Flood Control District
Of
Maricopa County

VALUE ENGINEERING

SUN VALLEY AREA DRAINAGE MASTER PLAN
BUCKEYE, ARIZONA

Recommended Alternative Phase

May 22-24, 2006

Prepared by:

SiteTek
Financial Arts

Final Report July 13, 2006

Recommended Alternative Value Engineering Study
FINAL REPORT

Sun Valley Area Drainage Master Plan
Buckeye, Arizona

May 22 & 24, 2006

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SUBJECT: **SUN VALLEY AREA DRAINAGE MASTER PLAN VALUE ENGINEERING WORKSHOP**

DATES: May 22-24, 2006

TEAM LEADER: John Pucetas – SiteTek Financial Arts, Inc.

TEAM MEMBERS:
Jeff Holzmeister, J2 Engineering – Hydrologist
Ernest Rodriguez, Olsson Associates – Landscape
Bob Stevens, FDCMC – Environmental
Jon Fuller, JE Fuller – Geomorphologist
Kevin Kugler, RBF Consulting - Planner
Hari Sundararaghavan, JE Fuller – Technical Advisor

DESIGN PRESENTATION BY:
Pat Quinn - Project Manager, JE Fuller

DOCUMENTS USED:
Step 2 Alternatives Design Parameters Summary - Base Design
Step 2 Alternatives Cost Summary – Alternatives LSC Enhanced Cost Summary
Step 2 – Recommended Alternative With Alt. D Elements
Excerpts for Sun Valley Area Drainage Master Plan Report, pp. 16 -18, 30-33.
PowerPoint presentation: Sun Valley Area Drainage Master Plan, Value Engineering Workshop, May 22, 2006.

SECTION 1 - EXECUTIVE SUMMARY

INTRODUCTION

The Flood Control District of Maricopa County (FCDMC) has commissioned an Area Drainage Master Plan (ADMP) of the Sun Valley area in the west valley. The Sun Valley ADMP includes the northern Areas 3 and 4 of the previously completed Buckeye / Sun Valley Area Drainage Master Study (ADMS). The boundaries of the study are: Gates Road on the north, White Tanks Mountains on the east, Interstate 10 on the south and the Hassayampa River on the west. The study area is bisected by the Sun Valley Parkway and is within the jurisdiction of the Town of Buckeye. The goal of this study is to identify flood hazards and develop flood control alternatives in advance of development in order to achieve a safe and cohesive plan for flood control. A total of approximately 250,000 new housing units are anticipated within the study area by the year 2025.

The Flood Control District of Maricopa County has retained JE Fuller, Hydrology & Geomorphology, Inc. to complete the ADMP. As part of the FCDMC's on-going commitment to Value Engineering activities, a three day Value Engineering Conference was conducted at the Recommended Alternative Phase of the master planning process.

PROJECT DESCRIPTION

Project Size: Approximately 183 square miles

Project Goals: Provide a Full / Whole Fan Solution: defined as a regional system to control flow from apex to outfall.

The District has identified the following concerns to be addressed and resolved by the ADMP:

1. Cost
2. Will it function as designed?
3. Sediment continuity
4. Maintenance
5. Incorporation of Landscape Aesthetics and Multi-use
6. Phasing / Implementation

Project Features: The primary flood hazard consists of 24 individual alluvial fans in, or near the White Tanks Mountains. Alluvial fans are characterized by the following unique flood hazards: flow path uncertainty, aggradation / sedimentation and flow rate uncertainty. Major drainage features include Wagner Wash, WhiteTank Wash, Fan 36 and Skyline Wash. Project Stakeholders include: Town of Buckeye, MCDOT, Arizona State Land Department and a series of private developers including Pulte, Community Southwest, Lennar and Stardust.

The Recommended Alternative calls for construction of 21 regional detention basins at each alluvial fan apex as well as 65 miles of regional channels to convey runoff from each fan apex to the ultimate outfall at each alluvial fan toe.

Estimated Cost: $ 884 million total project cost including land, construction, maintenance, landscape and enhancements. The following table summarizes the project cost estimate:

Project Element	Estimated Cost	% of Total Project Cost
Land	$ 329,000,000	37.3%
Construction	$ 301,000,000	34.0%
Landscaping	$ 80,000,000	9.0%
Maintenance	$ 174,000,000	19.7%
TOTAL (incl. enhancements)	**$ 884,000,000**	**100.0%**
Landscape Enhancements (included in above items)	$ 296,000,000	33.5%

Highest Costs by Function:

1. Channels (convey flow) $ 489 million
2. Basins (detain flow) $ 98 million

Estimated Project Costs by Sub-area (incl. enhancements):

Project Sub-Area	Estimated Cost	% of Total Project Cost
FRS #1	$ 293,000,000	33.1%
White Tank Wash	$ 173,000,000	19.6%
Hassayampa	$ 144,000,000	16.3%
Wagner Wash	$ 139,000,000	15.7%
CAP	$ 88,000,000	9.9%
FRS #2 & #3	$ 47,000,000	5.3%

Workshop Objectives:

The following list of objectives was identified by the VE Team at the start of the workshop:

1. Meet Corps of Engineers objectives for a regional system
2. Develop a regional flood control system
3. Evaluate the Recommended Alternative for other lower life-cycle cost alternatives
4. Balance public / private sector issues
5. Explore implementation options

SUMMARY OF VALUE ENGINEERING RESULTS
(a summary of these results is attached at the end of this section and a detailed description of each of the VE alternatives appears in Section 2 of this report)

Brainstorming Ideas Generated: 29
VE Alternatives Developed: 20

During the workshop, the following major issues and questions were identified by the VE Team and became the focus of value improvement:

- Project Cost, How much? How is it funded?
- Project Implementation: Phasing, Scheduling, Permitting (Regional 404?)
- Regional vs. Local Improvements, Is a regional trunk channel system required?
- Differences between north and south portions of the watershed. Does one whole fan solution fit all 24 fans? Is there a different solution based on the pace of development?
- Re-visit and re-consider alternatives that were rejected as part of the Recommended Alternative selection process.

MOST SIGNIFICANT PROPOSALS

A summary of the alternatives with the greatest potential cost savings are as follows:

	Potential Savings:
1. Administer flood plain in lieu of improvements (G-9)	$ 893,693,000
2. Basin only, no channels (entire plan area) (F-2)	$ 489,347,000
3. Developers pay for buffer construction (L-1)	$ 202,386,000
4. Use wall cross section in lieu of levee (L-3)	$ 177,725,000
5. Do nothing at Sun Valley South (WT-2)	$ 173,407,000

Detailed narratives and cost estimate back-up for all of the alternatives under Section 2 of this report. The value engineering effort generated proposals which could reduce the overall cost of the project. The value of the total implemented savings will be determined by the FCDMC, Town of Buckeye and the JE Fuller engineering team at the Implementation Meeting. However, the other opportunities for potential savings and enhancements listed as design suggestions and environmental permitting suggestions should be considered and estimated by the engineering team as the design effort progresses.

IMPLEMENTATION PLAN

The following schedule summarizes the tasks that need to occur during the Post Workshop Phase in order to complete the Value Engineering process:

Task	Date	Responsibility
1. Prepare Final Report	Week of May 30, 2006	SiteTek Financial Arts, Inc.
2. Conduct Implementation Meeting	Mid June 2006	FCDMC, Town of Buckeye, JE Fuller
3. Implement VE Recommendations	Ongoing through Completion of SVADMP	JE Fuller

IMPLEMENTATION RESULTS

An Implementation Meeting was held on June 22, 2006 with the JE Fuller engineering team and the Flood Control District of Maricopa County. The results of this meeting and responses from the design team are summarized in the attached memorandum from JE Fuller dated June 23, 2006. The following is a summary of the implementation results:

Value Engineering Alternatives Proposed:	20
Accepted Alternatives:	6 (30%)
Rejected Alternatives:	8 (40%)
Alternatives Considered for further Review:	6 (30%)

60% of the proposed alternatives were accepted or being reviewed for implementation. The following Summary of Value Engineering Alternatives details which proposals were included in the categories above.

VALUE ENGINEERING ALTERNATIVES		Sun Valley Area Drainage Master Plan 6/6/2006				
ITEM NO.	ALTERNATIVE DESCRIPTION	IMPLEMENTATION PHASE (see attached memo from JE Fuller)				
		COST SAVINGS TOTAL ESTIMATED COST SAVINGS	ACCEPT	REJECT	REVIEW	TOTAL IMPLEMENTED COST SAVINGS
FRS #1 SUB AREA						
F-1	Reconsider B41 channel alignment	$138,000,000		✔		
F-2	Basin only, no channels (entire plan area)	$489,347,000		✔		
F-3 / G-9	Administer flood plain in lieu of improvements	See G-9				
F-4	Investigate new and bigger culvert crossings at Sun Valley Parkway	Design Suggestion				
F-5	Consider channel alignment along Sun Valley Parkway	Design Suggestion				
F-6	Consider moving downstream portion of Channel 36 900 ft. east off Su Valley Parkway	$4,350,000			✔	$4,350,000
F-7	Reconsider off-line basins	$3,800,000		✔		
WHITE TANK WASH SUB AREA						
WT-1	Basin only, no channels (see F-2)	See F-2		✔		
WT-2	Do nothing at Sun Valley South	$173,407,000		✔		
WT-3	Investigate new and bigger culvert crossings at Sun Valley Parkway	Design Suggestion				
HASSAYAMPA SUB AREA						
H-1	Consider managed approach for Fans 4 & 5. (incorporating G-8, see G-9)	$143,827,000			✔	
H-2	Reduce amount of structured channel by using existing channels	$16,073,000	✔			
WAGNER WASH SUB AREA						
WW-1	Consider managed approach for Fans 17, 18 & 19 (see G-9)	$41,700,000		✔		
WW-2	Basin only, no channels for Fans 3,13,16 & 16	See F-2		✔		
		$41,700,000				**$0**

VALUE ENGINEERING ALTERNATIVES		Sun Valley Area Drainage Master Plan 6/6/2006				
ITEM NO.	ALTERNATIVE DESCRIPTION	IMPLEMENTATION PHASE (see attached memo from JE Fuller)				
		COST SAVINGS TOTAL ESTIMATED COST SAVINGS	ACCEPT	REJECT	REVIEW	TOTAL IMPLEMENTED COST SAVINGS
LANDSCAPE COMPATIBILITY ASSESSMENT (entire study area)						
L-1	Developers pay for buffer construction	$202,386,000			✔	$202,386,000
L-2	Delete one foot vertical undulation for levee walls	$2,772,000	✔			$2,772,000
L-3	Use wall cross section in lieu of levee	$177,725,000	✔			$177,725,000
L-4	Use corridor section for trails / multi-use in lieu of buffers	$134,279,000			✔	$134,279,000
L-5	Establish corridor width criteria based on functions required	$69,960,000			✔	$69,960,000
L-6	Are trails required on both sides of channel	Design Suggestion				
GENERAL (entire study area)						
G-1	Confirm need for environmental document due to regional permitting	Design Suggestion	✔			
G-2	Develop implementation strategies including source of funding, enforcement and timing / phasing plan	Design Suggestion				
G-3	Coordinate planning of State Trust parcel with Sun Valley ADMP	$12,375,000	✔			$12,375,000
G-4	Reduce number of drop structures and monitor erosion	$9,725,000	✔			$4,862,500
G-5	Fund improvements through Community Facilities Districts (FRS #1 example)	Implementation Strategy			✔	
G-6	Embankment in lieu of excavation (balance cut & fill)	Design Suggestion				
G-7	Optimize toe-down to grade control relationship	Design Suggestion				
G-8	Use low density development in lieu of infrastructure for flood control					
G-9 / F-3	Administer flood plain in lieu of improvements	$893,693,000		✔		

Memorandum JE Fuller/ Hydrology & Geomorphology, Inc.

DATE: June 23, 2006

TO: Valerie Swick, PE/FCDMC

FROM: Jon Fuller, PE

RE: SVADMP Value Engineering Meeting Response

CC: Ted Lehman, PE

The following summarize the SVADMP team's responses to design suggestions made by the Value Engineering (VE) team:

FRS #1 Subarea

F-1. Reconsider B41 Channel Alignment: **Reject**

- The B41 channel alignment crosses watershed divides, resulting in substantial excavation costs, inability to integrate the channel into the natural environment, and interbasin transfers of stormwater.
- District staff and project participants preferred a non-excavated channel. The B41 channel alternative requires substantial cuts through divides.
- The B41 alternative is less compatible with developer corridor plans.
- The B41 alternative does not provide for a regional drainage system for areas downstream of the corridor alignment. Providing a regional drainage system has been identified by District staff as a critical success criteria.

F-2. Basin Only, No Channels (Entire Study Area): **Reject**

- The basin only concept addresses only the alluvial fan aspect of a regional drainage solution. Providing a more comprehensive regional drainage system has been identified by District staff as a critical success criteria.
- Leaving channel construction to downstream developers may result inconsistent, incompatible designs, gaps in conveyance system, and phasing issues.
- Non-regional drainage systems to be maintained by homeowners associations are a likely problem.

F-6. Consider Moving Downstream Portion of Channel 36 900 Feet East Off Sun Valley Parkway: **Review**.

- Final recommended channel alignments will be evaluated as part of Step 3 of the ADMP process. The landowners of this parcel are included in the stakeholder involvement process and will be consulted for their alignment preferences. Discussions thus far with these landowners suggests that

realignment in this area is not likely acceptable given their land use objectives.

F-7. Reconsider Off-Line Basins: **Reject**

- ADMP team members expressed significant concerns regarding the ability off-line basins to function adequately to remove alluvial fan flooding hazards over the long-term.

White Tank Wash Subarea

WT-1. Basin Only, No Channels: **Reject**

- See F-2 above.

WT-2. Do Nothing At Sun Valley South: **Reject**

- The do-nothing alternative is evaluated as part of the ADMP process.
- The do-nothing alternative does not provide a comprehensive regional drainage system, which has been identified by District staff as a critical success criteria for an ADMP.
- See G-9

Hassayampa Subarea

H-1. Consider Managed Approach for Fans 4 & 5: **Review**

- Idea will be reviewed and evaluated as part of Step 3 of the ADMP.
- If apex basin is removed, a basin will be required at Sun Valley Parkway in order to meet team objective of not disturbing Sun Valley Parkway.
- The management alternative does not provide a comprehensive regional drainage system, which has been identified by District staff as a critical success criteria for an ADMP.
- Incorporation of the existing channel capacities (see H-2) will likely result in significant reaches of non-structural solutions in this sub-area.
- See G-9

H-2. Reduce Amount of Structured Channel by Using Existing Channels: **Accept**

- This idea is already part of Step 3 and was already being implemented by the ADMP team.

Wagner Wash Subarea

WW-1. Consider Floodplain Management Approach for Fans 17-19: **Reject**

- The management alternative does not provide a comprehensive regional drainage system, which has been identified by District staff as a critical success criteria for an ADMP.
- See H-1.

WW-2. Basin Only, No Channels: **Reject**

- See F-2

Landscape Compatibility Assessment

L-1. Developers Pay for Buffer Construction: **Review**

- This idea is an implementation issue, not a design issue. Implementation issues are addressed in Step 3, which is currently underway.

L-2. Delete One Foot Vertical Undulation for Levee Walls: **Accept**

- District LA has suggested that aesthetic treatment objectives can be met without this additional height variation.
- Was already under consideration as part of Step 3 refinement.

L-3. Use Wall Cross Section in Lieu of Levee: **Accept**

- Was already selected as part of Step 3 refinement.

L-4. Use Corridor Section for Trails/Multi-Use in Lieu of Buffers: **Review**

- Subject to District LA approval. However, discussions thus far indicate that the purpose of the buffers is primarily an aesthetic treatment approach (as opposed to a multiple use objective).
- Step 3 refinement will consider trails on alternate sides (inside vs. outside).

L-5. Establish Corridor Width Criteria Based on Functions Required: **Review**

- Requires coordination with District LA during Step 3 refinement.
- Already incorporated into Step 3 refinement process.

General (Entire Study Area)

G-1. Confirm Need for Environmental Document – Regional Permit. **Accept**

- ADMP team concurs on need, but is not authorized for such activity in the project scope of work.
- Currently, this task is a District function, not a consultant team function.
- Use of environmental permit as implementation tool may be explored.

G-3. Coordinate Planning of State Trust Parcel with Sun Valley ADMP: **Accept**

- ADMP team is already coordinating with ASLD

G-4. Reduce Number of Drop Structures & Monitor Erosion: **Partially Accept**

- District has indicated that monitoring is not an acceptable erosion mitigation measure.
- Refinement of the number, spacing and design of grade control structures is normal part of the Step 3 design process.

G-5. Fund Improvements Through Community Facilities District: **Review**

- ADMP team will consider as part of the scoped implementation plan.

G-9/F-3. Non-Structural Floodplain Management Approach: **Reject**

- Does not meet District objectives for an ADMP.

Recommended Alternative Value Engineering Study
FINAL REPORT

Sun Valley Area Drainage Master Plan
Buckeye, Arizona

May 22 & 24, 2006

SECTION 2: VALUE ENGINEERING ALTERNATIVES

- FRS #1 (F)
- White Tank Wash (WT)
- Hassayampa (H)
- Wagner Wash (W)
- Landscape (L)
- General (G)

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reconsider B41 Channel Alignment** — **F-1**

Original Design

The B43 is the recommended alternative addressing the fan systems 37, 36, 7, 8 and 12. The alternative has basins located at all the apices and has three major channel alignments originating at frons 36, 37 and 7. The channel alignment originating at apex 7 also collects flows from basins at apex 8 and apex 12. All the three channel alignments convey the flow from the respective basins at the apices to the outfall location at FRS #1.
Key parameters: Channel Length: 19.5 miles, ROW Area: 1192 acres, Total Cost: $292 million

Proposed Design

The proposed design is the alternative B4-1 which represents a single channel alignment alternative to convey the flows from the basins at apices 36, 37, 7, 8 and 12. The basins are the same size as that of the recommended B43 alternative. The single channel alignment collects flows from fans 37, 36, 7, 8 and 12, in that order, and then outfalls into FRS #1.
Key parameters: Channel Length: 11.2 miles, ROW Area: 557 acres, Total Cost: $ 154 million

Advantages and Disadvantages

Advantages:

- Provides cost reduction of $138 million over the recommended alternative, by eliminating two channels
- Provides flood control solution to eliminate the alluvial fan uncertainties similar to that of B43 alternative
- Provides a regional trunk system for a large portion of the land area in FRS #1 watershed

Disadvantages:

- Provides only a single channel alignment:
  - Only a portion of the FRS #1 could tap into the trunk system to convey the flows from the adjacent areas
  - All the flows are conveyed in one large, single channel compared to three channels in B43
  - Reduced habitat preservation, multi-use opportunities and other environmental benefits
  - Excavated channel must be constructed between apices 37 and 36

Discussion

The B41 alternative presents significant cost savings compared to the B43 alternative. Both alternatives reduce the alluvial fan uncertainty to the same extent. The B43 alternative provides a more comprehensive regional system while the B41 alternative provides a single channel alignment which may not benefit a large portion of the watershed area. B41 also includes construction of the excavated channel between the apices 37 and 36 which may pose an engineering challenge. The cost savings are significant to reconsider the B41 alternative. B41 leaves regional, non-fan flooding addressed through local drainage regulations and constructed by developers.

Life Cycle Cost Summary

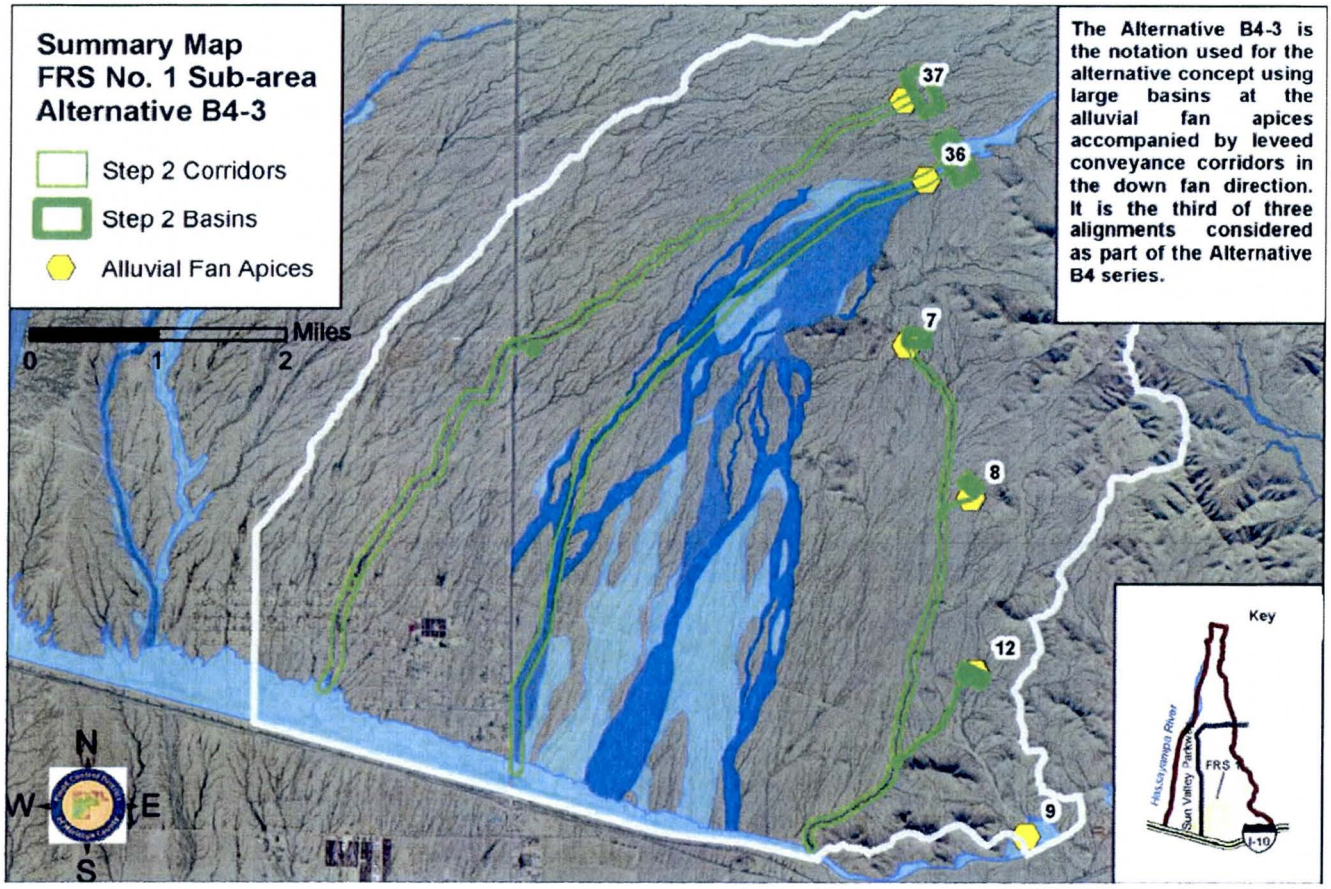
	Initial Cost
Original Design	**292,000,000**
Proposed Design	**154,000,000**
Potential Savings	**138,000,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reconsider B41 Channel Alignment** — **F-1**

■ **Original Design** ☐ **Proposed Design**



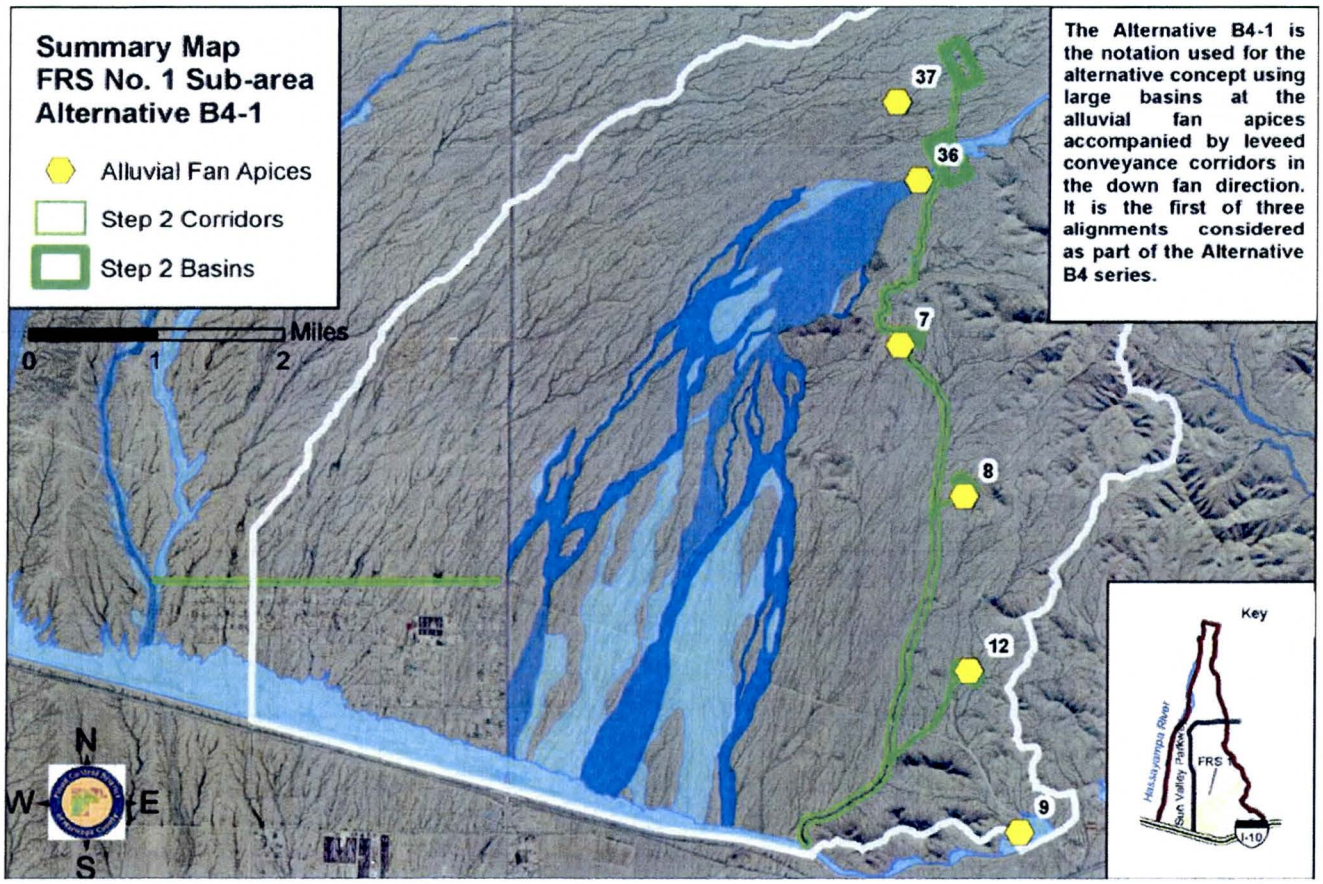
The Alternative B4-3 is the notation used for the alternative concept using large basins at the alluvial fan apices accompanied by leveed conveyance corridors in the down fan direction. It is the third of three alignments considered as part of the Alternative B4 series.

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reconsider B41 Channel Alignment** — **F-1**

☐ **Original Design** ■ **Proposed Design**



The Alternative B4-1 is the notation used for the alternative concept using large basins at the alluvial fan apices accompanied by leveed conveyance corridors in the down fan direction. It is the first of three alignments considered as part of the Alternative B4 series.

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reconsider B41 Channel Alignment** — **F-1**

Original Design

	Quantity	Unit	Unit Cost	Total
Total Cost		1	0	292,000,000
			Total Cost ($)	**292,000,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
Total Cost			0	154,000,000
			Total Cost ($)	**154,000,000**

Potential Savings

Potential Savings ($) **138,000,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Basin only (at apex), no channels** — **F-2**

Original Design

The recommended design calls for large basins at the apex of each alluvial fan, with a constructed channel extending from the basin outlet to the ultimate outfall at the toe of the alluvial fan. The constructed channels are designed to be wide to meet expected USACE 404 requirements, match corridor widths being used by developers, and to maintain low, non-erosive flood velocities. Because of their width, and because of the distance from apex to the outfall, the channels have a large footprint. With land costs at $100,000 per acre, the large channel footprint results in significant costs to the project.

Proposed Design

The proposed design modification is for the public sector participation in the cost of the basins only. By storing flood water and sediment, the basins remove the alluvial fan hazard from downstream areas. By reducing peak discharges through detention or retention, the basins significantly reduce downstream flood hazards. Therefore, there is no need for the public to construct channels downstream of the apex basins, since the alluvial fan hazard is removed, and only local (non-fan) drainage occurs. Construction of regional drainage facilities for the non-fan flooding sources downstream of the basins is a typical responsibility of developers, especially in undeveloped areas like the SVADMP study area. Coordination of channel alignment and design can be facilitated through the normal drainage review process, or by definition of regional channel alignments in the SVADMP recommended plan, or by inclusion of channel alignments in a regional 404 permit.

Advantages and Disadvantages

Advantages:

- Reduced cost by eliminating up to 72.3 miles of channelization (up to $951,145,000)
  (65 miles & $489,347,000 in the recommended alternatives)
- Places construction cost for regional, non-fan channels on primary beneficiaries (developers)
- Eliminates primary phasing concern related to piecemeal construction of channels
- Achieves primary objective of removing alluvial fan flood hazard

Disadvantages:

- District staff felt lack of downstream channels did not provide regional drainage solution.
  The study area is undeveloped, therefore there are no drainage "problems" that require solutions.
- Increases potential for piecemeal construction & differing design standards
  Could be solved by providing alignment and typical sections in ADMP, which is then adopted by Buckeye
- Need to revise floodplain delineations to reflect non-fan floodplains
  Non-public cost, only done if LOMR desired by developer
- May need additional basins for downstream inset channel fans on a few systems
- May be issue for 404 permit - cut off of flow by basins
  This issue already exists for any basin, mitigate by bleed off or scientific study.
- Basins may get larger
- May create long-term scour hazard downstream due to clear water discharge - needs additional study

Discussion

A basin at the apex can eliminate "alluvial fan flooding" downstream. No channel is required to mitigate the alluvial fan flood hazard. The channels comprise the largest cost component of the recommended alternative, yet they are not needed to achieve the primary objective. The overall need for regional channel alignments or design guidelines can be achieved by zoning, planning or regional 404 permitting at no capital cost to the public. Developers would be the primary beneficiaries of channel construction, yet the project cost includes the land cost, leading the VE team to question why the public should pay for the land if the benefit of the project is solely to the landowner. FDCMC maintains control of channel design through CLOMR review process.

Life Cycle Cost Summary

	Initial Cost
Original Design	**489,347,000**
Proposed Design	**0**
Potential Savings	**489,347,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Channel 36 realignment near Sun Valley Parkway and I-10 intersection** **F-6**

Original Design

Situated within the FRS #1 subarea, the Fan 36 preferred alternativre corridor originates at the apex in the northereastern portions of the Tartesso East land holdings and conveys in a southwesterly direction that ultimately discharges into the Buckeye FRS #1 structure. The southerly most portion of the proposed leveed channel runs along the Sun Valley Parkway eastern frontage. It has been identified that the Fan 36 channel alignment follows an existing wash alignment. The Project Team was directed to minimize any design solutions that may negatively impact existing Sun Valley Parkway roadway and drainage crossing structures.

Proposed Design

The proposed design suggests the Project Team reconsider the proposed alignment and design of the Fan 36 channel near the Sun Valley Parkway and I-10 intersection. Consistent with the Town of Buckeye General Plan Proposed Land Use Map an intensification of commercial retail, office and mixed uses are desired adjacent to the Sun Valley Parkway and Interstate 10 interchange.

It is suggested that the Project Team consider realigning the southernmost 2600 feet of the channel approximately 900 to 1500 feet to the east. This proposed change would eliminate the need to channel along Sun Valley Parkway, create a more functionally efficient and aesthetically pleasing commercial center while also utilizing the new wash alignment to serve as a buffer between the commercial uses fronting Sun Valley Parkway and the residential uses presumably planned adjacent to the east. For this portion, utilizing a wall-design versus a leveed design should also be considered as a more palatable design in a more intensified, urbanized setting. It is anticipated that this approach would be more appealing to the land owner, increasing the liklihood that the ROW would be donated as opposed purchased by the District.

Advantages and Disadvantages

Advantages:

- Avoiding conflicts with Sun Valley Parkway roadway and drainage crossing infrastructure
- Reducing project costs by creating favorable conditions to promote ROW donation by expanding/enhancing commercial development square footage
- Reducing channel construction costs by 35% by utilizing walled channel section versus leveed system.

Disadvantages:

- Design does not follow existing wash alignment for a potion of the corridor. May complicate outfall structure design into FRS#1

Discussion

Proposal minimizes conflicts with Sun Valley Parkway which was a directive to the Project team. The proposal does not create an adverse hydraulic design solution and creates a more desireable land use footprint in the immediate area and may also entice the property owner to donate ROW as opposed to other acquisition means.

Life Cycle Cost Summary

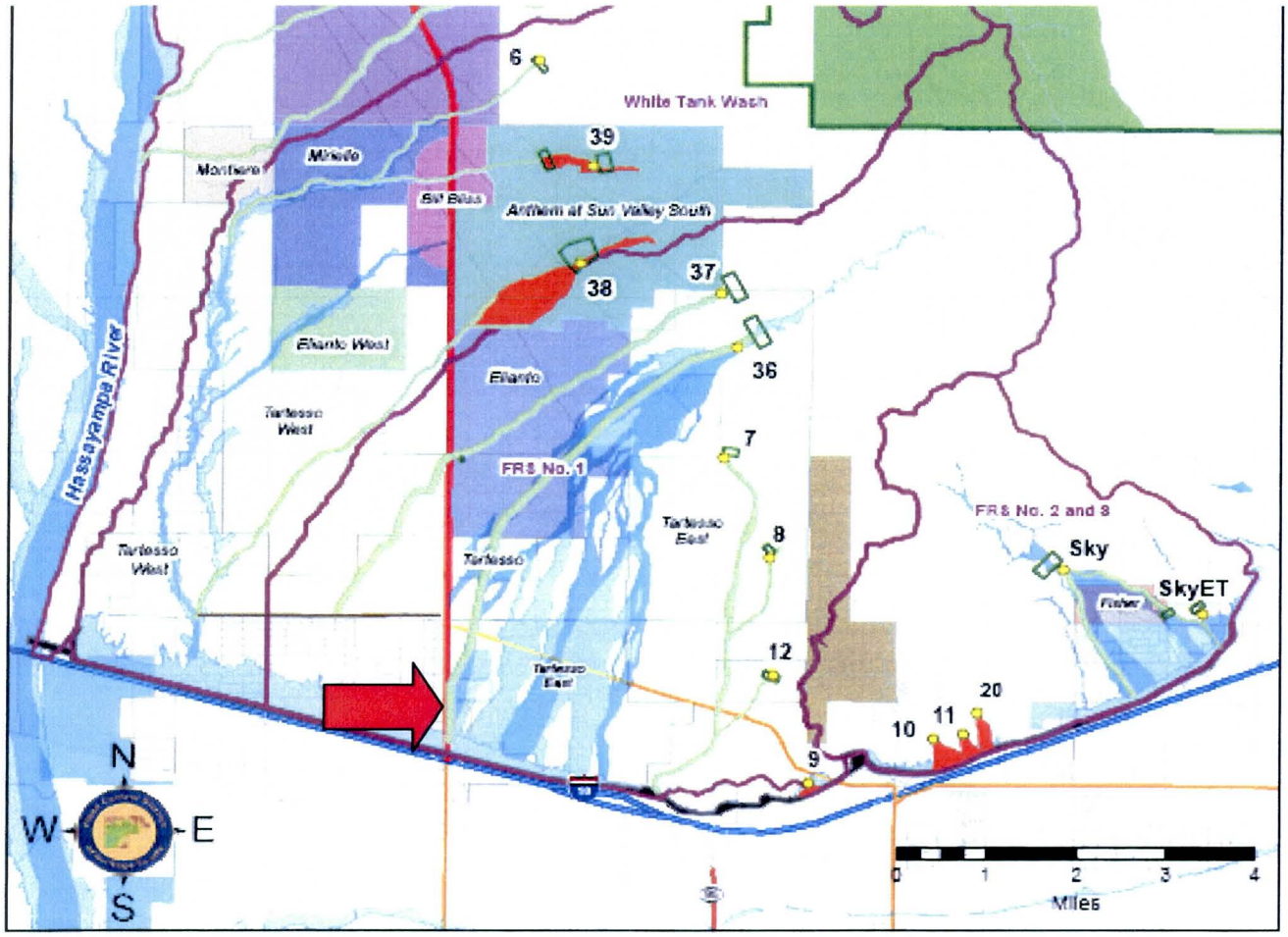
	Initial Cost
Original Design	**6,950,000**
Proposed Design	**2,600,000**
Potential Savings	**4,350,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Channel 36 realignment near Sun Valley Parkway and I-10 intersection** — **F-6**

■ **Original Design** □ **Proposed Design**



Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reconsider Offline Basins** — **F-7**

Original Design

The original design includes detention basins at the apecies of the aluvial fans. It appeared that the detention basin design utilized only online basins. Online basins require additional right-of-way and may have a larger aesthetic impact than offline basins. The online basins capture the entire hydrograph volume and may release "cleaner" water into the downstream channels. The reduction in sediment may reduce maintenance in the downstream channels.

Proposed Design

The proposed design includes the evaluation of offline basins. (see attached sketch) Offline basins require less right-of-way allow low flows to pass by the basin relatively undistriburbed, and may have less of an aesthetic impact. Offline basins may require a RCBC/side weir to distribute flow into the basin. The lateral spillway cost may be relatively expensive. Offline basins scalp the peak off the hydrograph and online basins route the entire hydrograph through the basin.

The offline basins probably are not applicable on all watersheds, but may work on watersheds located further to the west.

Advantages and Disadvantages

Advantages:

- Smaller Basins (less right-of-way)
- Less Aesthetic Impact
- Less Excavation Required

Disadvantages:

- Sediment laidened flow allowed to pass
- Side weir expense
- Larger channels required

Discussion

Difficult to assign a cost without performing a more detailed hydrologic/hydraulic analyses. The costs are close enough that it should be evaluated further. (Estimated savings for CAP sub-area only)

Life Cycle Cost Summary

	Initial Cost
Original Design	**87,990,000**
Proposed Design	**84,190,000**
Potential Savings	**3,800,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Reconsider Offline Basins** **F-7**

■ **Original Design** ☐ **Proposed Design**

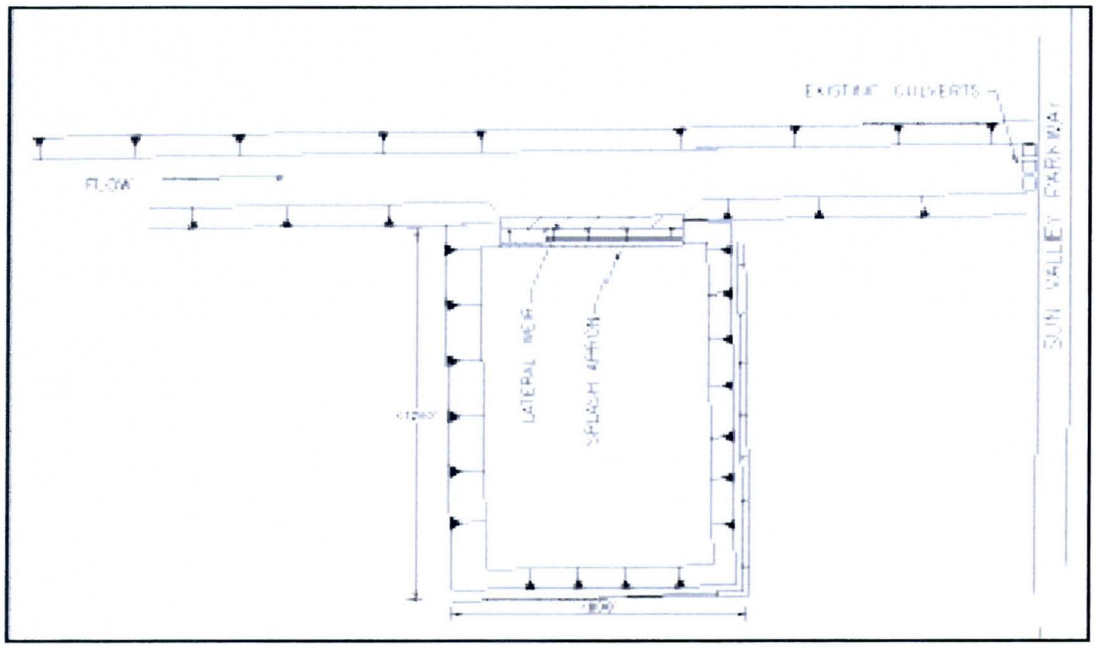


Figure 41 Concept Plan View of Off-line Basins (Not to scale)

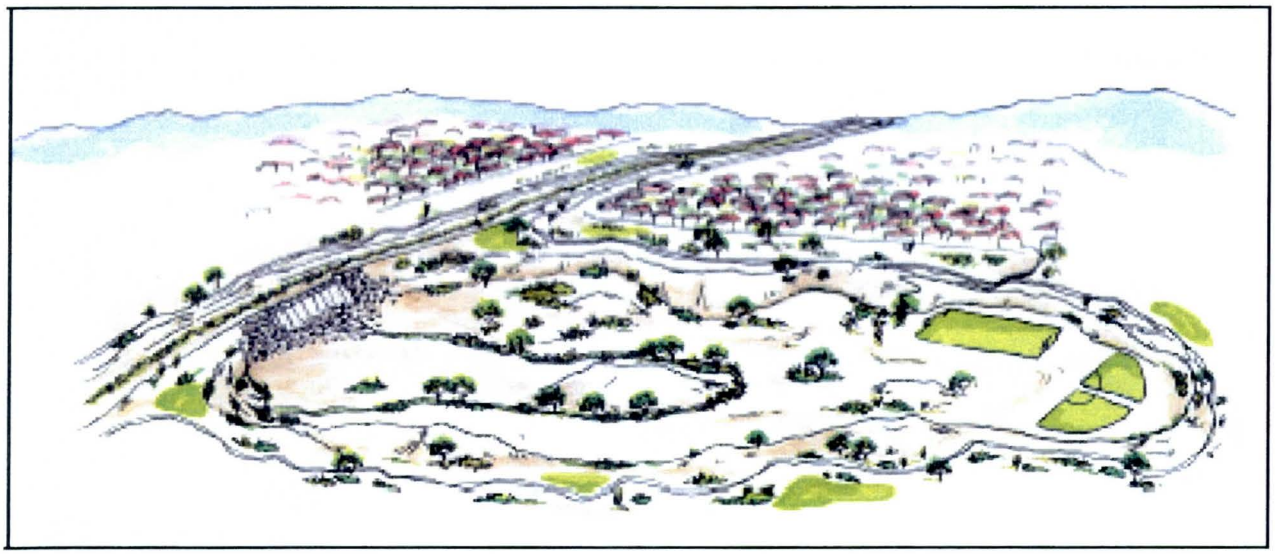


Figure 42 Concept Plan View of Off-line Basins with Landscape Compatibility Enhancements (Not to scale)

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reconsider Offline Basins** — **F-7**

Original Design

	Quantity	Unit	Unit Cost	Total
CAP Example	1	EA	87,990,000	87,990,000
			Total Cost ($)	**87,990,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
CAP Example	1	EA	84,190,000	84,190,000
			Total Cost ($)	**84,190,000**

Potential Savings

Potential Savings ($) **3,800,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Do Nothing at Sun Valley South** — **WT-2**

Original Design

The original design included a detention basin and channels (Regional Solution) for the for the alluvial fans in the Anthem at Sun Valley South development.

Proposed Design

The Anthem at Sun Valley South development is attempting to process their USACOE/FEMA applications in an expedited manner. Their master plan keeps residents out of the proposed "alluvial fan floodway". They have agreed to "set aside" relatively large parcels of property for drainage corridors.
If these developments have already addressed their drainage issues, then the FCDMC doesn't need to provide a regional soulution. The Anthem development extends upstream of the apex and extends downstream to Sun Valley Parkway. It appears that Anthem may not be an eager participant in a regional drainage solution.

Advantages and Disadvantages

Advantages:

- Elimination of regional drainage solution for large portion of White Tanks Basin
- Schedule - private development can move ahead
- District not responsible for maintenance of this portion of the improvements

Disadvantages:

- Regional drainage facility designed by private development
- Large area of land set aside for drainage corridor

Discussion

We specifically looked at the Anthem area. Then we utilized the cost estimate for the entire White Tanks Basin. This results in a larger savings than would be anticipated. JEF should evaluate the White Tanks Basin in sub-basins to determine a comprehensive plan.

Life Cycle Cost Summary

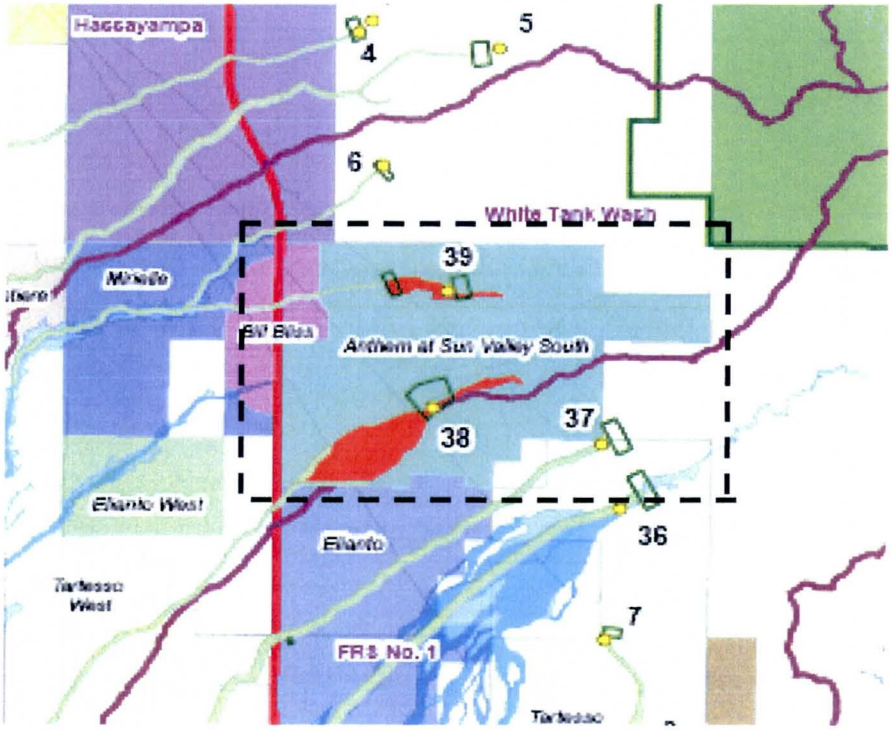
	Initial Cost
Original Design	**173,407,000**
Proposed Design	**0**
Potential Savings	**173,407,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Do Nothing at Sun Valley South** **WT-2**

■ **Original Design** ☐ **Proposed Design**



Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Do Nothing at Sun Valley South** — **WT-2**

Original Design

	Quantity	Unit	Unit Cost	Total
Option B1	1	EA	173,407,000	173,407,000
			Total Cost ($)	**173,407,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
Private Development	0		0	0
			Total Cost ($)	**0**

Potential Savings

Potential Savings ($) **173,407,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Non-Structural Floodplain Management for Hassayampa Subarea** — **H-1**

Original Design

The original design calls for regional detention basins at fan apexes for Fan #4 and #5, and 11.6 miles of regional flood control channels. (see attached sketch)

Proposed Design

The proposed design modification is to eliminate regional detention basins at both fan apexes (#4 and #5) and eliminate downstream flood control channels. The active portions of Fan #4 and #5 are relatively small, and the fans rapidly transition into stable distributary flow areas. The total floodplain area downstream of the fan apexes is approximately 1365 acres - most of this area would remain as floodplain even with the constructed basins and channels. The existing natural system is relatively effective at containing floodplains within defined channels, although the flow (rate) distribution is uncertain.

"Band-aid" structural measures could be applied to eliminate most split flow points and increase flow rate certainty (not included in cost savings below). The "band-aid" measures are local structures and should be implement by appropriate individual landowners.

Note that Pulte (CMX) has proposed this type of approach on the Anthem at Sun Valley subdivision at Fan #38 and #39, based on an evaluation of basin construction cost vs. benefit within the property limits.

Advantages and Disadvantages

Advantages:

- Potential cost savings of $143,827,000 by eliminating two regional basins and 11.6 miles of channels
- Floodplain delineations are already completed as part of the SVADMP
- Minimal land area affected due to small size of active fan and lack of sheet flow area at fan toe.
- Recognizes unique characteristics of this subarea (small fans, defined channels)
- Could be credited as mitigation in a regional 404 plan

Disadvantages:

- The non-structural approach leaves flow rate uncertainty, which may be problematic for road crossing design.
  (Except for Sun Valley Parkway, there are probably no regional transportation corridors affected)
- Does not provide a regional drainage corridor
  (Although the natural drainage system already provides one)

Discussion

The fans in the Hassayampa subarea (#4 & #5) are small and transition rapidly into a defined distributary system. The high cost of proposed regional basins and channels probably is not justified given the small amount of land area removed from the floodplain. A cost / benefit analyis of this alternative is recommended. The distributary channel pattern dictates that construction of a regional basin would not remove flow rate uncertainty. There is minimal public benefit to justify the cost of the proposed recommended plan.

Life Cycle Cost Summary

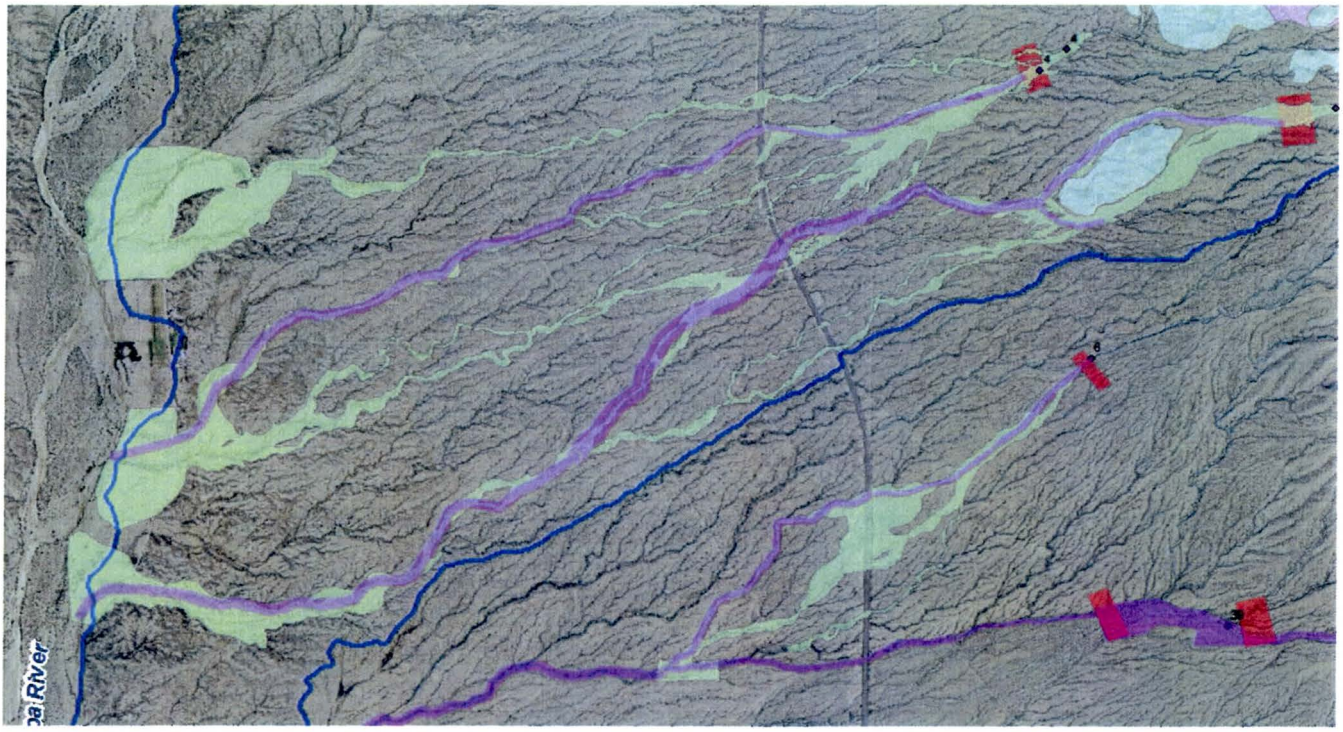
	Initial Cost
Original Design	**143,827,000**
Proposed Design	**0**
Potential Savings	**143,827,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Non-Structural Floodplain Management for Hassayampa Subarea** **H-1**

■ **Original Design** □ **Proposed Design**



Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reduce amount of Structural Channels (use existing channels)** — **H-2**

Original Design

The original design assumes structural channels for all of the proposed channels. The structural channels would be bounded by levees and/or flood walls.

Proposed Design

The proposed design should evaluate the possibility of utilizing the existing channels. Particularly, in areas where the existing channels are stable and well-incised. This may require the proposed retention basin size to be increased so that the basin outlet capacity matches the channel capacity. This concept may eliminate the need for channelization in several wash corridors. It appears that the Hassayampa Watershed may be the most practical watershed to implement this concept.

Advantages and Disadvantages

Advantages:

- Reduce required structural channels
- Maintain the existing desert wash aesthetics

Disadvantages:

- Larger Basins
- Less stable channels

Discussion

Difficult to assign a cost without performing a more detailed hydrologic/hydraulic analyses. The cost are close enough that it should be evaluated further. Estimated savings is based on the assumption that a 20% reduction in structured channels is possible. (cost savings for Hassayampa sub-area only)

Life Cycle Cost Summary

	Initial Cost
Original Design	**80,365,000**
Proposed Design	**64,292,000**
Potential Savings	**16,073,000**

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reduce amount of Structural Channels (use existing channels)** — **H-2**

Original Design

	Quantity	Unit	Unit Cost	Total
CAP Example	1	EA	80,365,000	80,365,000
			Total Cost ($)	**80,365,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
CAP Example	1	EA	64,292,000	64,292,000
			Total Cost ($)	**64,292,000**

Potential Savings

Potential Savings ($) **16,073,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Non-Structural Floodplain Management for Wagner Wash Subarea** — **WW-1**

Original Design

The original design calls for a regional detention basin at the apex of Fan #16, and about 7.5 miles of regional flood control channels on Fans #16, 17, 18, and 19.

Proposed Design

Eliminate regional detention basins at fan apex #16 and eliminate downstream flood control channels. The active portions of Fans #16-19 are relatively small, and the fans rapidly transition into stable distributary flow areas. The total floodplain area downstream of the fan apexes is small - most of this area would remain as floodplain even with the constructed basins and channels. The existing natural system is relatively effective at containing floodplains within defined channels, although the flow (rate) distribution is uncertain.

"Band-aid" structural measures could be applied to eliminate most split flow points and increase flow rate certainty (not included in cost savings below). The "band-aid" measures are local structures and should be implemented by appropriate individual landowners.

The proposed alternative design does not apply to the more active and extensive Fan 3-13 complex.

Advantages and Disadvantages

Advantages:

- Potential cost savings of $41,700,000 by eliminating a regional basin and 7.5 miles of channels
- Floodplain delineations are already completed as part of the SVADMP
- Minimal land area affected due to small size of active fan and lack of sheet flow area at fan toe.
- Recognizes unique characteristics of this subarea (small fans, defined channels)

Disadvantages:

- The non-structural approach leaves flow rate uncertainty, which may be problematic for road crossing design.
  (Except for Sun Valley Parkway, there are probably no regional transportation corridors affected)
- Does not provide a regional drainage corridor
  (Although the natural drainage system already provides one)

Discussion

The fans in the Wagner Wash subarea (#16, 17, 18, 19) are small and transition rapidly into defined distributary systems. The high cost of proposed regional basins and channels probably is not justified given the small amount of land area removed from the floodplain. A cost / benefit analysis is recommended for this portion of the improvements. The distributary channel pattern dictates that construction of a regional basin would not remove flow rate uncertainty. There is minimal public benefit to justify the cost of the proposed recommended plan.

Life Cycle Cost Summary

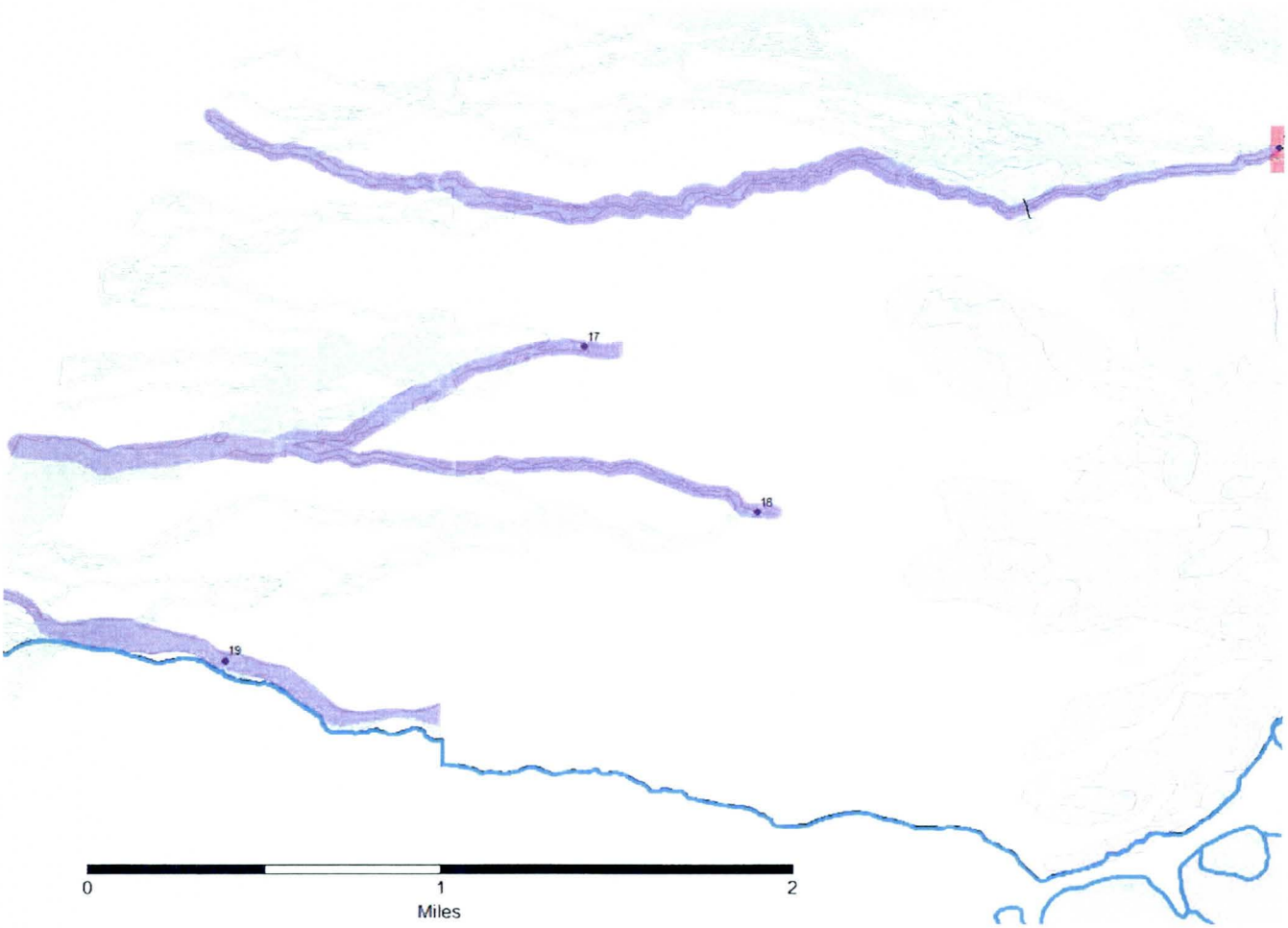
	Initial Cost
Original Design	**41,700,000**
Proposed Design	**0**
Potential Savings	**41,700,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Non-Structural Floodplain Management for Wagner Wash Subarea** **WW-1**

■ **Original Design** ☐ **Proposed Design**



Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Developer Pays for Buffer Construction** — **L-1**

Original Design

Flood Control District pays for the land, construction, landscape and maintenance of the drainage system from the apex basin and all the drainage channel.

Proposed Design

Flood Control District pays for all the land, construction, landscape and maintenance of the apex basin and the drainage channel only. Developer pays for the land, construction, landscape and maintenance of the buffers adjacent to the drainage channel.

Advantages and Disadvantages

Advantages:

- Cost is passed on to developers

Disadvantages:

- Enforcement of construction or design guidelines

Discussion

This recommendation is a cost deferral that could be part of an implementation strategy, not necessarily a value engineering recommendation.

Life Cycle Cost Summary

	Initial Cost
Original Design	**759,452,952**
Proposed Design	**557,066,898**
Potential Savings	**202,386,054**

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Developer Pays for Buffer Construction** — **L-1**

Original Design

	Quantity	Unit	Unit Cost	Total
FRS 1 - B43	1	EA	302,768,550	302,768,550
White Tank Wash - B1	1	EA	173,557,402	173,557,402
Hassayampa - B43	1	EA	144,077,000	144,077,000
Wager Wash - B43	1	EA	139,050,000	139,050,000
			Total Cost ($)	**759,452,952**

Proposed Design

	Quantity	Unit	Unit Cost	Total
FRS 1 - B43	1	EA	242,924,850	242,924,850
White Tank Wash - B1	1	EA	121,984,295	121,984,295
Hassayampa - B43	1	EA	104,680,860	104,680,860
Wager Wash - B43	1	EA	87,476,893	87,476,893
			Total Cost ($)	**557,066,898**

Potential Savings

Potential Savings ($)	**202,386,054**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Eliminate variable levee/wall height (1 foot) for aesthetics** **L-2**

Original Design

The original design included a landscape enhancements to provide a more aesthetic drainage corridor. The plan called for varied side slopes and varied vertical height of the levee/wall system.

Proposed Design

The proposed design would elimnate the one foot vertical variation of the levee/wall height. From a practical standpoint you probably would not notice a one foot variation in the levee height with a several hundred foot wide channel. In addition, the existing ground has some variation. This variation would create the illusion of a varied top of levee.

Advantages and Disadvantages

Advantages:

- Cost Savings in Levee/Wall
- Does not adversely impact the aesthetic character of the corridor

Disadvantages:

- None apparent

Discussion

42 miles of channel * 5280 ft/mile * 0.5 average height * $25/ sq ft of wall = $2,772,000
Eliminate the variation and save the entire amount

Life Cycle Cost Summary

	Initial Cost
Original Design	**2,772,000**
Proposed Design	**0**
Potential Savings	**2,772,000**

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Eliminate variable levee/wall height (1 foot) for aesthetics** — **L-2**

Original Design

	Quantity	Unit	Unit Cost	Total
Variable Wall Height (1 foot)	1	EA	2,772,000	2,772,000
			Total Cost ($)	**2,772,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
Uniform wall height	0		0	0
			Total Cost ($)	**0**

Potential Savings

Potential Savings ($) **2,772,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Use wall cross section in lieu of levee** **L-3**

Original Design

Construct levee system to contain drainage. Assumed cost = $1,600 per lineal foot of cross section

Proposed Design

Construct walls to contain drainage. Assumed cost = $1,000 per lineal foot of cross section

Advantages and Disadvantages

Advantages:

- Wall construction decreases the amount of land necessary for construction. Less land, less money.

Disadvantages:

- Wall construction can detract from the overall visual quality of the drainage corridor.
- Wall construction will need to be penetrated for periodic access along length which could compromise containment
- Area between residential perimeter wall and channel wall can be problematic if too narrow.

Discussion

Life Cycle Cost Summary

	Initial Cost
Original Design	**473,932,800**
Proposed Design	**296,208,000**
Potential Savings	**177,724,800**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Use wall cross section in lieu of levee** — **L-3**

■ **Original Design** ☐ **Proposed Design**

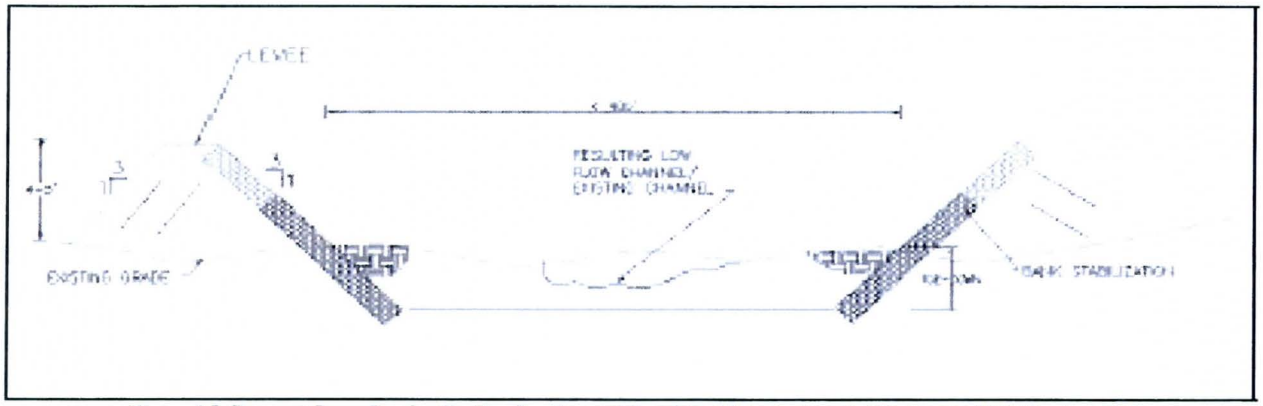


Figure 16 Concept Cross Section for Earthen Leveed Corridor (Alternatives A, B1, B2, B4, B5) (Not to scale)

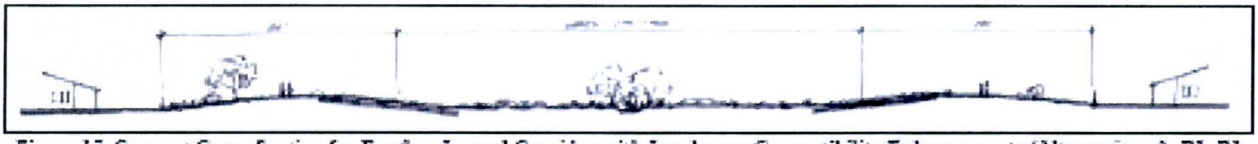


Figure 17 Concept Cross Section for Earthen Leveed Corridor with Landscape Compatibility Enhancements (Alternatives A, B1, B2, B4, B5) (Not to scale)

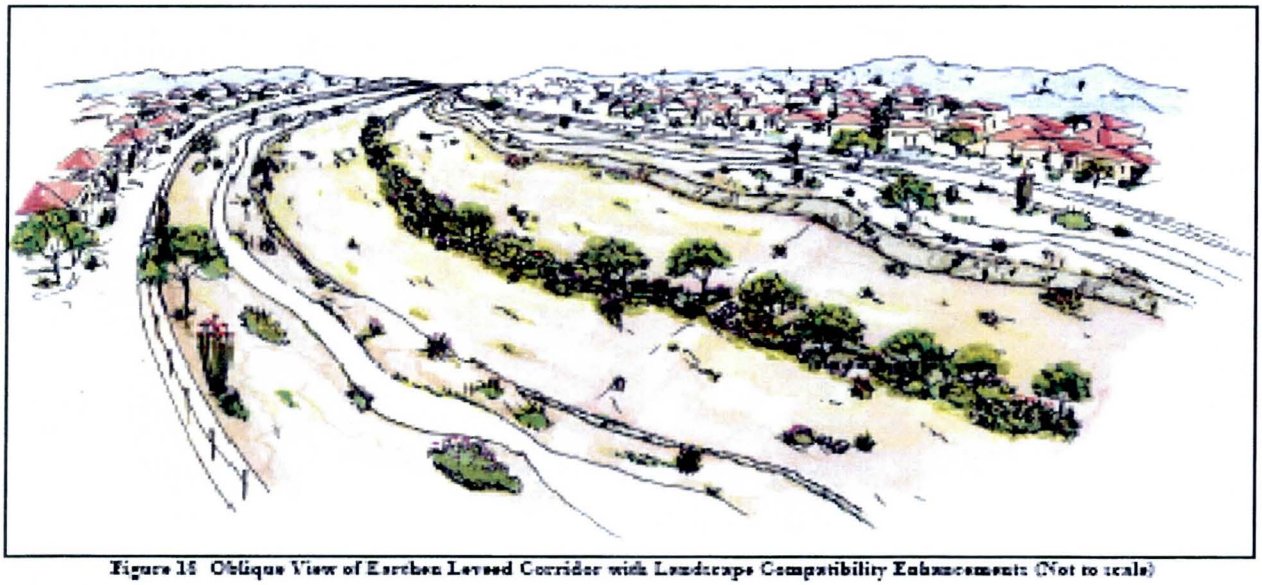


Figure 18 Oblique View of Earthen Leveed Corridor with Landscape Compatibility Enhancements (Not to scale)

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Use wall cross section in lieu of levee** **L-3**

☐ **Original Design** ■ **Proposed Design**

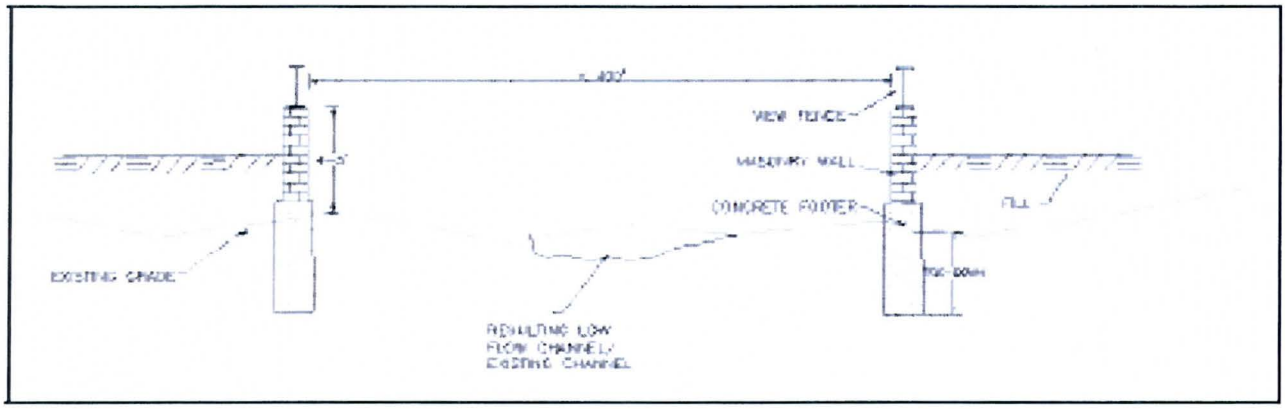


Figure 19 Concept Cross Section for Leveed Corridor with Walls (Alternatives A, B1, B2, B4, B5) (Not to scale)

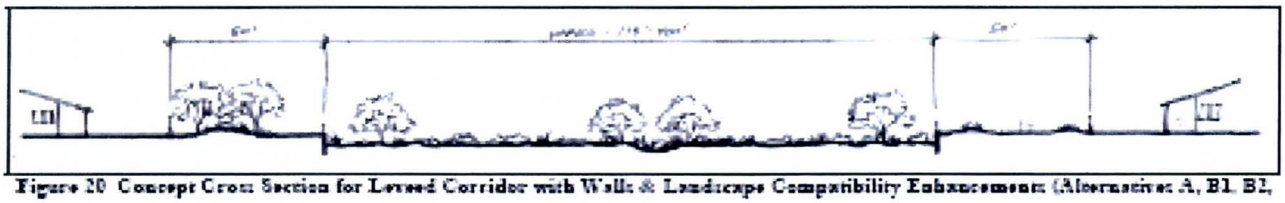


Figure 20 Concept Cross Section for Leveed Corridor with Walls & Landscape Compatibility Enhancements (Alternatives A, B1, B2, B4, B5) (Not to scale)

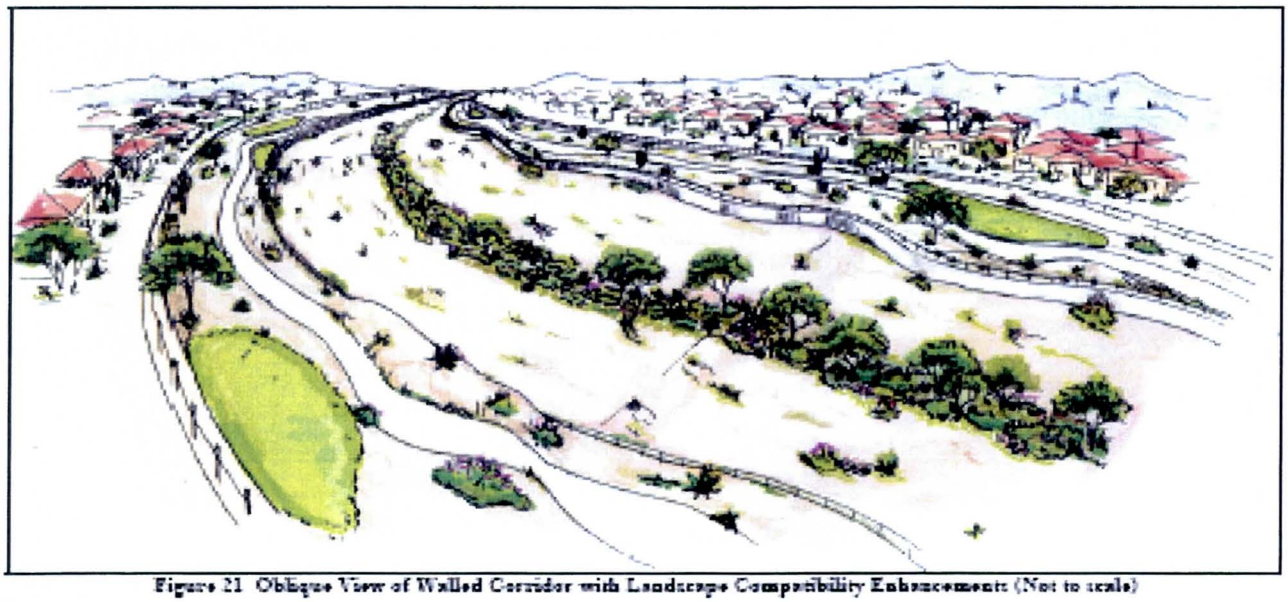


Figure 21 Oblique View of Walled Corridor with Landscape Compatibility Enhancements (Not to scale)

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Use wall cross section in lieu of levee** — **L-3**

Original Design

Levee Construction		Quantity	Unit	Unit Cost	Total
FRS 1 - B43	19.5 miles	102,960	LF	1,600	164,736,000
White Tank Wash - B1	13.8 miles	72,864	LF	1,600	116,582,400
Hassayampa - B43	11.6 miles	61,248	LF	1,600	97,996,800
Wager Wash - B43	11.2 miles	59,136	LF	1,600	94,617,600
				Total Cost ($)	**473,932,800**

Proposed Design

Wall Construction		Quantity	Unit	Unit Cost	Total
FRS 1 - B43	19.5 miles	102,960	LF	1,000	102,960,000
White Tank Wash - B1	13.8 miles	72,864	LF	1,000	72,864,000
Hassayampa - B43	11.6 miles	61,248	LF	1,000	61,248,000
Wager Wash - B43	11.2 miles	59,136	LF	1,000	59,136,000
				Total Cost ($)	**296,208,000**

Potential Savings

Potential Savings ($) **177,724,800**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Use corridor section for trails/multi-use in lieu of buffers** **L-4**

Original Design

Flood Control District pays for the land, construction, landscape and maintenance of the drainage system from the apex basin and all the drainage channel with a 50' landscape buffer on each side of the drainage channel

Proposed Design

Flood Control District pays for all the land, construction, landscape and maintenance of the apex basin and the drainage channel only. All multi-use trails are located within the drainage channel. Assume that a 14' maintenance access road will be on each side of the drainage corridor.

Advantages and Disadvantages

Advantages:

- Requires less land for corridor thus decreasing the cost of land, landscape, maintenance, etc.

Disadvantages:

- Multi-use trails will be subject to occasional damage and maintenance associated with drainage in channel. Could become a liability over time.
- May conflict with existing 404 permit requirements restricting use of the corridor

Discussion

Projected flows of less than 5 FPS are anticipated during the 100 year event in the channel which are too low to cause damage to trails and multi-use infrastructure.

Life Cycle Cost Summary

	Initial Cost
Original Design	**759,452,952**
Proposed Design	**625,174,052**
Potential Savings	**134,278,900**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Use corridor section for trails/multi-use in lieu of buffers** **L-4**

■ **Original Design** ☐ **Proposed Design**

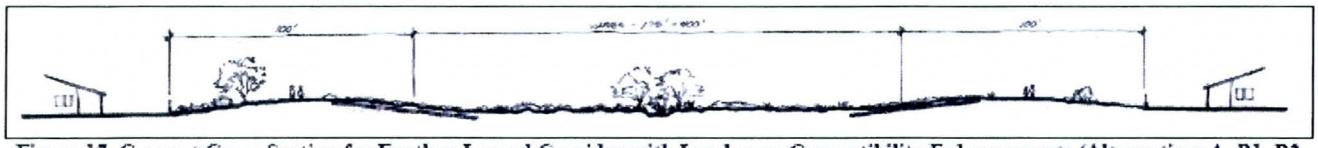


Figure 17 Concept Cross Section for Earthen Leveed Corridor with Landscape Compatibility Enhancements (Alternatives A, B1, B2, B4, B5) (Not to scale)

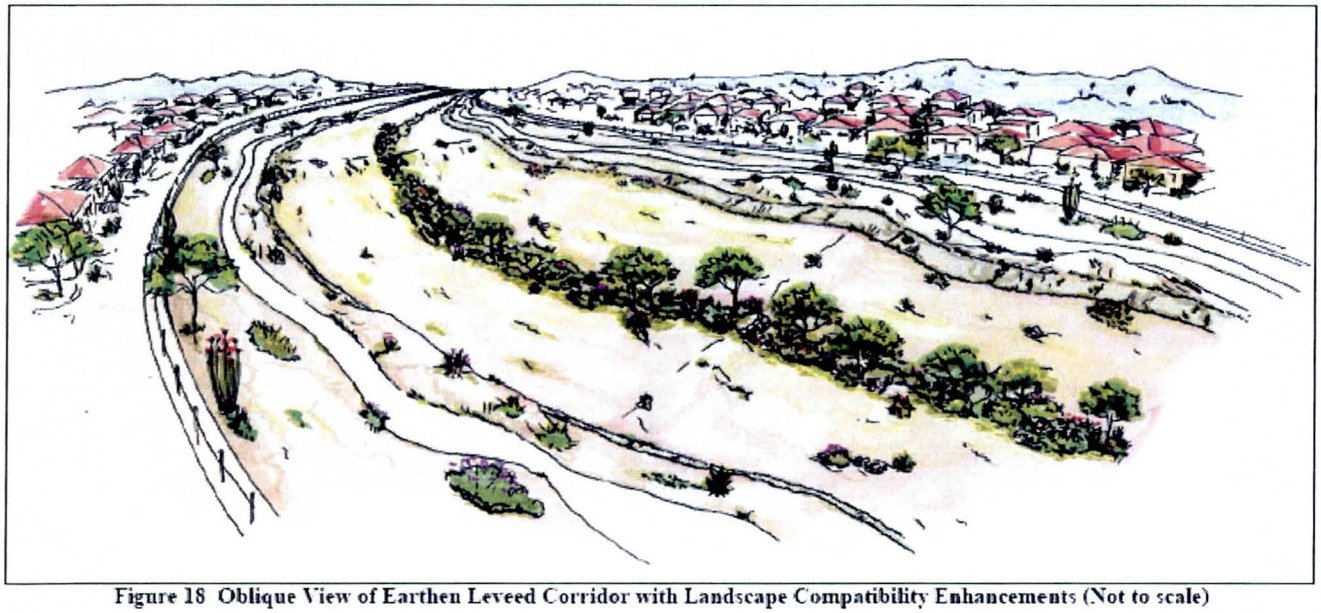


Figure 18 Oblique View of Earthen Leveed Corridor with Landscape Compatibility Enhancements (Not to scale)

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Use corridor section for trails/multi-use in lieu of buffers** — **L-4**

Original Design

	Quantity	Unit	Unit Cost	Total
FRS 1 - B43	1	EA	302,768,550	302,768,550
White Tank Wash - B1	1	EA	173,557,402	173,557,402
Hassayampa - B43	1	EA	144,077,000	144,077,000
Wager Wash - B43	1	EA	139,050,000	139,050,000
			Total Cost ($)	**759,452,952**

Proposed Design

	Quantity	Unit	Unit Cost	Total
FRS 1 - B43	1	EA	259,660,800	259,660,800
White Tank Wash - B1	1	EA	136,498,882	136,498,882
Hassayampa - B43	1	EA	115,655,499	115,655,499
Wager Wash - B43	1	EA	113,358,871	113,358,871
			Total Cost ($)	**625,174,052**

Potential Savings

Potential Savings ($)	**134,278,900**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Establish corridor width criteria based on functions required** — **L-5**

Original Design

Corridor width is based on requirements for drainage and the added buffer desired for maintenance road, multi use trails, etc. (see estimate for average corridor widths) Assumed corridor widths are based in part on developer improvements including 404 permit issues.

Proposed Design

As a point of reference, the proposed design assumes a reduction of 100' from overall average ROW width of drainage corridor. Savings reflects only the savings in land no longer necessary.

Assume: 100' decrease in overall ROW equals $1.2 million saved per mile of channel.

Advantages and Disadvantages

Advantages:

- 15%- 25% savings per 100' less of ROW

Disadvantages:

- Less ROW could affect multi-use trail system and create less than desireable corridors.
- Corridors may not work for private or public trail systems if ROW is too narrow
- Drainage requirements will always get necessary widths, buffers will suffer.

Discussion

This alternative was identified to illustrate the total project cost, including maintenance and ROW acquisition per increment of total channel width (ROW) including suggested buffer zones. Proposed channel cross sections and oblique views illustrated in the JE Fuller report are labeled as "Not to scale". Would suggest the District and Consultant team consider including true to scale sections in final report.

Life Cycle Cost Summary

	Initial Cost
Original Design	**423,672,444**
Proposed Design	**353,712,444**
Potential Savings	**69,960,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Establish corridor width criteria based on functions required** **L-5**

■ **Original Design** ☐ **Proposed Design**

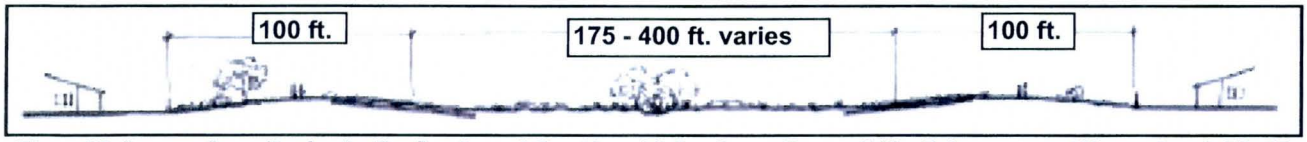


Figure 17 Concept Cross Section for Earthen Leveed Corridor with Landscape Compatibility Enhancements (Alternatives A, B1, B2, B4, B5) (Not to scale)

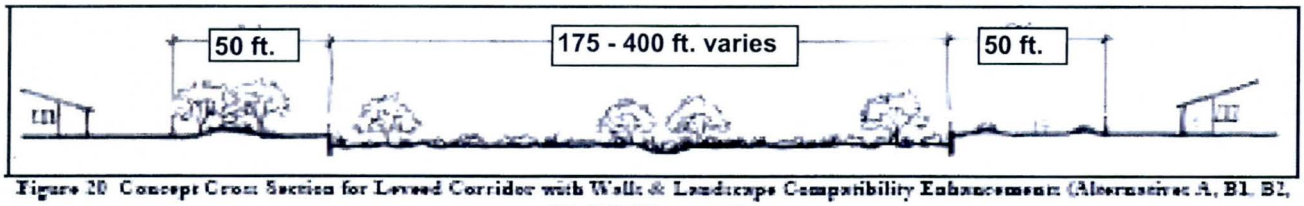


Figure 20 Concept Cross Section for Leveed Corridor with Walls & Landscape Compatibility Enhancements (Alternatives A, B1, B2, B4, B5) (Not to scale)

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Establish corridor width criteria based on functions required** — **L-5**

Original Design

	Quantity	Unit	Unit Cost	Total
FRS 1 - B43 @ 394 ' ROW	1	EA	170,870,000	170,870,000
White Tank Wash - B1 @210' ROW	1	EA	87,393,000	87,393,000
Hassayampa - B43 @ 268' ROW	1	EA	80,365,000	80,365,000
Wager Wash - B43 @ 284' ROW	1	EA	85,044,444	85,044,444
			Total Cost ($)	**423,672,444**

Proposed Design

	Quantity	Unit	Unit Cost	Total
FRS 1 - B43 @ 394 ' ROW	1	EA	147,470,000	147,470,000
White Tank Wash - B1 @110' ROW	1	EA	70,833,000	70,833,000
Hassayampa - B43 @ 268' ROW	1	EA	63,805,000	63,805,000
Wager Wash - B43 @ 184' ROW	1	EA	71,604,444	71,604,444
			Total Cost ($)	**353,712,444**

Potential Savings

Potential Savings ($) **69,960,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Confirm need for environmental document due to regional permitting** — **G-1**

Original Design

It was proposed that the Town of Buckeye meet with the Army Corps of Engineers to discuss the prospects of a regional permit to construct a regional drainage system. Currently there have been no meetings with the ACOE to discuss regional permitting.

Proposed Design

Assumed that a regional system will be required to protect current and future development, the group confirms need for environmental document due to regional permitting. Based on communication from developers in the Sun Valley area, the EPA has indicated that an EIS would be needed for regional permitting. Construction of regional system (i.e., basins, channels) at the apex of the fans would most likely trigger a regional 404 permit along with EA/EIS. Consequently in anticipation of the permit an agency should be identified that would initiate the 404 permitting and EIS process. The permit would become part of the ADMP which would become an enforceable document with the ACOE.

Advantages:

- It would allow for permitting of the regional drainage system
- It would avoid piecemealing of projects
- It would allow for development to proceed with conditions imposed by the ADMP
- Multiple permittees to allow phasing
- Provides leverage to enforce conditions of the ADMP, developers cannot build if non-compliant

Disadvantages:

- An EA/EIS would require one to two years for processing
- It will require an agency/agencies to assume responsibility for enforcing conditions of 404
- It will require coordination and compatibility with proposed development
- Impacts from development and the regional drainage system will be treated as one complete stand alone project
- It may impose delay on current proposed development

Discussion

Current and proposed development could trigger a regional permit. In anticipation of regional permit, an agency should be identified that will start discussions with the ACOE on requirements and conditions for regional permit.

Life Cycle Cost Summary

	Initial Cost
Original Design	
Proposed Design	
Potential Savings	**Design Suggestion**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Partnership with ASLD for Basin Site Selection and Acquisition** — **G-3**

Original Design

The investigations of the project study have identified five different apeces on the ASLD property west of the White Tank Mountain Regional Park. Apeces 3, 4, 5, 6 and 13 are located within the Hassayampa and Wagner subareas. (see attached sketch)

Proposed Design

The proposal here is provided as policy guidance to aid in the cost effective implementation of planning, designing and acquiring needed basin areas needed to implement recommendations of the VE Team to construct regional basins to capture unpredictable alluvial flows that enhances promotes more efficient and predictable systems downstream.

Advantages and Disadvantages

Advantages:

- Cost effective and predictable ROW acquisition process
- Potentiall significant cost savings to the overall project
- Identification of public need is recognized and accounted for prior to private sector disposition and development (proactive vs. reactive)
- Simplifies acquisition process with substantial cost savings

Disadvantages:

- Partnership with other government agencies may hamper or delay process

Discussion

This VE Recommendation suggests that if the Project Team concludes (holistically) that the construction of large basins at or near the apex is desired to capture unpredictable alluvial flows is the most beneficial regional solution (thereby reducing channel construction downstream), a collaboration between the FCDMC, ASLD, and Town of Buckeye should be codified now for the planning and ultimate disposition of ASLD lands for flood control purposes. While ASLD values can be planned and maximized on other portions of the ASLD parcel, the areas identified for basins can be planned now for such purposes. Planning for the basins now] and formally identifying these ASLD areas as "open space" or "conservation" will allow for the FCDMC to acquire these lands at an appraised value consistent with their intended purpose rather than a potentially over inflated values associated with residential of commercial rates.

Life Cycle Cost Summary

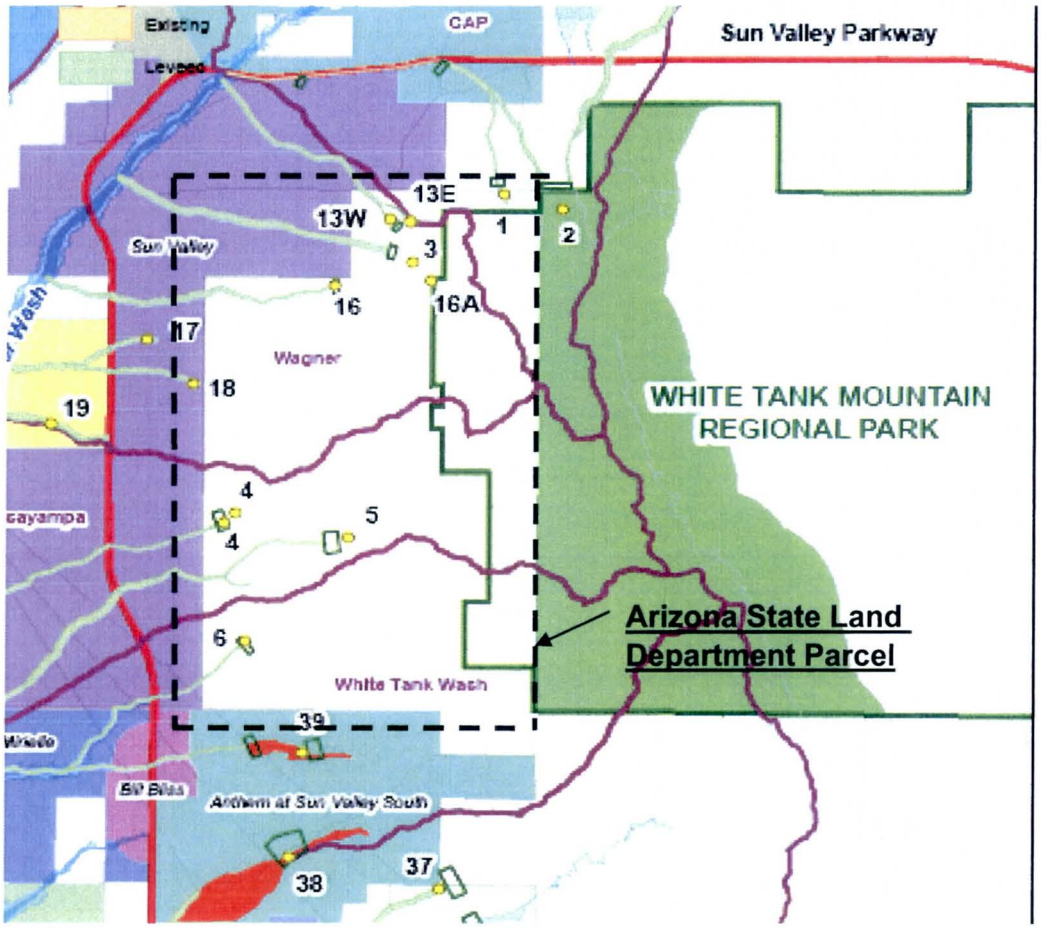
	Initial Cost
Original Design	**16,500,000**
Proposed Design	**4,125,000**
Potential Savings	**12,375,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Partnership with ASLD for Basin Site Selection and Acquisition** — **G-3**

■ **Original Design** ☐ **Proposed Design**



Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Partnership with ASLD for Basin Site Selection and Acquisition** — **G-3**

Original Design

	Quantity	Unit	Unit Cost	Total
5 basins totalling 165 acres			$100,000/acre	16,500,000
			Total Cost ($)	**16,500,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
5 basins totalling 165 acres			25,000	4,125,000
			Total Cost ($)	**4,125,000**

Potential Savings

Potential Savings ($) **12,375,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reduce Number of Drop Structures and Monitor Erosion** — **G-4**

Original Design

The original design estimated that drop structures would be required every 200 - 400 feet in order to maintain the desired longitudinal slope for the channels. The drop structure would extend across the channel section to prevent the longitudinal slope from increasing beyond the design slope. It was estimated that the proposed design include approximately 65 miles of channels. This would require between 1100 drop structures at a cost of approximately $40,000 each.

1100 * $40,000 = $44,000,000

Proposed Design

The proposed design would eliminate a portion of the drop structures and increase the toe-down of the longitudinal walls to accommodate degradation/erosion. The increase in the depth of the walls may be less expensive than the construction of drop structures acrss the entire wash corridor (particularly if the wash corridors are wide). There is a limit to the wall depth extension that would be practical. At this point a drop structure would be constructed and the design repeated. It appears that an additional average depth of 2 feet may be required to eliminate 1/2 of the drop structures.

Advantages and Disadvantages

Advantages:

- Less impact to the wash corridor
- Less capital cost
- Improved aesthetics

Disadvantages:

- Additional concrete and steel required
- Additional excavation and footing depth

Discussion

Need to have more detailed equilibrium slope, channel geometry, etc. to accurately determine the potential savings. This option is worth looking at in more detail during the design process.

Life Cycle Cost Summary

	Initial Cost
Original Design	**44,000,000**
Proposed Design	**34,275,000**
Potential Savings	**9,725,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan VE No.

Item: **Reduce Number of Drop Structures and Monitor Erosion** **G-4**

■ **Original Design** ☐ **Proposed Design**

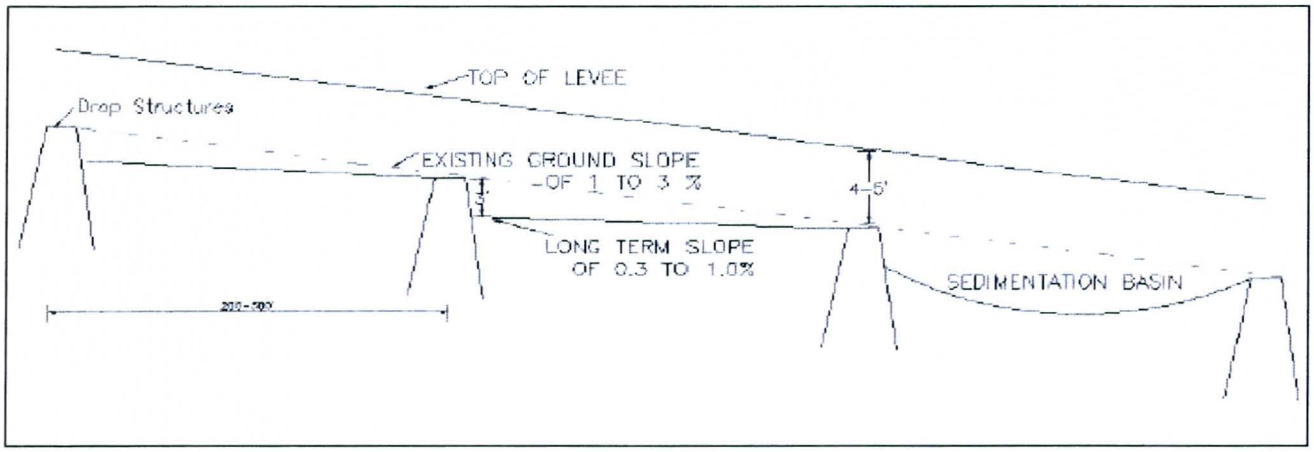


Figure 35 Concept Profile View of Leveed Channel Corridor (Alternatives A, B1, B2, B4, B5) (Not to scale)

Cost Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Reduce Number of Drop Structures and Monitor Erosion** — **G-4**

Original Design

	Quantity	Unit	Unit Cost	Total
drop structure	1,100	EA	$40,000	$44,000,000
			Total Cost ($)	**$44,000,000**

Proposed Design

	Quantity	Unit	Unit Cost	Total
Drop Structure	550	EA	$40,000	$22,000,000
Additional Wall (1.5 feet average)	491,000	SF	$25	$12,275,000
			Total Cost ($)	**$34,275,000**

Potential Savings

Potential Savings ($) **$9,725,000**

Value Analysis Recommendation

Project:	Sun Valley Area Drainage Master Plan	VE No.
Item:	**Funding of Private Sector Infrastructure Commitments with CFD of Development Impact Fee Funding**	**G-5**

Original Design

The original design calls for a series of basins and regional trunk lines to be absorbed as part of the total project cost. The preferred alternative for FRS #1 subarea has been identified at $292,000,000. Private land holders within FRS #1 are proceeding (or near proceeding) with initial stages of development on their respective properties.

Proposed Design

Under the VE Team recommendation that large basins would be constructed at or near the apices and developers would be responsible to seamlessly construct trunks and laterals downstream, it is suggested here that developers would be responsible to construct all channels impacting their project and could be constructed with funding secured through the creation of Community Facility Districts (CFD's) or development impact fees to reduce the developers initial costs and ultimately distribute those costs across the the project and prospective homebuyers. This proposal examines a preliminary financial analysis to test the validity of considering an impact fee to fund the flood infrastructure improvements.

Advantages and Disadvantages

Advantages:

- District responsible for regional costs of constructing basins only, no channels downstream
- Potentiall significant cost savings to the overall project
- Development community responsible for improvements on their site
- Simplifies acquisition process with substantial cost savings

Disadvantages:

- Relies on assumption that each developer will formulate a CFD to finance project improvements
- May rely on Town of Buckeye to implement special development impact fee for this area

Discussion

Since development activity is nearing the construction phases for some projects within the FRS #1 subarea, it is critical that washes originating one project and leaving another are designed with continuity. If the District constructs large basins near the apex, channel corridor widths downstream can be reduced, increasing developable land and therefore giving developers incentive to design and construct their respective improvements. Based on current zoning entitlements in the area, approximately 72,000 homes could be constructed within the FRS #1 subarea. Under this approach, the District would be responsible for constructing the basins at a $41,000,000 cost with the development community collectively responsible to construct the channel improvements at an estimated cost of $251,000,000 that could be spread over a per lot assessment of approximately $3,500 per lot. It is probable that only a portion of the $3,500 per lot assessment may be absorbed through the CFD or development impact fee cost component.

Life Cycle Cost Summary

	Initial Cost
Original Design	**292,000,000**
Proposed Design	**41,000,000**
Potential Savings	**258,000,000**

Value Analysis Recommendation

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Non-Structural Floodplain Management Alternative (Basin-wide)** — **G-8, G-9**

Original Design

The original design calls for construction of regional detention basins at each alluvial fan apex as well as regional channels to convey runoff from each fan apex to the ultimate outfall at each alluvial fan toe.

Proposed Design

The proposed alternative to the original design is a non-structural approach that relies on delineation of alluvial fan and riverine floodplains in the study area, combined with enforcement of existing floodplain regulations. Floodplains have been delineated for most, if not all, of the significant watercourses and alluvial fans in the study area as part of the SVADMP and BSVADMS. (see attached sketch) The alluvial fan floodplain delineations include administrative floodway zones that are already adopted as no-build zones in the Maricopa County Floodplain Regulations (i.e., enforcement authority exists). If no development occurs in the alluvial fan floodways, then there is no risk of flood damage to development, and no need to expend public funds on structural flood control measures. For the non-floodway alluvial fan floodplain zones (sheet flow), low density development could be enforced by the Town of Buckeye (with density trades, etc). Where developers wish to encroach on alluvial fan floodways (or riverine floodplains), the developers can bear the cost of the flood control improvements.

Advantages and Disadvantages

Advantages:

- Reduced cost by eliminating 21 regional detention basins and 65 miles of regional flood control channels
  Savings of $883,693,000 in construction costs
- Floodplain mapping already completed for SVADMP
- Floodplain management tools already adopted by Ordinance
- Places burden for structural flood control measures on private developers

Disadvantages:

- Limits public agency control of flood control measure design.
- Requires rigorous and aggressive review of inadequate development plans
- Political impact from change in direction from structural to non-structural approach

Discussion

The recommended alternative calls for nearly $1 billion in publicly-funded flood control improvements. The primary beneficiaries of this expenditure are developers who have proposed construction in highly hazardous flood zones. At a minimum, a compelling explanation of why it is in the public interest to expend public funds to benefit private corporations and individuals is required. Why shouldn't these developers spend their own money to protect their proposed projects? If the proposed developments are unsafe, why don't public review agencies simply reject the developers' plans?

Life Cycle Cost Summary

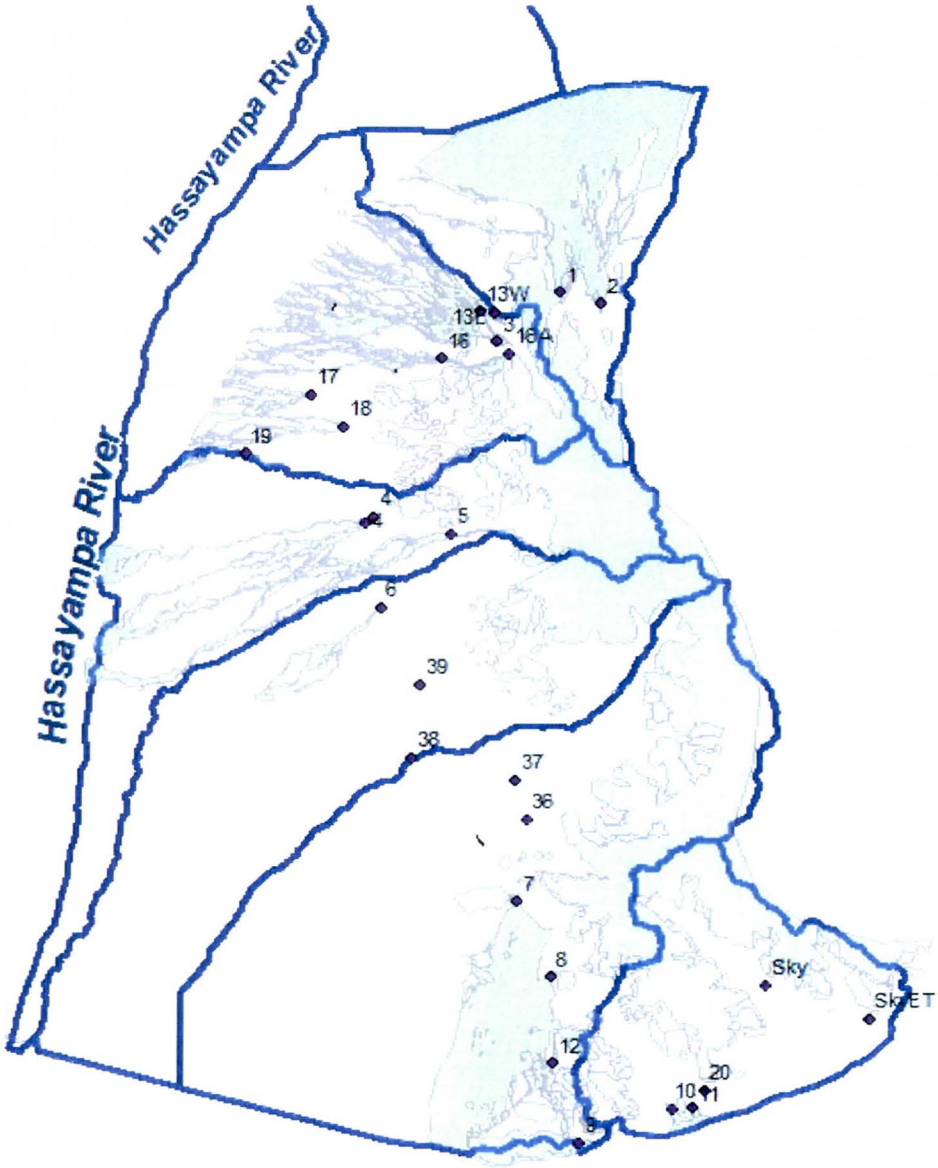
	Initial Cost
Original Design	**883,693,000**
Proposed Design	**0**
Potential Savings	**883,693,000**

Sketch Worksheet

Project: Sun Valley Area Drainage Master Plan — VE No.

Item: **Non-Structural Floodplain Management Alternative (Basin-wide)** — **G-8, G-9**

☐ **Original Design** ■ **Proposed Design**



Recommended Alternative Value Engineering Study
FINAL REPORT

Sun Valley Area Drainage Master Plan
Buckeye, Arizona

May 22 & 24, 2006

SECTION 3: VALUE ENGINEERING PROCESS

- VE Conference Agenda
- Diagram of Recommended Alternative
- Step 2 Alternatives Cost Summary – Alternatives LSC Enhanced Cost Summary
- Function Analysis System Technique (FAST) Diagram
- Alluvial Fan Functional Diagram

3-DAY VALUE ENGINEERING CONFERENCE AGENDA
PREFERRED ALTERNATIVE PHASE
SUN VALLEY AREA DRAINAGE MASTER PLAN

May 22-24, 2006

Workshop Location:

Flood Control District of Maricopa County
Operations Building Conference Room
2801 West Durango Street
Phoenix, AZ 85009

DAY 1 – May 22, 2006

8:30 a.m. **INFORMATION PHASE - INTRODUCTION TO WORKSHOP**
(by VE Team Leader, John Pucetas, SiteTek)

Welcome & Opening Remarks
Team Member Introductions
Value Engineering Briefing
Objectives of Workshop
Questions & Comments

9:15 **BREAK**

9:30 **INFORMATION PHASE - PROJECT BRIEFING**
(by J.E. Fuller)

Project Goals
Project Design: Project history & evolution
Presentation of preferred alternative including: hydrology, structures, planning issues, environmental, landscaping, multi-use, constructability
Project Budget Review

12:00 **LUNCH**

12:30 **DOCUMENT REVIEW**
(VE Team)

1:30 **FUNCTION ANALYSIS PHASE**

Function - Cost - Worth Relationship
Identify high cost to worth relationships for further consideration
Function Analysis System Technique Diagrams (as needed)

2:30 **CREATIVE (SPECULATION) PHASE**

Brainstorm ideas to meet required functions at lower cost
Identify opportunities to achieve best balance of life-cycle cost, performance & durability, while meeting required functions
No Judgment

5:00 **ADJOURN**

DAY 2 – May 23, 2006

8:30 a.m. **CREATIVE (SPECULATION) PHASE - continued**

10:00 **EVALUATION PHASE**

Define Ranking Evaluation Criteria
Evaluate Ideas By Comparison
Select most promising alternatives for development

11:00 **DEVELOPMENT/COSTING PHASE**

Review of Proposal Forms and Final Products
Team Member Proposal Development Assignments
Cost Estimates of Alternatives
Sketches of Alternatives
Life Cycle Cost Calculations (as appropriate)
Written Proposals

12:00 **LUNCH**

12:30 **DEVELOPMENT/COSTING PHASE - continued**

5:00 **ADJOURN**

DAY 3 – May 24, 2006

8:30 a.m **REVIEW STATUS AND PROGRESS**

DEVELOPMENT/COSTING PHASE - Continued

12:00 **LUNCH**

12:30 **PRESENTATION PHASE**

Summarize & Check Proposals
Print & Copy Summary Sheets

3:00 – 3:30 **VE PRESENTATION**

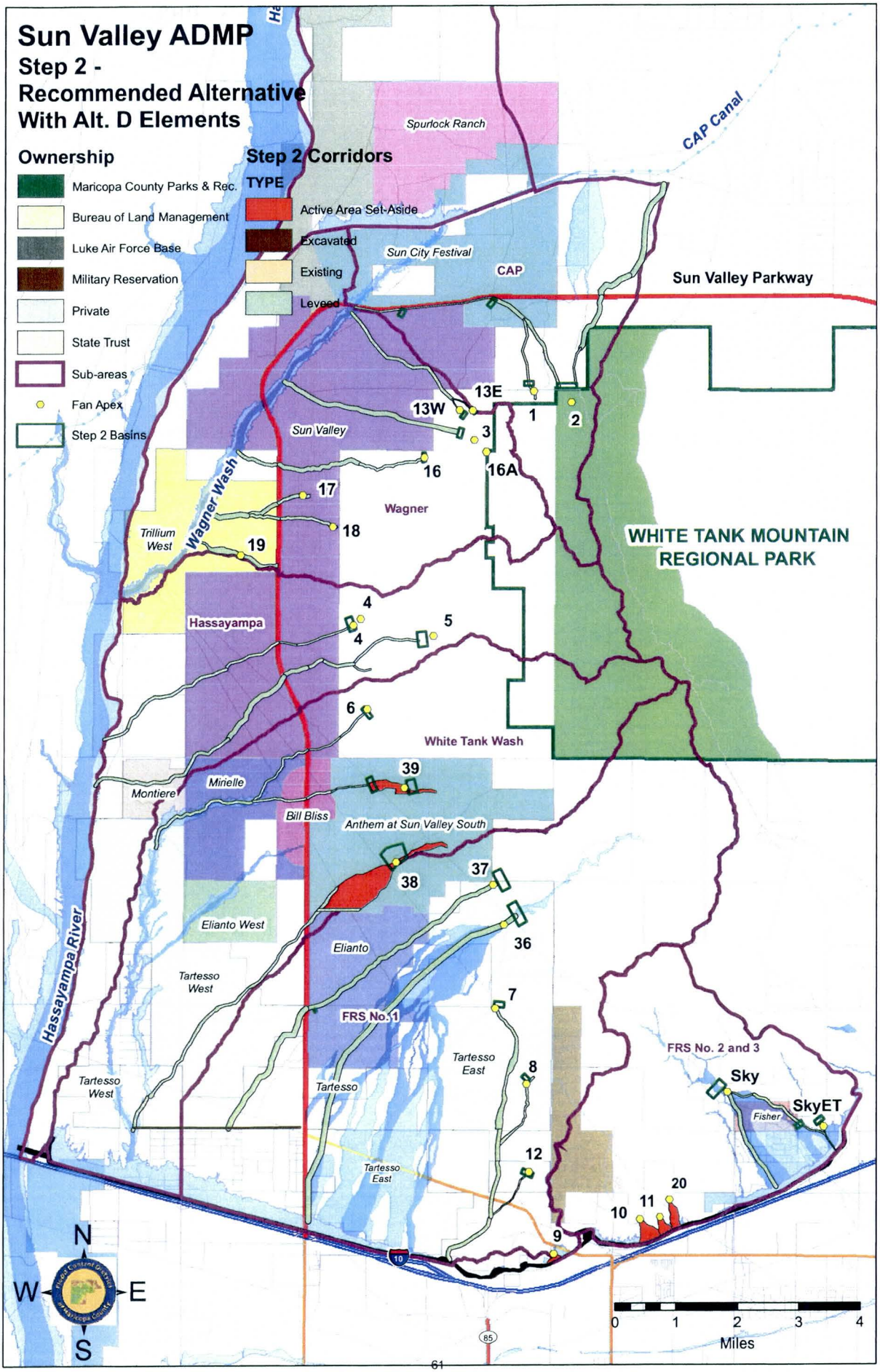
Purpose of Presentation: "Sell Ideas"

Summary of VE Process
VE Proposals, Benefits & Cost Savings (by VE Team Members)
Summary of Value Enhancements and Potential Cost Savings
Comments & Discussion

4:30 **IMPLEMENTATION PHASE**

Process for Accepting/Rejecting Recommendations
Implementation Tracking Log
Develop Implementation Schedule of Events

5:00 **CLOSING REMARKS**
ADJOURN/CELEBRATION!!!

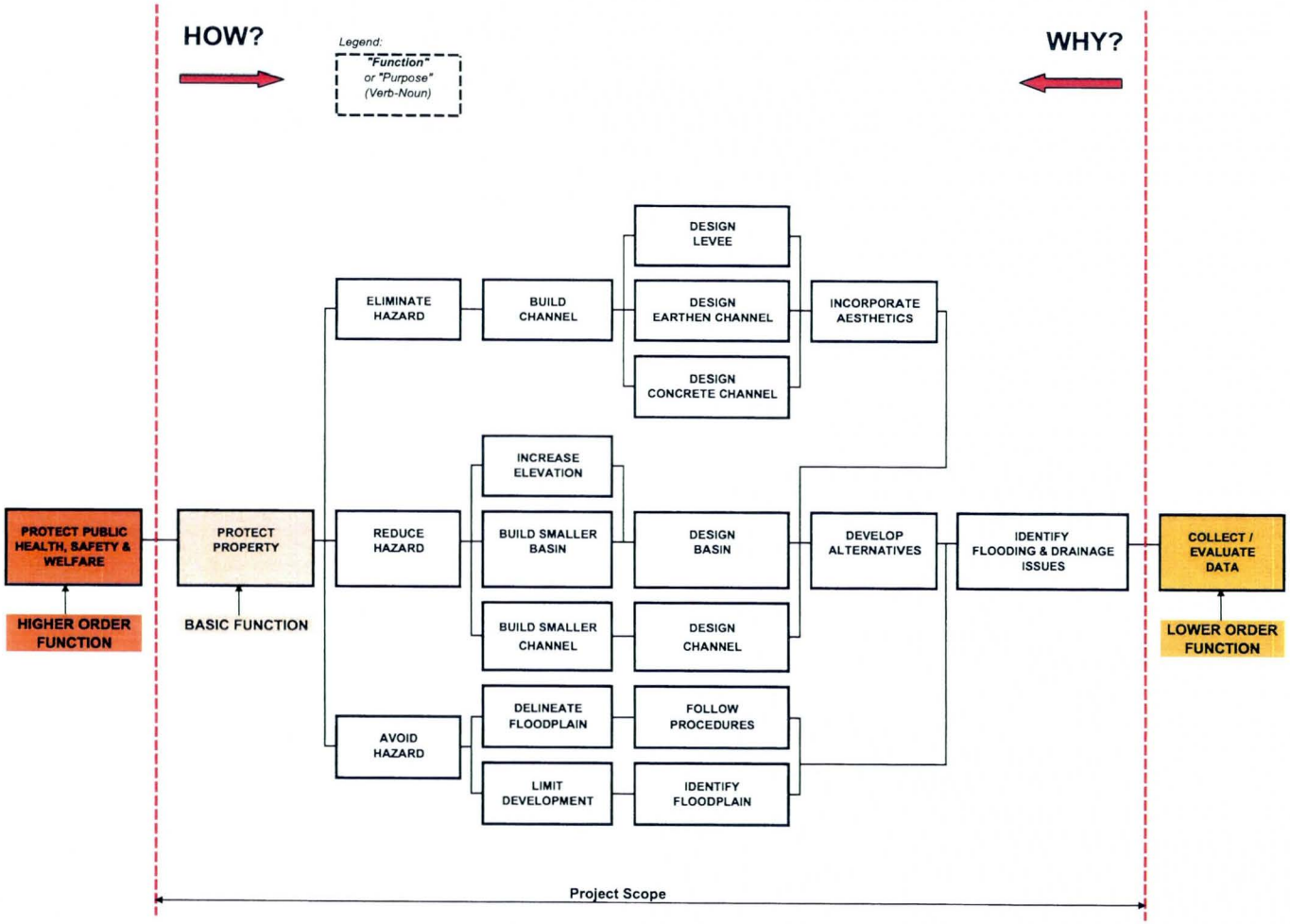

Sun Valley ADMP
Step 2 -
Recommended Alternative
With Alt. D Elements
Ownership
Maricopa County Parks & Rec.
Bureau of Land Management
Luke Air Force Base
Military Reservation
Private
State Trust
Sub-areas
Fan Apex
Step 2 Basins
Step 2 Corridors
TYPE
Active Area Set-Aside
Excavated
Existing
Leveed
Spurlock Ranch
CAP Canal
Sun City Festival
CAP
Sun Valley Parkway
13E
13W
1
2
3
Sun Valley
16
16A
17
Wagner
18
Wagner Wash
Trillium West
19
WHITE TANK MOUNTAIN REGIONAL PARK
4
5
Hassayampa
6
White Tank Wash
39
Montiere
Mirielle
Bill Bliss
Anthem at Sun Valley South
38
37
Elianto West
36
Elianto
Hassayampa River
Tartesso West
7
FRS No. 1
Tartesso East
8
FRS No. 2 and 3
Sky
SkyET
Fisher
Tartesso West
Tartesso
12
Tartesso East
20
11
10
9
N
W
E
S
0
1
2
3
4
Miles

Alternatives Design Parameters

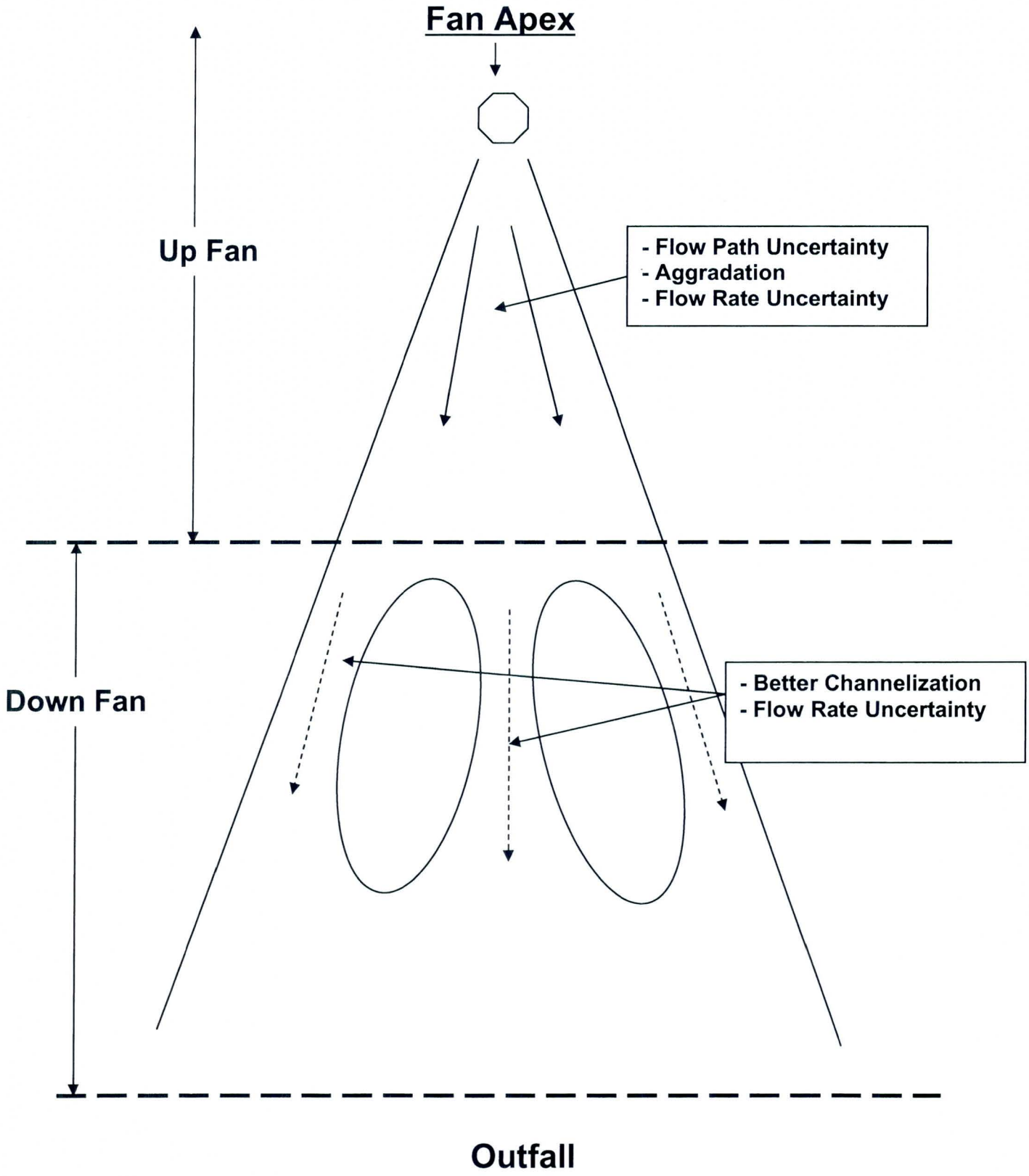
Sub-Area	Alternative	CHANNEL							BASINS				TOTAL			
		Length	*Width*	*Area*	*Volume*		*Cost (in $1000)*		*Area*	*Volume*	*Cost (in $1000)*		*(Channel & Basins)*			
		Total Length (miles)	Average Total ROW Width (ft)	Total ROW Area (acres)	Fill Volume (million cu. Yd)	Exc. Volume (million cu. Yd)	Total Channel Cost	Cost per mile	Total ROW Area (acres)	Basin Exc. Volume (million cu. Yd)	Total Basin Cost	Cost per ac. ft	ROW Area (acres)	Fill Volume (million cu. Yd)	Exc. Volume (million cu. Yd)	Total Cost (in $1000)
CAP	A	5.2	422	416	0.235	0.137	$ 64,912	$ 12,483	19	0.286	$ 5,150	$ 29	435	0.235	0.423	$ 70,062
CAP	B1	5.9	208	251	0.291	0.000	$ 48,658	$ 8,247	38	0.655	$ 10,850	$ 27	289	0.291	0.655	$ 59,508
CAP	B2	5.9	275	298	0.271	0.000	$ 53,647	$ 9,093	20	0.258	$ 5,310	$ 33	318	0.271	0.258	$ 58,957
CAP	B3	5.9	183	208	0.000	6.105	$ 114,662	$ 19,434	40	0.696	$ 11,502	$ 27	248	0.000	6.801	$ 126,164
CAP	B5	5.9	275	298	0.271	0.000	$ 54,050	$ 9,161	17	0.225	$ 4,635	$ 33	315	0.271	0.225	$ 58,685
CAP	C	5.9	162	175	0.000	5.390	$ 103,978	$ 17,623	22	0.349	$ 6,144	$ 28	197	0.000	5.739	$ 110,122
Wagner Wash	A	13.9	341	856	0.602	0.057	$ 140,667	$ 10,120	0	0.000	$ -	$ -	856	0.602	0.057	$ 140,667
Wagner Wash	B2	9.0	263	324	0.429	0.000	$ 66,494	$ 7,388	6	0.068	$ 1,762	$ 42	330	0.429	0.068	$ 68,256
Wagner Wash	B3	9.0	213	257	0.000	6.770	$ 128,050	$ 14,228	19	0.349	$ 5,802	$ 27	276	0.000	7.119	$ 133,852
Wagner Wash	B41	8.4	240	275	0.402	0.000	$ 58,851	$ 7,006	21	0.423	$ 6,665	$ 25	296	0.402	0.423	$ 65,516
Wagner Wash	B42	9.0	226	283	0.429	0.000	$ 61,438	$ 6,826	19	0.343	$ 5,756	$ 27	302	0.429	0.343	$ 67,194
Wagner Wash	B43	11.2	284	421	0.537	0.000	$ 85,044	$ 7,593	18	0.336	$ 5,625	$ 27	439	0.537	0.336	$ 90,669
Wagner Wash	C	9.0	202	249	0.000	7.382	$ 142,364	$ 15,818	1	0.010	$ 390	$ 63	250	0.000	7.392	$ 142,754
Hassayampa	A	5.5	354	441	0.230	0.363	$ 69,757	$ 12,683	23	0.506	$ 7,096	$ 23	464	0.230	0.869	$ 76,853
Hassayampa	B2	7.4	387	353	0.325	0.144	$ 65,959	$ 8,913	34	0.683	$ 10,280	$ 24	387	0.325	0.827	$ 76,239
Hassayampa	B3	7.4	243	226	0.000	5.190	$ 103,225	$ 13,949	48	1.198	$ 15,614	$ 21	274	0.000	6.388	$ 118,839
Hassayampa	B41	7.4	289	266	0.324	0.087	$ 53,730	$ 7,261	48	1.198	$ 15,614	$ 21	314	0.324	1.285	$ 69,344
Hassayampa	B42	10.9	264	361	0.528	0.000	$ 76,739	$ 7,040	40	1.085	$ 13,515	$ 20	401	0.528	1.085	$ 90,254
Hassayampa	B43	11.6	268	382	0.556	0.000	$ 80,365	$ 6,928	40	1.085	$ 13,515	$ 20	422	0.556	1.085	$ 93,880
Hassayampa	C	7.4	250	232	0.000	7.248	$ 138,892	$ 18,769	22	0.542	$ 7,064	$ 21	254	0.000	7.790	$ 145,956
White Tank Wash	A	18.0	306	1,335	0.974	0.323	$ 206,914	$ 11,495	38	0.889	$ 19,056	$ 35	1,373	0.974	1.212	$ 225,970
White Tank Wash	B1	13.8	210	372	0.722	0.000	$ 87,393	$ 6,333	69	1.528	$ 21,891	$ 23	441	0.722	1.528	$ 109,284
White Tank Wash	B2	13.8	311	543	0.741	0.000	$ 107,751	$ 7,808	59	0.967	$ 16,757	$ 28	602	0.741	0.967	$ 124,508
White Tank Wash	B3	13.8	225	396	0.000	6.383	$ 144,648	$ 10,482	69	1.536	$ 21,957	$ 23	465	0.000	7.919	$ 166,605
White Tank Wash	C	13.8	237	417	0.000	9.096	$ 197,775	$ 14,332	45	0.858	$ 13,025	$ 24	462	0.000	9.954	$ 210,800
FRS #1	A	16.0	402	1,950	0.762	1.067	$ 277,699	$ 17,356	20	0.349	$ 5,626	$ 26	1,970	0.762	1.416	$ 283,325
FRS #1	B2	11.2	375	517	0.472	0.353	$ 100,984	$ 9,016	24	0.483	$ 7,703	$ 26	541	0.472	0.836	$ 108,687
FRS #1	B3	11.2	218	304	0.000	6.185	$ 130,840	$ 11,682	97	2.917	$ 34,014	$ 19	401	0.000	9.102	$ 164,854
FRS #1	B41	11.2	227	311	0.384	0.490	$ 73,281	$ 6,543	97	2.892	$ 33,712	$ 19	408	0.384	3.382	$ 106,993
FRS #1	B42	14.7	337	605	0.739	0.000	$ 117,605	$ 8,000	95	2.653	$ 32,235	$ 20	700	0.739	2.653	$ 149,840
FRS #1	B43	19.5	394	932	0.978	0.000	$ 170,870	$ 8,763	95	2.653	$ 32,235	$ 20	1,027	0.978	2.653	$ 203,105
FRS #1	C	11.2	252	348	0.000	12.080	$ 232,936	$ 20,798	0	0.000	$ -	$ -	348	0.000	12.080	$ 232,936
FRS #2 & #3	A	1.7	162	519	0.060	0.921	$ 70,614	$ 41,538	0	0.000	$ -	$ -	519	0.060	0.921	$ 70,614
FRS #2 & #3	B2	3.0	363	150	0.148	0.000	$ 28,226	$ 9,409	12	0.195	$ 3,560	$ 29	162	0.148	0.195	$ 31,786
FRS #2 & #3	B3	3.0	187	74	0.000	0.868	$ 22,952	$ 7,651	61	1.443	$ 19,695	$ 22	135	0.000	2.311	$ 42,647
FRS #2 & #3	B41	3.4	215	91	0.135	0.000	$ 21,651	$ 6,368	62	1.460	$ 19,958	$ 22	153	0.135	1.460	$ 41,609
FRS #2 & #3	B42	3.0	146	56	0.121	0.000	$ 15,416	$ 5,139	60	1.427	$ 19,444	$ 22	116	0.121	1.427	$ 34,860
FRS #2 & #3	B43	3.0	187	71	0.126	0.000	$ 17,017	$ 5,672	43	1.104	$ 14,176	$ 21	114	0.126	1.104	$ 31,193
FRS #2 & #3	C	3.0	203	83	0.000	1.605	$ 39,086	$ 13,029	0	0.000	$ -	$ -	83	0.000	1.605	$ 39,086

Whole Fan Solution

Sun Valley ADMP Recommended Alternative



Function Analysis System Technique (FAST) Diagram



Alluvial Fan Functional Diagram