Flood Control District
Of
Maricopa County

VALUE ANALYSIS

SIPHON DRAW DRAINAGE IMPROVEMENTS (CONCEPTUAL PLANS)

February 20, 21, 22, 2008

SUBJECT: **SIPHON DRAW DRAINAGE IMPROVEMENTS**

DATES: February 20 – 22, 2008

TEAMLEADER: Geza Kmetty , FCDMC

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PROJECT BACKGROUND:

The Siphon Draw Wash Drainage Improvement Project consists of flood control and drainage concepts initially proposed as part of regional improvements in the East Mesa Area Drainage Master Plan (ADMP), the FCDMC's regional planning document for east Mesa and eastern Maricopa County. These concepts were further investigated in subsequent studies and will culminate with the design of regional improvements as part of the Siphon Draw Wash Drainage Improvement Project.

The proposed conceptual improvements included channels/storm drains to route flood water and a detention basin(s) to attenuate of peak discharges from Siphon Draw Wash and channelized flow along Meridian Road. The improvements are to provide local flood protection and attenuate peak flood discharges along Siphon Draw Wash such that existing downstream flood control and drainage facilities are not overwhelmed during the 100-year design event.

Title and General Description of VE Recommendation

Recommendation No. 1 and No. 2 (6,3)

Limit slope to 4:1, no meander

Fits an earthen channel within 160' easement

Limits vegetation to grass and shrubs within flow area

Future road ROW will include landscape buffer & sidewalk

Freeboard is available for tree planting

Feasibility (Compare to baseline)

Need exploration to determine exact x-section needs

Could consider 4:1-2:1 with rip-rap protection

Function (Compare to baseline)

Disadvantages –forces straight channel alignment, more drops, longer bridges, no fissure mitigation, only one O&M road.

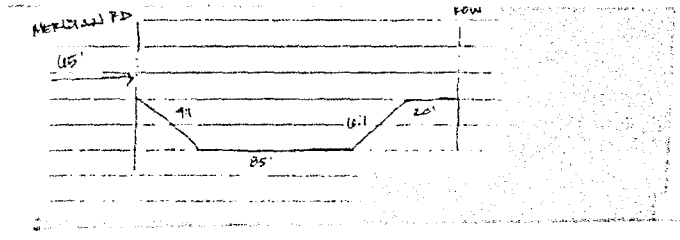
Advantages – More natural, easier to construct, least cost,

Life-Cycle Cost (Compare to baseline)

Earthen channel has greater associated O & M

Likely to cost less – initial cost; Cost of future road crossings needs to be compared, baseline and proposal.

POST WORKSHOP DECISION – DO NOT RECOMMEND.


MERIDIAN RD
FOW
65'
4:1
6:1
20'
85'

Title and General Description of VE Recommendation
#3 (7)

Full aesthetic channel section south of power lines.

Earthen, unlined channel.

Variable side slopes -

6:1 or flatter

Riparian landscape theme in bottom.

Lower Sonoran desert theme side slopes & overbank

4:1-2:1

See attached design guidelines with rec # 19, 20

Feasibility (Compare to baseline)
*Land is available within basin site.

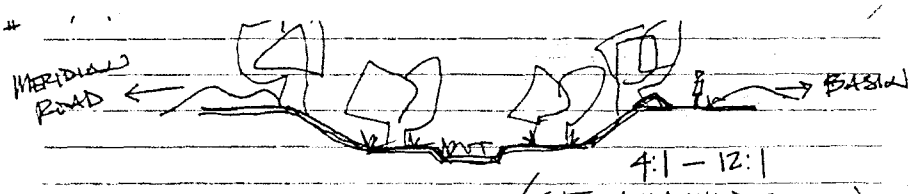
Lower volume of water for bypass.

Function (Compare to baseline)
Meet hydrologic function.

Advantages –
Increases scenic & recreation functions; more natural; can landscape within channel; lower initial cost than concrete channel
Disadvantages – Increases O&M cost, may impact diversion options, does not provide fissure mitigation.

Life-Cycle Cost (Compare to baseline)
Less cost

POST WORKSHOP DECISION: RECOMMEND.



(SEE ATTACHED DESIGN GUIDELINES W/ REC# 19, 20)

Title and General Description of VE Recommendation
Recommendation #4 (9 & 56)
Item – split storm drain plus channel on top. Landscaped with grass and trail on top; similar to Old Cross-cut and 10th St. wash.

Original design – open channel concrete lined.

The function of the channel is to collect flows and convey them.

The storm drain and channel on top will convey flows. Lower frequency storms will be conveyed in the storm drain, higher frequency will be conveyed in both storm drain and channel on top.

Advantage – provides same function, future roadway improvement can be collected in the storm drain. Provides more room for recreation via trail.
Disadvantage – May not fit within proposed r/w; cost of the project and its implementation, storm drain maintenance, may not have vertical clearance for drop structures; may not have sufficient drop for pipe and channel.

Feasibility (Compare to baseline)
Provides recreation facility, convey flows as originally designed.

Function (Compare to baseline)
The function is same as baseline.

Life-Cycle Cost (Compare to baseline)
Maintenance will be higher compared to baseline, for the trail on top of channel and stormdrain.

POST WORKSHOP DECISION – DO NOT RECOMMEND, TOO EXPENSIVE.

Stanley Consultants INC

Project No. ..... Page No. .....

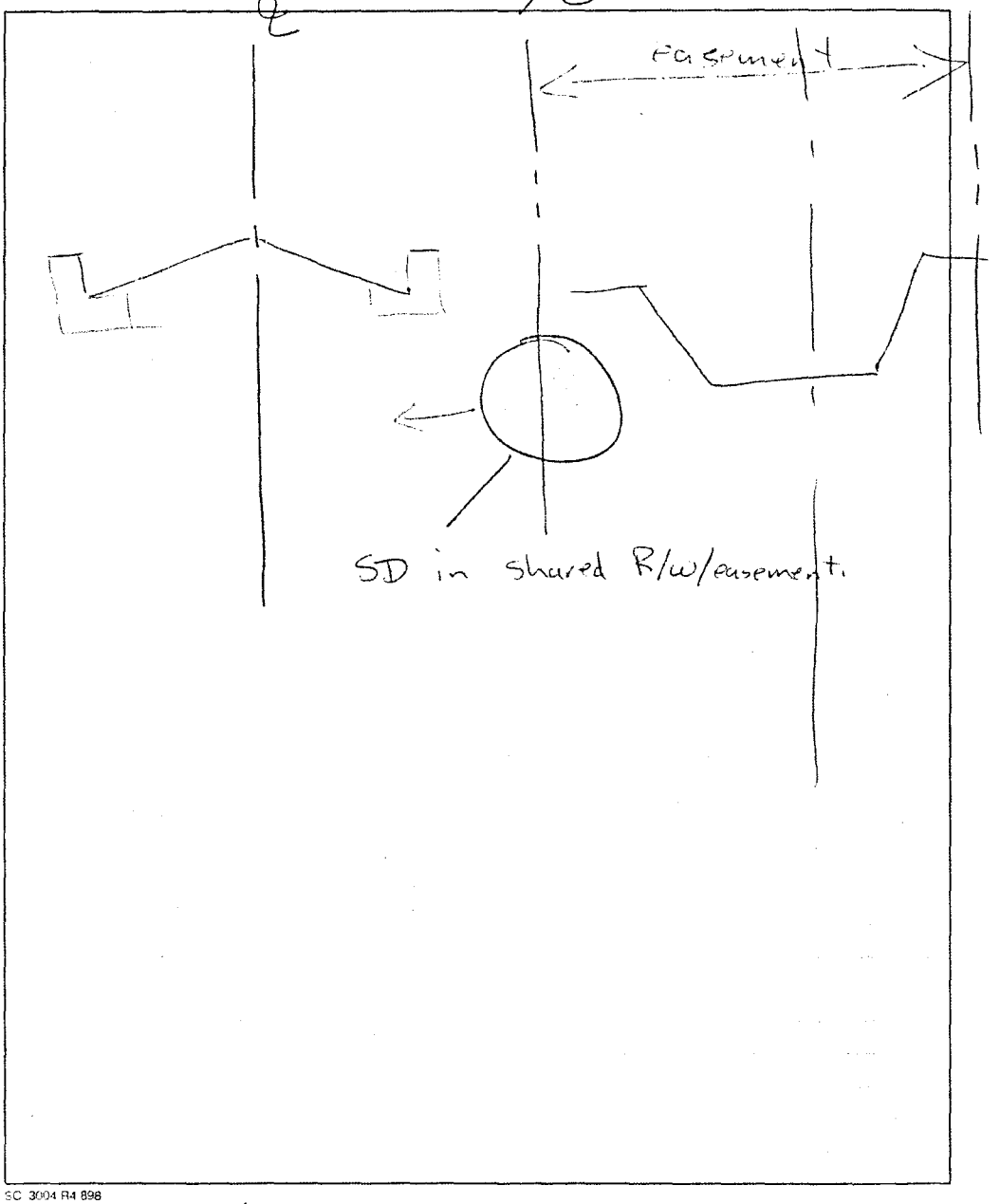
Subject ..... Channel

Computed by ..... Date .....

Checked by ..... Date .....

Approved by ..... Date .....

Sheet No. R/W of ℄



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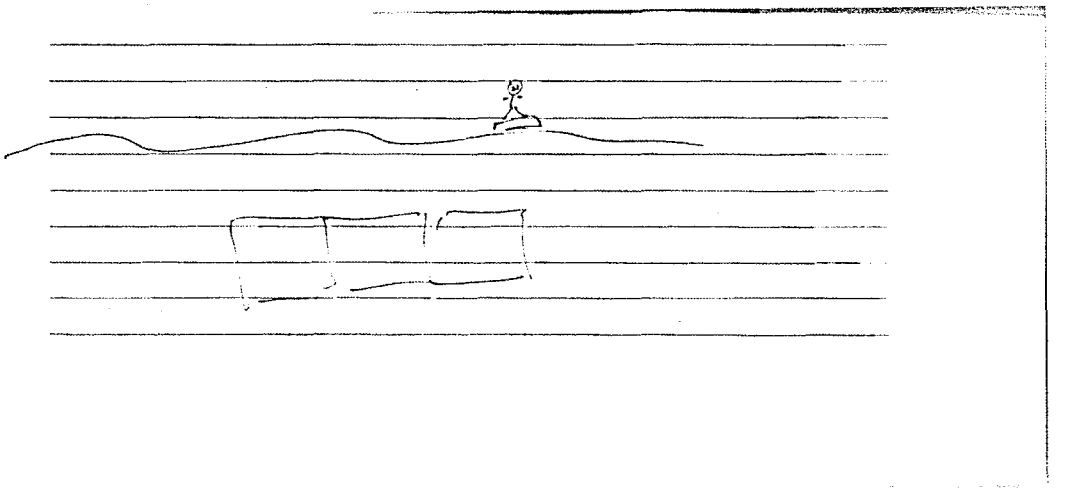


Title and General Description of VE Recommendation

Recommendation No. 5 – Meander and aesthetically stain concrete-lined channel.

Feasibility (compared to Baseline)
Meander should be slight; long curves; so as to use less right-of-way. This would use 10 to 20 feet more r/w than baseline "straight" channel. This would still stay well within the 160-foot easement.

Use permion-type stain for inverts and sideslopes (compared to no stain for Baseline).

Function (compared to Baseline)
Will function the same as Baseline, but blend in better with surroundings.

Advantages: Blends better with surroundings, graffiti can be painted over.
Disadvantages: More costly than unstained, meander may increase freeboard requirements.

Life Cycle Cost (Compared to Baseline)
Adds initial cost to stain concrete; no additional O&M costs. Would need to ensure that all aesthetic costs stay within our guidelines.

POST WORKSHOP DECISION – RECOMMEND

Title and General Description of VE Recommendation
Recommendation #6 (15a)

Delay channel design to future date (Guadalupe to ½ mi south).

Current design: Date: Sept 07 – Sept 08.

Cost – monies budgeted FY 11

Feasibility (Compare to baseline)

Delaying design until 2009 or later would allow design to occur when other stakeholders have enough interest to provide serious input to design, and potential cost share.

MCDOT: future Meridian Road may require 1. fissure mitigation that could benefit channel; 2. drainage improvements that can be accommodated by channel.

Development: existing developer channel is providing same drainage capacity along this alignment. Future development type to the east and west will help identify what is needed in this section (earth, concrete, trails?)

Would provide same function. May happen with a separate, contract, or Stanley's contract duration could be extended.

Life-Cycle Cost (Compare to baseline)

Could add cost to design.

POST WORKSHOP RECOMMENDATION – DO NOT DELAY

Title and General Description of VE Recommendation

Recommendation #8 (19,31,32)

Make basin on-line for Meridian Channel and Siphon Draw flows.

Feasibility (Compare to baseline)

Current basin volume: 260 ac ft.

On line basin volume required: Approx. 350 ac ft.

Advantages:

1 - No by pass channel needed.

2 - Simplified (and more accurate) hydraulics.

Disadvantages:

1 – larger basin excavation. ($)

2 – Possible additional 404 mitigation.

3 – Need to take low flows to Siphon Draw with pipe or similar

Life-Cycle Cost (Compare to baseline)

Increase initial cost (excavation).

Increase maintenance of larger parcel.

POST WORKSHOP RECOMMENDATION – NOT RECOMMENDED.

Title and General Description of VE Recommendation
Recommendation #9

Down-size basin through negotiations with ASLD to decrease detention requirements.

Feasibility (Compare to baseline)
Revised basin will still accommodate 100 – year future flow detention requirements but will not accommodate all of the retention requirements for ASLD land upstream of the basin. It will accommodate roughly 30% of the ASLD retention. Still provides 100 –year flood protection.

Life-Cycle Cost (Compare to baseline)
Reduces life-cycle cost because smaller basin = less maintenance. Construction cost about the same; excavation decrease, but storm drain increase.

Advantages – Frees up area for ASLD commercial corner; less maintenance; reduces sediment coming to the basin.
Disadvantages – Less volume for ASLD development retention; less potential for open space and park.

POST-WORKSHOP RECOMMENDATION; RECOMMEND

Title and General Description of VE Recommendation

Recommendation #10, #13, #18 (24,28,51,55) COMBINE WITH

Recommendation # 15 (47) & Recommendation #12 (27)& Recommendation #7 (18)

Three shallow basins; offline for Meridian Channel and SDW

Eliminate storm drain – increase basin size -

Drain basins through Siphon Draw

12" +/- retained for infiltration & veg watering

Siphon Draw is outfall

Feasibility (Compare to baseline)

Works; may allow elimination or decrease in length of stormdrain.

Life-Cycle Cost (Compare to baseline)

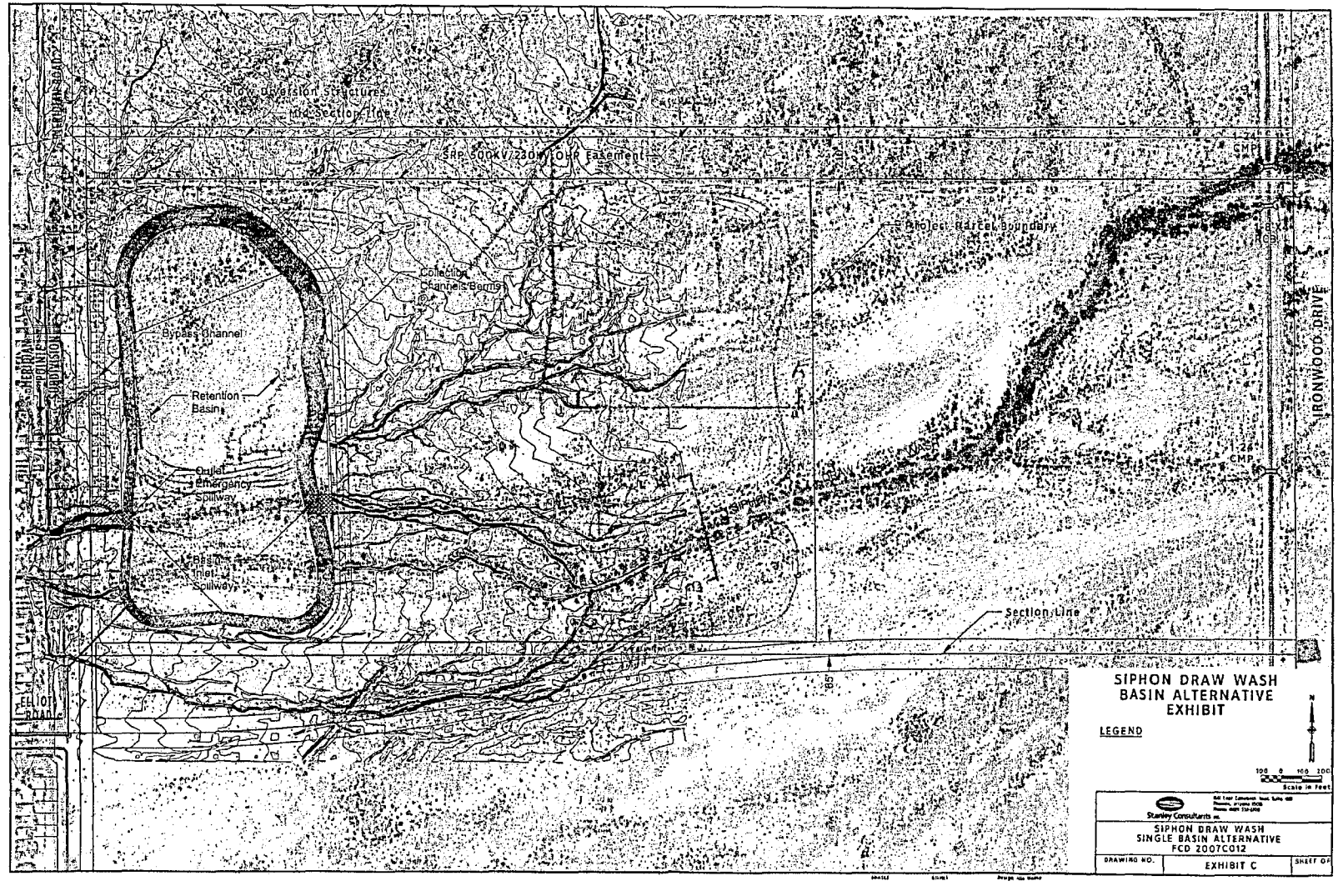
Construction cost higher if stormdrain is not eliminated or reduced; $1 million less if storm drain is eliminated or greatly reduced.

More Acres to maintain

Advantages: More opportunity for aesthetics, open space, future recreation; earthwork volumes similar, not just big hole, more contoured to landscape, increases natural rainfall available and lowflows to sustain vegetation growth; preserves natural wash; less sediment into basin(s); less storm drain to construct and maintain; provides for commercial corner for ASLD.

Disadvantages: More basin area to maintain; would need to add hard channelization at wash adjacent to basin weir (200' +/-); more basins means more inlet weirs and outlets; may need to investigate more "lineaments"; may require more fissure mitigation.

POST WORKSHOP RECOMMENDATION: Stanley Consultants Inc. should investigate this further via Optional Item, and compare with Baseline.


Flow Diversion Structures
Mid Section Line
SRP 500KV/230KV OHP Easement
Project Parcel Boundary
Collection Channels/Berms
Bypass Channel
Retention Basin
Outlet Emergency Spillway
Basin Inlet Spillway
Section Line
IRONWOOD DRIVE
ELLIOT ROAD
SIPHON DRAW WASH
BASIN ALTERNATIVE
EXHIBIT
LEGEND
Scale in Feet
Stanley Consultants
SIPHON DRAW WASH
SINGLE BASIN ALTERNATIVE
FCD 2007C012
DRAWING NO.
EXHIBIT C
SHEET OF

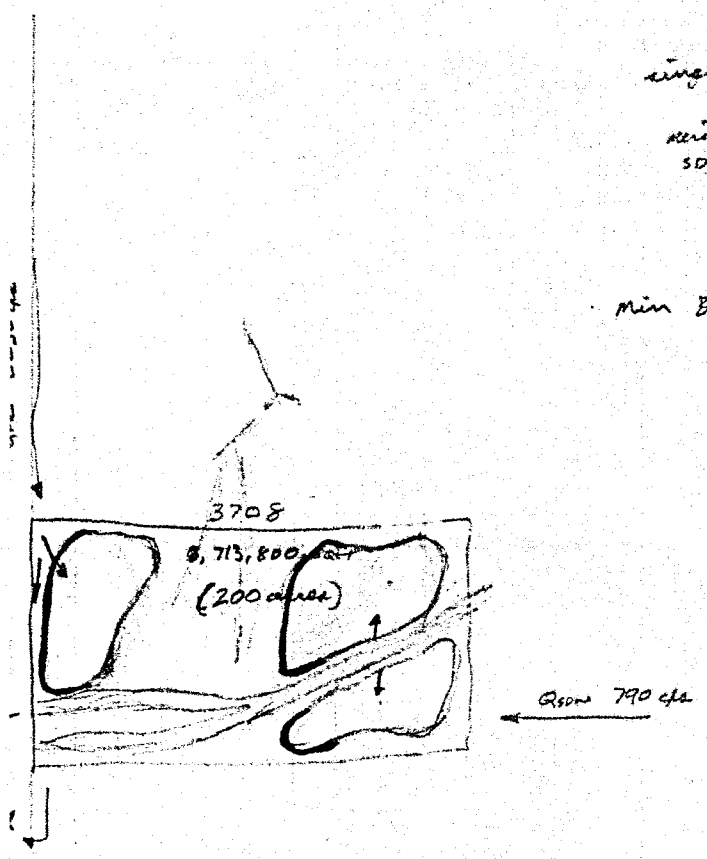
single basin 263 acre ft

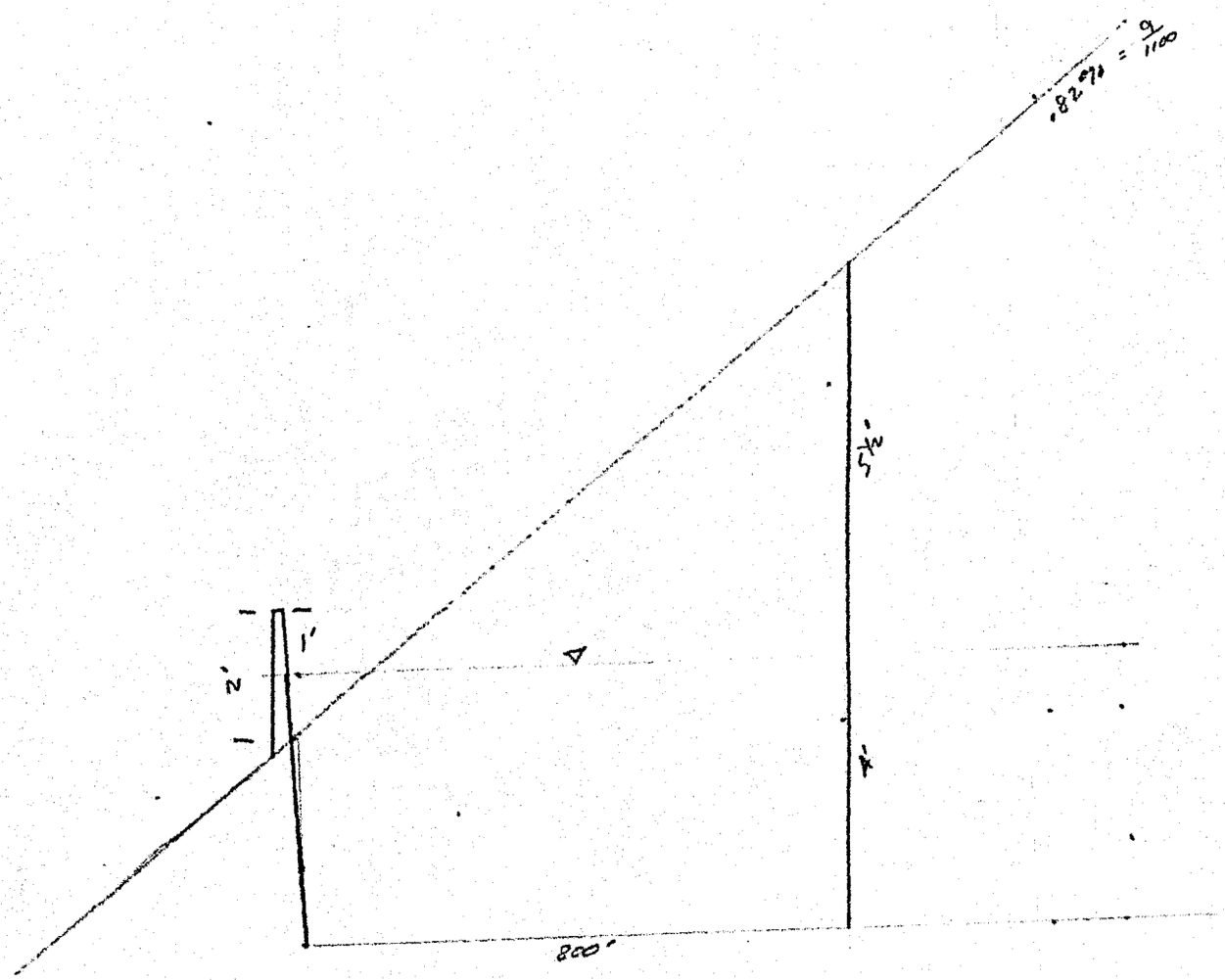
meridian 165 acre ft
SDW 138 acre ft
304

min Basin depth ≈ 4'

$s = \frac{10}{1200} = .0083$

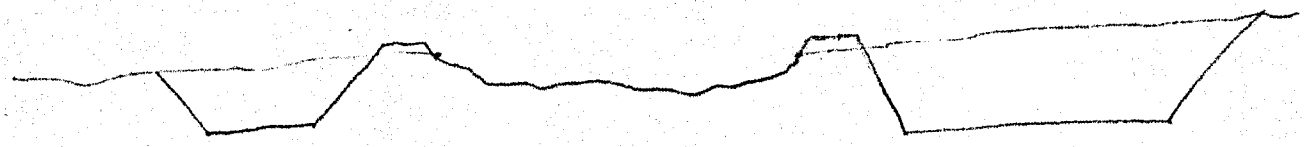
1'FB BY BERM





SECTION A-A

H = 200
V = 20



SECTION B-B
NTS

Basin 300 acre ft	
Depth	Acres
1	300
2	150
3	100
4	75
5	60
6	50
7	43
8	38
9	33
10	30

Width	800
Length	1900
Acres	35
Depth	9
CY	478,519
$	1,196,296

Meridian 165 acre ft	
Depth	Acres
1	165
2	83
3	55
4	41
5	33
6	28
7	24
8	21
9	18
10	17

Width	1000
Length	1200
Acres	28
Depth	6
CY	266,667
$	666,667

Siphon Draw 135 acre ft	
Depth	Acres
1	135
2	68
3	45
4	34
5	27
6	23
7	19
8	17
9	15
10	14

Width	800	300
Length	1450	900
Acres	27	6
Depth	4	4
CY	171,852	40,000
$	429,630	100,000

Same CY & Cost 1.2M

Added Cost Items	Unit $	$
1500' of drain pipe	125	187,500
2 inlets	5000	10,000
2 outlets	5000	10,000
1 weir	105,000	105,000
Extra Ex		150,000
Total		462,500

Title and General Description of VE Recommendation
Recommendation #14

Construct fissure mitigation burrito in orange zone at basin perimeter.

Feasibility (Compare to baseline)
Baseline – no fissure mitigation.

Construction of burrito is simple and not expensive, and would decrease risk of basin impacts to and by the existing approaching fissure.

The fissure "burrito" mitigation will reduce risk to basin and to neighborhood.

Life-Cycle Cost (Compare to baseline)
. Adds initial cost:

. (1500') Excavation: 3555 cy @ $2.50=8887

(16' x 4') Fill 3555 cy @ $42 = $150,000

Geotextile 48,000 sf=5333 sy @ $4.25 = 22,700

Total est = $182K

Decreases risk, it will be less likely for the fissure to impact the basin and/or neighboring homes; may decrease life cycle cost.

POST WORKSHOP RECOMMENDATION - RECOMMEND

Title and General Description of VE Recommendation
Recommendation # 16

Optimize storm drain size to reduce basin size.

Feasibility (Compare to baseline)
Baseline = 42" storm drain and 260 af

Capacity = 70 cfs

Increase outlet size to 72"; capacity = 210 cfs

70 cfs = 90 af

210 cfs = 270 af

(Not a direct correlation; would still need basin for peak flows)

Reduction in storage due to increased outlet flows about 3x.

One issue may exceed 500 cfs

Criteria at outlet

Otherwise, still provides required function.

.

Basin would drain faster.

Life-Cycle Cost (Compare to baseline)
Initial cost increase ($100/delta) of larger storm drain (+850k)

Would not be offset by reduced basin size.

Say, 90 af = 144,000 cy 2.50 = $360,000

(1600/af)

POST WORKSHOP RECOMMENDATION – DELETE.

Title and General Description of VE Recommendation
Rec. # 17 (49)

Replace storm drain with open channel.

(west of Mountain Road only).

48"storm drain carries 70 cfs (Approx. $1m)

Feasibility (Compare to baseline)
Advantages:
1 – Reduce cost, by replacing storm drain with earthen channel.
2 – May use existing channel along south side of Elliot Road, in (old) GM r/w.

Disadvantages:
1 – storm drain can be placed under roadway (or future roadway).
2 – R/W may need to be purchased for channel.
3 – Channel may be deep.

Function (Compare to baseline)

Life-Cycle Cost (Compare to baseline)
Channel maintenance may be greater than storm drain maintenance; would need to acquire r/w.

POST WORKSHOP RECOMMENDATION - DELETE

Title and General Description of VE Recommendation
Recommendation # 19, 20 (52,53)

52. Utilize natural earth forms & vegetation for earth structures.

53. Use rustication for hardened features with combination w/#52.

Feasibility (Compare to baseline)
. Can be incorporated in all solutions. However, hard facilities require a higher level of design/development in order to meet compatibility with scenic quality, recreation values.

Function (Compare to baseline)

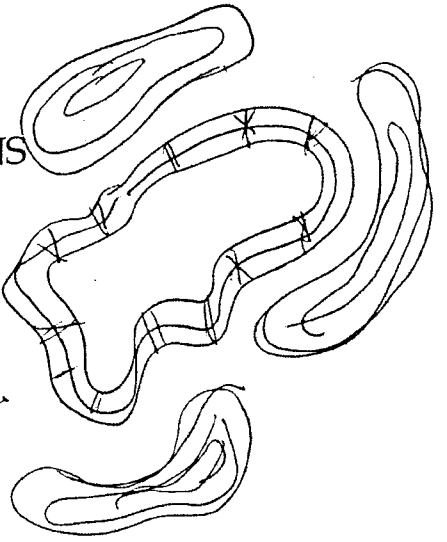
Earthen facilities require less expenditure to "lipstick the pig".

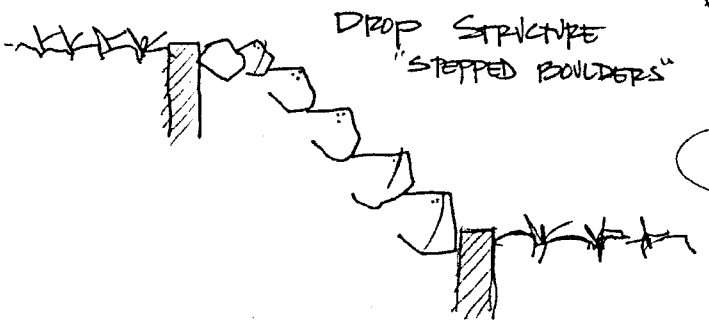
Hardened facilities shall be designed as feature attractions.

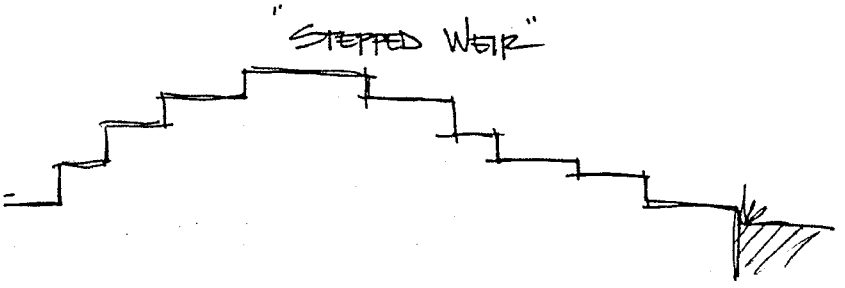
Life-Cycle Cost (Compare to baseline)

POST WORKSHOP RECOMMENDATION – RECOMMEND.

C. SKETCHES/CALCULATIONS







POST WORKSHOP RECOMMENDATIONS SUMMARY

#1,2(6,3)	Earthen channel, 4:1, 160'	Do not recommend
#3(7)	Earthen channel south of Powerline	Recommend
#4(9,56)	Split stormdrain plus channel	Do not recommend
#5	Aesthetic concrete channel	Recommend
#6 (15a)	Delay channel design	Do not recommend
#8(19,31,32)	On-line basin	Do not recommend
#9	Downsize basin, decrease retention volume	Recommend
#7(18),#10,13,18 (24,28,51,55), #15(47),#12(27)	Three shallow off-line basins	Recommend further investigation by consultant and compare to baseline
#14	Fissure mitigation at basin – burrito in orange zone	Recommend
#16	Optimize storm drain size to reduce basin size	Do not recommend
#18	Replace storm drain with open channel	Do not recommend
#19, 20 (52,53)	Earthen forms, rustication	Recommend

PERFORMANCE MATRIX

FCDMC

Siphon Draw Drainage Improvements (30% Plans)

Criteria	Unit of Measurement	Criteria Weight	Concept	Performance Rating 1	2	3	4	5	Total Performance	Ideas Included
Internal Fissure Impacts		8	Baseline				4		32	
			VE Alternative1				4		32	3,5,10,12,13,15,18
External Fissure Impacts		18	Baseline			3			54	
			VE Alternative 1				4		72	3,5,10,12,13,15,19
Environmental Effects		13	Baseline			3			39	
			VE Alternative 1		2				26	3,5,10,12,13,15,20
R/W Impacts		12	Baseline				4		48	
			VE Alternative 1				4		48	3,5,10,12,13,15,21
Recreation Use Opportunities		3	Baseline		2				6	
			VE Alternative 1					5	15	3,5,10,12,13,15,22
Flood Protection		16	Baseline				4		64	
			VE Alternative 1				4		64	3,5,10,12,13,15,23
Constructability		9	Baseline		2				18	
			VE Alternative 1			3			27	3,5,10,12,13,15,24
Stakeholder Acceptance		7	Baseline			3			21	
			VE Alternative 1				4		28	3,5,10,12,13,15,25
Scenic Quality		5	Baseline	1					5	
			VE Alternative 1				4		20	3,5,10,12,13,15,26

OVERALL PERFORMANCE	Total Performance	% improved	Cost $xM
Note: Baseline=One Basin +Trapezoid Concrete Channel	287	N/A	6.46
VE Alternative 1=Three Basin + Meander Trapez. Conc. Channel * to	332	16%	3.91

*VE Alternative 1=Three Basin +Meander Trapez. Conc. Channel to splitter and Aesthetic Earth Channel south of splitter and eliminate Elliot Rd. stormdrain

VALUE=PERFORMANCE / COST

Baseline Value=287/6.46=44.4

VE Alternative 1 Value =332/3.91 = 82.3

Design Suggestions:

#1 (Channel) Eliminate one maintenance road along Meridian Channel.
The suggestion is to reduce initial easement requirements by providing only one maintenance road along the Meridian Channel (Reach). (Maintenance Group to be asked if access is required on both sides of channel)

#2 (Channel) Use riprap and/or soil cement for erosion/slope protection in an aesthetic manner such that it is a feature attraction.

#3 (Basin)
Terrace basin bottom to provide vertical separation, dry areas, and/or to provide separate detention. Limit basin bottom (depth) to less than 10 ft.

$4 (Basin)
Incorporate bypass channel into basin.
The suggestion is to design a bypass channel within the basin area such that it is not viewed as a separate feature. During large events the bypass channel would be engulfed by detained water. The benefit being the availability of the channel for detention.

#5 (Basin)
Deepen basin to provide additional detention storage without increasing the basin footprint and/or to provide a smaller basin footprint.

#6 (Splitter)
Use a weir to separate flows between the bypass channel and the detention basin.

#7 (Splitter)
Use a hybrid box to separate to split flows between the bypass channel and the detention basin. The "hybrid" would be a modification of a RCBC used for the maintenance crossing of the Meridian Channel with the SRP easement. A barrel(s) of the RCBC could be constructed at a lower elevation for low flow and by pass flows.

#8 (Splitter)
Use a "turning vane" splitter structure to separate flows between the bypass channel and the detention basin. The "turning vane" would be a separate structure from the RCBC SRP maintenance crossing. The vane would be designed to be a pleasing "feature".

#9 (Splitter)
For the weir structure, use a stepped weir and other approaches in the design to make it a more aesthetic structure and not just a straight lateral weir.

#10 (Fissures)
Intercept/provide fissure mitigation (only) at known fissure locations and no other mitigation measures.

#11 (Fissures)
Restrict, limit, reduce surface flows into fissures upstream of flood control structures. Potentially by placing fill atop fissures.

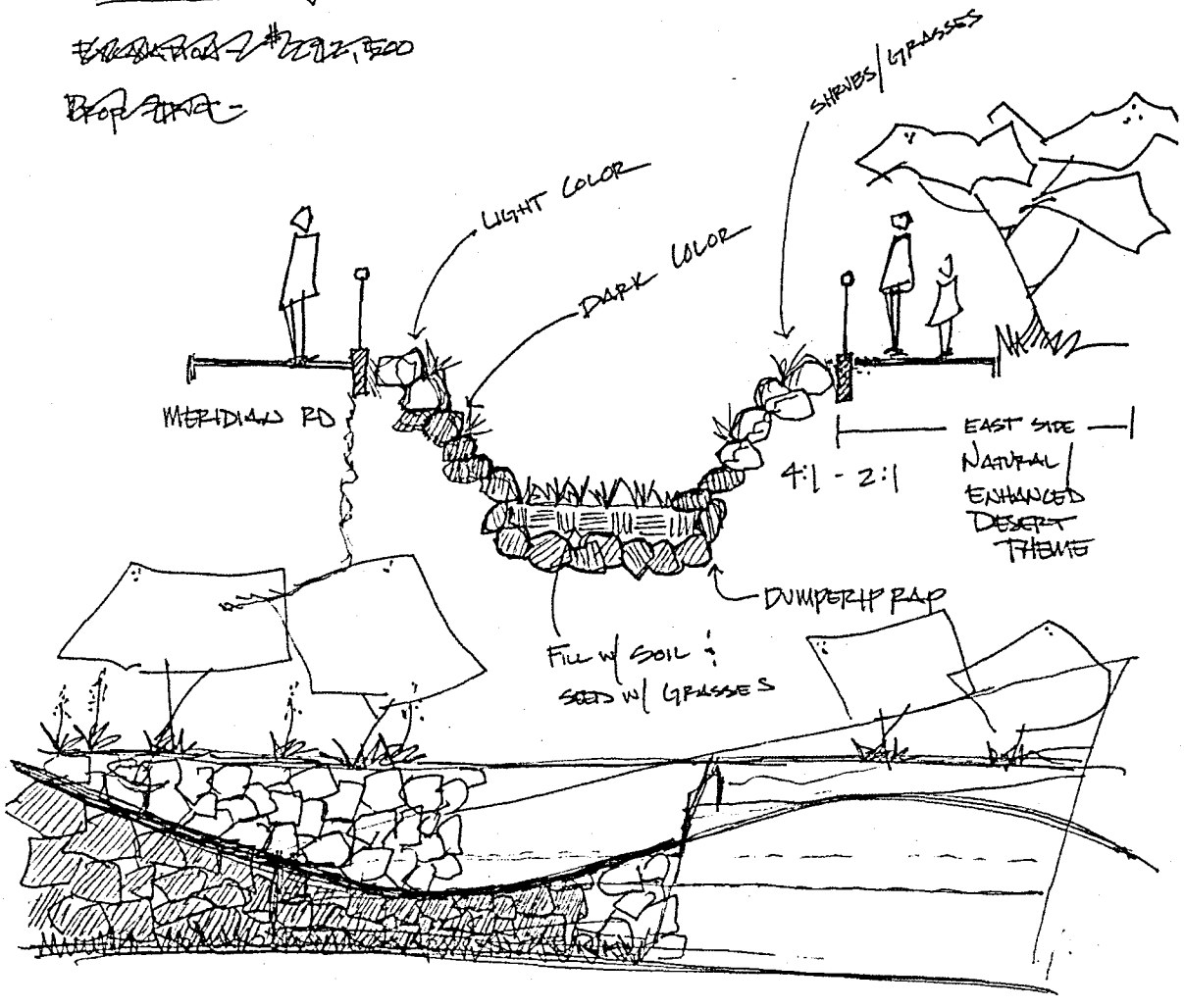
#12 (Fissures)
Limited fissure mitigation methods with monitoring: This may or may not include permeable cutoffs in the orange zone; but will include monitoring four fissures including regular inspections, and potentially extensometers, etc.

#13 (Fissures)
Develop fissure response plan, in the event a fissure appears at channel or basin embankments. Response plan should include recommendations for repair of fissures, & what equipment & materials will be needed and kept on hand.

#14
Create interpretive features being things like an educational trail, providing plant descriptions etc.

#15
Use "Rock Scapes" to create aesthetic features similar to freeway designs.

D.S. #2 (4, 10, 13, 11)


SHRUBS/GRASSES
LIGHT COLOR
DARK COLOR
MERIDIAN RD
EAST SIDE
NATURAL
ENHANCED
DESERT
THEME
4:1 - 2:1
DUMPERTIP RAP
FILL W/ SOIL &
SEED W/ GRASSES

V.A. Study Record

VALUE ANALYSIS

DESIGN PRESENTATION

1. **Presenter: Mike Lopez**

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2. **Significant Items Discussed:**

PROPOSED FLOOD CONTROL AND DRAINAGE FACILITIES

Major project elements will consist of a new channel along the east side of the Meridian Road alignment, a detention basin facility located northeast of the intersection of Meridian Road and Elliot Road, a storm drain along Elliot Road from the detention basin facility to the project outfall, and a diversion structure to divert flow from the new channel into the detention basin facility.

Meridian Channel (Channel Reach 1)

A new incised channel along the east side of the Meridian Road alignment is proposed from Siphon Draw Wash to approximately the Navarro Avenue alignment (Meridian Road Channel Reach 1). The new channel will connect to an existing offsite flows to the north and east and route flows south to the proposed detention basin facility.

Siphon Draw Detention Facility

A detention facility comprised of one or more detention basins will be located in a large drainage easement located northeast of the intersection of Elliot Road and Meridian Road. The detention basin will receive flow from Siphon Draw Wash (to the east) and from the proposed Meridian Channel (to the north). The purpose of the basin(s) will be to attenuate flow to Siphon Draw Wash downstream of the facility such that the flow does not exceed the design capacity of Siphon Draw Wash through the Meridian Point Subdivision and flow at the project outfall is sufficiently attenuated such that a maximum combined discharge (flow from both Siphon Draw Wash and the detention basin storm drain outlet) to the existing Elliot Road storm drain discharge is less than 500 cfs.

Diversion Structure

A diversion structure is proposed to divert flow from the proposed Meridian Channel into the proposed detention basin facility. The structure will allow low flows within the channel to bypass the detention basin facility unabated and to divert flow into the proposed detention basin facility during large storm events.

Elliot Road Storm Drain

An extension of the existing Elliot Road storm drain is proposed to serve as the outlet to drain basins within the proposed detention basin facility. The storm drain will extend east along Elliot Road from the existing terminus at approximately the 104th Street alignment and then north along Meridian Road to the proposed detention basin facility.

Project Outfall Improvements

To maintain full operation for the existing Elliot Road Detention Basin and to meet the project goal of discharging a maximum of 500 cfs to the existing Elliot Road storm drain, it is anticipated that improvements will be necessary to the structures at the project outfall. These improvements will most certainly consist of modifications to the inlet of the existing Elliot Road storm drain to increase and control inlet capacity, however, modifications or improvements may also be necessary to the existing concrete lined channel and the lateral side weir/Elliot Road Detention Basin inlet. The nature and extent of these improvements will not be investigated during this pre-design phase.

Multiple-Use, Aesthetics and Landscaping Improvements

These landscaping, aesthetics and opportunities for multiple-use were considered in the development and assessment of project alternatives. The extent to which these improvements will incorporated into the final designed and can be implemented will be based upon available funding and/or the participation and commitments from other outside agencies or vested parties.

Project Description

The major project improvements include the following: the Meridian Channel, a proposed channel to intercept and divert flood water to a detention basin facility; a detention basin facility that will receive and attenuate flow from the Meridian Channel and Siphon Draw Wash and a new storm drain along Elliot Road to drain the proposed detention basin facility. Additional features associated with the major project improvements such as diversion structures and grade control structures will also be required

Agency Involvement

While the project will be designed and constructed as a joint effort between the FCDMC and the City of Mesa, the project area falls under the jurisdiction of several different government agencies. West of Meridian Road, the project area falls under the jurisdiction of the City of Mesa and/or Maricopa County. East of Meridian Road the project area is generally located within the jurisdiction of the City of Apache Junction and/or Pinal County.

Other agencies also have authority and/or rights within the project area. Essentially all the undeveloped land within the project area east of Meridian Road is held in trust by the State of Arizona. All this property is administered by the Arizona State Land Department (ASLD). In addition, the Salt River Project has a 260-foot overhead power line easement located along the east-west mid-section line of Section 7, Township 1 South, Range 8 East

Challenges and Constraints

Fissures:

The project area is located in a geotechnical study area known as Hawk Rock. Previous geotechnical studies and investigations in the Hawk Rock study area have shown the project area is undergoing land subsidence and revealed the presence of existing earth fissures in the vicinity of the proposed Meridian channel and the proposed detention basin facility. The presence of land subsidence and particularly earth fissures will have a significant impact on the potential project alternatives and necessary mitigation measures.

Elliot Road Storm Drain (Existing):

One of the primary constraints for project alternatives is to limit discharge to a maximum 500 cfs into an existing large storm drain system along Elliot Road. The existing Elliot Road Storm drain discharges to the Elliot Outfall Channel just west of Ellsworth Road

Existing Meridian Road Channel (Reach 2):

The existing Meridian Channel is located along the west side of the Meridian Road monument line where future roadway improvements are planned. The Meridian Channel drains south to the SRP transmission line corridor where it turns west and is conveyed within the SRP corridor to Signal Butte Road where it ends. Under existing conditions flows overtop the basins within the SRP corridor and continue flowing to the west or southwest.

SRP Browning – Dinosaur Transmission Line Corridor:

The Salt River Project (SRP) Browning – Dinosaur Transmission Line Corridor contains high voltage overhead power transmission lines within a 260-foot easement. The easement runs along the along east-west mid-section line of Section 7 of Township 1 South, Range 8 East (approximately one half mile north of Elliot Road) and is situated such that 50 feet are located north of the mid-section line and 210 feet are located south of the mid-section line. The easement forms the north boundary of the drainage easement for the proposed Siphon Draw Wash detention facility

SRP is currently improving the transmission facilities within the corridor replacing old steel lattice towers with steel poles. When complete there will be two 500KV lines and one 230 KV line within the corridor. A pair of the new steel poles has been placed 75 feet east of the Meridian section line which is 10 feet inside the new Meridian channel's 160 foot wide drainage easement.

The proposed Meridian Channel must cross through this power corridor and underneath high power electric lines as it enters the basin parcel. A permit will be required to cross the SRP corridor. SRP's requirements within the transmission corridor will impact the project design.

Larger Discharges from Meridian Channel:

Project hydrology indicates that flows from the proposed Meridian Channel will be much larger than from the Siphon Draw Wash (Q100, MC = 2230 cfs, Q100, SDW = 790 cfs). The Meridian Channel will likely flow more frequently than the Siphon Draw Wash thereby more consistently providing low flows necessary to help sustain downstream vegetation.

Maintaining Low Flows Through Siphon Draw Wash:

The previous concept study proposed an offline detention basin for Siphon Draw Wash that bypassed 25 cfs (of over 700 cfs) to maintain low flows in Siphon Draw Wash through the drainage easement and downstream of Meridian Road.

Flow from Meridian Channel Restore Historic Flows:

Prior to residential development of the area, runoff conveyed by the channels drained southwesterly overland or through small natural drainage channels eventually discharging into Siphon Draw Wash further to the west Following development, the existing Meridian Channel (Reach 2) was constructed diverting flow previously discharged to Siphon Draw Wash into a series of small basins located within the SRP easement west of Meridian Road. Diverting flow from the SRP easement to Siphon Draw Wash at Meridian Road therefore can be considered as returning flow to historic flow conditions.

Future Road Improvements:

Meridian Road

A corridor study for Meridian Road was completed in June 2006 for the Maricopa County Department of Transportation (MCDOT). The study identifies a typical right-ofway width of 65 feet on each side of the Meridian Road section line.

Guadalupe Road

It is anticipated that this road will eventually be paved and extended to the east and intersect Ironwood Road. Guadalupe Road will not likely extend west of Meridian Road along the section line as depicted in MCDOT's corridor study since the development west of Meridian Road, Sunland Springs Village, has been platted, improved and partially constructed. It is likely that any extension of Guadalupe Road from the west will intersection Meridian Road 300-400 feet south of the section line. The exact alignment of Guadalupe road, east of Meridian Road is yet to be determined.

Elliot Road:

West of Meridian Road, Elliot road is fully improved and paved with curb and gutter. These improvements terminate at Meridian Road. East of Meridian Road, Elliot Road has not been constructed and the future alignment of has not been established. It is anticipated that the alignment will gradually jog to the north to the south section line of Section 7, Township 1 South, Range 8 East

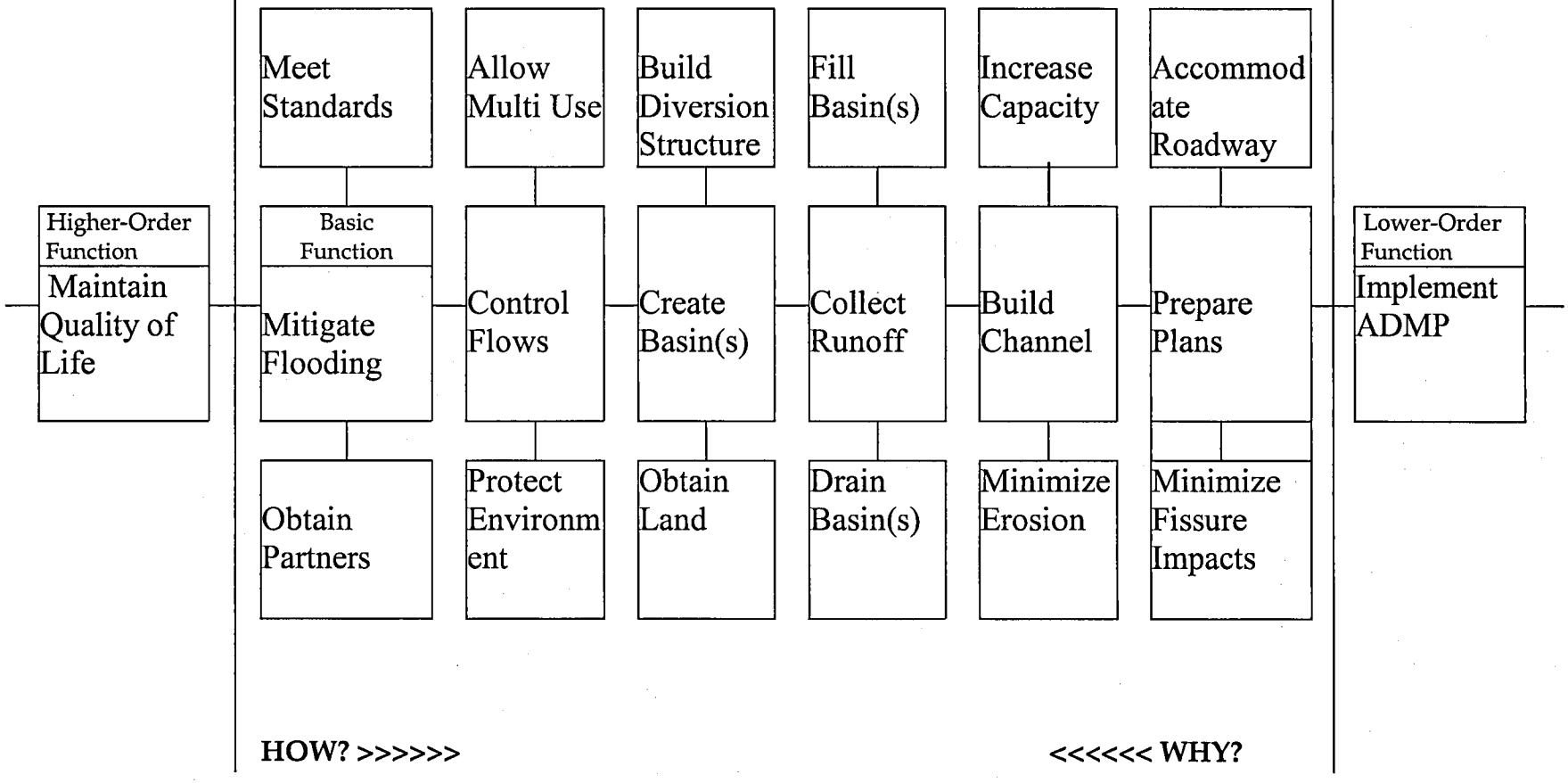
COST MODEL

ELEMENT	COST	PERCENT OF TOTAL
Alternative 2. (Baseline)		
Basin (Single)	$ 9,683,000	73%
Stormdrain (Without R/W)	$ 1,982,000	15%
Channel (Trapezoidal Conc.)	$ 1,611,000	12%
Total:	**$13,276,000**	100%

1.H. F.A.S.T. DIAGRAM - OVERALL SUBJECT

Study Subject: Siphon Draw Drainage Improvements

Basic Function: Mitigate Flooding



ELEMENTS SELECTED FOR ANALYSIS

ELEMENT	SELECTION CRITERIA
Create Basin(s)	High Cost and Land Utilization Constraints
Build Channel	Multi Use, Complexity and High Cost
Allow Multi Use	Meet Expectations, Lack of Space
Minimize Fissure Impacts	Potential LCC Impacts, Structural Integrity, Complexity
Diversion Structure	Complexity, Maintainability

NOTE: An "Element" is a portion of the whole which performs the same function(s), regardless of the method used to provide that function.

FUNCTION ANALYSIS

Element: Basin (s)

WHY?	FUNCTION	HOW?
	B Reduce Peak Flows	
	B Mitigate Flooding	
	S Allow Recreation	
	Attract Partners	
	Preserve Open Space	
	Collect Runoff	
	Detain Flows	
	Trap Sediment	
	Enhance Aethetics	

Element: Channel

WHY?	FUNCTION	HOW?
	B Collect Flows	
	Allow Roadway	
	Convey Flows	
	Improve Exist. Channel	
	Divert Flows	
	Provide Outfall	
	Sustain Veg. Growth	
	Divide Communities	
	Allow Recreation	
	Concentrate Flows	

Element: Diversion Structures

WHY?	FUNCTION	HOW?
	B Optimize Basin	
	B Maintain Base Q	
	Reduce Flooding	
	Split Flows	
	Reduce Sedimentation	
	Attracts Graffiti	
	Allows Overflow	

Element: Mitigate Fissures

WHY?	FUNCTION	HOW?
	B Limit Liability	
	Enhance Good P.R.	
	Reduce Risk	
	Improve Safety	
	Improve Reliability	
	B Maintain F.C. Funct	
	Protect Community	

Element: Stormdrain

WHY?	FUNCTION	HOW?
	B Drain Basin	
	Allow Catch Basins	
	Carry Roadway Flows	

Element: Aesthetics

WHY?	FUNCTION	HOW?
	B Complement Surroundings	
	Follow Policy	
	Please Stakeholders	
	Allow Habitat	

Brainstorm Ideas

Element: **Channel**

1. Eliminate one maintenance road.
2. Postpone Reach 1 and build by others, based on FCD design
3. Varying side slopes to achieve meandering (4:1 to 6:1)
4. Same as No.3 + soil cement on 1 side
5. Use Gabions for Channel lining
6. 4:1 Sideslopes with meandering (O & M and Alignment)
7. Full K&G Cross Section south of the power lines
8. Use Storm Drain instead of Channel
9. "Split" Storm drain and Channel on top
10. Use Soil Cement for slope protection
11. Use Riprap for slope protection
12. Use pre-cast blocks for slope protection
13. Use Rip-Rap + Soil Cement in an aesthetic combination for slope protection
14. Vegetative lining for slope protection
15. Meander and Aesthetically stained Concrete Lined Channel

15a. Delay Channel Design for future date

Element: **Basin**

16. 10' deep on West end and 16' on East end.
17. Terraced bottom –limit terrace depth to 10'
18. Make it an off-line basin for both inflows
19. Make it an on-line basin for both inflows
20. Negotiate upstream retention to reduce basin size
21. Incorporate by-pass channel into basin
22. Meander Low Flow Channel inside the basin
23. Allow maintenance and multi use access into and out of basin
24. Cascading basins
25. Optimize use of Earth Forms inside basin, with excavation material
26. Deepen and Shrink footprint of basin
27. Shallow and increased footprint to maximize multi use
28. Multiple basins for Siphon Draw and Meridian Channel (Separate Systems)

Element: **Splitter Structures**

29. Use Weir structure
30. Use Hybrid structure
31. Eliminate Splitter structure (On-line basin)
32. Pipe to the Low-Flow
33. Grouted Boulder Splitter structure
34. Soil cement Splitter structure
35. "Turning Vein" Splitter structure
36. "Step-Weir" Splitter structure

Element: **Fissure Mitigation**

37. Intercept Fissure at known location
38. Limit surface flows into Fissure upstream of Flood Control facilities
39. Add-on "Burritos" in the "Orange Zone"
40. No physical mitigation. Just monitor the Fissures.
41. Limited measures with monitoring.
42. Develop Fissure Response Plan
43. Buy out downstream properties
44. Pay for flood insurance
45. Concrete Channel lining
46. Pressure injected "Jell" into fissure

Element: **Storm Drain**

47. Eliminate storm drain – Increase basin size
48. Optimize storm drain size to reduce Basin size
49. Replace storm drain with open channel
50. Postpone storm drain channel until development occurs
51. Encourage infiltration and ground water re-charge by scarifying basin inlet and raise outlet invert

Element: **Aesthetics**

52. Utilize natural earth-forms and vegetation for Earthen Structures
53. Use Rustication for creating feature attraction
54. Create Interpretive features
55. Water harvesting, incorporating aesthetics, re-vegetation, with solar energy
56. Use "Old Cross-Cut" idea
57. Use "Rock Scapes" to create aesthetic features

IDEA GENERATION RECORD

Idea Description	Score	Retain?
1.Eliminate one maintenance road.	2	DS #1
2.Postpone Reach 1 and build by others, based on FCD design	1	No
3.Varying side slopes to achieve meandering (4:1 to 6:1)	2	Rec.#1
4.Same as No.3 + soil cement on 1 side	1	DS #2
5.Use Gabions for Channel lining	0	No
6.4:1 Sideslopes with meandering	4	Rec.#2
7.Full K&G Cross Section south of the power lines	2	Rec.#3
8.Use Storm Drain instead of Channel	0	No
9. "Split" Storm drain and Channel on top	2	Rec.#4
10.Use Soil Cement for slope protection	1	DS #2
11.Use Riprap for slope protection	1	DS #2
12.Use pre-cast blocks for slope protection	0	No
13.Use Rip-Rap + Soil Cement in an aesthetic combination for slope protection	1	DS #2
14.Vegetative lining for slope protection	1	No
15.Meander and Aesthetically stained Concrete Lined Channel	6	Rec.#5
15a.Delay Channel Design for future date	3	Rec.#6
16.10' deep on West end and 16' on East end	0	No
17.Terraced bottom –limit terrace depth to 10'	2	DS #3
18.Make it an off-line basin for both inflows	3	Rec.#7
19.Make it an on-line basin for both inflows	3	Rec.#8
20.Negotiate upstream retention to reduce basin size	3	Rec.#9
21.Incorporate by-pass channel into basin	2	DS #4
22.Meander Low Flow Channel inside the basin	0	No
23.Allow maintenance and multi use access into and out of basin	0	No
24.Cascading basins	2	Rec.#10
25.Optimize use of Earth Forms inside basin, with excavation material	3	Rec.#11
26.Deepen and Shrink footprint of basin	2	DS #5
27.Shallow and increased footprint to maximize multi use	6	Rec.#12

Idea Description	Score	Retain?
28.Multiple basins for Siphon Draw and Meridian Channel (Separate Systems)	5	Rec.#13
29 Use Weir structure	3	DS #6
30.Use Hybrid structure	1	DS #7
31.Eliminate Splitter structure (On-line basin)	1	Rec. #8
32.Pipe to the Low-Flow	1	Rec.#8
33.Grouted Boulder Splitter structure	0	No
34.Soil cement Splitter structure	0	No
35."Turning Vein" Splitter structure	2	DS #8
36."Step-Weir" Splitter structure	2	DS #9
37.Intercept Fissure at known location	4	DS #10
38.Limit surface flows into Fissure upstream of Flood Control facilities	2	DS #11
39.Add-on "Burritos" in the "Orange Zone"	3	Rec.#14
40.No physical mitigation. Just monitor the Fissures	0	No
41.Limited measures with monitoring	3	DS #12
42.Develop Fissure Response Plan	2	DS #13
43.Buy out downstream properties	0	No
44.Pay for flood insurance	0	No
45.Concrete Channel lining	0	No
46.Pressure injected "Jell" into fissure	0	No
47.Eliminate storm drain – Increase basin size	3	Rec.#15
48.Optimize storm drain size to reduce Basin size	4	Rec.#16
49.Replace storm drain with open channel	2	Rec.#17
50.Postpone storm drain channel until development occurs	1	No
51.Encourage infiltration and ground water re-charge by scarifying basin inlet and raise outlet invert	1	Rec.#18
52.Utilize natural earth-forms and vegetation for Earthen Structures	3	Rec.#19
53.Use Rustication for creating feature attraction	3	Rec.#20
54.Create Interpretive features	1	DS #14
55.Water harvesting, incorporating aesthetics, re-vegetation, with solar energy	3	Rec.#10
56.Use the "Old Cross-Cut" idea	1	Rec.#4
57.Use "Rock Scapes" to create aesthetic feature	1	DS #15

EVALUATE FEASIBILITY

GROUPING – GROUP RETAINED IDEAS INTO CATEGORIES FOR FURTHER ANALYSIS

NO.	CATEGORY DESCRIPTION	IDEAS INCLUDED (LIST NUMBERS ONLY)
1	Varying Channel side slopes	6,3
4	Buried conduit with aesthetic channel on top	9,56
8	On-Line Basin	19,31,32
10	Cascading Basin with Water Harvesting	24,51,55