



- Board of Directors  
*Engineering and Operations Committee*

3/13/2012 Board Meeting

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**7-8**

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## **Subject**

Appropriate \$170,000; and authorize preliminary design for canal improvements on the Colorado River Aqueduct (Approp. 15438)

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## **Description**

This action authorizes preliminary design to improve the lining along portions of open canal on the Colorado River Aqueduct (CRA). These improvements will prevent water from overtopping the canal's sidewalls during periods of high flow.

### **Timing and Urgency**

There are several locations along the CRA's 63 miles of open canal which have little freeboard during periods of high flows. At these locations, water may overtop the canal's sidewalls and erode the soils behind the concrete lining. Soil erosion could potentially undermine the concrete sidewalls, resulting in damage to the canal's earthen embankments. Improving the canal to contain water at high flow conditions will enhance CRA reliability while allowing Metropolitan to maximize the conveyance of available supplies from the Colorado River.

This project has been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria, and is categorized as an Infrastructure Refurbishment project. Funds for this action are available within Metropolitan's capital expenditure plan for fiscal year 2011/12.

### **Background**

The CRA is a 242-mile-long conveyance system which transports water from the Colorado River to Lake Mathews. The aqueduct was constructed in the late 1930s and was placed into service in 1941. It consists of five pumping plants, 124 miles of tunnels, 63 miles of open canals, and 55 miles of conduits, siphons and reservoirs. The open canals are trapezoidal concrete-lined structures with sloped sidewalls which are entrenched within earthen embankments. Most stretches of the canal are 20 feet wide at the invert and 55 feet wide at the top, with a depth of 11.75 feet.

When the CRA was placed into service in 1941, the maximum flowrate of the system was 600 cubic feet per second (cfs), due to the original number of pumps at each pumping plant. The installation of additional pumps in 1959 permitted an increase in the maximum flowrate to 1,605 cfs. At this flow, the depth of water in the canal is approximately 10.25 feet, leaving a freeboard of 1.5 feet below the top of the canal wall. Freeboard is defined as the vertical distance between the maximum water surface and the top of the canal. Freeboard protects the canal from water which could overtop the liner or earthen embankment due to wind-driven waves, superelevation of the water surface as the flows goes around curves, or changes in the depth caused by canal settlement or deposition in the waterway.

During the mid-1980s, the CRA pumps were upgraded, which increased the system's maximum flowrate to 1,750 cfs. At this maximum flowrate, the canal freeboard is reduced to less than one foot. At certain locations, water overtops the canal sidewalls. These locations are typically found along curves where the velocities are high, at locations where sedimentation occurs, or at low spots where the canal sidewalls may have settled. In the

past, overtopping has resulted in concrete damage to the canal where the water undermined the canal sidewall and eroded the adjacent soil embankment. Overtopping of the canal sidewalls has been observed at several locations between Mile Markers 28 and 104, which are downstream of Copper Basin Reservoir. It is estimated that a total of ten miles of canal may require sidewall extensions to accommodate the system's maximum flowrate.

In some areas where overtopping has been observed, staff previously installed approximately 1.5-foot-high steel plates to extend the top of the canal walls as a temporary measure. A comprehensive permanent solution is needed to ensure that adequate freeboard is available when the CRA is operated at its maximum flowrate, in order to enhance Metropolitan's ability to convey surplus supplies from the Colorado River, and to reduce potential damage to the CRA.

### **CRA Canal Improvements – Preliminary Design Phase (\$170,000)**

The planned project will improve the open canal by extending the sidewalls at several locations between Mile Markers 28 and 104. Different materials such as cast-in-place concrete and concrete masonry units will be considered for the extension. Site grading and drainage improvements will be made in the locations where the sidewalls are extended.

Planned preliminary design phase activities include field surveys, hydraulic modeling, development of final design criteria, preparation of environmental documentation, and development of a construction cost estimate. All work will be performed by Metropolitan staff.

This action appropriates \$170,000 and authorizes preliminary design phase activities for canal improvements along the CRA open canal. Requested funds include \$135,000 for the technical activities described above; \$25,000 for preparation of environmental documentation and a construction cost estimate, and for project management; and \$10,000 for materials and supplies. Staff will return to the Board at a later date for authorization of final design.

This work will be performed under the CRA Reliability Program Phase 2 (Appropriation No. 15438), which was initiated in fiscal year 2006/07. Past work authorized under Appropriation No. 15438 includes the CRA 6.9 kV Fault Current Protection Upgrades, CRA 230 kV Disconnect Switches Replacement, and the Eagle Mountain and Iron Mountain Standby Generator Replacements. The total appropriated amount for this program will increase from \$29,124,000 to \$29,294,000.

This work has been evaluated and recommended by Metropolitan's CIP Evaluation Team, and funds are available within the fiscal year 2011/12 capital expenditure plan. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

This project is consistent with Metropolitan's goals for sustainability by enhancing reliability of the CRA in order to maintain reliable water deliveries in the future.

### **Project Milestone**

July 2012 – Completion of preliminary design of the CRA Canal Improvements

### **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 consists of basic data collection 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).

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).

CEQA determination for Option #2:

None required

**Board Options**

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**Option #1**

Adopt the CEQA determination and

- a. Appropriate \$170,000; and
- b. Authorize preliminary design of canal improvements for the Colorado River Aqueduct.

**Fiscal Impact:** \$170,000 in budgeted funds under Approp. 15438

**Business Analysis:** This option will enhance operational reliability of the CRA under maximum flow conditions.

**Option #2**

Do not proceed with the canal improvements project at this time.


**Fiscal Impact:** None

**Business Analysis:** Under this option, flow through the CRA may be limited to prevent water from overtopping the canal at certain locations.

**Staff Recommendation**

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Option #1

	2/21/2012
Gordon Johnson Manager/Chief Engineer, Engineering Services	Date
	2/28/2012
Jeffrey Kightlinger General Manager	Date

[Attachment 1 – Financial Statement](#)

[Attachment 2 – Location Map](#)

**Financial Statement for CRA Reliability Program Phase 2**

A breakdown of Board Action No. 18 for Appropriation No. 15438 for the CRA Canal Improvements<sup>1</sup> is as follows:

	<b>Previous Total Appropriated Amount (Feb. 2012)</b>	<b>Current Board Action No. 18 (Mar. 2012)</b>	<b>New Total Appropriated Amount</b>
Labor			
Studies & Investigations	\$ 1,261,800	\$ 135,000	\$ 1,396,800
Final Design	1,948,900	-	1,948,900
Owner Costs (Envir. doc., program mgmt)	2,377,090	25,000	2,402,090
Submittal Reviews & Record Dwgs.	393,600	-	393,600
Construction Inspection & Support	1,846,000	-	1,846,000
Metropolitan Force Construction	3,014,700	-	3,014,700
Materials & Supplies	2,352,405	10,000	2,362,405
Incidental Expenses	130,800	-	130,800
Professional/Technical Services	1,607,000	-	1,607,000
Equipment Use/Procurement	25,505	-	25,505
Contracts	12,951,440	-	12,951,440
Remaining Budget	1,214,760	-	1,214,760
<b>Total</b>	<b>\$ 29,124,000</b>	<b>\$ 170,000</b>	<b>\$ 29,294,000</b>

Funding Request

<b>Program Name:</b>	CRA Reliability Program Phase 2		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15438	<b>Board Action No.:</b>	18
<b>Requested Amount:</b>	\$ 170,000	<b>Capital Program No.:</b>	15438-I
<b>Total Appropriated Amount:</b>	\$ 29,294,000	<b>Capital Program Page No.:</b>	290
<b>Total Program Estimate:</b>	\$ 67,891,000	<b>Program Goal:</b>	I-Infrastructure Reliability

<sup>1</sup>This is the initial appropriation for the CRA Canal Improvements project.

### Location Map

