



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

7/12/2016 Board Meeting

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**7-2**

**Subject**

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Appropriate \$950,000; and authorize design and installation of Stage 1 upgrades to the dam monitoring system at Diamond Valley Lake (Approp. 15419)

**Executive Summary**

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This action authorizes design, procurement of equipment, and installation by Metropolitan forces of the initial stage of upgrades to the dam monitoring system at Diamond Valley Lake (DVL). The dam monitoring system measures survey monuments and seepage at the dam, collects monitoring data required by the California Division of Safety of Dams (DSOD), and provides prompt notification in case of potential problems with the dam embankments or foundations.

**Timing and Urgency**

The three rock-fill dams which form DVL are monitored continuously by the lake's dam monitoring system, which transmits the performance data to Metropolitan's Headquarters Building at Union Station and to the Operations Control Center at Eagle Rock. This data is collected to prepare mandatory reports for submission to DSOD, and to provide early indication of any potential problems with the dam embankments or foundations. The current monitoring equipment was installed during the dams' original construction in the late 1990s and no longer functions reliably. A new monitoring system is needed to maintain Metropolitan's ability to continuously monitor dam performance and to comply with the dams' operating permit. The upgrades to the monitoring system will be completed in three stages.

This project has been reviewed with Metropolitan's Capital Investment Plan (CIP) prioritization criteria and is included in the Distribution System Reliability Program. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2016/17.

**Details**

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**Background**

DVL is Southern California's largest surface water reservoir, with a maximum storage capacity of 810,000 acre-feet. DVL was completed in 2000 and is located south of the city of Hemet in Riverside County.

During construction of the three dams at DVL, an extensive monitoring system was installed to provide early warning signs of dam distress and to monitor real-time performance of the embankments and foundations. The dam monitoring system uses a wireless communication network to store and transmit data from approximately 300 monitoring instruments, including 189 piezometers, 74 settlement sensors, 16 weirs and sensors, 15 strong motion accelerographs, eight deformation monitors, four fixed embankment extensometers, and three inclinometers. This information is collected continuously and transmitted through Metropolitan's Wide Area Network (WAN) to the Headquarters Building at Union Station and to the Operations Control Center at Eagle Rock, where it enables continuous monitoring of dam performance, detection of potential conditions requiring prompt response, and preparation of reports that must be submitted regularly to DSOD.

Following 16 years of continuous operation, portions of the dam monitoring network are deteriorating and have begun to fail at an accelerated rate. The instruments are no longer produced, spare parts are increasingly difficult to obtain, and the manufacturer no longer supports the software used by the system. Staff recommends replacement of the following dam monitoring components:

- Weir level sensors and strong motion accelerographs – Sixteen seepage weirs and sensors are installed in manholes along the toes of the dams to measure seepage flow rates and turbidity. Changes in these characteristics are indicators of potential problems in dam performance, and require a rapid response. Fifteen accelerographs are located throughout the three dams. These instruments measure ground motion at the dams caused by seismic events, and provide important information for staff while evaluating the effect of an earthquake on the dams.
- Robotic survey stations – Nineteen robotic survey stations measure 487 permanently installed survey prisms located on the crest and downstream face of the dams and forebay. These instruments perform measurement cycles three times daily, providing over 11,000 measurements each day. These instruments are needed to alert staff of any movement of the dams and forebay as a result of an earthquake, or of erosion of the foundation material due to seepage/leakage.
- Automated data acquisition system – The data acquisition system includes 105 remote monitoring units located on the benches, dam crests, and at the downstream toes of the dams. The remote monitoring units receive and store data generated by the individual monitoring instruments. These units are equipped with a radio system that transmits data through Metropolitan's WAN to the Headquarters Building at Union Station and to the Operations Control Center at Eagle Rock.

In November 2012, Metropolitan's Board authorized preliminary design to upgrade the dam monitoring system, including a condition assessment of all monitoring instruments; detailed evaluation of options for wireless technology upgrades; preparation of environmental documentation; and development of final design criteria.

Preliminary design of the upgrades to the dam monitoring system has been completed, and staff recommends moving forward with the upgrades in three stages. Stage 1, which is the subject of this action, includes procurement and installation of 16 weir level sensors and 15 strong motion accelerographs, preparation of procurement documents for 19 robotic total stations, and preparation of procurement documents for the automated data acquisition system. Stage 2 will include award of a procurement contract for the 19 robotic survey stations, and their installation, while Stage 3 will include award of a procurement contract and installation of the automated data acquisition system. Stage 1 activities are recommended to proceed at this time. Staff will return to the Board in the future for authorization of the Stage 2 and Stage 3 activities.

### **Diamond Valley Lake Dam Monitoring System Upgrades, Stage 1 – Design, Procurement and Installation (\$950,000)**

Planned Stage 1 work includes procurement and installation of the weir level sensors and accelerographs, preparation of procurement documents and receipt of bids for the robotic total stations and the data acquisition system, and design of local upgrades to the WAN system. The level sensor and accelerograph procurement contracts are planned to be awarded under the General Manager's Administrative Code Authority to award contracts of \$250,000 or less, and the instruments will be installed by Metropolitan forces.

This action appropriates \$950,000 and authorizes Stage 1 upgrades to the dam monitoring system at DVL. The requested funds include: \$300,000 for design and preparation of multiple procurement documents; \$224,000 for purchase of the level sensors and accelerographs; \$165,000 for equipment installation by Metropolitan forces; \$26,000 for submittals review, technical support during construction, and preparation of record drawings; \$88,000 for consultations with DSOD, receipt of multiple bids, and project management; and \$147,000 for remaining budget.

The cost of final design as a percentage of the estimated construction cost for all three stages of upgrades is approximately 11 percent. Engineering Services' goal for design of projects with construction cost less than \$3 million is 9 to 15 percent. The construction cost for this project is anticipated to range from \$2.7 million to \$3 million.

This project has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds are available within the fiscal year 2016/17 capital expenditure plan. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for a Location Map.

This project is included within capital Appropriation No. 15419, the Dam Rehabilitation and Safety Improvements Appropriation, which was initiated in fiscal year 2006/07. With the present action, the total funding for Appropriation No. 15419 will increase from \$4.6 million to \$5.55 million.

The total estimated cost to complete this project, including the amount appropriated to date, current funds requested, and future construction costs, is anticipated to range from \$3.3 million to \$3.5 million.

### ***Project Milestones***

December 2016 – Completion of procurement of robotic survey stations

April 2017 – Completion of installation of weir seepage sensors and accelerographs

May 2017 – Award of contract for installation of a data acquisition system

### **Policy**

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Metropolitan Water District Administrative Code Section 5108: Appropriations

### **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 involves the funding, design, and minor alterations, reconstruction or replacement of existing public facilities and 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 action qualifies 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**

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#### **Option #1**

Adopt the CEQA determination that the proposed action is categorically exempt, and

- a. Appropriate \$950,000; and
- b. Authorize design and installation of Stage 1 upgrades to the dam monitoring system at Diamond Valley Lake.

**Fiscal Impact:** \$950,000 of capital funds under Appropriation No. 15419

**Business Analysis:** This project will protect Metropolitan assets, maintain the ability to efficiently comply with DVL's operating permit, and enhance reliability and public safety.

**Option #2**

Do not proceed with the upgrades at this time.

**Fiscal Impact:** None

**Business Analysis:** This option would forgo an opportunity to replace outdated equipment and improve the reliability of the DVL dam monitoring system. Staff would manually collect dam monitoring data and consult with DSOD for potential modifications to DVL's operating permit. Under this option, staff's ability to detect potential conditions at the dams that require prompt response would be diminished.

**Staff Recommendation**

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Option #1

  
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Gordon Johnson  
Manager/Chief Engineer  
Engineering Services  
6/21/2016  
Date

  
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Jeffrey Kightlinger  
General Manager  
6/27/2016  
Date

**Attachment 1 – Financial Statement**

**Attachment 2 – Location Map**

Ref# es12643631

**Financial Statement for Dam Rehabilitation & Safety Improvements Program**

A breakdown of Board Action No. 5 for Appropriation No. 15419 for the dam monitoring system at Diamond Valley Lake<sup>1</sup> is as follows:

	<b>Previous Total Appropriated Amount (Jan. 2014)</b>	<b>Current Board Action No. 5 (July 2016)</b>	<b>New Total Appropriated Amount</b>
Labor			
Studies & Investigations	\$ 857,511	\$ -	\$ 857,511
Owner Costs (Program mgmt., envir. doc.)	355,200	88,000	443,200
Final Design	-	300,000	300,000
Submittals Review & Record Drwgs.	-	26,000	26,000
Metropolitan Force Construction	-	165,000	165,000
Construction Inspection & Support	-	-	-
Materials & Supplies	8,000	223,000	231,000
Incidental Expenses	16,000	1,000	17,000
Professional/Technical Services	2,361,159	-	2,361,159
Contracts	390,000	-	390,000
Remaining Budget <sup>2</sup>	612,130	147,000	759,130
<b>Total</b>	<b>\$ 4,600,000</b>	<b>\$ 950,000</b>	<b>\$ 5,550,000</b>

**Funding Request**

<b>Appropriation Name:</b>	Dam Rehabilitation & Safety Improvements		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15419	<b>Board Action No.:</b>	5
<b>Requested Amount:</b>	\$ 950,000	<b>Budget Page No.:</b>	225
<b>Total Appropriated Amount:</b>	\$ 5,550,000	<b>Total Appropriation Estimate:</b>	\$ 8,900,000

1. The total amount expended to date to upgrade the dam monitoring system at DVL is approximately \$148,000. The total estimated cost to complete the system, including the amount appropriated to date, current funds requested, and future construction costs, is anticipated to range from \$3.3 million to \$3.5 million.

2. Includes previous reallocation of \$98,130 to Remaining Budget from the Spillway Capacity Study and the Dam Automation project, which were completed under budget.

# Distribution System

