



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

8/17/2010 Board Meeting

8-4

Subject

Appropriate \$4 million; and authorize design and construction of three chlorination projects at the Diemer and Weymouth plants (Approps. 15346 and 15447)

Description

This action authorizes design and construction by Metropolitan forces of three chlorination projects at the Robert B. Diemer and F. E. Weymouth Water Treatment Plants: (1) Addition of a chlorination system to control quagga mussel growth in the ozone system's cooling water equipment at the Diemer plant; (2) An increase of chlorination capacity at the outlet of the filters at the Diemer plant; and (3) An increase of chlorination capacity at the outlet of the filters at the Weymouth plant.

Timing and Urgency

The Diemer quagga mussel control chlorination system is needed to prevent unchecked growth of mussels in the ozone generation equipment's cooling water system. The open-loop cooling water system will rely on untreated water from the plant inlet to cool the ozone generation equipment's heat exchangers. If quagga mussel growth were to occur, shutdown of the ozonation process could be required to physically remove the mussels to prevent equipment overheating and eventual failure. Construction of the Diemer ozonation facilities is currently underway and is planned to be completed in mid-2012. In order for the quagga mussel control chlorination system to be complete when the ozone system commences operation, final design and construction should proceed at this time.

The existing chlorine systems at the Diemer and Weymouth plants do not have sufficient post-filtration chlorination capacity to enable the plants to meet water quality goals at maximum flow conditions, once the ozonation facilities become operational and the filters become biologically active. In order to meet the planned completion date for the Diemer ozonation facilities, final design and construction of the Diemer post-filtration chlorination capacity increase should proceed at this time. Similar post-filtration chlorination capacity increase projects have been completed at the Mills and Skinner plants, and will be completed at the Jensen plant in late 2010.

Final design of the Weymouth Oxidation Retrofit Program (ORP) is also currently underway. To efficiently integrate the Weymouth ORP and post-filtration chlorination design efforts and to avoid future construction interferences, final design and construction of the Weymouth chlorination work should proceed at this time.

These projects have been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria. The chlorination project to control quagga mussel growth is categorized as an Infrastructure Upgrade project, while the two post-filtration chlorination projects are categorized as Water Quality projects. Each is included within Metropolitan's reprioritized capital budget for fiscal year 2010/11.

Background

The Diemer plant was placed into service in 1963 and has a current treatment capacity of 520 million gallons per day (mgd). It delivers a blend of waters from the Colorado River Aqueduct and the State Water Project to

Orange County and to parts of Metropolitan's Central Pool portion of the distribution system. The Weymouth plant was placed into service in 1941 and also has a current treatment capacity of 520 mgd. It delivers a blend of waters from the Colorado River Aqueduct and State Water Project to Metropolitan's Central Pool.

Project No. 1 - Diemer Chlorination System for Ozone Cooling Water – Final Design, Procurement and Construction (\$1,600,000)

In October 2008, quagga mussels were discovered in the raw water entering the Diemer plant. Once the Diemer ozonation facilities commence operation in 2012, continuous chlorination of untreated water entering the plant will be halted because the presence of chlorine in the ozonation system is undesirable. Continuous chlorination would corrode stainless steel components in the new ozone contactors, degrade the catalysts in the ozone off-gas destruction system, and raise levels of raw water disinfection by-products, which counteracts the purpose of adding ozone as the primary disinfectant.

When continuous chlorination is halted, the untreated water drawn from the plant's inlet conduit to cool the ozone generation equipment's heat exchangers will likely contain quagga mussels. The growth of quagga mussels in the heat exchangers, if unchecked, would inhibit flow through the heat exchangers and lead to overheating and eventual failure of the ozone generation equipment.

Staff recommends proceeding with design and construction of a chlorination system to control the growth of quagga mussels in the open loop cooling water system. Metropolitan staff will design the chlorination system, procure chlorine equipment and piping, extend existing chlorine piping within the plant, and install a chlorine injection system at the inlet of the cooling water pumping station. Construction is scheduled to be completed before the Diemer ozonation facilities commence operation in mid-2012. In 2009, Metropolitan staff completed the construction of a similar quagga mussel chlorination system at the Skinner plant, and has successfully operated since that time.

This action appropriates \$1.6 million and authorizes final design, procurement of materials, and construction to provide a chlorination system to control quagga mussel growth in the Diemer ORP open cooling water loop. All work will be performed by Metropolitan staff. The appropriated funds include \$43,000 for preliminary design; \$163,000 for final design and preparation of drawings; \$505,000 for materials, supplies, and equipment; \$635,000 for construction by Metropolitan forces; \$60,000 for technical support and inspection during construction; \$74,000 for project management and record drawings; and \$120,000 for remaining budget. The anticipated cost of final design as a percentage of the construction cost is approximately 14.3 percent. Engineering Services' goal for design of projects with construction cost less than \$3 million is 9 to 15 percent. The total cost of construction of this quagga mussel control project is estimated to be \$1.14 million.

Projects Nos. 2 and 3 - Diemer and Weymouth Post-Filtration Chlorination Capacity Increase – Final Design, Procurement and Construction (\$1,000,000 -Diemer; \$1,400,000 - Weymouth)

Chlorine was originally used as the primary disinfectant at all five of Metropolitan's treatment plants. In response to stricter water quality regulations, Metropolitan initiated the ORP to add ozonation at all five plants in order to meet the maximum contaminant level and treatment technique requirements of the U.S. EPA's Disinfectants/Disinfection By-Products Rule (D/DBP Rule).

When ozone disinfection commences at the Diemer and Weymouth plants, the chlorine dosage supplied at the filter outlet channel will need to be increased because chlorination at upstream locations will be eliminated or significantly reduced in order to meet the D/DPB Rule requirements. The filter outlet chlorine increase will have minimal impact on the formation of chlorinated byproducts such as trihalomethanes, as ammonia is added to form chloramines, which produce significantly fewer chlorinated by-products. This increase, however, will be adequate to control bacteriological growth in the distribution system. Studies have shown that increasing the post-filtration chlorine dose from 4 mg/L to 6 mg/L is required to generate adequate chloramine residuals.

In October 2009, Metropolitan's Board authorized preliminary design of the post-filtration chlorination capacity increase at the Diemer and Weymouth plants. Similar projects were previously authorized for the Mills, Jensen, and Skinner plants. To provide the needed chlorination capacity increase at Diemer and Weymouth, staff recommends increasing the capacity of existing chlorinators serving the filter outlet injection points; replacing

existing ejectors with higher capacity ejectors; modifying existing chlorine piping; and adding new piping to supply chlorine gas and potable water to the new ejectors. Preliminary design has been completed, and staff recommends proceeding with final design, procurement and construction at this time.

This action appropriates \$2.4 million and authorizes final design, procurement, and construction to increase the chlorination capacity at the outlet of the filters at the Diemer and Weymouth plants to aid in compliance with water quality regulations. All work will be performed by Metropolitan staff.

For the Diemer project, the appropriated funds include \$111,000 for engineering design and preparation of drawings; \$305,000 for materials, supplies, and equipment; \$450,000 for construction by Metropolitan forces; \$60,000 for technical support and inspection during construction; and \$74,000 for project management and record drawings. The construction cost for the Diemer project is estimated to be \$755,000.

For the Weymouth project, the appropriated funds include \$162,000 for engineering design and preparation of drawings; \$495,000 for materials, supplies and equipment; \$605,000 for construction by Metropolitan forces; \$65,000 for technical support and inspection during construction; and \$73,000 for project management and record drawings. The construction cost for the Weymouth project is estimated to be \$1.1 million.

The anticipated cost of final design as a percentage of the construction cost for these two projects is approximately 14.7 percent. Engineering Services' goal for design of projects with construction cost less than \$3 million is 9 to 15 percent.

Summary

This action appropriates \$4 million; authorizes final design and Metropolitan force construction of a chlorination system for the ozone equipment cooling water loop at the Diemer plant; and authorizes post-filtration chlorination capacity increase projects at the Diemer and Weymouth plants. These projects have been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds have been included in the fiscal year 2010/11 capital budget. The work will be performed under two capital appropriations. See [Attachment 1](#) for the Financial Statements and [Attachment 2](#) for the Location Map.

These projects are consistent with Metropolitan's goals for sustainability by protecting water quality and maintaining reliable water deliveries in the future.

Project Milestones

August 2011 – Completion of construction of Diemer Chlorination System for Ozone Equipment Cooling Water Loop

October 2011 – Completion of construction of Diemer Post-Filtration Chlorination Capacity Increase

June 2012 – Completion of construction of Weymouth Post-Filtration Chlorination Capacity Increase

Policy

Metropolitan Water District Administrative Code Section 5108: Appropriations

California Environmental Quality Act (CEQA)

CEQA determination for Options #1 and #2:

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed project involves the funding; final design; and minor alterations, reconstruction or replacement of existing public facilities along with the construction of minor appurtenant structures with no expansion of use and no possibility of significantly impacting the physical environment. In addition, the proposed project involves minor modifications in the condition of land, water, and/or vegetation which does not involve removal of healthy, mature, scenic trees. Accordingly, the proposed action qualifies under Class 1, Class 2, Class 3, and Class 4 Categorical Exemptions (Sections 15301, 15302, 15303, and 15304 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed action qualifies under four Categorical Exemptions (Class 1, Section 15301; Class 2, Section 15302; Class 3, Section 15303; and Class 4, Section 15304 of the State CEQA Guidelines).

CEQA determination for Option #3:

None required

Board Options

Option #1

Adopt the CEQA determination and

- a. Appropriate \$4 million;
- b. Authorize final design and construction of the Diemer quagga mussel chlorination control project; and
- c. Authorize final design and construction of post-filtration chlorination capacity increase projects at the Weymouth and Diemer plants.

Fiscal Impact: \$4 million in budgeted funds under the following appropriations:

Approp. 15346: \$2.4 million (Chlorine Containment Program)

Approp. 15447: \$1.6 million (Quagga Mussel Control Program)

Business Analysis: A chlorination system for the Diemer ozone generation equipment's open cooling water loop will prevent quagga mussel infestation and reduce the risk of equipment overheating and failure. Increases in the post-filtration chlorination capacities will aid in reliably meeting Metropolitan's water quality objectives and compliance with drinking water disinfection regulations when the Diemer and Weymouth plants' new ozonation facilities commence operation.

Option #2

Adopt the CEQA determination and

- a. Appropriate \$2.6 million;
- b. Authorize final design and construction of the Diemer quagga mussel chlorination control project;
- c. Authorize final design and construction of the Diemer post-filtration chlorination capacity increase project; and
- d. Do not authorize the Weymouth post-filtration chlorination capacity increase project at this time.

Fiscal Impact: \$2.6 million of budgeted funds under the following appropriations:

Approp. 15346: \$1 million (Chlorine Containment Program)

Approp. 15447: \$1.6 million (Quagga Mussel Control Program)

Business Analysis: Deferral of the Weymouth post-filtration chlorination project until after the Weymouth ORP construction contract is awarded will forego an opportunity to efficiently integrate the design efforts of both projects, which could lead to contractor interferences and additional change orders during construction.

Option #3

Do not proceed with the three chlorination projects at this time.

Fiscal Impact: None

Business Analysis: Infiltration of quagga mussels in the ozone generation equipment's open cooling water loop would require ozonation process shutdowns to physically remove quagga mussels. When ozonation facilities become operational and the filters are biologically active, the plants would not achieve a chloramine disinfectant residual of 2.5 mg/L under maximum flow deliveries, which could impact downstream water quality.

Staff Recommendation

Option #1



Roy L. Wolfe
Manager, Corporate Resources

7/26/2010
Date



Jeffrey Kightlinger
General Manager

7/30/2010
Date

Attachment 1 – Financial Statements

Attachment 2 – Location Map

Ref# cr12606237

Financial Statement for Chlorine Containment and Handling Facilities Program

A breakdown of Board Action No. 19 for Appropriation No. 15346 for the Diemer and Weymouth Post-Filtration Chlorination Capacity Increase projects* is as follows:

	Previous Total Appropriated Amount (Oct. 2009)	Current Board Action No. 19 (Aug. 2010)	New Total Appropriated Amount
Labor			
Studies and Investigations	\$ 2,185,000 **	\$ -	\$ 2,185,000
Final Design	1,982,650	273,000	2,255,650
Owner Costs (Program mgmt., record drawings., envir. doc.)	3,669,162	147,000	3,816,162
Construction Inspection and Support	9,931,874	125,000	10,056,874
Metropolitan Force Construction	5,286,600	1,055,000	6,341,600
Materials and Supplies	3,833,129	790,000	4,623,129
Incidental Expenses	518,500	10,000	528,500
Professional/Technical Services	8,510,747 **	-	8,510,747
Right of Way Fees	118,000	-	118,000
Land Cost	7,050,000	-	7,050,000
Equipment Use	495,500	-	495,500
Contracts	75,162,651	-	75,162,651
Remaining Budget	5,626,187 **	-	5,626,187
Total	\$ 124,370,000	\$ 2,400,000	\$ 126,770,000

Funding Request

Program Name:	Chlorine Containment and Handling Facilities Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15346	Board Action No.:	19
Requested Amount:	\$ 2,400,000	Capital Program No.:	15346-W
Total Appropriated Amount:	\$ 126,770,000	Capital Program Page No.:	200
Total Program Estimate:	\$ 175,900,000	Program Goal:	W-Water Quality

* The total amounts expended to date on the Diemer and Weymouth Post-Filtration Chlorination Capacity Increase projects are approximately \$105,000 and \$125,000, respectively.

** Includes previous reallocation of \$371,000 from Remaining Budget to Studies & Investigations (\$270,000) for CUF Chlorine Containment preliminary design; to Professional/Technical Services (\$86,000) for Jensen Post-Filtration Chlorination Capacity Increase final design; and to Professional/Technical Services (\$15,000) for security upgrades at the Diemer Chlorine Containment Facility.

Financial Statement for Quagga Mussel Control Program

A breakdown of Board Action No. 5 for Appropriation No. 15447 for the Diemer Chlorination System for Ozone Cooling Water project* is as follows:

	Previous Total Appropriated Amount (Jun. 2009)	Current Board Action No. 5 (Aug. 2010)	New Total Appropriated Amount
Labor			
Studies and Investigations	\$ 503,900	\$ -	\$ 503,900
Preliminary Design	314,500	43,000	357,500
Final Design	1,174,000	163,000	1,337,000
Owner Costs (Program mgmt., record drawings., envir. doc.)	889,900	74,000	963,900
Construction Inspection and Support	-	60,000	
Metropolitan Force Construction	3,898,600 **	635,000	4,533,600
Materials and Supplies	2,497,600	500,000	2,997,600
Incidental Expenses	37,000	5,000	42,000
Professional/Technical Services	585,000	-	585,000
Equipment Use	30,000	-	30,000
Contracts	425,000 **	-	425,000
Remaining Budget	324,500 **	120,000	444,500
Total	\$ 10,680,000	\$ 1,600,000	\$ 12,220,000

Funding Request

Program Name:	Quagga Mussel Control Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15447	Board Action No.:	5
Requested Amount:	\$ 1,600,000	Capital Program No.:	15447-S
Total Appropriated Amount:	\$ 12,193,000	Capital Program Page No.:	313
Total Program Estimate:	\$ 15,922,000	Program Goal:	S-Supply and Delivery Reliability

* This action is the initial appropriation for the Diemer Chlorination System for Ozone Cooling Water project.
 ** Includes previous reallocation of \$275,000 from Remaining Budget to Metropolitan Force Construction (\$75,000) for the Copper Basin Chlorination System construction; and Contracts (\$200,000) for the Lake Mathews Chlorination System construction.

Robert B. Diemer and F. E. Weymouth Water Treatment Plants

