Summary of Cost-Benefit Analysis

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Project Name: **Cactus Basins 3 through 5**

Description: For Cactus Basins 3,4, and 5

Proposed project capital cost:	$ 34,346,985	[Note: construction costs which are assumed to occur in one year.]
Change in annual O&M costs:	$ 23,000	[Note: the change in annual O&M costs compared to without project conc
PV of future O&M costs:	$ 1,633,000	(at 6% discount rate over 50 years)
PV of future costs	$ 35,979,985	[Note: the sum of capital costs plus the PV of O&M costs.]

Benefits

	Actual	Potential	
EAD without project	$ 3,465,119	$ 3,810,751	[Note: for stormwater projects use "Potential" damage which ignores s
EAD with project	$ 32,128	$ 32,128	
Annual Benefit:	$ 3,432,991	$ 3,778,623	
PV of Future Benefits:	$ 54,110,332	$ 59,558,131	(at 6% discount rate over 50 years)

Cost-Benefit Analysis

	Actual	Potential	
Net Present Value (NPV)	$ 18,130,347	$ 23,578,146	(at 6% discount rate over 50 years)
Benefit:Cost Ratio	1.504	1.655	

NPV Sensitivity to Discount Rate:

	Actual	Potential
4%	$ 39,401,170	$ 46,826,094
5%	$ 28,325,450	$ 34,635,277
6%	$ 19,763,347	$ 25,211,146
7%	$ 13,030,858	$ 17,800,834
8%	$ 7,650,462	$ 11,878,743

Residential Buildings

	Without Project			With Project		
	Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
ARI:	10	50	100	10	50	100
Probability of Levee Failure	1.00	1.00	1.00	0.00	1.00	1.00
Flood depth above ground level (ft)	0.40	2.10	2.50	-0.39	-0.10	0.00
Buildings Inundated (no.)						
Rural - Res: Homesteads	0	0	0	0	0	0
Rural - Other: Barns, sheds	0	0	0	0	0	0
Urban Res: Single story (no base)	42	129	142	7	23	56
Urban Res: Two plus story (no base)	0	0	0	0	0	0
Mobile home	0	0	0	0	0	0
Structural Damages						
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ 158,603	$ 4,540,110	$ 4,997,640	$ -	$ -	$ -
Urban Res: Two plus story (no base)	$ -	$ -	$ -	$ -	$ -	$ -
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -
Structual Damages HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Total Structural Damages	$ 158,603	$ 4,540,110	$ 4,997,640	$ -	$ -	$ -
Content Damages						
Rural - Res: Homesteads	$ -	$ -	$ -	$ -	$ -	$ -
Rural - Other: Barns, sheds	$ -	$ -	$ -	$ -	$ -	$ -
Urban Res: Single story (no base)	$ 152,258	$ 2,591,565	$ 2,852,730	$ -	$ -	$ -
Urban Res: Two plus story (no base)	$ -	$ -	$ -	$ -	$ -	$ -
Mobile home	$ -	$ -	$ -	$ -	$ -	$ -
Contents Damage HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Actual:Potential Ratio	0.8	0.8	0.9	0.9	0.9	0.9
Total Contents Damages: Actual	$ 121,807	$ 2,073,252	$ 2,567,457	$ -	$ -	$ -
Total Contents Damages: Potential	$ 152,258	$ 2,591,565	$ 2,852,730	$ -	$ -	$ -
Clean-Up/ Other Costs						
External	$ 210,000	$ 645,000	$ 710,000	$ 35,000	$ 115,000	$ 280,000
Cleanup	$ 168,000	$ 516,000	$ 568,000	$ 28,000	$ 92,000	$ 224,000
Other Costs HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -
Total Other Costs: Potential	$ 378,000	$ 1,161,000	$ 1,278,000	$ 63,000	$ 207,000	$ 504,000
Sum Actual Damages	**$ 658,409**	**$ 7,774,362**	**$ 8,843,098**	**$ 63,000**	**$ 207,000**	**$ 504,000**
Sum Potential Damages	**$ 688,861**	**$ 8,292,675**	**$ 9,128,371**	**$ 63,000**	**$ 207,000**	**$ 504,000**
Total Actual Damage with levee failure ($):	**$ 658,409**	**$ 7,774,362**	**$ 8,843,098**	**$ -**	**$ 207,000**	**$ 504,000**
Total Potential Damage with levee failure ($):	**$ 688,861**	**$ 8,292,675**	**$ 9,128,371**	**$ -**	**$ 207,000**	**$ 504,000**
Indirect Actual Damage	$ 164,602	$ 1,943,590	$ 2,210,774	$ -	$ 51,750	$ 126,000
Indirect Potential Damage	$ 172,215	$ 2,073,169	$ 2,282,093	$ -	$ 51,750	$ 126,000

Commercial & Industrial Buildings

	Without Project						With Project					
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI:	10	50	100	#REF!	#REF!	#REF!	10	50	100	#REF!	#REF!	#REF!
Probability of Levee Failure	1.00	1.00	1.00	#REF!	#REF!	#REF!	0.00	1.00	1.00	#REF!	#REF!	#REF!
Commercial												
'Flood depth above ground level (ft)	0.50	2.20	2.60	#REF!	#REF!	#REF!	-0.29	0.00	0.10	#REF!	#REF!	#REF!
low building size	1745037	2101167	1887489	#REF!	#REF!	#REF!	1388907	1353294	1851876	#REF!	#REF!	#REF!
medium building size	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
high building size	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Industrial												
'Flood depth above ground level (ft)	1.00	2.70	3.10	#REF!	#REF!	#REF!	0.21	0.50	0.60	#REF!	#REF!	#REF!
low building size	96471	192942	385884	#REF!	#REF!	#REF!	0	0	96471	#REF!	#REF!	#REF!
medium building size	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
high building size	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Structural Damages												
Commercial												
low	$ -	$ 11,346,302	$ 10,192,441	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
medium	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
high	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Commercial HEC-FIA	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Industrial												
low	$ 231,530	$ 1,504,948	$ 3,009,895	#REF!	#REF!	#REF!	$ -	$ -	$ 231,530	#REF!	#REF!	#REF!
medium	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
high	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Industrial HEC-FIA	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Total Structural Damages	$ 231,530	$ 12,851,249	$ 13,202,336	#REF!	#REF!	#REF!	$ -	$ -	$ 231,530	#REF!	#REF!	#REF!
Contents Damages												
Commercial												
low	$ -	$ 13,867,702	$ 12,457,427	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
medium	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
high	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Commercial HEC-FIA	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Industrial												
low	$ -	$ 8,682,390	$ 17,364,780	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
medium	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
high	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Industrial HEC-FIA	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Actual:Potential Ratio	0.8	0.8	0.9	#REF!	#REF!	#REF!	0.9	0.9	0.9	#REF!	#REF!	#REF!
Total Contents Damages: Actual	$ -	$ 18,040,074	$ 26,839,987	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Total Contents Damages: Potential	$ -	$ 22,550,092	$ 29,822,207	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Clean-up/ Other Costs	$ 69,459	$ 3,855,375	$ 3,960,701	#REF!	#REF!	#REF!	$ -	$ -	$ 69,459	#REF!	#REF!	#REF!
Clean-Up/ Other Costs: HEC-FIA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sum Actual Damages	**$ 300,990**	**$ 34,746,698**	**$ 44,003,023**	**#REF!**	**#REF!**	**#REF!**	**$ -**	**$ -**	**$ 300,990**	**#REF!**	**#REF!**	**#REF!**
Sum Potential Damages	**$ 300,990**	**$ 39,256,716**	**$ 46,985,244**	**#REF!**	**#REF!**	**#REF!**	**$ -**	**$ -**	**$ 300,990**	**#REF!**	**#REF!**	**#REF!**
Total Damage with levee failure ($):	**$ 300,990**	**$ 34,746,698**	**$ 44,003,023**	**#REF!**	**#REF!**	**#REF!**	**$ -**	**$ -**	**$ 300,990**	**#REF!**	**#REF!**	**#REF!**
Total Damage with levee failure ($):	**$ 300,990**	**$ 39,256,716**	**$ 46,985,244**	**#REF!**	**#REF!**	**#REF!**	**$ -**	**$ -**	**$ 300,990**	**#REF!**	**#REF!**	**#REF!**
Indirect Actual Damages	$ 75,247	$ 8,686,674	$ 11,000,756	#REF!	#REF!	#REF!	$ -	$ -	$ 75,247	#REF!	#REF!	#REF!
Indirect Potentail Damages	$ 75,247	$ 9,814,179	$ 11,746,311	#REF!	#REF!	#REF!	$ -	$ -	$ 75,247	#REF!	#REF!	#REF!

Roads

	Without Project						With Project					
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI	10	50	100	#REF!	#REF!	#REF!	10	50	100	#REF!	#REF!	#REF!
Probability of Levee failure	1.00	1.00	1.00	#REF!	#REF!	#REF!	0.00	1.00	1.00	#REF!	#REF!	#REF!
Roads Inundated												
length of arterial roads inundated (miles)	0.10	1.70	1.94	#REF!	#REF!	#REF!	0.00	0.25	0.40	#REF!	#REF!	#REF!
length of major roads inundated (miles)	0.00	0.00	0.00	#REF!	#REF!	#REF!	0.00	0.00	0.00	#REF!	#REF!	#REF!
length of minor roads inundated (miles)	0.00	0.10	0.10	#REF!	#REF!	#REF!	0.00	0.00	0.00	#REF!	#REF!	#REF!
length of unsealed roads inundated (miles)	0.00	0.00	0.00	#REF!	#REF!	#REF!	0.00	0.00	0.00	#REF!	#REF!	#REF!
Potential Damages												
length of arterial roads inundated (miles)	$ 25,000	$ 425,000	$ 485,000	#REF!	#REF!	#REF!	$ -	$ 62,500	$ 100,000	#REF!	#REF!	#REF!
length of major roads inundated (miles)	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
length of minor roads inundated (miles)	$ -	$ 3,000	$ 3,000	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
length of unsealed roads inundated (miles)	$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Total Damages:	*$ 25,000*	*$ 428,000*	*$ 488,000*	*#REF!*	*#REF!*	*#REF!*	*$ -*	*$ 62,500*	*$ 100,000*	*#REF!*	*#REF!*	*#REF!*
Total Damage with levee failure ($):	$ 25,000	$ 428,000	$ 488,000	#REF!	#REF!	#REF!	$ -	$ 62,500	$ 100,000	#REF!	#REF!	#REF!

Agricultural Damages

		Without Project						With Project					
		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6
ARI:		10	50	100	#REF!	#REF!	#REF!	10	50	100	#REF!	#REF!	#REF!
Probability of Levee Failure		1.00	1.00	1.00	#REF!	#REF!	#REF!	0.00	1.00	1.00	#REF!	#REF!	#REF!
Length of Inundation <5d Y/N		Y	Y	Y	#REF!	#REF!	#REF!	Y	Y	Y	#REF!	#REF!	#REF!
Agricultural Land Inundated													
Corn	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Rice	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Walnuts	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Almonds	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Cotton	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Tomatoes	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Wine Grape	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Alfalfa	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Pasture	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Safflower	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Sugar Beets	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Beans	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Other	ac.	0	0	0	#REF!	#REF!	#REF!	0	0	0	#REF!	#REF!	#REF!
Potential Damages													
Corn		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Rice		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Walnuts		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Almonds		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Cotton		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Tomatoes		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Wine Grapes		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Alfalfa		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Pasture		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Safflower		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Sugar Beets		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Beans		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Other		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Total Potential Damages		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!
Total Damage with levee failure ($):		$ -	$ -	$ -	#REF!	#REF!	#REF!	$ -	$ -	$ -	#REF!	#REF!	#REF!

Inputs

Return to Menu

Project Name: Cactus Basins 3 through 5

Cost of Project: $ 34,346,985

Description: For Cactus Basins 3,4, and 5

Number of Events Modeled: 3

		Without Project			With Project		
		Event 1	Event 2	Event 3	Event 1	Event 2	Event 3
Average Return Interval (ARI)		10	50	100	10	50	100
Annual Probability of Exceedance		0.100	0.020	0.010	0.100	0.020	0.010
Probability of Levee Failure		1.00	1.00	1.00	0.00	1.00	1.00
Water Surface Elevation - channel (f)		1345.00	1345.00	1345.00	1345.00	1345.00	1345.00
Flood Warning Time (hours)		0	0	0	0	0	0
Flood Experience		N	N	N	N	N	N
Period of Inundation (days)							
HEC-FIA DATA INPUTS		N					
Residential Structural Damages ($)							
Residential Contents Damages ($)							
Residential Debris & Cleanup ($)							
Commercial Structural Damages ($)							
Commercial Contents Damages ($)							
Commercial Debris & Cleanup ($)							
Industrial Structural Damages ($)							
Industrial Contents Damages ($)							
Industrial Debris & Cleanup ($)							
Agricultural Structural Damages ($)							
Agricultural Contents Damages ($)							
Agricultural Debris & Cleanup ($)							
Residential Properties							
Ratio Depreciated Value to Replacement Value		50%	50%	50%	50%	50%	50%
Average Flood depth above ground level (f)		0.40	2.10	2.50	-0.39	-0.10	0.00
Rural - Res: Homesteads		0	0	0	0	0	0
Rural - Other: Barns, sheds		0	0	0	0	0	0
Urban Res: Single story (no base)		42	129	142	7	23	56
Urban Res: Single story (basement)		0	0	0	0	0	0
Urban Res: Two plus story (no base)		0	0	0	0	0	0
Urban Res: Two plus story (basement)		0	0	0	0	0	0
Mobile home		0	0	0	0	0	0
Commercial Properties							
Ratio Depreciated Value to Replacement Value		50%	50%	50%	50%	50%	50%
Average Flood depth above ground level (f)		0.50	2.20	2.60	-0.29	0.00	0.10
low value	building area inundated (sq.f.)	1745037	2101167	1887489	1388907	1353294	1851876
medium value	building area inundated (sq.f.)						
high value	building area inundated (sq.f.)	0	0	0	0	0	0
Industrial Properties							
Ratio Depreciated Value to Replacement Value		50%	50%	50%	50%	50%	50%
Average Flood depth above ground level (f)		1.00	2.70	3.10	0.21	0.50	0.60
low value	building area inundated (sq.f.)	96471	192942	385884	0	0	96471
medium value	building area inundated (sq.f.)						
high value	building area inundated (sq.f.)	0	0	0	0	0	0
Agricultural Production							
Corn	ac.	0	0	0	0	0	0
Rice	ac.	0	0	0	0	0	0
Walnuts	ac.	0	0	0	0	0	0
Almonds	ac.	0	0	0	0	0	0
Cotton	ac.	0	0	0	0	0	0
Tomatoes	ac.	0	0	0	0	0	0
Wine Grapes	ac.	0	0	0	0	0	0
Alfalfa	ac.	0	0	0	0	0	0
Pasture	ac.	0	0	0	0	0	0
Safflower	ac.	0	0	0	0	0	0
Sugar Beets	ac.	0	0	0	0	0	0
Beans	ac.	0	0	0	0	0	0
Other	ac.	0	0	0	0	0	0
Roads							
length of arterial roads inundated (miles)		0.1	1.7	1.9	0	0.3	0.4
length of major roads inundated (miles)		0	0.0	0.0	0	0.0	0.0
length of minor roads inundated (miles)		0	0.1	0.1	0	0.0	0.0
length of unsealed roads inundated (miles)		0	0.0	0.0	0	0.0	0.0

Extrapolate Y-intercept: N

Occ_Description	Parameter	Depth (ft) above First Finished Floor (FFE)																		
one story, no basement	Stage	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	S	0	2.5	13.4	23.3	32.1	40.1	47.1	53.2	58.6	63.2	67.2	70.5	73.2	75.4	77.2	78.5	79.5	80.2	80.7
	C	0	2.4	8.1	13.3	17.9	22	25.7	28.8	31.5	33.8	35.7	37.2	38.4	39.2	39.7	40	40	40	40
two or more stories, no basement	Stage	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	S	0	3	9.3	15.2	20.9	26.3	31.4	36.2	40.7	44.9	48.8	52.4	55.7	58.7	61.4	63.8	65.9	67.7	69.2
	C	0	1	5	8.7	12.2	15.5	18.5	21.3	23.9	26.3	28.4	30.3	32	33.4	34.7	35.6	36.4	36.9	37.2
	CN	0	3.5	2.9	2.6	2.5	2.5	2.7	3	3.2	3.3	3.4	3.5	3.5	3.5	3.5	3.5	3.6	3.8	4.2
	Struct	N		0.8																
Farm Homesteads	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
	S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49
	C	0	0	0	0	0	6	30	54	69	75	78	80	80	80	100	100	100	100	100
Mobile homes	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
	S	0	0	0	0	8	44	63	73	78	80	81	82	82	82	82	82	82	82	82
	C	0	0	0	0	0	27	49	64	70	76	78	79	81	83	83	83	83	83	83
Public buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
	S	0	0	0	0	8	22	30	35	39	41	44	46	48	49	49	49	49	49	49
	C	0	0	0	0	0	17.5	25	30	34	37	39	40.5	41.5	42	42	42	42	42	42
Industrial Buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
	S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49
	C	0	0	0	0	0	72	75	76.5	78	81	84	87	90	96	102	108	114	120	120
Commercial Buildings	Stage	-10	-3	-2	-1	0	1	2	3	4	5	6	7	8	10	13	15	19	21	25
	S	0	0	0	0	4	9	13	18	22	27	31	35	38	49	49	49	49	49	49
	C	0	0	0	0	0	11	30	54	69	75	78	80	80	80	100	100	100	100	100

split level, no basement	Stage	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	S	0	6.4	7.2	9.4	12.9	17.4	22.8	28.9	35.5	42.3	49.2	56.1	62.6	68.6	73.9	78.4	81.7	83.8	84.4
	SN	0	2.9	2.1	1.9	1.9	2	2.2	2.4	2.7	3.2	3.8	4.5	5.3	6	6.7	7.4	7.9	8.3	8.7
	C	0	2.2	2.9	4.7	7.5	11.1	15.3	20.1	25.2	30.5	35.7	40.9	45.8	50.2	54.1	57.2	59.4	60.5	60.5
	CN	0	2.2	1.5	1.2	1.3	1.4	1.5	1.6	1.8	2.1	2.5	3	3.5	4.1	4.6	5	5.4	5.7	6
	Struct	N		0.8																
one story, with basement	Stage	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	S	0	0	0.7	0.8	2.4	5.2	9	13.8	19.4	25.5	32	38.7	45.5	52.2	58.6	64.5	69.8	74.2	77.7	80.1	81.1	81.1	81.1	81.1	81.1	81.1
	SN	0	0	1.34	1.06	0.94	0.91	0.88	0.85	0.83	0.85	0.96	1.14	1.37	1.63	1.89	2.14	2.35	2.52	2.66	2.77	2.88	2.88	2.88	2.88	2.88	2.88
	C	0	0.1	0.8	2.1	3.7	5.7	8	10.5	13.2	16	18.9	21.8	24.7	27.4	30	32.4	34.5	36.3	37.7	38.6	39.1	39.1	39.1	39.1	39.1	39.1
	CN	0	1.6	1.16	0.92	0.81	0.78	0.76	0.74	0.72	0.74	0.83	0.98	1.17	1.39	1.6	1.81	1.99	2.13	2.25	2.35	2.45	2.45	2.45	2.45	2.45	2.45
	Struct	N		0.8																							
two or more stories, with basement	Stage	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	S	0	1.7	1.7	1.9	2.9	4.7	7.2	10.2	13.9	17.9	22.3	27	31.9	36.9	41.9	46.9	51.8	56.4	60.8	64.8	68.4	71.4	73.7	75.4	76.4	76.4
	SN	0	2.7	2.7	2.11	1.8	1.66	1.56	1.47	1.37	1.32	1.35	1.5	1.75	2.04	2.34	2.63	2.89	3.13	3.38	3.71	4.22	5.02	6.19	7.79	9.84	12.36
	C	0	0	1	2.3	3.7	5.2	6.8	8.4	10.1	11.9	13.8	15.7	17.7	19.8	22	24.3	26.7	29.1	31.7	34.4	37.2	40	43	46.1	49.3	52.6
	CN	0	0	2.27	1.76	1.49	1.37	1.29	1.21	1.13	1.09	1.11	1.23	1.43	1.67	1.92	2.15	2.36	2.56	2.76	3.04	3.46	4.12	5.08	6.39	8.08	10.15
	Struct	N		0.8																							
split level, with basement	Stage	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	S	0	0	0	2.5	3.1	4.7	7.2	10.4	14.2	18.5	23.2	28.2	33.4	38.6	43.8	48.8	53.5	57.8	61.6	64.8	67.2	68.8	69.3	69.3	69.3	69.3
	SN	0	0	0	1.8	1.6	1.5	1.6	1.6	1.6	1.6	1.7	1.9	2.1	2.4	2.6	2.9	3.2	3.4	3.6	3.9	4.2	4.8	5.7	5.7	5.7	5.7
	C	0	0.6	0.7	1.4	2.4	3.8	5.4	7.3	9.4	11.6	13.8	16.1	18.2	20.2	22.1	23.6	24.9	25.8	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
	CN	0	2.09	1.49	1.14	1.01	1	1.02	1.03	1.04	1.06	1.12	1.23	1.38	1.57	1.76	1.95	2.13	2.28	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44
	Struct	N		0.8																							

Potential Damages

	Without Project							With Project						
Water Surface Elevation - channel (f)	1345	1345	1345	#REF!	#REF!	#REF!		1345	1345	1345	#REF!	#REF!	#REF!	
ARI	10	50	100	#REF!	#REF!	#REF!		10	50	100	#REF!	#REF!	#REF!	
Probability of Exceedence (AEP)	0.100	0.020	0.010	#REF!	#REF!	#REF!		0.100	0.020	0.010	#REF!	#REF!	#REF!	
Damages incurred	$ 1,268,563	$ 59,971,739	$ 70,752,018	#REF!	#REF!	#REF!	$ 70,752,018	$ -	$ 336,875	$ 1,131,237	#REF!	#REF!	#REF!	$ 1,131,237

Actual Damages

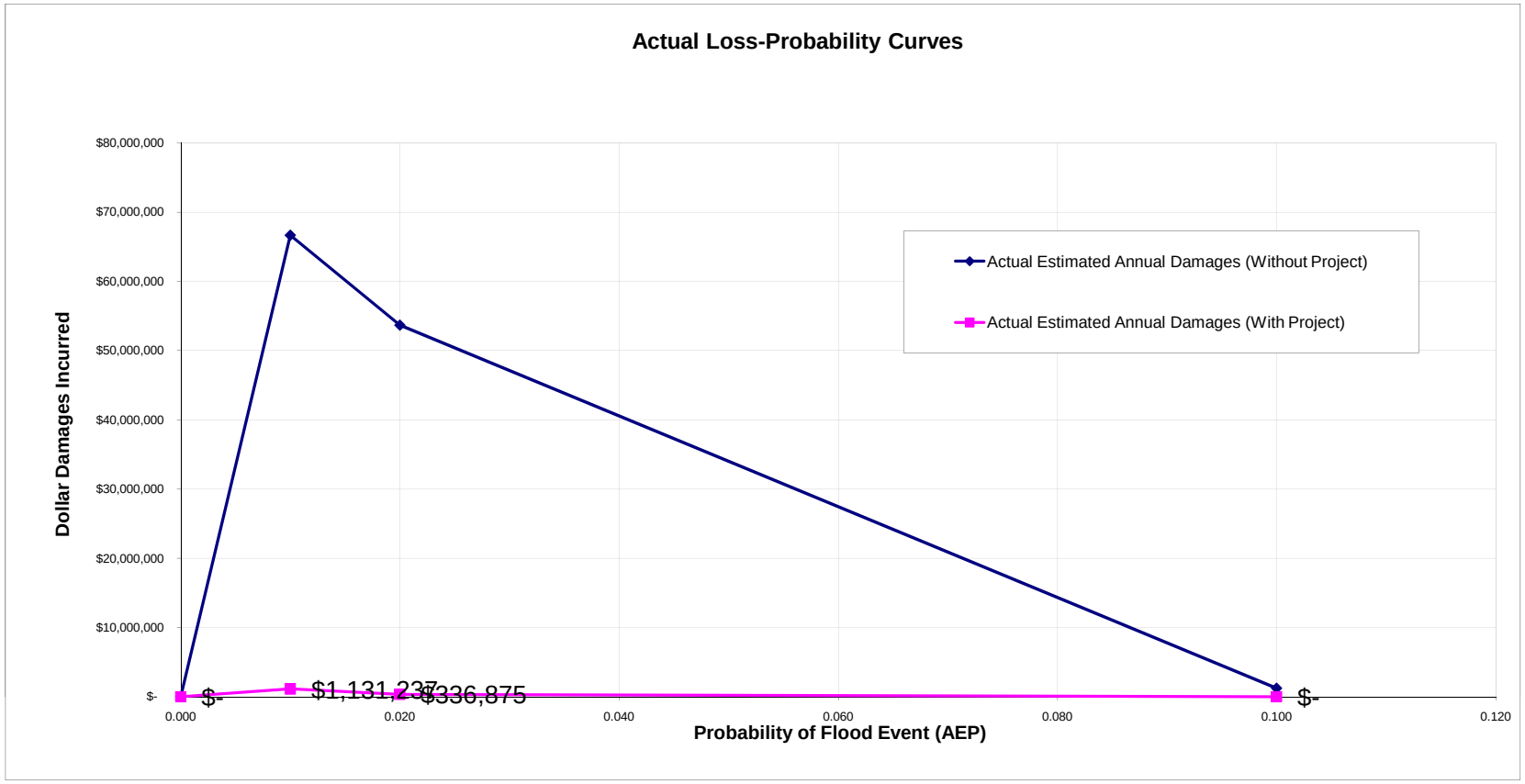
	Without Project							With Project						
Water Surface Elevation - channel (f)	1345	1345	1345	#REF!	#REF!	#REF!		1345	1345	1345	#REF!	#REF!	#REF!	
ARI	10	50	100	#REF!	#REF!	#REF!		10	50	100	#REF!	#REF!	#REF!	
Probability of Exceedence (AEP)	0.100	0.020	0.010	#REF!	#REF!	#REF!		0.100	0.020	0.010	#REF!	#REF!	#REF!	
Damages incurred	$ 1,230,498	$ 53,686,325	$ 66,667,651	#REF!	#REF!	#REF!	$ 66,667,651	$ -	$ 336,875	$ 1,131,237	#REF!	#REF!	#REF!	$ 1,131,237

Without Project

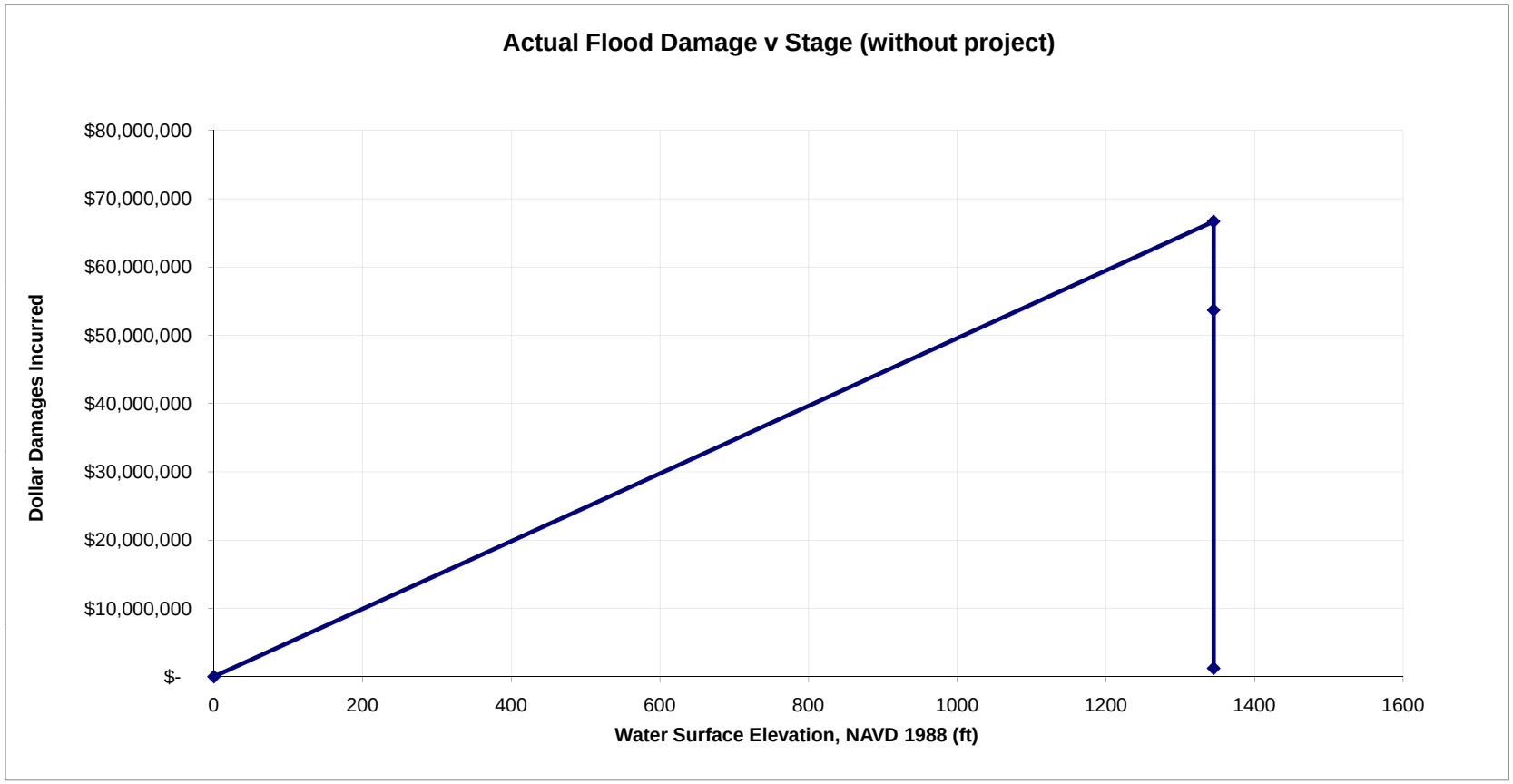
Water Surface Elevation - channel (f)	10	50	100	#REF!	#REF!	#REF!
Probability of Exceedence (AEP)	0.100	0.020	0.010	#REF!	#REF!	#REF!
Potential	$ 1,268,563	$ 59,971,739	$ 70,752,018	#REF!	#REF!	#REF!
Actual	$ 1,230,498	$ 53,686,325	$ 66,667,651	#REF!	#REF!	#REF!

With Project

Water Surface Elevation - channel (f)	10	50	100	#REF!	#REF!	#REF!
Probability of Exceedence (AEP)	0.100	0.020	0.010	#REF!	#REF!	#REF!
Potential	$ -	$ 336,875	$ 1,131,237	#REF!	#REF!	#REF!
Actual	$ -	$ 336,875	$ 1,131,237	#REF!	#REF!	#REF!


Actual Loss-Probability Curves
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
$-
Dollar Damages Incurred
Actual Estimated Annual Damages (Without Project)
Actual Estimated Annual Damages (With Project)
$-
$1,131,237
$336,875
$-
0.000
0.020
0.040
0.060
0.080
0.100
0.120
Probability of Flood Event (AEP)

Return to Menu



Calculation of With Project EAD

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	
Average Recurrence Interval (ARI)	10	50	100	#REF!	#REF!	#REF!	
AEP	0.100	0.020	0.010	#REF!	#REF!	#REF!	0
Actual Damage to Residential Buildings ($)	$ -	$ 207,000	$ 504,000	#REF!	#REF!	#REF!	
Potential Damage to Residential Buildings ($)	$ -	$ 207,000	$ 504,000	#REF!	#REF!	#REF!	
Actual Damage to Commercial/Industrial Buildings ($)	$ -	$ -	$ 300,990	#REF!	#REF!	#REF!	
Potential Damage to Commercial/Industrial Buildings ($)	$ -	$ -	$ 300,990	#REF!	#REF!	#REF!	
Damage to Agriculture ($)	$ -	$ -	$ -	#REF!	#REF!	#REF!	
Damage to Roads ($)	$ -	$ 62,500	$ 100,000	#REF!	#REF!	#REF!	
Actual Indirect Costs	$ -	$ 67,375	$ 226,247	#REF!	#REF!	#REF!	
Potential Indirect Costs	$ -	$ 67,375	$ 226,247	#REF!	#REF!	#REF!	
Special Cases	$ -	$ -	$ -	#REF!	#REF!	#REF!	
Total Actual Damages	$ -	$ 336,875	$ 1,131,237	#REF!	#REF!	#REF!	$ 1,131,237
Total Potential Damages	$ -	$ 336,875	$ 1,131,237	#REF!	#REF!	#REF!	$ 1,131,237

EAD (Actual)	$ 32,128
EAD (Potential)	$ 32,128

Actual Damages

Calculation of Without Project EAD

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Y Intercept
Average Recurrence Interval (ARI)	10	50	100	#REF!	#REF!	#REF!	
AEP	0.100	0.020	0.010	#REF!	#REF!	#REF!	0
Actual Damage to Residential Buildings ($)	$ 658,409	$ 7,774,362	$ 8,843,098	#REF!	#REF!	#REF!	
Potential Damage to Residential Buildings ($)	$ 688,861	$ 8,292,675	$ 9,128,371	#REF!	#REF!	#REF!	
Actual Damage to Commercial/Industrial Buildings ($)	$ 300,990	$ 34,746,698	$ 44,003,023	#REF!	#REF!	#REF!	
Potential Damage to Commercial/Industrial Buildings ($)	$ 300,990	$ 39,256,716	$ 46,985,244	#REF!	#REF!	#REF!	
Damage to Agriculture ($)	$ -	$ -	$ -	#REF!	#REF!	#REF!	
Damage to Roads ($)	$ 25,000	$ 428,000	$ 488,000	#REF!	#REF!	#REF!	
Actual Indirect Costs	$ 246,100	$ 10,737,265	$ 13,333,530	#REF!	#REF!	#REF!	
Potential Indirect Costs	$ 253,713	$ 11,994,348	$ 14,150,404	#REF!	#REF!	#REF!	
Special Cases	$ -	$ -	$ -	#REF!	#REF!	#REF!	
Total Actual Damages	$ 1,230,498	$ 53,686,325	$ 66,667,651	#REF!	#REF!	#REF!	$ 66,667,651
Total Potential Damages	$ 1,268,563	$ 59,971,739	$ 70,752,018	#REF!	#REF!	#REF!	$ 70,752,018
EAD (Actual)	$ 3,465,119						
EAD (Potential)	$ 3,810,751						

Actual Damages					
No. of events		3	4	5	6
Extr					F!
Con					F!
Actu					F!

Do Not Change

No.					6
Extr					F!
Const Y Intercept	$	70,752,018	#REF!	#REF!	#REF!
Potential EAD	$	3,810,751	#REF!	#REF!	#REF!

Model Assumptions

Residential

Foundation heights

Structure Category	Foundation Height (ft)
Rural - Res: Homesteads	1.5
Rural - Other: Barns, sheds	0
Urban Res: Single story (no base)	1.1
Urban Res: Two plus story (no base)	1.1
Mobile home	2.0
Commercial: Low	1
Commercial: Medium	1
Commercial: High	1
Industrial: Low	0.5
Industrial: Medium	0.5
Industrial: High	0.5

Estimate Replacement Value (assumed proxy for depreciated value)

Structure Category	Unit Cost $/ft^2 (2)	Average Size ft^2 (1)	Construction Cost
Rural - Res: Homesteads	159	1900	302100
Rural - Other: Barns, sheds	98	4000	392000
Urban Res: Single story (no base)	159	1900	302100
Urban Res: Two plus story (no base)	155	2200	341000
Mobile home (3)	98	1180	115640
Commercial: Low	120		0
Commercial: Medium	142		0
Commercial: High	207		0
Industrial: Low	120		0
Industrial: Medium	142		0
Industrial: High	207		0

1. Residential Square Footage Source: Sacramento County Tax Assessor Unit Cost and Commercial/Industrial/Public Square Footage Assumptions Source: Saylor Publications, Inc, 2007 Current Construction Costs

2. Replacement unit cost per square foot reflects average costs in the San Francis

3. According to FEMA guidance, replacement costs per square foot for mobile homes and barns and outbuildings are similar.

Other

External damages garden/outdoor areas $/building	$	5,000
Cleanup $/building	$	4,000
Number of residents per residential property		2.6

Commercial / Industrial Buildings

Clean-up costs as a percentage of direct structural damages	30%

Calculation of Other Direct Damages

Percentage of residential direct damages applied as indirect:	25%
Percentage of comm/ind. direct damages applied as indirect:	25%
HEC-FIA only: Percentage all building direct damages applied as indirect	25%
Percentage of roads direct damages applied as indirect:	25%

NPV Calculation

Discount Rate	6%
Time Horizon	50 years

Roads

Cost per mile of highway road inundated	$	250,000
Cost per mile of major road inundated	$	100,000
Cost per mile of minor road inundated	$	30,000
Cost per mile of unsealed road inundated	$	10,000

Agricultural Damages

	Weighted, Average Annual Damages ($/acre)	Establishment Costs ($/acre)	Land Cleanup & rehabilitation ($/acre)	Total <5 d) ($/acre)	Total (>=5 d) ($/acre)
Corn	$48	$0	$246	$293	$293
Rice	$227	$0	$243	$471	$471
Walnuts	$585	$5,284	$243	$828	$6,112
Almonds	$1,618	$3,514	$243	$1,862	$5,376
Cotton	$301	$0	$246	$547	$547
Tomatoes	$1,015	$0	$235	$1,250	$1,250
Wine Grapes	$3,241	$3,240	$235	$3,476	$6,716
Alfalfa	$250	$246	$243	$493	$739
Pasture	($15)	$82	$272	$257	$339
Safflower	$164	$0	$241	$405	$405
Sugar Beets	$313	$0	$262	$575	$575
Beans	$111	$0	$246	$356	$356
Other	$0	0	$246	$246	$246

Source: Comp Study

Establishment Costs are 50% costs of total establishment costs

Calculation of Actual to Potential Damages Ratio

	Without Project						With Project					
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event	Event 2	Event 3	Event 4	Event 5	Event 6
Warning Time: hours	0.8	0.8	0.8	#REF!	#REF!	#REF!	0.8	0.8	0.8	#REF!	#REF!	#REF!
Recent Flood Exp Y / N	y	y	N	#REF!	#REF!	#REF!	N	N	N	#REF!	#REF!	#REF!
Actual : Potential Ratio	0.8	0.8	0.9	#REF!	#REF!	#REF!	0.9	0.9	0.9	#REF!	#REF!	#REF!

Warning Time	Experienced Community	Inexperienced Community
< 2 hours	0.8	0.9
2-12 hours	Linear reduction from 0.8 at 2 hours to 0.4 at 12 hours	0.8
>12 hours	0.4	0.7