East Raymond Basin Water Resources Plan Appendix I – Economics Base Study

Prepared for: Cities of Arcadia and Sierra Madre And the Los Angeles County Department of Public Works







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EAST RAYMOND BASIN WATER RESOURCES PLAN APPENDIX I – ECONOMIC BASE STUDY

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EAST RAYMOND BASIN WATER RESOURCES PLAN APPENDIX I – ECONOMIC BASE STUDY

1.0 INTRODUCTION

Project alternatives at the Santa Anita Dam, the Santa Anita Debris Basin, and the Sierra Madre Channel Diversion Structure to develop increased safe yield in the East Raymond Basin (ERB) have been identified and described in this memorandum. The 'cost of increased safe yield' can be used to compare different alternatives, based on project cost and amount of water conserved.

Van Dell & Associates' (Van Dell) "Modeling Alternatives - Analyses and Procedures" (see Appendix G-A of Appendix G) provides a list of ten project alternatives. These project alternatives include various combinations of proposed improvements to the Santa Anita Dam, the Santa Anita Debris Basin, and the Sierra Madre Channel Diversion Structure (Alternative 6 only). Under normal conditions, ground water mounding (Ground Water Mounding) occurs at the Santa Anita Spreading Grounds (SASG), which limits the amount of water recharge (and the total water conservation amount) at the SASG. Installation of an extraction well to reduce the ground water mounding (Reduced Ground Water Mounding) increases the amount of water recharge (and the total water conservation amount) at the SASG. Van Dell's report also provides water conservation amounts for each of the proposed alternatives for both Ground Water Mounding and Reduced Ground Water Mounding conditions. Preliminary capital and Operations and Maintenance (O&M) costs for each of these ten alternatives have been provided in Appendix G. A summary of the project components, capital costs, water conserved, and 'cost of increased safe yield' are provided in Table I-1. The 'cost of increased safe yield' is determined by dividing the amortized preliminary capital costs and annual O&M costs by the amount of water conserved.

In addition to the ten alternatives, there are other projects that have been considered in determining the amount of water conserved. These projects include the following:

- Improvements at the Santa Anita Headworks Diversion Structure
- Improvements to the SASG
- Improvements to the transmission pipeline from the Santa Anita Headworks to the SMSG
- Improvements to the SMSG

The costs for these improvements, not included in the 'cost of safe yield' in Table I-1, will be discussed later in this report.

2.0 COST ANALYSIS

The cost analysis for the ten project alternatives are based on the total annualized capital cost of the projects (at a 6 percent interest rate), the annual O&M costs, the year 2005 value of the annualized costs, and the estimated service life of the project. The 'cost of the increased safe yield' is calculated by dividing the total annualized cost by the total amount of water conserved. Details for the components used to develop costs and/or 'cost of the increased safe yield' are presented in Appendix I-A (the ten alternatives) and Appendix I-B (other projects).

The total annualized costs were converted to year 2005 costs using Engineering News-Records' (ENR) monthly construction cost indexes (see Appendix I-A). Preliminary capital and O&M costs provided in Appendix G included costs developed in the years 2001, 2004, and 2005.

Capital costs for the project alternatives were annualized based on a 6 percent interest rate over the estimated service life of the project .The projected service life of each project varies depending on the facility type, existing condition of the facility, and the type of proposed improvements. Based on the facility type, the California Public Utilities Commission's (CPUC) "Standard Practice for Determination of Straight-Line Remaining Life Depreciation Accruals" (January 1961) provides average ranges of service life for different types of utilities, including water systems. These service life ranges are based upon factors such as the future effect of wear and tear, decay, action of the elements, inadequacy, and public requirements. The scenarios in the following sections present service life estimates for the different facilities investigated in this cost analysis.

2.1 Santa Anita Dam - Full and Partial Rehabilitation

Full rehabilitation of the Santa Anita Dam is proposed for Alternatives 3, 4, 5, and 6. Full rehabilitation of the Santa Anita Dam includes construction of buttress fill (up to an elevation of 1,300 ft), additional reinforced shotcrete/concrete erosion protection, and spillway notch modifications.

Partial rehabilitation of the Santa Anita Dam is proposed for Alternatives 2, 9, and 10. Partial rehabilitation of the Santa Anita Dam includes construction of buttress fill (up to an elevation of 1,270 ft) and spillway notch modifications.

Due to these significant physical improvements, the existing condition of the dam, and the 1961 CPUC report, it is assumed that both full and partial rehabilitation will extend the service life of the Santa Anita Dam by approximately 100 years.

2.2 Santa Anita Dam – Debris Retention

Debris retention of the Santa Anita Dam is proposed for Alternatives 1, 7, and 8. Debris retention of the Santa Anita Dam only includes spillway notch modifications and does not appear to significantly improve the condition of the existing structure. However, based on these improvements, the existing condition of the dam, and the 1961 CPUC report, it is assumed that the remaining service life of the Santa Anita Dam is approximately 40 years.

2.3 Santa Anita Debris Basin

Full rehabilitation of the Santa Anita Debris Basin is proposed for Alternatives 5, 8, and 10. Partial rehabilitation of the Santa Anita Debris Basin is proposed for Alternatives 4, 7, and 9. Debris retention of the Santa Anita Debris Basin is proposed for Alternatives 1, 2, 3, and 6. Full rehabilitation, partial rehabilitation, and debris retention do not appear to significantly improve the condition of the existing structure. However, based on the condition of the existing structure and the 1961 CPUC report, it is assumed that the remaining service life of the Santa Anita Debris Basin, with full rehabilitation, partial rehabilitation, or debris retention, is approximately 40 years.

2.4 Extraction Well

Based on the conditions of existing ground water production wells in the Arcadia area, it is estimated that the service life for the proposed extraction well is approximately 70 years.

2.5 Santa Anita Headworks Diversion Structure

Proposed improvements (Alternative 6) to the Santa Anita Headworks Diversion Structure include replacement of the existing earthen berm with a more permanent spillway structure, such as a roller compacted concrete weir or soil cement berm with an engineered foundation. Based on these improvements, the existing condition of the structure, and the 1961 CPUC report, it is assumed that the remaining service life of the Santa Anita Headworks Diversion Structure is approximately 60 years.

2.6 Santa Anita Spreading Grounds

Proposed improvements at the Santa Anita Spreading Grounds include boulder clearing and expansion. Although some annual maintenance is required, these are one-time improvements and will provide benefits on a permanent basis. As a result, the annualized cost analysis is based on a payback period over perpetuity.

2.7 Pipeline Transmission from Santa Anita Headworks Diversion Structure to Sierra Madre Spreading Grounds

The pipeline from the Santa Anita Headworks Diversion Structure to the Sierra Madre Spreading Grounds can be rehabilitated or replaced, depending on the findings of a video survey. In addition, rehabilitation or replacement can occur for a segment or the complete length of the pipeline. Based on pipeline replacement and the 1961 CPUC report, pipeline replacement will extend the service life of the pipeline by approximately 100 years. Based on pipeline rehabilitation, the existing condition of the pipeline, and the 1961 CPUC report, it is assumed that pipeline rehabilitation will extend the service life of the pipeline by approximately 50 years.

2.8 Sierra Madre Channel Diversion Structure and Spreading Ground Outlet

Proposed improvements at the Sierra Madre Channel Diversion Structure include construction of an improved gate structure to better convey ground water to the diversion pipeline. Based on these improvements, the existing condition of the structure, and the 1961 CPUC report, it is assumed that the remaining service life of the Sierra Madre Channel Diversion Structure is approximately 60 years.

2.9 Sierra Madre Spreading Grounds

Proposed improvements at the Sierra Madre Spreading Grounds include boulder clearing and overflow relief. Although some annual maintenance is required, these are one-time improvements and will provide benefits on a permanent basis. As a result, the annualized cost analysis is based on a payback period over perpetuity.

3.0 SUMMARY AND CONCLUSIONS

As mentioned previously, a summary of the ten project alternatives, capital costs, water conservation, and 'cost of increased safe yield' are provided in Table I-1. These ten project alternatives, including Ground Water Mounding and Reduced Ground Water Mounding, can be compared with each other based on water conservation and 'cost of increased safe yield'. Summaries of projects based on water conservation and 'cost of increased safe yield' are provided in Table I-2 and Table I-3, respectively. Figure 1 provides a plot of water conserved versus the 'cost of increased safe yield' for each of the alternatives,

According to Table I-2, projects with the lowest 'cost of increased safe yield' include the following:

- Alternative 9 (Ground Water Mounding)
 - Santa Anita Dam Partial Rehabilitation
 - Santa Anita Debris Basin Partial Rehabilitation
- Alternative 10 (Ground Water Mounding)
 - Santa Anita Dam Partial Rehabilitation
 - Santa Anita Debris Basin Full Rehabilitation
- Alternative 4 (Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Partial Rehabilitation
- Alternative 6 (Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
 - Sierra Madre Channel Diversion Structure Full Rehabilitation

- Alternative 10 (Reduced Ground Water Mounding)
 - Santa Anita Dam Partial Rehabilitation
 - Santa Anita Debris Basin Full Rehabilitation

According to Table I-3, projects with the greatest amount of water conservation include the following:

- Alternative 4 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Partial Rehabilitation
- Alternative 5 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Full Rehabilitation
- Alternative 6 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
 - o Sierra Madre Channel Diversion Structure Full Rehabilitation
- Alternative 3 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
- Alternative 4 (Ground Water Mounding).
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Partial Rehabilitation

According to Figure A-1, there is a group of projects with a relatively low 'cost of increased safe yield' (approximately \$2,600 per acre-ft or less) which conserves a relatively high amount of water (greater than 1,800 acre-ft per year). These projects include the following:

- Alternative 4 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Partial Rehabilitation
 - Capital Cost: Approximately \$41 million
- Alternative 5 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Full Rehabilitation
 - Capital Cost: Approximately \$48.2 million
- Alternative 6 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
 - Sierra Madre Channel Diversion Structure Full Rehabilitation
 - Capital Cost: Approximately \$40.9 million
- Alternative 3 (Reduced Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
 - Capital Cost: Approximately \$40.8 million
- Alternative 4 (Ground Water Mounding).
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Partial Rehabilitation
 - Capital Cost: Approximately \$37.9 million

- Alternative 5 (Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Full Rehabilitation
 - Capital Cost: Approximately \$45 million
- Alternative 6 (Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
 - Sierra Madre Channel Diversion Structure Full Rehabilitation
 - Capital Cost: Approximately \$37.8 million
- Alternative 3 (Ground Water Mounding)
 - Santa Anita Dam Full Rehabilitation
 - Santa Anita Debris Basin Debris Retention
 - Capital Cost: Approximately \$37.7 million
- Alternative 10 (Reduced Ground Water Mounding)
 - Santa Anita Dam Partial Rehabilitation
 - Santa Anita Debris Basin Full Rehabilitation
 - Capital Cost: Approximately \$29.8 million

The total capital costs for these nine projects range from approximately \$29.8 million (Alternative 10 – Reduced Ground Water Mounding) to approximately \$48.2 million (Alternative 5 – Reduced Ground Water Mounding), with an average of approximately \$39.9 million. The total capital costs for six of these nine projects range from approximately \$37.7 million to approximately \$41 million.

In addition to the ten project alternatives originally identified by Van Dell, other projects have been identified which can improve water conservation operations at the SASG and at the SMSG (see Appendix I-B). The total estimated capital cost for these other projects, including improvements at the Santa Anita Headworks Diversion Structure, improvements at the SASG, full rehabilitation of the transmission pipeline from the Santa Anita Headworks Diversion Structure to the SMSG, and improvements at the SMSG, is approximately \$6.9 million. The total annual O&M cost for these improvement projects is approximately \$110,000 per year.

An additional alternative, a pipeline extension (see Appendix G-B) from the Devil Canyon-Azusa Pipeline to the ERB, to increase the availability of replenishment water and enhance spreading operations and extraction potential in the ERB was considered. The total construction cost for the pipeline extension ranges from approximately \$17.4 million to approximately \$19.3 million. The cost to purchase replenishment water can range from approximately \$130 per acreft to approximately \$195 per acre-ft. Based on an interest rate of 6 percent, a pipeline service life estimate of 100 years, and a water yield of 2,030 acre-ft/year (which represents the highest water conservation among the ten project alternatives), the unit cost for the ERB pipeline extension may range from approximately \$700 per acre-ft to \$820 per acre-ft. Although the availability of water from the ERB pipeline extension is not limited by local rainfall factors (such as the ten project alternatives), it is subject to the availability of untreated imported water supplies.

3.1 Project Funding

Grants and loans may be available to fund the proposed project alternative through various federal and local agencies. Examples of potential funding include direct appropriation of federal funds through the Water Resource Development Act for the Army Corp of Engineers and Proposition 50 grant funds for the Department of Water Resources and the State Water Resources Control Board. Federal and local funding opportunities may also be available through the Environmental Protection Agency, the Bureau of Reclamation, and Metropolitan Water District of Southern California. Regional collaboration in developing and implementation of the proposed project can significantly enhance the opportunity to obtaining project funding.

3.2 Cost Comparisons

The cost to implementing one of the ten project alternatives can be compared with the cost of developing other sources of water supply in California. Based on several water storage projects which increase water yields in California, it has been reported that the cost to develop new ground water storage capacity ranges from approximately \$1,200 per acre-ft to \$2,000 per acre-ft (Kern County and the proposed Chino Basin ground water banking programs). In addition, the cost to purchase West Coast and Central Basin pumping rights is approximately \$3,600 per acre-ft. Furthermore, improvements to the Terminus Dam, at Lake Kaweah near the City of Visalia, to increase yield, will cost approximately \$4,600 per acre-ft. These reported costs are comparable with the 'cost of increased safe yield' values for the ten project alternatives listed in Table I-3.

4.0 RECOMMENDATIONS

Figure I-1 shows there are 14 projects each with a relatively low total unit cost or 'cost of increased safe yield' within a narrow range (from approximately \$2,100 to \$2,700 per acre-ft) and with a relatively high amount of water conservation (greater than 1,340 acre-ft/year). Since the 'cost of increased safe yield' amounts for the 14 projects are similar to one another, a project recommendation has been considered based on the amount of water conservation and the total capital costs for these projects. Out of these 14 projects, there are nine projects which provide relatively higher water conservation amounts ranging from approximately 1,802 to 2,030 acreft/year. The total capital costs for these nine projects range from \$30 to \$48 million. Out of these nine project alternatives, Alternative 4 (full rehabilitation of Santa Anita Dam, partial rehabilitation of Santa Anita Debris Basin, and reduced ground water mounding) is recommended because it provides the greatest amount of water conservation (approximately 2,030 acre-ft/year) and has a lower capital cost (approximately \$41 million) than projects with similar water conservation benefits. Although Alternative 5 (full rehabilitation of Santa Anita Dam, full rehabilitation of Santa Anita Debris Basin, and reduced ground water mounding) provides a similar amount of water conservation, the capital cost for this alternative is approximately \$48 million. Alternative 10 (partial rehabilitation of Santa Anita Dam, full rehabilitation of Santa Anita Debris Basin, and reduced ground water mounding), which has a smaller capital cost of approximately \$30 million, provides approximately 228 acre-ft/year less water conservation than Alternative 4 (full rehabilitation of Santa Anita Dam, partial rehabilitation of Santa Anita Debris Basin, and reduced ground water mounding).

Alternative 4 (Reduced Ground Water Mounding), the recommended project alternative, includes full rehabilitation of Santa Anita Dam and partial rehabilitation of Santa Anita Debris Basin. Although there may be other factors that can influence the determination of a recommended project (i.e. environmental, funding, and permitting issues), Alternative 4 (Reduced Ground Water Mounding) has been recommended based on this alternative providing the greatest amount of water conserved while maintaining a relatively low 'cost of increased safe

yield' and a relatively low capital cost. The total capital cost for this alternative is approximately \$41 million and the annual O&M cost is approximately \$2.3 million. As mentioned previously, there are other improvement projects which can enhance water conservation operations at the SASG and at the SMSG (including improvements at the Santa Anita Headworks Diversion Structure, improvements at the SASG, full rehabilitation of the transmission pipeline from the Santa Anita Headworks Diversion Structure to the SMSG, and improvements at the SMSG). The water conservation estimates for the projects alternatives were developed assuming these other water conservation operation improvements were in place. The total combined capital cost of Alternative 4 (Reduced Ground Water Mounding) and all improvement projects is approximately \$48 million (\$41 million + \$6.9 million), with a combined annual O&M cost of approximately \$2.4 million (\$2.3 million + \$0.1 million).

Alternative 4 (full rehabilitation of Santa Anita Dam, partial rehabilitation of Santa Anita Debris Basin, and reduced ground water mounding) is a relatively long term project due to size and cost. In addition to longer construction periods, implementation of this project alternative may take several years to secure funding, negotiate among participating agencies, and address environmental and permitting issues. It is estimated that this project alternative can be completed approximately five to ten years after project initiation. The total capital cost of Alternative 4 (Reduced Ground Water Mounding) is approximately \$41 million, which includes approximately \$36.6 million for full rehabilitation of Santa Anita Dam, approximately \$1.3 million for partial rehabilitation of Santa Anita Debris Basin, and approximately \$3.1 million for a production well to reduce ground water mounding. Individual project components of Alternative 4 (Reduced Ground Water Mounding) with smaller scopes, such as partial rehabilitation of Santa Anita Debris Basin and a production well, may be implemented sooner due to fewer potential environmental and permitting issues, and lower funding requirements. These individual project components can provide partial water conservation benefits before the entire project is completed.

Additional projects, including improvements at the Santa Anita Headworks Diversion Structure, improvements at the Santa Anita Spreading Grounds, full rehabilitation of the transmission pipeline from the Santa Anita Headworks Diversion Structure to the Sierra Madre Spreading Grounds, and improvements at the Sierra Madre Spreading Grounds are relatively short term projects. In addition to shorter construction periods, these projects may have less funding, negotiation, environmental, and permitting issues. Based on the City of Sierra Madre's Water System Improvement Plan (see Appendix I-C), the City of Sierra Madre has projected scheduling for these projects. According to the projected schedule, improvements at the Santa Anita Headworks Diversion Structure will occur primarily from 2012 to 2014; improvements at the Santa Anita Spreading Grounds will occur primarily after 2014; full rehabilitation of the transmission pipeline from the Santa Anita Headworks Diversion Structure to the Sierra Madre Spreading Grounds will occur primarily from 2012 to 2014; and improvements at the Sierra Madre Spreading Grounds will occur primarily from 2006 to 2007.

In addition to alternatives for the utilization of the Santa Anita Dam and the Santa Anita Debris Basin to conserve local rainfall runoff, extension of SGVMWD's pipeline to supply imported water for ground water recharge was considered. The pipeline extension can provide additional water supply and should be studied further.

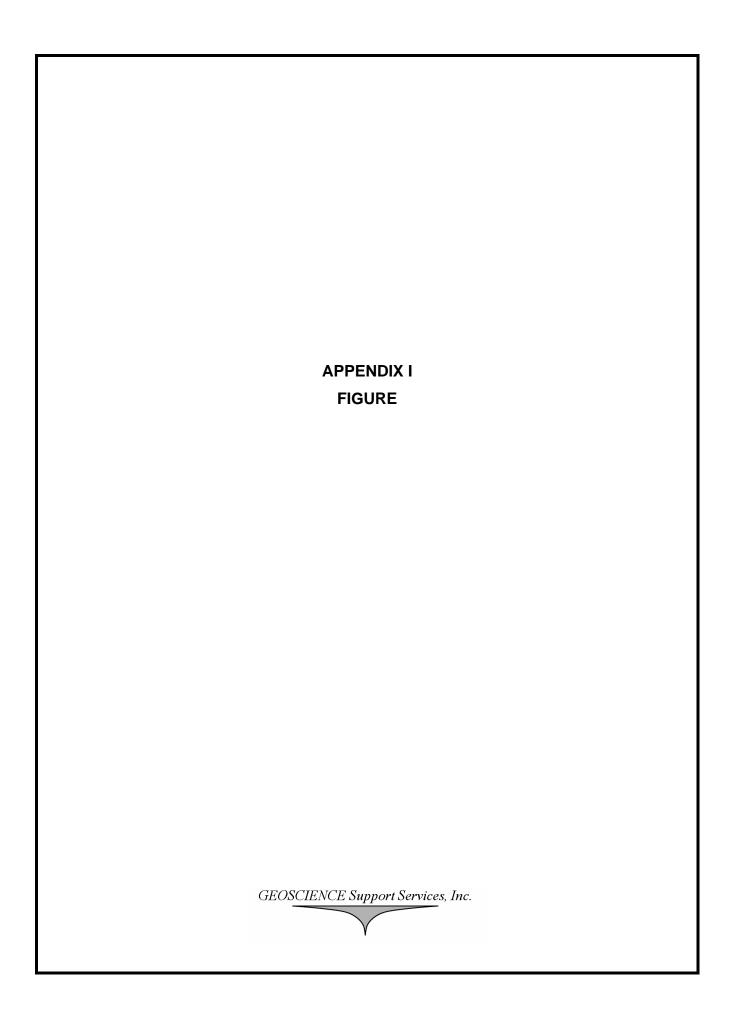
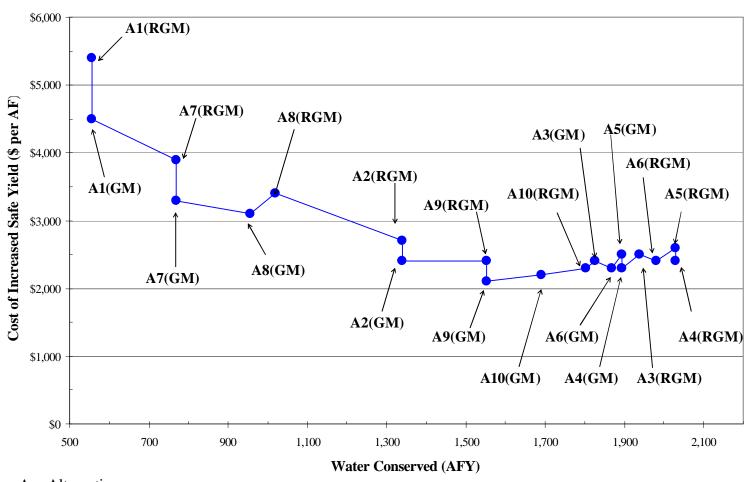


Figure I-1. Water Conserved Versus Cost of Increased Safe Yield



A = Alternative

GM = Groundwater Mounding

RGM = Reduced Groundwater Mounding

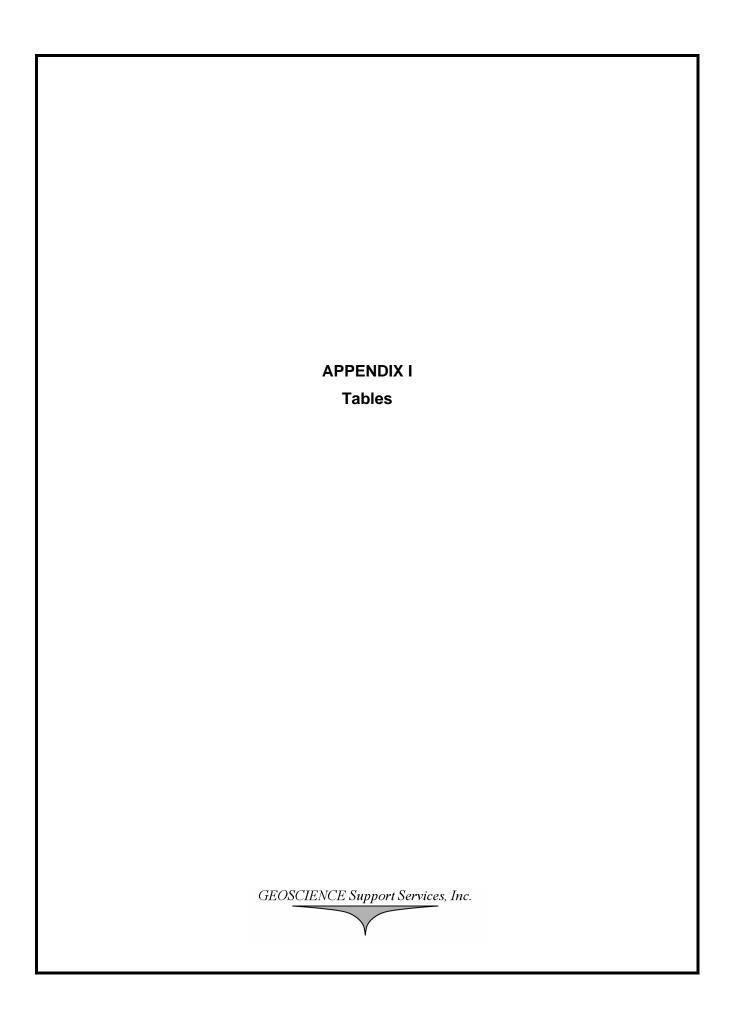


Table I-1. Summary of Project Costs and Increased Safe Yield

		Project Alternative	Description			Cost of
Project Alternative	Santa Anita Dam	Santa Anita Debris Basin	Groundwater Mounding at Santa Anita Spreading Grounds	Total Capital Cost	Water Conservation (AFY)	Increased Safe Yield (\$ per AF)
Alternative 1 ²	Debris Retention	Debris Retention	Groundwater Mounding	\$7,150,000	556	\$4,500
			Reduced Groundwater Mounding	\$10,293,500	556	\$5,400
Alternative 2 ²	Partial Rehabilitation	Debris Retention	Groundwater Mounding	\$19,375,000	1,340	\$2,400
			Reduced Groundwater Mounding	\$22,518,500	1,340	\$2,700
Alternative 3	Full Rehabilitation	Debris Retention	Groundwater Mounding	\$37,689,000	1,825	\$2,400
			Reduced Groundwater Mounding	\$40,832,500	1,937	\$2,500
Alternative 4 ¹	Full Rehabilitation	Partial Rehabilitation	Groundwater Mounding	\$37,939,000	1,894	\$2,300
			Reduced Groundwater Mounding	\$41,082,500	2,030	\$2,400
Alternative 5 ¹	Full Rehabilitation	Full Rehabilitation	Groundwater Mounding	\$45,014,000	1,894	\$2,500
			Reduced Groundwater Mounding	\$48,157,500	2,030	\$2,600
Alternative 6 ³	Full Rehabilitation	Debris Retention	Groundwater Mounding	\$37,768,500	1,868	\$2,300
			Reduced Groundwater Mounding	\$40,912,000	1,980	\$2,400
Alternative 7 ²	Debris Retention	Partial Rehabilitation	Groundwater Mounding	\$7,400,000	769	\$3,300
			Reduced Groundwater Mounding	\$10,543,500	769	\$3,900
Alternative 8	Debris Retention	Full Rehabilitation	Groundwater Mounding	\$14,475,000	956	\$3,100
			Reduced Groundwater Mounding	\$17,618,500	1,018	\$3,400
Alternative 9 ²	Partial Rehabilitation	Partial Rehabilitation	Groundwater Mounding	\$19,625,000	1,553	\$2,100
			Reduced Groundwater Mounding	\$22,768,500	1,553	\$2,400
Alternative 10	Partial Rehabilitation	Full Rehabilitation	Groundwater Mounding	\$26,700,000	1,690	\$2,200
			Reduced Groundwater Mounding	\$29,843,500	1,802	\$2,300

^[1] No increase in infiltrated storm water volume between Alternatives 4 and 5 due to limits in spreading ground infiltration capacity

Table I-

^[2] No increase in infiltrated storm water volume with the consideration of reduced groundwater mounding at SASG due to full infiltration of storm water detained, if any, at Santa Anita Dam and Santa Anita Debris Basin.

^[3] Project alternative includes full rehabilitation at the Sierra Madre Channel Diversion Structure.

Table I-2. Summary of Projects Based on Ascending 'Cost of Increased Safe Yield'

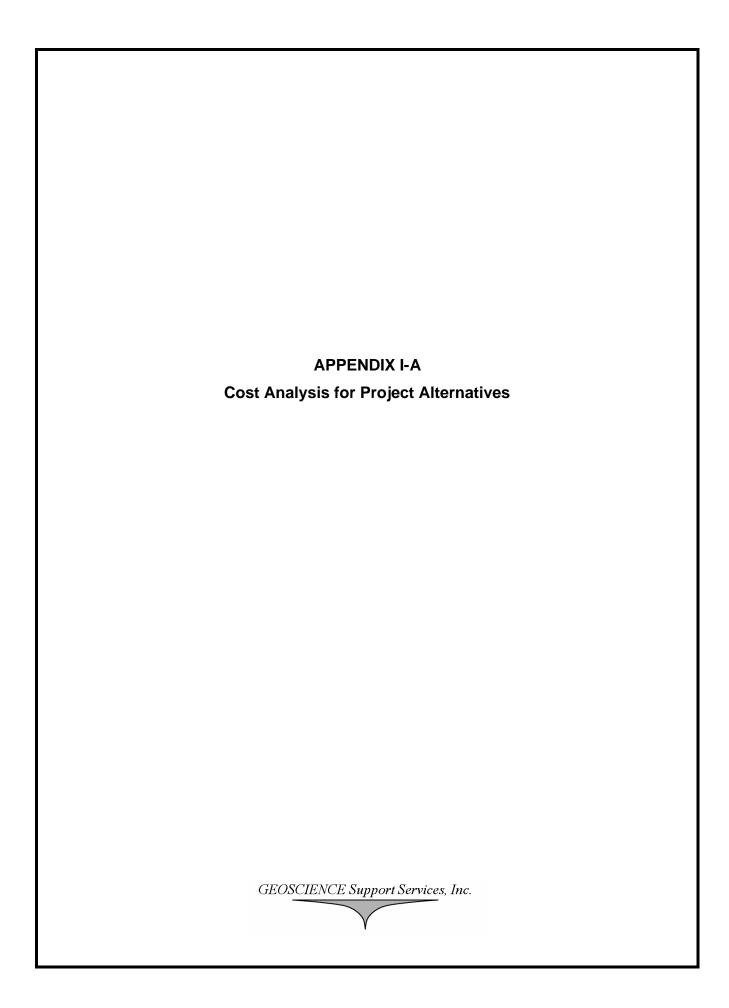
		Project Alternative	Santa Anita Dam	Santa Anita Debris Basin	Water Conservation (AFY)	Cost of Increased Safe Yield (\$ per AF)
1)	Alternative 9	Groundwater Mounding at SASG	Partial Rehabilitation	Partial Rehabilitation	1,553	\$2,100
2)	Alternative 10	Groundwater Mounding at SASG	Partial Rehabilitation	Full Rehabilitation	1,690	\$2,200
3)	Alternative 4	Groundwater Mounding at SASG	Full Rehabilitation	Partial Rehabilitation	1,894	\$2,300
4)	Alternative 6	Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,868	\$2,300
5)	Alternative 10	Reduced Groundwater Mounding at SASG	Partial Rehabilitation	Full Rehabilitation	1,802	\$2,300
6)	Alternative 4	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Partial Rehabilitation	2,030	\$2,400
7)	Alternative 6	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,980	\$2,400
8)	Alternative 3	Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,825	\$2,400
9)	Alternative 9	Reduced Groundwater Mounding at SASG	Partial Rehabilitation	Partial Rehabilitation	1,553	\$2,400
10)	Alternative 2	Groundwater Mounding at SASG	Partial Rehabilitation	Debris Retention	1,340	\$2,400
11)	Alternative 3	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,937	\$2,500
12)	Alternative 5	Groundwater Mounding at SASG	Full Rehabilitation	Full Rehabilitation	1,894	\$2,500
13)	Alternative 5	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Full Rehabilitation	2,030	\$2,600
14)	Alternative 2	Reduced Groundwater Mounding at SASG	Partial Rehabilitation	Debris Retention	1,340	\$2,700
15)	Alternative 8	Groundwater Mounding at SASG	Debris Retention	Full Rehabilitation	956	\$3,100
16)	Alternative 7	Groundwater Mounding at SASG	Debris Retention	Partial Rehabilitation	769	\$3,300
17)	Alternative 8	Reduced Groundwater Mounding at SASG	Debris Retention	Full Rehabilitation	1,018	\$3,400
18)	Alternative 7	Reduced Groundwater Mounding at SASG	Debris Retention	Partial Rehabilitation	769	\$3,900
19)	Alternative 1	Groundwater Mounding at SASG	Debris Retention	Debris Retention	556	\$4,500
20)	Alternative 1	Reduced Groundwater Mounding at SASG	Debris Retention	Debris Retention	556	\$5,400

Note: Alternative 6 includes full rehabilitation at SMCDS.

Table I-3. Summary of Projects Based on Descending Water Conservation

		Project Alternative	Santa Anita Dam	Santa Anita Debris Basin	Water Conservation (AFY)	Cost of Increased Safe Yield (\$ per AF)
1)	Alternative 4	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Partial Rehabilitation	2,030	\$2,400
2)	Alternative 5	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Full Rehabilitation	2,030	\$2,600
3)	Alternative 6	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,980	\$2,400
4)	Alternative 3	Reduced Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,937	\$2,500
5)	Alternative 4	Groundwater Mounding at SASG	Full Rehabilitation	Partial Rehabilitation	1,894	\$2,300
6)	Alternative 5	Groundwater Mounding at SASG	Full Rehabilitation	Full Rehabilitation	1,894	\$2,500
7)	Alternative 6	Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,868	\$2,300
8)	Alternative 3	Groundwater Mounding at SASG	Full Rehabilitation	Debris Retention	1,825	\$2,400
9)	Alternative 10	Reduced Groundwater Mounding at SASG	Partial Rehabilitation	Full Rehabilitation	1,802	\$2,300
10)	Alternative 10	Groundwater Mounding at SASG	Partial Rehabilitation	Full Rehabilitation	1,690	\$2,200
11)	Alternative 9	Groundwater Mounding at SASG	Partial Rehabilitation	Partial Rehabilitation	1,553	\$2,100
12)	Alternative 9	Reduced Groundwater Mounding at SASG	Partial Rehabilitation	Partial Rehabilitation	1,553	\$2,400
13)	Alternative 2	Groundwater Mounding at SASG	Partial Rehabilitation	Debris Retention	1,340	\$2,400
14)	Alternative 2	Reduced Groundwater Mounding at SASG	Partial Rehabilitation	Debris Retention	1,340	\$2,700
15)	Alternative 8	Reduced Groundwater Mounding at SASG	Debris Retention	Full Rehabilitation	1,018	\$3,400
16)	Alternative 8	Groundwater Mounding at SASG	Debris Retention	Full Rehabilitation	956	\$3,100
17)	Alternative 7	Groundwater Mounding at SASG	Debris Retention	Partial Rehabilitation	769	\$3,300
18)	Alternative 7	Reduced Groundwater Mounding at SASG	Debris Retention	Partial Rehabilitation	769	\$3,900
19)	Alternative 1	Groundwater Mounding at SASG	Debris Retention	Debris Retention	556	\$4,500
20)	Alternative 1	Reduced Groundwater Mounding at SASG	Debris Retention	Debris Retention	556	\$5,400

Note: Alternative 6 includes full rehabilitation at SMCDS.



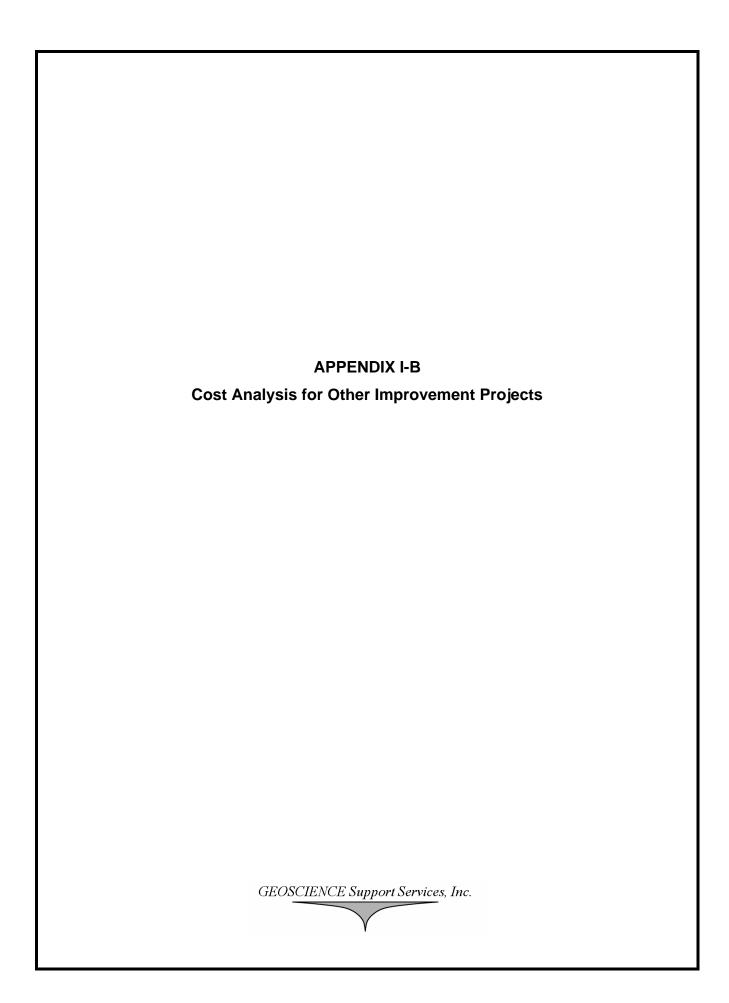
Cost Analysis for Project Alternatives

Project Alternative	Capital Cost	Investigations Plans & Specs	CEQA/NEPA Compliance	Regulatory Permits	Total Capital Cost	Estimated Service Life (Years)	Annualized Capital (@ 6%) Over Estimated Service Life	A LOSMEC 4	Total Annualized Project Cost	Year Costs are Based on [1]	Adjusted Present (2005) Total Annualized Cost	Water Conservation (AFY)	Cost of Increased Safe Yield (\$ per AF)
Alternative 1 Santa Anita Dam Debris Retention Santa Anita Debris Basin Debris Retention	\$5,300,000 \$800,000	\$500,000 <u>\$125,000</u>	\$200,000 \$100,000	\$75,000 <u>\$50,000</u>	\$6,075,000 \$1,075,000	40 40	\$403,754 <u>\$71,446</u>	\$1,800,000 <u>\$249,000</u>	\$2,203,754 \$320,446	2001/2004 2004	\$2,321,512 \$330,198		
- Total (Groundwater Mounding at SASG) Production Well	\$6,100,000 <u>\$3,100,000</u>	\$625,000 \$20,000	\$300,000 \$22,500	\$125,000 \$1,000	\$ 7,150,000 \$3,143,500	<u>70</u>	\$475,200 \$191,858	\$2,049,000 \$260,000	\$2,524,200 \$451,858	<u>2004</u>	\$2,651,709 \$465,608	556	\$4,500
- Total (Reduced Groundwater Mounding at SASG)	\$9,200,000	\$645,000	\$322,500	\$126,000	\$10,293,500		\$667,058	\$2,309,000	\$2,976,058		\$3,117,317	556	\$5,400
Alternative 2 Santa Anita Dam Partial Rehabilitation	\$15,900,000	\$2,000,000	\$300,000	\$100,000	\$18,300,000	100	\$1,101,246	\$1,800,000	\$2,901,246	2001/2004	\$3,127,807		
Santa Anita Debris Basin Debris Retention - Total (Groundwater Mounding at SASG)	\$800,000 \$16,700,000	\$125,000 \$2,125,000	\$100,000 \$400,000	\$50,000 \$150,000	\$1,075,000 \$19,375,000	<u>40</u>	\$71,446 \$1,172,692	\$249,000 \$2,049,000	\$320,446 \$3,221,692	<u>2004</u>	\$330,198 \$3,458,004	1,340	\$2,400
Production Well	\$3,100,000	\$20,000	\$22,500	\$1,000	\$3,143,500	<u>70</u>	<u>\$191,858</u>	\$260,000	<u>\$451,858</u>	<u>2004</u>	<u>\$465,608</u>		
- Total (Reduced Groundwater Mounding at SASG)	\$19,800,000	\$2,145,000	\$422,500	\$151,000	\$22,518,500		\$1,364,549	\$2,309,000	\$3,673,549		\$3,923,612	1,340	\$2,700
Alternative 3 Santa Anita Dam Full Rehabilitation Santa Anita Debris Basin Debris Retention	\$33,814,000 \$800,000	\$2,400,000 <u>\$125,000</u>	\$300,000 <u>\$100,000</u>	\$100,000 <u>\$50,000</u>	\$36,614,000 \$1,075,000	100 <u>40</u>	\$2,203,334 <u>\$71,446</u>	\$1,800,000 <u>\$249,000</u>	\$4,003,334 <u>\$320,446</u>	2001/2004 2004	\$4,401,812 \$330,198		
- Total (Groundwater Mounding at SASG) Production Well	\$34,614,000 \$3,100,000	\$2,525,000 \$20,000	\$400,000 \$22,500	\$150,000 \$1,000	\$37,689,000 \$3,143,500	<u>70</u>	\$2,274,780 \$191,858	\$2,049,000 \$260,000	\$4,323,780 \$451,858	<u>2004</u>	\$4,732,010 \$465,608	1,825	\$2,400
- Total (Reduced Groundwater Mounding at SASG)	\$37,714,000	\$2,545,000	\$422,500	\$151,000	\$40,832,500		\$2,466,638	\$2,309,000	\$4,775,638		\$5,197,618	1,937	\$2,500
Alternative 4 Santa Anita Dam Full Rehabilitation Santa Anita Debris Basin Partial Rehabilitation	\$33,814,000 \$1,000,000	\$2,400,000 <u>\$125,000</u>	\$300,000 <u>\$150,000</u>	\$100,000 <u>\$50,000</u>	\$36,614,000 \$1,325,000	100 <u>40</u>	\$2,203,334 <u>\$88,062</u>	\$1,800,000 \$249,000	\$4,003,334 <u>\$337,062</u>	2001/2004 2004	\$4,401,812 <u>\$347,319</u>		
- Total (Groundwater Mounding at SASG) Production Well	\$34,814,000 \$3,100,000	\$2,525,000 \$20,000	\$ 450,000 \$22,500	\$150,000 \$1,000	\$37,939,000 \$3,143,500	<u>70</u>	\$2,291,395 \$191,858	\$2,049,000 \$260,000	\$4,340,395 \$451,858	<u>2004</u>	\$4,749,131 \$465,608	1,894	\$2,300
- Total (Reduced Groundwater Mounding at SASG)	\$37,914,000	\$2,545,000	\$472,500	\$151,000	\$41,082,500		\$2,483,253	\$2,309,000	\$4,792,253		\$5,214,739	2,030	\$2,400
Alternative 5 Santa Anita Dam Full Rehabilitation Santa Anita Debris Basin Full Rehabilitation	\$33,814,000 <u>\$7,500,000</u>	\$2,400,000 <u>\$700,000</u>	\$300,000 <u>\$150,000</u>	\$100,000 <u>\$50,000</u>	\$36,614,000 \$8,400,000	100 <u>40</u>	\$2,203,334 <u>\$558,277</u>	\$1,800,000 \$249,000	\$4,003,334 <u>\$807,277</u>	2001/2004 2004	\$4,401,812 <u>\$831,843</u>		
- Total (Groundwater Mounding at SASG) Production Well	\$41,314,000 \$3,100,000	\$3,100,000 \$20,000	\$450,000 \$22,500	\$150,000 \$1,000	\$45,014,000 \$3,143,500	<u>70</u>	\$2,761,611 \$191,858	\$2,049,000 \$260,000	\$4,810,611 <u>\$451,858</u>	<u>2004</u>	\$5,233,655 \$465,608	1,894	\$2,500
- Total (Reduced Groundwater Mounding at SASG)	\$44,414,000	\$3,120,000	\$472,500	\$151,000	\$48,157,500		\$2,953,468	\$2,309,000	\$5,262,468		\$5,699,263	2,030	\$2,600
Alternative 6 Santa Anita Dam Full Rehabilitation Santa Anita Debris Basin Debris Retention Sierra Madre Channel Diversion Struct Full Rehabilitation	\$33,814,000 \$800,000 <u>\$57,000</u>	\$2,400,000 \$125,000 <u>\$15,000</u>	\$300,000 \$100,000 <u>\$7,500</u>	\$100,000 \$50,000 <u>\$0</u>	\$36,614,000 \$1,075,000 <u>\$79,500</u>	100 40 <u>60</u>	\$2,203,334 \$71,446 \$4,919	\$1,800,000 \$249,000 <u>\$14,000</u>	\$4,003,334 \$320,446 <u>\$18,919</u>	2001/2004 2004 2005	\$4,401,812 \$370,433 <u>\$19,495</u>		
- Total (Groundwater Mounding at SASG) Production Well	\$34,671,000 \$3,100,000	\$2,540,000 \$20,000	\$407,500 \$22,500	\$150,000 \$1,000	\$37,768,500 \$3,143,500	<u>70</u>	\$2,279,699 <u>\$191,858</u>	\$2,063,000 \$260,000	\$4,342,699 <u>\$451,858</u>	<u>2004</u>	\$4,791,740 <u>\$465,608</u>	1,868	\$2,300
- Total (Reduced Groundwater Mounding at SASG)	\$37,771,000	\$2,560,000	\$430,000	\$151,000	\$40,912,000		\$2,471,557	\$2,323,000	\$4,794,557		\$5,257,348	1,980	\$2,400

Cities of Arcadia and Sierra Madre East Raymond Basin Water Resources Plan Appendix I - Economic Base Study

Project Alternative	Capital Cost	Investigations Plans & Specs	CEQA/NEPA Compliance	Regulatory Permits	Total Capital Cost	Estimated Service Life (Years)	Annualized Capital (@ 6%) Over Estimated Service Life	Annual O&M Cost	Total Annualized Project Cost	Year Costs are Based on [1]	Adjusted Present (2005) Total Annualized Cost	Water Conservation (AFY)	Cost of Increased Safe Yield (\$ per AF)
Alternative 7													
Santa Anita Dam Debris Retention Santa Anita Debris Basin Partial Rehabilitation	\$5,300,000 \$1,000,000	\$500,000 <u>\$125,000</u>	\$200,000 \$150,000	\$75,000 \$50,000	\$6,075,000 \$1,325,000	40 <u>40</u>	\$403,754 \$88,062	\$1,800,000 \$249,000	\$2,203,754 \$337,062	2001/2004 <u>2004</u>	\$2,321,512 \$347,319		
- Total (Groundwater Mounding at SASG) Production Well	\$6,300,000 <u>\$3,100,000</u>	\$625,000 \$20,000	\$350,000 \$22,500	\$125,000 \$1,000	\$7,400,000 <u>\$3,143,500</u>	<u>70</u>	\$491,815 \$191,858	\$2,049,000 \$260,000	\$2,540,815 \$451,858	<u>2004</u>	\$2,668,830 \$465,608	769	\$3,300
- Total (Reduced Groundwater Mounding at SASG)	\$9,400,000	\$645,000	\$372,500	\$126,000	\$10,543,500		\$683,673	\$2,309,000	\$2,992,673		\$3,134,438	769	\$3,900
Alternative 8													
Santa Anita Dam Debris Retention <u>Santa Anita Debris Basin</u> <u>Full Rehabilitation</u>	\$5,300,000 <u>\$7,500,000</u>	\$500,000 <u>\$700,000</u>	\$200,000 <u>\$150,000</u>	\$75,000 <u>\$50,000</u>	\$6,075,000 <u>\$8,400,000</u>	40 <u>40</u>	\$403,754 \$558,277	\$1,800,000 <u>\$249,000</u>	\$2,203,754 \$807,277	2001/2004 2004	\$2,321,512 <u>\$831,843</u>		
- Total (Groundwater Mounding at SASG) Production Well	\$12,800,000 \$3,100,000	\$1,200,000 \$20,000	\$350,000 \$22,500	\$125,000 \$1,000	\$14,475,000 \$3,143,500	<u>70</u>	\$962,031 <u>\$191,858</u>	\$2,049,000 <u>\$260,000</u>	\$3,011,031 \$451,858	<u>2004</u>	\$3,153,355 \$465,608	956	\$3,100
- Total (Reduced Groundwater Mounding at SASG)	\$15,900,000	\$1,220,000	\$372,500	\$126,000	\$17,618,500		\$1,153,888	\$2,309,000	\$3,462,888		\$3,618,963	1,018	\$3,400
Alternative 9													
Santa Anita Dam Partial Rehabilitation Santa Anita Debris Basin Partial Rehabilitation	\$15,900,000 \$1,000,000	\$2,000,000 <u>\$125,000</u>	\$300,000 \$150,000	\$100,000 \$50,000	\$18,300,000 \$1,325,000	100 <u>40</u>	\$1,101,246 \$88,062	\$1,800,000 \$249,000	\$2,901,246 \$337,062	2001/2004 2004	\$3,127,807 \$347,319		
						40				<u>2004</u>	· <u></u>		
- Total (Groundwater Mounding at SASG) Production Well	\$16,900,000 \$3,100,000	\$2,125,000 \$20,000	\$450,000 \$22,500	\$150,000 \$1,000	\$19,625,000 \$3,143,500	<u>70</u>	\$1,189,307 <u>\$191,858</u>	\$2,049,000 \$260,000	\$3,238,307 <u>\$451,858</u>	<u>2004</u>	\$3,475,125 \$465,608	1,553	\$2,100
- Total (Reduced Groundwater Mounding at SASG)	\$20,000,000	\$2,145,000	\$472,500	\$151,000	\$22,768,500		\$1,381,165	\$2,309,000	\$3,690,165		\$3,940,733	1,553	\$2,400
Alternative 10													
Santa Anita Dam Partial Rehabilitation Santa Anita Debris Basin Full Rehabilitation	\$15,900,000 <u>\$7,500,000</u>	\$2,000,000 <u>\$700,000</u>	\$300,000 <u>\$150,000</u>	\$100,000 \$50,000	\$18,300,000 \$8,400,000	100 <u>40</u>	\$1,101,246 <u>\$558,277</u>	\$1,800,000 <u>\$249,000</u>	\$2,901,246 \$807,277	2001/2004 2004	\$3,127,807 <u>\$831,843</u>		
- Total (Groundwater Mounding at SASG) Production Well	\$23,400,000 \$3,100,000	\$2,700,000 \$20,000	\$450,000 \$22,500	\$150,000 \$1,000	\$26,700,000 \$3,143,500	<u>70</u>	\$1,659,523 \$191,858	\$2,049,000 \$260,000	\$3,708,523 \$451,858	<u>2004</u>	\$3,959,650 \$465,608	1,690	\$2,200
- Total (Reduced Groundwater Mounding at SASG)	\$26,500,000	\$2,720,000	\$472,500	\$151,000	\$29,843,500		\$1,851,380	\$2,309,000	\$4,160,380		\$4,425,258	1,802	\$2,300

Notes
[1] Based on "Engineering News Record" Construction Cost Index averages
2005 Average = 7,331
2004 Average = 7,115
2001 Average = 6,342

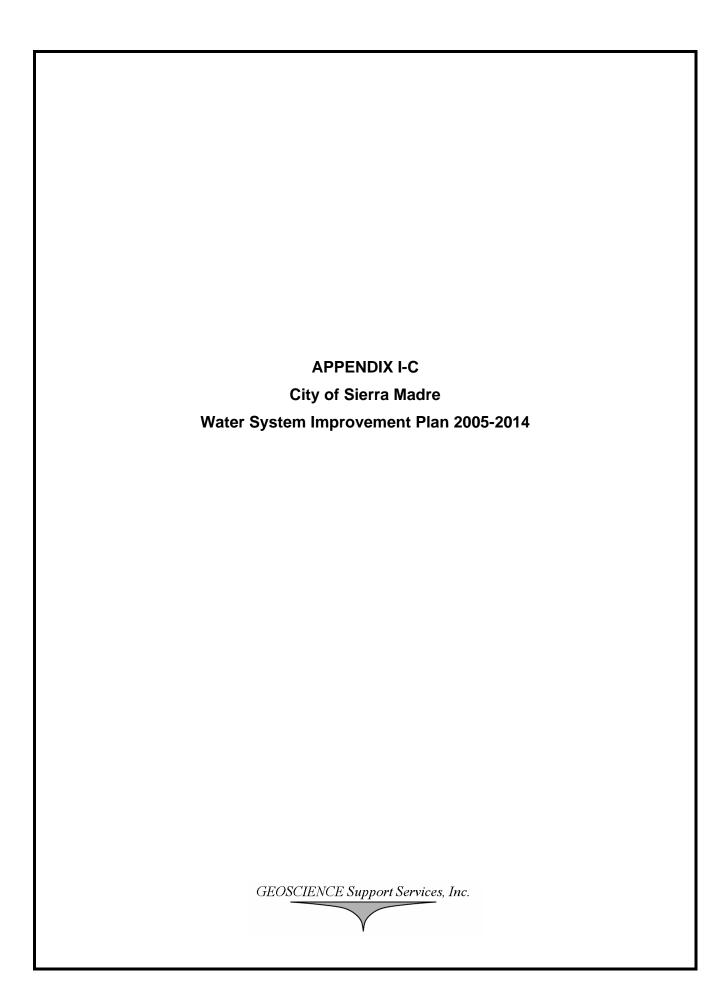


Cost Analysis for Other Improvement Projects

Improvement Project	Capital Cost	Investigations Plans & Specs	CEQA/NEPA Compliance	Regulatory Permits	Total Capital Cost	Estimated Service Life (Years)	Annualized Capital (@ 6%) Over Estimated Service Life	Annual O&M Cost	Total Annualized Project Cost	Year Cost is Based on	Adjusted Present (2005) Total Annualized Cost
Santa Anita Headworks Diversion Structure	\$1,250,000	\$200,000	\$100,000	\$50,000	\$1,600,000	60	\$99,001	\$26,000	\$125,001	2005	\$125,000
Santa Anita Spreading Grounds Clear Boulders and Place Sand Expansion Maintenance Total	\$1,474,500 \$92,000 <u>\$0</u> \$1,566,500	\$0 \$15,000 <u>\$0</u> \$15,000	\$80,000 \$100,000 <u>\$0</u> \$180,000	\$35,000 \$50,000 <u>\$0</u> \$85,000	\$1,589,500 \$257,000 <u>\$0</u> \$1,846,500	Perpetuity Perpetuity <u>Perpetuity</u>	\$95,370 \$15,420 <u>\$0</u> \$110,790	\$0 \$14,000 <u>\$50,000</u> \$64,000	\$95,370 \$29,420 <u>\$50,000</u> \$174,790	2004 2004 <u>2004</u>	\$95,400 \$29,400 <u>\$50,000</u> \$174,800
Transmission (from SA Headworks to SMSG) Alternative 1 (Partial Rehabilitation - Manhole to Manhole) Video Survey <u>Pipeline Rehabilitation</u> Total	\$15,000 <u>\$15,000</u> \$30,000	\$0 <u>\$0</u> \$0	\$0 <u>\$55,000</u> \$55,000	\$0 <u>\$50,000</u> \$50,000	\$15,000 <u>\$120,000</u> \$135,000	Perpetuity <u>50</u>	\$900 <u>\$7,613</u> \$8,513	\$0 <u>\$0</u> \$0	\$900 <u>\$7,613</u> \$8,513	2005 2005	\$900 <u>\$7,600</u> \$8,500
Alternative 2 (Full Rehabilitation - Approximately 2 miles) Video Survey Pipeline Rehabilitation Total	\$15,000 \$2,320,000 \$2,335,000	\$0 <u>\$0</u> \$0	\$0 <u>\$55,000</u> \$55,000	\$0 <u>\$50,000</u> \$50,000	\$15,000 \$2,425,000 \$2,440,000	Perpetuity <u>50</u>	\$900 <u>\$153,852</u> \$154,752	\$0 <u>\$0</u> \$0	\$900 <u>\$153,852</u> \$154,752	2005 2005	\$900 <u>\$153,900</u> \$154,800
Alternative 3 (Partial Replacement - 20' Segment) Video Survey Pipeline Replacement Total	\$15,000 \$20,000 \$35,000	\$0 <u>\$0</u> \$0	\$0 <u>\$100,000</u> \$100,000	\$0 <u>\$50,000</u> \$50,000	\$15,000 <u>\$170,000</u> \$185,000	Perpetuity 100	\$900 <u>\$10,230</u> \$11,130	\$0 <u>\$0</u> \$0	\$900 <u>\$10,230</u> \$11,130	2005 2005	\$900 <u>\$10,200</u> \$11,100
Alternative 4 (Full Replacement - Approximately 2 miles) Video Survey Pipeline Replacement Total	\$15,000 \$2,760,000 \$2,775,000	\$0 <u>\$0</u> \$0	\$0 <u>\$100,000</u> \$100,000	\$0 <u>\$50,000</u> \$50,000	\$15,000 \$2,910,000 \$2,925,000	Perpetuity 100	\$900 <u>\$175,116</u> \$176,016	\$0 <u>\$0</u> \$0	\$900 <u>\$175,116</u> \$176,016	2005 2005	\$900 <u>\$175,100</u> \$176,000
Sierra Madre Spreading Grounds Place Sand [1] Overflow Relief Maintenance Total	\$931,000 \$131,000 <u>\$0</u> \$1,062,000	\$0 \$10,000 <u>\$0</u> \$10,000	\$0 \$12,500 <u>\$0</u> \$12,500	\$0 \$0 <u>\$0</u> \$0	\$931,000 \$153,500 <u>\$0</u> \$1,084,500	Perpetuity Perpetuity <u>Perpetuity</u>	\$55,860 \$9,210 <u>\$0</u> \$65,070	\$0 \$0 <u>\$20,000</u> \$20,000	\$55,860 \$9,210 <u>\$20,000</u> \$85,070	2004 2004 2004	\$55,900 \$9,200 <u>\$20,000</u> \$85,100

Notes

[1] No costs provided for CEQA/NEPA compliance and regulatory permits



City of Sierra Madre - Water System Improvement Plan 2005 - 2014

Program & Project Descriptions	Zone	Unit	Quantity	Justification	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Totals	Post 2014
System Improvements Summary																
A. Source of Supply																
1 Rehabilitation of Sierra Madre Tunnel System	3	Job	LS	Rehab. Tunnels, Clearwell & Cl2 System												600
2 Water Treatment Facility	1	Job	LS	Design / Construct GAC Treatment Plant		2775									2775	
3 Spreading Basins Rehabilitation Design & Construction	1	Job	LS	Improve Hydraulics, Gauging, Infiltration			577								577	
4 Well No. 3 Replacement	1	Job	LS	Replace Well, Increase Production							84	1300			1384	
5 Well No. 4 Replacement	1	Job	LS	Replace Well, Increase Production									84	1300	1384	
6 Well No. 5 Replacement	1	Job	LS	Replace Well, Increase Production												1384
7 Well No. 6 Replacement	1	Job	LS	Replace Well, Increase Production												1384
8 West Raymond Basin Well No. 7 (Pasadena)	1	Job	LS	New Production Well					84	1300					1384	
9 Santa Anita Creek Diversion Pipeline Rehabilitation - Design & Const.	1	Job	LS	Rehab. Pipeline, & Headworks			15				15		195	2997	3222	
10 East Raymond Basin Water Resources Plan Pre-Design & Environmental Docs.	NA	Job	LS	Seismic Reliability, Increase Spreading & Yield		98									98	
11 Santa Anita Creek Spreading Grounds Rehabilitation	NA	Job	LS	Seismic Reliability, Increase Spreading & Yield											0	995
12 Water Exchange Project - MWD &SGVMWD Turnout - Design & Construction	1	Job	LS	Supply Reliability		175									175	
13 Main Basin Conjunctive Use Well - Arcadia - Design & Construction	1	Job	LS	Supply Reliability				584	800						1384	
14 Main Spreading Basin Maintenance Program	1	Job	LS	Maintain Spreading Efficiency		10		10		10		10		10	50	
15 SGVMWD Raymond Basin Pipeline - Joint Use Share (~30%) - Design & Const.	1	Job	LS	Supply Reliability						335	2690	2690			5715	
Subtotal Source of Supply Projects															18148	4363
B. Reservoirs																
1 Miramonte Reservoirs 1&2 Replacement (2.4MG) - Design & Construction	3	Job	LS	Seismic Improvements	534	2170	2170								4874	
2 Auburn Reservoirs North & South Repl. (2.0MG)Design & Construction of	3	Job	LS	Seismic Improvements, Increase Capacity								250	1901	1901	4052	
3 Carter Tanks Replacement - Design & Construction	3	Job	LS	Replace Tanks with Closed Pressure System												230
4 Replacement of Main Pumping Station Settling Basin	1	Job	LS	Replace Aging Reservoir, Seismic Reliability												660
Subtotal Reservoir Projects															8926	890
C. Pump Stations																
1 Miramonte Booster Pump Station Replacement - Design & Construction	2&3	Job		Replace Aging PS, Seismic Reliability	130	800	800								1730	
2 Main Pumping Station Replacement - Design & Construction	1	Job	+	Replace Aging PS, Seismic Reliability										150	150	1650
3 Zone 2 Booster Pump Station Arcadia's Santa Anita BPS (2000gpm)	2	Job	LS	Seismic Reliability Backup Supply												520
Subtotal Pump Station Projects															1880	2170
D. Transmission Pipelines												ļ				
1 Zone 2 Intertie with Arcadia - Design & Construction	2	12		Seismic Reliability										90	90	975
2 Design & Construction of 12" Zone 2 Pipeline in Lima Street	2	12	2300 LF	Seismic Reliability										30	30	360
Subtotal Transmission Main Projects															120	1335
	1															
E. Distribution System	,									1.50	1.00	1.50	4.50	4.50	000	me s
1 Water Main Replacement Program	All	Var.	+	Seismic Reliability, Fire Protection						160	160	160	160	160	800	TBD
2 Fire Hydrant Replacement Program	All	Var.		Seismic Reliability, Fire Protection						25	25	25	25	25	125	TBD
3 Annual Valve Replacement Program	All	Var.		System Reliability				107		35	35	35	35	35	175	TBD
4 Additional Funding for Idle Hour/Skyland Drive Main Replacement	3	Job	+	System Reliability				135							135	
5 Alta Vista Water Main Replacement	3	Job	LS	System Reliability				69				<u> </u>			69	
6 Manzanita Avenue Water Main Replacement	1	Job	LS	System Reliability				149]	149	

Cities of Arcadia and Sierra Madre East Raymond Basin Water Resources Plan Appendix I - Economic Base Study

Prog	gram & Project Descriptions	Zone	Unit	Quantity	Justification	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Totals	Post 2014
	7 Sierra Place Water Main Replacement	1	Job	LS	System Reliability					40						40	
	8 Santa Anita Court Water Main Replacement	1	Job	LS	System Reliability							112				112	
	9 San Gabriel Court Water Main Replacement	1	Job	LS	System Reliability							112				112	
	10 Colony Avenue Water Main Replacement	1	Job	LS	System Reliability						32					32	
	11 Holdman Avenue Water Main Replacement	1	Job	LS	System Reliability						40					40	
	12 Amo Drive Water Main Replacement	3	Job	LS	System Reliability					40						40	
	13 Kala Drive Water Main Replacement	3	Job	LS	System Reliability					12						12	
	14 Liliano Drive Water Main Replacement	2&3	Job	LS	System Reliability					16						16	
	15 Water Service Replacement Program	All	Job	LS	System Reliability, Revenue Accuracy				100	100	100	100	100	100	100	700	TBD
	Subtotal Distribution Main Projects															2557	0
F. P	ressure Regulating Stations																
	1 PRS - Upgrade Program	2&1	3	EA	Backup Connection, Seismic Reliability												660
	2 PRS - Upgrade Program	3&2	3	EA	Backup Connection, Seismic Reliability												660
	Subtotal Pressure Regulating Station Projects																1320
G. F	acility Improvements																
	1 Main Panel Replacement Main Pumping Station	All	Job	LS	Repair Fire Damage				170							170	
	2 GIS Database	All	Job	LS	Mapping & Records Computerization		13	13								26	
	3 Resurface Maintenance Yard	All	Job	LS	Maintain Facility					125						125	
\vdash	4 Computer Equipment	All	Job	LS	System Upgrading		10	10		10	10		10	10		60	TBD
	5 Computer Software	All	Job	LS	Software Updating			30		-	_		30			60	
					<i>y</i>												
l	Subtotal Facility Improvement Projects															381	0
	· · · · · · · · · · · · · · · · · · ·																
Н. (Capital Equipment																
	1 Vehicles	All	Job	LS	Maintain System			30			30			30		90	
	2 Other Capital Equipment	All	Job	LS	Maintain System	15		15		15		15		15		75	TBD
	3 Heavy Tools & Equipment	All	Job	LS	Maintain System	2	2	2	2	2	2	2	2	2	2	20	TBD
	4 Heavy Motorized Equipment	All	Job	LS	Maintain System	15		15		15		15		15		75	
l														_			
	Subtotal Capital Equipment															185	0
$\ \cdot \ $																- 50	Ŭ
$\ \cdot \ $																	
Sub	totals																
T						696	6053	3677	1219	1259	2079	3365	4612	2572	6800	32197	10078
Ecti	mated Federal Cost Share					365.2	1687.4	1641.75	321.2	486.2	715	54.45	852.5	1201.61	3491.4	10816.7	4055.7
	/MWD Grant & Loan Cost Share					303.2	3151	1041.73	341.4	400.2	335	2690	2690	1201.01	3471.4	10010./	4033.7
						220.0		2025.25	907.9	772 9				1270 20	2200 €	21200.2	6022.2
net	City Cost Share					330.8	1214.6	2035.25	897.8	772.8	1029	620.55	1009.5	15/0.39	3308.6	21380.3	6022.3

TBD = to be determined Source: Bucknum and Associates