Attachment 8
Benefits and Cost Analysis

The Project proposes to construct a 19 acre-foot basin to provide additional flood control and aquifer recharge to the 890 acre tributary area and the 62 acre flood inundation area. The system will convey a 100 year frequency discharge of 1,065 cubic feet per second (cfs) and the basin will be capable of recharging approximately 200 acre feet of storm water during an average rainfall year. The Project also intends to construct approximately 1,730 linear feet of drainage conveyance improvements along the Calimesa Creek between 5th Street and I-10 Freeway. The Project will eliminate 62 acres of flood inundation area of civic center, mixed residential, commercial, and industrial properties, as shown on Attachment 7-1.

The Project, when completed, will operate as a passive system. When precipitation occurs, peak discharges will be held in the basin for recharge and overflows will be conveyed through the Calimesa Creek. The Project will provide immediate flood protection to the existing flood hazard area. There are no uncertainties related to the project benefits and the Project will not create any adverse effects.

The Project's economic costs related to flood control include construction of the 19 acre-feet basin, including water quality and water level monitoring systems, and 1,730 linear feet of drainage conveyance improvements. As shown on Table 5, the drainage conveyance and basin construction are estimated at $2.2 million. The Project's total costs are shown on Table 6 in Attachment 4.

As described in Attachment 7, the City has had flooding along Calimesa Creek during moderate storm events which the Project will mitigate. The Project will mitigate flooding hazards along the civic center, downtown business district, residential developments and public safety facilities. Using methodologies described in Attachment 7, the flood inundation area was determined and used to determine flood damage.

The flood damage reduction benefit analysis was calculated using the data presented and DWR's Flood Rapid Assessment Model (F-RAM). Expected annual damage without the Project is approximately $269,000, as presented on Table 11, due the greater great economic impacts to the downtown business district through flood damage and lost revenue. As shown on Table 12, the present value of expected annual damage is $4.2 million. F-RAM analysis is included as Attachment 8-1.

The Yucaipa Groundwater Basin is managed by Yucaipa Valley Water District (YVWD). Since 2002, YVWD has increased the needs for costly import water. As described in Attachment 7, recently import water has made up approximately 28% of YVWD's total water supply. Import water is purchased through San Gorgonio Pass Water Agency at $277 per acre-foot.

Using methodologies described in Attachment 7, it is estimated that annual storm runoff for the Project's 890 acre tributary area will deliver approximately 884 acre-feet of storm water to reach the Basin annually and of that approximately 200 acre-feet of these flows will be recharged creating new groundwater supplies. Without the project, no new yield will be captured with projected amounts as presented above. YVWD and surrounding communities will benefit from the project. In addition to the flood protection benefits, the Project will also provide water recharge benefits. The monetized benefit analysis is described in Attachment 7 and is presented in Table 14. The total present value of discounted benefits for the Project is $926,000.

The Project's non-monetized benefit is greenhouse gas (GHG) emissions reduction. As described in Attachment 7, GHG emissions reductions will occur through reduced dependence on imported water. With the Project approximately 300 tons CO_2 per year of GHG reduction will be achieved.

Project costs include initial construction and ongoing maintenance. It is estimated that every 5 years the basin will require removal of sediment build-up and scouring of the basin floor. At these 5 year intervals, over the Projects 50 year life, operation and maintenance costs will increase to account for the additional work. The total present value of discounted costs is $3.55 million, as shown on Table 16. All values for total present value Project costs (Table 16), flood damage reduction (Table 12), and monetized Project benefits (Table 14) are summarized on Table 17. The Project's benefit cost summary (Table 17) show that Project benefits outweigh Project cost by 1.5:1.

All included tables have been described, qualified, and/or supported here and in the comment section of each table.

Table 11 - Expected Annual Damage

Project: Calimesa Creek Flood Control and Aquifer Recharge Project

Hydrologic Event	Event Probability	Damage if Flood Structures Fail	Probability Structural Failure		Event Damage		Interval Probability	Average Damage in Interval		Average Damage in Interval times Interval Probability	
			Without Project	With Project	Without Project	With Project		Without Project	With Project	Without Project	With Project
					(f)	(g)	(i)	(j)	(k)	(l)	(m)
(a)	(b)	(c)	(d)	(e)	(c)*(d)	(c)*(e)	from (b)	from (f)	from (g)	(i) x (j)	(i) x (k)
10-Year	0.100	$ 1,401,929	0.60	0.00	$ 841,157	$ -	0.050	$ 1,320,362	$ -	$ 66,018	$ -
25-Year	0.040	$ 7,955,703	0.75	0.00	$ 5,966,777	$ -	0.020	$ 7,611,592	$ -	$ 152,232	$ -
100-Year	0.010	$ 10,607,603	1.00	0.00	$ 10,607,603	$ -	0.005	$ 10,148,789	$ -	$ 50,744	$ -
Expected Annual Damages, Without and With Project										**$ 268,994**	**$ -**

Notes:

1.) Expected annual damage determined using DWR's Flood Rapid Assessment Model (FRAM). Detailed FRAM analysis is included as part of this attachment.

Table 12 - Present Value of Expected Annual Damage

Project: Calimesa Creek Flood Control and Aquifer Recharge Project

(a)	Expected Annual Damage Without Project[1.)]		$ 268,994
(b)	Expected Annual Damage With Project[1.)]		$ -
(c)	Expected Annual Benefit	(a)-(b)	$ 268,994
(d)	Present Value Coefficient[2.)]		15.76
(e)	**Present Value of Future Benefits Transfer to Table 17, Column (d).**	**(c)*(d)**	**$ 4,239,344**

Notes:

1.) This program assumes no land use changes in the floodplain. So, EAD will be constant over analysis period.

2.) 6% discount rate; 50-year analysis period (could vary depending upon life cycle of project).

Table 14 - Annual Benefit
(All Costs should be in 2012 Dollars)

Project: Calimesa Creek Flood Control and Aquifer Recharge Project

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (units)	Without Project	With Project	Change Resulting from Project (e)-(d)	Unit $ Value[1.)]	Annual $ Value[1.)] (f)*(g)	Discount Factor[1.)]	Discounted Benefits[1.)] (h)*(i)
2012	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	1.000	$ 55,400
2013	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.943	$ 52,242
2014	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.890	$ 49,306
2015	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.840	$ 46,536
2016	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.792	$ 43,877
2017	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.747	$ 41,384
2018	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.705	$ 39,057
2019	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.665	$ 36,841
2020	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.627	$ 34,736
2021	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.592	$ 32,797
2022	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.558	$ 30,913
2023	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.527	$ 29,196
2024	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.497	$ 27,534
2025	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.469	$ 25,983
2026	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.442	$ 24,487
2027	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.417	$ 23,102
2028	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.394	$ 21,828
2029	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.371	$ 20,553
2030	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.350	$ 19,390
2031	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.331	$ 18,337
2032	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.312	$ 17,285
2033	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.294	$ 16,288
2034	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.278	$ 15,401
2035	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.262	$ 14,515
2036	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.247	$ 13,684
2037	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.233	$ 12,908
2038	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.220	$ 12,188
2039	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.207	$ 11,468
2040	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.196	$ 10,858
2041	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.185	$ 10,249
2042	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.174	$ 9,640
2043	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.164	$ 9,086
2044	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.155	$ 8,587
2045	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.146	$ 8,088

Table 14 - Annual Benefit
(All Costs should be in 2012 Dollars)

Project: Calimesa Creek Flood Control and Aquifer Recharge Project

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	**Type of Benefit**	**Measure of Benefit (units)**	**Without Project**	**With Project**	**Change Resulting from Project (e)-(d)**	**Unit $ Value[1.)]**	**Annual $ Value[1.)] (f)*(g)**	**Discount Factor[1.)]**	**Discounted Benefits[1.)] (h)*(i)**
2046	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.138	$ 7,645
2047	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.130	$ 7,202
2048	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.123	$ 6,814
2049	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.116	$ 6,426
2050	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.109	$ 6,039
2051	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.103	$ 5,706
2052	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.097	$ 5,374
2053	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.092	$ 5,097
2054	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.087	$ 4,820
2055	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.082	$ 4,543
2056	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.077	$ 4,266
2057	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.073	$ 4,044
2058	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.069	$ 3,823
2059	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.065	$ 3,601
2060	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.061	$ 3,379
2061	Stormwater Capture and Storage	Acre-Feet	0	200	200	$ 277	$ 55,400	0.058	$ 3,213
							Total Present Value of Discounted Benefits Based on Unit Value (Sum of Column (j) for all Benefits shown in Table)		**$ 925,734**

Notes:
1.) Imported Water Rates Taken from Current Value of San Gorgonio Pass Water Agency
2.) Refer to Attachment 7 and Table 7 for benefit details.

Table 16 - Annual Costs of Project
(All Costs should be in 2012 Dollars)

Project: Calimesa Creek Flood Control and Aquifer Recharge Project

	Initial Costs Grand Total Cost from Table 6 (row (i), coulmn (d))	Adjusted Grant Total Cost[1.)]	Annual Costs[2.)]						Discounting Calculations	
			Admin	Operation	Maintainance	Replacement	Other	Total Costs (a)+...+(g)	Discount Factor	Discounted Costs (h)*(i)
Year	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
2012	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	1.000	$ -
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	0.943	$ -
2014	$ 3,871,818	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 3,877,318	0.890	$ 3,450,813
2015	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.840	$ 4,620
2016	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.792	$ 4,356
2017	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.747	$ 4,109
2018	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.705	$ 3,878
2019	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.665	$ 9,869
2020	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.627	$ 3,449
2021	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.592	$ 3,256
2022	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.558	$ 3,069
2023	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.527	$ 2,899
2024	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.497	$ 7,375
2025	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.469	$ 2,580
2026	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.442	$ 2,431
2027	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.417	$ 2,294
2028	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.394	$ 2,167
2029	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.371	$ 5,506
2030	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.350	$ 1,925
2031	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.331	$ 1,821
2032	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.312	$ 1,716
2033	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.294	$ 1,617
2034	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.278	$ 4,126
2035	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.262	$ 1,441
2036	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.247	$ 1,359
2037	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.233	$ 1,282
2038	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.220	$ 1,210
2039	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.207	$ 3,072
2040	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.196	$ 1,078
2041	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.185	$ 1,018
2042	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.174	$ 957
2043	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.164	$ 902
2044	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.155	$ 2,300
2045	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.146	$ 803
2046	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.138	$ 759
2047	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.130	$ 715
2048	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.123	$ 677
2049	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.116	$ 1,721
2050	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.109	$ 600
2051	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.103	$ 567
2052	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.097	$ 534
2053	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.092	$ 506
2054	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.087	$ 1,291
2055	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.082	$ 451
2056	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.077	$ 424
2057	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.073	$ 402
2058	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.069	$ 380
2059	$ -	$ -	$ 1,000	$ 4,500	$ 4,500	$ 4,840	$ -	$ 14,840	0.065	$ 965
2060	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.061	$ 336
2061	$ -	$ -	$ 1,000	$ 2,250	$ 2,250	$ -	$ -	$ 5,500	0.058	$ 319
								Total Present Value of Discounted Costs (Sum of Column (j))	**$**	**3,549,935**
								Transfer to Table 17, column (c), Proposal Benefits and Costs Summaries		

Notes:
1.) If any, based on opportunity costs, sunk costs and associated costs.
2.) The incremental change in O&M costs attributable to the project.

Comments:
(a) Capital and Other Initial Costs are take from and further described in Tables 5 and 6.
(b) Not Applicable.
(c) Administrative costs are estimated to include one week of work per year at a rate of $25 per hour.
(d) Operation costs are estimated to include three quarters of a week of work per year at a rate of $75 per hour. Additionally, pipe repair, sediment build-up removal, and scouring of the basin floor, will require extra costs every five years estimated at one and a half weeks of work at a rate of $75 per hour.
(e) Maintenance costs are estimated to include three quarters of a week of work per year at a rate of $75 per hour. Additionally, pipe repair, sediment build-up removal, and scouring of the basin floor, will require extra costs every five years estimated at one and a half weeks of work at a rate of $75 per hour.
(f) Replacement costs include sediment build-up removal (1,600 cubic-yards) and scouring of the basin floor at a rate of $3 per cubic-yard, to be done every 5 years.
(g) Other costs were not applicable.
(h) Total Costs are the summation of columns (a) through (f).
(i) Discount Factors are based on a 6% discount rate and a 50 year analysis period, as provided in the application.
(j) Discounted Costs are Total Costs multiplied by the Discount Factor.

Table 17 - Proposal Benefits and Costs Summary

Project: Calimesa Creek Flood Control and Aquifer Recharge Project
Agency: City of Calimesa

Project	Project Proponent	Total Present Value Project Costs[1.)]	Total Present Value Project Benefits			From Section D2 – Briefly describe the main Non-monetized benefits[4.)]
			From Section D1 – Flood Damage Reduction[2.)]	From Section D3 – Monetized[3.)]	Total	
(a)	(b)	(c)	(d)	(e)	(f)=(d)+(e)	(g)
Calimesa Creek Flood Control and Aquifer Recharge Project	City of Calimesa	$ 3,549,935	$ 4,239,344	$ 925,734	$ 5,165,078	As presented in Table 7, the project will reduce Green House Gases by approximately 300 tons per year.

Notes:
1.) Refer to Table 16.
2.) Refer to Table 12.
3.) Refer to Table 14.
4.) Refer to Attachment 7 for details.