



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

3/9/2010 Board Meeting

7-5

Subject

Authorize (1) final design of the Hayfield Groundwater Extraction Project; and (2) amendment to agreement with Kennedy/Jenks Consultants (Approp. 15402)

Description

This action authorizes final design of a system to extract water previously stored in the Hayfield groundwater basin. Results from tests of the recently installed prototype well and accompanying hydrogeologic investigations have been utilized to characterize the hydrogeologic behavior of the Hayfield aquifer, and form the basis for the recommended extraction system. This action also authorizes an amendment to the existing agreement with Kennedy/Jenks Consultants for design of the extraction system.

Timing and Urgency

Between 70,000 and 100,000 acre-feet of Colorado River water have been stored over time by Metropolitan in the Hayfield groundwater basin. Installation of a prototype well has been completed, and hydrogeologic investigations indicate that the construction of production wells could supplement flows in the Colorado River Aqueduct (CRA).

This project has been reviewed with Metropolitan's updated Capital Investment Plan (CIP) prioritization criteria and is categorized as a Supply Reliability project. The funds have been previously appropriated and are budgeted within Metropolitan's CIP for fiscal year 2009/10.

Background

The Hayfield groundwater basin is located south of the Julian Hinds Pumping Plant adjacent to the CRA. In June 2000, Metropolitan's Board authorized a feasibility study for storing surplus CRA water in the Hayfield basin for future extraction. In December 2002, the Board authorized detailed investigations for the Hayfield groundwater basin. As part of this study, over 70,000 acre-feet of CRA water were discharged into the Hayfield groundwater basin for investigation, modeling, and storage purposes.

In November 2004, the Board deferred the Hayfield Groundwater Storage Program because it was clear that surplus Colorado River water would not be available in the foreseeable future to store in the Hayfield aquifer. In early 2008, with Metropolitan's water supplies becoming more limited, staff initiated a study to reevaluate the feasibility of extracting the water that had previously been stored in the Hayfield basin. The goal at that time was to extract the stored water and pump it into the CRA over a 3- to 4-year period.

In February 2009, Metropolitan's Board authorized installation of a full-scale prototype well and geotechnical investigations to characterize the hydrogeologic behavior of the Hayfield aquifer. The prototype well was constructed using 24-inch-diameter carbon steel well casing in a 30-inch-diameter, 1,015-foot-deep borehole. After the well was developed, it was tested using a temporary pump and motor with portable generator. Groundwater was encountered at a depth of 495 feet below the ground surface, while drilling rates were significantly slower than originally anticipated due to hard metamorphic rock. The well was developed and then continuously tested for 72 hours to determine the pumping capacity of the confined aquifer. In addition, water samples were obtained and tested to ensure compliance with all applicable water quality requirements

(See **Attachment 3**). The aquifer extraction capacity exceeded expectations, with pumping rates as high as 3,500 gallons per minute (gpm), which is estimated to yield 4,000 to 5,000 acre-feet per year. Following the test, the prototype well was disinfected and capped to protect against contamination.

During the period that the prototype well was constructed and tested, Metropolitan's outlook for CRA supplies improved. As a result, it does not appear crucial to extract previously stored water from the Hayfield basin as quickly as possible. Staff therefore recommends converting the existing prototype well into a single production well to enable extraction of the previously stored water. Should the outlook for CRA supplies change in the future, this well could be incorporated into a full-scale wellfield consistent with the originally planned Hayfield Groundwater Storage Program, which had envisioned storage of 500,000 to 800,000 acre-feet of available CRA water in the Hayfield groundwater basin.

Conversion of the prototype well into a production well is anticipated to involve installation of a 700 to 800-horsepower in-line shaft vertical turbine pump and soft-start motor. The conveyance pipeline from the prototype well to the CRA connection would include approximately 13,000 feet of 16-inch-diameter pipe; combination air release and vacuum valves, shut-off valves and blow-off assemblies; metering; and electrical and controls systems to provide power to the production well. It is anticipated that there would be limited grading at the well site and that the pipeline would be placed abovegrade. Power will be supplied from the Hinds Pumping Plant via an aerial transmission line, and the production well will be started and stopped locally and remotely from the pumping plant. The CRA connection is anticipated to be a 16-inch-diameter gooseneck outlet at the Hinds Pumping Plant sandtrap. This approach would provide the least-cost option to extract the previously stored water. The projected unit cost for extraction is approximately \$150 per acre-foot. It would take approximately 14 to 16 years to recover 70,000 to 100,000 acre-feet of stored water.

Hayfield Groundwater Extraction Project – Final Design Phase (No funds required)

This action authorizes final design-phase activities to convert the prototype well into a production well for the Hayfield Groundwater Extraction project. Final design is recommended to be performed by Kennedy/Jenks Consultants, as discussed below. The planned final design activities include the following scope of work: (1) evaluate the available hydrogeologic data and perform an engineering analyses to design a pump and motor capable of extracting 3,500 gpm of water from the 24-inch, 1,015-foot deep production well; (2) assess existing power loads at the Hinds Pumping Plant, evaluate power requirements for the new wellfield, and design electrical equipment and aerial transmission power lines to connect the wellfield into the Hinds Pumping Plant power system; (3) evaluate and design conveyance pipeline and tie-in to the CRA that can be incorporated into a full-scale wellfield, should CRA supplies change in the future; (4) prepare grading plans to ensure proper drainage and design foundation for pump/motor at the wellfield site; and (5) evaluate requirements and prepare specifications for control system for the pumping operations. Preparations of two bidding document packages are planned. The first bid package will procure the well pump, which is a long-lead item that is expected to take 12 to 18 months to fabricate and deliver. The second bid package will include all remaining construction activities to achieve a fully operational well-field delivery system.

Other planned activities include permitting; water quality testing; receipt of competitive bids; development of a construction cost estimate; program management; and all other activities in advance of award of procurement and construction contracts. Staff will perform program management and permitting activities.

Technical Engineering Support – Amendment to Agreement with Kennedy/Jenks Consultants, Inc.

Kennedy/Jenks Consultants previously performed feasibility studies and hydrogeologic investigations for the Hayfield Groundwater Extraction project and has extensive experience in well drilling and groundwater production. Further, Kennedy/Jenks was responsible for drilling the existing prototype well in the Hayfield basin. As a result, staff recommends that Kennedy/Jenks perform final design for this project. Kennedy/Jenks was selected through a competitive process via Request for Qualifications No. 833. The estimated cost for Kennedy/Jenks' services is \$375,000.

This action authorizes an increase of \$400,000 to the existing agreement with Kennedy/Jenks, for a new not-to-exceed total of \$2.14 million, for the Hayfield Groundwater Extraction project. For this agreement, Metropolitan has established a Small Business Enterprise participation level of 18 percent.

Summary

This action authorizes final design of a single production well for the Hayfield Groundwater Extraction project, and an amendment to the existing agreement with Kennedy/Jenks. No funds are required to be appropriated for this work, as sufficient funds have previously been appropriated. The estimated cost of all planned activities is \$550,000, allocated as follows: \$456,000 for final design; \$12,000 for permitting with regulatory agencies and water quality testing; \$82,000 for preparation of multiple bid documents, construction cost estimates, and project management. The final design cost as a percentage of the estimated construction cost is approximately 15 percent. Engineering Services' goal for design of projects with construction cost less than \$3 million is 9 to 15 percent. These project costs are consistent with investments made by other water agencies on similar well-field systems. The construction cost for this project is anticipated to be approximately \$2.8 million to \$3 million.

This project has been evaluated and recommended by Metropolitan's CIP Evaluation Team. [Attachment 1](#) shows the distribution of previously appropriated funds for this capital program. See [Attachment 2](#) for the Location Map. See [Attachment 3](#) for Water Quality Summary.

This project is consistent with Metropolitan's goal for sustainability by enhancing reliability of the existing conveyance and distribution system in order to maintain reliable water deliveries in the future.

Action and Milestone

November 2010 – Award of procurement contract for pump and motor

Policy

Metropolitan Water District Administrative Code Section 5108: Appropriations

Metropolitan Water District Administrative Code Section 8117: Professional and Technical Consultants

California Environmental Quality Act (CEQA)

CEQA determination for Option #1:

To comply with CEQA and the State CEQA Guidelines, Metropolitan as the Lead Agency prepared a Mitigated Negative Declaration (MND) for the Hayfield Lake/Chuckwalla Valley Groundwater Conjunctive-Use Project. The MND was distributed for a 30-day public review period that began on February 25, 1999 and ended on March 26, 1999. The Board later adopted the MND and the Mitigation Monitoring and Reporting Program (MMRP) on April 13, 1999. The present board action is solely based on authorizing final design for the Hayfield Extraction Project, and not on any changes to the approved project itself. Hence, the previously adopted environmental documentation in conjunction with the current action fully complies with CEQA and the State CEQA Guidelines. Accordingly, no further environmental documentation is necessary for the Board to act on with respect to the proposed action.

The CEQA determination is: Determine that the proposed action has been previously addressed in the adopted 1999 MND and the MMRP and that no further environmental analysis or documentation is required.

CEQA determination for Option #2:

None required

Board Options

Option #1

Adopt the CEQA determination and

- a. Authorize final design of a single production well for the Hayfield Groundwater Extraction Project; and
- b. Authorize increase to existing agreement with Kennedy/Jenks Consultants, for a new not-to-exceed total of \$2.14 million.

Fiscal Impact: \$550,000 of previously appropriated and budgeted funds under Approp. 15402

Business Analysis: This option will recover approximately 70,000 to 100,000 acre-feet of previously stored water in 14 to 16 years.

Option #2

Do not proceed with the Hayfield Groundwater Extraction Project.

Fiscal Impact: None

Business Analysis: This option would forego an opportunity to develop a cost-effective and efficient approach for recovery of previously stored water from the Hayfield basin.

Staff Recommendation

Option #1



 Roy L. Wolfe
 Manager, Corporate Resources

2/24/2010

 Date



 Jeffrey Kightlinger
 General Manager

2/25/2010

 Date

- [Attachment 1 – Financial Statement](#)
- [Attachment 2 – Location Map](#)
- [Attachment 3 – Water Quality Summary](#)

Financial Statement for Hayfield Groundwater Storage Program

A breakdown of Appropriation No. 15402 for the Hayfield Groundwater Extraction project* is as follows:

	Previous Total Appropriated Amount (Feb. 2009)	Current Budget Redistribution** (Mar. 2010)	New Budget Distribution
Labor			
Studies & Investigations	\$ 500,000	-	\$ 500,000
Final Design	-	81,000	81,000
Owner Costs (Program mgmt, permitting, bidding process)	3,613,000	79,000	3,692,000
Construction Inspection & Support	-	-	-
Metropolitan Force Construction	-	-	-
Materials and Supplies	69,000	-	69,000
Incidental Expenses	27,000	15,000	42,000
Professional/Technical Services	7,869,000		7,869,000
Kennedy/Jenks Consultants		375,000	375,000
Equipment Use	1,000	-	1,000
Land Purchase	1,450,000	-	1,450,000
Contracts	-	-	-
Remaining Budget	3,360,000	-	3,360,000
Undistributed Funds	8,826,000	(550,000)	8,276,000
Total	\$ 25,715,000	\$ -	\$ 25,715,000

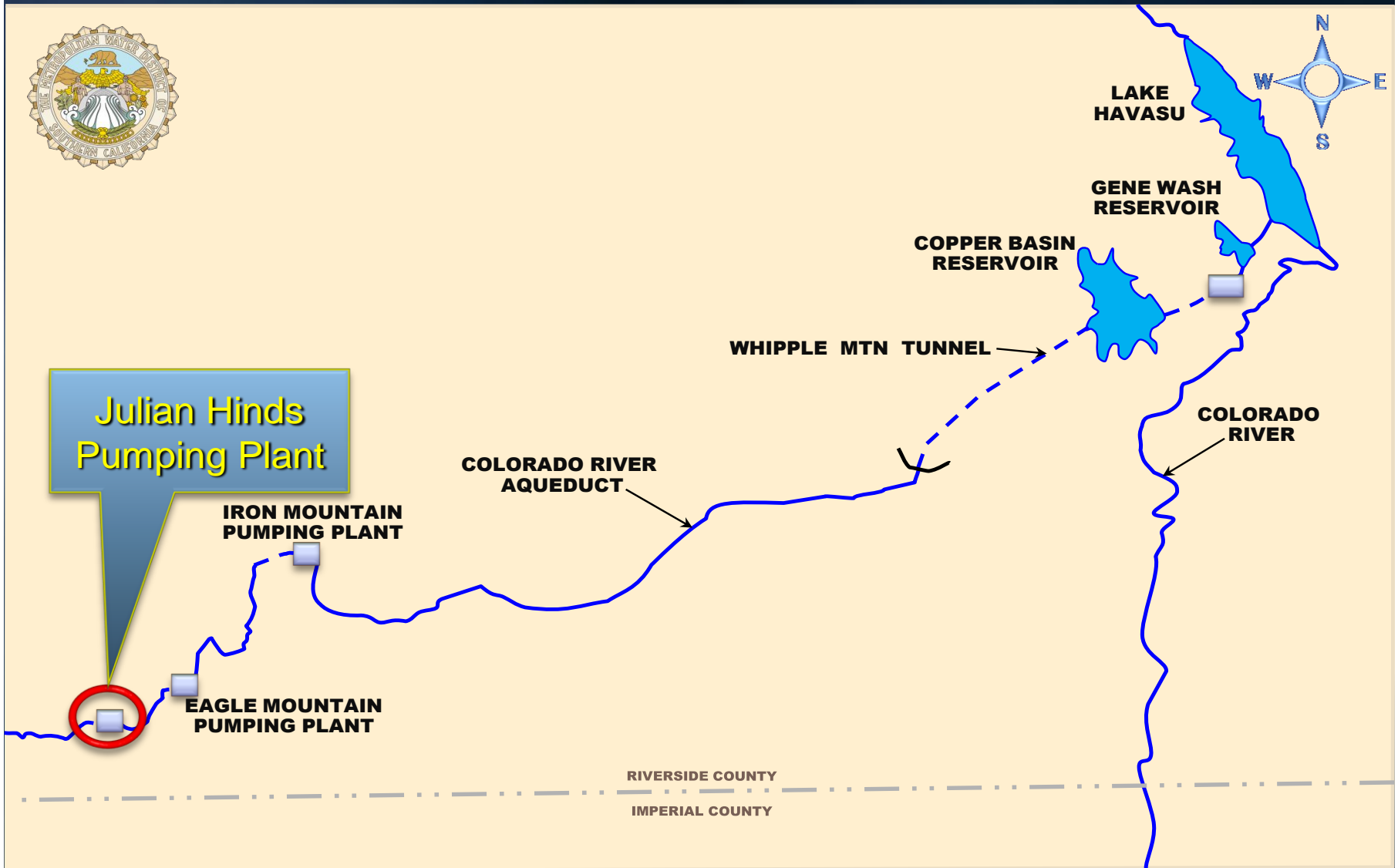
Funding Request

Program Name:	Hayfield Groundwater Storage Program		
Source of Funds:	Revenue Bonds, Replacement and Refurbishment or General Funds		
Appropriation No.:	15402	Board Action No.:	5
Requested Amount:	\$ N/A	Capital Program No.:	15402
Total Appropriated Amount:	\$ 25,715,000	Capital Program Page No.:	219
Total Program Estimate:	\$ 46,693,200	Program Goal:	S- Supply Reliability

* The total amount expended to date on the Hayfield Groundwater Extraction Project is approximately \$1,650,000.

** Reflects the scope of work contained in the present action.

Julian Hinds Pumping Plant



Water Quality Summary

The Hayfield groundwater basin contains 26 monitoring wells, of which 18 have been sampled since 2000 to characterize the water quality (Figure 1). The number of constituents analyzed per well ranges from 100-196, and includes testing for general physical (e.g., color, temperature, pH); trace minerals (e.g., arsenic); volatile and semivolatile organics (e.g., benzene, benzo-pyrene); pesticides; herbicides; radiologicals; and microbial agents (e.g., coliforms). Collectively, over 10,000 data points have been generated from these wells to assess the water quality characteristics of the basin. Water quality characterization studies of the 18 monitoring wells were used to assist in selection of a production well site (Well H27p). Furthermore, monitoring of Wells H2, H6, H16, H17, and H19 (located in the same area as H27p) provided additional data to characterize the water quality of H27p. In essence, 35 distinct sampling events, representing over 3,500 test results, were used to assess the resulting water quality after the introduction of water to the Colorado River Aqueduct (CRA) from Well H27p. Staff has reviewed the water quality data with the California Department of Public Health (CDPH). An operating permit for the Hayfield groundwater recovery project is anticipated to be issued by CDPH later this year.

Table 1 summarizes water quality testing results of selected constituents for Well H27p. Table 1 is only a partial listing of constituents analyzed for H27p. Analytical testing has been performed for 196 individual constituents including those with primary and secondary drinking water standards. Values for these other constituents were below detection, or were similar to levels occurring in CRA water. Table 1 includes standards [Maximum Contaminant Levels (MCL)] established by CDPH. While these standards only apply to treated water, they provide a point of reference when assessing the quality of source water supplies. Table 1 also illustrates the concentration of selected constituents in the CRA and finally provides a calculation of the resulting concentration of these constituents in the CRA after mixing with discharge water from H27p. Due to the low flow of H27p relative to the high flow in the CRA, there is little to no change in water quality characteristics in the aqueduct downstream of the H27p discharge point.

Concentrations of total dissolved solids and arsenic in Well H27p are slightly lower than CRA water. Levels of nitrate, perchlorate, gross beta, uranium, and gross alpha in H27p are higher than CRA water but lower than corresponding MCLs. However, due to the significant mixing factor, there is no observable water quality change in the aqueduct. Levels of radon 222 in Well H27p are higher than observed in CRA water. Radon gas is known to dissolve and accumulate in groundwater; however, radon is generally not considered a concern once it enters surface waters (e.g., in the CRA) due to its high volatility. The radon gas will dissipate once it enters the CRA.

Fluoride levels in H27p are elevated compared to background levels found in the CRA. Fluoride is a unique constituent, in that at optimum levels it provides a dental health benefit. Per CDPH requirements, Metropolitan supplements its source waters with fluoride at its treatment plants to achieve a final concentration in the finished water of approximately 0.8 m/L. Fluoride levels associated with the Hayfield Groundwater Extraction Project will not impact this optimum level.

Table 1. Selected Water Quality Testing Results of Well H27p

Constituent	California Department of Public Health Treated water MCL	CRA Water	Well H27p (6.68 cfs)	Concentrations after introduction into CRA (1,575 cfs)
Total dissolved solids	500 mg/L	635	604	635
Fluoride	2.0	0.31	3.6	0.32
Arsenic	0.01 mg/L	0.0026	0.0012	0.0026
Perchlorate	0.006 mg/L	0.001	0.0038	0.001
Nitrate	45 mg/L	1.19	5.50	1.21
Gross Beta	50 pCi/L*	5.1	9.5	5.1
Uranium	20 pCi/L	3.1	7.1	3.1
Gross Alpha	15 pCi/L	4.3	12.7	4.3
Radon 222	NS	29	1221	34

MCL = Maximum Contaminant Level

*MCL is 4 millirems/yr total body dose; 50 picoCuries per liter (pCi/L) is used as screening level

NS =No Standard

Figure 1

