MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

September 29, 1992

To: Board of Directors (Engineering & Operations Committee--Information)

From: General Manager

Subject: Progress Report on San Joaquin Reservoir Improvement Project

Report

Periodically, San Joaquin Reservoir experiences episodes of poor water quality. During these periods, there is a high probability that water in the reservoir will violate existing drinking water standards; therefore, Metropolitan must remove the reservoir from service and bypass flow around the reservoir to maintain service to a population of 400,000 in southern Orange County. Since 1985, the reservoir has been closed or bypassed 21 times, for periods ranging from hours to several months, due to these water quality problems. The San Joaquin Reservoir Improvement Project proposes to improve water quality in the reservoir to restore reliable service by meeting existing water quality standards as well as to ensure that more stringent water quality standards expected to be promulgated in the future can be met. Nearly 30 project alternatives have been evaluated for feasibility, cost, effectiveness in meeting objectives and environmental effects.

A draft EIR was issued for public review and comment, and a public hearing was held in July 1989. Public response to the draft EIR called for additional technical analysis. The additional analysis and revised conclusions were presented in the revised draft EIR released in June 1992. The revised draft EIR determines that flexible or rigid covers or a treatment plant to treat the reservoir outflow technically could be implemented. The revised draft EIR was sent to the reservoir owners, residents overlooking the reservoir and other interested parties, and a public hearing was conducted in July 1992. The 45-day public review period normally provided for environmental documents was extended 90 days, to mid-November, at the request of residents near the reservoir. Once comments have been received, responses will be prepared and the final EIR will be ready for certification.

A public information program has been conducted to inform the affected people and communities as to the project need and alternatives. Prior to the July 1992 public hearing, workshops were held with interested members of the public, including residents adjacent to the reservoir and those served by the reservoir. Presentations to city councils, service clubs, community groups and water agencies have been included in the public information program, as well as meetings with the print and broadcast media. The result of these meetings has been presented in a public information program containing questions and answers about San Joaquin Reservoir, and is enclosed for your reference.

In addition, informational meetings were held during June, July and August 1992, with Coastal Municipal Water District, Mesa Consolidated Water District, Costa Mesa Chamber of Commerce, Newport Harbor Chamber of Commerce, South Coast County Water District, Irvine Ranch Water District, Laguna Beach Water District, City of Costa Mesa, City of Huntington Beach, Orange County Board of Supervisors, Laguna Beach Chamber of Commerce, Irvine Chamber of Commerce and Huntington Beach Chamber of Commerce.

A survey to sample public opinion about San Joaquin Reservoir Improvement Project has also been conducted. A questionnaire was distributed to some 15,000 homes throughout the reservoir service area. Metropolitan has received about 675 replies from the survey to date. The questionnaire and a preliminary tally of all responses are enclosed for your review.

Board Committee Assignments

This letter was referred for information only to:

The Engineering and Operations Committee because of its interest in the storage and treatment of water pursuant to Administrative Code Section 2481 (c).

Recommendation

For information only.

Carl Boronkay

JSS/wlb
S:SJOAQ-BD1

Enclosures

PUBLIC INFORMATION PROGRAM

QUESTIONS and ANSWERS

about

SAN JOAQUIN RESERVOIR

Three meetings with owners of residences overlooking or adjacent to San Joaquin Reservoir were scheduled by Metropolitan Water District of Southern California at Harbor View Elementary School in Corona del Mar on July 13, 14 and 20, 1992.

The information in this document was compiled by the staff of Metropolitan in response to questions asked by the homeowners who attended.

WHAT IS THE SPECIFIC LEGISLATION OR REGULATION IMPOSED ON WATER QUALITY AT SAN JOAQUIN RESERVOIR (SJR)?

Water quality in SJR is regulated by State and Federal agencies. The Safe Drinking Water Act (SDWA; PL93-523), passed in 1974, charges the USEPA with promulgating national drinking water standards. These standards have been amended over the years since 1974 and will continue to be reviewed.

The SDWA designates that individual states are primarily responsible for enforcement of public water systems. Water quality standards at least as stringent as the USEPA's must be established by the state along with adequate monitoring and enforcement procedures. The USEPA has designated the California Department of Health Services (CDHS) as the responsible agency in California. CDHS regulates drinking water under Title 22 of the Health and Safety Code.

In 1986, the SDWA was amended to require the USEPA to develop regulations for a number of potential waterborne contaminants. In addition, the new federal Total Coliform Rule (TCR), which took effect December 31, 1990, calls for stricter maximum contaminant levels (MCLs) as well as more stringent monitoring, reporting, and public notification requirements for coliform bacteria in drinking water. The CDHS version of the TCR is expected to take effect December 1, 1992.

WHAT ARE THE REGULATORY/EMERGENCY STORAGE REQUIREMENTS OF THE RESERVOIR SERVICE AREA?

The reservoir owners require regulatory storage to meet fluctuations in daily water demands. Regulatory storage is utilized to allow treatment plants to operate at nearly constant flowrates. San Joaquin Reservoir also provides 1,500 to 2,000 acre feet of emergency storage for use during water supply interruptions. This is approximately 8 to 11 days of supply considering an average daily demand of 95 cubic feet per second (cfs) in the reservoir service area.

WHAT ARE SAN JOAQUIN RESERVOIR'S WATER QUALITY PROBLEMS?

The water quality problems are categorized as: (1) those that affect the public's health, and (2) those that impact the aesthetics (appearance, taste and odor) of the water. Current public health concerns are total trihalomethane (TTHM) levels and coliform bacteria, whereas aesthetic issues include the presence of frogs, midge fly larvae, crustaceans and algae.

Public Health Issues

THMs are regulated by both federal and state governments at a level of 0.10 mg/L based on a running annual average of quarterly analyses. This regulation took effect in 1981. THMs are formed as a result of chlorinating the water entering and leaving the reservoir. The influent needs to be chlorinated to remove ammonia, a nutrient for algae growth, whereas the effluent needs to be chlorinated to provide good disinfection.

As a result of these chlorination practices, the levels of THMs in the reservoir have, on a number of occasions, exceeded 0.10 mg/L in individual samples. Some downstream water utilities would have exceeded the maximum contaminant level (MCL) had the reservoir not been bypassed. Thus, it is difficult to operate the reservoir and reliably meet current standards. Because of high THM levels beginning in September 1991, the reservoir was removed from service for three months. Most recently, the reservoir was removed from service beginning July 17 owing to the presence of coliform bacteria. The extent of chlorination at the reservoir influent and effluent cannot be reduced without risking the bacteriological safety of the water.

The new federal Total Coliform Rule (TCR), which will be enforced by California this December, is considerably more stringent than the previous regulation. The TCR has maximum contaminant levels for both total and fecal coliform bacteria. Although these bacteria are not harmful, their presence indicates that the water may be contaminated with disease-causing bacteria.

The only effective options to control bacteriological problems at SJR are increased chlorination or temporarily shutting down the reservoir. The increased chlorine dosages lead to higher THM levels. If the problem is too severe, the reservoir is bypassed. Since 1985, the reservoir has been bypassed for more than 170 days due to bacteriological and TTHM problems.

Aesthetic Issues

Because the reservoir is exposed to the atmosphere, it is subject to a wide variety of contaminants that affect the appearance, taste and smell of the water. The combination of sunlight and nutrients in the water allows extensive growths of algae. Decaying algae enable a wide variety of aquatic invertebrate (such as crustaceans and midge fly larvae), to proliferate, which can show up in consumers' taps. In the early 1980s, the reservoir harbored approximately 850,000

African clawed frogs, which were subsequently removed in 1984. Although no frogs have been found recently, the potential for their return exists. The high nutrient content in the reservoir, owing to the growth and decay of the various organisms, along with direct contamination from bird droppings and other airborne contaminants, supports the growth of extensive bacterial populations. Some of these have been identified as coliforms and fecal coliforms, which are regulated under the new requirements.

WHAT ARE THE NEW DISINFECTION/DISINFECTION BY-PRODUCT (D/DBP) REGULATIONS?

Currently, the only DBPs regulated are TTHMs, at a level of 0.10 mg/L. This federal and state regulation applies only to systems serving more than 10,000 people. The new D/DBP regulations will be more stringent than the current one. They may revise the maximum contaminant levels (MCLs) for THMs, establish MCLs for other disinfection byproducts (DBPs) and would apply to all public water systems serving residential populations.

Compounds likely to be regulated by the new D/DBP rule include THMs (total, individual species or a combination of both), haloacetic acids (total, individual species, or a combination of both), chloral hydrate, bromate, chlorine, chloramines, chlorine dioxide, chlorate, and chlorite. MCLs for these have not yet been proposed.

The U. S. Environmental Protection Agency (USEPA) is considering implementing the regulation in two phases. In the first phase, utilities would be expected to optimize conventional treatment for DBP precursor removal. In the second phase, utilities might be expected to employ alternative treatment strategies, such as granular activated carbon filtration, membranes, or alternative disinfectants. Some MCLs are expected to be set in the mid-1990s, and the remainder in the late 1990s. Without improvements to the reservoir, the new D/DBP regulations will make it even more difficult to maintain acceptable water quality in SJR.

WHAT ARE THE CHLORINATION REQUIREMENTS OF COVERED RESERVOIRS?

Covered reservoirs typically require minimal chlorination. Since the cover prevents sunlight from reaching the water, the chloramine residual persists through the reservoir with minimal degradation. Depending on the water temperature and detention time in the reservoir, several tenths

of a mg/L of chlorine are added to the reservoir effluent to maintain a chloramine residual of 1.5 mg/L.

On rare occasions when nitrification occurs, the reservoir is temporarily bypassed and treated with several mg/L of chlorine using a mobile chlorinator. As an alternative, an additional few tenths of a mg/L of chlorine may be added at the reservoir influent, depending on the extent of nitrification.

Currently at San Joaquin Reservoir, the need to chlorinate the influent and rechlorinate the effluent to achieve adequate disinfection requires considerably higher chlorine requirements than for covered reservoirs. For example, up to 8 mg/L of chlorine have been applied to the influent of San Joaquin, while 1.5-1.8 mg/L is typically applied to the effluent.

WHAT IS THE 10-YEAR OUTLOOK FOR WATER QUALITY STANDARDS?

In general, the Safe Drinking Water Act Amendments of 1986 call for a dramatic increase in the number of regulated compounds in drinking water over the next 10 years. By 1989, standards were to have been set for 83 compounds, and beginning in 1991, 25 new standards were to be set every three years.

By the year 2000, approximately 200 compounds are supposed to be regulated. However, the USEPA has been unable to keep pace with the Congressional mandate and will have only about 150 new rules in place by the year 2000. Contaminants include organic, inorganic and microbiological constituents.

Comparisons in THM data can be made between covered and uncovered reservoirs receiving the same water over the same time period. Examination of these data reveal that additional chlorination at the influent and effluent of uncovered reservoirs dramatically increases the level of THMs.

For example, the 1988-1989 fiscal year average for THMs at the effluent of SJR was 0.087 mg/L (two quarters were over 0.10 mg/L), whereas the average THM level in the effluent of Garvey Reservoir, a covered reservoir, was 0.063 mg/L. Importantly, none of the quarterly THM averages from Garvey was over 0.10 mg/L.

In the summer of 1991, THM levels were over 0.20 mg/L in the effluent of SJR, prompting Metropolitan to remove the reservoir from service for three months. The THM levels in the remainder of the distribution system at this time were 0.060 to 0.070 mg/L.

WHAT IS THE SOURCE OF MONEY FOR THE SAN JOAQUIN RESERVOIR WATER QUALITY IMPROVEMENT PROJECT?

The financing of the San Joaquin Reservoir Water Quality Improvement Project is set forth in an agreement between the Metropolitan Water District (MWD) and a number of local water agencies that have ownership rights in the reservoir. This agreement provides that MWD will purchase certain capacity rights in the reservoir from the local agencies.

The funds received by the local agencies for this capacity are then returned to MWD to pay for the local agencies' share of the selected water quality improvement project. In effect, the local agencies are exchanging reservoir capacity they own in order to improve water quality.

MWD reserves the right to withdraw from the agreement if the cost of the project exceeds the benefit MWD derives from the reservoir.

The option is available to renegotiate the cost-sharing agreement between MWD and the local agencies if the project cost exceeds that which Metropolitan is willing to accept under the existing agreement.

WHAT ARE THE ENGINEERING DESIGN AND COST ASSUMPTIONS FOR OPERATION & MAINTENANCE (O&M) AND CAPITAL COSTS?

Costs for the project alternatives are presented in the attached table 5A.

HAVE DECISIONS ALREADY BEEN MADE?

No. Metropolitan's board of directors and the reservoir co-owners will decide which project alternative to implement following public review and comments on the Revised Draft Environmental Impact Report.

WHAT CONTINGENCY COSTS WERE USED FOR THE COVER AND FOR THE OTHER ALTERNATIVES?

Preliminary cost estimates were prepared using available design information. All project alternatives include 9 percent for engineering design, 9 percent for construction administration and a 15 percent contingency factor. The treatment plant costs also include costs for land acquisition.

THE CONSTRUCTION COST OF THE FLOATING COVER ALTERNATIVE AS STATED IN THE REVISED DRAFT EIR IS $17 MILLION. WHAT WOULD BE THE COSTS IF ASSESSED TO THE FOLLOWING COMMUNITY SEGMENTS?

- View Homes (100 people): $170,000 per person
- Service area (400,000 residents): $42.50/per person
- MWD delivery area (7 million people): $2.43/per person

THE CONSTRUCTION COST OF THE TREATMENT PLANT IS ESTIMATED AT S101 MILLION. WHAT WOULD BE THE COSTS IF ASSESSED TO THE FOLLOWING COMMUNITY SEGMENTS?

- View homes (100 people): $1 million per person
- Service area (400,000 people) $252.50 per person
- MWD delivery area (7 million people) $14.43 per person

IS A RESERVOIR COVER AS GOOD AS A TREATMENT PLANT?

Either a cover or a treatment plant would enable Metropolitan to comply with current and proposed regulations. the difference is that the covered reservoir alternative seeks to prevent water quality problems from occurring, whereas the treatment plant alternative seeks to treat water quality problems after they have occurred.

A covered reservoir is quite simply a wide spot in the distribution system. Consequently, if water quality in the distribution system is good, the water quality in the reservoir should be good. Since the cover blocks out sunlight and airborne contaminants and prevents surface runoff, there is no nutrient cycle to stimulate the growth of algae, crustaceans, frogs, etc.

In addition, a chloramine disinfectant residual can be maintained across the reservoir which will inhibit the growth of coliform bacteria and other bacteria. This eliminates the need for continual free chlorination, thus preventing the high THM levels.

Metropolitan has experience with covering three reservoirs: Garvey Reservoir in the city of Monterey Park, Palos Verdes Reservoir in the city of Rolling Hills Estates, and Orange County Reservoir in the city of Brea. In all cases, the water quality in the reservoirs was substantially improved

and regulations were met at all times. Data are on record at Metropolitan and the California Department of Health Services to document compliance with drinking water regulations.

In the treatment plant alternative, water leaving the reservoir would be treated prior to entry in the distribution system. This operation should allow Metropolitan to meet THM and microbiological standards.

WHAT PERCENT OF REMAINING OPEN SPACE IN ORANGE COUNTY WOULD THE TREATMENT PLANT USE?

The treatment plant would occupy less than .01 percent of the remaining open space in Orange County, based on our interpretation of the Orange County General Plan and planning documents. It does, nevertheless, constitute a significant impact since it is subtracted from designated open space for the City of Irvine.

WHAT KIND OF TREATMENT PROCESSES WOULD BE USED FOR THE TREATMENT PLANT ALTERNATIVE AND WHAT IMPACTS WOULD THE TREATMENT PLANT HAVE?

The plant would use direct filtration to purify the water. The treatment processes include ozonation, flocculation, filtration and chloramination. The treatment plant process also includes flocculation and clarification of washwater used to clean the filters as well as mechanical dewatering to dry plant sludge. Chemicals such as chlorine, ammonia, aluminum sulfate, and polymers used to treat the water would be stored on site. An operational storage reservoir would be provided for disinfection and regulatory storage to allow the treatment plant to operate at a more constant flowrate. Please see section 2.2.5 and section 4 of the Revised Draft Environmental Impact Report for more detailed information.

AT WHAT ELEVATION WOULD THE TREATMENT PLANT BE CONSTRUCTED?

The elevation of the proposed treatment plant site is approximately 550 feet.

WHAT WAS METROPOLITAN'S PRIOR KNOWLEDGE OF THE NEED TO COVER THE RESERVOIR?

Water quality problems at SJR have been documented since the mid-1970s. In April 1976, midge fly larvae were discovered in the distribution system downstream from the reservoir. The midge fly larvae again appeared in the fall of 1977 and this problem was compounded by the unintentional introduction of and rapid proliferation of African clawed frogs. Outlet screens were installed in an attempt to prevent midge fly larvae and frogs from entering the distribution system. At this time, the CDHS requested Metropolitan to submit a plan to improve the water quality in the reservoir.

The African clawed frog population continued to increase until the reservoir was taken out of service for cleaning in 1984 and approximately 850,000 frogs were removed. The presence of the frogs led to elevated coliform bacteria levels in the reservoir, which resulted in a mandate from the CDHS (in 1984) to pursue solutions to the water quality problems. Although the frog problems were largely controlled by draining the reservoir and trapping programs, total coliform bacterial problems have persisted because the reservoir is exposed to airborne contamination and lack of disinfectant in the reservoir.

The severe water quality problems experienced in the early 1980s coupled with the improved water quality observed in Garvey, Palos Verdes and Orange County reservoirs following installation of floating covers in 1984, suggested that covering SJR would be an effective alternative. A decision has not yet been made on the most appropriate alternative for San Joaquin Reservoir.

WHAT ARE THE PROBLEMS WITH COVERS? COULD THE COVER MAKE THE WATER QUALITY WORSE? WHAT IS THE LIKELIHOOD THAT THE COVER WOULD NOT WORK AND A TREATMENT PLANT WOULD HAVE TO BE CONSTRUCTED?

Two temporary problems have been observed with covers at Metropolitan. First, material used during the construction and installation of the cover includes xylenes. This organic compound can leach from the newly installed material into the water when first placed into service. The MCL for xylenes in water is 1.750 mg/L. Importantly, consumers can taste and smell xylenes at a much lower level, at approximately 20 ug/L. Filling times have to be kept to the minimum so that elevated xylene levels will not occur.

A problem that has occurred in covered reservoirs in the past is the process of nitrification. During nitrification, the ammonia used to form the disinfectant monochloramine, is converted to nitrite by a unique group of harmless bacteria. The development of nitrite accelerates the breakdown of the chloramine residual. In turn, this allows bacteria to grow.

Nitrification was first observed in Metropolitan's system in Garvey Reservoir in 1985 following the switch from free chlorine to chloramine disinfection. As a result of this incident, Metropolitan conducted extensive research into the causes and control of nitrification.

To prevent or reduce the possibility of nitrification, Metropolitan reduced the amount of ammonia added to the water. In addition, Metropolitan converts to free chlorine disinfection every year for a one-month period to inactivate these chlorine-sensitive bacteria.

Nitrification problems in Metropolitan's covered reservoirs have been minimal since Metropolitan implemented control measures.

The second question concerned whether a cover would or would not work. Large covered reservoirs have existed in Metropolitan's system since the early 1980s and no treatment plants have been necessary as replacements.

WHAT ARE THE IMPACTS OF VOLATILE ORGANIC COMPOUNDS (VOC) IN COVERING THE RESERVOIR?

We assume this question relates to the bonding of seams for the floating cover. A heat system combined with a solvent would be used to seal the seams. The exact solvent that would be used is not specified at this time. Whatever solvent would be used would conform to AQMD regulations as to toxicity and volatility. Therefore, we would expect no significant impact in terms of release of volatile organic compounds.

WHAT IS THE TEMPERATURE EFFECT ON THE NEIGHBORHOOD DUE TO COVERING THE RESERVOIR?

Under ideal evaporative conditions, the reservoir would reduce air temperatures over the water surface by a fraction of a degree. It would have generally less effect on the adjacent houses since the prevailing wind blows away from the houses toward the reservoir.

WHAT ARE THE OPEN SPACE IMPACTS OF THE SJR ALTERNATIVES COMPARED TO THE SAN JOAQUIN HILLS TRANSPORTATION CORRIDOR?

The San Joaquin Hills Transportation Corridor was considered within the cumulative baseline study of SJR alternatives. The impacts of this transportation project are far larger than impacts associated with the covering or treatment plant alternatives at San Joaquin Reservoir. The alternatives associated with San Joaquin Reservoir represent a fraction of one percent of the impacts to open space, biological resources, cultural resources and aesthetics compared to the San Joaquin Hills Transportation Corridor.

IS THE FLOATING COVER FEASIBLE AND IS THE ESTIMATED COST EXTRAPOLATED FROM SMALLER JOBS?

Metropolitan considers a floating cover to be technically feasible. The cover cost is based on dollar-per-square foot costs obtained from smaller cover projects. The actual cost may be lower because of economies of scale for San Joaquin Reservoir.

WHAT ARE THE EFFECTS OF HIGH WINDS ON THE COVER?

The floating cover would be anchored to the reservoir periphery by a concrete anchoring system and weighted in the central portion to prevent damage from high winds. Previous experience with floating covers at Metropolitan's Mills filtration plant in Riverside indicates that floating covers perform well during high winds.

The inflatable cover would also be anchored to the reservoir periphery by concrete anchors and the cover held in place by cables. The cover would be designed to withstand anticipated winds in the area.

WHAT IS THE LIFE OF THE COVER?

Metropolitan feels a floating cover or an inflatable cover would have a useful life of 20/25 years before replacement. If a rigid cover is selected, a 50-year useful life is anticipated before any substantial repairs would be required.

WHAT ARE THE NOISE EFFECTS OF BLOWERS FOR THE INFLATABLE COVER?

Noise from the blowers would be imperceptible because the blowers are electrically driven and are intrinsically quiet. The blowers may also be surrounded by acoustic enclosures to minimize any potential noise impacts.

WHAT IS THE IMPACT OF COVERING THE RESERVOIR ON LAND VALUES?

Metropolitan does not believe that covering the reservoir would result in any long-term loss of property values. Even if there should be some loss of value, Metropolitan is not liable for that loss. Metropolitan has not factored legal defense costs into the cost of covering the reservoir.

HOW DO YOU REPAIR CRACKS OR SINKHOLES WHEN A RESERVOIR IS COVERED?

Each type of cover would have hatches for access into the reservoir. Divers could enter the reservoir to perform minor repairs if there were water in the reservoir. Major repairs would require that the reservoir be drained.

To complete major repairs, the floating cover would be inflated. Again, access would be through hatches or doorways. Maintenance crews could then work under the inflated floating cover or under the rigid or inflatable dome-like cover.

WHAT ARE THE RISKS ASSOCIATED WITH THE USE OF CHLORINE AT THE RESERVOIR?

Currently, San Joaquin Reservoir water must be kept heavily chlorinated. This involves the use of automatic chlorination units as well as the use of a mobile chlorinator during the summer months.

A rather large supply of chlorine must be kept on hand for this purpose. Since chlorine gas is toxic and can cause severe respiratory complications if inhaled, extreme care is given to the handling of this material.

Metropolitan has a rigorous training program for the handling of chlorine by its employees, including controlling releases with Chlorine Institute A and B kits. Metropolitan also maintains contingency plans in the event of a spill.

Strict adherence to these practices, as well as frequent inspection, have resulted in no chlorine handling accidents in the last 50 years.

WHAT IS THE RELATIONSHIP OF BIG CANYON RESERVOIR TO SJR?

Big Canyon Reservoir (BCR) is a 540 acre-feet, uncovered, treated water reservoir located in the city of Newport Beach about one mile west of SJR. BCR is owned and operated by the city of Newport Beach.

Effluent from SJR is delivered to BCR via a connection to the Orange County Feeder. Consequently, water quality problems occurring in SJR may cause problems for BCR. BCR serves about two-thirds of the city's demand. Metropolitan has no involvement in the ownership or operation of BCR.

WHAT IS THE RELATIONSHIP BETWEEN THE CENTRAL POOL AUGMENTATION (CPA) PROJECT AND SAN JOAQUIN RESERVOIR?

The CPA project consists of treatment and conveyance facilities designed to take water from Lake Mathews, treat it and convey it to Metropolitan's Central Pool service area. The Central Pool service area consists of Los Angeles, Ventura and Orange counties and is currently served by the Jensen, Weymouth and Diemer filtration plants.

Even after the CPA project is operating, San Joaquin Reservoir will continue to receive its treated water from the Diemer plant in Yorba Linda. Additional pipelines would have to be constructed to convey water from the CPA project to San Joaquin Reservoir. The CPA project will make water available to a portion of South Coast County Water District through the South County Pipeline. This area is also served by San Joaquin Reservoir.

TABLE 5A

SAN JOAQUIN RESERVOIR PROJECT COSTS

ALTERNATIVE	A CONSTRUCTION COST (MILLIONS $)	B ANNUALIZED CAPITAL* COSTS (MILLIONS $)	C ANNUAL OPERATING ** COSTS (THOUSANDS $)	B & C TOTAL ANNUAL COST (MILLIONS $)
FLOATING COVER	$17	$1.8	$550	$2.4
INFLATABLE COVER	$23	$2.8	$840	$3.6
RIGID COVER	$111	$9.1	$640	$9.7
TREATMENT PLANT	$101	$8.5	$3,366	$11.9
NO PROJECT	N/A	N/A	$715	$0.72

* *ANNUALIZED CAPITAL COSTS CONSIST OF CONSTRUCTION COSTS AND EQUIPMENT REPLACEMENT COSTS OVER A FIFTY YEAR PROJECT LIFE.*

** *ANNUAL OPERATING COSTS INCLUDE STAFF, UTILITY SERVICES, CHEMICALS, ETC. FOR EACH ALTERNATIVE.*

DRAFT

San Joaquin Reservoir Improvement Project - Public Opinion Survey
September 29, 1992
Summary of All Responses

Factor	Very Important	Important	Unimportant	Very Unimportant
Effect on the environment	238	255	107	60
Traffic congestion and noise	43	135	225	250
Improving water quality	537	97	17	14
Views of reservoir neighbors	48	126	221	263
Cost effectiveness of solution	336	251	57	23
Length of construction	70	227	217	151
Retain water storage capacity	472	156	28	11

Single most important or least important impact	Most Important	Least Important
Effect on the environment	61	35
Traffic congestion and noise	3	194
Improving water quality	332	13
Views of reservoir neighbors	15	317
Cost effectiveness of solution	129	10
Length of construction	1	109
Retain water storage capacity	145	1