- **Board of Directors**
  Engineering, Operations and Real Property Committee

August 20, 2001 Board Meeting

8-3

Subject

Authorize funding for program planning, studies, preliminary design and preparation of environmental documentation for Capital Investment Plan projects: (1) $920,000 for four projects in Appn. 15373, Colorado River Aqueduct Conveyance Reliability Program; (2) $648,000 for four projects in Appn. 15374, Colorado River Aqueduct Pumping Plant Reliability Program

Description

The Colorado River Aqueduct (CRA) is a 242-mile conveyance system designed to transport water from Lake Havasu on the Colorado River to Lake Mathews. The CRA consists of 5 pumping plants, 63 miles of concrete lined canal, 55 miles of cut and cover conduit, and 124 miles of tunnels, inverted siphons, reservoirs and pumping plant piping. The CRA provides a maximum capacity of 1.3 million acre-feet per year under ideal conditions.

Metropolitan staff conducts regular maintenance on the CRA conveyance structures and mechanical and electrical equipment. In the mid-1980s, staff performed major rehabilitation work on the pump units at each pumping plant. Although the pump units and conveyance structures continue to perform today, the system has been in practically continuous service for more than 60 years. Staff recommends rehabilitation, repair or replacement of significant portions of the system to ensure continued reliable performance.

Metropolitan staff initiated the Infrastructure Reliability and Protection Plan (IRPP) in July 2000. The objective of this plan is to evaluate risks and vulnerability of Metropolitan facilities, and to identify cost-effective options to address those risks through rehabilitation, repair or replacement. As part of the IRPP, staff conducted a reconnaissance of the CRA conveyance system and pumping plants from the Whitsett Intake Pumping Plant to the Hinds Pumping Plant. Staff identified numerous items or portions of the system in need of repair, refurbishment or replacement to ensure the reliability and safety of the CRA. Staff organized the identified needs into programs, and submitted them for consideration for the fiscal year 2001/02 Capital Investment Plan (CIP).

The projects addressed by this Board action are organized into the CRA Conveyance Reliability Program and the CRA Pumping Plant Reliability Program. The CRA Conveyance Reliability Program consists of the following projects: (1) Canal Lining Repairs and Associated Work; (2) Reservoir Lining Repairs and Spillway Modifications; (3) Sand Trap Modification at Eagle Mountain; (4) Sand Trap Repairs and Rehabilitation at Iron Mountain, Eagle Mountain and Hinds; (5) Trash Rack Replacement at Eagle Mountain, Iron Mountain and Hinds; (6) Head-Gate Structure Leak and Gate Repairs at All Pumping Plants; (7) Seismic Study of Eagle Mountain Pumping Plant siphons; and an investigation of long-term needs and identification of future projects for implementation during the next five years. Staff recommends four projects for implementation during the 2002/2003 shutdown season: Canal Lining Repairs and Associated Work; Reservoir Lining Repairs and Spillway Modifications; Trash Rack Replacement at Eagle Mountain, Iron Mountain and Hinds; and Head-Gate Structure Leak and Gate Repairs at All Pumping Plants. These four projects are described within the detailed report **(Attachment 1)** and the estimated project costs are shown in **Attachment 2**.

The CRA Pumping Plant Reliability Program consists of the following projects: (1) Circulating Water System Repairs; (2) Main Pump Study; (3) Suction Line and Discharge Line Expansion Joint Repairs; (4) Air Compressor Replacements; and an investigation of long-term needs and identification of future projects to be implemented during the next five years. These four projects are described within the detailed report **(Attachment 3)** and the estimated project costs are shown in **Attachment 4**. It is necessary to begin environmental analysis and conduct site engineering studies in support of these projects as identified above. Staff will return to the Board for

authorization and funding at a later date for final design and construction of these projects, and for authority to proceed with any new project(s) resulting from the long-term investigation. The location of the CRA and associated pumping plants is shown in **Attachment 5**.

The projects described within these two CRA reliability programs were evaluated and recommended by the CIP Evaluation Team and are included in the Capital Budget for FY 2001/02.

Policy

Metropolitan Water District Administrative Code Section 5108: Capital Projects Appropriation

CEQA

The authorization for the program planning, studies, preliminary design, and preparation of environmental documentation for the identified projects in the two CRA reliability programs is exempt under the provisions of the California Environmental Quality Act (CEQA). The proposed action involves only feasibility and planning studies for possible future actions which the lead agency has not yet approved, adopted, or funded, and so therefore does not require the preparation of an Environmental Impact Report (EIR) or Negative Declaration at this time but does require consideration of environmental factors. As such, this proposed action qualifies under the Feasibility and Planning Studies Exemption (Section 15262 of the State CEQA Guidelines). Specific projects with environmental impacts will have appropriate CEQA compliance and will be brought back to the Board for approval.

The CEQA determination is: Determine that the proposed action is exempt per Section 15262 of the State CEQA Guidelines.

Staff Recommendation

Adopt the CEQA determination; and

a. Appropriate $920,000 to finance cost for program planning, studies, preliminary design and preparation of environmental documentation for the four CRA Conveyance Reliability projects as described in this board letter; and
b. Appropriate $648,000 to finance cost for program planning, studies, preliminary design and preparation of environmental documentation for the four CRA Pumping Plant Reliability projects as described in this board letter.

Fiscal Impact: $1.568 million of budgeted CIP funds (of which $920,000 under new Appropriation 15373 and $648,000 under new Appropriation 15374).

Roy L. Wolfe 8/6/2001
Roy L. Wolfe *Date*
Manager, Corporate Resources

Ronald R. Gastelum 8/6/2001
Ronald R. Gastelum *Date*
Chief Executive Officer

Attachment 1 – Detailed Report, CRA Conveyance Reliability Program

Attachment 2 – Financial Statement, CRA Conveyance Reliability Program

Attachment 3 – Detailed Report, CRA Pumping Plant Reliability Program

Attachment 4 – Financial Statement, CRA Pumping Plant Reliability Program

Attachment 5 – Location Map

BLA #1150

CRA Conveyance Reliability Program

Detailed Report

Purpose/Background. The CRA conveyance structures have been in operation for more than 60 years. During this time, Metropolitan has conducted normal repair and maintenance activities to the structures, but little major rehabilitation work has occurred. In 2000, Metropolitan staff initiated the Infrastructure Reliability and Protection Plan (IRPP). The purpose of the IRPP is to evaluate Metropolitan's infrastructure – pumping plants, water treatment plants, conveyance systems, and all associated components – to ensure that Metropolitan can continue to reliably supply high-quality drinking water to its entire service area.

Staff formed a team to implement the IRPP for the CRA conveyance system. The team reviewed existing, planned or ongoing projects and reliability assessments to avoid redundancies. The team obtained input from all staff levels to identify system or component vulnerabilities and risks. The team also performed physical inspections and reviewed maintenance records. Projects were developed and proposed to repair, replace, or rehabilitate systems, structures, or equipment to reduce risks to Metropolitan and increase system reliability. The projects were evaluated and recommended by the CIP Evaluation Team and are included in the Capital Budget for FY 2001/02.

Project Description. The CRA Conveyance Reliability Program comprises seven defined projects and one long-term study and investigation. These projects are: (1) Canal Lining Repairs and Associated Work; (2) Reservoir Lining Repairs and Spillway Modifications at Iron Mountain and Eagle Mountain; (3) Sand Trap Modification at Eagle Mountain; (4) Sand Trap Repairs and Rehabilitation at Iron Mountain, Eagle Mountain, and Hinds; (5) Trash Rack Replacement at Eagle Mountain, Iron Mountain and Hinds; (6) Head-Gate Structure Leak and Gate Repairs at All Pumping Plants; (7) Seismic Study of Eagle Mountain Pumping Plant Siphons; and an investigation of long-term needs and identification of future projects for implementation during the next five years.

At this time, staff recommends authorization to proceed with site engineering studies, preliminary design, and environmental documentation preparation for the following four projects of the identified seven projects within the CRA Conveyance Reliability Program. These four projects are planned for implementation during the 2002/2003 shutdown season.

Canal Lining Repairs and Associated Work

Inspections during the IRPP and other previous investigations have determined that the canal concrete liner, depth gauging stations, access covers and the bedrock cut area at Mile 77 need to be repaired. The canal concrete liner has deteriorated due to severe high and low temperature conditions on the exposed surface as well as subsidence and heaving of the concrete over time. The repairs to the damaged canal lining are essential to the integrity and reliability of the CRA. The existing gauging stations were recording type units and did not provide real-time information on the water elevation in the CRA. The proposed replacement gauging stations would assist the CRA dispatcher by providing real-time information to improve system operation at peak flow. Such devices would also provide timely water surface information to indicate any abnormal canal conditions. Access covers along the aqueduct were found to have seriously deteriorated over time. The canal near Mile 77 goes through a small mountainous area, which has very steep cuts into the mountainside. Boulders, rock and debris may slide down these steep slopes and into the canal. The proposed action will evaluate and recommend short-term repairs related to the bedrock cut area at Mile 77 until a long-term and permanent solution can be designed, along with appropriate environmental documentation. The proposed short-term solution to be studied would involve the installation of approximately 1,700 feet of 8-foot-tall chain link fencing along a portion of the canal. This proposed short-term solution would not protect the CRA in the event of a major slip occurring, but would assist in controlling small slides and minimizing debris from entering the canal.

Reservoir Lining Repairs and Spillway Modifications

The soil asphalt used to line the reservoirs at Iron Mountain and Eagle Mountain plants is original material and has deteriorated due to exposure to temperature extremes, wave action, and severe UV effects. The soil asphalt liner has lasted well beyond its expected useful life and must be repaired to ensure the integrity of the aqueduct system.

Trash Rack Replacement at Eagle Mountain, Iron Mountain, and Hinds

The IRPP team investigated the trash racks located at Iron Mountain, Eagle Mountain, and Hinds plants. The trash racks are original CRA equipment and are exhibiting signs of deterioration resulting from weathering effects and corrosion. Replacement trash racks are required to maintain their effectiveness in keeping debris from entering the pumps. A total of 300 trash racks are installed in the CRA system. Metropolitan has 25 replacement trash racks available for installation. The studies will examine the design of the trash racks and how they will ensure the integrity of the CRA.

Head-Gate Structure Leaks and Gate Repairs at All Pumping Plants

The IRPP team investigated reported leaks in the head-gate structures and deterioration of the steel gates at each pumping plant. The head-gate structures at Intake, Gene, Iron Mountain, and Eagle Mountain plants have developed leaks at the delivery line entry into the head-gate structure. Metropolitan has repaired the head-gate structure leaks in the past, and leakage has reoccurred. Although the Hinds plant head-gate is not leaking at present, staff intends to apply the same repair technique as at the remaining plants as a preventive measure. The gates at each pumping plant have degraded to the point that some areas of the gates have been damaged by corrosion. The studies will evaluate the best approach to repair structure leaks and re-coat the gates at all of the head-gate structures.

The remaining three projects within the CRA Conveyance Reliability Program will require significant planning and the preparation of an Environmental Impact Report. Staff will return for authorization to proceed with these projects at a later date.

Recommendation. Staff recommends the authorization and approval to fund the program planning, study, preliminary design, and preparation of environmental documentation for the four projects described above, and the initiation of a long-term investigation of future needs. Staff will return to the Board for authorization and funding for final design and construction of these projects at a later date.

Actions and Milestones

- November 2001 – Board authorization and funding for final design and construction of these projects. Board authorization to proceed with remaining identified projects.
- March 2002 – Board authorization to award construction contracts.

FINANCIAL STATEMENT

Authorize $920,000 for the program planning, studies, preliminary design, and preparation of environmental documentation for the four CRA Conveyance Reliability Program projects described in this Board action (Appn. 15373)

	BOARD ACTION NO. 1 (Aug. 2001)
Labor	
Owner Costs (Program Management, Environmental Documentation, etc.)	$ 275,000
Studies and Preliminary Design	505,000
Incidental Expenses	5,000
Remaining Budget	135,000
Total	**$ 920,000**

FUNDING REQUEST

Program Name:	Colorado River Aqueduct Conveyance Reliability Program		
Source of Funds:	Construction Funds (possibly General Obligation, Revenue Bonds, Pay-As-You-Go)		
Appropriation No.:	15373	**Board Action No.:**	1
Requested Amount:	$ 920,000	**Capital Program No.:**	01204-I
Total Appropriated Amount:	$ 920,000	**Capital Program Page No.:**	E-12
Total Program Estimate:	$ 14,500,000	**Program Goal:**	I-Infrastructure Reliability

CRA Pumping Plant Reliability Program

Detailed Report

Purpose/Background. The CRA conveyance system includes five pumping plants--Intake, Gene, Iron Mountain, Eagle Mountain, and Hinds. Each plant includes nine pumping units. CRA pumping capacity was installed in several phases. Pumping units 1 through 3 at each plant began operation in 1941. Units 4 and 5 at each plant went on-line in 1956. Unit 6 at each plant began operation in 1958. The final units, 7 through 9, went on-line in 1959. CRA capacity at that time was 1,605 cubic feet per second (cfs). Metropolitan initiated a program in 1962 to increase pump capacity at Gene, Iron Mountain, Eagle Mountain, and Hinds pumping plants. Pump unit performance was improved by enlarging the unit impeller diameter and modifying the angle of the vanes at the impeller discharge. These pump modifications, combined with the addition of curbing at selected canal locations, and reduction of biological fouling of concrete surfaces, resulted in an approximately 10 percent increase in CRA capacity. Further improvements in chlorinating the system began in 1977. Today, CRA pumping capacity is approximately 1,800 cfs.

Metropolitan's Desert facilities staff perform regular maintenance on pumping unit mechanical and electrical equipment. In 1984-1985, Metropolitan staff initiated the Colorado River Aqueduct Pumping Plant Rehabilitation (CRAPR) project based upon findings from equipment inspections that indicated the pumping units were approaching the end of their expected useful life. The CRAPR project included extensive testing and evaluation of the pumps and motors, replacement of impellers, rehabilitation of the motor fire protection systems and motor transformers. The majority of items included in the current Board action were not part of the CRAPR project.

Metropolitan staff initiated the Infrastructure Reliability and Protection Plan (IRPP) in July 2000. The objective of this plan is to evaluate risks and vulnerability of Metropolitan facilities, and to identify cost-effective options to address those risks through rehabilitation, repair, or replacement. During September – October 2000, Metropolitan staff conducted a reconnaissance of the CRA conveyance system from the Intake Pumping Plant to the Hinds Pumping Plant. During these inspections, staff documented numerous items related to the pumping units and auxiliary systems that were in need of repair, refurbishment, or replacement, and organized this work into projects. The projects were evaluated and recommended by the CIP Evaluation Team and are included in the Capital Budget for FY 2001/02.

Project Description. Projects associated with the operation and performance of the pumping units are organized into the CRA Pumping Plant Reliability Program. This program includes four defined projects and one long-term investigation. These projects are: (1) Circulating Water System Repairs; (2) Main Pump Study; (3) Suction Line and Discharge Line Expansion Joint Repairs; (4) Air Compressor Replacement; and an investigation of long-term needs and identification of future projects for implementation during the next five years.

At this time, staff recommends authorization to proceed with site engineering studies, preliminary design, and environmental documentation preparation for the four projects within the CRA Pumping Plant Reliability Program.

Circulating Water System Repairs

The circulating water system at each pumping plant is comprised of pumps, storage tank, piping, valves and appurtenances. This system provides source water for all cooling applications throughout the pumping plant. Reliable operation of this system is crucial to maintain pump operation. Staff investigations have found several deficiencies in the circulating water systems at the pumping plants. These deficiencies, if not corrected, could result in the failure of the system, resulting in the unplanned shutdown of pumping units. Certain deficiencies were identified for immediate corrective actions: repair deteriorated concrete water storage tanks; replace leaking pipes supplying cooling water to the pumps and motors; and replace deteriorated emergency supply valves. Other components in the circulating water system are recommended for immediate study. The pumps used to provide source water for the circulating water system are original plant equipment and subject to extensive maintenance and repair work. Staff recommends authorization of a study to evaluate current conditions of the circulating water pumps, motors, motor starters, valves, and other system components.

Main Pump Study

As previously indicated, the main pumps were subject to extensive testing and some rehabilitation in the CRAPR project in 1985. During the IRPP investigations in 2000, staff identified a number of potential reliability concerns for further evaluation. The majority of these items were not addressed during the CRAPR project. The main pump study authorized by this Board action will evaluate the motor exciter equipment, leaking discharge valves, automation of discharge valves, isolation gates for pump discharge lines, packing flush systems, pump bearing conditions, external cooling systems, stationary seal ring problems, motor oil vapor extraction system, rotating packing sleeve problems, self-loading and self-leveling thrust bearing systems, and tear-down maintenance manuals.

Suction Line and Discharge Line Expansion Joint Repairs

Pump unit 1 discharge lines at each pumping plant are constructed with riveted, lead-packed expansion joints. Past minor joint leakage has occurred at several locations. Previous repair attempts have resulted in restricting proper movement of the expansion joints. Staff recommends implementing a study to evaluate the condition of the expansion joints, assess their degree of movement, and evaluate repair options.

Air Compressor Replacement

Station compressed air is supplied at each pumping station to operate pneumatic control systems, pneumatic tools, provide automotive services, and other miscellaneous applications. High pressure (250 psig) is also available at each plant to operate the pump discharge valves. IRPP investigations confirmed that current air compressors have reached the end of their economic useful life. Several station air compressors have failed and require immediate replacement. The high-pressure compressors were found to have reached similar conditions. At this time staff recommends a study to evaluate and recommend the proper equipment to replace air compressors located at each pumping plant.

Staff will return to the Board at a later date to request authorization to implement recommendations from the studies described in this Board action.

Recommendation. Staff recommends the authorization and approval to fund the program planning, study, preliminary design, and preparation of environmental documentation for the four projects described above, and the initiation of a long-term investigation of future needs. Staff will return to the Board for authorization and funding at a later date for final design and construction of these projects, and for authority to proceed with any new project(s) resulting from the long-term investigation.

Actions and Milestones

- March 2002 – Board authorization and funding for final design and construction of the projects.

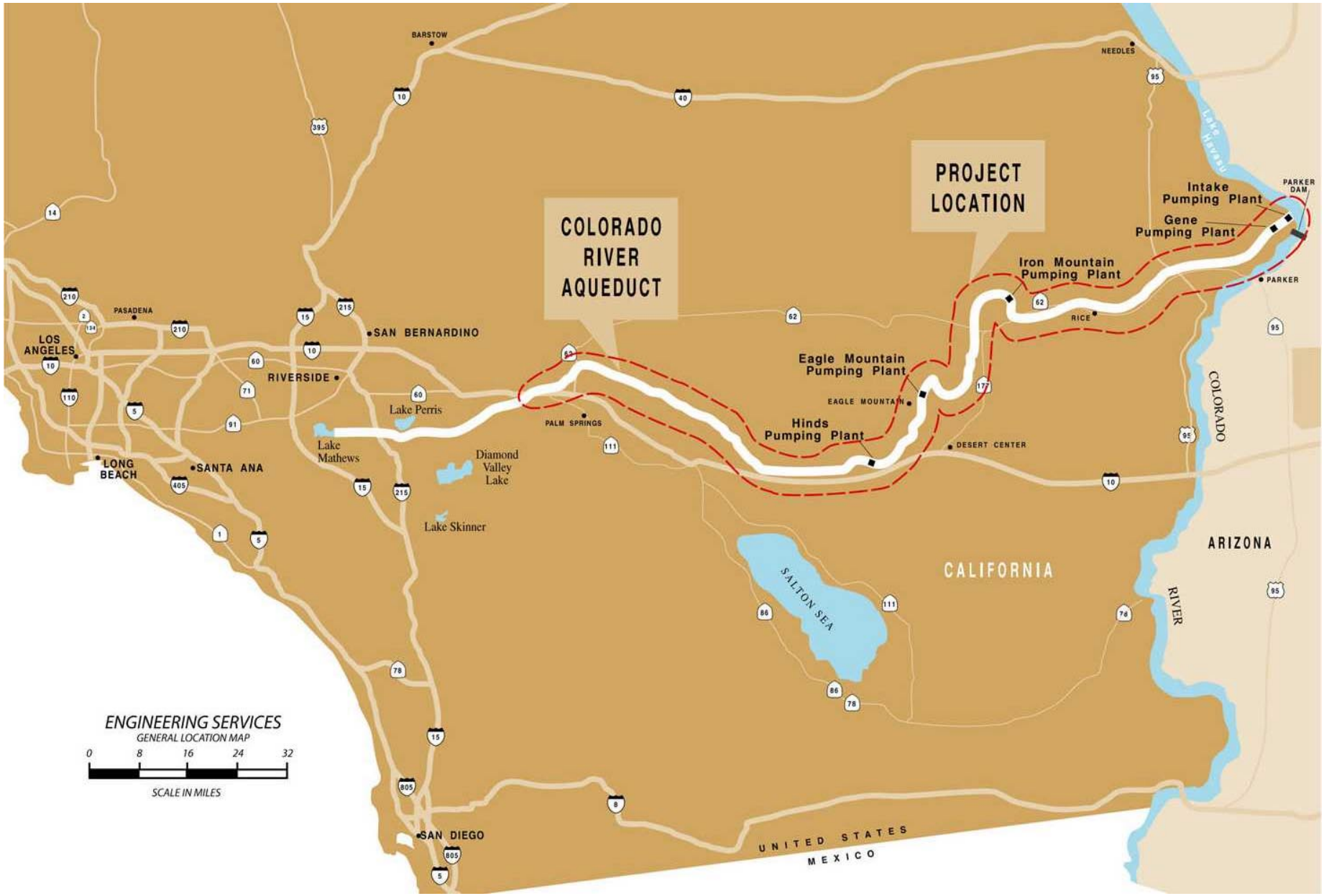
FINANCIAL STATEMENT

Authorize $648,000 for the program planning, studies, preliminary design, and preparation of environmental documentation for the four CRA Pumping Plant Reliability Program projects as described in this Board action (Appn. 15374)

	BOARD ACTION NO. 1 (Aug. 2001)
Labor	
Owner Costs (Program Management, Environmental Documentation, etc.)	$ 59,000
Studies and Preliminary Design	500,000
Incidental Expenses	5,000
Remaining Budget	84,000
Total	**$ 648,000**

FUNDING REQUEST

Program Name:	Colorado River Aqueduct Pumping Plant Reliability Program		
Source of Funds:	Construction Funds (possibly General Obligation, Revenue Bonds, Pay-As-You-Go)		
Appropriation No.:	15374	**Board Action No.:**	1
Requested Amount:	$ 648,000	**Capital Program No.:**	01210-I
Total Appropriated Amount:	$ 648,000	**Capital Program Page No.:**	E-14
Total Program Estimate:	$ 11,900,000	**Program Goal:**	I-Infrastructure Reliability


COLORADO RIVER AQUEDUCT
PROJECT LOCATION
Intake Pumping Plant
Gene Pumping Plant
Iron Mountain Pumping Plant
Eagle Mountain Pumping Plant
Hinds Pumping Plant
PARKER DAM
PARKER
RICE
EAGLE MOUNTAIN
DESERT CENTER
PALM SPRINGS
NEEDLES
BARSTOW
SAN BERNARDINO
RIVERSIDE
PASADENA
LOS ANGELES
LONG BEACH
SANTA ANA
SAN DIEGO
Lake Perris
Lake Mathews
Diamond Valley Lake
Lake Skinner
SALTON SEA
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GENERAL LOCATION MAP
0 8 16 24 32
SCALE IN MILES