

- **Board of Directors**  
**Engineering and Operations Committee**

May 16, 2006 Board Meeting

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7-2

### **Subject**

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Appropriate \$1.368 million; and authorize (1) final design of the Water Quality Pilot Plant Facility; and (2) an agreement with Carollo Engineers in an amount not to exceed \$850,000 (Approp. 15431)

### **Description**

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Metropolitan's Water System Operations Group is responsible for meeting the following objectives:

1. Ensure that Metropolitan complies with all federal, state, and regional drinking water regulations;
2. Provide water quality design criteria support for treatment design, construction, and operations as well as expertise in planning-related water quality issues (i.e., water transfers, storage);
3. Provide support to Metropolitan's member agencies; and
4. Maintain an effective, practical, applied research and development program to ensure that the above objectives may continually be met in a responsible manner.

To successfully meet these objectives and reduce costs, a pilot plant facility was built in unoccupied basement space of the F. E. Weymouth Water Treatment Plant's Softener Building No. 3 in 1980. Construction costs for the Oxidation Retrofit Program were reduced by more than \$100 million following key process enhancements made possible by pilot testing. The pilot plant provides project cost savings typically exceeding a benefit-to-cost ratio of 10:1. Technological advances and emergency preparedness needs accentuate the critical nature of maintaining a Pilot Plant facility.

The current plant is at the end of its useful life. Multiple safety reviews have identified several code, occupational health and safety, and accessibility-related deficiencies. The basement is space-constrained which limits its functionality; lacks Americans with Disabilities Act-classified accessibility (corridors/stairways); and routinely experiences sanitary stoppage. These deficiencies along with a continued need for the pilot plant facility to support objectives and maintain key support to internal customers (Engineering Services Section, Water Treatment Section, Water Resource Management Group) require implementation of a long-term solution to sustain pilot plant operation. The most cost-effective solution has been identified to be construction of a new pilot plant facility.

The Board authorized preliminary design of a new pilot plant in March 2004. Modification of existing buildings and replacement of aged structures were considered. To meet current building code requirements, the basement location requires upgrades estimated at \$7.5 million that would not resolve persistent accessibility and life/fire-safety challenges. An evaluation of alternative locations identified construction of a new facility to be the lowest cost option, estimated at \$8.6 million. Other alternatives considered retrofit of on- or off-site structures and were estimated to cost several million dollars more than the proposed new facility. A new Pilot Plant would provide the greatest value towards promoting staff accessibility, safety, and efficiency while allowing continued support of Metropolitan's goals and objectives (see [Attachment 1](#)). Staff recommends that final design of the new Pilot Plant facility proceed at this time.

### **Water Quality Pilot Plant Facility – Final Design (\$1.368 million)**

The Water Quality Pilot Plant will include small-scale water treatment plant process equipment and necessary space to conduct treatment evaluations, and will be located adjacent to staff offices. This location will optimize access and resolve operating challenges due to its current basement location.

### **Authorization of Agreement for Design Services**

Metropolitan issued Request for Proposals (RFP) No. 737 for “La Verne Water Quality Pilot Plant Final Design Services” in May 2005. Following evaluation for compliance with RFP instructions and negotiations, a focused, low-cost scope of services was developed. Staff recommends entering into a professional services agreement with Carollo Engineers to perform the design. A value-engineering study was conducted during the preliminary design phase of this project. Final design will incorporate results of this study that are anticipated to lower construction costs by more than 15 percent of the current estimate.

This action appropriates \$1.368 million and authorizes a professional services agreement with Carollo Engineers in an amount not to exceed \$850,000. Staff will return to the Board in early 2007 for award of a construction contract.

This project has been evaluated and recommended by Metropolitan’s Capital Investment Plan Evaluation Team and funds have been included in the fiscal year 2005/06 capital budget. See [Attachment 1](#) for the Detailed Report, [Attachment 2](#) for the Financial Statement and [Attachment 3](#) for the Location Map.

### **Policy**

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Metropolitan Water District Administrative Code Section 5108: Capital Project Appropriation

Metropolitan Water District Administrative Code Section 8117: Professional and Technical Consultants

### **California Environmental Quality Act (CEQA)**

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CEQA determinations for Option #1:

The environmental effects from the construction of the proposed project were evaluated in the F. E. Weymouth Filtration Plant Ozonation Facilities and Site Improvements Program Final Environmental Impact Report (Final EIR), which were certified by the Board on April 12, 2005. The Board also approved the Findings of Fact (findings), the Statement of Overriding Considerations (SOC), the Mitigation Monitoring and Reporting Program (MMRP), and the project itself. The current board action is solely based on authorizing all final design activities up to award of competitively bid contracts for construction of the Pilot Plant Facility and not on any changes to the approved project itself. Hence, the previous environmental documentation acted on by the Board fully complies with CEQA and the State CEQA Guidelines. Accordingly, no further CEQA documentation is necessary for the Board to act on the proposed action.

The CEQA determination is: Determine that the proposed action has been previously addressed in the certified 2005 Final EIR, findings, SOC, and MMRP and that no further environmental analysis or documentation is required.

The proposed action of entering into a professional services agreement with Carollo Engineers is not defined as a project under CEQA because it involves continuing administrative activities (Section 15378(b)(2) of the State CEQA Guidelines). In addition, the proposed action is not subject to CEQA because it involves other government fiscal activities, which do not involve any commitment to any specific project that may result in a potentially significant physical impact on the environment (Section 15378(b)(4) of the State CEQA Guidelines).

The CEQA determination is: Determine that the Pilot Plant Facility has been previously addressed in the certified 2005 Final EIR, findings, SOC, and MMRP and that no further environmental analysis or documentation is required. Further, determine that entering into a professional services agreement with Carollo Engineers is not subject to the provisions of CEQA pursuant to Sections 15378(b)(2) and 15378(b)(4) of the State CEQA Guidelines.

CEQA determination for Option #2:

None required

**Board Options/Fiscal Impacts**

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**Option #1**

Adopt the CEQA determinations and

- a. Appropriate \$1.368 million in budgeted funds;
- b. Authorize final design and all activities up to award of competitively bid contracts for construction of the Water Quality Pilot Plant Facility; and
- c. Authorize a professional services agreement with Carollo Engineers in an amount not to exceed \$850,000.

**Fiscal Impact:** \$1.368 million in budgeted capital funds under Approp. 15431

**Option #2**

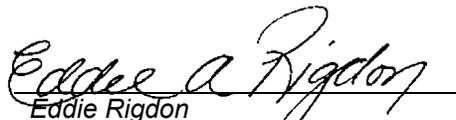
Defer authorization for pilot plant final design. This will likely increase both Metropolitan’s capital and operating budgets. Pilot-testing consulting contracts will be required.

**Fiscal Impact:** Increases in Water System Operations’ operating budget by more than \$1 million/year.

**Staff Recommendation**

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Option #1

  
 Eddie Rigdon  
 Manager, Water System Operations

4/7/2006  
 Date

  
 Jeffrey Kightlinger  
 General Manager

4/21/2006  
 Date

**Attachment 1 – Detailed Report**

**Attachment 2 – Financial Statement**

**Attachment 3 – Location Map**

BLA #3539

## Detailed Report

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### Background

Metropolitan Water District of Southern California's Water Quality Section conducts treatment process evaluations critical for Metropolitan to maintain 100 percent compliance with primary drinking water standards. These efforts allow the Water Quality Section to provide key support to (1) Water System Operations' Water Treatment Section to optimize treatment costs and benefits, (2) Corporate Resources' Engineering Services Section to develop effective design criteria for new infrastructure, and (3) the Water Resources Management Group to identify appropriate, alternative source waters that may be considered in the Integrated Resources Plan.

The existing Water Quality Pilot Plant has been used to support many past programs—a selection of which is listed in Table 1. It is estimated that this support has resulted in savings in excess of \$200 million to Metropolitan, along with several non-quantifiable benefits that include continued compliance with regulations and effective customer service. The existing Pilot Plant was constructed in the basement of the F. E. Weymouth Softener Building No. 3 approximately 25 years ago. Technologies evaluated in the Pilot Plant include granular activated carbon (GAC); chloramines; chlorine dioxide; ozone; ultraviolet light; dosages of elevated coagulants to meet regulatory requirements; and use of technologies to lower salinity and remove emerging contaminants (e.g., endocrine disrupting compounds). Many tests have been conducted in the Pilot Plant providing the immeasurable benefit of maintaining operational flexibility of Metropolitan's water treatment plants during a time period that included dramatic changes to source water blends and increasingly stringent water quality regulations. Future work in the Pilot Plant will provide support similar to that listed in Table 1 (i.e., capital and operating cost reductions, maintaining regulatory compliance for Metropolitan and its member agencies, supporting development of effective state and federal regulations) as well as development of new procedures to enhance water treatment security and emergency response and planning.

### Metropolitan's Pilot Plant Facilities

Process research testing (summarized in Figure 1) allows for the cost-effective simulation of water treatment plant and distribution-system performance. Applied research platforms allow rapid and cost-effective methods to evaluate treatment plant operations, future treatment plant design criteria, and emergency water quality treatment response criterion. Pilot-scale facilities allow staff to rapidly and cost-effectively identify solutions to water quality challenges (compared to demonstration-scale or full-scale studies). Furthermore, pilot process equipment (as opposed to demonstration- or large-scale evaluations) allows for the injection of target microorganisms and/or compounds at appropriate concentrations with subsequent disposal to the sanitary sewer.

Typically, the cost of process evaluations increase exponentially between bench, pilot, and demonstration scale. Without a functional Pilot Plant, Metropolitan may realize significantly increased cost of both capital improvements and operations and maintenance activities. Use of the current Pilot Plant has become challenging because it has reached the end of its useful life; there are many building code deficiencies; there are significant workplace health and safety upgrades required; and new treatment technologies may not be adequately evaluated due to space and equipment constraints.

### Alternatives Evaluation

An evaluation of alternatives to new construction was conducted during the preliminary design phase. A summary of results from this evaluation are presented here:

- (1) **End of Useful Life:** The majority of process equipment used in the existing Pilot Plant has reached the end of its useful life. The Pilot Plant has been in use for 25 years and now equipment age as well as facility deterioration are negatively impacting operation. Methods and materials of construction used for the current facility were of high quality and provided significant cost savings to Metropolitan; however, sustained operation of the Pilot Plant requires that new equipment be procured at this time.

- (2) **Remodel/Renovate Existing Location:** The current location has been evaluated by internal and consultant-led building code and safety evaluations. Reports from these evaluations characterize the facility as requiring significant building code and health and safety upgrades. While immediate-need upgrades have been completed, efforts to bring the facility into full compliance with current building code as well as Occupational Health and Safety Administration (OSHA) standards is estimated at \$7.5 million. Furthermore, this renovation would not address key accessibility and life-safety concerns of the below-grade location. Note: The newly remodeled area of the building above the Pilot Plant is now occupied by office staff.
- (3) ***Moving the Pilot Plant:*** Multiple alternative locations for the Pilot Plant were evaluated for meeting the Pilot Plant's hydraulic, staffing, and sanitary sewer needs. Results showed that facilities to house the Pilot Plant would require significant construction and upgrades in order to meet space and building code requirements. The cost to add the Pilot Plant facility to an existing building is estimated to exceed \$10 million.
- (4) ***Outsource Pilot Evaluations:*** This option would significantly limit Water System Operations' capabilities to comply with many water quality objectives and force more costly testing to be conducted at the demonstration-scale facility (demonstration-scale testing is best used to optimize pilot testing results, not to replace it). Limitations would be realized in reduced level of quality and control of outsourced testing, inability to use appropriate Metropolitan source waters during testing, and inability to respond rapidly to immediate-need projects when they arise. Outsourcing of pilot testing would require consultant contracts of approximately \$1,000,000 per year.

Attachment 3 shows the location of the existing and proposed pilot plant facility. Construction of this new facility was a project component of the F. E. Weymouth Treatment Plant Ozonation Facilities and Site Improvements Program Final Environmental Impact Report (April 2005).

### **Recommendation**

Staff recommends initiation of final design for a new Water Quality Pilot Plant at this time. This approach allows Metropolitan to identify and optimize treatment technologies for current and/or future use at its large-scale treatment plants. It is anticipated that the final design would be completed in fiscal year 2006/07 and construction of the new facility would be completed in fiscal year 2008/09.

**TABLE 1**

**Value of Selected Pilot Plant Projects**

Project Timeline	Project Name	Project Description	Metropolitan's Pilot Cost / Savings (\$ Millions)
1980 to 1985	<b>Granular Activated Carbon (GAC) tests</b>	New regulations were going to appoint GAC as the best available technology (BAT) for reduction of trihalomethanes (THMs). Pilot plant testing at Metropolitan showed this was not appropriate. <b>Result:</b> <u>GAC not chosen by EPA as THM reduction-BAT.</u>	\$1.0* / >\$100†
1982 to 1983	Switching to <b>Free Chlorine</b> to Chloramines	To meet new THM regulations, Metropolitan evaluated a switch from free chlorine to chloramines in the distribution system. Pilot plant tests identified and resolved significant challenges. <b>Result:</b> <u>Full-scale chloramine use, ability to educate the public &amp; health industry.</u>	\$1.5* / \$NQ‡
1988 to 1991	Evaluate to <b>Ozone Disinfection</b>	To meet new regulations, ozone was evaluated. EPA used results to develop effective regulations. <b>Result:</b> <u>EPA implemented effective regulations.</u>	\$2.5* / >\$100
1982 to 1983	Develop to <b>Biological Filtration</b>	Ozonation requires biological filtration, typically done with GAC. Pilot testing developed abilities to use Metropolitan's existing filters. <b>Result:</b> <u>Not necessary to install full-scale GAC treatment.</u>	\$0.5* / \$1, >\$18**
1995 to 1998	Evaluate to <b>Elevated Coagulant Dosages</b>	Metropolitan's full-scale facilities were not designed to operate with elevated coagulant dosages needed to meet new regulations. Pilot testing developed operating criteria to meeting Quantification Settlement Agreement requirements. <b>Result:</b> <u>Metropolitan was able to deliver more California State Project Water and meet all water treatment regulations.</u>	\$0.5* / \$NQ††
1996 to 2006	<b>Desalination Research and Innovation Partnership (DRIP)</b>	Develop next-generation, large-scale treatment technologies to reduce imported water salinity. Pilot-scale testing developed potential pre-treatment use for Metropolitan's facilities; new, 18-inch diameter membrane technology; and, new high-recovery concentrate treatment techniques. <b>Result:</b> <u>Membrane facility construction costs reduced by 30%.</u>	\$7.4 / \$19, \$44‡‡
1998 to 2002	Develop to <b>Ultraviolet Light Disinfection</b>	Evaluation of ultraviolet (UV) disinfection at the bench- and pilot-scale developed proper operating procedures for the process to treat <i>Giardia</i> and <i>Cryptosporidium</i> . EPA used results to develop effective regulations. <b>Result:</b> <u>Reduced costs needed to meet regulations.</u>	\$0.5* / \$1, \$NQ***
2001 to 2003	Alternative to Disinfectants ( <b>Chlorine Dioxide</b> ) Evaluation	New chlorine dioxide regulations made it potentially cost-competitive with ozonation. Metropolitan's Pilot Plant testing revealed fundamental flaws in the technology, saving future evaluation and implementation. <b>Result:</b> <u>Saved cost of implementing a technology that would not meet regulatory or water quality goals.</u>	\$2.2 / >\$100†††

\* Approximate cost.  
 † Estimated GAC installation cost for Metropolitan.  
 ‡ Non-quantifiable (NQ) savings include successful treatment changes and timely education to member agencies, hospitals and kidney-dialysis centers that avoided negative impacts on the regional healthcare industry.  
 \*\* Grants/partnerships reduced cost by \$1 million; \$18 million savings realized from avoiding need to install GAC at the J. Jensen and H. J. Mills Water Treatment Plants.  
 †† Non-quantifiable (NQ) savings from ability to maintain 100-percent compliance.  
 †† Grants/partnerships reduced cost by \$19 million; potential reverse-osmosis capital costs reduced by \$44 mill.  
 \*\*\* Grants/partnerships reduced cost by \$1 million; pilot tests found previously undiscovered water quality benefits.  
 ††† Metropolitan's plants were not retrofit with chlorine dioxide, saving unnecessary design and construction costs.

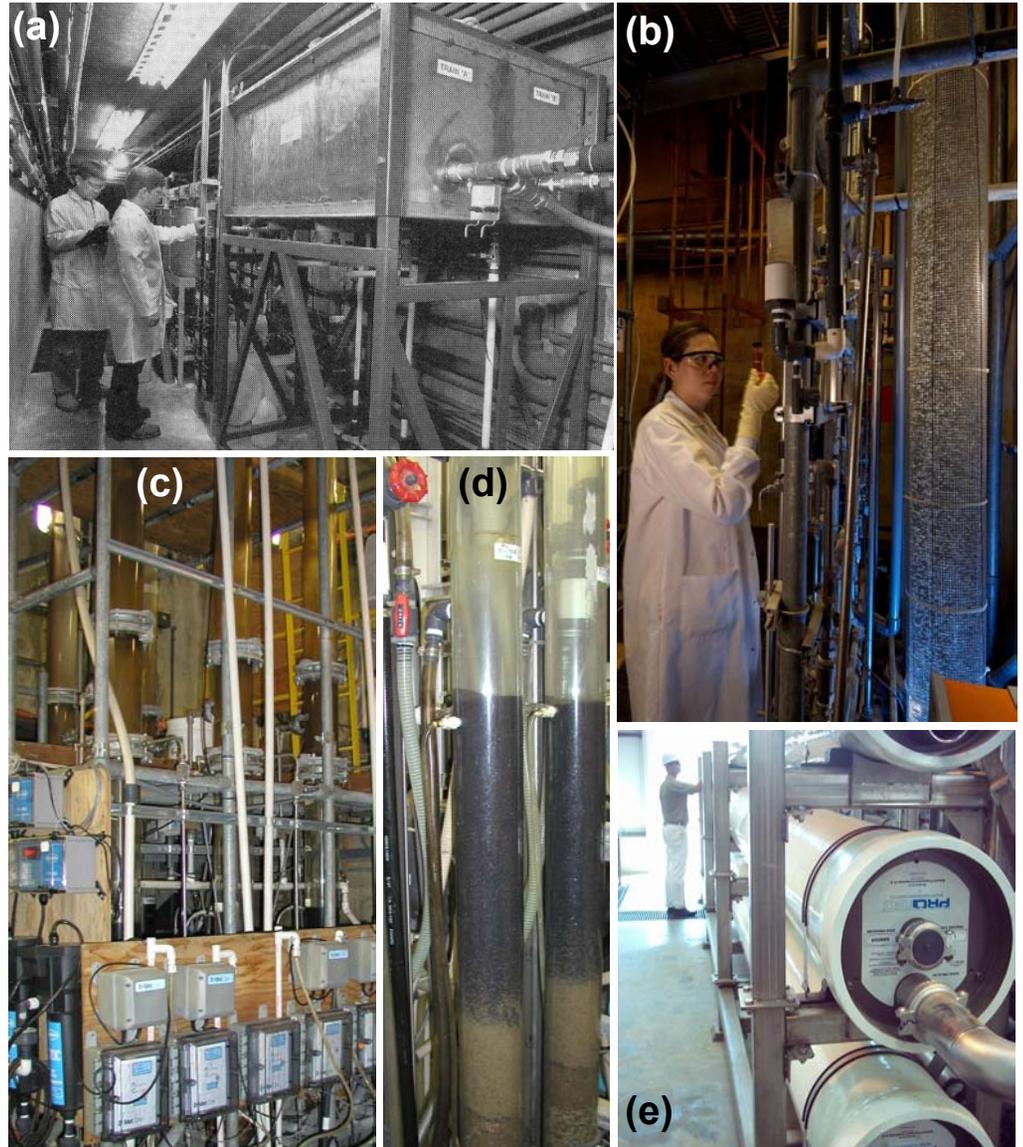
**FIGURE 1****SELECTED WATER QUALITY APPLIED PROCESS RESEARCH PLATFORMS****Pilot-scale (up to several hundred gallons per minute)**

**(a) Flocculation and sedimentation basins.** Using similar design criteria to Metropolitan's full-scale plants, pilot-scale basins are used to simulate the effect of treatment changes on subsequent water quality.

**(b) Ozone bubble contactor columns.** When originally constructed, performances of pilot-scale ozone contactors were compared against other potential alternatives to meet anticipated water quality and regulatory goals. Results from testing were used by the Environmental Protection Agency to enhance development of new regulations. Full-scale ozone contactor operating criteria for Metropolitan's H. J. Mills and J. Jensen water treatment plants were developed based on these results.

**(c) and (d) Multi-media filter columns.** These pilot plant filters are used to identify the effect of changing upstream treatment, filter media, or filter operations on water treatment plant finished water quality. Pilot tests allow for rapid, cost-effective evaluations of multiple treatment options that may reduce treatment costs, improve water quality, and make it easier for Metropolitan and its member agencies to comply with water quality goals as well as state and federal regulations.

**(e) Large, 18-inch diameter, reverse-osmosis membrane vessels for the Desalination Research and Innovation Partnership.** Pilot testing of these novel membranes developed in partnership between Metropolitan and a southern California membrane manufacturer is currently underway to develop full-scale design criteria for Colorado River water desalination facilities.



**FIGURE 1 (Continued)**

**SELECTED WATER QUALITY APPLIED PROCESS RESEARCH PLATFORMS**



**Bench-scale Testing (in a laboratory environment)**

**(f) Small-scale distribution systems.** Water flow and velocity in pipelines is simulated to provide information on potential treatment choices and how it may impact bacteriological, chemical, and physical system quality.

**(g) Membrane development testing bench.** This equipment was used to develop novel desalination membrane technology for the DRIP program and allow for further testing to be conducted at the pilot-scale.

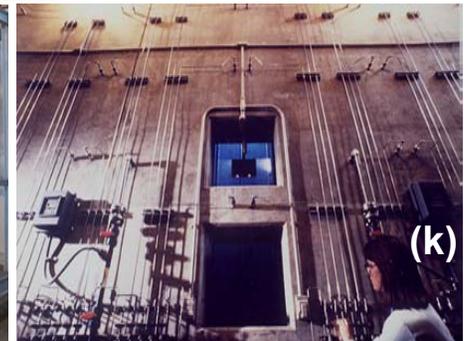
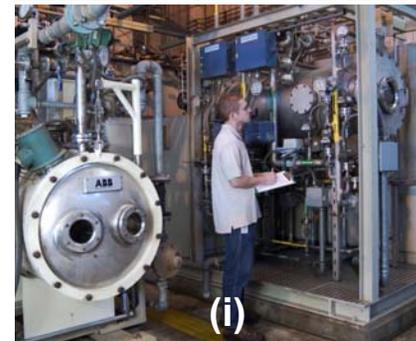
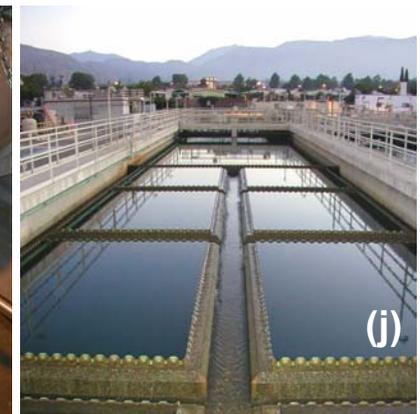
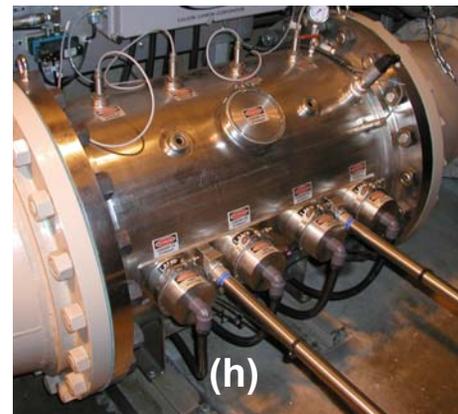
**Demonstration-Scale (5.5 million gallons per day)**

**(h) Ultraviolet (UV)-light disinfection reactor.** Metropolitan’s UV testing has heralded key findings defining not only how UV disinfection effects pathogens, but has also defined operating parameters to increase treatment effectiveness. Results have been used by the U.S. Environmental Protection Agency to develop regulations and nationwide guidance in how to use UV.

**(i) Ozone generators.** Evaluated for cost-effectiveness to determine the best technology to implement at Metropolitan’s full-scale plants.

**(j) Flocculation and Sedimentation basins.** These allow for further optimization of chemical usage and solids removal prior to filtration.

**(k) Demonstration-scale ozone contactor.** This contactor confirmed and optimized ozone contactor design developed at the pilot scale. Demonstration testing allowed further reduction of factors-of-safety typically incorporated into full-scale design while allowing reliable compliance with all disinfection and disinfection by-product regulations.



**Financial Statement for the Water Quality Pilot Plant Program**

A breakdown of Board Action No. 1 for Appropriation No. 15431 is as follows:

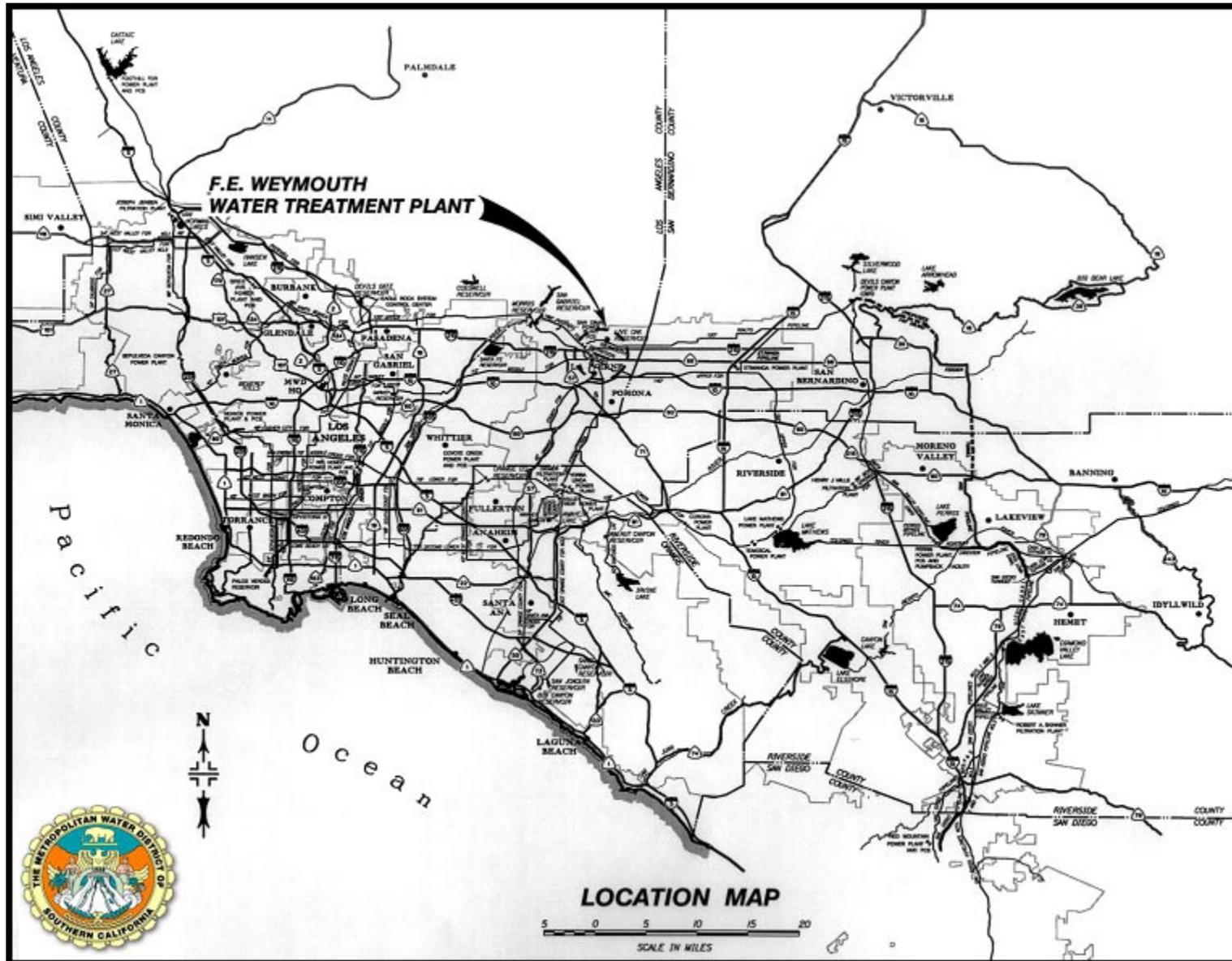
	<b>Board Action No. 1 (May 2006)</b>
Labor	
Owner Costs (Program management, permitting, bidding process)	\$ 414,375
WSO – Review & Support	2,500
Water Quality – Review & Support	22,125
Materials and Supplies	2,000
Incidental Expenses	5,000
Professional/Technical Services	
Final Design – Carollo Engineers	750,000
Asbestos Removal Consultant	3,000
Remaining Budget	169,000
<b>Total</b>	<b>\$ 1,368,000</b>

**Funding Request**

<b>Program Name:</b>	Water Quality Pilot Plant Treatment Facility		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds.		
<b>Appropriation No.:</b>	15431	<b>Board Action No.:</b>	1
<b>Requested Amount:</b>	\$ 1,368,000	<b>Capital Program No.:</b>	05067-W
<b>Total Appropriated Amount:</b>	\$ 1,368,000	<b>Capital Program Page No.:</b>	E-51
<b>Total Program Estimate:</b>	\$ 8,609,000*	<b>Program Goal:</b>	Reliability

\* Capital Investment Plan – Detail in the published FY 2005/06 CIP is incorrect (actual 2005/06 budget is \$5.8 million). Escalation from \$5.8 to \$8.6 million is due to increased construction-related estimates as a result of significant changes to marketplace costs during the past two years. The budgeted 2006/07 CIP detail is updated.

### LOCATION OF EXISTING AND PROPOSED WATER QUALITY PILOT PLANT FACILITY



### LOCATION OF EXISTING AND PROPOSED WATER QUALITY PILOT PLANT FACILITY (Cont.)



**Current Location**

Basement of softener offices (Building no.50)

**Proposed New Location**

Adjacent to the Water Quality Demonstration Plant and staff offices, (to replace building no.12)

