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METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

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February 20, 1997

To: Board of Directors (Special Committee on Water Quality, Desalination, and Environmental Compliance--Information)
(Engineering and Operations Committee--Information)

From: *for* General Manager

Charles D. Moore III

Submitted by: Mark D. Beuhler
Director of Water Quality

Mark Beuhler

Subject: Colorado River Water Salinity Reduction Partnership

RECOMMENDATION

For information only.

EXECUTIVE SUMMARY

Current salinity removal technologies for Colorado River water (CRW) are very expensive. However, if salinity removal costs could be significantly reduced through the implementation of a new and innovative technology, it could be used as a tool to assist in regional salinity management. It is proposed that new and innovative desalination technologies, including new and large-scale membrane facilities and "Aerogel" (capacitive deionization), be studied and evaluated by Metropolitan and other partners. Metropolitan's activities would be leveraged by those of our partners, including solicitation of state and federal funding to pay for the research.

DETAILED REPORT

Salinity in Southern California groundwater basins and in some surface water supplies has been slowly increasing. One reason for this increase is the high salinity of imported CRW (with a total dissolved solids [TDS] concentration of 600 to 800 mg/L). High TDS concentrations cause problems for agriculture, industrial processes, and homeowners through corrosion and scaling of plumbing fixtures and appliances. They also limit wastewater recycling and groundwater recharge in some cases.

Salinity removal technologies are currently expensive. The cost is estimated at \$300 per acre-ft to reduce the salinity in CRW from 750 mg/L to below 500 mg/L using conventional membrane technology such as reverse osmosis. In addition, this process would result in a water loss of approximately two percent. This cost includes both capital and operations and maintenance. A significant cost component for membrane treatment is electrical power for pumping to obtain the necessary membrane pressure differential. At present, this cost is too high to make widespread salinity reduction feasible. However, if the cost could be reduced through new and innovative technologies, large-scale desalination may be possible. Metropolitan and its partners may also be in a position to gain financially from these technologies.

Salinity removal costs could be reduced through a breakthrough in removal technology such as "Aerogel" or new membranes, use of low (or no) cost pretreatment, technological innovations that take advantage of economies of scale (few reverse osmosis plants are larger than 5 to 10 MGD), and through innovations in brine and/or solid residual reduction and disposal. Alone or in combination, advancements in these areas could substantially reduce treatment costs and increase viability. If successful, these new technologies could fundamentally change the salinity issue for CRW and also be applicable to other sources of supply water, such as reclaimed water, agricultural drainage water, and local groundwater. The key to testing these technologies is the development of prototypes to prove their practical application. Bench-, pilot-, and demonstration-scale studies would need to be conducted initially to determine the necessary design criteria for the prototypes. Metropolitan's facilities would be ideal for conducting some of this work.

A multi-year research effort is envisioned to evaluate new and innovative desalination technologies involving Metropolitan, member agencies and subagencies (e.g., Orange County Water District), Lawrence Livermore National Laboratory (developer of "Aerogel"), governmental agencies, and outside experts. Funds from other partners, stakeholders (e.g., Southern California Edison and the Electric Power Research Institute), research grants, and legislative sources (e.g., the State Electrical Restructuring Bill [AB 1890] and various federal sources) could be used to offset much of the research and development costs incurred by Metropolitan and others conducting the work. The project would not move forward until significant outside funds have been secured. Several milestone decision points would be incorporated into the program to review progress and determine future direction. Staff will continue to keep the Board advised.

JFG/MDB/mi