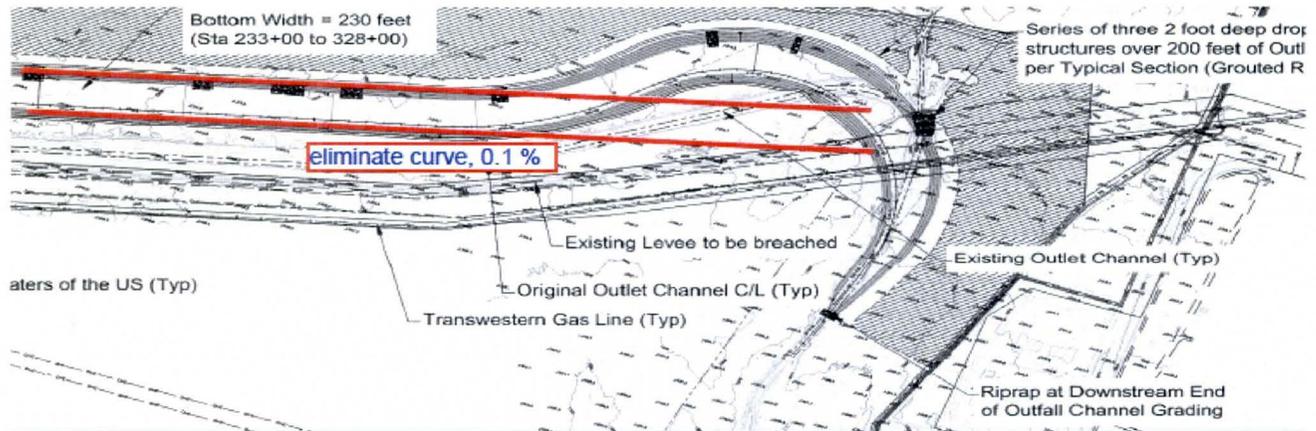
$$\frac{4.4 \times 22,000 \times 170}{2} = 304,741 \times 4 = 1,218,963$$



**VALUE ENGINEERING PROPOSAL DD-01**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Reduce bed slope to 0.10%

**SKETCH OF PROPOSED ALTERNATIVE**







**VALUE ENGINEERING PROPOSAL DD-04**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Move the eastern half of the channel next to the Loop 303 (all flows)

**FUNCTION:** **Drain Dam**

**DISCUSSION/JUSTIFICATION:**

By moving the Outlet Channel south towards Loop 303, there is a possibility to provided continuous saleable property north of the realigned channel, which also releases more excess land of greater value for sale. The additional cost for purchasing land and crossing the Transwestern Gas line offsets the release of excess land. The net cost for the proposed alternative is more than the cost for the current Alternative 4/3 hybrid Alignment Outlet Channel, as noted on the detailed cost sheet. In order to review this further, there is a need to determine footprint of the Loop 303/El Mirage Rd traffic interchange. We have assumed current channel geometry. However the ground is lower to the south therefore channel geometry would need to reevaluated.

Based on above discussion, the proposed alternative is not recommended for further consideration.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.



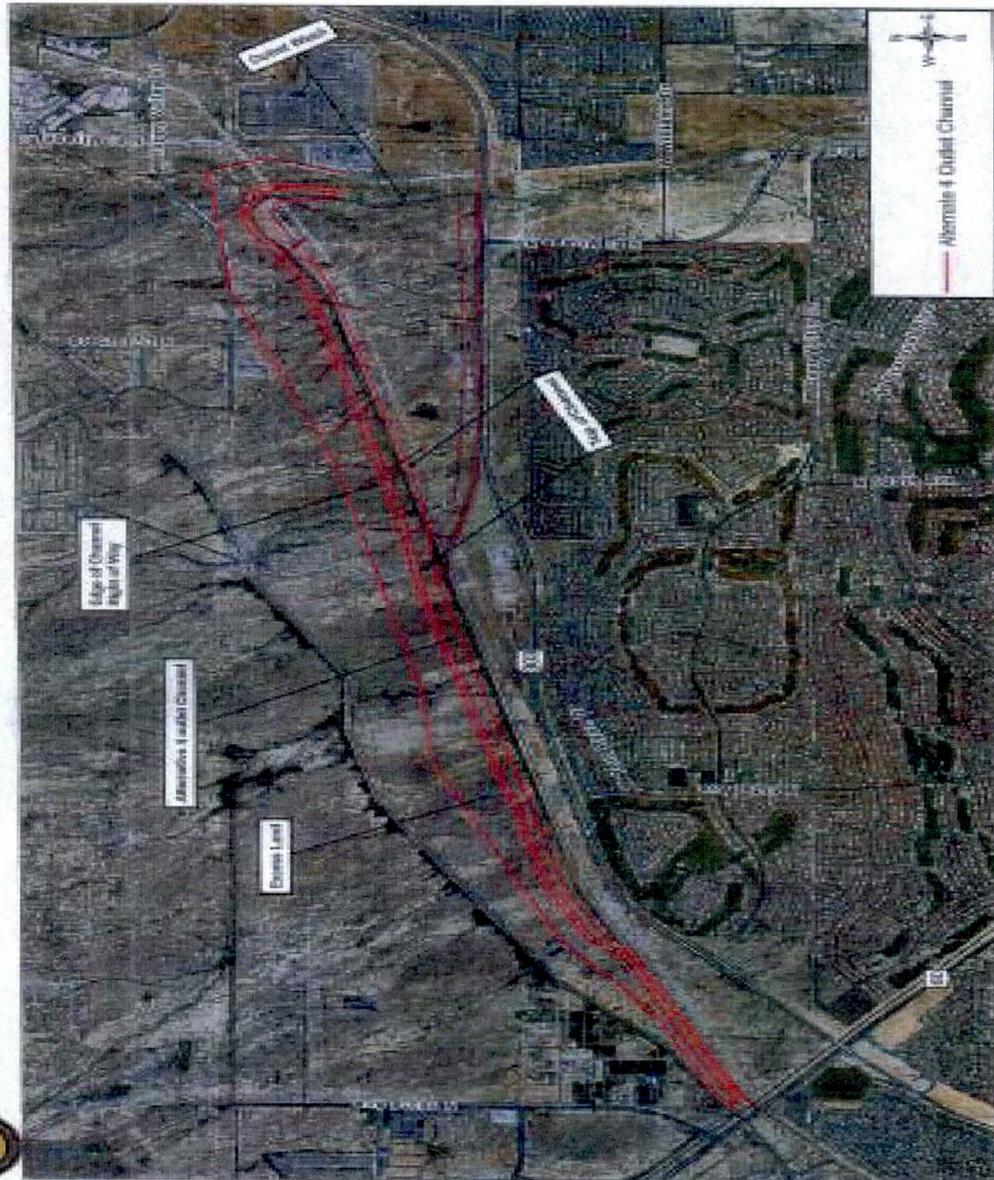


**VALUE ENGINEERING PROPOSAL DD-04**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Move the eastern half of the channel next to the Loop 303 (all flows)

**SKETCH OF PROPOSED ALTERNATIVE**

*Proposed*  
DD-4  
McMicken Dam Outlet Channel - Alternative 4







**VALUE ENGINEERING PROPOSAL DD-05**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use concrete at the outlet in lieu of the curve

**DISCUSSION/JUSTIFICATION:**

Alternative 3/4 hybrid uses a wide curve to confluence with the existing wash, extending the length of the channel 500 feet. Aligning the channel parallel to the levee reduces the channel length 500 feet and reduces excavation costs. To turn the flows 90 degrees, it is recommended to use a concrete structure, such as multiple-vaned training walls on a concrete slab.

**IMPLEMENTATION CONSIDERATIONS:**

Need to avoid power towers.



**VALUE ENGINEERING PROPOSAL DD-05**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use concrete at the outlet in lieu of the curve

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
		Unit	Qty	Unit Cost \$	TOTAL \$	Qty	Unit Cost \$	TOTAL \$
Description	%							
Channel excavation					9,365,196			8,872,604
Concrete structure								448,000
					9,365,196			9,320,604
<b>(BASELINE LESS PROPOSED)</b>								<b>44,592</b>

\*Note: Costs are rounded to nearest thousand dollars.

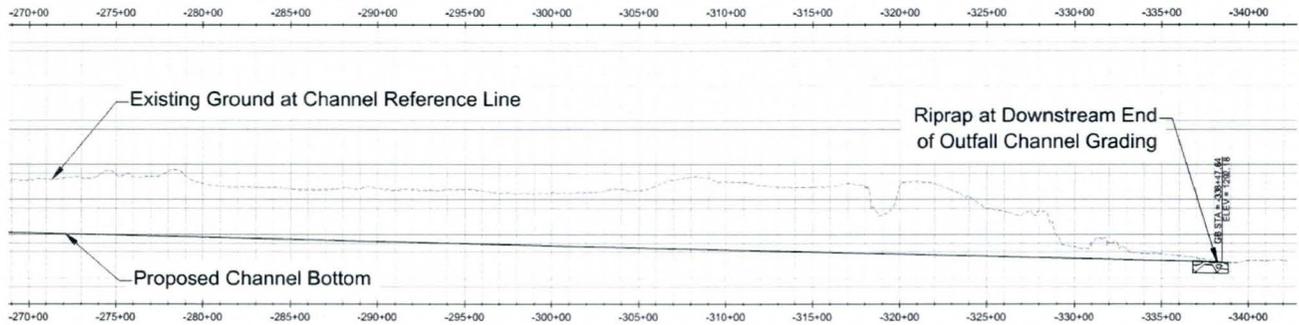
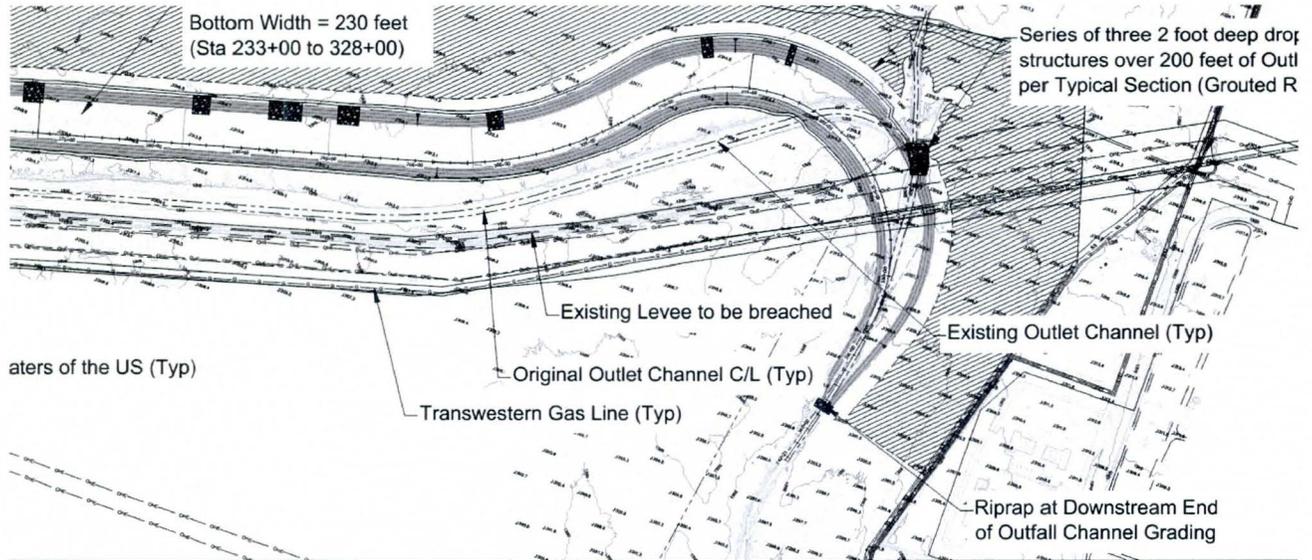
**SAVINGS**



**VALUE ENGINEERING PROPOSAL DD-05**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use concrete at the outlet in lieu of the curve

**SKETCH OF BASELINE**

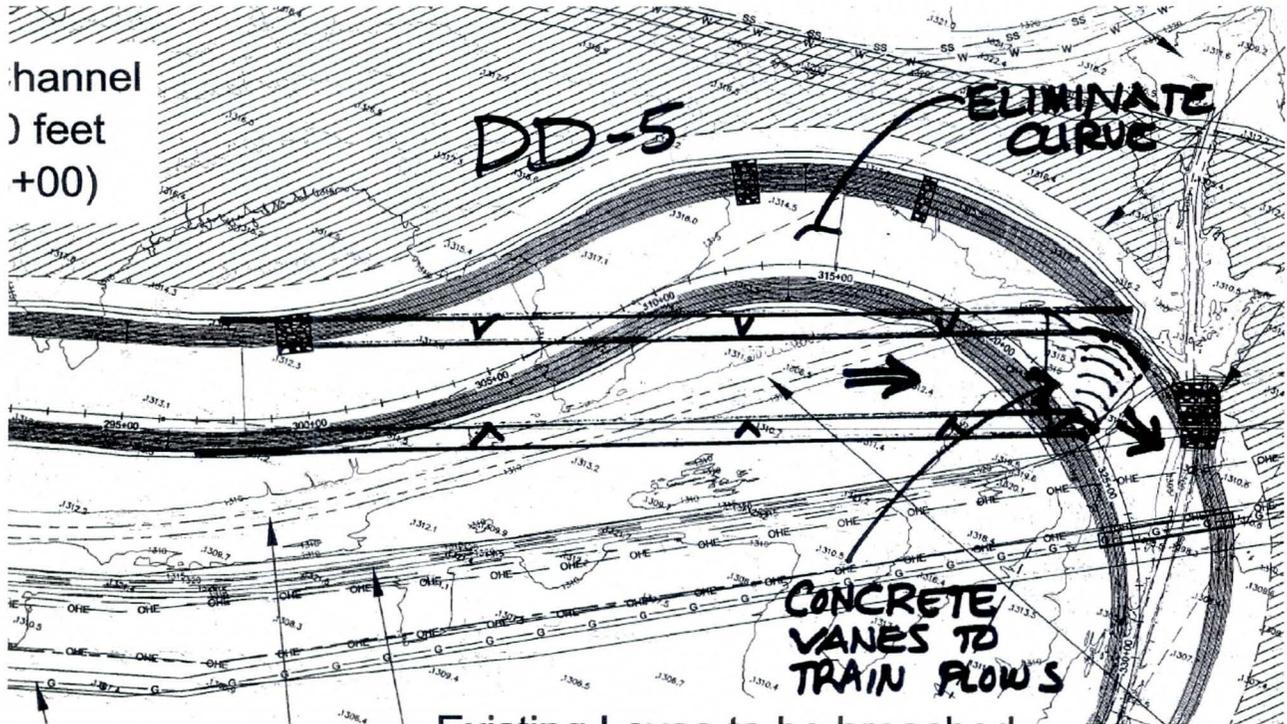




**VALUE ENGINEERING PROPOSAL DD-05**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Use concrete at the outlet in lieu of the curve

**SKETCH OF PROPOSED ALTERNATIVE**







**VALUE ENGINEERING PROPOSAL DD-06**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use boulders to dissipate energy at the outlet in lieu of the curve

**DISCUSSION/JUSTIFICATION:**

Alt ernative 3/4 hybrid uses a wide curve to confluence with the existing wash, extending the length of the channel 500 feet. Aligning the channel parallel to the levee reduces the channel length 500 feet and reduces excavation costs. It is recommended that to turn the flows 90 degrees, use a large boulder field set atop rip rap and a rip rap or gabion mattress at the opposite channel slope.

**IMPLEMENTATION CONSIDERATIONS:**

Need to avoid power towers.



**VALUE ENGINEERING PROPOSAL DD-06**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use boulders to dissipate energy at the outlet in lieu of the curve

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE				
		Description	%	Unit	Qty	Unit Cost \$	TOTAL \$	Qty	Unit Cost \$	TOTAL \$
Channel excavation				CY		4.00	9,365,196		4.00	8,872,604
Boulders										12,000
D50 12-inch rip rap with filter fabric										127,000
							9,365,196			9,011,604
<b>(BASELINE LESS PROPOSED)</b>										<b>353,592</b>

\*Note: Costs are rounded to nearest thousand dollars.

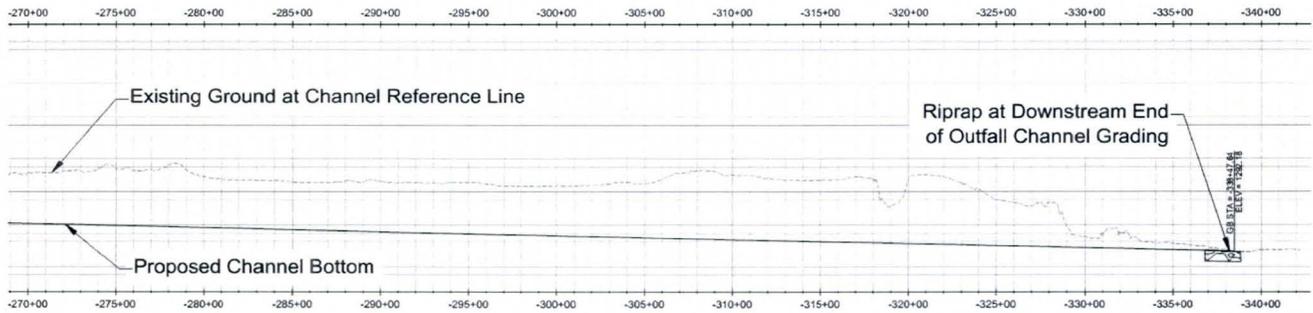
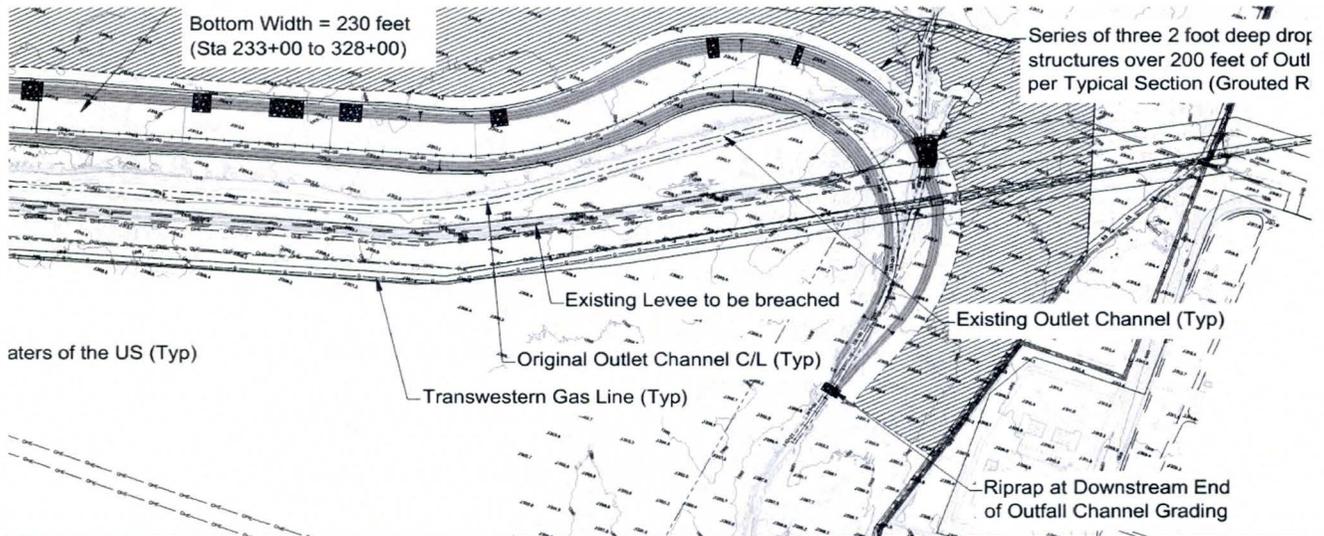
**SAVINGS**



**VALUE ENGINEERING PROPOSAL DD-06**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Use boulders to dissipate energy at the outlet in lieu of the curve

**SKETCH OF BASELINE**

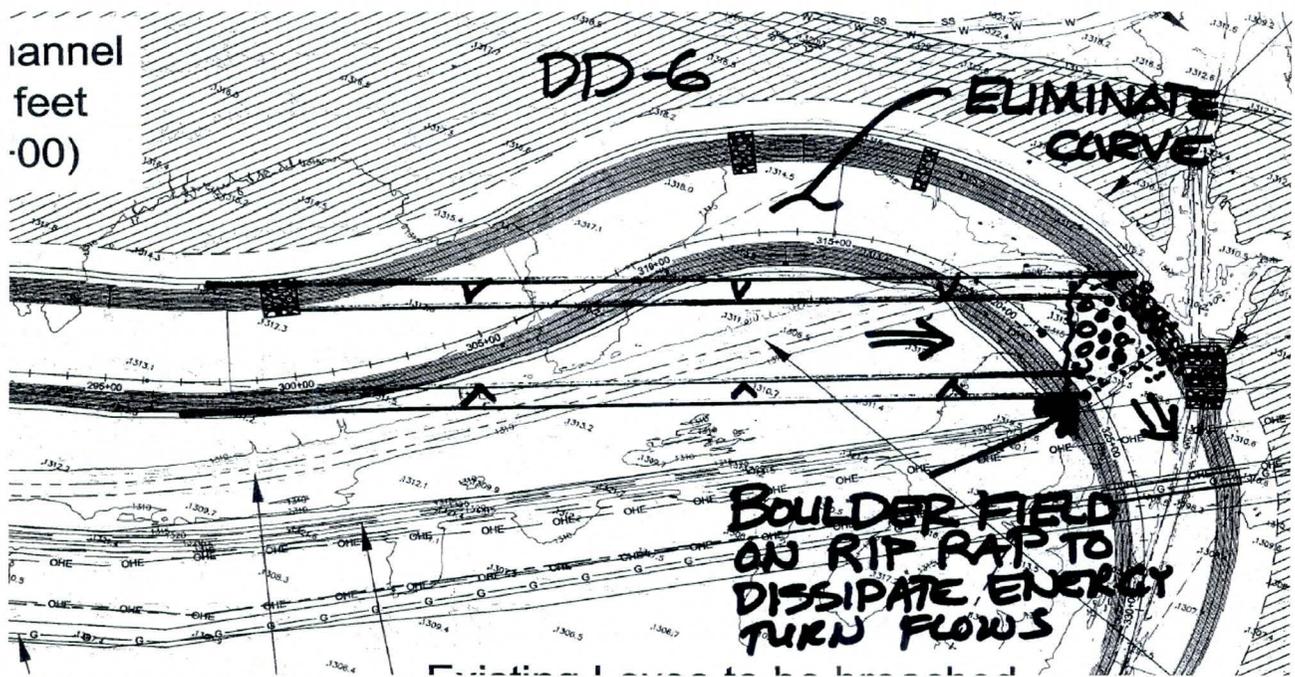




**VALUE ENGINEERING PROPOSAL DD-06**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Use boulders to dissipate energy at the outlet in lieu of the curve

**SKETCH OF PROPOSED ALTERNATIVE**







**VALUE ENGINEERING PROPOSAL DD-07**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use a drop structure at the outlet in lieu of the curve

**DISCUSSION/JUSTIFICATION:**

The baseline adds a curve to the existing channel to approach the wash with an acceptable radius and angle. This proposal replaces the curve with a concrete drop structure.

**IMPLEMENTATION CONSIDERATIONS:**

Need to avoid electrical power towers.



**VALUE ENGINEERING PROPOSAL DD-07**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use a drop structure at the outlet in lieu of the curve

DESIGN ELEMENT Description	Markup %	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
		Unit	Qty	Unit Cost \$	TOTAL \$	Qty	Unit Cost \$	TOTAL \$
Channel excavation					9,365,196			8,872,604
Concrete drop structure								200,000
					9,365,196			9,072,604
<b>(BASELINE LESS PROPOSED)</b>								<b>292,592</b>

\*Note: Costs are rounded to nearest thousand dollars.

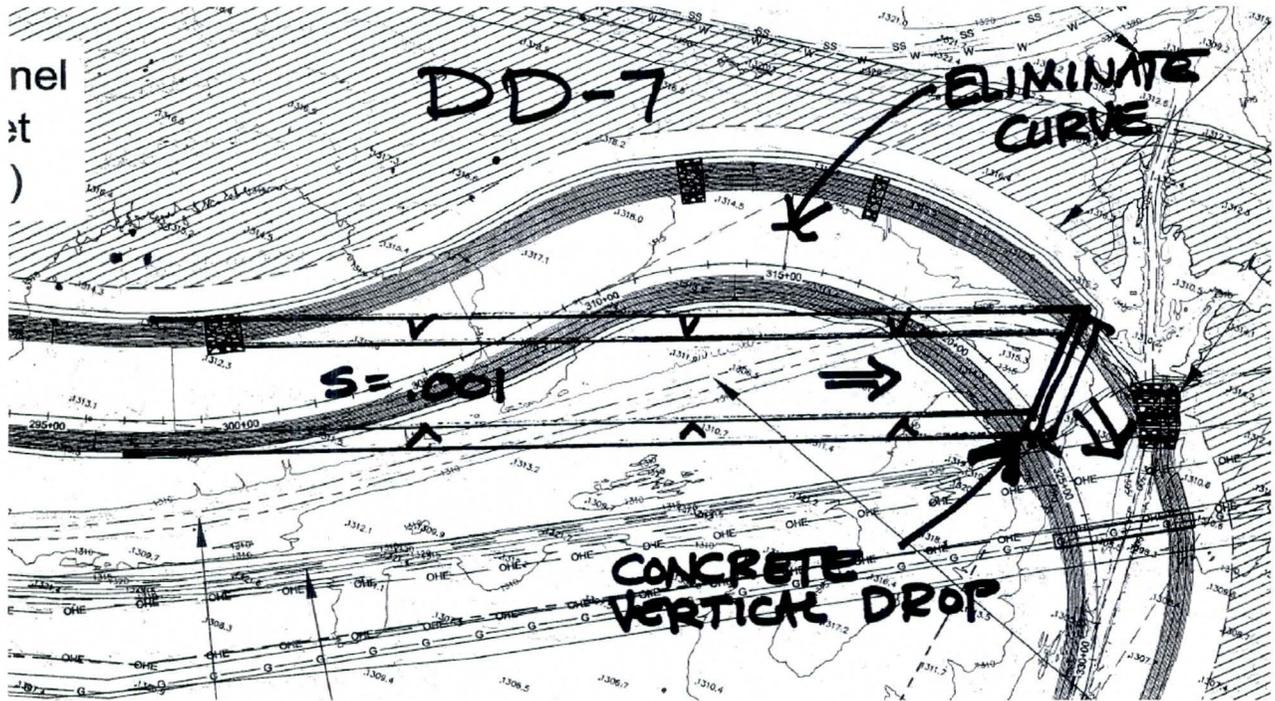
**SAVINGS**



**VALUE ENGINEERING PROPOSAL DD-07**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Use a drop structure at the outlet in lieu of the curve

**SKETCH OF PROPOSED ALTERNATIVE**





**VALUE ENGINEERING PROPOSAL DD-12**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Vary the channel cross section to protect existing trees - use a low flow channel																							
<b>FUNCTION:</b> Drain Dam																							
<b>BASELINE ASSUMPTION:</b>																							
From Sta 235+00 to Sta 305+00 (where WAPA lines have left the District right of way) the baseline assumes that the channel will move south to be adjacent or closer to the levee toe. This will require removal of the line of existing native trees that provide natural landscaping and habitat.																							
<b>PROPOSED ALTERNATIVE:</b>																							
Avoid removal of the trees by retaining the existing low-flow channel to convey a portion of the flow and begin excavation for the main channel north of the trees.																							
<b>BENEFITS</b>		<b>RISKS/CHALLENGES</b>																					
<ul style="list-style-type: none"> <li>Preserves existing landscaping and habitat</li> </ul>		<ul style="list-style-type: none"> <li>Could decrease amount of excess land for sale</li> </ul>																					
<ul style="list-style-type: none"> <li>Aesthetically pleasing, multi-channel terrace</li> </ul>		<ul style="list-style-type: none"> <li>Slightly more complicated design</li> </ul>																					
<ul style="list-style-type: none"> <li>Lower excavation cost due to flatter slope</li> </ul>		<ul style="list-style-type: none"> <li>More complicated construction</li> </ul>																					
<ul style="list-style-type: none"> <li>Maintains the levee buffer on south side</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>																					
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>																					
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>																					
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<table border="1"> <thead> <tr> <th colspan="2">COST SUMMARY</th> <th>Initial Costs</th> <th>O&amp;M Costs</th> <th>Total Life Cycle Cost</th> </tr> </thead> <tbody> <tr> <td colspan="2"><b>BASELINE ASSUMPTION:</b></td> <td>\$ 9,365,137</td> <td>\$ -</td> <td>\$ 9,365,137</td> </tr> <tr> <td colspan="2"><b>PROPOSED ALTERNATIVE:</b></td> <td>\$ 8,433,137</td> <td>\$ -</td> <td>\$ 8,433,137</td> </tr> <tr> <td colspan="2"><b>TOTAL (Baseline less Proposed)</b></td> <td>\$ 932,000</td> <td>\$ -</td> <td>\$ <b>932,000</b></td> </tr> </tbody> </table>				COST SUMMARY		Initial Costs	O&M Costs	Total Life Cycle Cost	<b>BASELINE ASSUMPTION:</b>		\$ 9,365,137	\$ -	\$ 9,365,137	<b>PROPOSED ALTERNATIVE:</b>		\$ 8,433,137	\$ -	\$ 8,433,137	<b>TOTAL (Baseline less Proposed)</b>		\$ 932,000	\$ -	\$ <b>932,000</b>
COST SUMMARY		Initial Costs	O&M Costs	Total Life Cycle Cost																			
<b>BASELINE ASSUMPTION:</b>		\$ 9,365,137	\$ -	\$ 9,365,137																			
<b>PROPOSED ALTERNATIVE:</b>		\$ 8,433,137	\$ -	\$ 8,433,137																			
<b>TOTAL (Baseline less Proposed)</b>		\$ 932,000	\$ -	\$ <b>932,000</b>																			
<b>SAVINGS</b>																							



**VALUE ENGINEERING PROPOSAL DD-12**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Vary the channel cross section to protect existing trees - use a low flow channel

**DISCUSSION/JUSTIFICATION:**

For the reach of channel downstream of where the WAPA lines leave the District right of way, the baseline project currently moves the channel adjacent to the toe of the levee. This will result in removal of the line of trees that provides landscaping and habitat. This proposal preserves the existing trees by splitting the channel; the conveyance would retain the existing low-flow channel and a new main branch of channel, beginning just north of the tree line. The tree line would be an "island" between the two channel branches, which would be connected in some locations. Although this could decrease the amount of excess right of way, the 100-foot buffer area on the north side could be decreased to compensate the right of way. This proposal assumes a channel invert of 0.001, which decreases the excavation quantity.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.

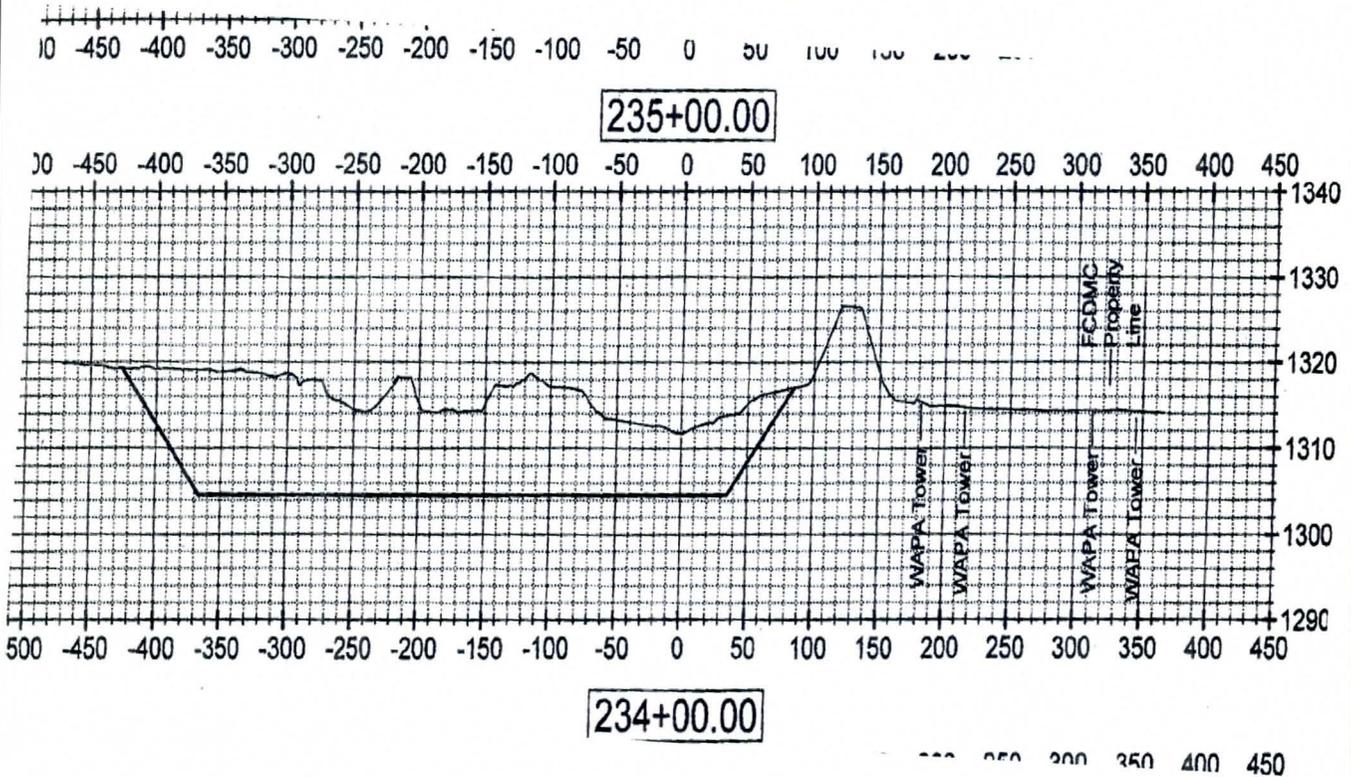




**VALUE ENGINEERING PROPOSAL DD-12**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Vary the channel cross section to protect existing trees - use a low flow channel

**SKETCH OF BASELINE**







**VALUE ENGINEERING PROPOSAL DD-13**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Dispose of spoil north of the channel for future building pads	
<b>FUNCTION:</b> Drain Dam	
<b>BASELINE ASSUMPTION:</b> The baseline has not specifically outlined the use of the spoil material for the channel.	
<b>PROPOSED ALTERNATIVE:</b> There are five possible scenarios for disposal of excess material.	
<b>BENEFITS</b>	<b>RISKS/CHALLENGES</b>
<ul style="list-style-type: none"> <li>Provides for opportunities to eliminate spoil</li> </ul>	<ul style="list-style-type: none"> <li>Need to ensure that excavation and haul occurs only within the footprint of intended design</li> </ul>
<ul style="list-style-type: none"> <li>Additional excess land becomes more valuable and appealing for purchase by private developer, by removing the property from the floodplain</li> </ul>	<ul style="list-style-type: none"> <li>Pad development on saleable lands could requires engineered fill, construction oversight and design work related to existing wash and flow direction</li> </ul>
<ul style="list-style-type: none"> <li>Minimizes haul distance and disposal location by placing excess material on District property</li> </ul>	<ul style="list-style-type: none"> <li>Additional oversight is needed from FCDMC</li> </ul>
<ul style="list-style-type: none"> <li>Helps to maintain the existing vegetation and increases the buffer</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
<ul style="list-style-type: none"> <li>Stockpile materials are still available for future sell off</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>



**VALUE ENGINEERING PROPOSAL DD-13**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Dispose of spoil north of the channel for future building pads

**DISCUSSION/JUSTIFICATION:**

Due to complications related to possible scenarios within this alternative discussion, each of the proposed alternatives are costed individually below: 1) ADOT is proposing to excavate and use nearly 350,000 CY, but the District will need to have diligent observation during their work - The excavation and haul would be at no cost to the project. However, the costs associated with prepping the site for their efforts requires; Survey = \$10k and construction observation and resurvey = \$3000; 2) MCDOT may propose using 267,000 CY of excess material to fill their borrow pit from earlier L303 construction. They will excavate and haul their portion. This will require the same efforts as the ADOT work as discussed above, but there may be less construction observation and survey costs; 3) Saleable land pads development - The proposal is to stockpile, levee/channel fill and provide saleable land pad plating. This will require construction to excavate and haul during this project scope. Placing excess material on saleable lands will increase its value by moving the land out of the floodplain. However, this may require engineered fill; 4) Stockpile the excess material on saleable la

Excess material placement cost cannot be determined at this time, since it is a combination of all 5 scenarios. Baseline a

**IMPLEMENTATION CONSIDERATIONS:**

CLOMR/LOMR will be required if built-up pads are provided on saleable land. Investigate if engineered fill is required to get the best land sale price.



**VALUE ENGINEERING PROPOSAL DD-15**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Buy the ranch on the west end to use the existing area as a basin to reduce flows - remove levee at the west end	
<b>FUNCTION:</b> Drain Dam	
<b>BASELINE ASSUMPTION:</b> Current excavation of the Outlet Channel Alternative 4/3 hybrid is north of the existing levee.	
<b>PROPOSED ALTERNATIVE:</b> Provide a detention basin in the Ranch property to reduce the peak flow and consequently reduce the downstream outlet channel size.	
<b>BENEFITS</b>	<b>RISKS/CHALLENGES</b>
<ul style="list-style-type: none"> <li>• Reduces the downstream outlet channel construction cost</li> </ul>	<ul style="list-style-type: none"> <li>• The need to purchase additional right-of-way</li> </ul>
<ul style="list-style-type: none"> <li>• Reduces potential erosion in the downstream outlet channel</li> </ul>	<ul style="list-style-type: none"> <li>• The purchased area may not have adequate storage volume; further hydrologic/hydraulic analysis will be needed</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Additional cost will be incurred in crossing the Transwestern gas line</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
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<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

**DROPPED**



**VALUE ENGINEERING PROPOSAL DD-15**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Buy the ranch on the west end to use the existing area as a basin to reduce flows - remove levee at the west end

**DISCUSSION/JUSTIFICATION:**

The available Ranch area is not sufficient to accommodate the required storage volume for the proposed detention basin in order to reduce the outlet discharge to the McMicken Dam principal outlet discharge of 4450 cfs.

The available Ranch area is 26 acres. The storage volume was calculated for the difference of the peak flows 7045 cfs (current flow in the outlet channel at the Ranch site) and 4450 cfs (McMicken Dam principal outlet discharge) over 6 hours. This results in a required storage volume of 643 acre-foot. For a 12 foot deep basin with 8H:1V side slopes, the storage volume available is only 260 acre-foot. With this 260 acre-foot storage, the outflow is reduced by only 1048 cfs instead of the required reduction of 2595 cfs.

Technically this alternative is not feasible. Therefore this alternative is not recommended for any further consideration.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.





**VALUE ENGINEERING PROPOSAL DD-16**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Use basins on the north end to reduce flows for tributaries			
<b>FUNCTION:</b>		<b>Drain Dam</b>	
<b>BASELINE ASSUMPTION:</b>			
The current Alternative 3/4 hybrid is a channel.			
<b>PROPOSED ALTERNATIVE:</b>			
The proposal recommends using basins within the project area to reduce design flows in the excavated channel.			
<b>BENEFITS</b>		<b>RISKS/CHALLENGES</b>	
<ul style="list-style-type: none"> <li>Reduces excavation of the channel</li> </ul>		<ul style="list-style-type: none"> <li>The existing levee must remain and may need reinforcement depending on basin water surface elevation</li> </ul>	
<ul style="list-style-type: none"> <li>Only requires a small amount of additional excavation if the proposed basins are located in the existing channel</li> </ul>		<ul style="list-style-type: none"> <li>Needs 50 to 80 feet of setback from the major power transmission towers</li> </ul>	
<ul style="list-style-type: none"> <li>Provides more land available for sale north of the new channel</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li>Better use of the existing channel land area</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li>Reduced flow in the channel will reduce erosion in the channel</li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<ul style="list-style-type: none"> <li></li> </ul>		<ul style="list-style-type: none"> <li></li> </ul>	
<b>COST SUMMARY</b>		<b>Initial Costs</b>	<b>O&amp;M Costs</b>
<b>BASELINE ASSUMPTION:</b>	\$ 7,783,467	\$ -	\$ 7,783,467
<b>PROPOSED ALTERNATIVE:</b>	\$ 5,758,808	\$ -	\$ 5,758,808
<b>TOTAL (Baseline less Proposed)</b>	\$ 2,024,659	\$ -	\$ 2,024,659
			<b>SAVINGS</b>



**VALUE ENGINEERING PROPOSAL DD-16**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use basins on the north end to reduce flows for tributaries

**DISCUSSION/JUSTIFICATION:**

Use basins within the project area to reduce design flows in the excavated channel. To reduce excavation of offline basins and increase the amount of saleable land, the basins could be located in the footprint of the existing channel. These basins/channels should be optimized with more refined modeling such as unsteady HEC-RAS. This modeling would account for the storage in the flat, very long outlet channel. The basins could be located within the footprint of the existing outlet channel since this right of way will not be sold and is already partially excavated. The advantage may save new channel costs by using as much of the existing channel possible downstream of Padelford Wash. Sediment basins could be included at the outlets of the existing washes before entering the new channel. Groundwater recharge basins could also be incorporated into the offline basins. The reduction in the size of the channel will provide additional acreage north of the new channel to be available for sale and an increase in revenues to the District. See "Proposed Sketches" for computations.

**IMPLEMENTATION CONSIDERATIONS:**

Requires CLOMR/LOMR for revised floodplain delineation.





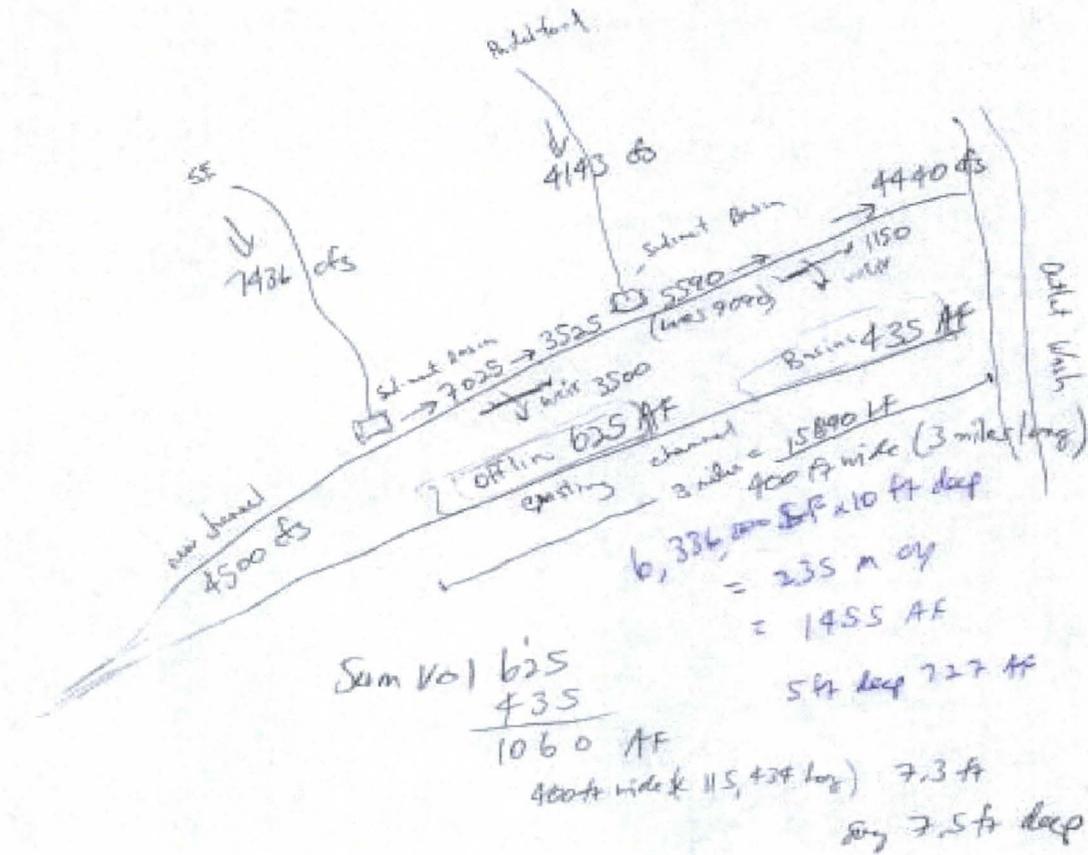
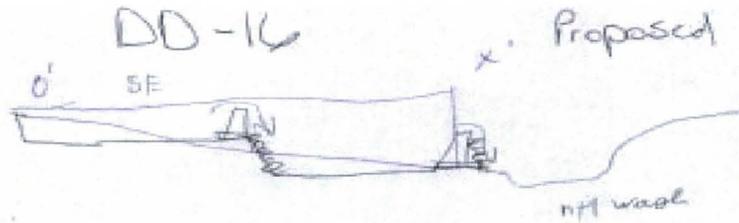
**VALUE ENGINEERING PROPOSAL DD-16**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use basins on the north end to reduce flows for tributaries

**SKETCH OF PROPOSED ALTERNATIVE**

Creative Ideas:

SE





**VALUE ENGINEERING PROPOSAL DD-16**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use basins on the north end to reduce flows for tributaries

**SKETCH OF PROPOSED ALTERNATIVE**

**Kenneth Rakestraw - FCDX**

**From:** Kenneth Rakestraw - FCDX  
**Sent:** Thursday, October 16, 2014 7:19 AM  
**To:** Frank Brown - FCDX  
**Cc:** Bobbie Ohler - FCDX  
**Subject:** RE: hydrology facts at McMicken Outlet Channel

Frank,  
 Following is the data you requested.

*13.25 hrs (time of peak)*

- 1) Wash 5E, Concentration Point 600 (before reaching outlet channel), Qpeak= 7436 cfs, 72-hr volume= 2658 AF
- 2) Padelford Wash, Concentration Point 710 (before reaching outlet channel), Qpeak= 4143 cfs, 72-hr volume=4121 AF

*13.50 hrs  
(time of peak)*

Ken Rakestraw  
 Hydrologist  
 Flood Control District of Maricopa County  
 602-506-2201

**From:** Frank Brown - FCDX  
**Sent:** Wednesday, October 15, 2014 5:21 PM  
**To:** Kenneth Rakestraw - FCDX  
**Cc:** Bobbie Ohler - FCDX  
**Subject:** hydrology facts at McMicken Outlet Channel

Ken, I could use the following data:

For the 2 main tributaries to the outlet channel, namely Wash 5E and Padelford Wash:

The peak flow rate for each tributary wash, before it joins with the outlet channel.

The total hydrograph volume for each tributary wash, before it joins with the outlet channel.

This will greatly assist me and my team for the conceptual design of some storage basins for these 2 tributaries.

Please email to me, or send write down and I will pick up tomorrow on a break from the VA workshop.

Frank Brown, P.E., CFM  
 Flood Control District of Maricopa County  
 (602) 506-4617  
[Frank.Brown@fcd.maricopa.gov](mailto:Frank.Brown@fcd.maricopa.gov)

Send us your feedback! [www.fcd.maricopa.gov/feedback](http://www.fcd.maricopa.gov/feedback)



**VALUE ENGINEERING PROPOSAL DD-16**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

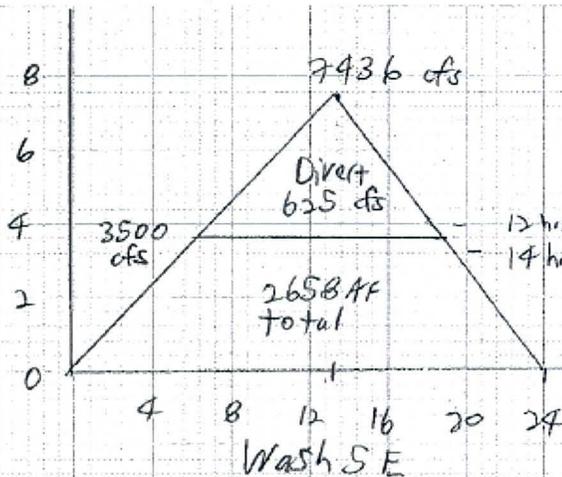
TITLE: Use basins on the north end to reduce flows for tributaries

**SKETCH OF PROPOSED ALTERNATIVE**



**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**

PROJECT In Line Basins within ex.isting channel PAGE DD-21 OF       
 DETAIL      COMPUTED FRB DATE 16 Oct 2014  
 CHECKED BY      DATE     



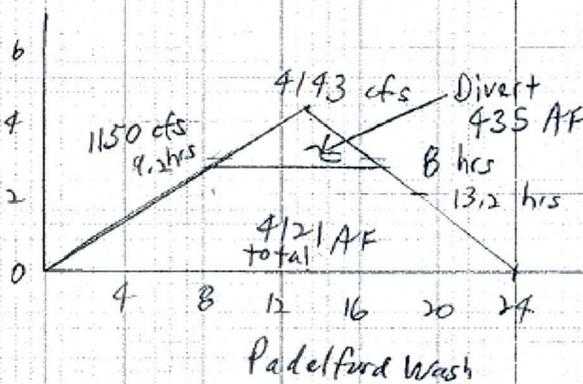
Direct top of hydrograph into  

$$Volume = 3500 \frac{ft^3}{Sec} \left( \frac{3600sec}{hr} \right) 12 \text{ hrs of top } \left( \frac{1}{2} \right)$$

$$Vol = \text{above } \left( \frac{1 \text{ acre}}{43560 ft^2} \right) = 1735 \text{ AF}$$

[reduce by 0.36 factor of triangular vs. true hydrograph shape, 2658 for HEC-1 Vol]  $\frac{2658}{7375}$   

$$Vol = \frac{625 \text{ AF}}{7375}$$
  
 7436 cfs in  
 - 3500 cfs Direct to basin, 625 AF store  
 3936 cfs channel remainder



$$Vol = 1150 \frac{ft^3}{Sec} \left( \frac{3600sec}{hr} \right) 8.2 \text{ hrs of top } \left( \frac{1}{2} \right)$$

$$Vol = \text{above } \left( \frac{1 \text{ acre}}{43560 ft^2} \right) = 435 \text{ AF}$$

reduce by 0.997 factor triangle  $\frac{4108}{4121}$  true  
 4143 cfs in  
 - 1150 cfs Direct to basin, 435 AF store  
 2993 cfs channel remainder





**VALUE ENGINEERING PROPOSAL DD-17**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Install a supplemental channel along the Loop 303

**DISCUSSION/JUSTIFICATION:**

By providing a supplemental channel (to the existing Outlet Channel), south towards Loop 303, additional land would need to be purchased between Loop 303 and the existing Outlet Channel. The existing outlet channel will need to be improved/upsized to accommodate the Padelford Wash flows (100 year flow is 4143 cfs). Also the remnant land between the supplemental channel and existing outlet channel is not contiguous to other saleable property. The additional cost for purchasing land and crossing the Transwestern gas line is more than the cost for the current Alternative 4/3 hybrid Alignment Outlet Channel.

Based on above discussion, the proposed alternative is not recommended for further consideration.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.



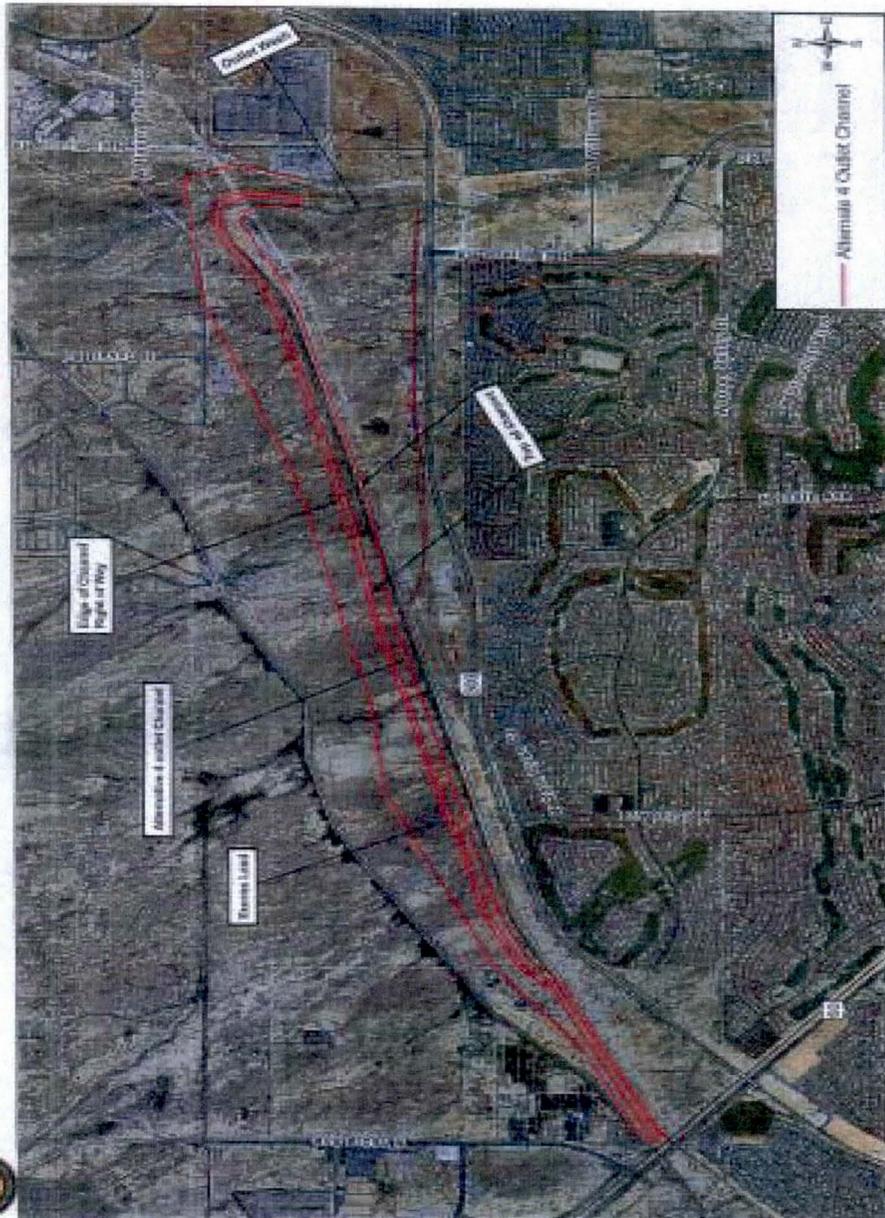


**VALUE ENGINEERING PROPOSAL DD-17**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Install a supplemental channel along the Loop 303

**SKETCH OF PROPOSED ALTERNATIVE**

*Proposed*  
McMicken Dam Outlet Channel - Alternative 4 DD-17





**VALUE ENGINEERING PROPOSAL DD-26**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Start Alternative 4 immediately after the road to eliminate possible levee conditions	
<b>FUNCTION:</b> Miscellaneous	
<b>BASELINE ASSUMPTION:</b> Outlet Channel Alternative 4 begins at Sta 111+00.	
<b>PROPOSED ALTERNATIVE:</b> Change the start of the Alternative to begin at Sta 105+00.	
<b>BENEFITS</b>	<b>RISKS/CHALLENGES</b>
<ul style="list-style-type: none"> <li>• Potentially eliminates levee condition for 4450 cfs</li> </ul>	<ul style="list-style-type: none"> <li>• 100 year flow is about 2800 cfs which is likely to be below natural grade</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Changing alignment earlier would increase excavation and construction cost with no regulatory benefit</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Transmission tower at Sta 108+00 precludes shifting Alternative 4 turnoff earlier/upstream</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

**DROPPED**



**VALUE ENGINEERING PROPOSAL DD-26**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Start Alternative 4 immediately after the road to eliminate possible levee conditions

**DISCUSSION/JUSTIFICATION:**

This alternative does not need to be considered further because FEMA regulatory concerns are likely to be satisfied with the 100 year flow (2800 cfs) depth which is below the design flow (4450 cfs) depth. FEMA would not consider this channel segment as a levee condition as the 100 year flow is below natural grade. Consequently, quantities and costs for implementation of this alternative were not estimated.

This alternative is to be dropped for further consideration.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.

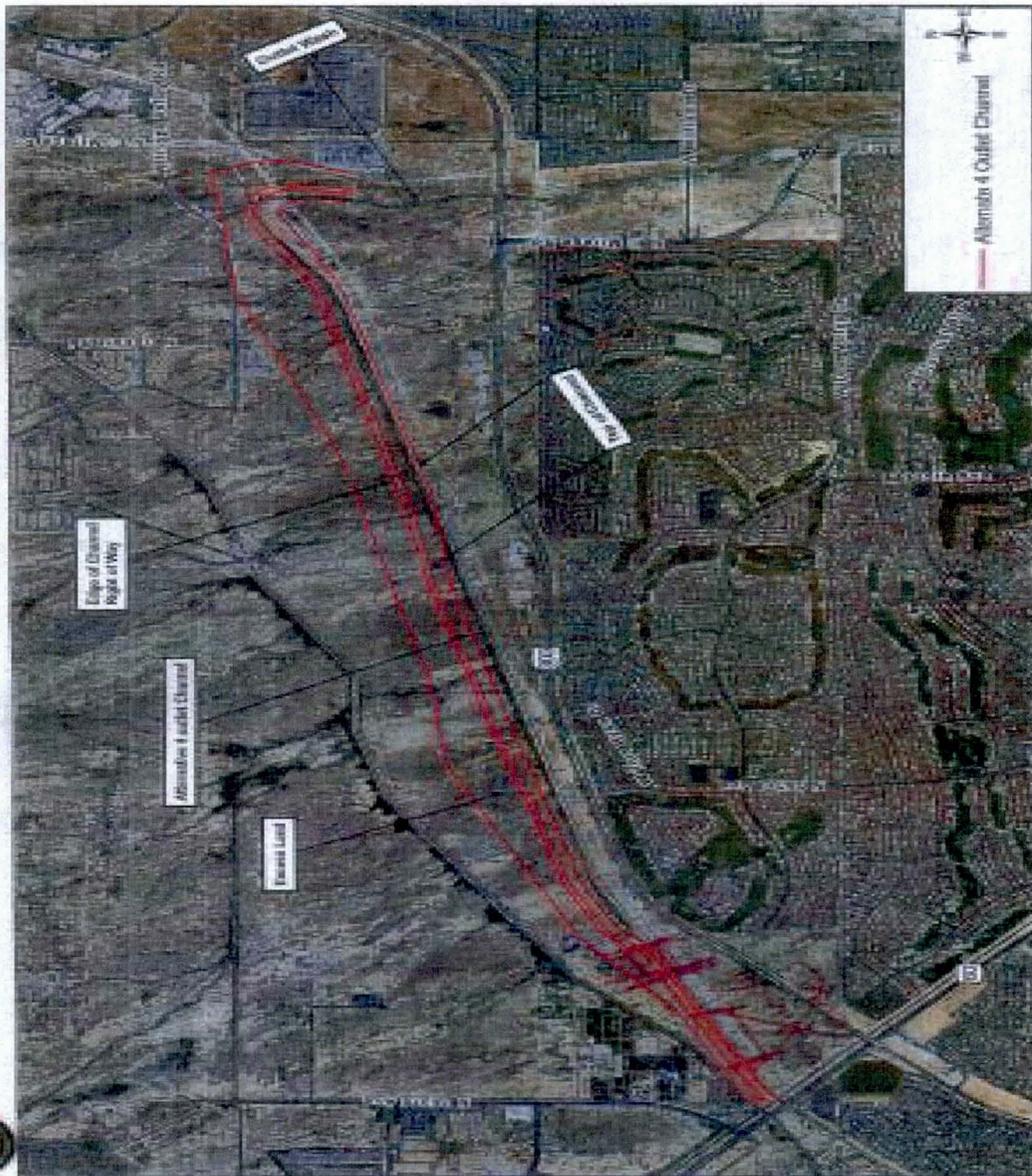


**VALUE ENGINEERING PROPOSAL DD-26**  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project

**TITLE:** Start Alternative 4 immediately after the road to eliminate possible levee conditions

**SKETCH OF PROPOSED ALTERNATIVE**

*Proposed*  
McMicken Dam Outlet Channel - Alternative 4 DD-26



VA WORKBOOKS:  
MITIGATE EROSION/DEPOSITION





**VALUE ENGINEERING PROPOSAL ME-03**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Use rock mulch for side slopes

**DISCUSSION/JUSTIFICATION:**

The current design has not accounted for rock mulch on the side slopes. Using rock mulch will help to reduce long term maintenance costs due to rodent burrows. Additionally, this will help to alleviate potential rilling of the side slopes.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.





**VALUE ENGINEERING PROPOSAL ME-06**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

<b>TITLE:</b> Provide buffer areas to accommodate lateral migration	
<b>FUNCTION:</b> Manage Erosion/Deposition	
<b>BASELINE ASSUMPTION:</b> The current plan does not accommodate lateral migration.	
<b>PROPOSED ALTERNATIVE:</b> Above and beyond the normal buffer zone, allow the new channel to meander, migrate, and erode naturally to reach equilibrium within a larger footprint than necessary to convey design flows.	
<b>BENEFITS</b>	<b>RISKS/CHALLENGES</b>
<ul style="list-style-type: none"> <li>• Natural, eroded state of the channel</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous headcutting beyond project limits</li> </ul>
<ul style="list-style-type: none"> <li>• Lower maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• May adversely modify performance of designed channel in terms of sediment and conveyance</li> </ul>
<ul style="list-style-type: none"> <li>• Provides habitat potential for local wildlife</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces excess land for sale</li> </ul>
<ul style="list-style-type: none"> <li>• Reduces construction cost</li> </ul>	<ul style="list-style-type: none"> <li>• Increases risk or damage to existing structures</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• The estimation of lateral migration is subject to great uncertainty</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

**DROPPED**



**VALUE ENGINEERING PROPOSAL ME-06**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Provide buffer areas to accommodate lateral migration

**DISCUSSION/JUSTIFICATION:**

Based on discussions within the group and as shown in the risks and challenges on the first page of this proposal, this alternative is not implementable.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.

VA WORKBOOKS:  
MISCELLANEOUS





**VALUE ENGINEERING PROPOSAL M-15**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Define the 80-foot buffer zone on the south side

**DISCUSSION/JUSTIFICATION:**

The original plans did not show any buffer between the south bank of the outlet channel and the toe of the existing levee. It does not allow for the opportunity for the channel, within the buffer for the side slopes, to vary from 4:1 to 8:1 to allow for a more natural looking channel. This approach will provide a more context sensitive solution by allowing the slopes to be laid back to an 8:1. This will allow the use of vegetation and biodegradable erosion control techniques to achieve slope stability at a potentially lower price point. If a 4:1 is used, this may require an armored slope right up against the levee but this cost is not currently included in the current cost estimate. The 4:1 will not accommodate the varying side slopes to decrease the erosion potential and reduce maintenance costs. The levee can eventually be regraded to add variation to the landscape.

**IMPLEMENTATION CONSIDERATIONS:**

None apparent.



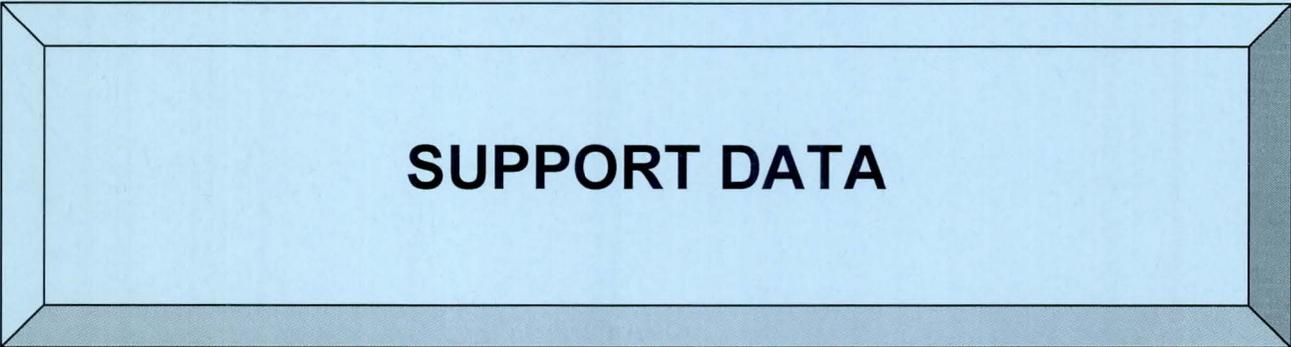
**VALUE ENGINEERING PROPOSAL M-15**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**TITLE:** Define the 80-foot buffer zone on the south side

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE			
		Description	%	Unit	Qty	Unit Cost \$	TOTAL \$	Qty	Unit Cost \$
Additional acres not saleable							16	20,000.00	320,000
Rock mulch					124,000				
					124,000				320,000
<b>(BASELINE LESS PROPOSED)</b>									<b>(196,000)</b>

\*Note: Costs are rounded to nearest thousand dollars.

**COST**



**SUPPORT DATA**



## Value Analysis Study Flood Control District of Maricopa County McMicken Dam Outlet Channel Project

### Project Constraints

The decision makers/stakeholders identified the project constraints to the VA team at the start of the VA Study. The following are those constraints:

- Not able to move electrical towers
- No levee considerations
- Cannot touch ADOT and Railroad facilities

### Function Analysis

Function definition and analysis is the heart of Value Analysis (VA). It is the primary activity that separates VA from all other “improvement” programs. The objective of this phase is to ensure the entire VA team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing study.

The VA team identified the functions of the McMicken Dam Outlet Channel project using active verbs and measurable nouns. The basic function was identified as **Convey Water** (Project Need) and the Higher Order Function (Project Purpose) as **Protect Property**. This process allowed the VA team to truly understand all of the functions associated with the project. During the creativity phase of the VA study, not all functions were brainstormed for improvement. A Function Analysis Systems Technique (FAST) diagram was not completed on this project.

Active Verb	Measurable Noun	Classification
Convey	Water	Basic
Protect	Property	Higher Order
Drain	Dam	Secondary
Manage	Erosion-Deposition	Secondary
Increase	Revenue	Secondary
Avoid	Levee	Secondary
Accommodate	Trail	Secondary
Ensure	Connectivity	Secondary
Improve	Aesthetics	Secondary
Minimize	Maintenance	Secondary
Protect	Natural-Environment	Secondary
Ensure	Safety	Secondary
Accommodate	Utilities	Secondary
Meet	Criteria	Secondary
Reduce	Floodplain	Secondary

The definitions of the classifications are:

**Higher Order Function** defines the need of the project and is outside of the scope of work under study.

**Basic Function** defines a performance feature that *must* be obtained to satisfy only user's needs not desires. It answers the question, “What must it do?”

**Secondary Functions** define performance features other than those that must be accomplished. These are the user's desires and answer the question, “What else do we want or does it do?”



**Value Analysis Study  
Flood Control District of Maricopa County  
McMicken Dam Outlet Channel Project**

**Cost Estimate**

Outlet Channel Alternatives  
Comparative Construction Cost Estimate  
Alternative 4 - Realign Outlet Channel North

DESCRIPTION	UNIT	PROJECT QUANTITY	UNIT COST NUMBERS	EXTENDED AMOUNT
<b>Outlet Channel</b>				
Upstream Channel and Levee Improvements	EA	1	\$ 1,092,549.04	\$ 1,092,549.04
Excavation - Channel (non-cemented soils)	CY	2,153,138	\$ 1.50	\$ 3,229,706.87
Excavation - Channel (cemented soils)	CY	758,960	\$ 6.00	\$ 4,553,762.34
Excavation - Levee Foundation (non-cemented soils)	CY	0	\$ 1.50	\$ -
Excavation - Existing Levee	CY	251,356	\$ 1.00	\$ 251,356.00
Remove and Stockpile Topsoil	CY	234,511	\$ 1.90	\$ 445,569.99
Topsoil Plating and Grading	CY	234,511	\$ 0.30	\$ 70,353.16
Levee Fill	CY	0	\$ 4.25	\$ -
Levee Fill (Foundation)	CY	0	\$ 4.25	\$ -
Filter	CY	0	\$ 32.00	\$ -
Excess Borrow Material Placement	CY	3,163,453	\$ 0.50	\$ 1,581,726.65
Rock Mulch	SY	0	\$ 4.00	\$ -
Hydroseed	AC	291	\$ 2,000.00	\$ 581,431.04
O&M Road (North Channel Bank)	SY	38,388	\$ 0.50	\$ 19,192.89
O&M Road AB (Upstream Toe, Levee Crest)	SY	37,451	\$ 2.40	\$ 89,881.60
Levee Riprap Lining (d <sub>50</sub> = 7")	CY	0	\$ 40.00	\$ -
Geotextile for Riprap	SY	0	\$ 2.50	\$ -
Side Channel Drop Structures (Riprap, d <sub>50</sub> = 8", D=16")	CY	7,827	\$ 40.00	\$ 313,062.72
Side Channel Drop Structures (Grouted Riprap, d <sub>50</sub> = 8", D=16")	CY	17,969	\$ 60.00	\$ 1,078,154.07
Longitudinal Channel Drop Structures (Riprap, d <sub>50</sub> = 12", D=24")	CY	0	\$ 40.00	\$ -
Longitudinal Channel Drop Structures (Grouted Riprap, d <sub>50</sub> = 12", D=24")	CY	0	\$ 60.00	\$ -
Outlet Wash Drop Structures (Riprap, d <sub>50</sub> = 12", D=24")	CY	968	\$ 40.00	\$ 38,728.89
Outlet Wash Drop Structures (Grouted Riprap, d <sub>50</sub> = 12", D=24")	CY	348	\$ 60.00	\$ 20,862.22
Channel Bottom Riprap at Outlet Wash (Riprap, d <sub>50</sub> = 12", D=24")	CY	374	\$ 40.00	\$ 14,948.15
Utility Footing Erosion Protection (Grouted Riprap, d <sub>50</sub> = 12", D=24")	CY	0	\$ 60.00	\$ -
Backfill Existing Outlet Channel (Common Fill)	CY	0	\$ 2.00	\$ -
Concrete Slab Protection for Existing Gas Line (Reinforced Concrete, D=6")	CY	271	\$ 250.00	\$ 67,675.93
Mitigation for Waters of the US	AC	19	\$ 15,000.00	\$ 279,409.44
Tall Pot Planting	AC	5	\$ 5,000.00	\$ 25,000.00
Biological Assessment	EA	1	\$ 5,000.00	\$ 5,000.00
Desert Tortoise and Burrowing Owl Surveys and Relocation	EA	1	\$ 8,000.00	\$ 8,000.00
Cultural Resources Report	EA	1	\$ 14,000.00	\$ 14,000.00
Cultural Resources Mitigation Measures	EA	1	\$ 116,684.00	\$ 116,684.00
			<b>SUBTOTAL</b>	<b>\$ 13,897,053.97</b>
Mobilization	%		3%	\$ 416,911.62
Supplemental General Conditions	%		0%	\$ -
Construction Contingency	%		15%	\$ 2,084,558.10
			<b>OUTLET CHANNEL TOTAL</b>	<b>\$16,398,523.69</b>

**Constructability Comments**

Under the "Miscellaneous" function, there were several ideas that related more to construction and required further explanation for future consideration. These include the following:

- **M-05: Evaluate how the stockpile areas will be used to ensure future use.** Any soil stockpiles where material is intended to be sold off at a later date, needs to be placed in an area of the project that has the least impact to the completed project. Future ingress and egress should allow for haul off routes that avoid the channel and other structures.



**Value Analysis Study  
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- **M-06: Ensure that the gas line location is properly identified.** Elevations and locations need to be clearly delineated so that there can be no mistaking this utility during any excavations. Additional potholing on utilities is recommended.
- **M-07: Ensure all elements are adequately covered for power lines.** Vertical and lateral constraints should be estimated. Discuss the required clearances with all utility companies (could have differing specifications). Are hard barricades needed during construction?
- **M-08: Consider construction areas adequately (access, lay-down, etc.).** Provision of ingress and egress locations makes sense throughout the sequencing of construction and through all phases of construction.
- **M-09: More soil borings to be in the centerline of the work related to conditions.** Borings within the project's centerline are essential especially due to the presence of possible cemented soils as defined within the bid line item. This will help in evaluating and interpolating costs associated with excavation of hard material.
- **M-10: Complete soil tests during design for vegetation uses.** Agronomy testing helps in adequately defining soil amendments.



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**Creative Ideas List**

The list of ideas and comments from the study immediately follow this page. Some of the ideas were selected for further development as represented in the previous workbooks of alternatives.

**Evaluation Results Score**

All of the ideas listed should be evaluated and reviewed by the design team for consideration to meet the goals and performance attributes of the project. The entire creative ideas list immediately follows this page. The VA team used a two-step process to first identify ideas that could be designated as a design suggestion and did not require any further definition than what is included in the list. This also included the identification of ideas that, after further consideration, were not recommended for further consideration. The scoring is shown to the right of the creative ideas list. Those ideas that were ranked a 4 or 5 are the alternatives that were moved forward into the next phase of the Job Plan, Development. Please note the index at the bottom of the creative ideas list to understand the scoring.



**Flood Control District of Maricopa County  
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**Creative Idea List**

No.	Description	Score
<b>DD</b>	<b>Drain Dam (Hydrology &amp; Hydraulics)</b>	
DD-01	Reduce bed slope to 0.10%	4
DD-02	Do not do the project	ABC
DD-03	Only add rock mulch to the levee to reduce erosion and rodent burrows	ABC
DD-04	Move the eastern half of the channel next to the Loop 303 (all flows)	4
DD-05	Use concrete at the outlet in lieu of the curve	4
DD-06	Use boulders to dissipate energy at the outlet in lieu of the curve	4
DD-07	Use a drop structure at the outlet in lieu of the curve	4
DD-08	Reduce outlet flow at the dam using gate	OS
DD-09	Reduce outlet size at the dam to reduce flow	OS
DD-10	Use soil cement as channel liner in lieu of earth	2
DD-11	Use vegetation as channel liner in lieu of earth	DS
DD-12	Vary the channel cross-section to protect existing trees - use a low flow channel	4
DD-13	Dispose of spoil north of the channel for future building pads	4
DD-14	Reduce design flows	DS
DD-15	Buy the ranch on the west end to use the existing area as a basin to reduce flows - remove levee at the west end	4
DD-16	Use basins on the north end to reduce flows for tributaries	4
DD-17	Install a supplemental channel along Loop 303	4
DD-18	Design a more sinuous approach to channel to reduce flows	DS
DD-19	Create a sinuous low flow channel	DS
DD-20	Use a box at special features in lieu of trapezoid channel	2
DD-21	Install large basins at two main washes to reduce flows in lieu of channel	w/DD-16
DD-22	Install recharge or wetland basins (see DD-21)	w/DD-16
DD-23	Expand channel to the south at US 60	2
DD-24	Use FLO-2D analysis to reduce flow	DS
DD-25	Relocate road and utilities to expand north	2
DD-26	Start Alternative 4 immediately after the road to eliminate possible levee conditions	4
DD-27	Incorporate rainwater harvesting swales on the upstream to reduce and direct water into channel (control water)	ABC
DD-28	Optimize outlets into the channel to reduce flow decreasing size of channel	w/DD-16
DD-29	Use concrete lining in lieu of earth	2
DD-30	Use a range of Manning's roughness N-values	DS
<b>ME</b>	<b>Manage Erosion/Deposition</b>	
ME-01	Utilize bio-engineering erosion control techniques (ECT) for site stability - long term	DS
ME-02	Stay within subcritical design regimes - strategic	ABC
ME-03	Use rock mulch for side slopes	4

OS = Out of Scope

ABC = Already Being Considered

DS = Design Suggestion (no impact to cost)  
No Workbook

FF = Fatal Flaw



**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**

**Creative Idea List**

No.	Description	Score
ME-04	Use soil cement for side slopes	2
ME-05	Use bio-engineering for outlets - use natural approaches	DS
ME-06	Provide buffer areas to accommodate lateral migration	4
ME-07	Add sediment basin at larger inlet areas - forebay	w/DD-16
ME-08	Use natural existing cemented material for erosion protection	DS
ME-09	Use gabions using existing (natural) materials	DS
ME-10	Change slopes to 8:1 in lieu of 4:1	DS
ME-11	Use vegetation on side slopes	DS
ME-12	Salvage existing trees and use for landscape	DS
ME-13	Use Beardsley Canal or WWTP for irrigation of vegetation	DS
<b>M</b>	<b>Miscellaneous</b>	
M-01	Manage sheet flow for off site (saleable) parcels where fill has been placed	w/DD-13
M-02	Breach and regrade levee	DS
M-03	Offer additional fill to MCDOT borrow site	w/DD-13
M-04	Use the outlet wash as a natural corridor for the community	DS
M-05	Evaluate how the stockpile areas will be used to ensure future use	DS
M-06	Ensure that the gas line location is properly identified	DS
M-07	Ensure all elements are adequately covered for power lines	DS
M-08	Consider construction areas adequately (access, laydown, etc.)	DS
M-09	More soil borings to be in the centerline of the work related to conditions	DS
M-10	Complete soil tests during design for vegetation uses	DS
M-11	Use CMAR delivery	DS
M-12	Accommodate wildlife corridor	DS
M-13	Provide interim (during construction) stormwater management information in the specials	DS
M-14	Analyze the hydrology and hydraulics between the Beardsley Canal and the channel	DS
M-15	Define the 80-foot buffer zone on the south side	4

DS = Design Suggestion (no impact to cost)  
 No Workbook

OS = Out of Scope  
 FF = Fatal Flaw

ABC = Already Being Considered



**Value Analysis Study  
Flood Control District of Maricopa County  
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**Performance Attributes**

The VA team identified and defined the performance attributes to use for evaluating the ideas.

- **Connectivity** – access to communities, freeways, and trails
- **Hydraulics/Hydrology** – meet drainage standards for flood conveyance and mitigation
- **Maintainability** – life cycle cost, minimize maintenance requirements, provide access
- **Environmental** – land restoration, multi-use, aesthetics, sustainability, mitigation

A compared comparison matrix was used to enable the VA team to reach agreement as to the relevant importance of each of the performance criteria. The compared comparison matrix is shown below:

PERFORMANCE CRITERIA MATRIX															
McMicken Dam Outlet Channel Project															
													TOTAL	%	
Connectivity	A	b	a/c	a	a									2.5	25%
Hydraulics/Hydrology	B		b	b	b									4.0	40%
Maintainability	C		c	c										2.5	25%
Erode-ability/Scour	D		e											0.0	0%
Environmental	E													1.0	10%
a	More Important														
a/b	Equal Importance														
														10.0	100%



## Value Analysis Study Flood Control District of Maricopa County McMicken Dam Outlet Channel Project

### Value Methodology

The value methodology (Synonyms: value analysis, value engineering and value management) is a function-oriented, systematic, team approach to add customer value to a program, facility, system, or service. Improvements like performance, quality, initial and life cycle cost are paramount in the value methodology. The workshop is conducted in accordance with the methodology as established by SAVE, the value society, and is structured using the Job Plan as outlined as follows:

- **Pre-Study**
  - Identify VA team members
  - Define workshop location
  - Review project documentation
  - Prepare for the Value Study (workshop)
  
- **Value Study (Workshop) Job Plan**
  - *Information Phase*
    - Gather, organize and analyze data,
    - Define costs and cost models,
    - Define the problem/purpose of the study,
    - Define study scope, define project goals and workshop goals
    - Risk Analysis
  - *Function Analysis Phase*
    - Define and evaluate functions
    - Define needs versus wants
  - *Creative Phase*
    - What else will perform the functions?
    - Is this function required?
    - Have we mitigated the identified risks?
  - *Evaluation Phase*
    - Rank and rate the ideas to select
    - Refine the best ideas for further development
  - *Development Phase*
    - Develop the best ideas into VA Alternatives with support and justification
  - *Presentation/Implementation*
    - VA team presents results
    - Prepare and issue the report
    - Report implementation ideas
  
- **Post Study**
  - Implement approved alternatives
  - Monitor status



**Value Analysis Workshop Agenda  
Flood Control District of Maricopa County  
McMicken Dam Outlet  
October 2014**



**Value Analysis Workshop Agenda (2.5-Day)**

***Tuesday, October 14, 2014***

***Kick-Off Meeting – Flood Control District of Maricopa County  
New River Conference Room***

***2801 West Durango Road, Phoenix, AZ***

***(Attendance by Stakeholders, Decision Makers, Designers and Study Team)***

- 11:00 - 11:10 Introductions (All)
- 11:10-12:00 Project Overview, Review Purpose and Need (Project Manager and Designers)
- 12:00-12:30 Workshop Objectives, Identify Key Performance Attributes  
*(Conclusion of Kick-Off Meeting Adjourn all but the VA Team)*
- 12:30-4:30 Site Visit
- 4:30 Adjourn

***Wednesday, October 15, 2014***

***Flood Control District of Maricopa County***

***Cave Buttes Conference Room (Operations Building)***

***2801 West Durango Road, Phoenix, AZ***

- 8:00 - 8:10 Recap of First Day
- 8:10 – 8:45 Team Observations
- 8:45 – 9:15 Function Analysis
- 9:15 – 10:15 Creativity/Team Brainstorming
- 10:15 - 10:30 Break
- 10:30 - 11:30 Creativity/Team Brainstorming
- 11:30 – 12:00 Evaluation of Ideas
- 12:00 - 1:00 Working Lunch
- 1:00 - 1:30 Finalize Evaluation
- 1:30 – 1:45 Review List; Make Assignments
- 1:45 – 2:00 Break
- 2:00 – 5:00 Alternative Development
- 5:00 Adjourn

***Thursday, October 16, 2014***

***Flood Control District of Maricopa County***

***Adobe Conference Room***

***2801 West Durango Road, Phoenix, AZ***

- 8:00 - 12:00 Alternative Development
- 12:00 - 1:00 Working Lunch/Alternative Development
- 1:00 – 2:30 Alternative Development
- 2:30 - 3:30 Group Review of Recommendations/Alternatives/ Prepare Presentation
- 3:30 - 4:30 **Presentation of Value Analysis Alternatives Meeting**  
*(Presentation of Results to Management and Stakeholders)*
- 4:30 – 5:00 Project Close-out
- 5:00 Adjourn

**VA STUDY ATTENDEES**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**



October			NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
14	15	16				E-MAIL			
X	X	X	Renee Hoekstra	RHA	Team Leader	602	493-1947	623	764-7490
						<a href="mailto:Renee@TeamRHA.com">Renee@TeamRHA.com</a>			
X	X	X	Patrice Miller	RHA	Assistant Team Leader	602	493-1947	480	773-8533
						<a href="mailto:Patrice@TeamRHA.com">Patrice@TeamRHA.com</a>			
X	X	X	Bobbie Ohler	FCDMC	Project Manager				
						<a href="mailto:bao@mail.maricopa.gov">bao@mail.maricopa.gov</a>			
X	X	X	Nasir Raza	Gannett Fleming					
						<a href="mailto:sraza@gfnet.com">sraza@gfnet.com</a>			
X	X	X	Valerie Swick	FCDMC					
						<a href="mailto:vas@mail.maricopa.gov">vas@mail.maricopa.gov</a>			
X	X	X	Mike Duncan	FCDMC					
						<a href="mailto:mwd@mail.maricopa.gov">mwd@mail.maricopa.gov</a>			
X	X	X	Gary Wesch	FCDMC	Project Manager				
						<a href="mailto:garywesch@mail.maricopa.gov">garywesch@mail.maricopa.gov</a>			
X			Jeff Riddle	FCDMC					
						<a href="mailto:jrr@mail.maricopa.gov">jrr@mail.maricopa.gov</a>			
X	X	X	Richard Waskowsky	FCDMC					
						<a href="mailto:rmw@mail.maricopa.gov">rmw@mail.maricopa.gov</a>			
	X	X	Harry Cooper	FCDMC	District Landscape Architect	602	506-2056	520	250-4021
						<a href="mailto:harryCooper@mail.maricopa.gov">harryCooper@mail.maricopa.gov</a>			
X	X	X	Frank Brown	FCDMC	Senior Civil Engineer				
						<a href="mailto:FrankBrown@mail.maricopa.gov">FrankBrown@mail.maricopa.gov</a>			

**VA STUDY ATTENDEES**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**



October			NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
14	15	16				E-MAIL			
X	X	X	Shimin Li	FCDMC	Senior Civil Engineer				
						<a href="mailto:ShiminLi@mail.maricopa.gov">ShiminLi@mail.maricopa.gov</a>			
X	X	X	Mike Stanley	FCDMC	Construction Manager			602	980-0451
						<a href="mailto:cms@mail.maricopa.gov">cms@mail.maricopa.gov</a>			
X	X	X	Gary Shapiro	FCDMC	Engineering			602	506-3076
						<a href="mailto:ghs@mail.maricopa.gov">ghs@mail.maricopa.gov</a>			
X		X	Bing Zhao	FCDMC	Engineering	602	506-3293		
						<a href="mailto:biz@mail.maricopa.gov">biz@mail.maricopa.gov</a>			
	X		Ken Rakestraw	FCDMC	Hydrologist	602	406-2201		
						<a href="mailto:kennethrakestraw@mail.maricopa.gov">kennethrakestraw@mail.maricopa.gov</a>			
	X		Craig Coronato	Logan Simpson Design	Landscape Architect	480	967-1343		
						<a href="mailto:ccoronato@logansimpson.com">ccoronato@logansimpson.com</a>			
		X	Ed Raleigh	FCDMC	Engineering Manager				
						<a href="mailto:ear@mail.maricopa.gov">ear@mail.maricopa.gov</a>			
		X	Amir Motamedi	FCDMC	Hydrologist				
						<a href="mailto:amm@mail.maricopa.gov">amm@mail.maricopa.gov</a>			
		X	Don Rerick	FCDMC	Planning and Project Management Division Manager				
						<a href="mailto:djr@mail.maricopa.gov">djr@mail.maricopa.gov</a>			
		X	Ken Proksa	FCDMC	Deputy Director	602	506-4603		
		X	Scott Vogel	FCDMC	Project Management Branch				
						<a href="mailto:csv@mail.maricopa.gov">csv@mail.maricopa.gov</a>			

**VA STUDY ATTENDEES**  
**Flood Control District of Maricopa County**  
**McMicken Dam Outlet Channel Project**



October			NAME	ORGANIZATION	POSITION	TELEPHONE	CELL
14	15	16				E-MAIL	
		X	Karen Scott	FCDMC	Finance		
		X	Dave Turney	FCDMC	Finance		
		X	Bill Wiley	FCDMC	Chief Engineer		



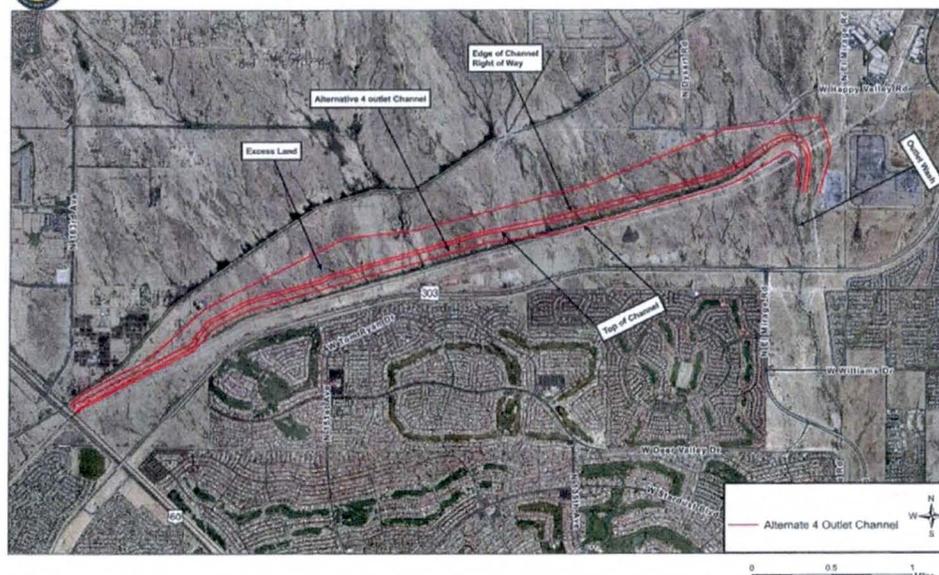
# McMicken Dam Outlet Channel Project

## Value Analysis Presentation

October 16, 2014



McMicken Dam Outlet Channel - Alternative 4



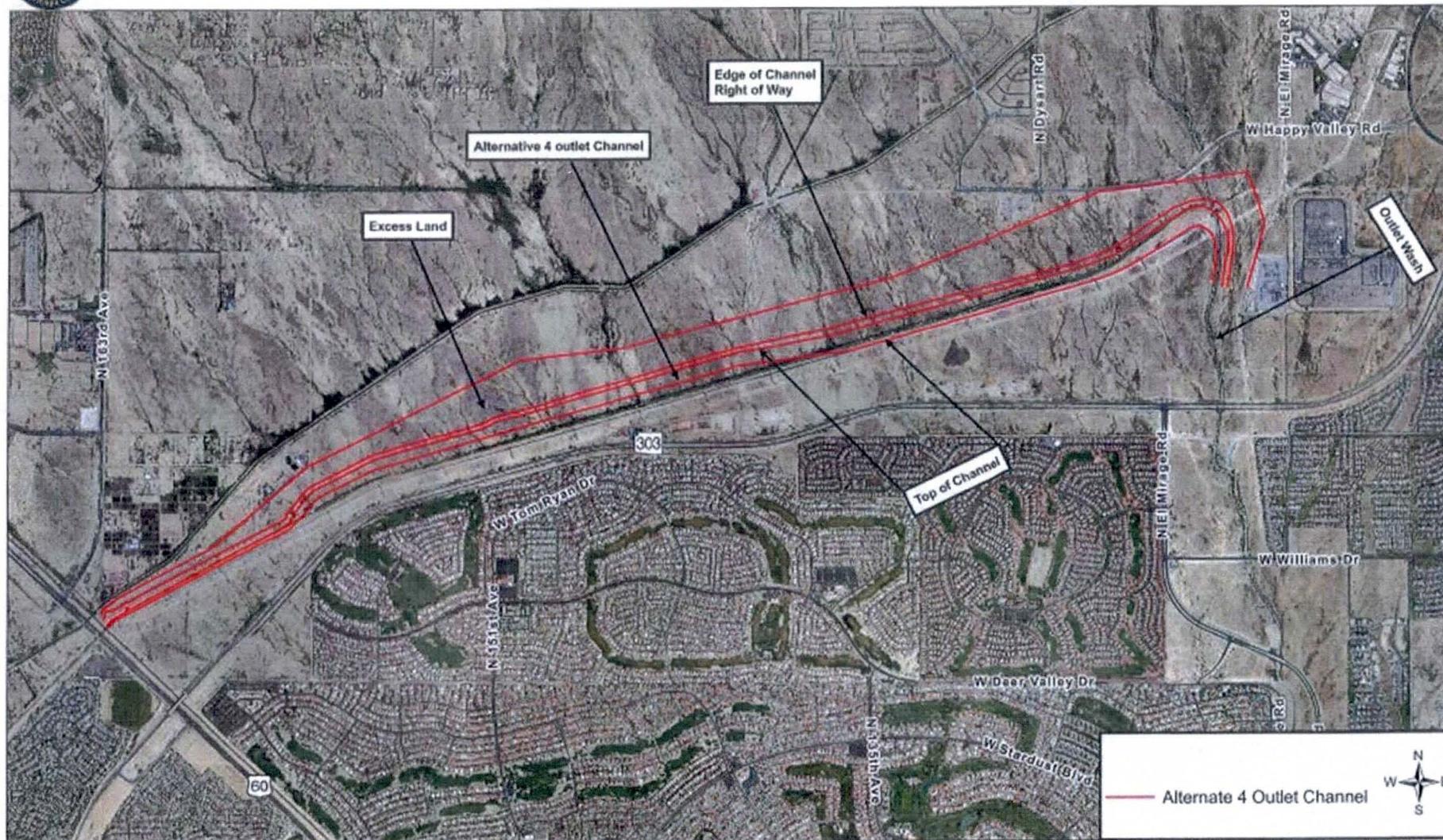


## Project Overview

- **Current Concept (Baseline):** Hybrid Alternative 4/3
- **Purpose:** Reduce Flooding
- **Need:** Mitigate Deficiencies
- Alternatives analysis did not cover the one mile on the west end
- Baseline is low resolution design with Qs of 4450 cfs



# McMicken Dam Outlet Channel - Alternative 4



0 0.5 1 Miles



# VE Study Team Members

- Bobbie Ohler, FCDMC – Project Manager
- Nasir Raza, Gannett Fleming – Designer
- Valerie Swick, FCDMC
- Mike Duncan, FCDMC
- Gary Wesch, FCDMC
- Richard Waskowsky, FCDMC
- Harry Cooper, FCDMC
- Frank Brown, FCDMC
- Shimin Li, FCDMC
- Mike Stanley, FCDMC
- Gary Shapiro, FCDMC
- Bing Zhao, FCDMC
- Renee Hoekstra, CVS, RHA, LLC – VE Team Leader
- Patrice Miller, AVS, RHA, LLC – Assistant Team Leader



## VE 6-Step Job Plan

- Information Phase
- Function Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation/Implementation





# Study Objectives

- Optimize channel configuration
- Determine potential uses for excess dirt
- Determine outlet opportunities
- Discuss options for the west end
- Consider aesthetic treatments related to north and south buffer areas
- Preserve vegetation
- Provide input to determine appropriate hydrology



## Constraints

- Not able to move electrical towers
- No levee considerations
- Cannot touch ADOT and RR facilities



# Performance Attributes

- **25%** Connectivity – access to communities, freeways, trail
- **40%** Hydraulics/Hydrology – meet flood standards/conveyance
- **25%** Maintainability – life cycle cost, minimize maintenance requirements, access
- **10%** Environmental – land restoration, multi-use, aesthetics, sustainability, mitigation



# Function Analysis

Active Verb	Measurable Noun	Classification
Convey	Water	Basic
Protect	Property	Higher Order
Drain	Dam	Secondary
Manage	Erosion-Deposition	Secondary
Increase	Revenue	Secondary
Avoid	Levee	Secondary
Accommodate	Trail	Secondary
Ensure	Connectivity	Secondary
Improve	Aesthetics	Secondary
Minimize	Maintenance	Secondary
Protect	Natural-Environment	Secondary
Ensure	Safety	Secondary
Accommodate	Utilities	Secondary
Meet	Criteria	Secondary
Reduce	Floodplain	Secondary



# Creative Ideas

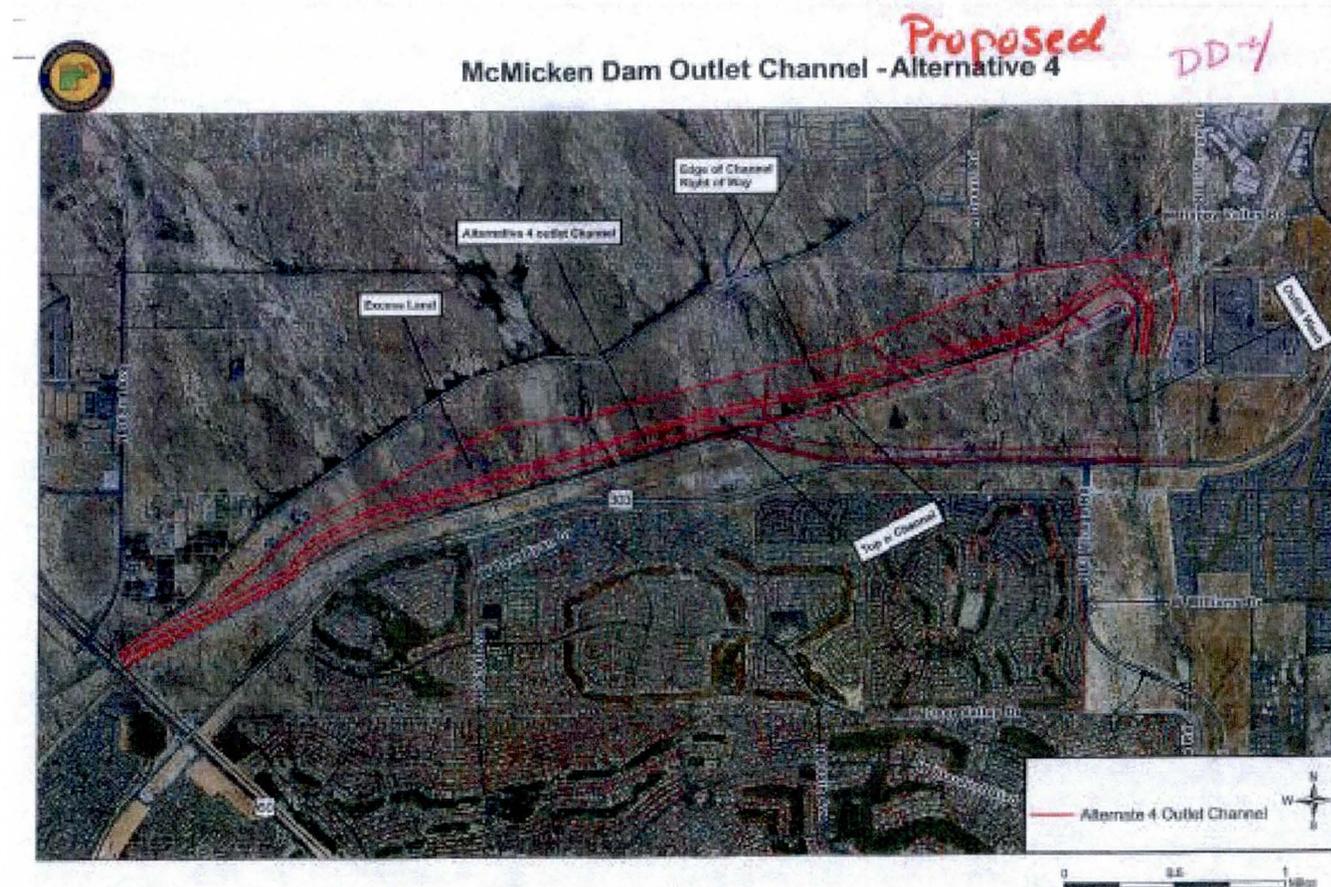
- **58** Total Ideas
  - Two-step evaluation
  - Some eliminated; some combined
  - **15** proposals developed
  - **25** design suggestions identified



# ALTERNATIVES CONSIDERED BUT DROPPED

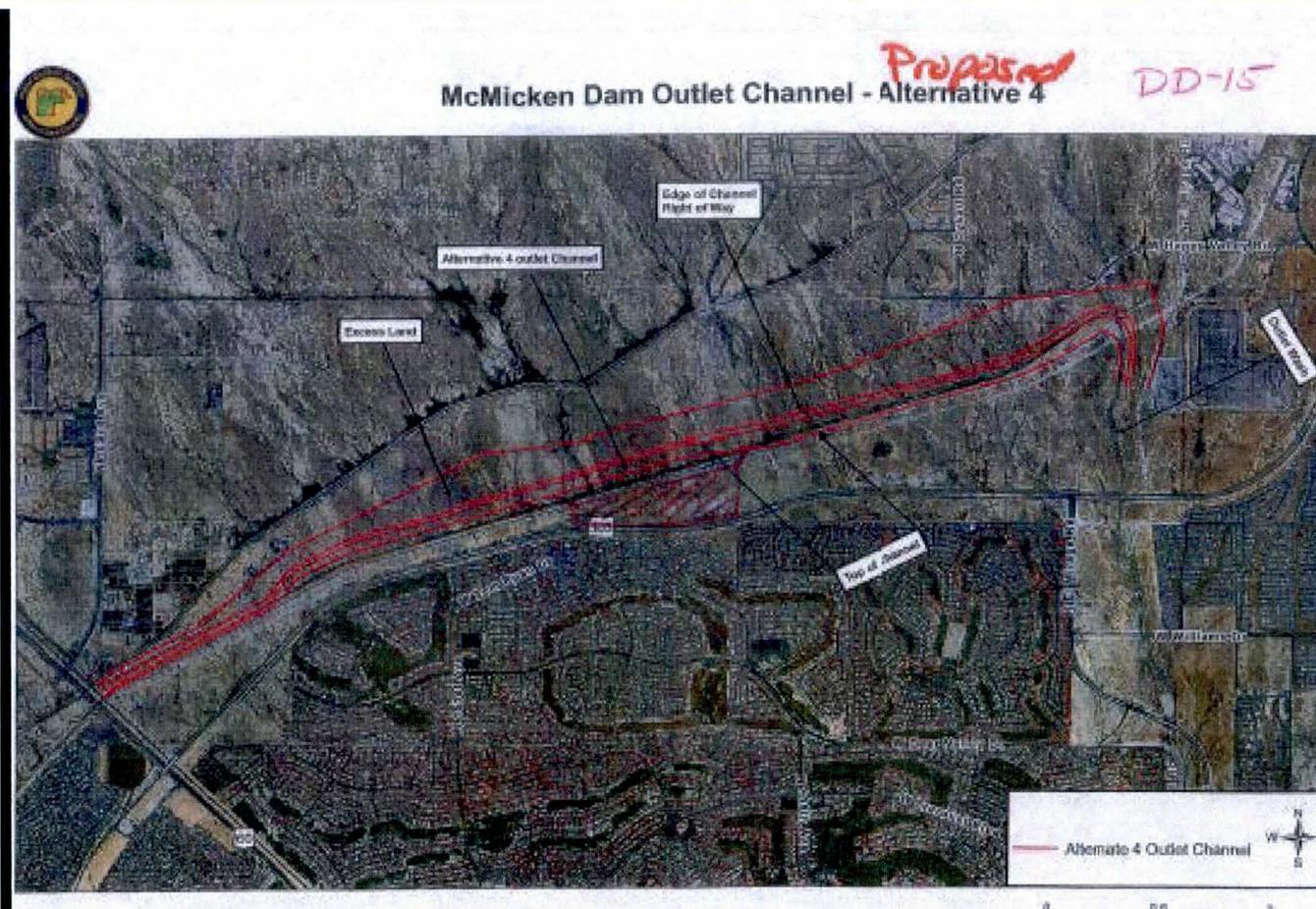


# DD-04 Move the eastern half of channel next to the Loop 303 (all flows)



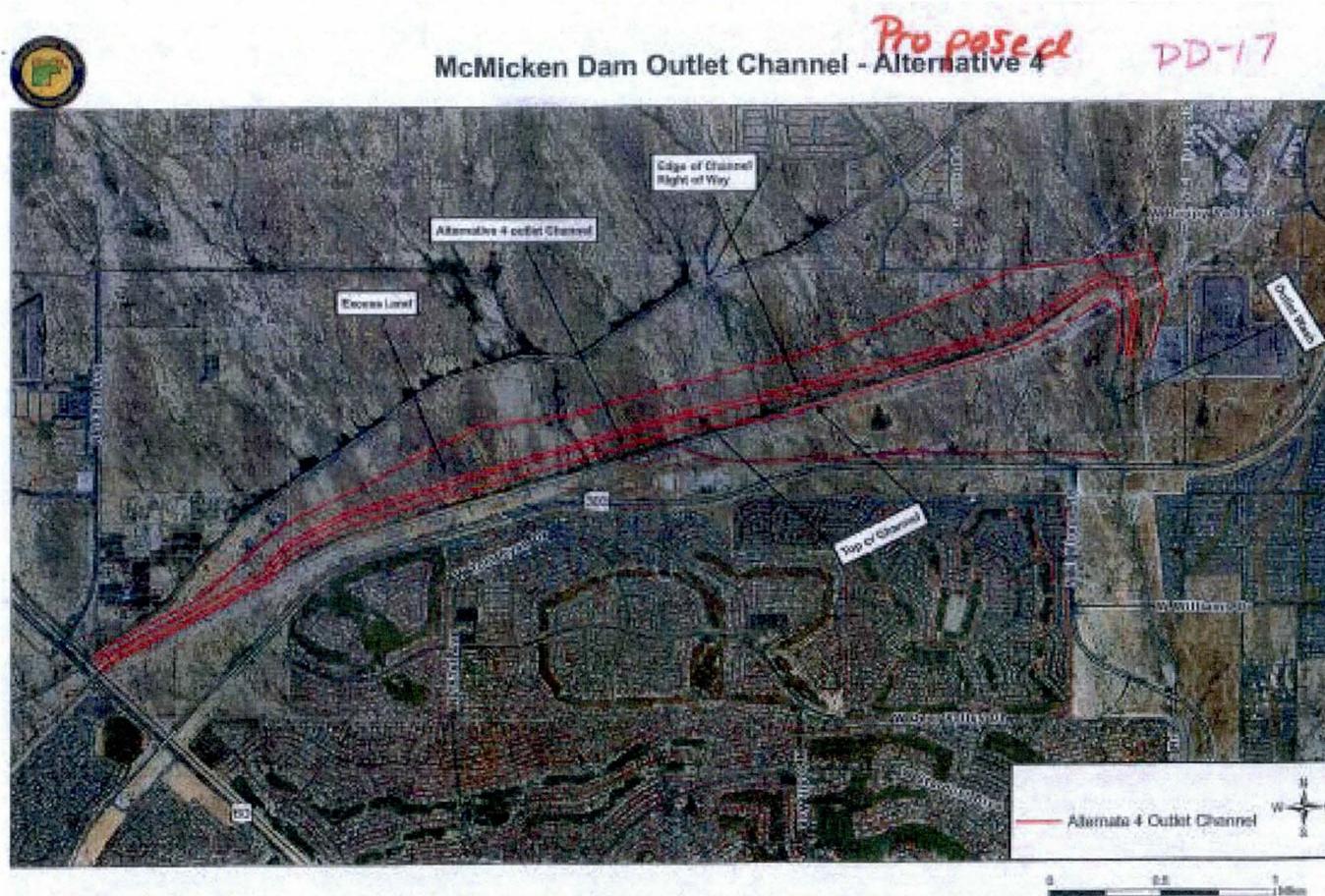


# DD-15 Buy the ranch on the west end to use the existing area as a basin to reduce floods – remove levee at the west end



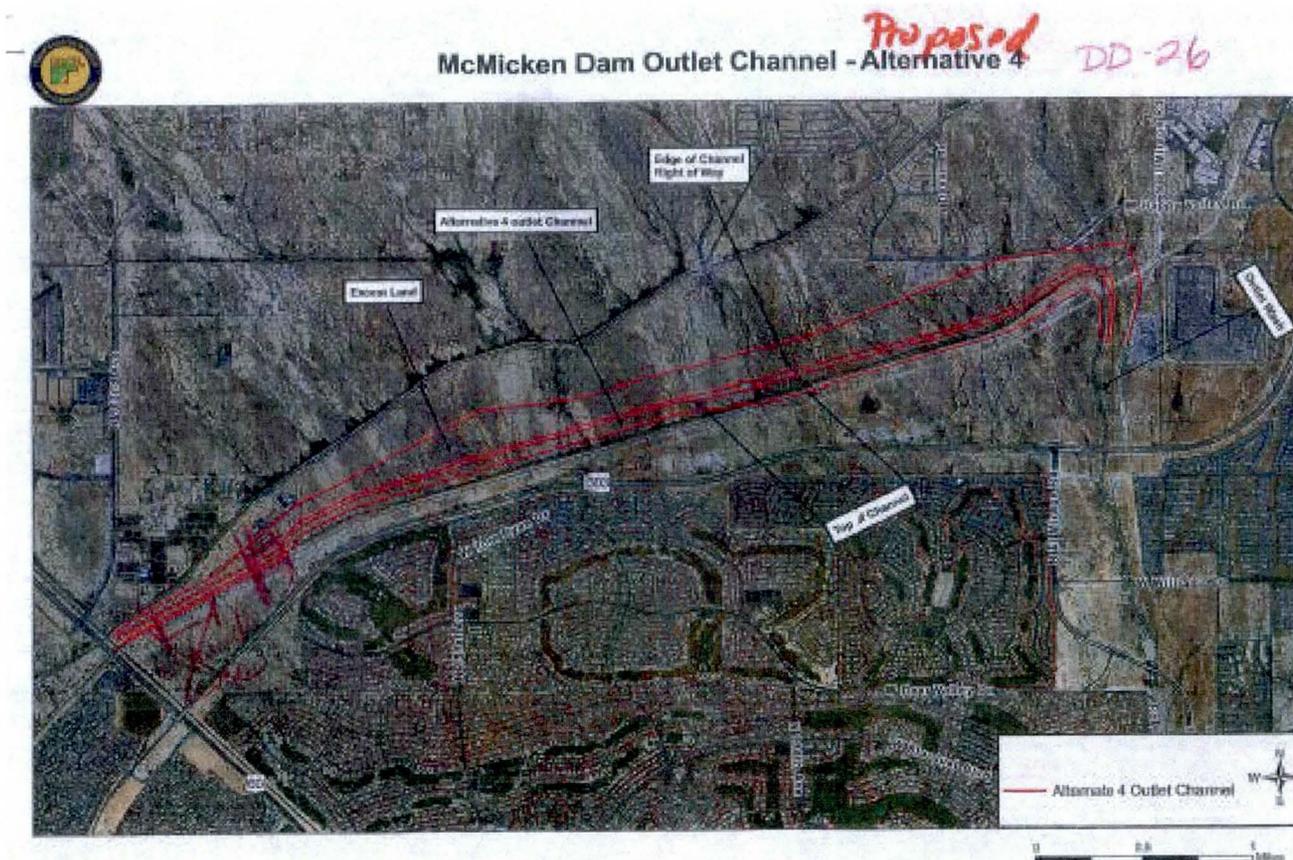


# DD-17 Install a supplemental channel along Loop 303





## DD-26 Start alternative 4 immediately after the road to eliminate possible levee conditions





# ALTERNATIVES



## **M-15 Define the 80' buffer zone on the south side**

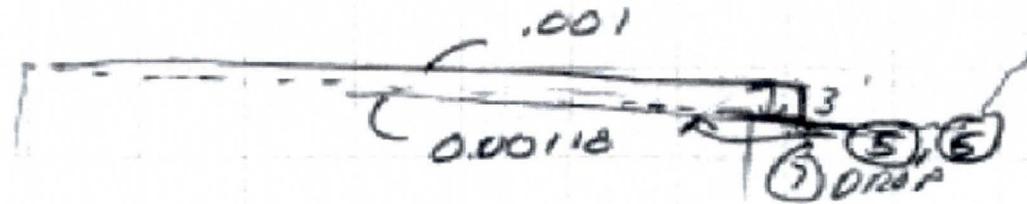
- Allows for varying side slopes for an 8:1
- Greater public acceptance
- More context sensitive solution
- Allows the use of vegetation and biodegradable erosion control techniques
- Lower maintenance costs



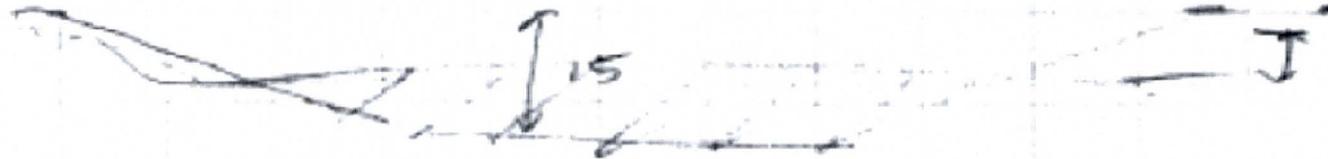
## **DD-01 Reduce bed slope to 0.1%**

- Eliminates curve
- Reduces excavation
- Reduces erosion potential
- Reduces project cost

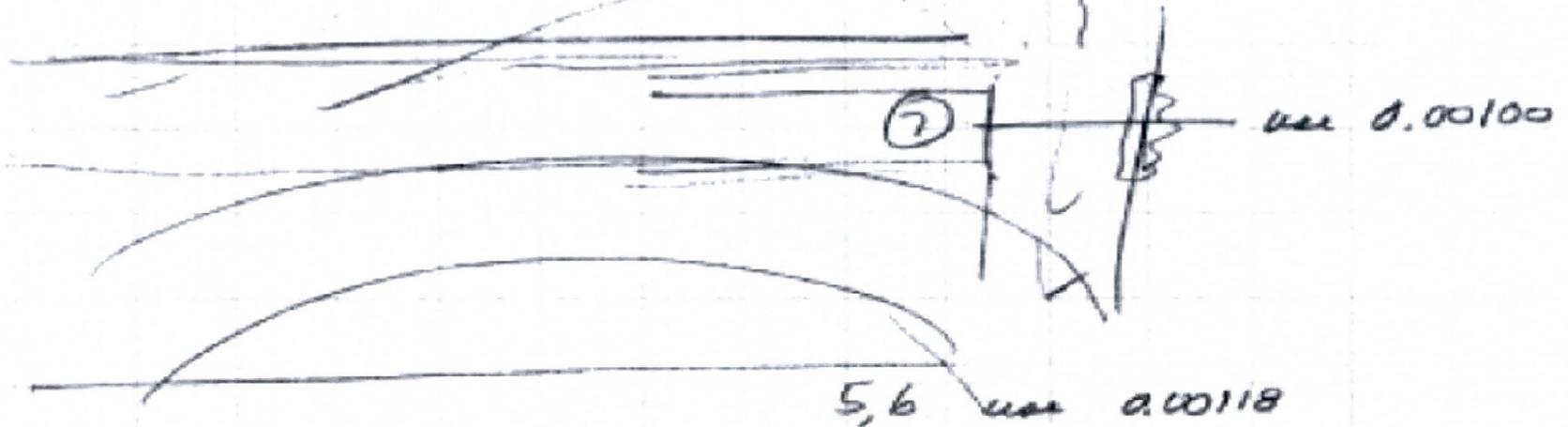
DDOT  
(PROPOSED) ①



22,000



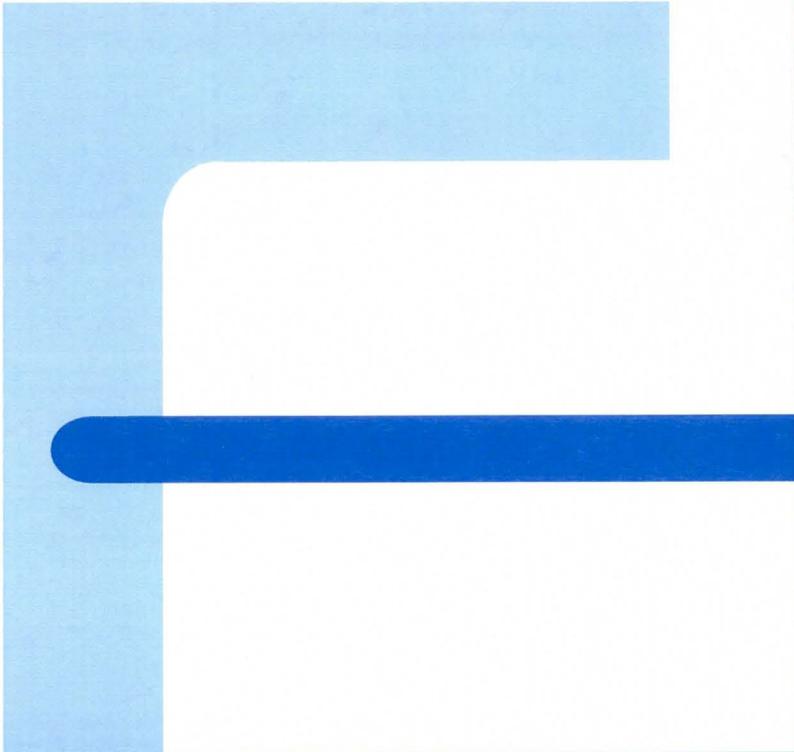
→ FLOW METER @ EACH FLOW RATE  
4450, 7025, 9090  
SE MP/MPH





## **DD-05, 06, 07 Eliminate curve, provide energy dissipation**

- **DD-05** Concrete training vanes
- **DD-06** Boulders/rip-rap
- **DD-07** Concrete drop structure



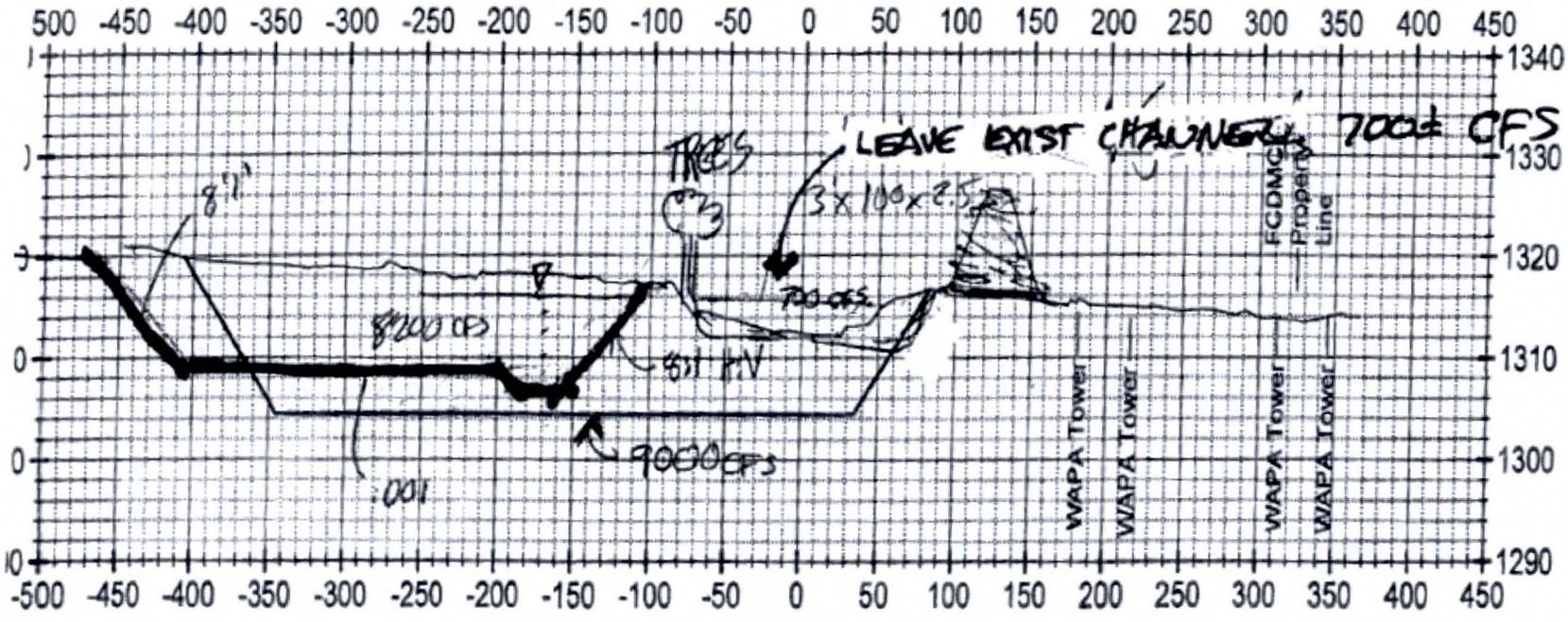


## **DD-12 Vary the cross-section to protect existing trees – use a low flow channel**

- Reduces excavation/cost
- Preserves trees

236+00.00

DP-12 (PROPOSED)



235+00.00

50 100 150 200 250 300 350 400 450



## **DD-13 Dispose of soil north of the channel for future building pads**

- Increases saleable land area/cost
- Reduces waste haul cost
- Controls incoming sheet flow flooding



## **DD-16, 21, 22 Use basins**

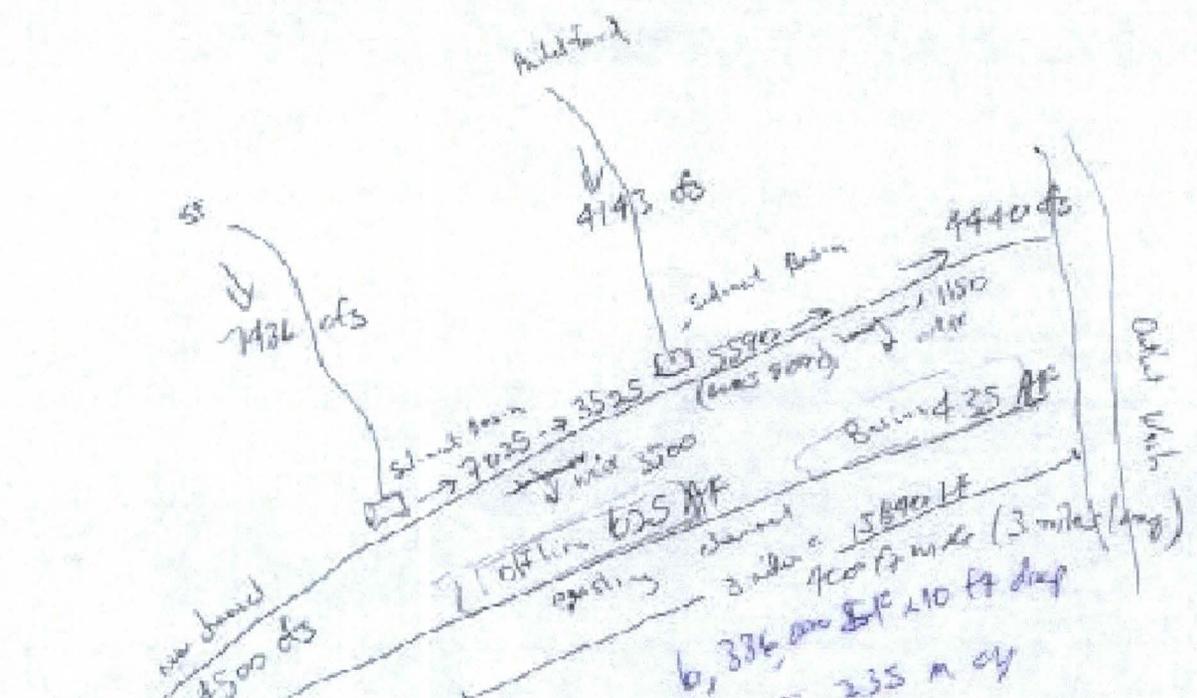
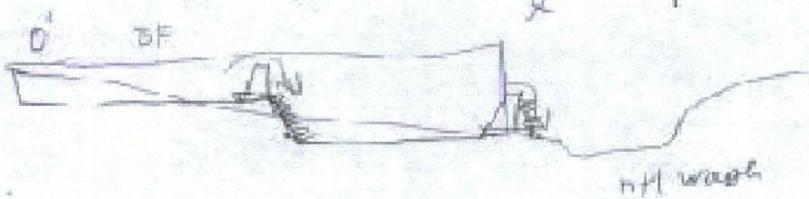
- Reduces proposed channel size
- Increases saleable land area/cost
- Optimizes use of old channel
- Recharge/wetland basins can be incorporated into main storage basin
- Optimizes channel storage

Creative Ideas

18

DD-16

x Proposed



Sum Vol 625  
+ 35  
1060 AF

4000 ft wide x 115,477 long) 7.3 ft  
8 ft 7.5 ft deep



## **ME-03 Use rock mulch for side slopes**

- Reduces rill erosion on side slopes
- Reduces rodent burrows
- Increases construction cost
- Reduces O&M cost



## Next Steps

- Draft Report to Bobbie on October 24<sup>th</sup>
- Comments back on October 31<sup>st</sup>
- Final Report to Bobbie on November 10<sup>th</sup>



# Questions

