

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

August 16, 2005 Board Meeting

7-9

Subject

Appropriate \$980,000; and authorize four power system rehabilitation projects within the Water Treatment Plant Improvements Programs (Approps. 15369, 15380, 15381)

Description

Capital programs have been established to maintain reliability and improve operating efficiency at each of Metropolitan's five water treatment plants, and to comply with drinking water and environmental regulations. These five treatment plants were initially placed into service between 1941 and 1978, and have been expanded several times. With each project, the plants' electrical systems have also been expanded or adapted to accommodate the increasing electrical loads. The addition of ozone will further tax the older electrical systems at the Weymouth and Diemer water treatment plants.

Metropolitan's current approach to treatment plant reliability is to ensure that a single random event will not cause the complete shutdown of a plant. When the Weymouth and Diemer plants were initially designed, the electrical system was designed as a radial system, with power running through a single path to each local Unit Power Center (UPC) for distribution to powered equipment. This practice of powering all the components of a critical system from a single electrical source leaves the plant vulnerable to a shutdown caused by a single failure in the power system. Many critical electrical components at the Weymouth plant are over 60 years old and many are over 40 years old at the Diemer plant, which increases the possibility of equipment shutdowns.

Staff has conducted assessments to evaluate vulnerabilities of Metropolitan treatment plants and to identify cost-effective options to address risks through rehabilitation, repair, or replacement work. These assessments have been completed for the Skinner, Weymouth and Diemer plants, and are in progress for Mills and Jensen. Recommended electrical system upgrades have been incorporated into the Skinner Expansion No. 4 and Oxidation Retrofit Program (ORP) designs. At this time, four projects are recommended to proceed at the Weymouth, Diemer, and Mills plants.

This board action appropriates \$980,000 for four power system rehabilitation projects and authorizes preliminary design of the Weymouth power system upgrades, design and installation of four microturbines at the Weymouth plant, study of Diemer power reliability, and final design of Mills ground fault protection upgrades. These four projects have 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.

Weymouth Water Treatment Plant Improvements Program**Weymouth Power System Upgrades – Preliminary Design (\$345,000)**

Principal components of the electrical system at the Weymouth plant date to the plant's original construction in 1941. Since that time, the electrical system has been expanded and adapted for subsequent projects without changing the fundamental design of the original system. The upcoming ORP facilities will more than triple the power demand of the Weymouth plant and will be required to meet up-to-date electrical standards. In May 2005, Metropolitan's Board authorized a study to evaluate the Weymouth plant's aging electrical infrastructure, to address compatibility of the existing system with the planned ozone facilities, and to identify cost-effective solutions to ensure continued reliable operation.

Several weaknesses were identified in the Weymouth plant electrical system including the following:

- A single 64-year old UPC provides electricity to the flocculation and clarification equipment in all eight basins, the filter valves in all 48 filters, the influent chemical feed systems, the plant control system, the chlorine system, and Metropolitan's information technology hub. A single failure of an electrical component in this UPC could jeopardize operation of the Weymouth plant.
- Electrical load studies indicate that several circuits may be periodically overloaded and that several motor control centers and circuit breakers are undersized.
- The electrical system at the Weymouth plant employs an obsolete 2,400-volt system to distribute power throughout the plant. Current industry standard is 4,160 volts for main distribution and to feed large motors.
- The currently installed emergency generator has inadequate capacity to supply the plant when operating at design flow during the summer.
- The ground fault protection system at the Weymouth plant is an outdated system which protects the faulted item and other connected equipment by shutting down the entire UPC serving all connected equipment instead of isolating the faulted item alone.

As a result of this study, staff recommends the following improvements to the electrical system at the Weymouth plant:

- Installation of five new UPCs so that critical process systems are powered by more than one source;
- Replacement of the existing 2,400-volt distribution system with 4,160-volt distribution system;
- Addition of an emergency generator to ensure operation at full capacity in the event of a utility power outage; and
- Upgrade of the grounding system to reduce the potential for plant shutdowns caused by electrical ground faults.

The new power system will be closely coordinated with the upcoming ozone facilities to ensure cost-effective implementation of needed improvements. In addition to preliminary design of the upgrades, detailed layouts will be developed to ensure that new equipment can be located in the available space. In addition, construction sequencing will be developed to plan for any required electrical system shutdowns; and a construction cost estimate will be prepared.

Staff recommends that the preliminary design be performed by a consultant, Lee & Ro, Inc., under an existing professional services agreement. Lee & Ro was selected through a competitive process (Request for Qualifications [RFQ] 578) to perform this type of work, and authority to enter into the agreement was approved by Metropolitan's Board in June 2003. No amendment to the Lee & Ro agreement is required for this work.

This action appropriates \$485,000 and authorizes preliminary design of power system upgrades at the Weymouth plant. Staff plans to return to the Board in fall 2006 to initiate final design.

Weymouth Microturbines – Design and Installation (\$315,000)

To combat rising air pollution levels, the SCAQMD has offered free, natural gas-powered, 60-kW microturbines to Metropolitan. Metropolitan staff entered into an agreement with the SCAQMD to install four natural gas-powered microturbines at the Weymouth plant. These four microturbines will provide automated, on-line back-up power to the domestic water pumps in the event of a utility power outage. Since the domestic water pumps supply water to the chlorine disinfection system, it is essential that these pumps remain operational during any interruption of electrical service. SCAQMD is providing the microturbines as a clean energy alternative to diesel-powered generation.

Design of the installation and construction of connecting utilities will be performed by Metropolitan staff. Installation of the microturbines and start-up will be performed by a specialty contractor. In addition to furnishing the microturbines and support equipment, SCAQMD will provide funding for the specialty contractor

to perform installation and startup. The total estimated value of equipment and services to be provided by SCAQMD is \$350,000. Construction is scheduled to be completed by April 2006.

This action appropriates \$315,000 for design and construction of connecting utilities by Metropolitan staff, and authorizes installation of four microturbines at the Weymouth plant.

Diemer Water Treatment Plant Improvements Program

Diemer Plant Power Reliability – Study (\$162,000)

A single 12-kV service from SCE provides power to the Diemer plant. The incoming 12-kV service is reduced to 4,160 volts at the main plant switchgear. From this point, power is distributed to three UPCs which vary in age from 42 to 36 years. A single failure of an electrical component in any of the UPCs could shut down the plant until the component is replaced.

In 2003, a loss of SCE power to the Diemer plant initiated startup of the Diemer emergency generators. The emergency power system failed to carry the load. A series of electrical component failures resulted in temporary loss of key process equipment including the plant's chlorine feed system and the chlorine scrubber system. A subsequent failure analysis of the power failure identified the specific cause, which was corrected.

Staff recommends an assessment to evaluate the Diemer plant's aging electrical infrastructure, to address integration of the existing system with the upcoming ozone facilities, and to identify cost-effective solutions to ensure continued reliable operation. The addition of ozone facilities at the Diemer plant will greatly increase the power demand at the plant. Power system upgrades will be closely coordinated with the upcoming ozone facilities.

Staff recommends that this study be performed by a consultant, Camp Dresser & McKee, Inc. (CDM), under an existing professional services agreement. CDM was selected through a competitive process (RFQ 578) to perform this type of work, and authority to enter into the agreement was approved by Metropolitan's Board in June 2003. No amendment to the CDM agreement is required for this work.

This action appropriates \$162,000 and authorizes a power reliability study at the Diemer plant. This study is planned to be completed by June 2006.

Mills Water Treatment Plant Improvements Program

Mills Plant Ground Fault Protection Upgrade – Final Design (\$158,000)

In early 2004, an electrical ground fault occurred at the Mills plant due to a pump failure. This isolated event caused a chain reaction of equipment shutdowns, which in turn shut down the entire plant until the problem could be identified and repaired. The ground fault protection system at the Mills plant is an outdated system which protects the faulted item and other connected equipment by shutting down the entire UPC serving all connected equipment instead of isolating the faulted item alone. Up-to-date designs isolate a ground fault for a specific piece of equipment and keep other equipment on-line. Staff recommends upgrading the ground fault protection system on nine of the Mills plant UPCs.

This action appropriates \$158,000 and authorizes final design by Metropolitan staff of ground fault protection upgrades. Final design is planned to be completed by February 2006.

See [Attachment 1](#) for the Financial Statement, and [Attachment 2](#) for the Location Map.

Policy

Metropolitan Water District Administrative Code Section 5108: Capital Project Appropriation
Metropolitan Water District Administrative Code Section 8117: Professional and Technical Consultants
Metropolitan Water District Administrative Code Section 9100(b): Risk Management

California Environmental Quality Act (CEQA)

CEQA determinations for Option #1:

Weymouth Water Treatment Plant - Improvements Program

The environmental effects from the funding, designing, constructing, and operating of the proposed projects, including studies, preliminary design and construction, were originally evaluated in the Final Environmental Impact Report (Final EIR) for the F. E. Weymouth Filtration Plant Ozonation Facilities and Site Improvements Program. The Final EIR was 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). The current board actions are solely based on preliminary design, design and construction for some of the Improvements Program and not on any changes to the approved projects themselves. Hence, the previous environmental documentation acted on by the Board in conjunction with the proposed actions fully comply with CEQA and the State CEQA Guidelines. Accordingly, no further CEQA documentation is necessary for the Board to act on the proposed actions.

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

Diemer Water Treatment Plant - Improvements Program

The proposed actions are exempt under the provisions of CEQA and the State CEQA Guidelines, since they consist of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. These may be strictly for information gathering purposes, or as part of a study leading to an action which a public agency has not yet approved, adopted, or funded (Class 6, Section 15306 of the State CEQA Guidelines).

The CEQA determination is: Determine that the proposed actions are exempt from CEQA pursuant to Section 15306 of the State CEQA Guidelines.

Mills Water Treatment Plant - Improvements Program

The proposed actions are categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed actions involve the funding, design, and minor alterations, reconstruction or replacement of existing public facilities along with the construction of minor appurtenant structures with negligible or no expansion of use and no possibility of significantly impacting the physical environment. Accordingly, the proposed action qualifies under Class 1, Class 2, and Class 3 Categorical Exemptions (Sections 15301, 15302, and 15303 of the State CEQA Guidelines).

The CEQA determination is: Determine that pursuant to CEQA, the proposed actions qualify under three Categorical Exemptions (Class 1, Section 15301; Class 2, Section 15302; and Class 3, Section 15303 of the State CEQA Guidelines).

CEQA determination for Option #2:

None required

Board Options/Fiscal Impacts

Option #1

Adopt the CEQA determinations and

- a. Appropriate \$980,000 in budgeted funds; and
- b. Authorize studies and preliminary and final design for four power system rehabilitation projects.

Fiscal Impact: \$980,000 of budgeted funds under the following appropriations:

- Appropriation 15369 (Weymouth): \$660,000
- Appropriation 15380 (Diemer): \$162,000
- Appropriation 15381 (Mills): \$158,000

Option #2

Do not authorize the four rehabilitation projects. This option will forego an opportunity to reduce the risk of unplanned plant outages.

Fiscal Impact: None

Staff Recommendation

Option #1


 Roy L. Wolfe
 Manager, Corporate Resources

7/14/2005
 Date


 Dennis B. Underwood
 CEO/General Manager

7/27/2005
 Date

Attachment 1 – Financial Statements

Attachment 2 – Location Map

BLA #3771

Financial Statement for Weymouth Water Treatment Plant Improvements Program

A breakdown of Action No. 15 for Appropriation No. 15369 for the Weymouth Water Treatment Plant Improvements Program is as follows:

	Previous Total Appropriated Amount (Jul 2005)	Current Board Action No. 15 (Aug 2005)	New Total Appropriated Amount
Labor			
Studies and Investigations	\$ 1,291,260	\$ 0	\$ 1,291,260
Final Design	531,000	95,000	626,000
Owner Costs (Program management, environmental documentation)	1,923,000	106,000	2,029,000
Construction Inspection and Support	2,351,000		2,351,000
Metropolitan Force Construction	1,148,000	62,000	1,210,000
Materials and Supplies	826,000	112,000	938,000
Incidental Expenses	74,000	4,000	78,000
Professional/Technical Services	4,974,000	238,000	5,212,000
Contracts	24,446,735	0	24,446,735
Remaining Budget	5,471,005	43,000	5,514,005
Total	\$43,036,000	\$ 660,000	\$43,696,000

Funding Request

Program Name:	Weymouth Water Treatment Plant Improvements Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15369	Board Action No.:	15
Requested Amount:	\$ 660,000	Capital Program No.:	15369-I
Total Appropriated Amount:	\$ 43,696,000	Capital Program Page No.:	E-64
Total Program Estimate:	\$ 153,300,000	Program Goal:	I – Infrastructure Reliability

Financial Statement for Diemer Water Treatment Plant Improvements Program

A breakdown of Board Action No. 7 for Appropriation No. 15380 for the Diemer Water Treatment Plant Improvements Program is as follows:

	Previous Total Appropriated Amount (Jun 2005)	Current Board Action No. 7 (Aug 2005)	New Total Appropriated Amount
Labor			
Studies and Investigations	\$1,092,000	\$ 28,000	\$1,120,000
Owner Costs (Program management, environmental documentation)	592,850	36,000	628,850
Final Design	491,900	0	491,900
Construction Inspection and Support	49,250	0	49,250
Metropolitan Force Construction	212,000	0	212,000
Materials and Supplies	447,000	0	447,000
Incidental Expenses	17,000	1,000	18,000
Equipment Use	66,500	0	66,500
Professional/Technical Services	1,382,000	85,000	1,467,000
Contracts	460,000	0	460,000
Remaining Budget	741,500	12,000	753,500
Total	\$5,552,000	\$162,000	\$5,714,000

Funding Request

Program Name:	Diemer Water Treatment Plant Improvements Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15380	Board Action No.:	7
Requested Amount:	\$ 162,000	Capital Program No.:	15380-I
Total Appropriated Amount:	\$ 5,714,000	Capital Program Page No.:	E-28
Total Program Estimate:	\$ 32,118,000	Project Goal:	I- Infrastructure Reliability

Financial Statement for Mills Water Treatment Plant Improvements Program

A breakdown of Board Action No. 6 for Appropriation No. 15381 for the Mills Water Treatment Plant Improvements Program is as follows:

	Previous Total Appropriated Amount (Jun 2005)	Current Board Action No. 6 (Aug 2005)	New Total Appropriated Amount
Labor			
Studies and Investigations	\$ 136,000	\$ 26,000	\$ 145,000
Design and Specifications	513,000	95,000	625,000
Owner Costs (Program management)	184,000	22,000	206,000
Construction Inspection and Support	192,000	0	192,000
Metropolitan Force Construction	117,000	0	117,000
Materials and Supplies	75,000	0	75,000
Incidental Expenses	13,000	1,000	14,000
Professional/Technical Services	21,000	0	21,000
Equipment Use	8,000	0	8,000
Contracts	2,354,000	0	2,354,000
Remaining Budget	404,000	14,000	418,000
Total	\$4,017,000	\$ 158,000	\$4,175,000

Funding Request

Program Name:	Mills Water Treatment Plant Improvements Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15381	Board Action No.:	6
Requested Amount:	\$ 158,000	Capital Program No.:	15381-I
Total Appropriated Amount:	\$ 4,175,000	Capital Program Page No.:	E-48
Program Estimate:	\$ 11,958,000	Program Goal:	I-Infrastructure Reliability

