



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

October 13, 2009 Board Meeting

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**7-5**

**Subject**

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Appropriate \$1.19 million; and authorize preliminary design of lining repairs for the Etiwanda Pipeline (Approp. 15441)

**Description**

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This action authorizes preliminary design to repair damaged mortar lining in the Etiwanda Pipeline. The mortar lining has fallen off or has become delaminated from the pipeline's interior surface. The loss of the mortar lining exposes the pipeline to accelerated levels of corrosion and to eventual leakage. Repair of the mortar lining will extend the useful life of the Etiwanda Pipeline.

**Timing and Urgency**

A recent inspection of the Etiwanda Pipeline revealed approximately 37 percent of the ¾-inch-thick mortar lining within the pipeline had fallen off or had become delaminated in 245 locations. This failure of interior mortar lining is very unusual and exposes the pipeline to accelerated rates of corrosion and eventual leakage. The integrity of the pipeline remains acceptable at this time. However, more frequent inspection and increased maintenance are anticipated until the lining is repaired. The Etiwanda Pipeline conveys water to the Etiwanda Hydroelectric Plant, which generates as much as \$8.3 million in annual revenues under peak flow conditions. In order to continue operating this renewable energy facility reliably, staff recommends that the work proceed and not be postponed. In order to determine the causes of the extensive mortar loss and the repair work that would prevent reoccurrence of this type of mortar damage, the preliminary design will include a forensic study by an independent industry expert.

This project has been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria and is categorized as an Infrastructure Reliability project. This project is budgeted within Metropolitan's CIP for fiscal year 2009/10.

**Background**

The Etiwanda Pipeline is a 12-foot-diameter, welded steel pipe with pipe thickness varying from ½ inch to 1 inch. The pipeline was constructed in 1993 and is approximately 6.4 miles long. Etiwanda Pipeline North conveys State Water Project (SWP) flows from the Department of Water Resources' Devil Canyon facility via the Rialto Pipeline to the Etiwanda Hydroelectric Plant. Based on pipeline flow rates and the pricing for natural gas, daily revenues for power generation may range up to \$35,000, and annual revenues may reach as much as \$8.3 million. The plant is presently out of service due to the current low SWP allocation.

During a December 2008 shutdown, it was discovered that approximately 37 percent of the Etiwanda Pipeline North's mortar lining had fallen off or had become delaminated at 245 locations. Longitudinal cracks in the lining were also observed. At some locations where the mortar lining had failed, minor corrosion of the steel pipe was found.

Mortar lining typically provides superior corrosion protection for steel pipe. The extensive failure of the mortar lining is highly unusual and is attributed to a combination of several factors: high pressures, fluctuating pressures, and long periods of dry pipe. The first factor relates to the high operating pressures exerted on the pipeline when

the Etiwanda Hydroelectric Plant is operated under peaking mode to maximize power generation revenues. The high pressures result in excessive stresses that crack the mortar lining. The second factor is that flows through the Etiwanda Plant fluctuate daily. The variation of pressures between peak and off-peak flows on a daily basis does not allow cracks in the mortar lining to self-heal. The Etiwanda Pipeline is the only pipeline in Metropolitan's system where pressures fluctuate daily from 240 psi to 320 psi. The third factor occurs when the pipeline is taken out of service for prolonged periods. The cracks in the mortar lining tend to increase in size as the mortar desiccates and shrinks. As a result, the mortar pulls away from the pipe surface and falls to the ground.

The Etiwanda Pipeline was designed in accordance with American Water Works Association (AWWA) standards in place in the early 1990s, but the design did not foresee the current operating conditions with high fluctuating pressures and cycles of long dry periods. This combination of high head fluctuations and periods of extended shutdown are unique in Metropolitan's delivery system. The changing SWP supply availability has also exacerbated the situation. Metropolitan's current design practice is to carefully establish operating criteria, to evaluate the impacts of high and fluctuating pressures, and to attempt to avoid these operating conditions whenever possible.

Although the mortar lining has failed, the integrity of the pipeline remains sound at this time. Over time, the loss of mortar lining will expose the pipeline to accelerated rates of corrosion and eventual leakage.

#### **Etiwanda Pipeline Lining Repair – Preliminary Design Phase (\$1,190,000)**

Repair of the damaged mortar lining has unique constructability challenges due to the widespread nature and number of damaged areas (245 locations over a 6-mile-long reach) and the substantial size (from 200 to 1,000 square feet) of many of the damaged areas. The repairs are expected to include removal of the damaged mortar lining and application of a corrosion-protective coating. While field repair of smaller areas of damaged mortar lining are manageable, field repairs of numerous large areas are unprecedented. Challenges include working in confined spaces, control of dust and moisture, and even application of the corrosion-protective coating before the coating sets up. No industry case studies are available to guide the design team. Inspections and field investigations of the damage are necessary to determine the locations and extent of the damage. Preliminary design activities will determine final repair methods. These activities include: a forensic study using independent industry experts to determine the specific causes of the mortar loss; engineering analyses and development of repair options; assessment of lining materials including sampling and testing; preparation of a preliminary design report; and development of a construction cost estimate. The forensic study will be performed by AECOM, a firm with specialized expertise in pipeline design and construction, as discussed below. Metropolitan staff will perform all studies and assessment activities. Staff will return to the Board at a future date to present the findings and to request authorization for final design.

Preparation of environmental documentation is recommended to be performed by INC/Jones & Stokes Associates, Inc., as discussed below. Metropolitan staff will perform permitting and coordination with resource agencies. As part of the project scope, field-level reconnaissance studies and an assessment of long-term and construction-related impacts will be developed.

This action appropriates \$1.19 million and authorizes preliminary design activities to repair the mortar lining of the Etiwanda Pipeline. The scope of work includes engineering analyses, preparation of a preliminary design report, preparation of environmental documentation, identification of permitting and right-of-way needs, and development of a preliminary cost estimate. Requested funds include \$209,300 for studies and investigations, \$289,000 for preliminary design; \$218,700 for right-of-way, environmental documentation, and program management; \$220,000 for specialized engineering support services; \$120,000 for biological surveys; \$25,000 for supplies and incidentals; and \$108,000 for remaining budget.

This project has been evaluated and recommended by Metropolitan's CIP Evaluation Team and funds have been included in the fiscal year 2009/10 capital budget. See [Attachment 1](#) for the Financial Statement and [Attachment 2](#) for the Location Map.

**Professional Services Agreements**

To execute the Etiwanda Pipeline Lining Repair project, staff recommends that consultants provide assistance in the areas of specialized engineering and environmental mitigation monitoring.

**Specialized Technical Support – New Agreement (No Action Required)**

Technical support for the lining repair is recommended to be performed by AECOM, whose staff includes members of the AWWA Steel Pipe and Mortar Lining Committees, under a new professional services agreement. AECOM was selected through a competitive process to provide engineering services via Request for Qualifications No. 833. For this agreement, Metropolitan has established a Small Business Enterprise (SBE) participation level of 18 percent. The estimated amount of AECOM's services is \$220,000. As a result, this agreement is planned to be awarded by the General Manager under his administrative code authority.

**Environmental Surveys and Documentation – New Agreement (No Action Required)**

Environmental surveys and documentation are recommended to be prepared by INC/Jones & Stokes, Inc. under a new agreement. INC/Jones & Stokes was selected through a competitive process to provide environmental planning services via Request for Qualifications No. 763. For this agreement, due to the specialized nature of the work, Metropolitan did not establish an SBE participation level. The estimated amount of INC/Jones & Stokes' services is \$120,000. As a result, this agreement is planned to be awarded by the General Manager under his administrative code authority.

This project is consistent with Metropolitan's goals for sustainability by enhancing the reliability of the existing distribution system, increasing Metropolitan's use of renewable power and power generation in the future.

***Project Milestones***

June 2010 – Completion of Preliminary Design

**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 \$1.19 million; and
  - b. Authorize preliminary design of the Etiwanda Pipeline Lining Repairs.

**Fiscal Impact:** \$1.19 million in budgeted funds under Approp. 15441

**Business Analysis:** This option will protect Metropolitan’s assets, improve reliability of the Etiwanda Pipeline, and reduce risk of damage to the Etiwanda Power Plant. This project will also permit a reliable source of renewable green energy to continue in operation; the power plant generates revenues of as much as \$35,000 per day when operating.

**Option #2**

Do not proceed with preliminary design of lining repairs.

**Fiscal Impact:** Unknown

**Business Analysis:** Under this option, Metropolitan would defer repair of the damaged lining. This will result in increased corrosion and more frequent inspections, maintenance, and repairs of the pipeline. Deferral may result in increased costs for future repairs.

**Staff Recommendation**

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Option #1

	9/22/2009
Roy L. Wolfe Manager, Corporate Resources	Date

	9/28/2009
Jeffrey Kightlinger General Manager	Date

**Attachment 1 – Financial Statement**

**Attachment 2 – Location Map**

BLA #6610

**Financial Statement for Conveyance and Distribution System Rehabilitation Program – Phase II**

A breakdown of Board Action No. 15 for Appropriation No. 15441 for the Etiwanda Pipeline Lining Repairs project\* is as follows:

	<b>Previous Total Appropriated Amount (Oct. 2009)</b>	<b>Current Board Action No. 15 (Oct. 2009)</b>	<b>New Total Appropriated Amount</b>
Labor			
Studies & Investigations	\$ 658,500	\$ 498,300	\$ 1,156,800
Final Design	1,353,050	-	1,353,050
Owner Costs (Program mgmt, env doc)	1,668,150	218,700	1,886,850
Construction Inspection & Support	328,500	-	328,500
Metropolitan Force Construction	3,792,000	-	3,792,000
Materials and Supplies	620,100	17,000	637,100
Incidental Expenses	489,500	8,000	497,500
Professional/Technical Services	410,500	-	410,500
AECOM	-	220,000	220,000
INC/Jones & Stokes	-	120,000	120,000
Equipment Use	148,000	-	148,000
Contracts	2,286,000	-	2,286,000
Remaining Budget	1,257,700	108,000	1,365,700
<b>Total</b>	<b>\$ 13,012,000</b>	<b>\$ 1,190,000</b>	<b>\$ 14,202,000</b>

<b>Program Name:</b>	Conveyance and Distribution System Rehabilitation Program – Phase II		
<b>Source of Funds:</b>	Revenue Bonds, Replacement and Refurbishment or General Funds		
<b>Appropriation No.:</b>	15441	<b>Board Action No.:</b>	15
<b>Requested Amount:</b>	\$ 1,190,000	<b>Capital Program No.:</b>	15441
<b>Total Appropriated Amount:</b>	\$ 14,202,000	<b>Capital Program Page No.:</b>	277
<b>Total Program Estimate:</b>	\$ 53,850,000	<b>Program Goal:</b>	R-Reliability

\* This action is the initial appropriation for the Etiwanda Pipeline Lining Repairs project.

