



- Board of Directors  
*Engineering and Operations Committee*

2/14/2012 Board Meeting

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**8-3**

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### **Subject**

Appropriate \$2.39 million; and authorize (1) preliminary design of control and protection upgrades for Hiram W. Wadsworth Pumping Plant; and (2) agreements with FluidIQs, LLC, and Power-Tech Engineers, Inc. (Approp.15467)

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### **Description**

This action authorizes preliminary design to rehabilitate and upgrade the control and electrical protection systems for Hiram W. Wadsworth pumping plant at Diamond Valley Lake (DVL). These systems operate and protect the pump/generator units, and regulate the pressures and flows between DVL, the Inland Feeder, and the San Diego Canal. This equipment has been in operation for 12 years, requires frequent repair, and has reached the end of the typical industry service life. Currently, the equipment failure rates appear to be accelerating. Without being upgraded, the operational reliability of the facility will diminish. Staff projects that, unless the upgrades are implemented, Metropolitan's revenue from hydroelectric power generation will decline in approximately five years.

### **Timing and Urgency**

In 2010, Metropolitan's Board authorized investigations by Black & Veatch, Inc., to assess the control and electrical protection systems at Wadsworth Pumping Plant. These recently completed studies confirmed that numerous system components are failing and have become obsolete. The aging components include: programmable logic controllers (PLCs) that control the pumping/generation equipment; the data and control communications system; the electrical protection relay system; the vibration monitoring system; and pump/generator power control components. Together, these components control and protect the pumping/generation equipment and the water flow between DVL, the Inland Feeder, and the San Diego Canal.

The service life for this type of equipment is generally 10 years. At the Wadsworth pumping plant, much of the equipment was procured as part of the construction contract more than 15 years ago and the installed equipment has been in continuous service for more than 12 years. Having reached the end of their expected service life, the components are beginning to fail. Further, the manufacturers no longer support these components and spare parts are increasingly difficult to obtain or are unavailable. As a result, the pump/generation system has become less reliable. Staff has proactively responded to this situation by acquiring spare parts from domestic and international sources and by scavenging parts from decommissioned units at the facility. While these actions have been prudent, they can only provide an interim solution. At the present failure rate, the electrical generating capacity and its associated revenue will progressively diminish with substantial loss of capacity anticipated in approximately five years. In addition to lost hydroelectric power revenue, equipment failures may disrupt the automatic control of pressures and flows between DVL, the Inland Feeder and the San Diego Canal, potentially impacting facilities and water deliveries to member agencies.

This project has been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria, and staff recommends moving forward with the upgrades to maintain system reliability and maximize power

generation. This project is categorized as an Infrastructure Refurbishment project and is budgeted within Metropolitan's CIP for fiscal year 2011/12.

### **Background**

The Wadsworth pumping plant, which was commissioned in 2000, can pump water into DVL or generate power as water flows out of the lake. A complex and proprietary in-plant Supervisory Control and Data Acquisition (SCADA) system locally controls the pump/generator units and a variety of electrical components which protect against electrical faults or hydraulic surges. The Wadsworth pumping plant control system is also a component of Metropolitan's distributed SCADA system so that the facility may be remotely operated from the Operations Control Center in Eagle Rock.

Following completion of the Inland Feeder, DVL has been filled exclusively from the Inland Feeder while water has been released to the San Diego Canal through the generators. Power generated from the release of water through the Wadsworth pumping plant was certified in 2010 as a renewable energy source and is now sold into the regional power grid at prices often triple that of nonrenewable energy sources. For fiscal year 2011/12, the projected revenue from hydroelectric generation at Wadsworth pumping plant is \$3.3 million.

Failure of control components may cause single pump/generator units to shut down, or an entire section of the pumping plant, resulting in reduced pump/generation capacity and reliability. While the pump/generator units may be operated manually in limited circumstances, specific risks with this mode of operation would include:

1. *The inability to control pressures and flows at the pumping plant.* Without an automatic control system, flow changes from loss of generation could rapidly draw down the water level in the San Diego Canal and crack or dislodge the canal lining due to water pressure behind the panels.
2. *The limitation or inability to generate power from DVL.* While water could still be withdrawn from DVL by gravity using generator bypass valves, the power generation would cease. Depending on the range of projected equipment failure rates and subsequent loss of generation units, Metropolitan will begin losing approximately 10 percent of the hydroelectric revenue (\$330,000) by 2017, and could lose all hydroelectric revenue (\$3.3 million) by 2022.
3. *The limitation or inability to pump water into DVL.* While State Water Project (SWP) flows may be gravity-fed into DVL via the Inland Feeder, all Colorado River Aqueduct (CRA) flow must be pumped into the lake. CRA water is not currently pumped into DVL due to adequate SWP supplies and to prevent quagga mussel infestation of the reservoir. However, staff has developed a contingency plan to control quagga mussel larvae by chlorination, which would allow pumping into DVL if water supply availability changes, or in the event of an emergency. Depending on equipment failure rates, the progressive loss of pumping capacity into DVL could begin by 2017.

Several of the current Wadsworth Pumping Plant systems are proprietary and unique, making them difficult to support. The planned new control system will follow modern industry open standards, will be consistent with Metropolitan's current electrical protection and control system practices, will be compatible with planned upgrades to the Metropolitan-wide SCADA system, and will not be a proprietary system. This will result in a longer-life system that is more easily supported.

Preliminary design will develop system and operational requirements, the preliminary system design and equipment selection, and a project plan. Following completion of preliminary design, staff will return to the Board for authorization to commence final design. Final design phase activities will include development of complete system and equipment specifications, equipment procurement package, and bidding package for the construction contract. Procurement of the equipment and construction/installation of the equipment will be competitively bid.

### **Hiram W. Wadsworth Pumping Plant Control and Protection Upgrades - Preliminary Design Phase (\$2,390,000)**

The initial investigation identified the scope of the needed upgrades and produced a conceptual design, schedule, and budget for the full-scale work. A risk assessment and value engineering session was included in this effort,

which confirmed the scope and urgency of the upgrades. The preliminary design effort will establish the detailed requirements for upgrading the control system including software and hardware, network communications, electrical protection, vibration monitoring, and pump/generator power controls.

The consulting firm FluidIQs will develop the preliminary design of the plant control and protection upgrades. Additionally, FluidIQs will prepare a project plan for the balance of the project, including final design, procurement, installation, and commissioning; and will prepare schedules and budgetary estimates.

Due to the specialized nature of this work, Owner's Engineering representation and technical oversight are recommended to be performed by Power-Tech Engineers, Inc. Owner's Engineering representation and technical oversight are necessary to assist in areas where Metropolitan does not maintain sufficient technical skills. These areas include high-voltage variable speed reversible pump/generation technology, plant control system programming, control communications, large equipment vibration monitoring systems, distributed protection relay systems, and complete system integration.

Metropolitan's role in the preliminary design phase will be to provide engineering and operational specifications and requirements to the design consultant FluidIQs. Staff will also perform preliminary design of the integration of plant systems to Metropolitan's SCADA system to ensure the ability to control the Wadsworth Pumping Plant from the Operations Control Center in Eagle Rock. Staff will also review and evaluate the design consultant progress submittals, perform quality assurance and quality control of system design against Metropolitan and industry standards, and will perform overall project and contract management.

This action appropriates \$2.39 million and authorizes preliminary design of the Wadsworth Pumping Plant Control and Protection Upgrades. The requested funds include: \$1,491,000 for FluidIQs to perform preliminary design; \$298,000 for Power-Tech to provide Owner's Engineering, submittal review, and design validation services; \$254,000 for Metropolitan staff to provide specifications on pumping plant systems and operation, provide design support, ensure consistency with internal design and operational practices, and perform detailed review of the preliminary design consultant's work; \$87,000 for project management; and \$260,000 for remaining budget. Staff will return to the Board for authorizations to commence final design, procure equipment, and install and commission the new equipment, hardware, and software. The total estimated cost to complete the control and protection upgrades is anticipated to range from \$20 million to \$24 million.

#### **Specialized Technical Support for Control and Protection Upgrades (FluidIQs, LLC) – New Agreement**

FluidIQs specializes in the design and deployment of plant control and equipment protection systems, and has performed similar work for other large utilities. FluidIQs was selected through a multistep competitive process, including Request for Qualifications (RFQ) No. 975, which was issued on March 16, 2011, and Request for Proposals (RFP) No. 993, which was issued on August 17, 2011. Three statements of qualifications, and three resulting proposals, were received and scored by Metropolitan staff. Due to the complex and specific nature of this work, no Small Business Enterprise (SBE) participation level has been established.

This action authorizes an agreement with FluidIQs, in an amount not to exceed \$1,491,000, to perform preliminary design of control and protection upgrades for Wadsworth pumping plant.

#### **Owner's Engineering Services for Control and Protection Upgrades (Power-Tech Engineers, Inc.) – New Agreement**

Power-Tech Engineers specializes in large pump/generation plant design, commissioning, and Owner's Engineering services, and has performed similar work for other large utilities. Power-Tech was selected through a competitive process via RFP No. 989, which was issued on June 27, 2011. For this agreement, Metropolitan established an SBE participation level of at least 18 percent of the agreement value. Power-Tech Engineers, Inc. is a certified Small Business Enterprise and thus achieves 100 percent participation.

This action authorizes an agreement with Power-Tech Engineers, Inc., in an amount not to exceed \$298,000, for technical oversight, Owner's Engineering representation, and third-party review for preliminary design of the control and protection upgrades for Wadsworth pumping plant.

**Summary**

This action appropriates \$2.39 million and authorizes preliminary design of the Hiram W. Wadsworth Pumping Plant Control and Protection Upgrades, authorizes an agreement with FluidIQs to perform preliminary design, and authorizes an agreement with Power-Tech Engineers, Inc. for Owner's Engineering services. This work will be performed under the Water Operations Control Program (Appropriation No. 15467), which was initiated in fiscal year 2010/11. Past work authorized under Appropriation No. 15467 includes the initial investigation which formed the basis for this project. The total appropriated amount for Appropriation No. 15467 will increase from \$450,000 to \$2.84 million.

This work has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds have been included in the fiscal year 2011/12 capital budget. This work is consistent with Metropolitan's goal for sustainability by enhancing the reliability of the controls and protection systems at Wadsworth pumping plant. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

**Planned Actions**

March 2013 – Completion of preliminary design of the Hiram W. Wadsworth Pumping Plant Control and Protection Upgrade project

**Policy**

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Metropolitan Water District Administrative Code Section 5108: Appropriations

Metropolitan Water District Administrative Code Section 8121: General Authority of the General Manager to Enter Contracts

**California Environmental Quality Act (CEQA)**

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CEQA determination for Option #1:

The proposed action is categorically exempt under the provisions of CEQA and the State CEQA Guidelines. The proposed action consists of basic data collection, research and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. This 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. Accordingly, the proposed action qualifies as a Class 6 Categorical Exemption (Section 15306 of the State CEQA Guidelines). In addition, the proposed action is not defined as a project under CEQA because it involves other government fiscal activities, which do not involve any commitment to any specific project which 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 pursuant to CEQA, the proposed action qualifies under a Categorical Exemption (Class 6, Section 15306 of the State CEQA Guidelines) and, further, that the proposed action is not subject to CEQA pursuant to Section 15378(b)(4) of the State CEQA Guidelines.

CEQA determination for Option #2:

None required

**Board Options**

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**Option #1**

Adopt the CEQA determination and

- a. Appropriate \$2.39 million;
- b. Authorize preliminary design of control and protection upgrades at Hiram W. Wadsworth Pumping Plant;
- c. Authorize an agreement with FluidIQs, LLC for preliminary design support, in an amount not to exceed \$1,491,000; and
- d. Authorize an agreement with Power-Tech Engineers, Inc. for Owner’s Engineering services, in an amount not to exceed \$298,000.

**Fiscal Impact:** \$2.39 million in budgeted funds under Approp. 15467

**Business Analysis:** This project will protect Metropolitan’s assets and increase delivery reliability to member agencies by upgrading the Wadsworth pumping plant’s control and protection systems to maintain pumping and generation capacity.

**Option #2**

Do not proceed with the upgrades at this time.

**Fiscal Impact:** None

**Business Analysis:** This option would forego an opportunity to upgrade control and protection systems at Wadsworth pumping plant. Failure to upgrade the control and protection systems will result in a lack of pumping and power generation capacity, and will likely lead to unplanned shutdowns.

**Staff Recommendation**

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Option #1

  
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 Roy L. Wolfe  
 Manager, Business Technology

1/26/2012  
Date

  
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 Jeffrey Lightlinger  
 General Manager

2/2/2012  
Date

**Attachment 1 – Financial Statement**

**Attachment 2 – Location Map**

Ref# bt12611076

## Financial Statement for Water Operations Control Program

A breakdown of Board Action No. 2 for Appropriation No. 15467 for the Wadsworth Pumping Plant Control and Protection Upgrades<sup>1</sup> is as follows:

	<b>Pervious Total Appropriated Amount (May 2010)</b>	<b>Current Board Action No. 2 (Feb. 2012)</b>	<b>New Total Appropriated Amount</b>
Labor			
Studies & Investigations	\$ 285,000	\$ -	\$ 285,000
Owner Costs (program mgmnt., tech. oversight)	-	87,000	87,000
Submittals Review. & Record Dwgs	-	254,000	254,000
Materials & Supplies	-	-	-
Incidental Expenses	5,000	-	5,000
Professional / Technical Services	125,000	-	125,000
FluidIQs, Inc.	-	1,491,000	1,491,000
Power-Tech Engineers, Inc.	-	298,000	298,000
Equipment Use	-	-	-
Contracts	-	-	-
Remaining Budget	35,000	260,000	295,000
<b>Total</b>	<b>\$ 450,000</b>	<b>\$ 2,390,000</b>	<b>\$ 2,840,000</b>

## Funding Request

<b>Program Name:</b>	Water Operations Control Program		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15467	<b>Board Action No.:</b>	2
<b>Requested Amount:</b>	\$ 2,390,000	<b>Capital Program No.:</b>	15467
<b>Total Appropriated Amount:</b>	\$ 2,840,000	<b>Capital Program Page No.:</b>	328
<b>Total Program Estimate:</b>	\$ 22,000,000	<b>Program Goal:</b>	Reliability

<sup>1</sup> The total amount expended to date on the Wadsworth Pumping Plant Control and Protection Upgrades is approximately \$410,000.

# Diamond Valley Lake

