



Engineering, Operations, & Technology Committee

Update on Rehabilitation of the Colorado River Aqueduct

Item 6a

April 8, 2024

Item 6a
Update on
Rehabilitation of the
Colorado River
Aqueduct

Subject

Overview of the Colorado River Aqueduct System

Purpose

Provide an update on the rehabilitation of the Colorado River Aqueduct

Agenda

- Background
- CRA shutdowns & maintenance activities
- CRA reliability goals
- Capital projects
- Planned expenditures

Location Map



Update on Rehabilitation of the Colorado River Aqueduct

Background

- Original Construction - 1933 to 1941
 - Five pumping plants
 - Three 200 cubic feet per second (cfs) pumps per plant
 - One delivery line/plant
 - Total capacity approx. 600 cfs
- Expansion - 1954 to 1959
 - Six additional pumps/plant
 - Two additional delivery lines/plant
 - Total capacity approx. 1,600 cfs
- Partial Refurbishment - 1987 to 1992
 - Refurbished all pumps to achieve 225 cfs/pump
 - Total capacity approx. 1,750 cfs



Intake Pumping Plant
1955

Major Components of the CRA



1. Conveyance System



2. Pumping Plants



3. Electrical System



4. Support Infrastructure

CRA Conveyance System

- 242 total miles
- 92 miles of tunnels
- 63 miles of open canal
- 55 miles of cut-and-cover conduit
- 29 miles of siphons
- 4 reservoirs
- 1.25 MAF annual delivery capacity



CRA Open Canal

Importance of CRA System

- Primary source during limited State Water Project (SWP) supplies
- Runs continuously all year except for one month
 - 2021: 8-pump flow 4 months & 7-pump flow 6 months
 - 2022: 8-pump flow 9 months
- Regular maintenance activities & annual shutdown conducted to sustain reliability of the system
 - Regular staff - 133 & recurrent staff - 18
 - Staff doubled during 2024 shutdown



Eagle Mountain Transition Joint Repairs

CRA Shutdowns & Maintenance Activities

- Tunnels, canal & siphon cleanings
- Electrical testing of equipment for code requirements
- Powerline maintenance & repairs
- Equipment replacement/rehabilitation within the pump plants, as required
- Maintenance of access roads & diversion dikes
- Quagga mussel control (dry out the system)



Hinds PP Discharge Valve Packing



Sand Removal at Iron Mountain PP



Copper Basin 2400V System Isolation

Tunnel Cleaning



Tunnel Cleaning Machine Setup

Tunnel Cleaning Machine at Work



Canal Cleaning



Canal Scraping



Canal Sand Removal

High Voltage Equipment Testing



Transformer Testing



Switchyard Equipment Testing

Power Line Maintenance and Repairs



230kV Power Line

Pump Unit Maintenance



Iron Mtn PP Pump Unit Maintenance



Unstacking of Pump Unit

Maintenance of Diversion Dikes

200 Miles of Protective Berms
& Drainage Features



SHUT DOWN--Damaged Colorado River Aqueduct structure east of Desert Hot Springs after a 10-foot wall of mud and boulders swept away the hatch and clogged system with debris. Times photo by Andy Hayt

Aqueduct Supplying L.A. Water Closed by Debris

Mud and Rocks From Flash Flood Clog Siphons;
Prolonged Repairs Could Bring Drastic Rationing

1977 Debris Flow



CRA Quagga Mussel Control



Mechanical Removal

Chlorination System



Update on Rehabilitation of the Colorado River Aqueduct

Goals for CRA Reliability

- CRA Reliability Program initiated in 2002
- Maintain CRA system
 - Maximize ability to operate at full hydraulic capacity
 - Minimize single-point-of-failure risks
 - Efficiently & cost-effectively operate under normal conditions using appropriate technologies
- Identify long-term rehabilitation needs
- Execute capital improvements with minimal disruption to aqueduct operations
- Expenditures since 2002: \$298M

Completed Projects



Radial Gates Improvements
\$10.4M (Completed: 2021)



Intake 2.4kV Power Line Upgrades
\$5.5M (Completed: 2018)

Completed Projects



Discharge Line Isolation Couplings
\$32.9M (Completed: 2021)



Iron Mtn. Reservoir & Canal Liner Replacement
\$4.7M (Completed: 2019)

Projects in Construction



CRA Structural Protection
(Planned completion: 2024)
\$8.6M



CRA Overhead Cranes Replacement
(Planned completion: 2024)
\$13.4M

Projects in Construction



Domestic Water Treatment Systems Replacement
(Planned completion: 2025)
\$34M



Flow Monitoring Stations
(Planned completion: 2024)
\$5.3M

Projects in Design



Discharge Structure

Copper Basin Discharge Structure Rehab.
(Planned design completion: 2024)
\$15M

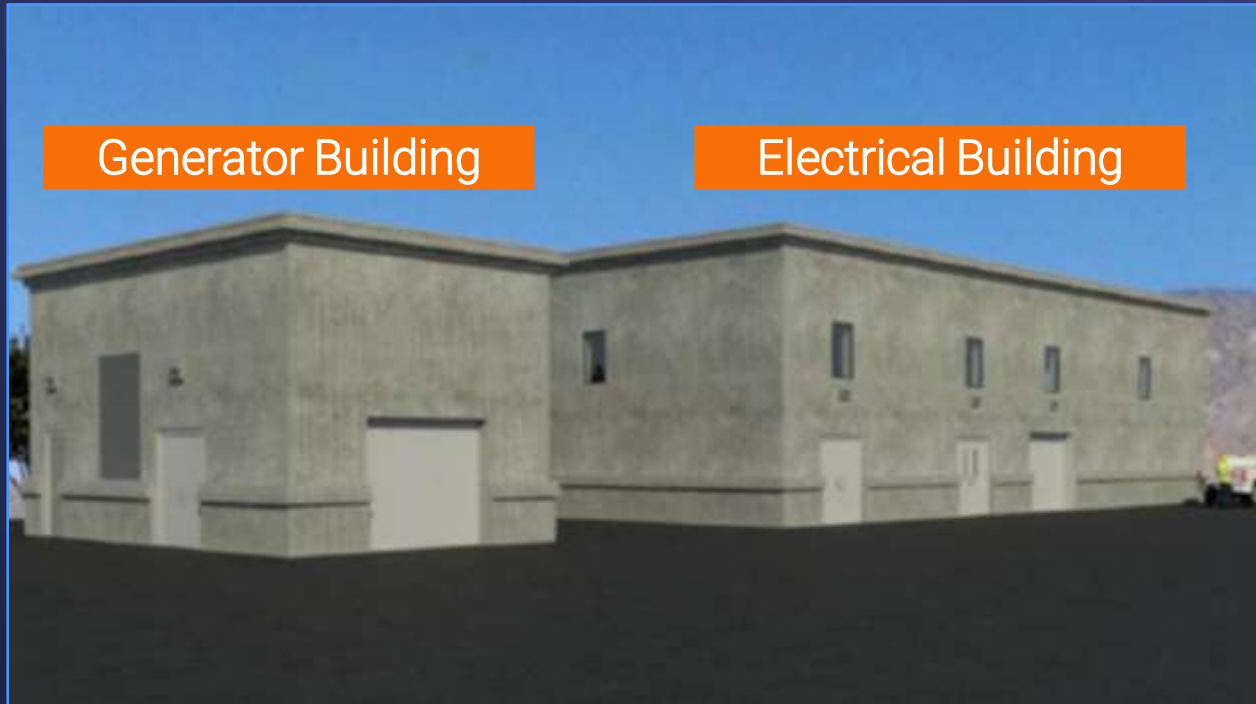
Iron Mtn. Wastewater System



Wastewater Line

Pumping Plants Utility Improvements
(Planned design completion: 2025)
\$24M

Projects in Design

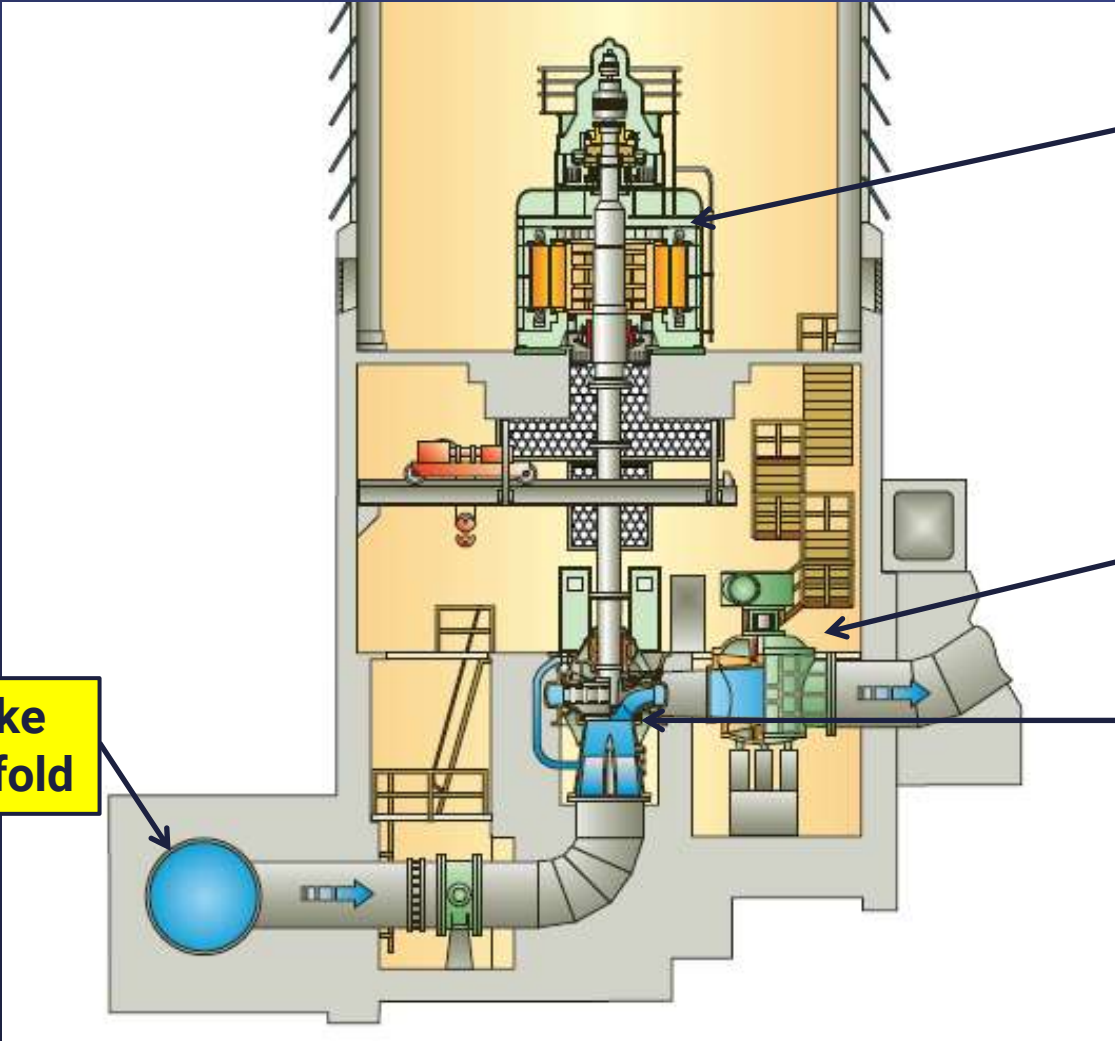


Medium & Low Voltage Electrical Equip.
Replacement
Iron Mtn. Pumping Plant
(Planned design completion: 2025)
\$40M



CRA Transformers Replacement
(Planned design completion: 2025)
\$120M

CRA Main Pump Rehabilitation



Cross section of CRA Pump/Motor Configuration



Motor



Discharge Valve



Pump

CRA Main Pump Rehabilitation – Auxiliary Systems

- Cooling water
- Lubricating oil
- Hydraulic systems
- Fire suppression
- Drainage sumps
- Control system

CRA Main Pump Rehabilitation
(Final design completion: 2030)
\$260 M

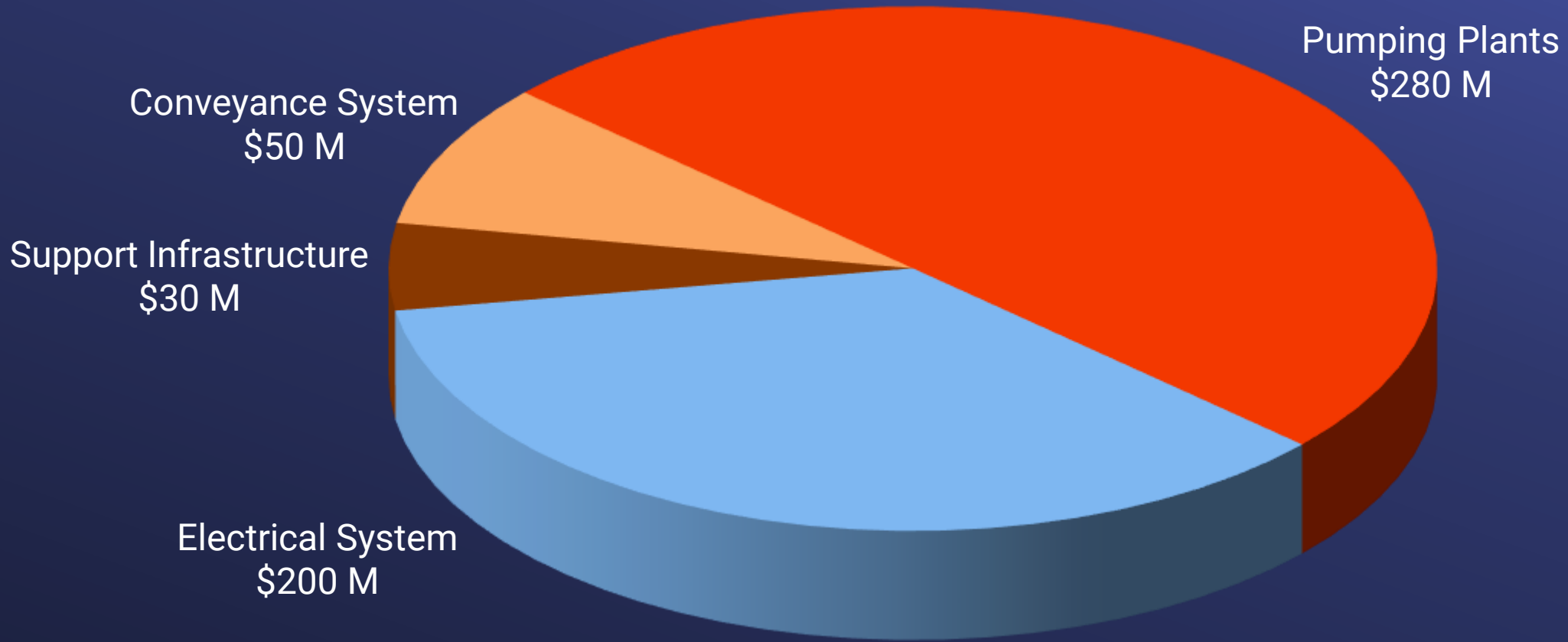


Lubricating Oil System

Control System



Planned CRA Expenditures FY2024/25 – 2034/2035



Total Planned Improvements - \$560 M

Upcoming Board Actions - 2024

- Second quarter:
 - CRA Erosion Control Improvements (Final design)
- Third quarter:
 - CRA 69kV & 230kV Transformers Replacement (Procurement contract & Final design)
 - Hinds & Eagle Mountain Utility Improvements (Const.)
 - Copper Basin Reservoir Discharge Structure Rehabilitation (Const.)
- Fourth quarter:
 - CRA Pumping Plant Sump Systems Rehabilitation (Const.)
 - CRA Cabazon Radial Gate Improvements (Const.)

CRA Reliability Program - Summary

- Total expenditures since 2002 - \$298 M
- Planned work from 2024 to 2035 - \$560 M (approx.)
- Benefits of following a long-term strategy
 - Flexibility to adjust schedules based on priorities & shutdown opportunities
 - Minimizes impacts to aqueduct operations
 - Proactive identification of work reduces risk of outages
 - Cost-effective project delivery

