

MEMORANDUM

Date: September 17, 2012

Comments:

Revised:

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Subject: Response to Coastal Commission Staff Request for Information Regarding the MBCSD Wastewater Treatment Plant Upgrade – Cost Estimating

1 SUMMARY

This memorandum is intended to respond to Coastal Commission Staff's request for information regarding the cost estimates generated for the Morro Bay/Cayucos Sanitary District (MBCSD) Wastewater Treatment Plant Upgrade project alternatives analysis. More specifically, Coastal Commission Staff has requested clarification and/or additional information regarding the professional engineering practices and standards, cost estimate methods and assumptions used in the analysis to better understand how cost estimates for the existing and alternative project sites were determined.

Consistent with the methodology reviewed with Coastal Commission Staff prior to initiating the Alternative Sites Evaluation Fine Screening Analysis (November 2011), the project alternatives analysis, including associated cost estimates, reflect a conceptual design level of analysis for each site considered during Fine Screening, which dictates the level of detail available for the cost estimate. To further clarify how cost estimates for the existing and alternative project sites were determined, this memo consolidates and, where appropriate, supplements information relative to the cost estimates provided in the MBCSD Rough Screening Wastewater Treatment Plant Upgrade Project Alternative Sites Evaluation Fine Screening Analysis (November 2011) and further refined in the Recycled Water Feasibility Study (March 2012). **It should be noted that all cost data discussed herein are consistent with the studies performed to date and no new information is presented - only an expanded discussion is being provided to facilitate CCC staff's understanding of the cost estimates previously prepared.**

In general, most costs are the same for both Site 1 (Existing Site) and Site 16 (Righetti Site) as it was assumed that the same treatment process recommended for Site 1 would be constructed at Site 16 to provide a co-equal evaluation, or an "apples to apples" comparison of costs. However, the following is a summary of the areas of significant varying costs between the two alternative sites:

- **Decommissioning/Demolition of Existing Site** -Moving the plant away from Site 1 will increase the costs to completely decommission and demolish/remove more existing facilities from the site. This increases Site 16 costs by **\$280,000**.
 - **Earthwork** – Both sites require grading for the planned treatment plant facilities. Site 1 requires soil stabilization and imported fill (approximately 35,000 cu. yds. plus subsurface stabilization) to raise the pad above the flood plain. Site 16 grading will require significant cut and export (approximately 90,000 cu. yds.) to situate the plant in a manner to mitigate the viewshed issues
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as it is highly visible from Highway 41, a designated scenic highway. This is anticipated to increase the Site 16 costs by **\$273,000**.

- **Interim Maintenance of Existing WWTP** – Should a new plant be constructed at Site 16, improvements to the existing plant operation will be required. Site 16's costs will be increased by **\$2,280,000** because it will take significantly longer, perhaps on the order of 10 years, to process entitlements, acquire property and easements, plan and design facilities at the new site, and the existing plant must be kept operational during this time. This assumes that the Regional Water Quality Control Board will allow delay of full secondary treatment discharge for the approximate 10 year period. If the United States Environmental Protection Agency and the Regional Water Quality Control Board are unwilling to continue to reissue 301H waivers, further and more expensive upgrades to the existing plant will be required. Costs for these upgrades would be on the order of **\$20-\$30 million** based on the 2007 Carollo Facilities Master Plan. Construction of a new plant at any site would likely be delayed for another 20-30 years (to get the full financial benefit of those constructed improvements).

An increase in cost of \$2,280,000 was added to the Righetti site estimate in recognition that there will be costs associated with maintaining the existing treatment plant and processes. The 2007 FMP listed a total of 15.7 million in rehabilitation costs. Additional study would be required to determine, based on the existing condition of the plant's facilities: what rehabilitation would be required, what rehabilitation might be required, and which of those costs would not be needed in the 10 year planning horizon for the Righetti site.

- **Conveyance Cost to a New Site** – Site 1 pumping and conveyance is already accommodated. Site 16 will require construction and operation of a new pump station and pipeline to pump all sewage up to the new site. In addition, a new pipeline to convey treated effluent and, with a implementation of a recycled water program, brine discharge, to the ocean outfall will be required. This alone **adds approximately \$12 million to the Site 16 costs** (\$8,717,000 capital cost, and O&M present worth costs of \$3,170,000 of estimated \$206,000/ year additional O&M costs).
- **Planning, Engineering, Admin, Legal Costs** – Site 16 costs will be **\$5,424,000 higher since additional facilities are required (pump station, pipelines, access roads, etc.)** and because significant work has already been done for Site 1, whereas Site 16 will be starting from scratch.
- **Property Acquisition** – Property for Site 1 is already owned and does not represent a project cost. Site 16 property acquisition and acquisition of easements between the pumping station located on the existing site and the Righetti site increases the project cost by an estimated **\$7,500,000**.

The costs above result in **Site 16 Righetti Site project costs being \$28 million higher, or 45% higher** than the proposed Site 1 alternative.

In addition to increased costs for Site 16 Righetti Site, the completion of the upgraded treatment plant, and therefore removal of the existing treatment plant, **will be delayed by roughly 10 years**, with the possible delay to **remove the existing plant by up to 20 to 30 years** as discussed above depending on

the United States Environmental Protection Agency and Regional Water Quality Control Board's requirements for implementation of full secondary treatment. It should be noted that the Alternative Sites Evaluation Fine Screening Analysis endeavored to provide a co-equal level of analysis for the existing and alternative sites considered to the extent feasible. For this reason, the Fine Screening Analysis considers only costs associated with interim upgrades necessary to keep the existing plant operational at current treatment levels for an approximate 10-year timeframe should an alternative site be pursued for the wastewater treatment plant upgrade project. The Fine Screening Analysis cost analysis does not include the more substantial interim upgrade costs should it be necessary to upgrade the existing plant to full secondary treatment to fully comply with EPA Clean water Act Standards and eliminate the federal 301(h) waiver during the same timeframe; this cost estimate is described in the MBCSD Wastewater Treatment Plant Upgrade Project Summary Memo (August 2012) and should also be given due consideration when comparing the project alternative cost estimates.

2 METHODOLOGY

The memorandum summarizes the procedures and guidelines used in the preparation of estimates of probable construction cost (cost estimates) presented in the Rough Screening and Fine Screening alternative analyses. The estimates draw on previously prepared estimates and where new cost data was required, those figures are based on the quantities and unit price models developed from project-specific planning assumptions and industry-standard estimating practices. In addition, a project complexity factor is incorporated into the unit price to adjust for expected difficulties based on the site and work conditions.

3 COST ESTIMATE CRITERIA

The Association for Advancement of Cost Estimating International provides guidelines for cost estimating practices and classification. The *Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries* (AACE International Recommended Practice No. 18R-97) provides guidelines for applying the principles of estimate classification to projects such as the MBCSD Alternative Analyses. A summary of the recommended classification system found in the Recycled Water Feasibility Study is repeated here in **Table 1**.

Table 1: Summary of Estimate Classifications

Estimate Class	Primary Characteristic		Secondary Characteristic		
	Level of Project Definition <i>Expressed as % of complete definition</i>	End Usage <i>Typical purpose of estimate</i>	Methodology <i>Typical estimating method</i>	Expected Accuracy Range [a] <i>Typical variation in low and high ranges</i>	Preparation Effort [b] <i>Typical degree of effort relative to least cost index of 1</i>
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgement or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10

Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100
Notes:					
[a]	The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for a given scope.				
[b]	If the range index value of "1" represents 0.0005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.				

The estimates utilized for the development of costs in MBCSD WWTP Alternative Analyses are considered Class 4 Estimates which is defined by AACE International as follows:

Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams (PFDs) for main process systems, and preliminary engineering process and utility equipment lists. Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval to proceed to next stage. Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. American National Standards Institute (ANSI) Standard Reference Z94.2-1989 references this class as a "Budget Estimate", with an accuracy range between -15% to +30%.

The estimates presented in the alternative analyses are anticipated to be within an accuracy of -20% to +30%. The accuracy of an estimate, which reflects the level of confidence that an estimate will be near the actual project, should not be confused with the application of a contingency, which is a percentage increase applied to the cost estimate to account for unknown conditions. As project specifics are refined along the typical project delivery cycle, the accuracy range will narrow to reflect an increased confidence in the estimating data. The cost estimate, including applicable contingencies, is expected to result in a delivered project price within the accuracy range identified for the specified estimate class.

4 COST INDICES

In developing project cost estimates, it is common to use historical data from similar projects (i.e., detailed cost estimates, bids from constructed projects). To be relevant to the immediate project, one must consider the date and geographical region of the cost data. The industry standard economic index of changes in construction market conditions over time is the Engineering News Record's (ENR) Construction Cost Index (CCI). This index is computed from constant quantities of structural steel (weighted 15%), portland cement (2%), lumber (10%), and common labor (73%) in 20 cities, the average of which is considered to be the national average and based on a value of 100 in 1913 (Sanks, 852). For consistency with other elements of the MBCSD Wastewater Treatment Plant Upgrades Project, costs reported will be normalized to the ENR-CCI, 20-City Average for September 2011 of 9116.

5 ENGINEERING ECONOMICS

Engineering economic factors that will be used to analyze estimated costs for project alternatives include project financing (i.e., interest rate and loan period) and life cycle costs.

5.1 Project Financing

The two variables used to define the project financing are the interest rate and repayment period for a loan. Funding for this project is assumed to be a loan through the SWRCB State Revolving Fund (SRF) program. Interest rates for these analyses are assumed to be 3.0% and the loan period is assumed to be 20 years. The interest rate for the SRF program is one-half of the general obligation bond rate at the time of preliminary funding commitment. The assumed 3.0% interest rate is conservative based on historical rates for the program and the loan period of 20-years is standard for SRF (A/P, 3%, 20-years = 0.0672).

5.2 Life-Cycle Costs

Where applicable, to evaluate project alternatives, life-cycle cost analyses were performed to identify the most cost effective solution. Life-cycle cost analyses consider the present worth of both capital costs and annual O&M costs for each alternative. Factors incorporated into the life-cycle analysis include: discount rate of 5% per year for computing present worth values and life-cycle period of 30 years (P/A, 5%, 30-years = 15.3725).

5.3 Annualized Unit Pricing

Costs will be analyzed by amortizing capital costs and estimating annual O&M costs in current dollar value. The sum of the amortized capital cost and annual O&M costs will be considered the cost of wastewater treatment.

Where recycled water costs are presented, the annual operating cost of water recycling, above the “base” cost of wastewater treatment, is calculated by dividing the annual recycled water production cost by the estimated recycled water quantity to determine a unit price (\$/AF) of recycled water. The unit price/cost of recycled water is used for comparison between reclamation alternatives. In other words, the baseline treatment costs to produce secondary effluent is not considered in the cost of producing recycled water.

6 BASIS OF CAPITAL AND OPERATING COST ASSUMPTIONS

Construction costs are estimated based on order-of-magnitude construction unit costs defined below. The unit costs are assumed to include materials, equipment, labor, contractor OH&P, bonds and insurance, and mobilization. Unit costs presented herein are not intended to represent the lowest prices achievable in a competitive bid market place, but rather a representative median price that could be expected from responsible bidders.

6.1 Previous WWTP Project Estimates

The City has developed cost estimates for various project alternatives between approximately 2006 and 2011. Where applicable, those estimates, prepared by wastewater professionals, were referred to in

the development of these alternative analyses. Those estimates were reviewed, escalated to current dollar values, and updated, where appropriate to match the known parameters of the subject alternatives. The significant studies utilized in the development of these alternative analyses and the relevant information derived from those studies are shown in Table 2

Table 2: Summary of Cost Data from Previous WWTP Study

Study Name, Date (ENR-CCI)	Scope of Study	Costs Used in Alternative Analysis
“Facility Master Plan” City of Morro Bay and Cayucos Sanitary District, <i>Wastewater Treatment Plant Facility Master Plan Report</i> by Carollo Engineers, September 2007 (ENR-CCI, June 2006 = 7700)	Master plan of facility for 20-year planning horizon; Condition Assessment of existing facility and development of alternatives including rehabilitation of existing facilities, upgrade of existing facilities to meet “full secondary treatment”, upgrades to membrane bioreactor process, upgrades to oxidation ditches and tertiary filtration/disinfection	Condition Assessment and costs associated with rehabilitation and upgrades of existing plant. Other upgrade alternatives were later updated in subsequent Amendments 1 and 2
“Facility Master Plan – Amendment 1” City of Morro Bay and Cayucos Sanitary District, <i>Wastewater Treatment Plant Facility Master Plan Report</i> by Carollo Engineers, August 2009 (ENR-CCI, June 2006 = 7700)	Modifications to recommended project due to flood impact mitigation; include tertiary treatment facilities, biosolids management, and support facilities; revised demolition	Operating costs for proposed facility Capital costs presented in this study were revised in subsequent Amendment 2
“Facility Master Plan – Amendment 2” City of Morro Bay and Cayucos Sanitary District, <i>Wastewater Treatment Plant Upgrade Project, Facility Master Plan Draft Amendment 2</i> by MWH, July 2010 (ENR-CCI, June 2010 = 8800)	Finalize FMP recommendations; provide description of recommended project for EIR, revise flow and loading parameters and process design criteria for final design; refine site layout	Cost estimates of proposed major secondary process units; site work, flood mitigation, etc. Operating costs Tertiary Treatment costs
<i>City of Morro Bay Wastewater Treatment Plant Study</i> by Cannon Associates (ENR-CCI, June 2006 = 7700)	Update to CDBG Reclamation Feasibility Study Phase II (by Boyle Engineers) to examine feasibility of a standalone WWTP for City and benefits of a revised discharge to Chorro Creek; Cost estimates derived for alternative comparisons	Data relevant to Advanced Water Treatment Assumptions on Chorro Creek Discharge requirements and brine disposal

6.2 WWTP – Secondary Treatment

The FMP and subsequent Amendments 1 and 2 provide detailed scope and cost estimates for the proposed project process train including influent pump station, preliminary treatment (screening and grit removal), biological process (oxidation ditches and secondary clarifiers), interstage pumping, solids handling, residual management, electrical systems, operations buildings, and miscellaneous site improvements.

To maintain a “co-equal” comparison methodology, an assumption was made that regardless of site, the preferred process train would consist of similar baseline process units and that the cost of constructing structures, equipment, etc. would remain essentially similar between sites.

One main differentiator between the sites then was site civil including rough grading, fine grading, finished surfaces, and in the case of Site 1, soil remediation and flood mitigation. Based on conceptual layouts, a “pad elevation” was defined for Site 5/15 and Site 16, representing the median elevation of

the site for rough grading. Using that elevation and available topographic contours, mass grading figures were calculated and typical unit cost factors assigned taking into consideration the extent of grading and soil characteristics described in the preliminary geotechnical investigations. In the case of Site 1, soil remediation and flood mitigation were estimated in FMP Amendment 2 and those costs were carried forward into the alternative analysis.

Demolition values were based on costs assigned in the FMP and subsequent Amendment 1 and 2 for the proposed project at Site 1. Additional costs were assumed for Site 5/15 and Site 16 since the vacating of the existing site would assume additional demolition of facilities retained in the Site 1 alternative.

Civil sitework including fine grading, yard piping, and surface improvements can be expected to vary between sites, however, for ease of comparison, the value developed in the previous studies was assumed to be common in order-of-magnitude for all project alternatives.

6.3 Pipelines

The unit cost of constructing pipelines can vary significantly by size, depth, material, and alignment. For these alternative analyses, the following pipeline sizes and costs were assumed.

Table 3: Pipeline Unit Costs

Pipeline	Description	Installed Unit Cost
Raw Wastewater Forcemain Effluent Land Outfall	Nominal 16" diameter; Ductile iron pipe, ceramic-epoxy lined, cathodic protection, conventional cut/cover construction	\$284 / linear foot Includes Contingency and Soft Costs
Recycled Water Transmission Mains	Nominal 6" to 12"; Polyvinyl Chloride (PVC) pressure pipe (AWWA, C900); conventional cut/cover construction, depth 3' to 5'	\$200 / linear foot Includes Contingency and Soft Costs

6.4 Storage

Storage tanks for delivery of recycled water typically realize a significant economy of scale. Water storage tanks are commonly steel (bolted or welded) or concrete. Typically, steel tanks (AWWA D100) are most cost effective at sizes under about 3 million gallons and thus will be the baseline assumption used herein. For the tank capacities contemplated in this *Study* a unit cost of \$1/gallon is appropriate.

6.5 Pump Stations

Pump stations vary significantly by capacity, head, installed horsepower, duty/standby requirements, wetwell/drywell configuration, standby power requirements, etc. Pump station capital costs are estimated using cost curves published in *Pumping Station Design* by Robert L. Sanks. The cost is extrapolated based on firm pumping capacity and normalized to current dollar values using the ENR-CCI and then compared against recent cost estimates and bids for recently constructed facilities to confirm relevance. For these alternative analyses, the pump station costs assumed are presented in **Table 4**.

Note that for Sites 5/15 and Site 16, no onsite lift station was included, assuming that the offsite lift station would convey raw wastewater directly into the WWTP; that is the wastewater forcemain would

discharge into the preliminary process. Because sewage enters the current site by gravity flow, only Site 1 includes an influent lift station, consistent with the process train defined in the FMP and subsequent Amendments 1 and 2.

Table 4: Pump Station Unit Costs

Facility	Description	Installed Cost
Raw Wastewater Pump Station (Remote, Applicable to Sites 5/15 & 16)	Peak wetweather flow of 8 mgd; Average daily flowrate of 1.5 mgd; Wetwell/drywell configuration, multiple pumping units on VFDs, standby power, above-grade equipment/maintenance room; odor control Approximately 400HP Installed	\$5.3 million to \$5.4 million (\$11,500/HP, plus 20% Contingency) Reference Sanks, Figure 29-2
Influent Pump Station (Onsite, Applicable to Site 1)	Peak wetweather flow of 8 mgd; Average daily flowrate of 1.5 mgd; Wetwell/drywell configuration, multiple pumping units on VFDs, odor control Standby power equipment/maintenance room provided at onsite WWTP Approximately 75 HP Installed	\$1.1 million (\$11,500/HP, plus 20% Contingency) Reference Sanks, Figure 29-2 Confirmed w/ FMP-Amendment 2
Recycled Water Pump Station	Peak pumping capacity to match peak hour demand defined by alternative; Vertical Turbine Pumps, VFD-driven; pumping from onsite CCBs/Storage Approximately 50HP to serve Morro Bay Service Area Approximately 100 HP to serve Hwy.41 Agricultural Service Area	Depending on Alternative, Varies between \$150k to \$300k Reference Sanks, Figure 29-7

6.6 Tertiary Treatment

Production of Title 22 disinfected tertiary treated recycled water will necessitate upgrades to the WWTP including filtration, tentatively assumed to be cloth disk filters, and chlorine contact disinfection as described above. Improvements to meet Title 22 requirements are detailed in the *FMP, Amendment 2, Appendix C – TF/CCB/Title 22 Considerations TM*. That study estimated costs associated with improvements for a Title 22 tertiary facility capacity of 0.4 mgd to be \$1.36 million (normalized to September 2011, \$1.41 million). This equates to a construction unit cost of approximately \$3.40 per gpd of Title 22 tertiary treatment capacity.

Project alternatives developed in the subsequent sections consider tertiary treatment capacities greater than and less than the planned 0.4 mgd facility. To avoid any bias toward larger projects, the baseline tertiary treatment unit cost of \$3.40 per gpd will be adjusted to reflect the actual required treatment capacity for each respective alternative. Economy of scale is particularly pronounced in small treatment facilities, especially for facilities below 1 mgd. For this *Study*, the capital costs are based on the baseline unit cost of \$3.40/gpd for a 0.4 mgd facility and prorated as a ratio of the flows to a power of 0.50 to account for economies of scale. The equation applied to tertiary treatment estimates will be:

$$\text{Tertiary Cost (at capacity, "Q")} = \$1.41 \text{ million} \times (Q / 0.4\text{mgd})^{0.50}$$

Or, deriving an equation based on differing flowrates, the prorated unit cost utilized will be:

$$\text{Unit cost (at capacity flowrate "Q")} = 2.23 \times Q^{-0.50}$$

6.7 Advanced Water Treatment

Certain water reuse alternatives under consideration necessitate higher levels of treatment than Title 22 disinfected tertiary recycled water to protect drinking water supplies and human health. Guidance for treatment requirements in indirect potable reuse projects is provided for in the Draft Title 22 GRRP and includes reverse osmosis and advanced oxidation (i.e., peroxide/ultraviolet light) as described previously.

Similarly, demineralization may be required to ensure water quality adequate for specific uses. Alternatives requiring higher quality irrigation water (i.e., reduced TDS and/or Chloride) are assumed to use reverse osmosis for salinity reduction as described previously.

Review of recent projects of similar type and scale suggest a construction unit cost of approximately \$7.00 per gpd of treatment capacity is appropriate.

6.8 Customer Retrofit and Connection Costs

Each recycled water customer would require a connection to the new recycled water distribution system including a service lateral and meter. This cost will vary by size, as a function of flowrate.

Onsite retrofits are also required to separate existing potable system from the recycled water plumbing. Onsite retrofits can vary in cost based on complexity with simple conversions on the order of \$10,000. More complex retrofits, for example golf courses that require separate water systems (i.e., potable connections) for green watering can cost hundreds of thousands of dollars.

For this *Study*, recycled water retrofits and connections are estimated using an average cost of \$15,000 per connection. These costs should be verified on a site-specific basis in subsequent project development.

6.9 Operating and Maintenance Costs

The O&M costs incorporated into the annualized recycled water production estimates are presented in **Table 24**. It is noted that these O&M costs do not include the cost of additional management and operational staff necessary for a recycled water program. At a minimum, a manager position would likely be required at a FTE burdened cost (i.e., including benefits) of approximately \$150,000 per year. Additional operations staff may also be required depending on the complexity and scale of a given recycled water system.

Table 5: Summary of Annual Operations and Maintenance Costs

Category	Annual O&M Cost (2011 \$s)
Pipelines	0.25% of construction cost
Pump Stations	1% of construction cost, plus power at \$0.14/kw-hr
Storage	0.5% of construction cost
Recycled Water Site Cross-Connection Checks	\$800 per customer per year

Wastewater Treatment – Secondary, using Oxidation Ditches	\$1.32 million (per FMP Amendment 1)
Tertiary Treatment	\$0.25 per gpd of treatment on annual basis
Advanced Water Treatment	\$0.50 per gpd of treatment on annual basis
Management and Operations Staff	Not included at this time – dependent on scale and complexity of project

6.10 Contingencies

Project contingencies are applied to cover uncertainties in the estimating practice including unknown or unforeseen costs. Industry standard contingencies can range from 10% to +30%, depending on the confidence level of the estimate (i.e., project stage, risk, scope development, engineering constraints, etc.). Unless noted otherwise, for these alternative analyses, a 25% contingency was added to the estimated construction cost prior to adding implementation costs described below.

6.11 Implementation Cost Allowances

Implementation cost allowances (a.k.a. “soft costs”) are included in project estimates for costs directly associated with delivering a project from planning through construction that are not included in the construction estimate (i.e., Planning, Design, Permitting, Construction Management/Inspection, Project Administration, and Commissioning and Closeout). It is recognized that projects with smaller construction costs have a larger percentage of project delivery (soft) costs, while the larger projects have a smaller percentage of soft costs. This is primarily due to the number of implementation cost tasks that have relatively fixed costs such as contract processing, permit fees, bidding, etc. These fixed costs have a greater impact on the smaller projects.

Seven of the largest municipalities in California (Cities of Long Beach, Los Angeles, Oakland, Sacramento, San Diego, San Jose, and the City and County of San Francisco) have collaborated to study over the last 10 years, the actual cost of delivering capital improvement projects. *The California Multi-Agency CIP Benchmarking Study* was first published in 2002 and has been updated yearly to reflect a larger number of projects. The results of this benchmarking study provide insight into soft costs of California projects as a function of project type and size. Of 112 municipal projects (median construction value of \$3.32 million) including reservoirs and treatment plants, and 252 pipeline projects (median construction value of \$0.86 million), the project implementation or delivery costs averaged 36% to 37% of the construction costs.

For the *2012 Recycled Water Feasibility Study*, a project implementation allowance of 35% of the estimated construction cost was utilized to reflect the project scale, complexity and lack of definition of recycled water alternatives during this early conceptual planning stage.

For the WWTP Alternative Analyses, a project implementation allowance of 30% of the estimated construction costs was utilized to reflect project scale, and level of definition available during the conceptual planning stage.