WATER QUALITY STANDARDS FOR SALINITY

COLORADO RIVER SYSTEM

Prepared by
Colorado River Basin Salinity Control Forum

1984

<u>NOTE</u> – This Review is composed of two parts, namely:

1) Proposed Report on the 1984 Review, *Water Quality Standards for Salinity, Colorado River System*, dated May 1984

2) Supplement Including Modifications to the *Proposed Report on the 1984 Review, Water Quality Standards for Salinity, Colorado River System,* dated July 1984

May 1984

PROPOSED REPORT ON THE

1984 REVIEW

WATER QUALITY STANDARDS FOR SALINITY

COLORADO RIVER SYSTEM

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COLORADO RIVER BASIN SALINITY CONTROL FORUM

MEMBERS

ARIZONA

Wesley Steiner, Director
Department of Water Resources
Dr. Ronald Miller, Acting Assistant Director
Department of Environmental Health
Stewart Udall, Attorney at Law, Member
Central Arizona Water Conservation District

CALIFORNIA

Myron B. Holburt, Chief Engineer
Colorado River Board of California
Walter Pettit, Deputy Executive Director
State Water Resources Control Board

COLORADO

David H. Getches, Executive Director
Department of Natural Resources
Robert Arnott, Assistant Director
Department of Health
David Robbins, Attorney at Law

NEVADA

Jack L. Stonehocker, Director
Colorado River Commission of Nevada
Lewis H. Dodgion, Administrator
Division of Environmental Protection
Roland D. Westergard, Director
Department of Conservation and Natural Resources

NEW MEXICO

Stephen E. Reynolds, State Engineer

UTAH

Daniel F. Lawrence, Director
Division of Water Resources
Calvin K. Sudweeks, Director
Bureau of Water Pollution Control
Division of Environmental Health

WYOMING

George L. Christopulos, State Engineer
William F. Garland, Administrator
Department of Environmental Quality

Jack A. Barnett, Executive Director
Colorado River Basin Salinity Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

SUMMARY

Section 303 of the Clean Water Act of 1977 requires that water quality standards be reviewed from time to time, but at least once during each 3-year period. The seven-state Colorado River Basin Salinity Control Forum (Forum) has reviewed the existing state-adopted and Environmental Protection Agency (EPA) approved numeric salinity criteria and plan of implementation for salinity control for the Colorado River system. Changes in hydrologic conditions and water use within the Colorado River Basin have been evaluated and this report presents the recommended revisions to the plan of implementation which are to be submitted to each of the Basin states for adoption.

The Forum finds no reason to recommend changes in the numeric salinity criteria at the three lower main stem stations. Those values are:

	Salinity in mg/l
Below Hoover Dam	723
Below Parker Dam	747
Imperial Dam	879

The revised plan of implementation comprises a number of federal and nonfederal measures to maintain the adopted salinity criteria while the Basin states continue to develop their compact-apportioned waters. The Forum recommends that the plan of implementation described in this report be carried out. The plan of implementation is:

1. Completion of the two salinity control units under construction (Paradox Valley and Grand Valley), and final

plan formulation and construction of the authorized Las Vegas Wash Unit.

2. Authorization and construction of the salinity control projects identified in the Forum's proposed legislation S. 752. In addition, the completion of the planning reports on the other projects described in Chapter IV of this report or their equivalents.

3. Implementation by the Department of Agriculture of onfarm and lateral improvement measures in cost-effective salinity control units.

4. Implementation of cost effective salinity control measures by the Bureau of Land Management to reduce salt contribution from public domain lands.

5. Imposition of effluent limitations, principally under the National Pollutant Discharge Elimination System (NPDES) permit program, provided for in Section 402 of the Clean Water Act of 1977 on industrial and municipal discharges based on the Forum's 1977 policy on salinity control through the NPDES permits.

6. Implementation of the 1980 Forum policy for the use of brackish and/or saline waters for industrial purposes.

7. Inclusion of the 208 Water Quality Management Plans. (Individually, the Basin states have developed water quality management plans to conform to the requirements of Section 208 of the Clean Water Act. The water quality management planning process is continuing. As the plans are refined or new elements added and after such changes have been adopted

by the states and approved by EPA, those portions of the plans dealing with salinity control will become part of the implementation plan.)

The plan also contemplates programs by water users to cope with higher salinity water, improvements in irrigation systems and management to reduce salt pickup, studies of means to minimize salinity in municipal discharges, and studies of future possible salinity control programs not now included in the plan.

Many natural and manmade factors affect the river's salinity. Consequently, salinity will vary from year to year may exceed the adopted numeric criteria.

The salinity control plan is designed to keep any temporary increases above the numeric criteria to a minimum as well as reduce the duration of such temporary increases.

Therefore, any increase in salinity above the criteria resulting from man's activities is expected to be small and of short duration. However, should water development projects be completed before control measures are brought on line, temporary increases above the criteria could result and these increases will be deemed in conformance with the standards if appropriate salinity control measures are included in the plan.

Increases above the criteria as a result of unfavorable periods of below normal annual river flows and resulting unfavorable reservoir conditions will also be in conformance with the standards, provided that when river flows return to normal and satisfactory reservoir conditions prevail, concentrations can be expected to be at or below the criteria level.

Salt routing studies for salinity projections for the 1984 Review were made using the Colorado River Simulation System, a river model developed by the U.S. Bureau of Reclamation. This model was also used for projecting future salinity concentrations at selected points in the Lower Basin for the period 1984 through 2000 under differing assumptions regarding available water supply, future water use, and salinity control measures in operation.

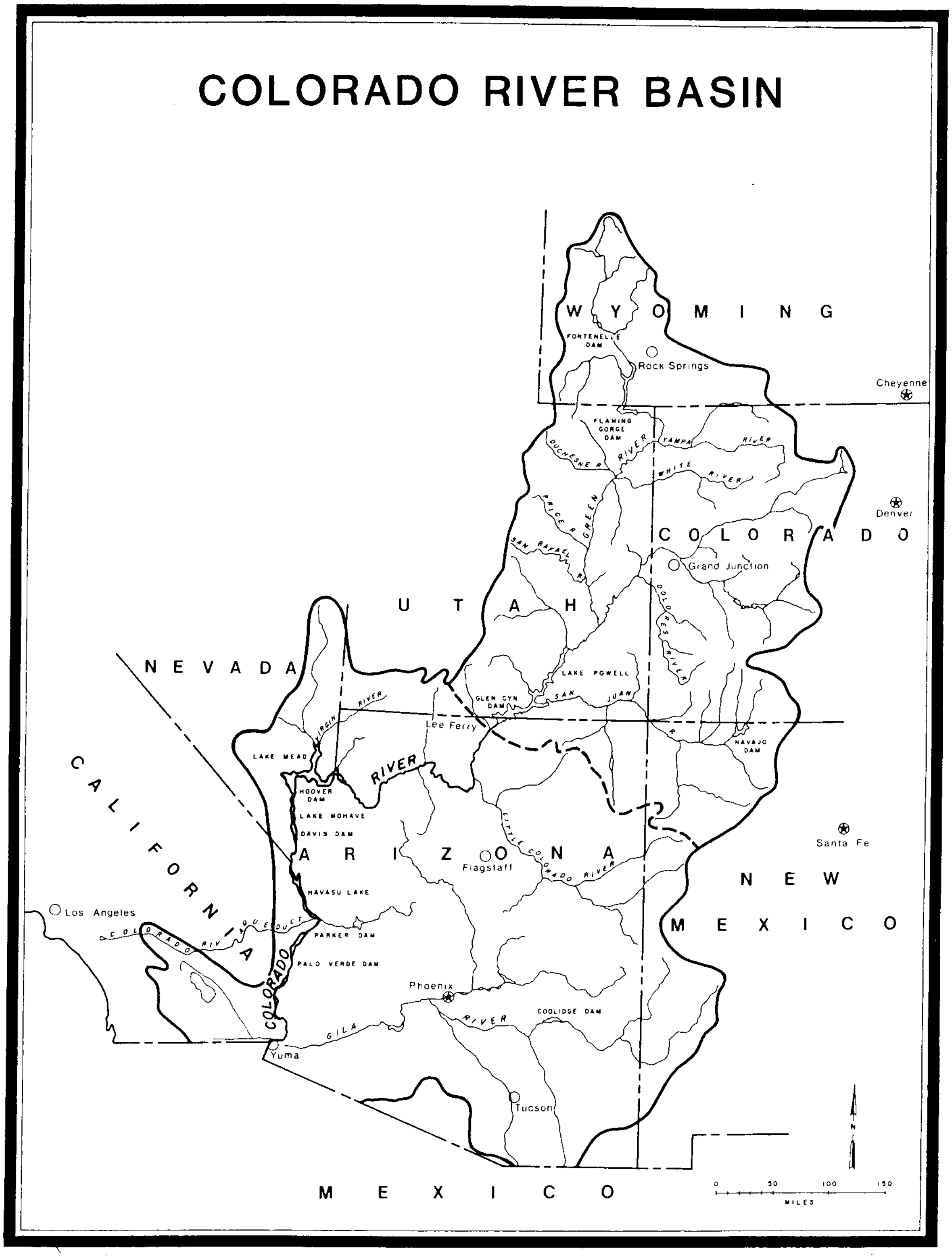
Salinity concentrations at each of the lower main stem stations for which numeric criteria have been established have generally been decreasing since 1972. Currently, salinity concentrations at the three stations are:

	Numeric criteria in mg/l	1983 salinity concentration in mg/l	Salinity concentration below numeric criteria in mg/l
Below Hoover Dam	723	682 1/	- 41
Below Parker Dam	747	703 1/	- 44
Imperial Dam	879	732 1/	-147

There is no reason to believe that the numeric criteria will be exceeded during the next 3-year review period. However, because of the extremely long lead time required to conduct salinity studies, complete feasibility reports,

1/ The low salinity concentration for Imperial Dam is the result of high flows that occurred in 1983. The salinity concentration values are provisional and subject to change.

authorize and complete construction, and achieve full impact at lower main stem stations, it is necessary to continue efforts to implement all cost-effective salinity control measures.


COLORADO RIVER BASIN
WYOMING
FONTENELLE DAM
Rock Springs
Cheyenne
FLAMING GORGE DAM
DUCHESNE R
GREEN RIVER
YAMPA RIVER
WHITE RIVER
PRICE R
SAN RAFAEL R
Denver
COLORADO
Grand Junction
DOLORES RIVER
UTAH
NEVADA
LAKE POWELL
GLEN CYN DAM
SAN JUAN R
Lee Ferry
NAVAJO DAM
VIRGIN RIVER
LAKE MEAD
RIVER
HOOVER DAM
LAKE MOHAVE
DAVIS DAM
CALIFORNIA
ARIZONA
Flagstaff
LITTLE COLORADO RIVER
Santa Fe
NEW MEXICO
HAVASU LAKE
Los Angeles
COLORADO RIVER AQUEDUCT
PARKER DAM
PALO VERDE DAM
COLORADO
Phoenix
COOLIDGE DAM
GILA RIVER
Yuma
Tucson
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LIST OF ABBREVIATIONS USED IN REPORT

ACP - Agricultural Conservation Program

ADHS - Arizona Department of Health Services

AOG - Association of Governments

ASCS - Agricultural Stablization and Conservation Service

ARS - Agricultural Research Service

AWT - Advanced Wastewater Treatment

Basin - Drainage Area of the Colorado River System

BLM - Bureau of Land Management

BMI - Basic Management Industries

BMP - Best Management Practices

COG - Council of Governments

CRBC - Colorado River Board of California

CRSM - Colorado River Simulation Model

CRSP - Colorado River Storage Projects

CRSS - Colorado River Simulation System

CRWQIP - Colorado River Water Quality Improvement Program

CSRS - Cooperative State Research Service

CSU - Colorado State University

DEQ - Department of Environmental Quality

DPR - Definite Plan Report

DRI - Desert Research Institute

EIS - Environmental Impact Statement

EPA - Environmental Protection Agency

ES - Extension Service (USDA)

LIST OF ABBREVIATIONS USED IN REPORT (continued)

FWS - Fish and Wildlife Service

FmHA - Farmers Home Administration

ft^3/s - cubic feet per second

Forum - Colorado River Basin Salinity Control Forum

IMS - Irrigation Management Services

lin.ft. - lineal feet

LTA - long term agreements

mg/d - million gallons per day

mg/l - milligrams per liter

MW - megawatts

MWD - Metropolitan Water District of Southern California

NPDES - National Pollution Discharge Elimination System

ORV - off-road vehicle

PPM - parts per million

RCWP - Rural Clean Water Program

Reclamation - Bureau of Reclamation

RMP - Resource Management Plan (BLM)

SCS - Soil Conservation District

T/AF - tons per acre-feet

TDS - Total Dissolved Solids

USDA - U.S. Department of Agriculture

USGS - U.S. Geological Survey

UIC - Underground Injection Control

WQA - Water Quality Association

CHAPTER I. INTRODUCTION

Purpose of Report

This report is in response to Section 303(c) of the Clean Water Act of 1977 (Public Law 92-500 as amended by Public Law 95-217) referred to in this report as the Clean Water Act.

This report is written as a complete document, but contains historical information only for the 1981-84 period. Background information regarding historical actions relative to the adoption of salinity standards is contained in the 1975 report. The 1978 report contains information pertaining to the 1975-1978 period and the 1981 report contains information pertaining to the 1978-81 period.

Section 303(c)(1) of the Clean Water Act requires that:

> The governor of a state or the state water pollution control agency of such state shall from time to time (but at least once each three-year period beginning with the date of enactment of the Federal Water Pollution Control Act Amendments of 1972) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. Results of such review shall be made available to the Administrator.

This report, prepared by the seven-state Colorado River Basin Salinity Control Forum (Forum) is a review of the water quality standards including numeric criteria and plan of implementation previously developed by the Forum. This is the fourth such report prepared by the Forum. This report includes the modifications to the 1981 Forum report and October 27, 1981, Supplement that have become necessary as a result of changed conditions and the availability of better information.

The Forum is composed of water resource and water quality representatives from each of the seven Colorado River Basin states (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming). The Forum was established for the purpose of providing the states with the necessary information to meet the Environmental Protection Agency's (EPA) regulation, 40 CFR, Part 120, entitled "Water Quality Standards - Colorado River System: Salinity Control Policy and Standards Procedures," and Section 303(a) and (b) of the Clean Water Act. The three previous Forum reports were prepared by the Forum in response to Section 303(c), as is this report.

The 1975 Forum report includes a detailed discussion of the legislation and events leading up to the establishment of salinity standards for the lower main stem of the Colorado River. The standards were adopted by all of the Basin states and subsequently approved by the EPA. The 1978 and 1981 reports reviewed the numeric criteria included in the 1975 report and concluded that no change was indicated; however, the plan of implementation was updated to reflect the circumstances at that time and changes that had taken place in the salinity control projects' status since 1975.

The plan of implementation, as set forth in the three earlier Forum reports, included effluent limitations for industrial point source discharges with the objective of no-salt return whenever practicable. In February 1977, the

Forum adopted the "Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program." The policy provides detailed guidance in the application of salinity standards developed pursuant to Section 303 of the Clean Water Act and through the NPDES permitting authority in the regulation of municipal and industrial point source discharges. The complete policy is presented in Appendix A of the 1978 report. On September 11, 1980, the Forum adopted a policy to encourage the use of brackish and/or saline waters for industrial purposes where it was environmentally sound and economically feasible. The complete policy is included in Appendix B of the 1981 Review.

Nothing in this report shall be construed to alter, amend, repeal, construe, interpret, modify, or be in conflict with the provisions of the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774), the Colorado River Basin Project Act (82 Stat. 885), the Colorado River Compact, the Upper Colorado River Basin Compact, or the Treaty with the United Mexican States (Treaty Series 994).

This report is consistent with the EPA-approved 1975, 1978, and 1981 reports and deals only with the portion of the Colorado River Basin above Imperial Dam. As used in this report, the lower mainstem of the Colorado River system is defined as that portion of the main river from Hoover Dam to Imperial Dam.

Below Imperial Dam, the river's salinity will be controlled to meet the terms of the agreement with Mexico on salinity in Minute 242 of the International Boundary and Water Commission, entitled "Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River." This agreement states that measures will be taken to assure that the waters delivered to Mexico upstream from Morelos Dam will have an annual average salinity concentration of no more than 115 ppm (±30 ppm) total dissolved solids greater than the annual average salinity concentration of Colorado River water arriving at Imperial Dam. Title I of Public Law 93-320 is the legislation which implements the provisions of Minute 242. Minute 242 and Title I constitute a federal numeric criterion and plan of implementation for the river below Imperial Dam.

Forum Activities Since 1981

During the 1981-1983 period, the Forum developed a policy concerning disposal of intercepted ground water. The intercepted ground water policy expands the previously adopted "Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program" and more clearly defines the type of information to be submitted by the discharger for use by the permitting agency.

Since the 1981 Review, two annual progress reports, numbers 5 and 6, which summarize 1982 and 1983 salinity control activities have been prepared by the Forum.

Legislative Action Since 1981

During much of 1981, the Forum engaged in detailed discussions concerning needed amendments to P.L. 93-320, the Colorado River Basin Salinity Control Act. Forum concerns included authorization of additional salinity control units, replacement of incidental wildlife values, authorization for joint ventures with non-federal entities, and authorization for USDA onfarm programs. In October of 1981, the Forum agreed on language to accomplish the desired objectives, and instructed the Executive Director to work for the introduction and passage of legislation containing such language. Since that time, the Forum has been influential in the introduction of six bills: S. 2202 and the companion H.R. 6097 in the 97th Congress; S. 752 and companion H.R. 2790; and S. 1842 and companion H.R. 3903 in the 98th Congress.

The first bill, S. 2202, was introduced into the 97th Congress on March 15,1982, by Senator Armstrong of Colorado and was cosponsored by 10 senators from the Colorado River Basin States. With the exception of some minor technical and editorial changes, S. 2202 was identical to the legislation proposed by the Forum.

On June 20, 1982, the Subcommittee on Water and Power of the Energy and Natural Resources Committee chaired by Senator Murkowski of Alaska held hearings on S. 2202. The Executive Director of the Forum testified, as did the State of Colorado and the State of California. Additional testimony was received from representatives of the Department of the

Interior, the Department of Agriculture, State Department, and the Environmental Protection Agency.

On April 6, H.R. 6097, which was virtually identical to S. 2202, was introduced into the House of Representatives by Representative Kogovsek of Colorado, along with 10 other representatives from the Colorado River Basin states. The House did not schedule hearings on the legislation, and a salinity control bill was not enacted in 1982. Consequently, Senator Armstrong introduced, on March 10, 1983, S. 752, which is substantially the same as S. 2202. The bill was co-sponsored by all fourteen Basin senators. Representative Kogovsek introduced H.R. 2790 on April 27, 1983, which is companion legislation to S. 752. H.R. 2790 has been co-sponsored by 24 basin congressmen.

Hearings were held on S. 752 by the Senate in the last session of the 98th Congress. Interior and Agriculture witnesses appeared and gave general support for the state-drafted legislation but did ask for some specific modifications. The states met on several occasions to consider the Administration's requests. On December 23, 1983, the states forwarded revised legislative language to Congress which has the support of all seven basin states and is responsive to all of the Administration's requests.

Because new legislation was critical for a viable USDA program in FY 1985, alternative bills containing only the USDA provisions were drafted and introduced into the Senate (S. 1842) and the House (H.R. 3903) in early September. H.R.

3903 was passed by the House on November 18, 1983. On April 3, 1984, the House Subcommittee on Water and Power Resources of the Committee on Interior and Insular Affairs heard H.R. 2790. Hearings on S. 1842 were held on April 5, 1984, by the Subcommittee on Soil and Water Conservation, Forestry, and Environment of the Committee on Agriculture, Nutrition and Forestry.

CHAPTER II. SALINITY OF THE RIVER

The Colorado River system drains 244,000 square miles of the western United States and a small portion of northern Mexico. Its waters serve some 2.5 million people within the United States portion of the Basin and through export provide full or supplemental water supply to another 14.5 million people. The regional economy is based on irrigated agriculture, livestock grazing, mining, forestry, manufacturing, oil and gas production, and tourism. About 2.5 million acres are irrigated within the Basin and hundreds of thousands of acres are irrigated by waters exported from the Basin. The Colorado River also serves about 1.5 million people and 425,000 irrigated acres in Mexico.

Salinity 1/ has long been recognized as one of the major problems of the river. The Colorado, like most western rivers, increases in salinity from its headwaters to its mouth. This is the result of both natural and manmade causes. Natural causes include salt contribution of saline springs and other ground waters, erosion and solution of sediments, and the concentrating effects of evaporation and transpiration. Man-caused increases in salinity result from the diversion, consumptive use, out-of-basin exports of

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1/ Salinity is a measure of the total dissolved solids of a water sample including all inorganic material in solution, whether ionized or not. The principal constituents include sodium, potassium, calcium, magnesium, carbonates, chlorides, sulfates, and nitrates. The terms salinity and total dissolved solids are considered equivalent. The measure of salinity is presented as the numerical sum of constituents in terms of milligram per liter (mg/l) or parts per million (ppm).

water, and salt loading. The largest man-induced increase in salinity is caused by the concentrating effect of, and salt loading associated with, irrigated agriculture.

In addition to the comprehensive studies conducted by the Forum in 1975, 1978, 1981, and for this review, evaluations of the salinity of the Colorado River have been made by Reclamation, U.S. Geological Survey (USGS), Environmental Protection Agency (EPA), Bureau of Land Management (BLM), and the Colorado River Board of California (CRBC).

Water quality and streamflow data are being obtained on a daily, weekly, monthly, or quarterly basis at various points on streams throughout the Basin by the USGS in cooperation with the states and other federal agencies. Gaging stations in the Basin that are of significance to this report and for which streamflow and water quality records are available are listed on Figure 1. This figure shows the availability of streamflow and water quality data for key stations during the period 1941-1982 and the current frequency of sampling as classified by the USGS. Where the water quality information is not complete, the missing data have been estimated by correlation with data from other stations.

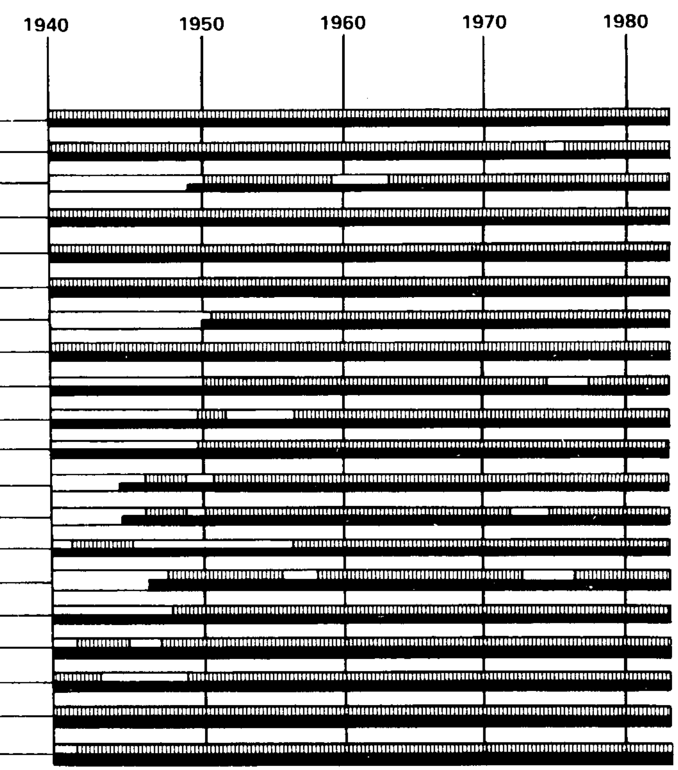
Salinity: 1972 - 1982

The flow-weighted annual average salinity at the stations for which numeric criteria have been set are shown in the following tabulation:

FIGURE I

COLORADO RIVER BASIN
Flow and Quality of Water Data
1941-83

Station	Current Sampling 1/ Frequency: Flow	Current Sampling 1/ Frequency: Quality 2/
Colorado River near Cameo, Colorado	Daily	Daily
Gunnison River near Grand Junction, Colorado	Daily	Daily
Dolores River near Cisco, Utah	Daily	Daily
Colorado River near Cisco, Utah	Daily	Daily
Animas River at Farmington, New Mexico	Daily	Daily
San Juan River near Bluff, Utah	Daily	Daily
Green River near Green River, Wyoming	Daily	Daily
Green River at Green River, Utah	Daily	Daily
Yampa River near Maybell, Colorado	Daily	Daily
Duchesne River near Randlett, Utah	Daily	Daily
White River near Watson, Utah	Daily	Daily
Price River at Woodside, Utah	Daily	Daily
San Raphael River near Green River, Utah	Daily	Daily
San Juan River at Shiprock, New Mexico	Daily	Daily
Little Colorado River near Cameron, Arizona	Daily	Intermittent
Virgin River at Littlefield, Arizona	Daily	Daily
Colorado River at Lee's Ferry, Arizona	Daily	Daily
Colorado River below Hoover Dam, Arizona-Nevada	Daily	Biweekly
Colorado River below Parker Dam, Arizona-California	Daily	Every 5 days
Colorado River at Imperial Dam, Arizona-California	Daily	Daily



1/ Sampling frequency as classified by the U.S. Geological Survey.

2/ Electrical conductivity measurements. Frequency of complete chemical analyses varies from station-to-station.

3/ Sampled quality data

Measured flow record

Flow-weighted annual* average salinity
(Total dissolved solids in milligrams per liter)

Station	1975 Numeric criteria	1973	1974	1975	1976	1977	1978	1979	1980	1981**	1982**	1983**
Hoover Dam	723	706	686	689	675	667	686	694	691	678	682	682***
Parker Dam	747	726	700	703	689	681	681	694	686	721	717	703***
Imperial Dam	879	846	836	829	823	821	812	808***	757***	816	825	732***

*Calendar Year
**Provisional, subject to change
***The low salinity concentration is due to high flows which occurred in 1979, 1980, and 1983.

Projections of Future Water Use

One of the significant factors affecting salinity concentrations is water use. The depletion of Colorado River water by the Upper Basin States in 1982 was estimated at 3,377,000 acre-feet, exclusive of Colorado River Storage Project (CRSP) reservoir evaporation.1/ In addition, there are a number of water development projects now under construction, and on some of the recently completed units water use is building up to project capacities. Several projects have been authorized for construction but work has not yet been initiated. In addition, studies are being made of numerous in-Basin projects that would develop water for irrigated agriculture, coal and oil shale development, thermal-electric generation, and municipal and industrial purposes. Some of the projected future developments provide for increased transmountain diversions to the eastern slope of the Rocky Mountains in Colorado, to the Bonneville Basin

1/ Evaporation from Navajo Reservoir is included as a part of New Mexico's water use.

in Utah, to the Rio Grande Basin in New Mexico, and to the Platte River Basin in Wyoming.

Estimates of both 1982 water use and projected future use through the year 2000 for each of the seven states were furnished by the states. Since future water use is subject to many uncertainties and will be dependent on many variables, three alternative future water depletion levels were developed for use in salt routing studies. These were identified as low, moderate, and high. The three projected possible levels of depletion were based on anticipated demand and are independent of physical limitations on water supply. The terminology of "low, moderate, and high" is not to be taken as implying that the projection designated as "moderate" is the most probable one. Rather, the three terms merely reflect the relative rate of increased use for one projection as compared to the others.

Projected depletions in the Upper Basin under year 2000 conditions of development, exclusive of CRSP reservoir evaporation, range from a low of about 4,183,000 to a high of 4,799,000 acre-feet. The annual CRSP reservoir evaporation, estimated by Reclamation, averages about 520,000 acre-feet per year. 1/

Projected consumptive use 2/ from the main stem in the

1/ Evaporation from Navajor Reservoir is included as part of New Mexico's water use.

2/ Consumptive use as defined by the U.S. Supreme Court in (276 U.S. 340) means diversions from the stream less such return flow thereto as is available for consumptive use in the United States or in satisfaction of the Mexican Treaty obligation.

Lower Basin in 2000 varies in a narrow range from 7,407,000 to 7,466,000 acre-feet.

Table 1 presents a summary of projected water use in the Colorado River Basin. Figure 2 presents this same information in graphical form for the Upper Basin. As can be seen, even the low projection of depletions exceeds the historical rate of increase. Presented in Appendix A are data on 1982 base conditions and projected future uses by state and by specific categories of use.

Table 1. - Summary of estimated water use in the Colorado River Basin[1]/
(1,000 acre-feet)

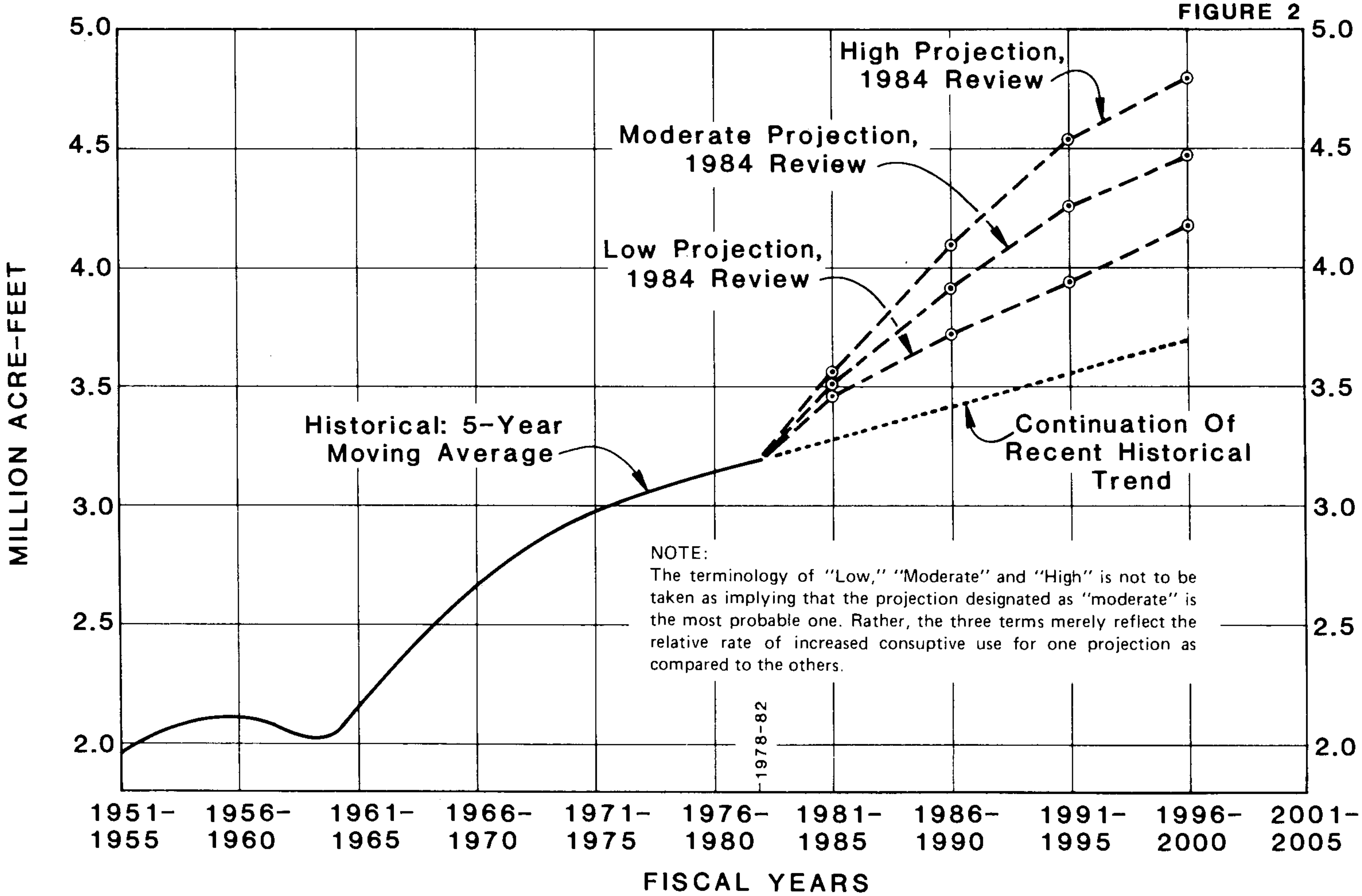
	1982 base condition	Assumption as to level of use	1985	1990	1995	2000
Upper Basin[2]/	3,377	Low[4]/	3,464	3,719	3,938	4,183
		Moderate[4]/	3,512	3,922	4,255	4,470
		High[4]/	3,555	4,096	4,536	4,799
Lower Basin[3]/	5,404	Low	6,235	6,714	7,073	7,407
		Moderate	6,283	6,914	7,401	7,436
		High	6,295	7,392	7,434	7,466
Total	8,781	Low	9,699	10,433	11,011	11,590
		Moderate	9,795	10,836	11,656	11,906
		High	9,850	11,488	11,970	12,265

1/ Does not include deliveries to Mexico.
2/ Depletions at point of use. Does not include CRSP reservoir evaporation estimated by Reclamation to average 520,000 acre-feet per year.
3/ Diversions from the main stem less returns. Does not include main stem reservoir evaporation and stream losses.
4/ The terminology of "low, moderate, and high" is not to be taken as implying that the projection designated as "moderate" is the most probable one. Rather, the three terms merely reflect the relative rate of increased use for one projection as compared to the others.

HISTORICAL AND PROJECTED UPPER BASIN DEPLETIONS AT LEE FERRY

(EXCLUDING CRSP RESERVOIR EVAPORATION)

FIGURE 2



Salt Routing Studies

Extensive salt routing studies were made for the 1984 Review using the Colorado River Simulation System (CRSS) developed by the Bureau of Reclamation. 1/ The CRSS is a package of computer programs and data bases developed by Reclamation as a tool for use by water resource managers dealing with water related issues and problems in the Colorado River Basin. The central feature of the CRSS is a computer program which simulates the flow of water and salt through the system and the operation of the reservoirs including hydroelectric power plants.

The salt routing studies were conducted to provide estimates of future flow-weighted average annual salinity concentrations for each year of the 1984 through 2000 study period at selected points in the Lower Basin under different assumptions regarding: (1) water supply, (2) future water uses, and (3) existing and proposed salinity control measures.

Three water supply levels were used. These were virgin flows of 13, 14, and 15 million acre-feet per year at Lee

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1/ Detailed information on CRSS is presented in: "Colorado River Simulation System, An Executive Summary", Bureau of Reclamation, U.S. Department of the Interior (October 1981) and "Colorado River Simulation System, Users Manual," Bureau of Reclamation, U.S. Department of the Interior (June 1982).

Previous Forum salt routing studies were conducted using a different computer model, also developed by Reclamation, because the development of the CRSS was not completed. Results obtained with the CRSS are approximately, though not exactly, the same as those obtained with the earlier model.

Ferry, Arizona. 1/ It is expected that this range of flows would encompass the actual future flows in the study time frame. 2/ The low, moderate, and high levels of water use shown in Table 1 provided the water use input to the CRSS.

Four levels of salinity control were used in the analysis:

Level 1:

Grand Valley (Stage I and existing USDA onfarm)
Meeker Dome
Uinta Basin (existing USDA onfarm)
No-salt return policy (Forum)

Level 2:

All Level I
Grand Valley (Stage II) (USBR-USDA)
Paradox Valley
Las Vegas Wash

Level 3:

All Level 2
Lower Gunnison Basin (Stage I) (USBR-USDA)
McElmo Creek (USBR-USDA)
Big Sandy River (USBR-USDA)
Sinbad Valley (BLM)
San Rafael River (USDA)
Price River (USDA)
Mancos Valley (USDA)
Uinta Basin (USDA)
Virgin Valley (USDA)
Moapa Valley (USDA)
Saline Water Use and Disposal Opportunities (partial) (USBR)

1/ The estimated average annual virgin flow at Lee Ferry varies with the period of record. For the period 1896-1982 it is 14.7 million acre-feet; for 1922-1982, 13.9 million acre-feet.

2/ The method of handling water supply differs from that normally used by Reclamation in the CRSS. In water supply projections, Reclamation usually operates the model through different sequences of historical flows, so that more sophisticated techniques of probability analysis may be employed. The additional complexity of this approach was not felt to be necessary in the Forum salt routing studies.

Level 4:

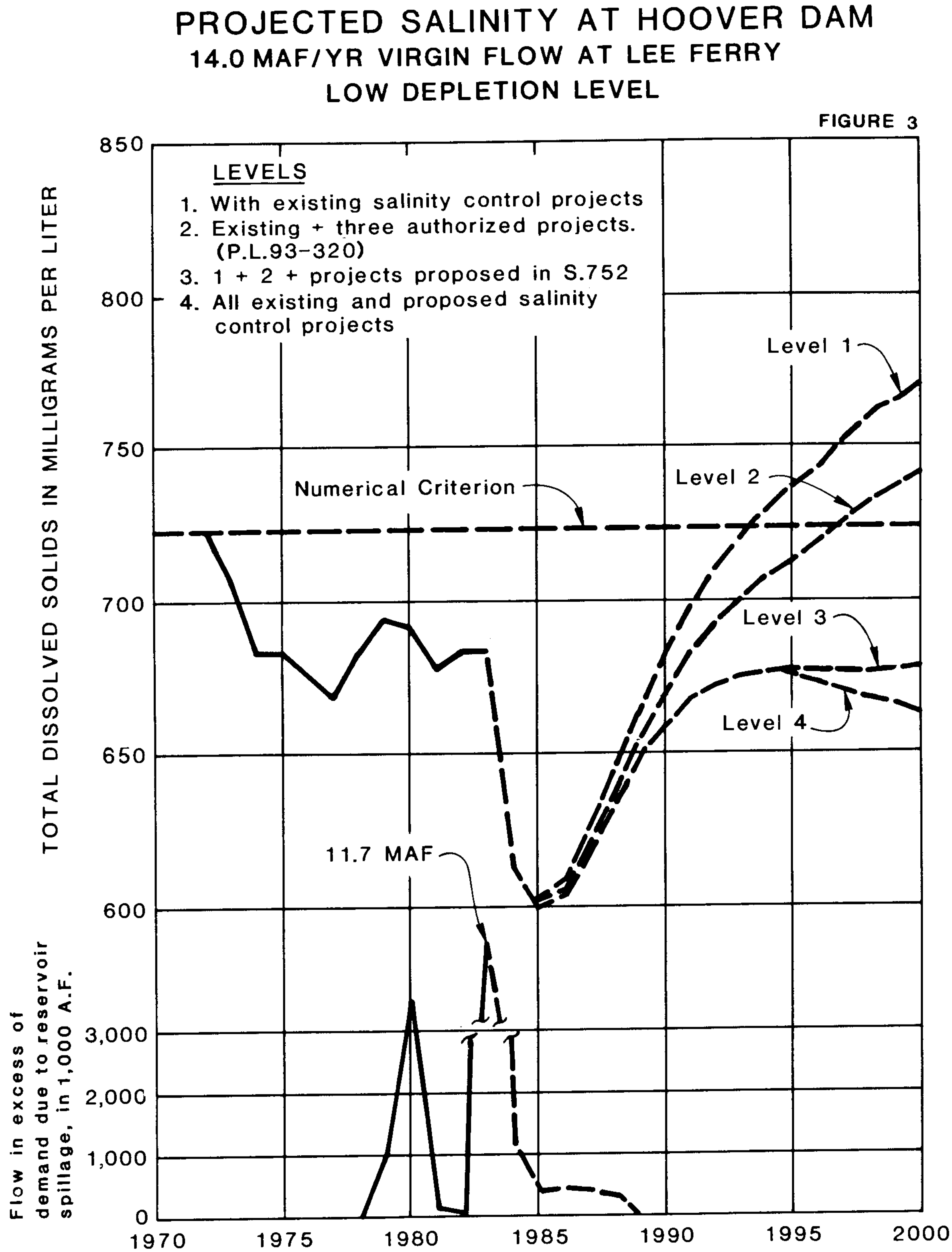
All Level 3
Uinta Basin (USBR)
Glenwood-Dotsero Springs (USBR)
LaVerkin Springs (USBR)
Price-San Rafael Rivers (USBR)
Dirty Devil River (USBR)
Lower Virgin River (USBR)
Lower Gunnison Basin (Stage II USBR - USDA)
Palo Verde Irrigation District (USBR - USDA)
Sagers Wash (BLM)
Upper Virgin River (USDA)

For the salt routing analysis, the initial year of operation of a particular salinity control project was determined after estimating the time required for planning, authorization, and construction. The individual projects are described in Chapter IV.

As discussed in the 1981 Review, analyses performed by the Forum for the 1981 salt routing studies indicated that salt loading relationships based on historical data resulted in salt loads greater than are occurring under present conditions. To compensate for this over estimation of projected salinity concentrations, appropriate modifications were made to the CRSS.

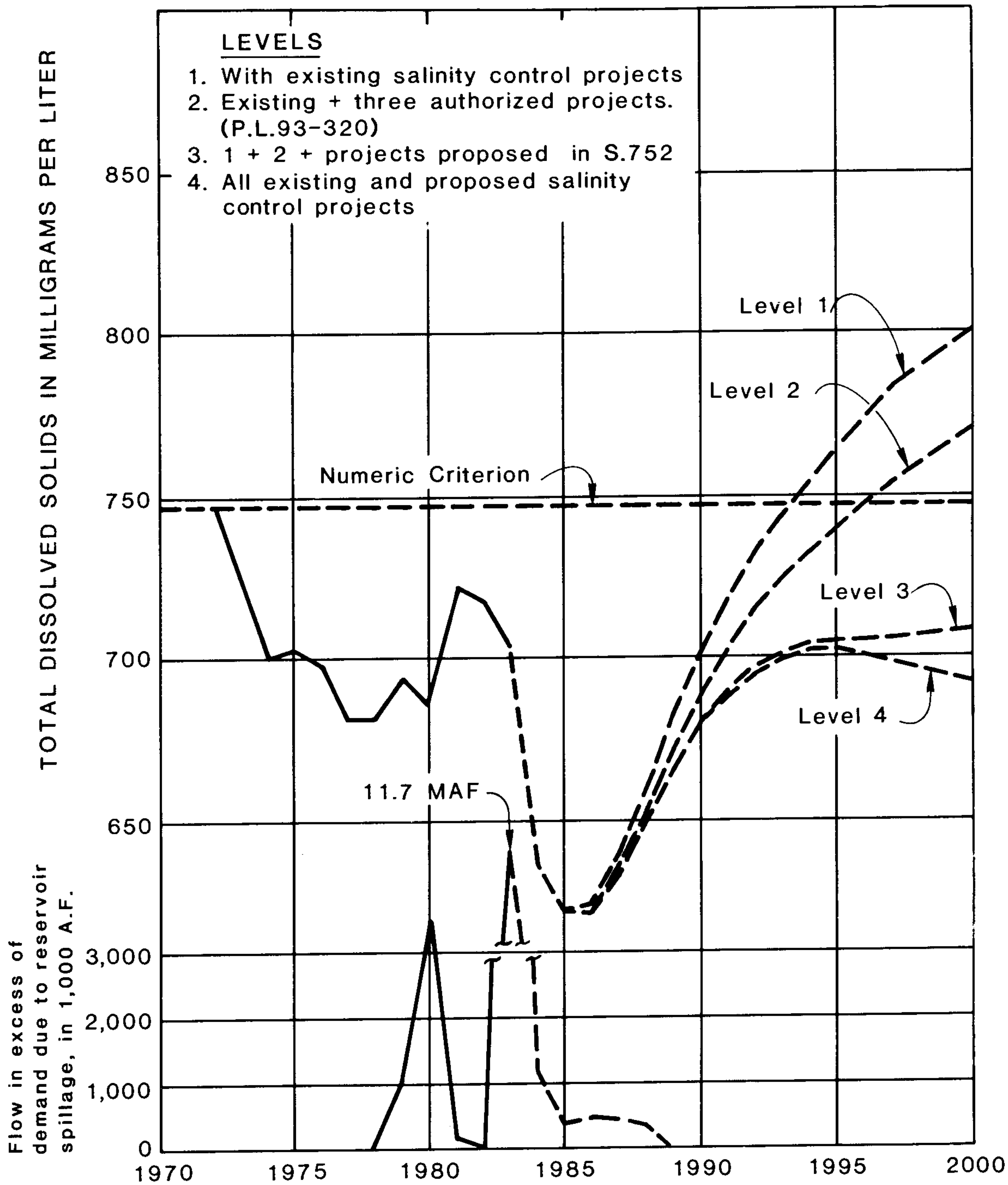
Projected Salinity Concentrations

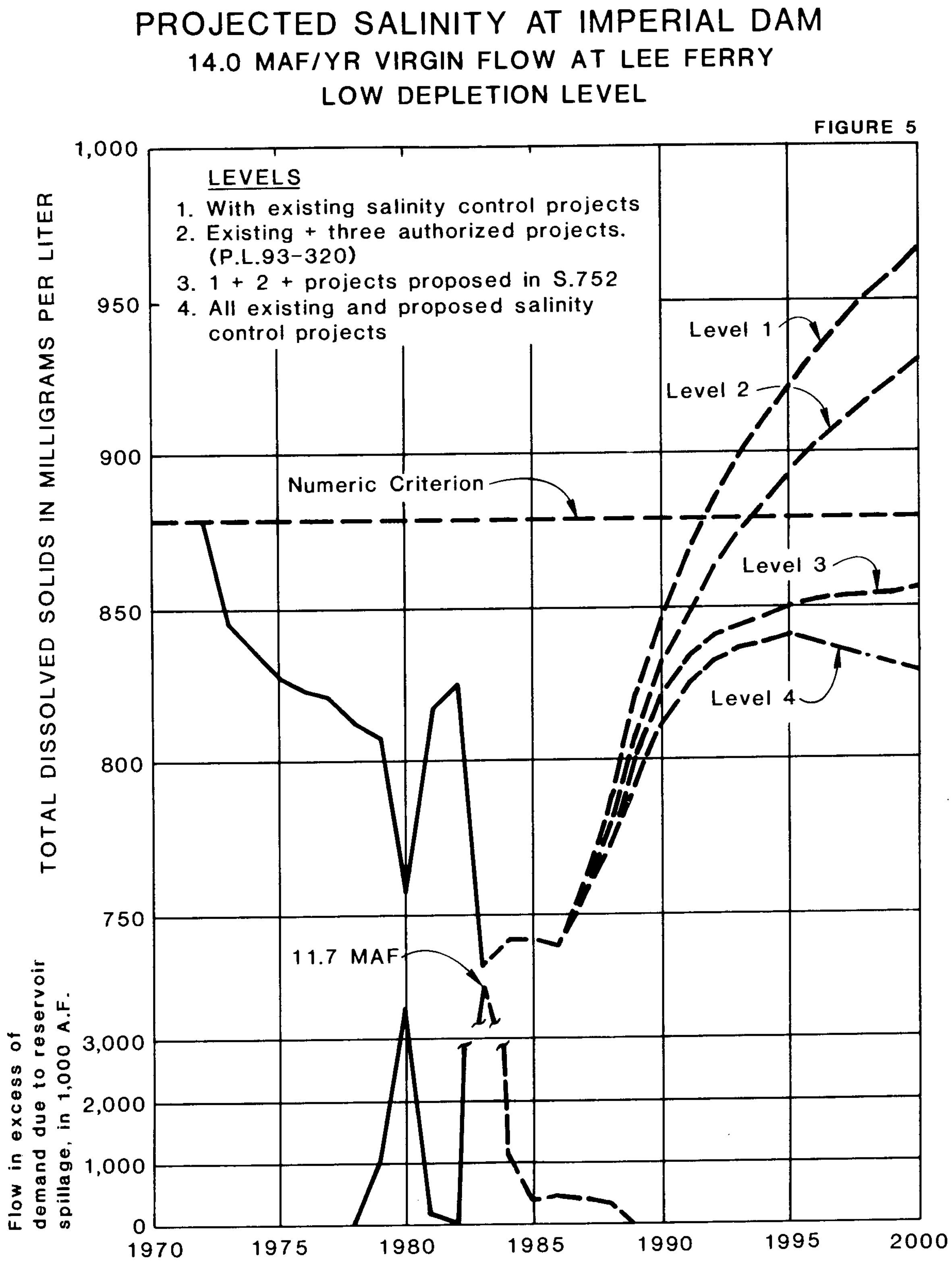
Projected 1985, 1990, 1995, and 2000 flow-weighted average annual salinity concentrations both with existing and with future salinity control measures for Hoover, Parker, and Imperial Dams are presented in Tables 2, 3, and 4. Projected salinity concentrations at these locations for a 14 million acre-feet virgin flow at Lee Ferry and the low depletion level are presented graphically on Figures 3, 4, and 5.


PROJECTED SALINITY AT HOOVER DAM
14.0 MAF/YR VIRGIN FLOW AT LEE FERRY
LOW DEPLETION LEVEL
FIGURE 3
LEVELS
1. With existing salinity control projects
2. Existing + three authorized projects. (P.L.93-320)
3. 1 + 2 + projects proposed in S.752
4. All existing and proposed salinity control projects
Level 1
Level 2
Level 3
Level 4
Numerical Criterion
11.7 MAF
TOTAL DISSOLVED SOLIDS IN MILLIGRAMS PER LITER
Flow in excess of demand due to reservoir spillage, in 1,000 A.F.
850
800
750
700
650
600
3,000
2,000
1,000
0
1970
1975
1980
1985
1990
1995
2000

PROJECTED SALINITY AT PARKER DAM
14.0 MAF/YR VIRGIN FLOW AT LEE FERRY
LOW DEPLETION LEVEL

FIGURE 4




PROJECTED SALINITY AT IMPERIAL DAM
14.0 MAF/YR VIRGIN FLOW AT LEE FERRY
LOW DEPLETION LEVEL
FIGURE 5
LEVELS
1. With existing salinity control projects
2. Existing + three authorized projects. (P.L.93-320)
3. 1 + 2 + projects proposed in S.752
4. All existing and proposed salinity control projects
TOTAL DISSOLVED SOLIDS IN MILLIGRAMS PER LITER
1,000
950
900
850
800
750
Numeric Criterion
Level 1
Level 2
Level 3
Level 4
11.7 MAF
Flow in excess of demand due to reservoir spillage, in 1,000 A.F.
3,000
2,000
1,000
0
1970
1975
1980
1985
1990
1995
2000

Future salinity concentrations will depend not only upon man's activities but upon natural phenomena, including periods of high and low annual water supply over the entire Basin and various portions of the Basin, variations in natural evapotranspiration, and other variables. Also, within the major storage reservoirs, salts precipitate, dissolve, and are mixed. Except for deviations caused by factors beyond the control of man, average annual salinity levels can be maintained at or below the 1972 levels as indicated on Table 2, 3, and 4.

Baseline Values

Baseline values, which are relationships between salt load and flow, were developed[1] in 1980 for the following thirteen stations in the Colorado River Basin.

Colorado River near Cameo, Colorado
Gunnison River near Grand Junction, Colorado
Colorado River near Cisco, Utah
San Juan River near Archuleta, New Mexico
San Juan River near Bluff, Utah
Colorado River at Lees Ferry, Arizona
Duchesne River near Randlett, Utah
Green River near Green River, Wyoming
Green River at Green River, Utah
San Rafael River near Green River, Utah
Dolores River at Cisco, Utah
White River at Watson, Utah
Virgin River at Littlefield, Arizona

The 1975 report called for the development of baseline values for monitoring points on the main stem and major

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[1] A description of the methodology for developing these values and the values themselves can be found in the baseline value report adopted by the Forum September 11, 1980, and is summarized in the 1981 Review.

Table 2. - Projected 1990 Salinity Levels
(mg/l)
Numeric Criteria: Hoover Dam 723, Parker Dam 747, Imperial Dam 879

Average virgin flow (maf)	Location	With Existing Salinity Control			With Existing & 3 Authorized Projects			With Existing, 3 Authorized and S. 752 Projects			With All Proposed Projects		
		Low[1]	Mod[1]	High[1]	Low	Mod	High	Low	Mod	High	Low	Mod	High
13.0	Hoover Dam	709	713	716	696	699	702	685	688	691	685	689	691
	Parker Dam	731	735	740	718	721	726	708	712	716	708	712	716
	Imperial Dam	<u>882</u>	<u>890</u>	<u>898</u>	866	873	<u>882</u>	855	862	871	845	853	861
14.0	Hoover Dam	682	685	688	668	672	674	658	661	664	659	662	664
	Parker Dam	702	706	710	689	693	697	680	684	688	680	684	688
	Imperial Dam	848	855	864	833	834	848	822	829	837	812	819	828
15.0	Hoover Dam	654	657	660	641	644	647	631	634	637	632	635	637
	Parker Dam	673	677	681	661	664	668	652	655	659	652	655	659
	Imperial Dam	801	808	816	787	794	801	776	783	790	768	774	782

Note: The Colorado River System is subject to highly variable annual flows which affect the river's salinity. Although reservoir storage tends to dampen the effects of variable flow, it is probable that actual salinity levels will exceed or fall below the values shown, even though the conditions upon which the projections are based, such as average virgin flow and future level of development, are met.

1/ Low, Mod, and High refer to levels of development.

Values underlined exceed the numeric criteria.

Table 3. - Projected 1995 Salinity Levels
(mg/l)
Numeric Criteria: Hoover Dam 723, Parker Dam 747, Imperial Dam 879

Average virgin flow (maf)	Location	With Existing Salinity Control			With Existing & 3 Authorized Projects			With Existing, 3 Authorized and S. 752 Projects			With All Proposed Projects		
		Low[1]	Mod[1]	High[1]	Low	Mod	High	Low	Mod	High	Low	Mod	High
13.0	Hoover Dam	784	797	807	758	770	779	718	729	738	717	728	737
	Parker Dam	813	826	837	786	799	809	747	759	769	747	758	768
	Imperial Dam	980	1002	1015	948	969	982	903	922	933	892	912	923
14.0	Hoover Dam	737	754	764	712	727	738	676	689	701	675	688	700
	Parker Dam	764	781	793	739	755	767	703	718	730	703	717	729
	Imperial Dam	923	947	962	893	917	931	850	873	887	840	862	877
15.0	Hoover Dam	698	711	722	675	688	698	640	653	662	639	651	661
	Parker Dam	723	737	748	700	714	724	666	679	689	664	678	688
	Imperial Dam	872	896	909	844	868	880	804	826	838	793	816	828

Note: The Colorado River System is subject to highly variable annual flows which affect the river's salinity. Although reservoir storage tends to dampen the effects of variable flow, it is probable that actual salinity levels will exceed or fall below the values shown, even though the conditions upon which the projections are based, such as average virgin flow and future level of development, are met.

1/ Low, Mod, and High refer to levels of development.

Values underlined exceed the numeric criteria.

Table 4. - Projected 2000 Salinity Levels
(mg/l)
Numeric Criteria: Hoover Dam 723, Parker Dam 747, Imperial Dam 879

Average virgin flow (maf)	Location	With Existing Salinity Control			With Existing & 3 Authorized Projects			With Existing, 3 Authorized and S. 752 Projects			With All Proposed Projects		
		Low[1]	Mod[1]	High[1]	Low	Mod	High	Low	Mod	High	Low	Mod	High
13.0	Hoover Dam	820	841	862	788	807	827	720	737	754	704	720	737
	Parker Dam	852	874	896	819	839	861	750	768	787	734	851	770
	Imperial Dam	1027	1059	1085	988	1018	1044	906	933	956	878	904	926
14.0	Hoover Dam	771	795	815	741	764	783	678	700	718	663	685	703
	Parker Dam	800	826	846	770	794	814	707	729	748	692	714	733
	Imperial Dam	966	1002	1026	1929	965	988	856	887	909	829	860	882
15.0	Hoover Dam	725	747	776	698	719	738	640	660	678	625	645	663
	Parker Dam	752	775	796	724	746	766	666	686	706	651	672	692
	Imperial Dam	909	942	966	876	907	931	807	836	859	780	810	833

Note: The Colorado River System is subject to highly variable annual flows which affect the river's salinity. Although reservoir storage tends to dampen the effects of variable flow, it is probable that actual salinity levels will exceed or fall below the values shown, even though the conditions upon which the projections are based, such as average virgin flow and future level of development, are met.

[1] Low, Mod, and High refer to levels of development.

Values underlined exceed the numeric criteria.

tributaries as part of the process of identifying and evaluating changes in river salinity. The baseline values will be used to assess the effects of development, salinity control measures, and/or other changes in the area upstream from the baseline station. They may be used to adjust the parameters used in the river salt routing models. However, there is no intent to make baseline values standards nor are they to be considered or interpreted as standards for salinity. Preliminary values for the average annual salinity concentration at each station were developed by Reclamation for the 1982 and 1983 water years and compared to the baseline values. All fell within the two standard deviations of variation.

CHAPTER III. WATER QUALITY STANDARDS FOR SALINITY

Criteria

The Forum developed and agreed upon basinwide water quality standards for salinity, including numeric criteria and a plan of implementation for salinity control in 1975 (1975 Forum report). Each of the Basin states adopted the 1975 Forum report as its standards for salinity. The state-adopted water quality standards were subsequently approved by EPA. The 1975 report described the rationale for the selection of the criteria stations.

In response to Section 303(c) of the Clean Water Act, the Forum in 1978 and 1981 reviewed the standards. After each review, the Forum determined that the 1975 criteria were appropriate. The Forum also reviewed and modified the plan of implementation in 1978 and again in 1981. Appropriate documents were adopted by the states.

Again, in 1984, the Forum in response to Section 303(c) reviewed the criteria and determined that the 1975 criteria are still appropriate. The numeric criteria are: 1/

Below Hoover Dam	723 mg/l
Below Parker Dam	747 mg/l
Imperial Dam	879 mg/l

1/ The weighted average annual salinity at the three locations in the lower mainstem of the Colorado River where numerical criteria have been established was and continues to be computed by the U.S. Bureau of Reclamation utilizing salinity data determined by the "calculation method" (sum of constituents). The calculation method is described in the latest edition of the U.S. Geological Survey Techniques of Water Resources Investigations - "methods for determination of inorganic substances in water and fluvial sediments."

As in 1981, the plan of implementation was reviewed and modified to reflect changes that have occured since 1981. The plan is described in Chapter IV.

Temporary Increases

Many natural and manmade factors affect the river's salinity. Consequently, salinity will vary from year to year and may exceed the adopted numeric criteria on occasion. In recognition of this, the approved standards permit temporary increases above the criteria levels if appropriate salinity control measures are included in the plan.

A salinity control plan is designed to keep any temporary increases above the numeric criteria to both a minimum as well as the duration of such temporary increases. Therefore, any increase in salinity above the criteria resulting from man's activities is expected to be small in magnitude and of short duration. However, should water development projects be completed before control measures are brought on line, temporary increases above the criteria are possible and these increases will be deemed in conformance with the standard.

A reliable determination of the time and magnitude of temporary increases would be both expensive and time consuming because of the complex relationships between water development, salinity control, and natural variations in river conditions. To date the numeric criteria have not been exceeded.

Increases above the criteria resulting from unfavorable periods of below normal annual river flows and resulting unfavorable reservoir conditions also will be in conformance with the standards, provided that, when river flows return to normal and satisfactory reservoir conditions prevail, concentrations are expected to be at or below the criteria level.

Uses

The Colorado River, from its headwaters in the Rocky Mountains to its mouth in the Gulf of California, is extensively used for a wide variety of uses. A portion of the flows is transported out of the Colorado Basin for use in adjacent river basins. The major uses in the Colorado River Basin are irrigation, municipal and industrial, powerplant cooling, fish and wildlife, and recreation.

Each state under its laws and regulations has defined the beneficial uses of the waters of the Colorado River within its boundaries.

Salinity Monitoring Points

The salinity control program includes a water quality monitoring and analysis program that will provide information on a basinwide basis for plan evaluation. This system is essential to establish a data base for future studies, support state and regional planning activities, and evaluate the effectiveness of salinity control measures. The monitoring points are not locations at which numeric criteria are now set or contemplated, except for those located below Hoover and Parker Dams and at Imperial Dam.

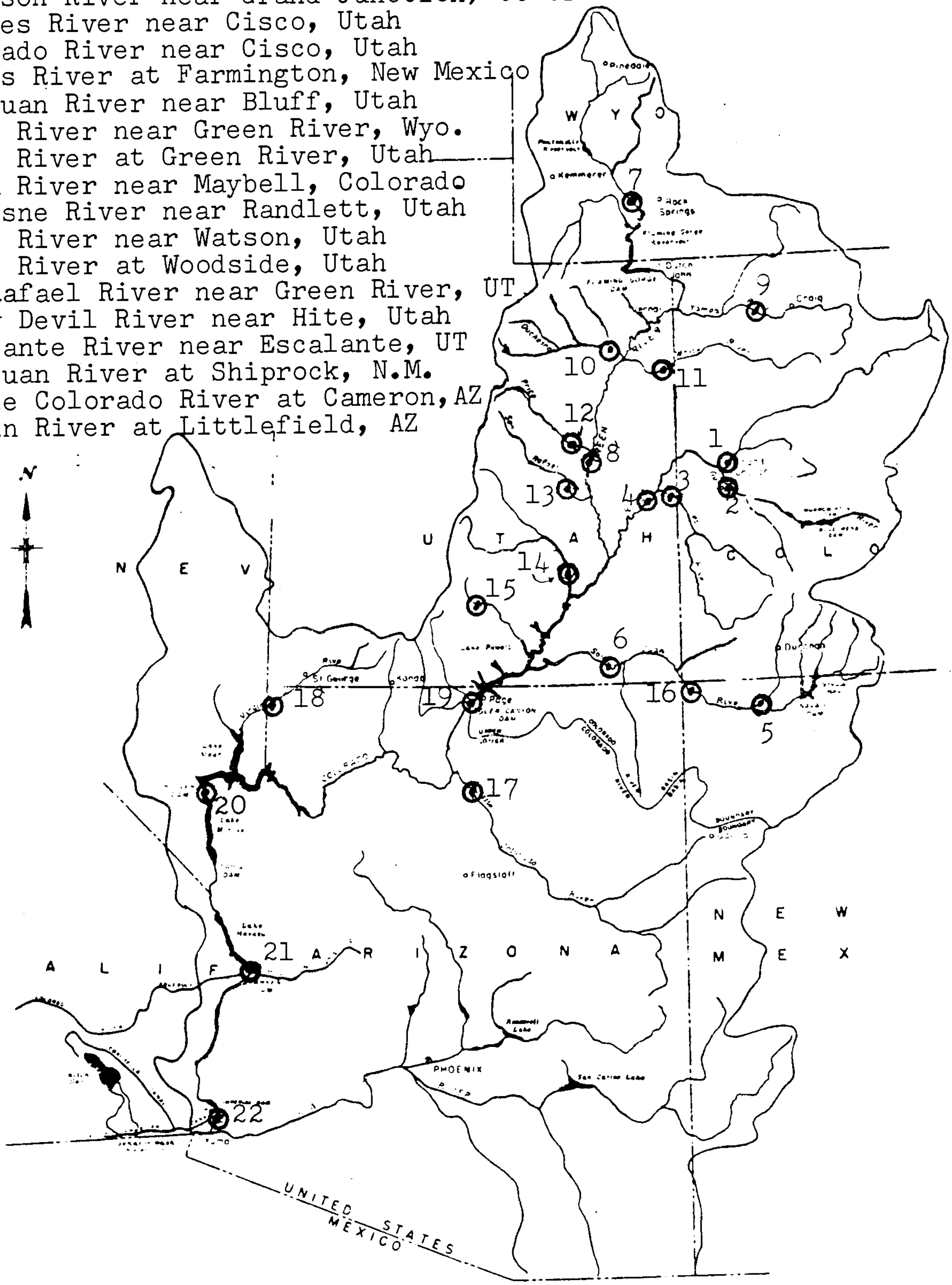
Salinity monitoring is being conducted by the USGS at the stations listed and shown on Figure 6. As budget and gaging station conditions permit, these stations are being converted to continuous monitoring of temperature and specific conductivity, rather than daily instantaneous samples. Monthly or bimonthly instantaneous samples are taken for analysis of chemical constituents.

In addition to cooperative programs with the USGS, some states maintain individual networks of salinity monitoring stations. As an example, the Utah Bureau of Water Pollution Control monitors 28 sites in the Colorado River Basin. These sites are sampled bimonthly and samples are analyzed for chemical constituents, nutrients, 5-day biochemical oxygen demand, suspended solids, dissolved solids, and coliform. In addition to routine samples collected at these stations, continous recordings of temperature and specific conductivity are taken at four stations.

Further evaluation is needed to assess both the spatial and temporal adequacy of the monitoring system, to determine whether a greater or lessor frequency of sampling is needed to achieve a desired confidence level.

FIGURE 6

1. Colorado River near Cameo, Colorado
2. Gunnison River near Grand Junction, Colorado
3. Dolores River near Cisco, Utah
4. Colorado River near Cisco, Utah
5. Animas River at Farmington, New Mexico
6. San Juan River near Bluff, Utah
7. Green River near Green River, Wyo.
8. Green River at Green River, Utah
9. Yampa River near Maybell, Colorado
10. Duchesne River near Randlett, Utah
11. White River near Watson, Utah
12. Price River at Woodside, Utah
13. San Rafael River near Green River, UT
14. Dirty Devil River near Hite, Utah
15. Escalante River near Escalante, UT
16. San Juan River at Shiprock, N.M.
17. Little Colorado River at Cameron, AZ
18. Virgin River at Littlefield, AZ



19. Lees Ferry, Arizona
20. Below Hoover Dam, Arizona-Nevada
21. Below Parker Dam, Arizona-California
22. Imperial Dam, Arizona-California

M O N I T O R I N G   P O I N T S

CHAPTER IV. PLAN OF IMPLEMENTATION

The plan of implementation is designed to maintain the salinity concentration of the river below numeric criteria, principally by reducing the salt contribution to the river from existing sources and minimizing future increases in salt load. The control measures selected would be the most cost-effective means, and would be implemented at a rate commensurate with the expected increase in future Basin water use after consideration of environmental impacts and social acceptability. The plan also includes measures that water users have adopted or will adopt to cope with the use of relatively saline water, such as water softening and treatment/blending and installation of tile drains in agricultural areas.

The plan of implementation consists of:

1. Completion of the two salinity control units under construction (Paradox Valley and Grand Valley), and final plan formulation and construction of the authorized Las Vegas Wash Unit.

2. Authorization and construction of the salinity control projects identified in the Forum's proposed legislation S. 752, and the completion of the planning reports on the other projects described in this Chapter or their equivalents.

3. Implementation by the Department of Agriculture of onfarm and lateral improvement measures in cost-effective salinity control units.

4. Implementation of cost-effective salinity control measures by the Bureau of Land Management to reduce salt contribution from public domain lands.

5. Imposition of effluent limitations, principally under the National Pollutant Discharge Elimination System (NPDES) permit program provided for in Section 402 of the Clean Water Act of 1977, on industrial and municipal discharges, based on the Forum's 1977 policy on salinity control through NPDES permits.

6. Implementation of the Forum-recommended policy for use of brackish and/or saline waters for industrial purposes.

7. Implementation of the 208 Water Quality Management Plans. (Individually, the Basin states have developed water quality management plans to conform to the requirements of Section 208 of the Clean Water Act. The water quality management planning process is continuing. As the plans are refined or new elements added and after such changes have been appropriately adopted by the states and approved by EPA, those portions dealing with salinity control will be a part of the implementation plan.)

The plan also contemplates programs by water users to cope with higher salinity water, improvements in irrigation systems and irrigation management to reduce salt pickup, studies of means to minimize salinity in municipal discharges, and studies of future possible salinity control programs.

Federal Programs

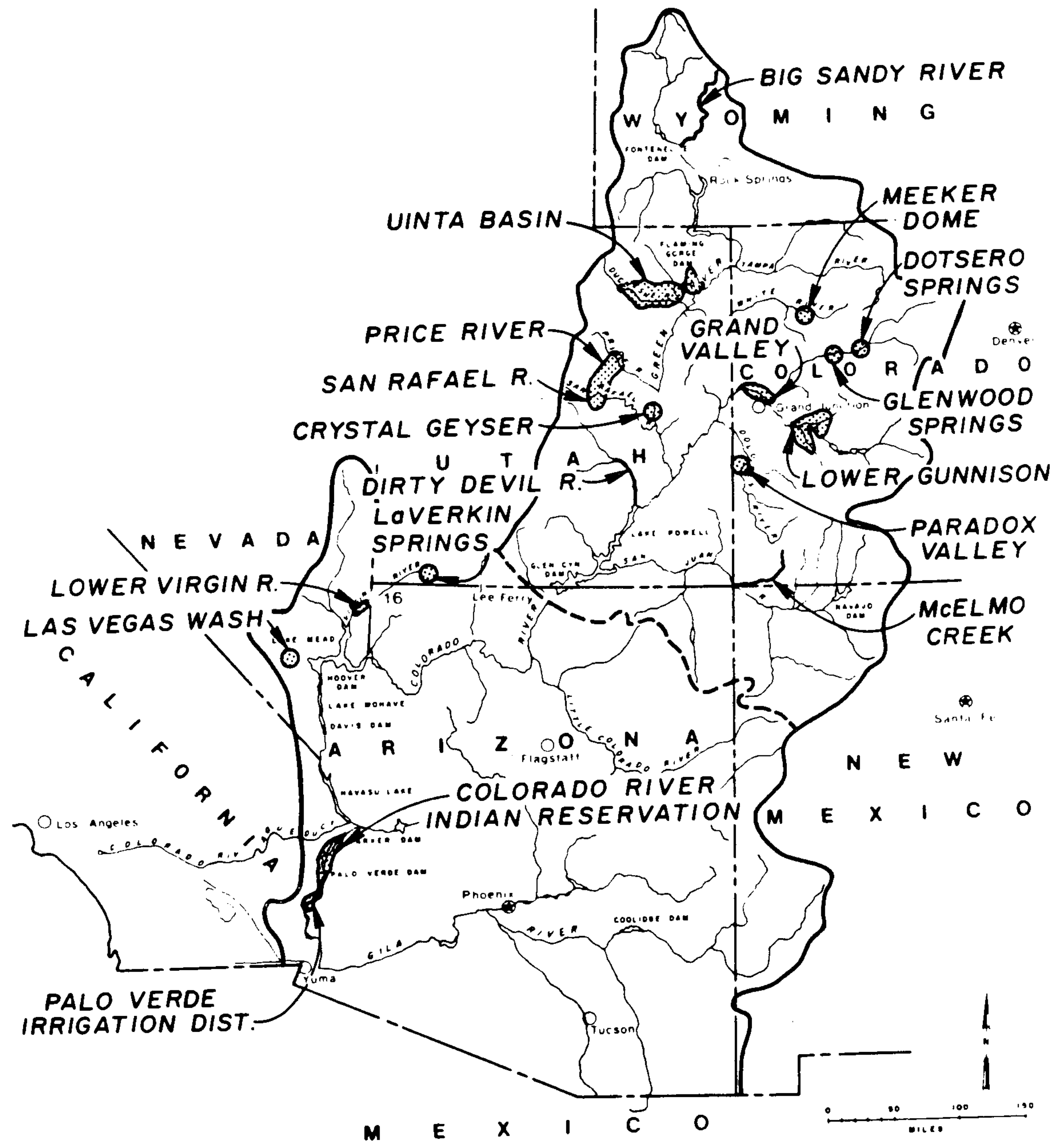
In the authorizing legislation for the Colorado River Storage Project (Public Law 84-485), the San Juan Chama and Navajo Indian Irrigation Projects (Public Law 87-483), and the Fryingpan-Arkansas Project (Public law 87-590), Congress directed the Secretary of the Interior to study the quality of water of the Colorado River system and to investigate all possible means of improving the quality of such waters. In partial response to this direction, Reclamation has published 11 biennial reports which summarize the existing water quality conditions in the Basin and include projections of future conditions.

An additional response to the congressional direction on Colorado River water quality was the initiation in 1971 of the comprehensive Colorado River Water Quality Improvement Program (CRWQIP). The intent of this program is to investigate the means by which salinity control objectives would be achieved.

Title II of Public Law 93-320, by reference to the recommendations of the Seventh Session of the Conference in the Matter of Pollution of the Interstate Waters of the Colorado River and Its Tributaries (1972), directs the Secretary of the Interior to expedite the investigation, planning, and implementation of the salinity control program defined by the CRWQIP. The location of the salinity control program units is shown on Figure 7.

Public Law 93-320 also established the program objective

LOCATION OF PROPOSED SALINITY CONTROL PROJECTS-COLORADO RIVER BASIN



of treating salinity as a basinwide problem to be solved in order to maintain salinity concentrations at or below 1972 levels in the lower main stem of the river while the Basin states continue to develop their Compact-apportioned waters. Specifically, the Act authorized the construction, operation, and maintenance of four salinity control projects (Paradox Valley, Grand Valley, Las Vegas Wash, and Crystal Geyser units) and the expeditious completion of planning reports on 12 other projects listed below:

Irrigation Source Control

- Lower Gunnison Basin Unit
- Uinta Basin Unit
- Colorado River Indian Reservation Unit (deferred)
- Palo Verde Irrigation District Unit

Point Source Control

- LaVerkin Springs Unit
- Lower Virgin River Unit
- Glenwood-Dotsero Springs Unit

Diffuse Source Control

- Price River Unit
- San Rafael River Unit
- Dirty Devil River Unit
- McElmo Creek Unit
- Big Sandy River Unit

The Secretary of the Interior, Secretary of Agriculture, and Administrator of the Environmental Protection Agency were directed to cooperate and coordinate their activities to meet the program objective.

The U.S. Department of Agriculture (USDA) is actively involved in the planning process on those units having an irrigation source control component and has initiated implementation of onfarm salinity control activities in the Grand Valley, Colorado, and the Uinta Basin, Utah. The Bureau of Land Management is involved in studies of diffuse sources from public domain lands in the basin.

It should be recognized that some of the salinity control units now under study by Reclamation may not prove to be cost-effective, and other projects and/or salinity control measures will have to be developed in order to maintain the numeric criteria while the Basin states continue to develop their compact-apportioned waters. Two projects, Crystal Geyser Unit, Utah, and Colorado River Indian Reservation, Arizona, have been indefinitely postponed because of poor cost effectiveness.

The onfarm salinity control measures being planned and implemented by the USDA appear to be among the most cost-effective measures for salinity reduction. The Forum is encouraging implementation of these measures as rapidly as possible. Further, the Forum encourages the use of brackish and/or saline waters for industrial purposes as an additional measure of reducing salt contribution to the river system.

Bureau of Reclamation

Colorado River Basin Salinity Control Project

Paradox Valley Unit. The Paradox Valley is a collapsed salt anticline in southwestern Colorado. Several brine seeps enter the Dolores River along a 1.2-mile reach within the valley. The brine is highly concentrated (260,000 mg/l) and contributes about 205,000 tons of salt to the river system each year.

The proposal for salinity control involves lowering the freshwater-brine interface below the river channel by ground water pumping. The brine would be pumped and injected in deep wells in Paradox Valley. A second alternative for disposal would be pumping the brine to a nearby hydrogen sulfide stripping plant for treatment and then pumping to the proposed Radium evaporation pond. About 180,000 tons of salt would be removed annually by this project.

Construction of the well field began shortly after the Definite Plan Report was issued in January, 1979. The well field pump tests confirm that salt pickup by Dolores River can be significantly reduced by ground water pumping.

The original plan assumed a pumping rate of 5 ft^3/s; however, testing of the well field indicates a lower pumping rate in the range of 1.0 to 2.0 ft^3/s is adequate for brine control. Brine extraction in this lower range has made deep well injection the most cost effective and environmentally preferred disposal alternative.

Reclamation filed an application in February 1983 for a change of water rights and a plan for augmentation for the Paradox Valley Salinity Control Project. This application would transfer water rights previously used on land in the McPhee Reservoir area of the Dolores Project to supplant the depletions resulting from the operation of Paradox Valley well field. The water would provide replacement for the tributary saline water which would be pumped from the well field along the Dolores River to insure that downstream water users are not injured. The State of Colorado, acting through the Division of Water Resources and the Colorado Water Conservation Board, has filed "Statements of Opposition" in this water right proceeding. Under Colorado law, this is standard procedure to establish party standing in the case. The State of Colorado will work with Reclamation in an effort to resolve any issues which this filing may raise. No other entities have entered the proceedings.

Information obtained by the deep well drilling consultant resulted in a decision not to attempt rehabilitation of the abandoned Conoco Well in Paradox Valley. This change necessitated revising the deep well drilling specifications and delayed the contract award until January 1984. A later independent review of specifications for a new injection well showed that the specifications were inadequate for a well in the selected location of the salt dome. Therefore, additional study is needed to select another location for an injection well with a resultant delay in award of contract until about March 1985. The U.S. Geological Survey completed installation of all remote seismic stations, with testing completed in July, 1983.

Grand Valley Unit. - Grand Valley Unit plans call for increasing the efficiency of irrigation in the Grand Valley area of western Colorado by improving distribution systems and water management techniques.

Approximately 66,000 acres are irrigated in the area, mostly from unlined canals and laterals. The Grand Valley area contributes about 580,000 tons of salt per year to the Colorado River. These salts are derived from deep percolation from onfarm water application and seepage from delivery systems coming in contact with the weathered marine shales underlying the region. Water and salt budgets indicate that this project, including the USDA onfarm salinity control measures, can prevent about 410,000 tons of salt from entering the river system.

Stage I of the Grand Valley Unit covers approximately 10 percent of the area and is designed to provide information to analyze the effectiveness of the proposed plan. The lining of 6.8 miles of the Government Highline Canal is complete. The associated laterals were completed prior to the 1983 irrigation season. Monitoring continues on the Stage I laterals for flow fluctuations or operational problems. The moss and debris removal structure was installed in 1983, approximately 1 year ahead of schedule. Monitoring of the Stage I area has shown a reduction in salt load for 1982 of 15,600 tons, of which 14,200 tons was related to the canal and lateral lining and 1,400 tons to the USDA onfarm program in the Stage I area.

A recommended plan has been identified in the Stage II draft supplement to the Definite Plan Report. This plan would reduce salinity concentration at Imperial Dam by 14.1 mg/l and result in an overall cost-effectiveness of $618,000 per mg/l. The selected plan includes concrete lining the west, middle, and east reaches of the Government Highline Canal and all laterals in the Stage II area except the Redlands. Lateral lining of the middle and east sections of the Government Highline Canal will be deferred until needed to meet goals of the salinity control program.

USDA activities in the Grand Valley Unit area are explained and discussed under the Department of Agriculture program.

Las Vegas Wash Unit. The Las Vegas Wash is a natural drainage channel which traverses the Las Vegas Valley, Nevada. The lower portion is now a perennial stream as a result of waste water effluent and ground water discharges. Flow in the Wash has increased steadily in recent years due primarily to increased sewage discharges resulting from a rapidly growing population. The 1982 discharge carried approximately 230,000 tons of dissolved solids.

The October 1982 status report presented recent study findings and recommended modifications to the salinity control plan for Las Vegas Wash. The major finding of the study was that the salt loading was induced by the disposal of waste water into waste ways or basins which leach salt from the underlying saline geologic deposits. A recommended solution is to channel the waste water around the saline deposit to reduce the leaching and salt loading.

The salt pickup could be reduced by 79,000 tons per year by a 4.5-mile bypass channel which would convey, with minimal seepage, waste water and minor storm runoff along the north side of the Wash flood plain.

Reclamation has begun a verification program in the Pittman area which would monitor the ground water response to the elimination of waste water seepage from unlined ditches. Following completion of an environmental assessment report, a Finding of No Significant Impact (FONSI) for the Pittman Verification Program was signed in May 1983. The FONSI describes the Pittman Verification Program and its minor impacts. This report also outlines a demonstration program to show the feasibility of establishing and maintaining native vegetation with available ground water. This concept was developed in consultation with the Fish and Wildlife Service. Construction of a 3.5-mile Pittman bypass pipeline began in March 1984.

An effort is being made to coordinate the proposed salinity control action with plans of Clark County agencies. Several local entities have opposed the proposed bypass channel, citing two major concerns. The first relates to the possible impact of the bypass channel on the existing and proposed wetlands environment in the Las Vegas Wash. The second concern is the possible increased waste water treatment costs resulting from reduction in treatment capability of the Wash wetlands.

In response to local issues and recent changes in the location of salt pickup by the surface stream flow, another salinity control strategy has been identified which would reduce salt pickup by reducing ground water flow. Development of the ground water flow reduction strategy began in November 1983, with discussions of the concept with state and local government agencies and advisory groups. Local response has been relatively positive, primarily because sewage treatment plant effluent would not be diverted from the Wash flood plain. If the ground water flow reduction action proves successful, a bypass channel would no longer be needed.

Colorado River Water Quality Improvement Program

In addition to the investigation of specific salinity control projects named in Section 203 of Public Law 93-320, the CRWQIP includes supporting studies of economic evaluation of salinity damages, return flow and hydrologic modeling, and research into salinity control techniques. The investigations of the individual units are at a feasibility level and are discussed below in the expected order of study completion. Subsequent to the passage of Public Law 93-320, the Meeker Dome and the Saline Water Use and Disposal Opportunities units were added to the program and are also discussed in this section.

Big Sandy River Unit. - Approximately 167,000 tons of salt are contributed annually to the Big Sandy River from natural seeps, flowing wells, and irrigation return flows. Most of the salt load enters through seeps in a 15-mile reach of the river west of Eden, Wyoming. Salinity of the seeps varies from 3,000 to 6,000 mg/l, with a total annual contribution of over 110,000 tons of salt to the river.

The proposed plan would reduce salinity by some 77,300 tons of salt annually and would result in a 7.8 mg/l reduction of salinity at Imperial Dam. Saline water would be collected through wells near the river and be pumped via pipelines for industrial use in southwestern Wyoming. Because of changing market conditions, however, it appears that industrial water demand will be delayed significantly, and new alternative plans will have to be formulated. These may include (1) reformulating the recommended plan to include the same collection system but utilize evaporation as the form of disposal, (2) scaling the recommended plan back and continuing to seek other opportunities to use the rest of the saline water, (3) adopting the evaporation alternative but not seeking construction authorization until water right and allocation issues have been resolved, or (4) concluding the investigation until all problems can be resolved.

USDA has published a separate salinity control report identifying various onfarm implementation alternatives. However, implementation of this unit has been postponed pending final resolution of the saline water use and disposal opportunities investigations by Reclamation and the State of Wyoming. Completion of Reclamation's planning report is scheduled for September 1984.

Uinta Basin Unit. - The Uinta Basin contributes about 450,000 tons of salt annually to the Colorado River system through the Duchesne and Green Rivers in northeastern Utah.

Return flows from 204,000 acres of irrigated land account for much of the salt contribution.

By improving distribution systems, onfarm facilities, and water management techniques, an annual reduction of 100,000 tons in salt loading appears possible. Coordination between Reclamation and USDA has been maintained in this study.

The 1979 USDA salinity control report on the Uinta Basin indicates 76,000 tons of salt load reductions per year can be achieved through the onfarm program. The USDA is proceeding with the onfarm implementation program and is working on a number of canal and lateral improvements. Other canal and lateral improvements needed in the basin are being accomplished through Reclamation's Central Utah Project, and about 75 miles of canals and laterals are proposed for rehabilitation under Reclamation's salinity study. A proposed Reclamation feasibility report and draft environmental impact statement are scheduled for April 1985.

Glenwood-Dotsero Springs Unit. - A major source of salinity in the Upper Basin is a series of thermal springs located along a reach of the Colorado River between the Eagle River and the Roaring Fork River near Glenwood Springs, Colorado. Approximately 500,000 tons of dissolved solids are added to this reach annually, about half of which comes from 18 springs.

Reclamation's preferred plan is expected to decrease the salt loading to the Colorado River by an average of 284,000 tons annually. Brine would be collected from Glenwood and Dotsero Springs and delivered via a 140-mile pipeline to evaporation ponds for disposal near West Salt Creek on the Colorado-Utah border. Another disposal alternative is to utilize the saline water for industrial purposes.

The Forum has recommended that Reclamation proceed with finalizing the planning report/environmental impact statement. The report is due in June 1985.

McElmo Creek Unit. - McElmo Creek drains 350 square miles in southwestern Colorado, including 40,000 irrigated acres in the Montezuma Valley. The creek carries an average annual salt load of 115,000 tons, most of which comes from irrigation return flows.

The preferred plan for the McElmo Creek Unit would include improvements to the Highline Canal, Rocky Ford laterals, and smaller segments of other canals. Studies have indicated that it is more cost-effective to combine the salinity improvements on the Highline Canal with the proposed Towaoc Canal on the Dolores Project. Since the Dolores Project is now under construction, special legislative authorization, such as that proposed in S. 752, would be required to credit salinity benefits derived from this combination. The remaining laterals and other canals would be done later as part of the McElmo Creek Unit.

The Planning Report/Draft Environmental Statement is scheduled for completion in June 1985.

The USDA onfarm salinity control report for McElmo Creek estimates a potential average annual salt load reduction of 38,000 tons. Improvements to onfarm irrigation system, improvements to related lateral distribution systems, and onfarm water application are key features to salinity control in the onfarm program.

Meeker Dome Unit. - An oil exploration well known as the Meeker Well, was drilled into the localized anticlinal structure known as the Meeker Dome in 1915. This well, located near the bank of the White River 3 miles east of Meeker, Colorado, tapped a supply of warm, salty water (19,000 mg/l) and increased the Colorado River salt load by about 57,000 tons per year. As a result of the well drilling, artesian pressures decreased and many natural springs in the area dried up. In 1968 the Meeker well was plugged by Reclamation, and in a few months other wells and seeps in the area began discharging saline water.

In 1980, as part of a verification process, the contractor, CH2M-Hill, reopened and plugged three other abandoned oil wells, effectively eliminating the seepage of saline water. Monitoring over the past three years has confirmed the success of the oil well plugging during the verification stage. These recent actions together with the earlier work done by Reclamation have reduced the salt load by about 57,000 tons per year. A draft report describing the details of the total program will be completed by April 1985.

LaVerkin Springs Unit. - The LaVerkin Springs are located in a canyon reach of the Virgin River in southwest

Utah. These springs discharge about 109,000 tons of salt annually.

Reclamation developed a plan which called for the construction of a diversion dam upstream from the springs to divert normal river flows around the springs. A control dam located just below the springs would form a pool around which flows would be returned to the Virgin River, and brine would be pumped to an evaporation pond formed by diking a natural depression about 3-1/2 miles away. Cost effectiveness of this plan was poor and a concluding report was issued in December 1981.

Because of renewed State and local interest, Reclamation reinitiated salinity studies in FY 1983 to evaluate a new concept for diverting the saline springs to clay-lined evaporation ponds. Clay lining was not seriously considered in previous studies by Reclamation because of concerns for ground water intrusion. Washington County Water Conservancy District, a local entity, suggested that clay lining would be acceptable for saline water disposal.

In response to requests by the State of Utah and the Washington County Conservation District, additional studies examined the costs of alternative pond liner materials and hydrologic effects of salinity impacts in the Lower Basin. Preliminary results from these detailed studies show that the high costs of lining the pond and the reduction in potential salt removal have not made the new plan more cost effective than the earlier plan. As such, the revised cost-effectiveness of the unit does not warrant further investigation at this time.

<u>Saline Water Use and Disposal Opportunities Unit - Saline Water Cooling Tower Verification Program</u> - About 610,000 acre-feet per year of saline water containing 2.6 million tons of salt could be collected from various sources for disposal or for use in energy development, such as for cooling coal-fired powerplants and for possible use in slurry lines which could transport coal products or other minerals. Of special concern in this study are legal and institutional, environmental, equipment reliability, and cost-sharing issues. Public involvement activities are being conducted throughout the study.

A contract study is currently evaluating available technology for saline water use and application at Hunter Powerplant in Utah. Preliminary findings from the study have established that (1) the binary cooling tower (BCT) is not cost competitive with other saline water use equipment, and (2) there are other existing processes and off-the-shelf hardware that can be economically used for saline water cooling and disposal applications. The softener and brine concentrator processes and hardware have already been successfully used by industry for years; however, for saline water cooling application, a complete system of selected equipment has not been evaluated under field conditions.

Consequently, continuing contract studies will examine specific site applications to optimize process and hardware selection. The studies will also establish the incremental costs of using saline water for powerplant cooling, as compared to freshwater use. Preliminary discussions are under way for field verification of selected hardware at existing powerplant sites.

<u>Saline Water Use and Disposal Opportunities Unit - Aquatrain</u>

Aquatrain is a proposed pipeline system to divert saline water from the Colorado River and carry it to points of beneficial use, while providing an economically competitive method of transporting western coal and other commodities to domestic and possibly foreign markets. Liquid carbon dioxide may be the transport medium for coal and potentially other commodities. If that is to occur, separate pipelines will be constructed to transport saline water.

In November 1983, the private sector interest in Aquatrain, Inc. was transferred from W. R. Grace to Western Water Reserves, Inc., of Boulder, Colorado. Reclamation released Grace from a prior cooperative agreement and executed a new agreement with Western Water Reserves. Western Water Reserves is evaluating markets, preparing preliminary engineering, cost, and financial analyses, pursuing conditional contracts for the use of the system, and continuing efforts to commercialize two technologies associated with Aquatrain--liquid carbon dioxide coal slurry and the ChemCoal process. ChemCoal is a clean burning product made from coal. Concurrently, Reclamation is focusing the saline water facilities to take full advantage of the opportunities for beneficial use of saline water that are being identified with Western Water Reserves, Inc. A joint preliminary report on project configuration and appraisal-level costs is being prepared by Reclamation and Aquatrain, Inc.

A preliminary corridor study has been completed by the Bureau of Land Management. The BLM and the Forest Service are cooperating with Reclamation during the planning process to identify rights-of-way and perform environmental studies. The planning process also includes public involvement with ongoing dialogue between affected Federal entities, states, counties, and municipalities to incorporate public views into formulation of the project.

Price-San Rafael Rivers Unit. - The Price and San Rafael Rivers originate in the mountains of the Wasatch Plateau and provide tributary flows to the Green River in east-central Utah. The combined salt output of the two rivers is about 430,000 tons per year.

Reclamation and USDA continue to coordinate planning efforts. Reclamation's recommended plan consisting essentially of removing livestock water from the canal system during winter months (winter water), has been selected and would reduce the salt loading by about 30,000 tons per year. If industrial uses for the saline water can be developed, an additional 50,000 to 60,000 tons of salt per year could be removed from the river system.

USDA planning efforts are focusing on onfarm systems improvements, some replacement canal and/or lateral structures, and a heavy emphasis on providing onfarm water management assistance. The USDA onfarm report is scheduled for completion in October 1984 while Reclamation's Planning and Draft EIS Report is scheduled for completion in September 1985.

Dirty Devil River Unit. - The Dirty Devil River drainage area originates in the mountains of Wasatch, Fishlake, Awapa, and Aquarius Plateaus of Utah and discharges into the Colorado River at the upper end of Lake Powell. The estimated total dissolved solids contributed by the Dirty Devil River is 144,000 tons annually. The estimated annual removal of salt by a potential salinity control program might be as much as 35,000 tons annually.

The plan of study and preliminary findings report have been completed and approved. Geologic studies and field investigations of potential evaporation pond sites were initiated. Geologic studies and hydrologic data collection will continue. Irrigation canal systems improvements are being investigated. The planning report/draft EIS is scheduled for completion in September 1986.

Lower Virgin River Unit. - This project is located in southeast Nevada and northwest Arizona, and includes both the natural saline springs near Littlefield, Arizona, and the irrigated areas along the Virgin River between the springs and Lake Mead. The salinity control potential was believed to be as much as 80,000 tons per year; but studies did not justify a water quality improvement project, and a concluding report was prepared in March 1982.

Further Reclamation studies are underway to investigate the viability of capturing Lower Virgin River saline underflows and surface flows and diverting them for industrial use as powerplant cooling water. Both the State and the Nevada Power Company have expressed interest in the project.

Lower Gunnison Basin Unit - The Lower Gunnison Basin Unit encompasses irrigated areas on the Uncompahgre River and the North Fork of the Gunnison River. There are approximately 160,000 acres of irrigated land included in the study area, contributing an estimated 1,000,000 tons of salt annually. The Stage I study area is the Uncompahgre Valley, and the Stage II Study area is to be centered around the community of Hotchkiss.

It is estimated that with an improved distribution system the salt loading from the Stage I area will be reduced by 150,000 tons per year. Studies to determine salt reduction from the Stage II area are being conducted currently by Reclamation.

The Stage I area recommended plan for reducing salt contribution was adopted following extensive public involvement and technical and economic analyses. Reclamation's planning report and Draft Environmental Impact Statement were filed on January 4, 1983. A final Environmental Impact Statement and Planning Report was filed with the Environmental Protection Agency on February 10, 1984. Basic data collection on Stage II is underway. Preconstruction planning began in FY 1984 on the winter water portion of Reclamation's plan.

The USDA Soil Conservation Service onfarm report is compatible with Reclamation's report and focuses upon the same priority salt load problem areas on the east side of the Uncompahgre River. Implementation of the USDA onfarm program is scheduled to begin in fiscal year 1986 and is estimated to reduce the salt load by 335,000 tons per year when fully implemented.

<u>Palo Verde Irrigation District Unit</u> - Palo Verde Irrigation District is located along the Colorado River between Parker Dam and Imperial Dam in southeastern California. The 91,400 acres of land under irrigation in the District yield about 152,000 tons of salt to the river each year. A special report was published in July 1981.

Studies to date have indicated a potential for a salinity control project on a subarea of the district that is underlain by saline ground water. Control measures would consist of onfarm improvements to facilitate more efficient irrigation water application and lining of canals and laterals to reduce seepage loss. However, more detailed studies, including ground water modeling, are required to verify these conclusions and to provide a basis for initiating a Federal expenditure program. Reclamation and USDA have worked together to formulate a joint plan of study which will be conducted in three phases. Additional discussions on the proposed plan of study with local entities are planned for 1984. Reclamation and USDA funding limitations may delay the start of the study until 1986. The planning report is tentatively scheduled for April 1987.

The following tabulation presents the estimated completion dates for planning reports.

Water Quality Improvement Program Estimated Completion - Regional Director's Draft Planning Reports

Unit	January 17, 1984 Schedule
Big Sandy River	9/84
Uinta Basin	4/85
McElmo Creek	4/85
Glenwood-Dotsero Springs	6/85
Meeker Dome	6/85
LaVerkin Springs	8/85
Saline Water Use and Disposal Opportunites	
Aquatrain	9/85
Binary Cooling Tower Contractor's Report	7/84
Price-San Rafael Rivers	9/85
Dirty Devil River	9/86
Palo Verde Irrigation District	4/87
Lower Virgin River	9/87
Lower Gunnison Basin, Stage II	9/88

Bureau of Land Management Programs

Salt Loading Studies

Since the completion of the 1978-1979 Salinity Status Report, BLM has continued to examine salt pick up and transport. A total of eight studies have been completed which examine salt pickup and transport, long-term sediment and salt yields from saline rangeland, and the effects of grazing on hydrologic responses and salt yields from public lands. A 1980-82 Salinity Status Report (expected to be released in 1984) summarizes the most important results and conclusions from the studies.

Point Source Control Programs

The Sinbad Valley Salinity Report was completed in April 1983. The report identifies two alternatives for this salinity control unit in western Colorado. Both alternatives have very similar cost effectiveness. The total cost of each of the two alternatives is approximately 7.5 million dollars, with a cost per milligram per liter at Imperial Dam for each of the two alternatives of approximately $750,000. The Assistant Secretary of the Interior for Land and Water Resources has decided that if the Sinbad Valley Unit is to be implemented, it will be done by the BLM.

Presently, the BLM is operating a streamflow and water quality monitoring station, along with a recording rain gauge in the Salt Creek drainage. Any additional future work on this project will require special Congressional funding.

Non-Point Source Control Program

Watershed rehabilitation, through watershed control measures, according to BLM, provides an appropriate approach to salinity control from a land management standpoint because of the multiple use benefits. These multiple use benefits include salinity and sediment reductions, increased forage production, greater distribution of livestock by an increase in water sources, increased wildlife habitat, and flood control. Reports identifying potential salinity control areas have been completed for Eastern Utah, and the Montrose, Craig, and Grand Junction areas in Colorado. A Draft Watershed Management Plan, which includes salinity control, has been completed for the Red Creek Drainage in Wyoming.

To be considered for implementation of watershed control measures, an area must have the following three characteristics:

1. The project area is a major contributor of salt and sediment due to surface runoff and erosion.

2. Surface runoff and erosion rates are high, in part, because of past management practices, and can be reduced by proper watershed management.

3. Implementation of watershed improvements must be preceeded by watershed activity planning.

Watershed treatments were implemented in a small portion of the Leach Creek drainage near Grand Junction, Colorado, in FY 1983. Leach Creek is one area identified for salinity control in the Grand Junction area Report. Approximately 100 acres of the watershed will be treated through construction of a series of small check dams and retention reservoirs. The treatment area consists of steep badlands with erosion rates of approximately 9 tons/acre, with a salt content of approximately 3 percent. When implemented, 880 tons of sediment and 22.5 tons of salt per year should be controlled. Similar areas within Leach Creek are scheduled for treatment in the future.

Other Activities

In addition to the above, the BLM is sponsoring a project entitled "Modeling of Surface Mining on Dissolved Solids in the Yampa River" and is being conducted by the U.S. Geological Survey. The objectives of this project are to identify and calibrate the relationship of existing dissolved solids with discharge for the tributary system of the Yampa River above Maybell, Colorado; and to assess through model simulation, the potential increases in dissolved solids of streams as a result of increasing levels of mining. This project is scheduled for completion in FY 1984.

The Bureau of Land Management has recommended that all Resource Area offices within the Colorado River Basin consider salinity control as a major issue in the Resource Managment Plans (RMP) for public domain lands. Activities identified and recommended in the RMP are eligible for funding and implementation. This is a significant step on the part of BLM with regard to salinity control.

Fish and Wildlife Service (FWS)[1]/

Fish and Wildlife Service responsibilities, including those set forth in the Endangered Species Act, Fish and Wildlife Coordination Act, Clean Water Act, National Environmental Policy Act and the Migratory Bird Treaty Act, provide for FWS participation in the Colorado River Salinity Control

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1/ This is the first time the Forum has included a discussion of Fish and Wildlife Service (FWS) activities related to salinity control. Therefore, the discussion has been expanded to give some background.

Program. It is mainly through these legislative authorities that the FWS works toward meeting its objective to provide the federal leadership to conserve, protect, and enhance fish and wildlife and their habitat for the continuing benefit of the public.

FWS currently is involved with 13 of the salinity control units under study in the Colorado River Basin. There is a biological diversity of fish and wildlife resources and a great number of unique species in the Colorado River Basin. This river system has the largest list of threatened and endangered fish and wildlife species in the United States as well as significant other resources, including migratory birds and waterfowl, non-migratory birds, big game, wetlands, riparian lands, and other habitats that support wildlife.

Of the 13 salinity control units, 10 are located within FWS's Region 6, where participating offices include Salt Lake City, Utah; and Grand Junction and Denver, Colorado. Region 1 participating offices in Reno, Nevada and Laguna Niguel, California, have jurisdiction over the other three units (Table 5). The Denver Regional Office has been assigned responsibility for overall coordination within the FWS.

General FWS activities during 1983 consisted of evaluating salinity control unit proposals and preparing related Fish and Wildlife Coordination Act reports, Planning Aid Memorandums (See Table 5 for status), biological opinions, and commenting on Draft Environmental Impact Statements and biological assessments.

Table 5 - FWS Involvement in Salinity Control Studies - 1983

Project	Region	Office	Status Fish and Wildlife Coordination Act Report
Paradox Valley	6	Grand Junction, CO	1986
Grand Valley	6	Grand Junction, CO	1984
Glenwood Dotsero	6	Grand Junction, CO	1983
McElmo Creek	6	Grand Junction, CO	Completed
Lower Gunnison I	6	Grand Junction, CO	Completed
Lower Gunnison II	6	Grand Junction, CO	Unscheduled
Big Sandy	6	Salt Lake City, UT	1983 Draft Completed
Price-San Rafael	6	Salt Lake City, UT	1984
Uinta Basin	6	Salt Lake City, UT	1984
Dirty Devil	6	Grand Junction, CO	1986
La Verkin Springs	6	Salt Lake City, UT	1984
Lower Virgin River	1	Reno, NV	1984
Las Vegas Wash	1	Reno, NV	
Pittman Verification Program			Final Out on Pipe-line Portion
Ground Water Flow Reduction			1984
Coachella Canal	1	Laguna Niguel, CA	Completed

FWS input to planning salinity control units also is provided through participation in a variety of working/planning meetings with the Bureau of Reclamation, Soil Conservation Service, Bureau of Land Management, State water development agencies, fish and wildlife resource agencies, Indian tribes, and the public. As required by the Endangered Species Act, lists of threatened or endangered species in salinity control project areas and biological opinions are provided by the FWS.

Draft biological opinions for the Big Sandy Unit and the Glenwood-Dotsero Springs Unit are being prepared. Based on the biological assessment prepared by the Bureau of Reclamation for the Grand Valley Unit, the FWS determined that the project would have "no effect" on the threatened and endangered species occurring or thought to be occurring in the project area. Non-jeopardy biological opinions (meaning formal consultation has been completed with the conclusion that the project "is not likely to jeopardize the continued existence of the threatened or endangered species") have been previously given for the following units: Paradox Valley, McElmo Creek, Lower Gunnison River, and the Uinta Basin.

Geological Survey

The Geological Survey's Water Resources Division provides and analyzes hydrologic information to assess the Nation's water resources. Programs are developed with cooperation and financial support from state, local, and other federal agencies. The programs provide hydrologic and geochemical information for evaluation of surface and ground water systems as well as for management and policy decisions.

To provide information required by Reclamation to address Colorado River salinity, the Water Resources Division operates and maintains a network of 22 streamflow and water quality stations in the Colorado River drainage basin. The network consists of stations shown on Figure 6 plus the following:

Wellton-Mohawk Main Conveyance Channel
Colorado River at Northern International Boundary above Morelos Dam
Colorado River at Southern International Boundary near San Luis
Main Drain at Arizona-Sonora Boundary

Streamflow and water-quality information from these stations provide input to the hydrologic data base for Reclamation's Colorado River Simulation System.

In addition to collecting hydrologic data for Reclamation programs, the Water Resources Division has developed an information base from site specific studies of surface and ground water quality impacts associated with mining and agricultural land uses. These studies have been conducted in cooperation with the Bureau of Land Management and state agencies.

Environmental Protection Agency

The major Environmental Protection Agency (EPA) programs dealing with salinity control (Water Quality Standards, Water Quality Management Planning and NPDES permits) are largely delegated to the States. Therefore, these programs are discussed in other sections of this document. EPA maintains oversight and/or approval responsibilities for these delegated programs. For example, EPA has reviewed and commented on NPDES permit applications for the Jim Bridger Power Plant, Clark County Sanitation District, City of Las Vegas, uranium mines on the Rio Puerco, and the San Juan Power Station. Also, EPA has responsibility for approving revisions to water quality standards. EPA continues to encourage the Basin States to develop and implement the state salinity control strategies.

The Forum and EPA policy encouraging the use of poorer quality water for industrial purposes is being supported primarily through NEPA review responsibilities. Also, through the NEPA review process, EPA urges the identification of potential salinity impacts resulting from proposed projects, and encourages discussion of mitigation of adverse impacts as required by the Council on Environmental Quality regulations (40 CFR Parts 1500-1508) for implementing the National Environmental Policy Act. For example, EPA has commented on potential salinity impacts in reviewing EIS' for grazing and land management, oil development, and water development projects.

EPA continues to work with Reclamation on the underground injection control requirements for the Paradox Valley salinity control unit.

Department of Agriculture

General

With irrigated agriculture contributing approximately 37 percent of the total salt loading to the Colorado River, the onfarm USDA salinity control program can significantly contribute towards reducing the overall salt loading. Throughout the Colorado River Basin there are approximately 1 million irrigated acres of cropland in 17 identified irrigation salt source areas. Generally onfarm irrigation efficiencies are low and the many miles of unlined earthened canal and lateral distribution systems along with excessive over-irrigation contributes substantially to the salt loading process.

Many of the USDA onfarm salinity control projects cover the same irrigation salt source units being investigated by the Bureau of Reclamation. USDA is working closely with Reclamation to coordinate the onfarm program with the major off-farm canal and lateral delivery system improvements. In most cases, the USDA and Reclamation programs are complementary efforts where both programs are necessary for the most effective project-wide salinity control benefits.

Planning Activities

Salinity control planning activities of USDA are carried out by the Soil Conservation Service (SCS). SCS investigates and evaluates salt loading and salt load reduction potential of identified irrigation salt source areas. The findings from these investigations along with needed water management and salinity control practices and alternative implementation plans are included in published USDA salinity control reports. Recommended plans and implementation costs in these reports form the basis for the proposed USDA implementation program. Table 6 lists the status of irrigation salt source studies completed, underway, and pending.

TABLE 6
USDA Salinity Control Planning Report Status

Irrigation Salt Source Area	Irrigated Acres	Date Published or Scheduled	Estimated Salt Load Reduction (tons per year)	Start or Suggested Start of Imple-mentation
Completed				
Grand Valley (CO)	66,000	1977	230,000	1979
Uinta Basin (UT)	205,000	1979	76,600	1980
Big Sandy (WY)	15,700	1980	113,400	1986
Moapa Valley (NV)	5,000	1981	19,300	1984
Lower Gunnison (CO)	182,500	1981	335,000	1985
Virgin Valley (NV,)	4,600	1982	37,700	1984
McElmo Creek (CO)	29,000	1983	38,000	1992
Little Colorado River (AZ)	21,000	1981	none made	--
Subtotals	528,800		850,000	
Underway				
Price-San Rafael (UT)	68,000	1985	100,000	1988
Mancos Valley (CO)	9,200	1985	20,000	1996
Subtotals	77,200		120,000	
Pending				
Upper Virgin (UT)	14,000	1987	10,000	1993
Palo Verde (CA)	90,000	1987	unk.	---
Subtotals	104,000		10,000	
TOTAL	710,000		980,000	

Implementation

USDA continues to use existing agency authorities to implement salinity control programs in Grand Valley and the Uinta Basin. SCS uses the conservation technical assistance program for providing technical support staff while Agricultural Stabilization and Conservation Service (ASCS) uses the Agricultural Conservation Program (ACP) for financial cost-share assistance for individual and group salinity control participants. While some progress is being made, more effective results and greater efficiencies in the overall program could be realized under special authorities tailored specifically to the Colorado River system.

The major problems in using the existing program authorities are the $3,500 maximum annual cost-share payment for participants and the restrictions on cost-sharing with irrigation districts and canal companies. There are also problems related to the various funding levels to be provided through USDA. Within each USDA agency, the Colorado River salinity control program must compete independently against other national program priorities for annual appropriations. A separate legislative authority and specific funding for Colorado River salinity control still remains a priority for the Basin states.

Grand Valley - Implementation started in Grand Valley in 1979 and continues to follow the implementation plan of the 1977 USDA report "Onfarm Program for Salinity Control" and the March 1980 Supplement covering laterals. SCS has provided a 21-man technical support staff composed of conservationists, engineers, and technicians to assist with onfarm planning, engineering, design and construction, and follow-up irrigation water management assistance. This staffing level has been increased over the last few years.

Over the period 1979-1983, 1650 applications were made. In 1983, there were over 300 applications for technical and financial assistance with 224 applicants actually completing a salinity control and water management practice. Major salinity control and water management practices applied are as follows:

Practice	1983	1979-1983 Cumulative
Underground pipeline (feet)	94,481	450,283
Gated pipe (feet)	71,570	186,515
Ditch lining (feet)	36,573	220,066
Land leveling (acres)	272	2,054
Irrigation Water Mgt. Complete (acres)	447	831

These practices have resulted in a reduction in deep percolation of approximately 4,655 acre-feet per year and an estimated salt load reduction of about 23,300 tons per year, or 2.3 mg/l reduction at Imperial Dam.

USDA, through the Extension Service and the Colorado Cooperative Extension Service, has also created an extension agent position, funded by Reclamation, specifically for educational support and assistance in the Grand Valley project. The extension agent provides information and helps small groups of farmers and landowners on private irrigation laterals to organize into legal entities. These legal entities are needed to permit USDA and Reclamation to contract for lateral improvements to achieve salinity control objectives. Many of these lateral improvements are needed before onfarm improvements can proceed.

Uinta Basin - Implementation began in the Uinta Basin in 1980 and follows the implementation plan identified in the 1979 "USDA Salinity Report, Uinta Basin, Utah." In the Uinta Basin a greater emphasis is being placed on the use of ACP long term agreements (LTA's) and contracts rather than annual contracts as in Grand Valley. Through this process, complete salinity control and water management plans are prepared for each farm operating unit, and they become the basis for 3 to 10 year long term agreements.

SCS technical staffing has been increased from 15 in 1981 to 21 in 1983 to keep pace with planning activities and the implementation of long term contracts.

The total number of LTA's since beginning the project is 294, covering 22,279 acres. Approximately 85 percent of the cost-share funds are obligated and spent through the long term agreements.

In 1983, there were 168 applications covering 23,720 acres for long term agreements for salinity control and water management. Since 1980, there have been 433 requests covering 61,590 acres. SCS assisted with developing 108 plans on 8,208 acres in 1983 and ASCS executed LTA's on the same units.

Practices completed in the Uinta Basin are as follows:

Practices	1983	1980-1983 Cumulative
Pipeline (feet)	255,993	819,976
Sideroll sprinkler (feet)	38,663	149,984
Pivot sprinkler (feet)	2,625	11,182
Gated pipe (feet)	47,942	110,559
Land leveling (acres)	215	514
Irrigation Water Mgt. (acres)	6,378	7,849

The practices have resulted in an estimated salt load reduction for 1983 of approximately 26,400 tons per year.

The combined effect of the Grand Valley and Uinta Basin projects in 1983 represents an estimated salt load reduction of approximately 49,700 tons per year.

Future implementation efforts are subject to budget and legislative authorities. Provided that appropriate legislative authority and funding are made available, USDA plans to implement new salinity control projects consistent with the modified implementation schedule shown in Figure 8.

Monitoring

In 1983, USDA implemented a comprehensive onfarm salinity control monitoring program in both Grand Valley and the Uinta Basin. The monitoring program will provide better evaluation of onfarm irrigation efficiencies, and of reductions in salt load from individual farms as well as the project area. Approximately $400,000 were used in 1983 to initiate the monitoring program with a substantial portion going towards the purchase and installation of monitoring equipment.

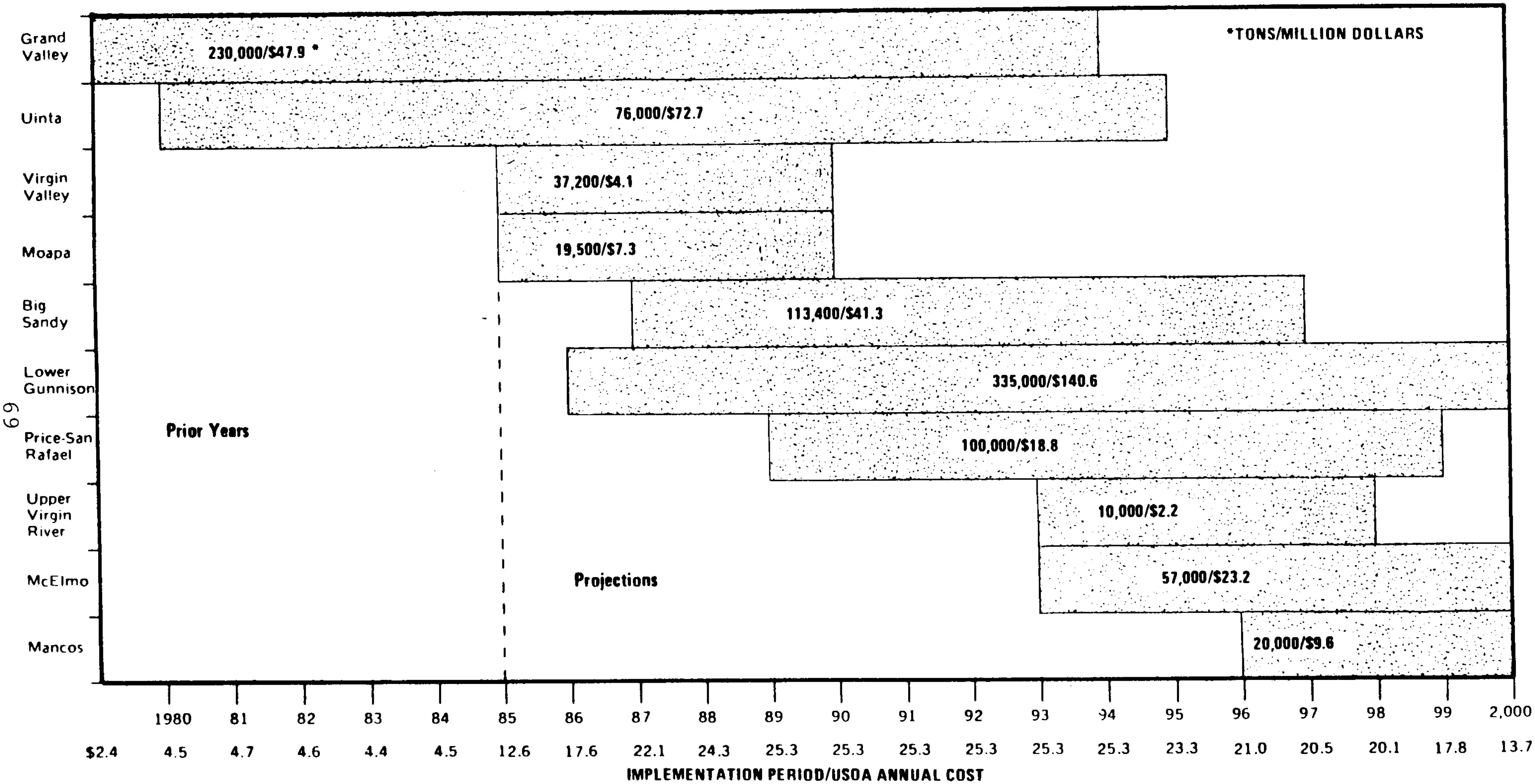
USDA monitoring programs also include provisions for monitoring of wildlife habitat impacts, land use change impacts, and economic assessments on individual farm units. However, these activities have not yet been initiated due to a lack of funding.

Budget

USDA has attempted since 1981 to establish a funding

Figure 8

USDA
COLORADO RIVER BASIN SALINITY CONTROL PROGRAM
Implementation Schedule, Salt Reduction Upon Completion, and Costs



Total Salt Reduction = 998,000 Tons Per Year
Total Cost = $369.7 Million (Includes $2.0 Million for Basin Studies)
Total Economic Benefit = $529.8 Million Per Year

mechanism for the Colorado River Salinity Control Program which would consolidate funding for all agencies within one account and line item. In 1982, the Administration submitted a FY 1984 budget package to the Congress which increased funding levels for the program, and provided a consolidated Colorado River salinity account in the ASCS budget.

The Congressional Appropriation Committee refused to appropriate funds to USDA for the program until authorizing legislation had been passed. As a result, the increased funding levels of about $8 million for accelerating the program and the opportunity to expand the program into new project areas were delayed.

A similiar budget package has been submitted by USDA and the Administration for FY 1985. The FY 1985 budget proposal is nearly identical to 1984 and would provide for increased funding through ASCS with funding increases for the two existing projects, for initiation of two new projects, for expansion of the monitoring effort, and for an increase in SCS salinity control project planning activities.

USDA has prepared Departmental and Administration proposed legislation for a separate USDA salinity control program. This legislation has been introduced as S. 1842 (September 14, 1983) and H.R. 3903 (September 15, 1983). Either the Forum or USDA legislation will provide sufficient legislative authority for the USDA to accomplish the desired salinity control objectives. In fact, the legislative language regarding agricultural onfarm programs is nearly identical in the four bills now before the Congress.

State Programs

A principal component of the plan of implementation is the control of discharge of total dissolved solids from point discharges through the NPDES Permit program. To facilitate the issuance of discharge permits, the Forum developed, in 1977, a "Policy for Implementation of the Colorado River Basin Salinity Standards Through the NPDES Permit Program," which was approved by EPA and adopted by all of the Basin states. During the period 1981-1983, actions relating to the NPDES policy were taken by each of the seven Basin states.

Effluent Limitations - Industrial Discharges

Arizona - Authority for issuing NPDES permits has not been delegated to the State and still resides in the Region IX office of EPA. Arizona is currently operating under an "interim" plan in which the State prepares the permit, solicits public comments and involvement, and forwards the final draft to EPA for signatures and issuance.

Arizona, in drafting NPDES permits for industries throughout the Colorado River watershed within the state above Imperial Dam, follows the Forum's policy regarding salinity control. Reuse of treated wastewater is encouraged as a general principle.

There are presently three industrial discharges to tributaries of the Colorado River above Imperial Dam. The three discharges are from uranium product mines.

The Department of Health Services annually reviews monitoring reports of facilities potentially discharging under NPDES permits. No system is discharging more than one ton per day or 350 tons per year of TDS; and in most cases, discharges are to tributaries which are remote from the mainstream of the Colorado River.

California - The California Regional Water Quality Control Board, Colorado River Basin Region, issues the NPDES permits and waste discharge requirements within the Colorado River drainage portion of the state. No NPDES permits for industrial discharges were issued or reissued nor were any applications filed during the period 1981-1983.

Colorado - Administration of the NPDES permit program has been delegated to the Colorado Water Quality Control Division by EPA. The February 1977 Forum policy calling for "no discharge wherever practicable" was adopted as a regulation by the Water Quality Control Commission. Applications for new permits or renewal of discharge permits in the Colorado River Basin are evaluated under the "no salt return" policy. Sixty of sixty-four industrial permits have incorporated salinity monitoring requirements. Collectively, they discharge less than 18,000 tons of salt per year.

Nevada - The Nevada Division of Environmental Protection has been delegated authority to issue NPDES Permits. Permits issued to Basic Management Industries' (BMI) Companies are intended to eliminate industrial wastewater by delivery of the waste by pipe to lined ponds where the water is evaporated. Pipe and pond lining material have deteriorated and caused some problems, but the effort has been largely successful. Permits have been issued to two companies, Titanium Metals and Kerr-McGee, which allow discharge of cooling water with no more than 75 mg/l increase over the water supply. 1/ A permit to the Stauffer Chemical Company allows discharge of surface storm runoff.

Permits issued to Nevada Power Company prohibit discharging brackish cooling water from both the Clark and the Sunrise Generating Stations as returns to the Las Vegas Wash. The company has installed equipment which treats and recycles the water for reuse before final disposition in lined ponds by evaporation.

New Mexico. - Authority for issuing permits has not been granted to the State, and the program is being administered by EPA, Region VI. EPA is following the Forum policy in the administration of the NPDES permit program. In the Colorado River Basin within the State the following industrial permits have been issued: electric power - 3, coal mines - 3, uranium mines - 5, and gravel plants - 4.

EPA, Region VI, has determined that discharges covered by the uranium mine permits will contribute less than 350 tons of salt per year per discharger to the nearest perennial stream segment of the Colorado River. (Some of the mines are inactive.) The steam electric power generating permits are for the Four Corners Power Plant (operated by the Arizona

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1/ The Department of Justice filed a civil suit for EPA against Titanium Metals on August 26, 1983. The suit is for effluent limit violations including total dissolved solids. Settlement negotiations are underway.

Public Service Company), the San Juan Generating Station (operated by Public Service Company of New Mexico), and the Animas Steam Plant (operated by the city of Farmington). New Mexico, relying on the EPA approved Colorado River salinity standards and plan of implementation, sought a condition in the NPDES permit for the 2175-MW Four Corners Power Plant requiring the elimination of the discharge of fly ash sluicing water to the San Juan River by 1981. By a progress letter dated January 11, 1980, to EPA and the State, Arizona Public Service announced that discharges of fly ash sluicing water to the Chaco Wash were reduced to less than 0.5 mg/d on December 22, 1979. Since December 23, 1979, there have been no discharges from the ash ponds to Chaco Wash with the exception of a 1-day accidental discharge to the Wash.

With the power plant operating as it has in recent years, at a load factor of 0.60, the elimination of discharges of fly ash sluicing water resulted in a reduction of about 7,500 tons of salt discharge per year to the Colorado River system. Additional elimination of salt loading by the Four Corners Power Plant has been documented to be economically impracticable.

The NPDES permit issued to the Public Service Company of New Mexico's San Juan Generating Station requires the development of a program to ensure compliance with the Forum policy.

The reissued NPDES permit, in 1981, contained a construction schedule for implementation of a compliance program satisfactory to EPA and the state to meet the Public Service Company's goal of zero discharge through the use of a new wastewater management system. Zero discharge was achieved on May 13, 1983, and on February 17, 1984, a no discharge permit was issued to the company.

Utah - Major industrial permits are drafted by EPA and minor industrial NPDES permits are drafted by the Utah Bureau of Water Pollution Control. The State has the responsibility to review all of the permits for compliance with the Forum policy and to provide water quality certification for all new and renewal permits.

A total of 72 NPDES permits are in effect for industrial facilities and construction projects in the Utah portion of the Colorado River Basin. Most of the permits are for mining operations which normally have no discharge or discharge less than one ton of salt per day. All facilities are periodically reviewed to determine their potential for salt reduction and compliance with Forum policy. No new discharges of process water have been allowed since the adoption of the 1977 Forum policy. All new NPDES permits and the three permit renewals in the basin scheduled for FY 1984 will comply with the Forum policy.

Wyoming - The Wyoming Department of Environmental Quality, Water Quality Division, has been granted authority for state administration of the NPDES permit program. The Forum "Policy for Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program" is followed in the issuance of all NPDES permits. The objective of this policy for industrial discharges is no salt return whenever practicable.

In December of 1982, a conditional discharge permit was issued to Pacific Power and Light Company for the Jim Bridger Power Plant, located in Sweetwater County, Wyoming. The permit was conditioned on the salt load reaching the Green River being less than one ton per day or 350 tons per year, whichever is less, as prescribed in the Forum Policy. The entire discharge will be eliminated by 1990 as air pollution control devices are installed in 1986, 1988, and 1990.

Effluent Limitations - Municipal Discharges

Arizona - There are 18 municipalities or quasi-public NPDES permittees in the watershed under discussion. Several small municipal dischargers have ceased discharging wastewater to the Colorado River or its tributaries over the last few years. Fredonia is an example.

The combined Indian reservation/town of Parker collection and treatment system discharges from 2 to 4 tons of salt per day to the Colorado River. Between April 1983 and March 1984 the increased concentration in salinity from use in this system exceeded the Forum policy guidelines. Average TDS in the supply source during this period was 748 mg/l while the discharge averaged 1200 mg/l, for an increase of 452 mg/l. This increase varied from a high of 673 to a low of 293 mg/l.

Most of the 18 permitees do not impact the main stem significantly, as they discharge to washes which are dry through most of the year. Nevertheless, all permits require that TDS of both source water and plant effluent be monitored.

California - The City of Needles has received a reissuance of its municipal discharge permit. The Regional Water Quality Control Board's proposed requirements are consistent with the adopted Forum policy.

In implementing the objectives of the Water Quality Control Plan for the East Colorado River Basin, the California Regional Water Quality Control Board has included in most discharge permit requirements a prohibition of brine backwash from water softeners to the Colorado River and into ground waters which are in hydraulic continuity with the Colorado River System.

Colorado - Sixty-five of seventy-five municipal permits, including all of the majors, have incorporated salinity monitoring requirements. None of the 75 discharges exceed the 400 mg/l increase.

Nevada - An NPDES permit has been issued to Clark County specifying effluent limits from their sewage treatment plant. These limits are intended to assure that the standards will be met. The permit also requires limits on salinity to minimize salt discharges.

A similar permit was prepared for the City of Las Vegas, however, its issuance has been delayed because of several questions raised by the City. A public hearing was held June 8-11, 1983, to allow argument of the issues. The principal issues which remain unresolved are the permit limitations on flow and phosphorous and the requirement for the City to develop and maintain a water quality monitoring program. The next public hearing has not been scheduled.

The City of Henderson, acting independently of the other municipalities contributing effluent to the Las Vegas Wash, has been issued a ground water discharge permit. This will enable Henderson to discharge excess treated effluent from their new 6.4 MGD aeration treatment plant, in an acceptable manner from that utilized for re-use on several local projects, including parks, cemetaries, 2 or more golf courses, and a green belt along the Boulder Highway.

New Mexico - Permits have been issued for two major and two minor municipal sewage treatment plants, two water treatment plants, and two small domestic sewage systems. Forum policy will be followed in the issuance of new or reissued permits.

Utah - There are 31 municipal treatment facilities in the Colorado River Basin of Utah. Through consolidation into regional facilities, three wastewater treatment plants have been eliminated since 1981. Currently 21 wastewater treatment facilities provide total containment. All five of the water treatment plants continue to provide total containment of their wastewater. The three 1984 renewal discharge permits will comply with the Forum policy.

Wyoming - Municipal NPDES permits are issued by the Wyoming Department of Environmental Quality, Water Quality Division. A total of 13 municipal permits are in effect in the Wyoming portion of the Colorado River Basin. All of the discharges are very small. No new municipal permits have been issued during the period 1980-83. Permits are issued for a five year period and are reissued as they expire.

Water Quality Management Plans

The states have developed water quality management plans to conform with the requirements of Section 208 of the Clean Water Act. The status of the plans are summarized as follows:

Arizona - The Northern Arizona Council of Governments (NACOG) generated water quality management plans for the Colorado River and its tributaries in the northeast and north central parts of the state, while the Western Arizona Council of Governments developed similar management plans for Mohave, La Paz, and Yuma Counties. Agricultural best management practices and implementation of the policy for industrial uses of brackish/saline waters offer the best opportunity for salinity control and are consistent with the Forum's plan of implementation for salinity control.

California - The Water Quality Control Plan for the East Colorado River Basin, adopted by the California Regional Water Quality Control Board and the State Water Resources Control Board in 1975, has been updated. A public hearing on the updated plan is scheduled for May 16, 1984. Following the public hearing the Regional Water Quality Control Board will consider adoption of the updated plan. The salinity control component of the water quality plan is consistent with the Forum's plan of implementation for salinity control. The Regional Water Quality Control Board is working with the Forum and local entities to insure that implementation of the water quality plan is achieved.

Colorado - Two Regional Councils of Government in the Colorado River Basin of Colorado were designated as 208 planning agencies by the Governor. These were the Colorado West Area Council of Governments, consisting of Moffat, Rio Blanco, Garfield, and Mesa Counties; and the Northwest Colorado Council of Governments, including Eagle, Grand, Jackson, Routt, Pitkin, and Summit Counties. The remainder of the Basin was included in the nondesignated 208 planning area in which the state has responsibility for preparing the plan. Opportunities for salinity control were identified in the plans for all areas of the Basin in Colorado.

The Grand Valley, a major salt producing area, is located in the Colorado West Area region. The 208 plan for this area has been certified by the Governor and approved by EPA.

The Northwest Colorado region is primarily at the high mountain headwaters of the Colorado River and produces little salt loading to the river system. The plan directs its salinity control toward local control of nonpoint sources, i.e., municipal and urban runoff. The plan, withdrawn from certification due to litigation, is expected to be resubmitted to the state in 1984.

The statewide plan which covers the remainder of the Basin was prepared by the State in cooperation with the San Juan Regional Commission (updated in 1983) and the District 10 Regional Planning Commission (updpated in 1981). The plans have been approved by the Water Quality Control Commission and certified by the Governor to EPA.

Critical salt yielding areas were assessed in both areas covered by the statewide plan by the Colorado Soil Conservation Board in cooperation with local soil conservation districts. Two areas were selected as candidates for cost-share assistance under the RCWP and were approved by the Governor. They are the Mancos Valley in the San Juan Basin, and Tongue Creek, a tributary of the Gunnison River in Delta County. The Soil Conservation Service has recently completed a review draft report concerning irrigation improvements in the Mancos Valley. The Tongue Creek area is located in the study area of Lower Gunnison Basin Unit - Stage II area and will be appropriately evaluated.

Nevada - The Clark County Department of Comprehensive Planning has prepared original and revised 208 plans for all of Clark County. The revised plan was completed in February, 1980 and has been approved by EPA and the State of Nevada. An amendment to the plan has been submitted for proposed development in the Laughlin area. Amendments regarding storm water and ground water activities in that area are pending completion of studies.

Due to issues regarding waste water treatment requirements and water quality standards for Las Vegas Wash and Lake Mead, the Cities of Las Vegas and North Las Vegas brought suit against Clark County, the State of Nevada, and EPA resulting in a Consent Decree which was entered in March, 1979.

Through processes set up by the Consent Decree a water quality standard study was made to determine if former water quality standards were adequate or should be revised. On December 19, 1982, EPA approved revised water quality standards for Las Vegas Wash and Lake Mead which had been adopted by the State Environmental Commission in September 1982. The State and EPA determined that these standards were sufficient to meet the requirements of the Clean Water Act.

The original and subsequent lawsuits dismissed on November 28, 1983, by the U.S. District Court for Nevada. In February 1984, the City of Las Vegas submitted a letter of intent to appeal to the Ninth Circuit Court of Appeals.

The revised 208 plan for Clark County is scheduled for completion on September 1, 1984.

New Mexico. - The Section 208 program in New Mexico is under the direction of the New Mexico Water Quality Control Commission. The Commission originally adopted the State of New Mexico Water Quality Management Plan in October 1978 and May 1979. The Plan was conditionally approved by EPA in March and again in June 1979. The Plan has been updated three times thus far and will be updated in the future as ongoing planning is completed. The importance of working cooperatively with the Forum is recognized in the Plan.

The Water Quality Management Plan covers the entire state except for that portion of the Navajo Reservation lying within the state boundary. Planning within the Reservation boundary is the responsibility of the Tribe. Much of the Colorado River Basin in New Mexico is within the Reservation.

Major planning elements that have applicability to the Colorado River Basin are sediment control, silviculture, and irrigated agriculture.

The voluntary use of best management practices (BMPs) to control or reduce sediment is encouraged in the Water Quality Management Plan. The San Juan River Basin in New Mexico is one of the four priority areas identified for implementation of BMPs. The New Mexico Soil and Water Conservation Division has completed major reports on the environmentally proper construction of rural roads and on the cost-effectiveness of rangeland BMPs. The Division is still continuing its planning activities on sediment control.

The New Mexico Forestry Division has completed studies on the effectiveness of silviculture management practices and on the control of erosion from forest roads. The Division has also developed an information program directed at private landowners. While privately-held forest lands within the Colorado Basin in New Mexico are minimal because of the large amount of National Forest and Indian lands, the state-recommended practices are used on National Forest lands.

The New Mexico Environmental Improvement Division has recently updated the irrigated agriculture element of the Plan. The update recommends the voluntary use of those practices for irrigated agriculture, recommended in the New Mexico Soil and Water Conservation Plan, that may have water quality benefits. The update also supports further research in New Mexico on water quality benefits of management practices and the provision of information to farmers through the New Mexico Cooperative Extension Service. The update was certified by the Governor on September 30, 1983, and approved by EPA on November 15, 1983.

Utah - The three designated planning agencies in the Utah portion of the Colorado River Basin (Five-County AOG, Uinta Basin AOG, and Southeastern Utah AOG) have developed conditionally certified water quality management plans. In addition, the Wayne County portion of the water quality management plan for the Six-County Commissioners Organization (a nondesignated area) also has been conditionally certified. The update to the Five-County Water Quality Management Plan should be certified in 1984. Improved irrigation methods and onfarm improvements are being implemented in the Uinta Basin as part of the Uintah Basin Water Quality Management Plan.

The Bureau of Water Pollution Control has certified the Water Quality Management Plans for Recapture and Montezuma Creek Subbasins (San Juan County) and the Nonpoint Source (NPS) Pollution Assessment and Control Plan, as part of the

Southeastern Utah Water Quality Management Plan. These are currently awaiting approval by EPA. The NPS Plan states that salinity is one of the major NPS problems in Southeastern Utah. Currently, the Bureau of Reclamation and the Soil Conservation Service are conducting studies to determine the sources and amounts of salinity and the management practices necessary to reduce salinity levels.

Within the NPS Plan, the Soil Conservation Districts (SCD's) have been identified as the primary management agencies for NPS pollution control implementation. This plan recommends methods to improve their capability and effectiveness in implementing the recommendations. The SCD's should become the main contact at the local level for issues concerning resource conservation and development. The principal recommendation of this plan is that the water quality management agency work with the SCD's to increase their involvement in natural resource and environmental protection programs.

Wyoming - The Water Quality Management planning program in Wyoming is under the direction of the Water Quality Division of the Department of Environmental Quality. The Clean Water Report for Southwestern Wyoming addresses water quality in Lincoln, Uinta, and Sweetwater Counties. This report was adopted at the local level, certified by the Governor, and conditionally approved by the EPA on October 9, 1980. The Governor's certification recognizes a salinity control program for the Green River Basin as a major water quality priority. The report recommends continuation of the Big

Sandy River Unit Study, improvement of irrigation efficiencies, and further study of a number of other management alternatives.

The Statewide Water Quality Management Plan establishes an institutional framework under which planning and implementation activities can proceed in Wyoming. Implementation of much of the program depends on the availability of funds and the acceptance of responsibilities by the designated management agencies. Management agency agreements have been developed and are presently being implemented with the BLM, State Engineer, and the Wyoming Conservation Commission.

Education and Public Involvement

The Basinwide nature of salinity increases the need for effective public education and public involvement program. Further, implementation of salinity control programs requires a greater awareness of salinity - its sources, impacts, and alternative methods of control. The seven Basin states have and will continue to work with concerned agencies to increase public understanding of salinity and will coordinate this effort with the Forum. The Forum's Annual Progress Reports are a component of this educational effort and are distributed to interested individuals and organizations.

Since irrigation is the principal human-induced source of salinity, a major thrust of the public education/public involvement effort focuses on educating irrigators as to the sources, impacts, and methods of controlling salinity as it relates to irrigation practices. The goal of this effort is to encourage desirable changes in application of technology and management practices. The Basin states work with ongoing efforts (208 programs, SCS, and ES) to achieve this goal, and assistance from the Executive Director of the Forum is available. The plan formulation phase of USBR, SCS, and BLM salinity control projects is providing an excellent opportunity for public education on Colorado River salinity.

The Forum meetings are open to the public, and all input is considered and acted on as appropriate. The Forum also provides for public involvement in the standards review process. The Forum, as part of the review process, holds public meetings to receive comments on the standards for salinity. As a result of such public input, appropriate changes are made.

As each of the Basin states proceeds with its adoption process, one or more statewide public hearings are held. There is widespread announcement of the Forum and state hearings, and copies of the Forum Review and associated State standards are mailed to interested agencies and groups.

The Forum members participate with their 208 agencies in matters related to salinity and salinity control and will continue to do so as the need arises.

The Bureau of Reclamation publishes a quarterly newsletter entitled "Salinity Update" which provides current information on USBR and other activities related to salinity control. In addition, the Forum and the states utilize the newsletter as a means of keeping the public advised of their activities. The newsletter is mailed to over 1,000 readers.

Other State Salinity Control Implementation Activities

Arizona - Arizona continues to support the basinwide approach to salinity control through the Colorado River Basin Salinity Control Forum. The State Water Quality Control Council adopted the original 1975, 1978, and 1981 Reviews of the Colorado River salinity control standards including the plan of implementation as part of its water quality regulations. The State Water Quality Control Council adopted the "Policy for Use of Brackish and/or Saline Waters for Industrial Purposes" on July 8, 1981. This policy encourages and promotes the use of brackish and saline waters for industrial purposes where environmentally sound and economically feasible.

Arizona has adopted the policy developed by the Forum and approved by EPA regarding implementation of standards through the NPDES permit program. The state does not have permit issuing authority, but currently prepares the permits which are then issued by EPA.

California - The state has in the past and continues to support the basinwide approach to salinity control. California adopted, as regulation, the Forum recommended numeric criteria and plan of implementation for salinity control as its water quality standards for salinity in 1975, 1978, and 1981. Requirements for NPDES permits issued by the state, in the Colorado River drainage, are more stringent than those recommended by the Forum. California also places stringent requirements on salt discharges to ground waters which are in hydraulic continuity with the Colorado River. Finally, the state fully supports the Forum policy regarding use of saline water for industrial purposes. In June 1975, a Water Quality policy on the use and disposal of inland waters for powerplant cooling was adopted. The policy established a priority for the use of saline water for powerplant cooling, California's only industrial use in the Colorado River drainage portion of the basin.

Colorado - Colorado continues to support the basinwide approach to salinity control through its participation in the Colorado River Basin Salinity Control Forum and associated activities. Among these has been substantial effort on the Forum's proposed amendments to the Colorado River Basin Salinity Control Act, which were introduced at the request of the Forum by members of the Colorado congressional delegation. Much coordination has also been acomplished by the State with the local entities which have an interest in the legislation.

Another activity which the State has carried out is encouraging industrial use of saline water, particularly by the oil shale industry. All environmental assessments and impact statements concerning oil shale development are reviewed and opportunities for saline water use identified by the State as appropriate.

The Colorado Soil Conservation Board, Department of Natural Resources, with support from other state agencies, is working with the U.S. Soil Conservation Service, U.S.

Agricultural Stabilization and Conservation Service, and local soil conservation districts to direct, to the extent appropriate, available federal soil conservation funding programs towards improvement of onfarm irrigation practices. The salinity control benefits of improved practices are one of the reasons for this effort.

Finally, the Colorado Department of Health is working with the Union Carbide Corporation to expedite a phase-out of the Uravan uranium mill discharge. This mill is the largest point source discharger of salinity within the Colorado River Basin in Colorado. The efforts to eliminate this discharge are due in part to the State's concern over the salt contribution from this source.

<u>Nevada</u> - A program has been developed by Clark County Sanitation District No. 1, Las Vegas, and North Las Vegas to coordinate, investigate, and encourage the implementation of management practices resulting in reduction of wastewater salinity. The principal emphasis of this program will be directed toward salinity control to meet the requirements of the NPDES permits issued to Clark County and the City of Las Vegas.

The first phase of the program will develop a public education program on salinity control and controlled use of water softeners.

<u>New Mexico</u> - The State of New Mexico through the Forum Member, Advisory Council Members, and the New Mexico Water Quality Control Commission supports the Colorado River Basin

Salinity Control Program and is taking all reasonable action to insure its implementation. State actions include: (1) support of federal legislation including appropriations to implement the program, (2) inclusion of salinity control measures in the 208 plans, (3) dissemination of information on salinity sources and control measures to the water users and the public in the Colorado River Basin area of the state, (4) consultation with industries on potential salinity reduction measures, (5) implementation of Forum's Policy through existing legal and institutional mechanisms, e.g., NPDES, (6) support of future funding for the Forum executive director whose major function is to assist in carrying out the Colorado River salinity program, (7) allocation of state financial and manpower resources to several salinity research efforts, (8) provision of matching funds to support the USGS water quality data collection program in the Colorado River Basin portion of the state which is necessary to monitor salinity conditions on the river, and (9) maintainance of continuous water quality planning program whereby new or additional salinity control measures can be addressed.

Utah - The 1982 "Utah State Strategy for Salinity Control in the Colorado River Basin" is the latest summary of salinity control responsibilities of local state and federal agencies in Utah. Surface disposal of water produced from gas and oil wells is being regulated and inspected by the Bureau of Water Pollution Control pursuant to regulations adopted in 1982.

Wyoming - In 1981 the Governor's office began an active search for industrial users for the Big Sandy water. The Chevron Chemical Company has contracted to accept a portion of the Big Sandy water as a part of the water supply for its proposed phosphate fertilizer plant near Rock Springs, Wyoming. Other industries in the area are seriously considering the use of such water, and negotiations are continuing. The water obtained from the Big Sandy River Unit can be used in conjunction with good quality water purchased from Wyoming's nearby Fontenelle Reservoir when necessary to meet quality or quantity requirements.

The joint effort between the State of Wyoming, Reclamation, and the USDA is expected to reduce the TDS concentration at Imperial Dam by 7-9 mg/l upon the full implementation of the project.

Forum Activities

In 1981 the question of the applicability of the Forum's 1977 "Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program" to intercepted saline ground water was brought before the Forum. The Forum Work Group undertook a review of the 1977 NPDES permit policy, developed and recommended, for Forum consideration, "Intercepted Ground Water Policy for Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program." The intercepted ground water policy was adopted by the Forum on October 20, 1982. This policy more clearly defines the type of information to be submitted by the discharger for the permitting agency review. The policy is included as Appendix B.

Other Non-Federal Measures to Control Salinity

Minimizing Salinity Increases Caused By Powerplant Cooling

Since the passage of the Clean Water Act, all thermal-electric power generating plants in the West have been designed with evaporating cooling towers. With this system, water is continually flowing from the condenser to the cooling tower and back to the condenser. Water use (or loss) in the cooling cycle consists of the evaporation loss in the tower plus an additional requirement for "blowdown". Blowdown is necessary so the cooling water can evaporate without forming excessive mineral deposits. It is this highly saline blowdown water which is the potential source of salinity to be controlled.

In the Colorado River Basin all of the powerplants planned and under construction, and all but three of the presently operating plants, will not or do not return salt to the system. The Four Corners plant in New Mexico, which was designed and constructed prior to the no-salt return policy, has been upgraded to a "no-salt added" condition. The Huntington and Hunter plants in Utah have in operation, with conditional approval of the state, a system whereby the blowdown water is used for agriculture without appreciable return of salts to the stream system. Final approval will be given if the effectiveness of the system can be verified; otherwise, the plants will have to revert to lined evaporation ponds.

Use of Agricultural Drainage Water for Powerplant Cooling

The 1974 California legislature amended the Metropolitan Water District Act to permit the District to enter into contracts for the sale of water for use in the generation of electric power. The amendment states in part:

> "b. *** Every such contract shall provide that agricultural waste water, brackish ground water, or other water not suitable for domestic, municipal, or agricultural purposes shall be utilized for powerplant cooling to the extent practicable and if not immediately available, such waste or brackish water, as it becomes available and to the extent practicable, shall replace the fresh water then being used for such purpose***."

The Metropolitan Water District of Southern California has agreed, in principle, to furnish up to a total of 100,000 acre-feet of Colorado River water each year to sites in the Mojave Desert area for powerplant cooling and related purposes. It is anticipated that through exchange provisions, agricultural drainage water would be used in the powerplant cooling cycle in lieu of freshwater supplies.

Industrial Uses of Saline Water

In September 1980, the Forum adopted a "Policy for Use of Brackish and/or Saline Water for Industrial Purposes". This policy was aimed at encouraging the use of brackish and/or saline water wherever practical. If this water can be put to use, the sources of salinity are eliminated or greatly reduced.

Use of Saline Water in Oil Shale Development

Oil shale facilities will use water in as many as six different steps in the process of producing crude oil from shale rock:

1. Dust control associated with mining and crushing of shale

2. Scrubbing by-product gasses

3. Upgrading (i.e., carrying out a chemical process known as hydrogenation, which will also necessitate evaporative cooling) of the product oils and tars to produce a pumpable crude oil suitable as a refinery feedstock

4. Cooling, compaction, and disposal of spent shale

5. Revegetation of spent shale disposal areas

6. Miscellaneous plant uses (sanitary waste systems, etc.)

The possibility exists to use relatively high salinity waters from sources such as salt springs and perhaps irrigation return flows in the first four of the six steps identified above. This would result in larger reductions in the salt load in the Colorado River system than if higher quality water of lesser salinity concentrations were used. Such uses of higher salinity water would be subject to the water rights laws of the state in which the use occurred.

While the technology of using highly saline water in various industrial processes is promising, the particulars of such potential uses in the oil shale industry have yet to be thoroughly explored. In addition, the economic feasibility of such uses has yet to be proven. The Forum will continue to work with the appropriate federal agencies and the industry to seek answers to these questions as the oil shale industry moves into the design of its commercial facilities.

Use of Saline Water in Tar Sand and Solution Mining Development

The tar sand industry in east-central Utah is another potential user of saline water. The Utah Combined Hydrocarbon Regional Draft EIS prepared by the Bureau of Land Management estimates a total water requirement of 88,295 acre-feet/year by the year 2005 if the High Commercial Production Scenario is realized. Preliminary plans indicate that a large portion of this demand could be met with low-quality water supplies.

Solution mining or mineral mining using fresh water is already an established industry within the Colorado River Basin. There appears to be some potential for using saline water in mining or transporting of potash, trona, or other marketable minerals in the Basin.

Use of Saline Water in Coal Slurry Pipelines

The transport of coal with water as a slurry in pipelines from western coal fields to areas with large energy demand for use in thermal electric or coal gasification plants is under consideration in a number of instances. Considerable opposition from water users and transportation interests has developed to this type of use. In order to minimize this opposition, the possibility of using saline or brackish water is being considered.

A recent Bureau of Reclamation report entitled "Assessment of Saline Water Use in Coal Transport and Multipurpose Systems," states that the capability exists for using saline water in both slurry pipeline and hydro-capsule pipeline systems. However, there is concern about the potential cross-contamination problem with the coal and saline water in a slurry pipeline system which may affect the final utilization of the coal and water. It would appear that hydrophobic coating of coal or some other innovative technique may be necessary if a conventional slurry approach using saline water is to be viable.

Encapsulating the coal for a hydro-capsule pipeline segregates the coal from the saline water, but the technology has not been proven viable as yet.

The Forum is supporting the use of brackish and/or saline water for industrial purposes in lieu of low salinity water. Reduced salt load in the Colorado River would result if saline water were used in a slurry pipeline to export coal from the Basin.

Non-Federal Efforts to Cope With Salinity of Colorado River Water Supply

Land Drainage

In order to prevent salt buildup on irrigated lands in the Colorado River Basin, it is necessary, in many areas, to provide extensive subsurface and surface drainage systems. This is most evident in Arizona and California where in excess of $65 million have been expended to install drainage facilities. By providing adequate subsurface drainage facilities, dissolved salts are carried away and the salinity of the soil is maintained at a level that is acceptable for farming. Without these subsurface drainage pipes, farmers would not be able to apply sufficient water to leach the salts out of their lands. Extensive drainage systems have been installed by Imperial Irrigation District and Coachella Valley Water District. Drainage water from these Districts flows into the Salton Sea and thus is not returned to the Colorado River. In order to minimize seepage and to conserve water, canal lining programs are being carried out by the districts.

Treatment and Blending

Where a supply of higher quality water is available it can be blended with the more saline Colorado River water in order to reduce the salinity of the water delivered for use. This practice is followed by The Metropolitan Water District of Southern California (MWD). The MWD has two sources of water supply, the Colorado River and northern California water from the State Water Project system. The MWD blends lower salinity, higher cost northern California waters with higher salinity water from the Colorado River to achieve a blend of approximately 500-mg/l. The blended waters are then delivered to its customers to the maximum extent possible within the limitations of its distribution system. Only a small portion of the MWD service area is not able to receive blended supplies.

Research and Analysis on Salinity

Completed Studies

Several studies funded by the BLM have generated significant information on salt pickup and transport from natural lands in the Price River Basin. The most important findings from the Price River Basin studies are as follows:

1. Highest salt and sediment concentrations occurred in the first streamflow event following a long period where no discharge occurred. This suggests a flushing of accumulated salts and sediments.

2. Salt yields, from steep Mancos shale badland formations are much higher on a per unit basis than from gently sloped Mancos lowlands.

A one-year study to determine long-term trends and salinity streamflow relationships was completed by Reclamation in 1984. The effect of construction of major reservoirs on ion concentration was evaluated, and a theoretical model for describing ion concentration/streamflow relationships was developed and tested.

Another research study performed under contract to Reclamation involved development of a two-dimensional reservoir model to predict changes in temperature and salinity concentrations, and associated salt precipitation. This model will increase the reliability of long-range salinity projections.

The USGS completed two studies FY 1984; the first dealing with the contribution of ground water and other natural sources to salinity, and the second relating to trends in ion concentrations at four selected stations. The reports are:

James Warner and others, Contribution of ground water and other natural sources to the salinity of streams in the Upper Colorado River basin in Colorado and adjacent parts of Wyoming and Utah.

Jim Kircher and others, Trend analysis of salt loads and frequency of water-quality measurements for the Gunnison, Colorado, and Dolores Rivers in Colorado and Utah: USGS, WRI Report No. 84-4048.

Ongoing Research

A contract for professional engineering services was awarded by Reclamation to evaluate the viability of installing a saline water cooling tower at an existing power-plant. The contract study will review new process technology and recommend appropriate saline water use systems for field testing/verification at Hunter Powerplant in Central Utah. The verification study will be a joint venture between government and industry to examine potential costs and benefits of saline water use for powerplant cooling in the Colorado River Basin.

The salinity research activities of the Department of Agriculture (USDA) are conducted by the Agricultural Research Service (ARS) and by state agricultural experiment stations through the Cooperative State Research Service (CSRS). The ARS has developed and is implementing a Coordinated Salinity Control Research Program for the Colorado River. Current research includes: use of saline drainage water for irrigation at different stages of growth; better water management;

irrigation scheduling; interface between delivery systems and onfarm distribution; changing infiltration rates; automated systems such as cablegation; irrigation water and salinity source determination using "isotope" tracking; soil salinity measuring devices; and new means of mapping and monitoring land salinization. Many of the field research activities are conducted in cooperation with the Soil Conservation Service, irrigation and drainage districts, and local landowners or operators.

Research activities through the CSRS are carried out by the state agricultural experiment stations, using both federal and state funds. A major regional research project in the western states is "The Physio-chemical Basis for Managing Salt-affected Soils." This project is aimed at better understanding the physical and chemical processes that affect the reclamation of soils and geologic materials, and includes determining and quantifying chemical and mineralogical properties of carbonates and evaporites in saline soils, geological formations, and water.

Studies are currently underway by the Geological Survey which are scheduled for completion between 1985 and 1987. The studies will: (1) develop a salt load data base for the period 1970 to 1983 for inclusion in Reclamation's biennial reports; (2) develop a historical salinity load and ancillary data base to define reasons for and magnitude of salinity changes in the Basin; and (3) develop additional information on Upper Basin aquifers through the Upper Colorado Regional Aquifer Systems Analysis project.

Additional studies which could benefit the hydrologic data program include:

(1) A data network analysis of current operations and necessary revisions to the current operations based on the purpose of information, variability in flow and water-quality conditions, and prescribed accuracy of the data needed.

(2) Statistical analyses and geochemical modeling to define the quality differences in base-flow and runoff water, and to determine the salt loading processes which control water quality. These studies will require the cooperation and assistance of all agencies that have responsibility for water resource planning and management in the Basin.

CHAPTER V. MEANS OF MAKING PLAN OPERATIONAL

The plan of implementation contains all of those projects and programs described in Chapter IV which have been assessed as feasible and likely to be cost-effective. As stated previously, the choice of specific control measures, and their associated implementation schedules, will depend on projections of future water use (which determines the amount of dilution water in the river) and future Basin water supply. Making this plan operational will require additional legislation, including authorization for the construction of control units, decisions on cost-sharing and financing, clear delineation of the responsibility of the various participants, and the continuation of a monitoring program.

Legislation Needed to Carry Out Programs

Federal Programs

Public Law 93-320 authorized construction of four salinity control projects and the completion of planning reports for 12 salinity control units of Reclamation's CRWQIP.

The proposed amendments to Public Law 93-320 will authorize the construction of five new Department of the Interior salinity control units: Stage I of the Lower Gunnison Basin Unit, Colorado; McElmo Creek Unit, Colorado; Big Sandy River Unit, Wyoming; Saline Water Use and Disposal Opportunities Unit; and the Sinbad Valley Unit, Colorado. The proposed amendments do not however, raise Interior's spending ceiling which was established by the Congress in 1974. The authorization of five new units will allow the Secretary of the Interior the latitude to proceed with the units, or portions thereof, which are the most cost effective. The legislation provides that cost effectiveness will be the criteria for the selection of salinity control efforts.

The legislation would further authorize the Secretary of the Interior to enter into joint ventures for salinity control with non-federal entities when it is in the best interests of the United States.

Experience has demonstrated that some of the most cost effective measures are on the irrigated farms of the Basin. The Forum-proposed legislation authorizes an expanded Colorado River Basin salinity control program for the Department of Agriculture, with a separate, consolidated line item budget account. The Agriculture program would allow cost sharing directly with the basin farmers when they elect to participate in a voluntary program of onfarm irrigation improvement practices. It also allows the Department of Agriculture to work directly with canal companies, irrigation districts, and subdivisions of state government. (The USDA-sponsored legislation is essentially the same as the agricultural portions of the Forum-proposed bill).

The legislation also sets criteria for the replacement of incidental wildlife values when wildlife habitat is impacted by the salinity control effort. This subject was not addressed in 1974. The legislation also clarifies the responsibility of the government and local entities for operation, maintenance, and replacement of salinity control features.

Financing Salinity Control Projects

There are many entities and levels of government concerned with the salinity of the Colorado River. However, only the federal government is involved in all the major Basinwide aspects of the salinity problem, and a solution is only possible in a Basinwide context. The Governments of the United States and Mexico have agreed that terms of Minute 242 constitute a permanent and definitive solution to the problem of the salinity of the water delivered to Mexico; however, without upstream salinity control, it may not remain a permanent solution.

Federal lands, including Indian reservation lands, are the source of most of the naturally occurring salts in the river. Accordingly, it is believed that the federal government is the appropriate unit of government to finance the salinity control projects and to be allocated a major share of costs.

In enacting Public Law 93-320, Congress recognized the federal responsibility for the Colorado River as an interstate stream and adopted a cost-sharing formula which provides that 75 percent of the costs of the four salinity control projects authorized by Title II of the Act shall be nonreimbursable. The remaining 25 percent of the Department of Interior costs are to be repaid from the Basin funds of the Upper and Lower Colorado River Basins. The Act directs the Secretary of Interior to consider the benefits to each of the Upper and Lower Basins from improved water quality, the causes of salinity, and the availability of revenues in each of the Basin funds in determining the allocation of costs. The maximum allocation to the Upper Basin Fund for any unit, however, is not to exceed 15 percent of the total costs allocated to the two Basin funds, with the remainder to be allocated to the Lower Basin Fund.

The cost-sharing arrangements for the other salinity control units authorized for study in the Act will be determined when these projects are authorized. However, the Colorado River Basin Salinity Control Forum in S. 752 recommended that the same 75 percent federal, 25 percent Basinwide financing arrangement that exists for the four authorized units be applied to the new units proposed for authorization, including the USDA onfarm program. In response to comments from the Administration on S. 752, the Forum has agreed to a compromise repayment plan. The costs of construction and replacement allocated to the Upper Basin would be repaid with interest within 50 years. The costs allocated to the Lower Basin would be repaid without interest in the fiscal year following the fiscal year in which costs are incurred--to the extent that money is available from the Colorado River Basin Development Fund. If funds were not available, the balance of the costs would be repaid with interest within 50 years.

Responsibility for Accomplishing Salinity Control Measures

The plan of implementation recognizes that the Forum, the several federal agencies, and the Basin states each have specific responsibilities for furthering the salinity control program. Table 7 presents, in summary form, the elements of the plan of implementation, which considers full implementation of all salinity control measures discussed in Chapter IV.

The table includes actions to be taken, the time schedule, and the responsible entities.

The Forum will provide overall coordination and a continuing review of salinity changes and program effectiveness. Every 3 years, or more often if necessary, the Forum, in light of existing depletions and salt concentrations, will consider and, where needed and feasible, recommend revisions in the schedule for installing salinity control measures and/or modifications of the numeric criteria. The review will include both federal and non-federal programs.

Appropriate federal agencies will complete planning reports and seek authorizataion and funding for salinity control in accordance with Title II of Public Law 93-320. The Basin states will lend their support to requests for authorization and funding.

Identifying and Evaluating Progress in the Salinity Control Program

Progress in the salinity control program will be monitored and evaluated on a continuing basis. Changes in

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Paradox Valley Unit	Complete Definite Plan Report. Environmental Statement.	September 1978 March 1979	USBR
	Provide the leadership and resources required to maintain local and Basin support for project implementation.	October 1975 through construction	USBR, State of Colorado, Forum.
	Install pipeline; construct reservoir or deep wells.	1985-1987	USBR.
	Initial year of salt removal.	1986 (deep well inj) 1987 (evap pond)	
Grand Valley Unit			
Water Systems Improvement	Complete Definite Plan Report (Stage I).	March 1980	USBR
	Negative Determination of EIS Stage I.	July 1978	
	EIS remainder of Unit.	December 1985	
	Complete Definite Plan Report (Stage II).	June 1983	
	Improve canals, laterals. Initial year of salt removal.	1980-1992 1982	USBR, State of Colorado.
Onfarm Improvements	Initiate onfarm irrigation and related lateral improvements	1979	USDA, State of Colorado local entities.
	Initial year of salt removal.	1980	
Crystal Geyser Unit	Complete Definite Plan Report. Negative Determination of EIS.	Completed June 1976 June 1976	USBR. USBR.
	This unit has been indefinitely deferred because of its poor cost effectiveness.		

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Las Vegas Wash Unit	Complete Definite Plan Report. Environmental Statement.	November 1978 Completed May 1977	USBR.
	Construction of this unit has been deferred, owing to changing conditions as outlined in Chapter IV. The project is being reevaluated and reformulated.		USBR
Lower Gunnison Basin Unit			
Water Systems Improvement Uncompahgre Project Portion	File Feasibility Report/DES Stage I.	January 4, 1983	USBR, State of Colorado
	Construct winter water portion. Initial year of salt removal.	1987 1988	Congress and Federal Administration.
Balance of Lower Gunnison Basin Area	Complete Planning Report, Stage II.	September 1988	USBR, State of Colorado.
Onfarm Improvements	Initiate onfarm irrigation and related lateral improvements.	1986	USDA, State of Colorado, local entities.
	Initial year of salt removal.	1987	Congress and Federal Administration.
Uinta Basin Unit			
Water Systems Improvement	Complete Planning Report.	April 1985	USBR, State of Utah.
	Construct lining of canals and laterals. Initial year of salt removal.	1989-1990 1990	Congress and Federal Administration
Onfarm Improvements	Initiate onfarm and related lateral improvements.	1980	USDA, State of Utah, local entities.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
	Initial year of salt removal.	1981	
Meeker Dome Unit	Complete Planning Report.	June 1985	USBR.
	Initial year of salt removal through verification activities.	1980	
LaVerkin Springs Unit	Status report.	December 1979	USBR, State of Utah.
	Concluding Report.	December 1981	USBR, State of Utah.
	Reinitiate study.	1983	
	Complete Preliminary Findings Report.	January 1984	
Lower Virgin River Unit (formerly Littlefield Springs Unit)	Complete Concluding Report.	March 1982	USBR, State of Arizona and Nevada.
	Reinitiate studies.	January 1984	
	Complete planning report.	September 1987	
Point Source Control	Initial year of salt removal.	1994	
Onfarm Improvements	Initiate onfarm and related lateral improvements.	1985	USDA, states, local entities.
	Initial year of salt removal.	1986	Congress and Federal Administration.
Glenwood-Dotsero Springs Unit	Complete Planning Report.	June 1985	USBR, State of Colorado.
	Initiate Construction	Not scheduled	Congress and Federal Administration.
	Initial year of salt removal.	Not scheduled	State of Colorado.
Price-San Rafael Rivers Unit	Complete Planning Report.	September 1985	USBR, State of Utah.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Diffuse Source Control	Initiate construction.	1989	Congress and Federal Administration.
	Initial year of salt removal.	1990	
Onfarm Improvements	Initiate onfarm irrigation related lateral improvements.	1989	USDA, States, local entities.
	Initial year of salt removal.	1990	Congress and Federal Administration.
Dirty Devil River Unit	Complete Planning Report.	September 1986	USBR, State of Utah.
Diffuse Source Control	Initiate construction.	1995	Congress and Federal Administration.
	Initial year of salt removal.	1996	
Onfarm Improvements	Initiate onfarm irrigation related lateral improvements.	Not scheduled	USDA, States, local entities, Congress, and Federal Administration.
	Initial year of salt removal.	Not scheduled	
McElmo Creek Unit	Complete Planning Report.	June 1985	USBR, State of Colorado.
Diffuse Source Control	Initiate Construction.	1988	Congress and Federal Administration.
	Initial year of salt removal.	1989	
Onfarm Improvements	Initiate onfarm irrigation and related lateral improvements.	1993	USDA, States, local entities, congress, and Federal Administration.
	Initial year of salt removal.	1994	
Big Sandy River Unit	Complete Planning Report.	September 1984	USBR, State of Wyoming.
Point Source Control	Initiate Construction	1988	Congress and Federal Administration.
	Initial year of salt removal.	1988	

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing [2]/	Entities Responsible for taking action [1]/
Onfarm Programs	Initiate onfarm irrigation related lateral improvements.	Not scheduled (pending coordination with industrial use alternatives)	USDA, state, local entities, Congress, and Federal Administration.
	Initial year of salt removal.	Not scheduled	
Sinbad Valley Unit	Complete planning report	April 1983	BLM
Point Source Control	Initiate construction. Initial year of salt removal.	1986 1987	BLM, State of Colorado, Congress and Federal Administration.
Moapa Valley Onfarm Improvements	Initiate onfarm irrigation and related lateral improvements.	1984	USDA, States, local entities, Congress and Federal Administration.
	Initial year of salt removal.	1985	
Mancos Valley Onfarm Improvements	Initiate onfarm irrigation and related lateral improvements.	1995	USDA, States, local entities, Congress and Federal Administration.
	Initial year of salt removal.	1996	
Palo Verde Irrigation District	Special Report	July 1981	USBR
	Initiate project investigations.	October 1985	USBR, USDA
	Complete Planning Report.	April 1987	
	Complete Planning Report/DES	1987	
Onfarm Improvements	Initiate construction Initial year of salt removal.	Not scheduled	
Saline Water Use and Disposal Opportunities (Aquatrain)	Initiate Construction. Initial year of salt removal.	1987 1989	USBR, BLM Colorado River Basin States. Private entities.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing [2]/	Entities Responsible for taking action [1]/
Industrial Water Use	Encourage and promote the use of saline or brackish water for industrial purposes except where it would be environmentally unsound, economically infeasible, or significantly increase comsumptive use.	1980 through 1995	Affected state, USBR, and EPA.
Industrial Discharges	The objective for industrial discharges shall be a no-salt return policy wherever practicable. EPA has endorsed the policy statement of the Forum and each state that has permit issuing authority has adopted the policy, except Wyoming. All states are following the Forum policy regarding NPDES permits.	November 1975	Each state or EPA.
Agricultural Discharges	Conduct educational program.	1980 through 1995.	Affected state and
Measures to Cope with Salinity	Expand land drainage system in Lower Basin.	Ongoing	Local agencies.
	Treating and blending Colorado River water.	Ongoing	Local agencies.
Research and Special Studies	Research on irrigation water application in relation to salinity output, Grand Valley, Colorado.	Ongoing	USDA (ARS), USBR, State of Colorado.
	Wellton-Mohawk Irrigation Management.	Completed	USBR, USDA (ARS), State of Arizona.
	Studies of salt precipitation in reservoirs.	Completed	USBR.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Research and Special Studies - Continued	Studies of land processes contribution of salt production from diffuse sources.	Ongoing	BLM, Utah State University.
	Study of the natural interaction of water and soil in the Green River Basin.	Ongoing	USDA (ARS).
	Studies of other areas where production of salts from non-point sources is significant (the scope and makeup of this study will depend on results from the research already underway).	Ongoing	USBR, BLM, EPA, affected states.
	Studies in other areas of the extent to which increases in irrigation efficiency will be effective in reducing salt loading (the scope and makeup of this study will depend on results from the research already underway).	Not yet scheduled except New Mexico where applicable research has been completed.	EPA, affected states.
	Identify and evaluate state water resources management programs, policies, and regulations and assess them for the purpose of identifying where they can be redirected toward salinity control policy.	Ongoing	Each Basin state, EPA.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Research and Special Studies - continued	Examination of municipal discharges as a source of salinity and of possible control measures.	Ongoing	Each Basin state.
	Implementation of municipal discharge salinity control.		
	California	Ongoing	Regional Water Quality Control Board.
	Studies of brine pond cost reduction.	Ongoing	USBR.
	Study of relationship between sediment production and salinity.	Ongoing	CSU.
Water Quality Management (208) Plans	Develop Water Quality (208) Management Plans.		Certification by the state and approval by EPA.
Arizona Western Arizona COG	State certification. EPA approval of plans.	June 1979 May 1981	Western Arizona COG, local agencies, state, EPA.
	Develop nonpoint source controls.	Not scheduled	District IV COG, local agencies.
Northern Arizona COG	State certification. EPA approval of plans. Develop nonpoint	June 1979 May 1981	Northern Arizona COG state, local agencies, EPA.
Statewide Plan	State certification. EPA approval. Develop nonpoint source control.	June 1979 May 1981 May 1981	State, local agencies, EPA. State, local agencies.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Water Quality Management (208) - continued			
California			
Statewide	State certification.	August 1979	Calif. Regional Water Quality Control Board, state, local agencies.
	Test program - accelerated flushing of saline ground waters	Completed	USBR, USGS, Palo Verde Irrigation District, local farmers.
Colorado			
Northwest Colorado COG	Being revised in response to litigation.	Ongoing	NW. Colorado COG, state, local agencies, EPA.
Colorado West COG	State certification. EPA approval.	December 1980 February 1981	Colorado West COG, state, local agencies USBR, USDA, EPA.
Statewide	State certification EPA approval.	1980 1981	USBR, USDA, state, local agencies, local farmers.
Nevada			
Clark County (includes entire drainage area of Colorado River in Nevada)	Conditional state certification. Conditional EPA approval. Revised 208 Plan completed. State certification. EPA approval.	June 1978 July 1979 February 1980 May 1980 October 1981	Clark Co. Comm., state, local agencies., EPA.
	Wastewater reuse and disposal with industrial use.		

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Water Quality Management (208) - continued			
	Develop salinity source control strategy for wastewater.		
Statewide	State certification. Conditional EPA approval. Revised 208 plan (draft). State certification. EPA approval.	November 1978 March 1979 June 1981 September 1981 October 1981	Nevada Department of Natural Resources, state, EPA.
	Nevada diffuse source regulations adopted by State Environmental Comm.	October 1980	
New Mexico			
Statewide	State certification. EPA aprpoval.	January 1981 April 1981	State, local agencies, EPA.
	Implement BMP's Develop information and education programs. Reduce nonpoint source. salinity from silviculture.		State, NM Soil and Conservation District.
Indian Lands		June 1979	Navajo Tribal Council
Utah			
Southwestern	Conditional state certification. Conditional EPA approval.	April 1980 May 1980	Southwestern Utah AOG, state, local agencies, EPA.
Uintah Basin	State certification. EPA approval.	December 1978 October 1979	Uintah Basin AOG, state, local agencies, EPA.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Water Quality Management (208) - continued			
	Identify problem areas. Establish monitoring programs. Implement site specific BMP's Improve irrigation water mangement.	Ongoing	Uintah Basin AOG, State USDA, Soil Conservation District, local agenices.
Southeastern	State certification. EPA approval.	December 1978 October 1979	Southeast Utah AOG, state, local agencies EPA.
	Assessment of problem areas. Coordinate between entities. Reviewfederalandstate water projects.	Ongoing	Southeast Utah AOG, USDA, USBR, BLM, state,local agencies.
Six County Area	State certification. EPA approval.	December 1979 May 1980	Six County AOG, state, EPA.
	Sampling and monitoring activities, prioritize and schedule site-specific BMP's.	Ongoing	Six County AOG, state, USGS, USDA, local agencies.
Ute Indian Tribe	In progress.	Ongoing	Ute Indian Tribe.
<u>Wyoming</u> Southwestern	State certification. EPA approval.	March 1980 October 1980	Southwestern Wyoming, Water Quality Association, state, EPA.
	Improvement of irrigation management practices, promote use of saline waters for industrial purposes, point source salinity control.	Further action pending completion of USBR and USDA studies	WYO WQA, USDA, USBR, state, local agencies, local farmers.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Water Quality Management (208) - continued			
Statewide	State certification. EPA approval. Improved Irrigation management practices. Use of saline water for industrial purposes.	March 1980 July 1980	Wyoming Dept. of Environmental Quality State, local agencies, EPA.
Other Activities	Analyze the monitoring program to determine the adequacy of the selected stations for the establishment of baseline salinity values.	1979	Forum and Seven states.
	Develop baseline salinity values for the specified monitoring points.	1979	Forum.
	Prepare annual report on salinity control program effect of other activities having an influence on salinity.	Annually	Forum.
	Implement onfarm improvements in local agricultural areas under USDA Programs. Erosion control and improved irrigation management.	Ongoing	USDA, states, conservation districts, local farmers.
	Reconsider and, where necessary, revise schedule for installing salinity control measures and/or modify the numeric criteria.	1981 or before, at least each 3 years thereafter	Seven states.

Table 7. - Timing and responsibility for accomplishing the implementation plan

Activity or Source of Salinity	Major Actions	Timing 2/	Entities Responsible for taking action 1/
Other Activities - continued			
	Investigate measures for limiting salinity in addition to those now in the plan of implementation to be applied after about 1990.	1981 and thereafter	Seven states.
	Review effluent limitations on salinity through the NPDES permit program.	Ongoing	Basin states having permit issuing authority. Otherwise EPA.

1/ States will review and comment on research and special studies, feasibility reports, EIS, and DPR.
2/ Some ongoing programs will continue indefinitely; others will have dates assigned for either completion or significant action after they have progressed further.

the plan of implementation will be considered with each 3-year review or more often as appropriate. Annually, the states, acting through the Forum, will prepare a report which summarizes pertinent results and progress of the salinity control program and the effect of other actions in the Basin having influence on salinity. The report will be transmitted to the EPA and to state water resources and pollution control agencies, and will be made available to others interested in the salinity control program.

Baseline salinity values have been developed for 13 points on the main stem of the Colorado River and major tributaries other than the three main stem locations for which numeric criteria for salinity have been established. The determination of these baseline values, or ranges of values, is based on historic flow and quality data modified to the 1972 level of development. A more complete explanation of the computation of the baseline values and a list of locations is given in the 1981 Review.

Standards Review Procedures

Prior to state action on the review of the numeric criteria and plan of implementation, public review and discussion will be sought through public meetings. The Forum will hold two regional meetings in the Basin to describe the Basinwide nature of the salinity problem and the control program and to solicit views from interested agencies, groups, and individuals.

In accordance with provisions of the Clean Water Act, each of the Basin states plans to review its salinity standards for the Colorado River within its boundaries, and transmit the results of that effort to the EPA in early 1985. It should be noted that there is no recommendation for change in the numeric criteria for salinity at the three lower main stem stations. Action by each state will be accomplished according to the required procedures of each state.

CHAPTER VI. FUTURE POSSIBLE SALINITY CONTROL PROGRAMS

The plan of implementation presented in the 1975 report included all of the salinity control projects authorized or identified for further study by Title II of Public Law 93-320 as part of the CRWQIP of the Bureau. The status of these units is discussed in Chapter IV of this report.

Since the analyses presented in this report only cover the period up to 2000 and since development will continue beyond 2000, other means of limiting the salinity level must be sought. Only a few of the following described actions have been evaluated in any depth, and their effectiveness and feasibility are not conclusive at this time. The others have undergone only very preliminary investigation and their feasibility is not known. Because of the relatively short period before some of them may be required, it is important that a state-federal program to examine these and other possibilities be initiated as expeditiously as possible.

Agricultural Return Flow and Other Saline Water Utilization

Increasing demands of energy in and near the Colorado River Basin has focused attention on the need for water to meet projected cooling requirements for energy conversion and power production. A potential source of water for these and other industrial purposes is the return flow from irrigated agriculture which occurs in substantial quantities in the Colorado River Basin. In recognition of this fact, the following policy (quoted in part) was adopted by the Forum on

September 11, 1980:

> "***The Forum finds that the objective of maintaining 1972 salinity levels would be served by the exercise of all feasible measures including, wherever practicable, the use of brackish and/or saline waters for industrial purposes."
>
> "The summary and on Page 32 of the Forum's 1978 Revision of the Water Quality Standards for Salinity states 'The plan also contemplates the use of saline water for industrial purposes whenever practicable, ***.' In order to implement this concept, and thereby further extend the Forum's basic salinity policies, the Colorado River Basin states support the Water and Power Resources Service appraisal study of saline water collection, pretreatment and potential industrial use."

A special study entitled "Saline Water Use and Disposal Opportunities" was completed by Reclamation in September 1981. The special study covered a broad spectrum of potential sources, uses, and disposal options for saline waters. Following a number of public participation meetings and input from the states, industry representatives, and technical reviewers, it was concluded that local industrial uses and coal slurry transport appear to be the most cost-effective options. Long distance collection and disposal options do not appear viable at this time.

A similar collection effort on a relatively small scale was earlier proposed in the Grand Valley area in Colorado.

Grand Valley Collection System, Colorado

A significant portion of the diverted flow for the 66,000 irrigated acres in the Grand Valley reenters the Colorado River as highly saline surface and ground water return flow. Installation of the USDA onfarm irrigation water use facilities began in 1979 and contracts for lining a portion of the main canal under Stage I of the Grand Valley Salinity Control Unit were completed in 1981. Following a 1-year monitoring program to verify the results of Stage I, construction should be continued on the remainder of the unit. The Grand Valley Salinity Control Unit is projected to significantly reduce the irrigation return flows, but the remaining surface and ground water flows could be intercepted and transported by pipelines to a point of industrial use.

Weather Modification

Reclamation was directed by Congress in 1977 to prepare plans to augment the flows of the Colorado River through the use of weather modification. The proposed plan, which is called Colorado River Enhanced Snowpack Test (CREST), is an eight year demonstration program to confirm the capability of cloud seeding to augment the Colorado River. This plan is based on the results of a 1975 winter orographic cloud seeding experiment in the San Juan Mountains of southwest Colorado.

CREST would be conducted in two phases. The first phase would be a three year effort to select and equip two subbasin field sites. The two sites would reduce the uncertainity about the frequency of seeding, storm variability, and the seeding mode operations throughout the Basin. The second phase would be a five year demonstration project with a randomized seeding program which would determine the total area effects, environmental response, and safety.

In many recent reports, Reclamation claims a significant increase in flow for the Colorado River (up to 1.7 million acre-feet per year) and a corresponding decrease in the salinity concentration at Imperial Dam. However, increased flows due to weather modification would also result in an increased salt load to the river. Any reduction in salinity concentrations due to the increase in flows would be highly dependent upon location of increased precipitation and the type and location of consumptive use.

Irrigation Efficiency

Return flow from agriculture has been identified as the major controllable source of salinity in the Colorado River. If seepage of irrigation water through saline soils can be minimized, the amount of salt carried to the Colorado River can be significantly reduced. To help meet the general objective of maintaining salinity at or below 1972 levels while permitting development to continue, research to improve irrigation efficiency must be continued.

Recent cooperative work by the SCS, Reclamation, and farmers in the Wellton-Mohawk Irrigation and Drainage District near Yuma, Arizona, and the Colorado River Indian Reservation, Arizona, show positive results in reducing water diversions. Use of lasers to achieve dead level irrigation and onfarm and related irrigation system improvements have been used singly and in combination. A similar program is being initiated in Imperial Valley in cooperation with the Imperial Irrigation District.

Laser leveling is effective where the original slope of the land is not excessive and relatively high heads of water are available for irrigation. Rapid application of water onto dead level fields results in a very uniform application not yet found possible by other means. The SCS has been involved with the farmers in onfarm improvements under provisions of Public Law 93-320. The principal improvement in reducing water consumption has been installation of water measurement structures. These have permitted better control of the application of the irrigation water. Other improvements have been aimed at increasing hydraulic head by resloping and lining laterals.

Rangeland Management Practices

BLM has investigated the effects of livestock grazing on public lands on the salinity concentration of the surface runoff. It has been suggested that utilizing proper grazing measures during critical periods can be one means of controlling salinity in runoff. The BLM is also evaluating methods for controlling highly saline ground water discharges from public domain lands.

CHAPTER VII. PROVISION FOR REVIEWING AND REVISING STANDARDS

Both the numeric criteria and plan of implementation will be continuously reviewed in light of changed conditions and/or new information. Revisions to the plan of implementation and upward or downward changes to the numeric criteria will be considered at 3-year intervals.

The Forum in its statement of "Principles and Assumptions for Development of Colorado River Salinity Standards and Implementation Plan," approved by the Forum on September 20, 1974, included Principle 7 as follows:

> "7. The plan of implementation shall be reviewed and modified as appropriate from time to time, but at least once each 3 years. At the same time, the (numeric) standards, as required by Section 303(c) (1) of P.L. 92-500 shall be reviewed for the purpose of modifying and adopting standards consistent with the plan so that the Basin States may continue to develop their compact-apportioned waters while providing the best practicable water quality in the Colorado River Basin."

The Forum took this position because the Colorado River Basin is a large and complex area with many problems. A wide range of research, technical studies, and actions are underway and much knowledge is yet to be gained. Usable procedures for dealing with the salinity of irrigation return flows have been developed and the Department of Agriculture has initiated its voluntary cost-share program with individual farmers to improve onfarm water management practices.

The permanent Work Group continues to keep current with salinity control efforts and suggests revisions. The Work

Group operates under a schedule which enables the states to take action on any potential revision by the required revision date.

APPENDIX A

Summary Estimated Total Use,
Colorado River Basin

REPORT 5

SALINITY FORUM LOW DEPLETION SCHEDULE - WITH EXISTING WQIPS
THURSDAY DECEMBER 29, 1983 9:31 A.M. JOB AHSC ON ACCOUNT ER07152
UPPER BASIN ESTIMATED DEMANDS

DEMAND FUNCTIONS (KAF)

		THERMAL POWER	AGRICUL TURE	FISH,WLD + REC	MINERALS	WQIP	M + I	EXPORTS	COAL GAS	OIL SHALE	TOTAL
ARIZONA	TOTAL DEPLETIONS										
	1982	21	8	1	0	0	4	0	0	0	34
	1985	21	8	1	0	0	4	0	0	0	34
	1990	21	7	1	0	0	4	0	0	0	33
	1995	24	8	1	0	0	4	0	0	0	37
	2000	26	8	1	0	0	4	0	0	0	39
COLORADO	TOTAL DEPLETIONS										
	1982	10	1266	5	18	4	20	528	0	0	1851
	1985	16	1266	5	19	4	20	584	0	2	1916
	1990	16	1271	6	19	4	32	669	0	2	2019
	1995	16	1283	7	21	4	35	699	0	9	2074
	2000	16	1356	7	23	4	39	709	0	9	2163
NEW MEXICO	TOTAL DEPLETIONS										
	1982	36	191	1	3	0	7	131	0	0	369
	1985	48	196	1	3	0	10	70	0	0	328
	1990	48	221	3	4	0	17	90	0	0	383
	1995	61	290	5	5	0	33	90	0	0	484
	2000	66	368	7	5	0	41	100	0	0	587
UTAH	TOTAL DEPLETIONS										
	1982	27	565	8	10	1	7	128	0	0	746
	1985	33	571	8	10	1	7	167	0	0	797
	1990	40	575	8	10	1	8	232	0	1	875
	1995	52	574	8	10	1	8	232	0	4	889
	2000	52	577	8	10	1	10	232	0	4	894
WYOMING	TOTAL DEPLETIONS										
	1982	41	288	6	30	0	5	7	0	0	377
	1985	41	288	12	30	0	6	12	0	0	389
	1990	41	292	20	35	0	6	15	0	0	409
	1995	53	300	20	41	0	7	17	16	0	454
	2000	63	304	20	47	0	8	20	34	4	500
BASIN	TOTAL DEPLETIONS										
	1982	135	2318	21	61	5	43	794	0	0	3377
	1985	159	2329	27	62	5	47	833	0	2	3464
	1990	166	2366	38	68	5	67	1006	0	3	3719
	1995	206	2455	41	77	5	87	1038	16	13	3938
	2000	223	2613	43	85	5	102	1061	34	17	4183

REPORT 5

SALINITY FORUM LOW DEPLETION SCHEDULE - WITH EXISTING WQIPS
THURSDAY DECEMBER 29, 1983 9:31 A.M. JOB AHSC ON ACCOUNT ER07152
LOWER BASIN ESTIMATED DEMANDS

DEMAND FUNCTIONS (KAF)

		THERMAL POWER	AGRICUL TURE	FISH,WLD + REC	MINERALS	WQIP	M + I	EXPORTS	COAL GAS	OIL SHALE	TOTAL
ARIZONA	TOTAL DEPLETIONS										
	1982	0	972	55	0	0	17	0	0	0	1044
	1985	0	972	55	0	0	782	0	0	0	1809
	1990	0	1070	60	0	0	1035	0	0	0	2165
	1995	0	1094	63	0	0	1340	0	0	0	2497
	2000	0	1118	67	0	0	1615	0	0	0	2800
CALIFORNIA	TOTAL DEPLETIONS										
	1982	0	3553	0	0	0	716	0	0	0	4269
	1985	0	3675	0	0	0	638	0	0	0	4313
	1990	0	3887	0	0	0	513	0	0	0	4400
	1995	0	3887	0	0	0	513	0	0	0	4400
	2000	0	3887	0	0	0	513	0	0	0	4400
NEVADA	TOTAL DEPLETIONS										
	1982	17	0	0	0	0	74	0	0	0	91
	1985	15	0	0	0	0	98	0	0	0	113
	1990	12	0	0	0	0	137	0	0	0	149
	1995	13	0	0	0	0	163	0	0	0	176
	2000	15	0	0	0	0	192	0	0	0	207
LOWER	TOTAL DEPLETIONS										
	1982	17	4525	55	0	0	807	0	0	0	5387
	1985	15	4647	55	0	0	1519	0	0	0	6235
	1990	12	4957	60	0	0	1685	0	0	0	6714
	1995	13	4981	63	0	0	2016	0	0	0	7073
	2000	15	5005	67	0	0	2320	0	0	0	7407

REPORT 5

SALINITY FORUM MODERATE DEPLETION SCHEDULE - WITH EXISTING WQIPS
THURSDAY DECEMBER 29, 1983 9:58 A.M. JOB AHYW ON ACCOUNT ERO7152
UPPER BASIN ESTIMATED DEMANDS

DEMAND FUNCTIONS (KAF)

		THERMAL POWER	AGRICUL TURE	FISH,WLD + REC	MINERALS	WQIP	M + I	EXPORTS	COAL GAS	OIL SHALE	TOTAL
ARIZONA	TOTAL DEPLETIONS										
	1982	21	8	1	0	0	4	0	0	0	34
	1985	21	8	1	0	0	4	0	0	0	34
	1990	23	8	1	0	0	4	0	0	0	36
	1995	26	9	2	0	0	4	0	0	0	41
	2000	30	9	2	0	0	4	0	0	0	45
COLORADO	TOTAL DEPLETIONS										
	1982	10	1266	5	18	4	20	528	0	0	1851
	1985	16	1266	5	19	4	20	587	0	2	1919
	1990	16	1283	7	20	4	35	694	0	2	2061
	1995	16	1356	7	22	4	37	704	0	9	2155
	2000	16	1356	7	24	4	40	719	0	18	2184
NEW MEXICO	TOTAL DEPLETIONS										
	1982	36	191	1	3	0	7	131	0	0	369
	1985	51	209	3	4	0	10	90	0	0	367
	1990	56	266	5	5	0	23	100	0	0	455
	1995	71	328	9	5	0	38	100	0	0	551
	2000	79	368	10	5	0	47	105	0	0	614
UTAH	TOTAL DEPLETIONS										
	1982	27	565	8	10	1	7	128	0	0	746
	1985	33	573	8	10	1	8	167	0	0	800
	1990	52	620	8	10	1	8	232	0	1	932
	1995	52	662	8	10	1	8	270	0	4	1015
	2000	65	697	8	10	1	10	270	0	15	1076
WYOMING	TOTAL DEPLETIONS										
	1982	41	288	6	30	0	5	7	0	0	377
	1985	41	291	12	30	0	6	12	0	0	392
	1990	56	298	20	40	0	7	17	0	0	438
	1995	68	303	20	47	0	8	22	25	0	493
	2000	78	308	20	55	0	9	27	50	4	551
BASIN	TOTAL DEPLETIONS										
	1982	135	2318	21	61	5	43	794	0	0	3377
	1985	162	2347	29	63	5	48	856	0	2	3512
	1990	203	2475	41	75	5	77	1043	0	3	3922
	1995	233	2658	46	84	5	95	1096	25	13	4255
	2000	268	2738	47	94	5	110	1121	50	37	4470

REPORT 5

SALINITY FORUM MODERATE DEPLETION SCHEDULE - WITH EXISTING WQIPS
THURSDAY DECEMBER 29, 1983 9:58 A.M. JOB AHYW ON ACCOUNT ERO7152
LOWER BASIN ESTIMATED DEMANDS

DEMAND FUNCTIONS (KAF)

		THERMAL POWER	AGRICUL TURE	FISH,WLD + REC	MINERALS	WQIP	M + I	EXPORTS	COAL GAS	OIL SHALE	TOTAL
ARIZONA	TOTAL DEPLETIONS										
	1982	0	972	55	0	0	17	0	0	0	1044
	1985	0	1011	55	0	0	782	0	0	0	1848
	1990	0	1142	61	0	0	1138	0	0	0	2341
	1995	0	1184	67	0	0	1549	0	0	0	2800
	2000	0	1188	71	0	0	1541	0	0	0	2800
CALIFORNIA	TOTAL DEPLETIONS										
	1982	0	3553	0	0	0	716	0	0	0	4269
	1985	0	3675	0	0	0	638	0	0	0	4313
	1990	0	3887	0	0	0	513	0	0	0	4400
	1995	0	3887	0	0	0	513	0	0	0	4400
	2000	0	3887	0	0	0	513	0	0	0	4400
NEVADA	TOTAL DEPLETIONS										
	1982	17	0	0	0	0	74	0	0	0	91
	1985	16	0	0	0	0	106	0	0	0	122
	1990	15	0	0	0	0	158	0	0	0	173
	1995	17	0	0	0	0	184	0	0	0	201
	2000	18	0	0	0	0	218	0	0	0	236
LOWER	TOTAL DEPLETIONS										
	1982	17	4525	55	0	0	807	0	0	0	5408
	1985	16	4686	55	0	0	1526	0	0	0	6283
	1990	15	5029	61	0	0	1809	0	0	0	6914
	1995	17	5071	67	0	0	2246	0	0	0	7401
	2000	18	5075	71	0	0	2272	0	0	0	7436

REPORT 5

SALINITY FORUM HIGH DEPLETION SCHEDULE - WITH EXISTING WQIPS
MONDAY JANUARY 9, 1984 9:26 A.M. JOB ACII ON ACCOUNT ER1000M
UPPER BASIN ESTIMATED DEMANDS

DEMAND FUNCTIONS (KAF)

		THERMAL POWER	AGRICUL TURE	FISH,WLD + REC	MINERALS	WQIP	M + I	EXPORTS	COAL GAS	OIL SHALE	TOTAL
ARIZONA	TOTAL DEPLETIONS										
	1982	21	8	1	0	0	4	0	0	0	34
	1985	21	8	1	0	0	4	0	0	0	34
	1990	25	9	2	0	0	4	0	0	0	40
	1995	30	9	2	0	0	4	0	0	0	45
	2000	34	10	2	0	0	4	0	0	0	50
COLORADO	TOTAL DEPLETIONS										
	1982	10	1266	5	18	4	20	528	0	0	1851
	1985	16	1266	5	19	4	20	592	0	2	1924
	1990	16	1283	7	21	4	38	704	0	9	2082
	1995	16	1356	7	23	4	41	714	0	18	2179
	2000	16	1396	7	25	4	47	724	0	18	2237
NEW MEXICO	TOTAL DEPLETIONS										
	1982	36	191	1	3	0	8	131	0	0	370
	1985	53	223	5	4	0	11	110	0	0	406
	1990	68	311	7	5	0	26	110	0	0	527
	1995	81	372	12	6	0	37	110	0	0	618
	2000	91	373	12	6	0	46	110	0	0	638
UTAH	TOTAL DEPLETIONS										
	1982	27	565	8	10	1	7	128	0	0	746
	1985	33	573	8	10	1	7	167	0	0	799
	1990	52	620	8	10	1	14	232	0	13	950
	1995	52	662	8	10	1	14	270	0	51	1068
	2000	59	697	8	10	1	16	270	0	87	1148
WYOMING	TOTAL DEPLETIONS										
	1982	41	288	6	30	0	5	7	0	0	377
	1985	41	291	12	30	0	6	12	0	0	392
	1990	61	316	20	51	0	7	27	15	0	497
	1995	90	328	20	64	0	9	62	50	3	626
	2000	103	352	20	72	0	10	77	85	7	726
BASIN	TOTAL DEPLETIONS										
	1982	135	2318	21	61	5	44	794	0	0	3378
	1985	164	2361	31	63	5	48	881	0	2	3555
	1990	222	2539	44	87	5	89	1073	15	22	4096
	1995	269	2727	49	103	5	105	1156	50	72	4536
	2000	303	2828	49	113	5	123	1181	85	112	4799

REPORT 5

SALINITY FORUM HIGH DEPLETION SCHEDULE - WITH EXISTING WQIPS
MONDAY JANUARY 9, 1984 9:26 A.M. JOB ACII ON ACCOUNT ER1000M
LOWER BASIN ESTIMATED DEMANDS

DEMAND FUNCTIONS (KAF)

		THERMAL POWER	AGRICUL TURE	FISH,WLD + REC	MINERALS	WQIP	M + I	EXPORTS	COAL GAS	OIL SHALE	TOTAL
ARIZONA	TOTAL DEPLETIONS										
	1982	0	972	55	0	0	17	0	0	0	1044
	1985	0	1015	56	0	0	782	0	0	0	1853
	1990	0	1203	65	0	0	1532	0	0	0	2800
	1995	0	1224	70	0	0	1506	0	0	0	2800
	2000	0	1224	73	0	0	1503	0	0	0	2800
CALIFORNIA	TOTAL DEPLETIONS										
	1982	0	3553	0	0	0	716	0	0	0	4269
	1985	0	3675	0	0	0	638	0	0	0	4313
	1990	0	3887	0	0	0	513	0	0	0	4400
	1995	0	3887	0	0	0	513	0	0	0	4400
	2000	0	3887	0	0	0	513	0	0	0	4400
NEVADA	TOTAL DEPLETIONS										
	1982	17	0	0	0	0	74	0	0	0	91
	1985	18	0	0	0	0	111	0	0	0	129
	1990	20	0	0	0	0	172	0	0	0	192
	1995	21	0	0	0	0	213	0	0	0	234
	2000	23	0	0	0	0	243	0	0	0	266
LOWER	TOTAL DEPLETIONS										
	1982	17	4525	55	0	0	807	0	0	0	5404
	1985	18	4690	56	0	0	1531	0	0	0	6295
	1990	20	5090	65	0	0	2217	0	0	0	7392
	1995	21	5111	70	0	0	2232	0	0	0	7434
	2000	23	5111	73	0	0	2259	0	0	0	7466

APPENDIX B

Intercepted Groundwater Policy For Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program

Approved
10/20/82

INTERCEPTED GROUNDWATER* POLICY FOR IMPLEMENTATION OF THE COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM

by
The Colorado River Basin Salinity Control Forum

The States of the Colorado River Basin in 1977 agreed to the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program" with the objective for industrial discharge being "no-salt return" whenever practicable. That policy required the submittal of information by the applicant on alternatives, water rights, quantity, quality and costs to eliminate or minimize the salt discharge. The information is for use by the NPDES permit issuing agency in evaluating the practicability of achieving no-salt discharge.

There are mines and wells in the Basin which discharge intercepted groundwaters. The factors involved in those situations differ somewhat from those encountered in other industrial discharges. Continued development will undoubtedly result in additional instances in which permit conditions must deal with intercepted groundwater.

The discharge of intercepted groundwater needs to be evaluated in a manner consistent with the overall objective of "no salt return" whenever practical. The following provides more detailed guidance for those situations where groundwaters are intercepted with resultant changes in groundwater flow regime.

I. The "no-salt" discharge requirement may be waived at the option of the permitting authority in those cases where the discharged salt load reaching the main stem of the Colorado River is less than one ton per day or 350 tons per year, whichever is less. Evaluation will be made on a case-by-case basis.

II. Consideration should be given to the possiblity that the groundwater, if not intercepted, normally would reach the Colorado River System in a reasonable time frame. An industry desiring such consideration must provide detailed information including a description of the topography, geology and hydrology. Such information must include direction and rate of groundwater flow, chemical quality and quantity of groundwater, and the location, quality and quantity of surface streams and springs that might be affected. If the information adequately demonstrates that the groundwater to be intercepted normally would reach the river system in a reasonable time frame and would contain approximately the same

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*The term intercepted groundwater means all groundwater encountered during mining or other industrial operations.

or greater salt load than if interecepted, and if no significant localized problems would be created, then the permitting agency may waive the "no-salt" discharge requirement.

III. In those situations where the discharge does not meet the criteria in I or II above, the applicant will be required to submit the following information for consideration:

A. Description of the topography, geology and hydrology. Such information must include the location of the development, direction and rate of groundwater flow, chemical quality and quantity of groundwater, and relevant data on surface streams and springs that are or might be affected. This information should be provided for the conditions with and without the project.

B. Alternative plans that could substantially reduce or eliminate salt discharge. Alternative plans must include:

1. Description of water rights, including beneficial uses, diversions and consumptive use quantities.

2. Description of alternative water supplies, including provisions for water reuse, if any.

3. Description of quantity and quality of proposed discharge.

4. Description of how salts removed from discharges shall be disposed of to prevent their entering surface waters or groundwater aquifers.

5. Technical feasibility of the alternatives.

6. Total construction, operation and maintenance costs and costs in dollars per ton of salt removed from the discharge.

7. Closure plans to ensure termination of any proposed discharge at the end of the economic life of the project.

8. A statement as to the one alternative plan for reduction of salt discharge that the applicant recommends be adopted including an evaluation of the technical, economic and legal practicability of achieving no discharge of salt.

9. Such other information as the permitting authority may deem necessary.

IV. In determining whether a "no salt" discharge is practicable, the permit issuing authority shall consider, but not be limited to, the water rights and the technical, economic and legal practicability of achieving no discharge of salt.

V. Where "no-salt" discharge is determined not to be practicable the permitting authority shall, in determining permit conditions, consider:

A. The impact of the total proposed salt discharge of each alternative on the lower mainstem in terms of both tons per year and concentration.

B. Costs per ton of salt removed from the discharge for each plan alternative.

C. The compatibility of state water laws with each alternative.

D. Capability of minimizing salinity discharge.

E. The localized impact of the discharge.

F. Minimization of salt discharges and the preservation of fresh water by using intercepted groundwater for industrial processes, dust control, etc, whenever it is economically feasible and environmentally sound.

SUPPLEMENT TO

1984 REVIEW

SUPPLEMENTAL REPORT ON THE 1984 REVIEW

WATER QUALITY STANDARDS FOR SALINITY

COLORADO RIVER SYSTEM

July 1984

July 1984

Supplemental Report on the 1984 Review

WATER QUALITY STANDARDS FOR SALINITY COLORADO RIVER SYSTEM

Prepared by

Colorado River Basin Salinity Control Forum

COLORADO RIVER BASIN SALINITY CONTROL FORUM
MEMBERS

ARIZONA
- Wesley Steiner, Director
  - Department of Water Resources
- Dr. Ronald Miller, Acting Assistant Director
  - Department of Environmental Health
- Stewart Udall, Attorney at Law, Member
  - Central Arizona Water Conservation District

CALIFORNIA
- Myron B. Holburt, Assistant General Manager
  - The Metropolitan Water District of Southern California
- Walter Pettit, Deputy Executive Director
  - State Water Resources Control Board

COLORADO
- David H. Getches, Executive Director
  - Department of Natural Resources
- Robert Arnott, Assistant Director
  - Department of Health
- David Robbins, Attorney at Law

NEVADA
- Jack L. Stonehocker, Director
  - Colorado River Commission of Nevada
- Lewis H. Dodgion, Administrator
  - Division of Environmental Protection
- Roland D. Westergard, Director
  - Department of Conservation and Natural Resources

NEW MEXICO
- Stephen E. Reynolds, State Engineer

UTAH
- Daniel F. Lawrence, Director
  - Division of Water Resources
- Calvin K. Sudweeks, Director
  - Bureau of Water Pollution Control
  - Division of Environmental Health

WYOMING
- George L. Christopulos, State Engineer
- William F. Garland, Administrator
  - Department of Environmental Quality

Jack A. Barnett, Executive Director
Colorado River Basin Salinity Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

CONTENTS

TRANSMITTAL LETTERS

The Federal Water Pollution Control Act requires that at least once every three years the states of the Colorado River Basin review water quality standards relating to the salinity of the waters of the Colorado River. The states collectively initiate this review under the aus pices of the Colorado River Basin Salinity Control Forum and prepare a proposed report and a supplemental report.

Upon the Forum's adoption of these two reports, they are transmitted to the individual states for their own independent action. The following is a copy of the transmittal letter to the State of Arizona. Following Arizona's transmittal letter is a listing of the recipients in each of the states of an identical letter.

Colorado River Basin

Salinity Control Forum

Honorable Bruce Babbitt
Governor of Arizona
Statehouse
Phoenix, Arizona 85007

Dear Governor Babbitt:

Enclosed is a copy of the report "1984 Review Water Quality Standards for Salinity, Colorado River System", approved on May 1, 1984, by the seven state Colorado River Basin Salinity Control Forum.

Subsequent to the May approval, two regional public meetings were held to provide an opportunity for those who so desired to present comments or suggestions on the proposed report. The meetings were held on June 25, 1984, in Rock Springs, Wyoming, and June 27, 1984, in Las Vegas, Nevada. A supplement, including modifications to the report based on comments and suggestions received, is also enclosed. The attached supplement was approved by the Forum on July 25, 1984. The report and the supplement constitute the 1984 review of the Colorado River salinity standards.

Section 303(c)(1) of the Clean Water Act requires that:

> The Governor of a State or the State water pollution control agency of such State shall from time to time (but at least once each three year period beginning with the date of enactment of the Federal Water Pollution Control Act Amendments of 1972) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. Results of such review shall be made available to the Administrator.

106 West 500 South, Suite 101
Bountiful, Utah 84010
(801) 292-4663

The enclosed report and its supplement recommends no change in the numeric criteria for salinity but reflects some changes in the plan of implementation previously adopted by the Forum. The Forum urges that each state water control agency adopt the 1984 Review as appropriate, thus preserving the basin-wide approach to salinity control developed by the basin states over the last decade. The Forum urges that your State take prompt action in adopting this review.

Sincerely,

David Robbins
Chairman

Enclosure

cc: Arizona Forum Members

Identical transmittal letter sent to each of the following:

Honorable George Deukmejian
Governor of California
State Capitol
Sacramento, California 95814

Honorable Richard D. Lamm
Governor of Colorado
State Capitol
Denver, Colorado 80203

Honorable Richard Bryan
Governor of Nevada
State Capitol
Carson City, Nevada 89701

Honorable Toney Anaya
Governor of New Mexico
State Capitol
Santa Fe, New Mexico 87501

Honorable Scott M. Matheson
Governor of Utah
State Capitol
Salt Lake City, Utah 84114

Honorable Ed Herschler
Governor of Wyoming
State Capitol
Cheyenne, Wyoming 82001

INTRODUCTION

This supplement to the 1984 Review - Water Quality Standards for Salinity contains statements and comments received by the Forum and the Forum's response. Statements and comments were received at public meetings held in Rock Springs, Wyoming on June 25, 1984, and in Las Vegas, Nevada on June 27, 1984. Written comments received by June 30, 1984 were also accepted. The supplement also includes the correction of typographical errors. Each comment or statement received is presented followed by the Forum's response.

STATEMENTS, COMMENTS AND FORUM RESPONSES

STATE OF CALIFORNIA—RESOURCES AGENCY

GEORGE DEUKMEJIAN, *Governor*

DEPARTMENT OF WATER RESOURCES

P.O. Box 6598
LOS ANGELES
90055

JUN 27 1984

Colorado River Basin
Salinity Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Attention: Mr. Jack A. Barnett
Executive Director

As requested in the June 7, 1984, letter to the Department from the Colorado River Basin Salinity Control Forum, we have reviewed the "Proposed Report on the 1984 Review - Water Quality Standards for Salinity Colorado River System". We find the report to be comprehensive and informative.

We support the Forum's plan of retaining the salinity numeric criteria, and continuing to use them during the next three-year period. These numeric criteria consist of total dissolved solids concentrations for the Colorado River of:

Below Hoover Dam	723 mg/L
Below Parker Dam	747 mg/L
Imperial Dam	879 mg/L

Concerning the LaVerkin Springs Unit (page 47) and the diversion of saline waters from these springs into evaporation ponds, we question the use of clay liners. Because of the potential for base exchange between saline waters and clays, the integrity of the liners could be threatened. Therefore careful consideration should be given to selecting the appropriate type of liner material to mitigate this potential problem.

For further information, you may wish to contact Sanford L. Werner at (213) 620-4836.

Sincerely,

C B Arnold

~~Jack~~ J. Coe, Chief
Southern District

RESPONSE

As stated in the report, additional studies were made to evaluate clay lining in the LaVerkin Springs Unit. Those studies considered all aspects of pond lining, however, it was found that the use of clay liners or membrane liners did make the unit cost-effective. Therefore, further investigation of the LaVerkin Springs Salinity Control Unit has been discontinued at this time.

COMMENT FROM DR. LARRY PAULSON, PROFESSOR,
UNIVERSITY OF NEVADA LAS VEGAS

Dr. Paulson suggested that the Forum include in the supplement a comparison of the salinity projections made in 1972 with the salinity concentrations measured in the lower main stem subsequent to 1972.

RESPONSE

Such comparison and analyses are regularly being made by the Forum and the Bureau of Reclamation. As a result, continuous refinements are being made in the assumptions, data base, simulation system, and salinity projections. During the 1978 Review, the Forum recognized that measured salinity concentrations were not following the earlier projections. The Forum addressed this question in the 1978 Review and in more detail in the 1981 Review. Early indications were that the salt load entering the river was overestimated. In the 1981 Review, the Forum evaluated the inflow to Lake Powell, inflow from Lees Ferry to Grand Canyon, salt gain or loss in Lake Powell, and bank storage in Lake Powell. Based on the above evaluation, the salt load estimate was revised for the salinity projections used in the 1981 Review. The Forum continued this process for the 1984 Review and again revised its salinity projections. Research and evaluation is continuing by the Forum and Reclamation to develop a higher level of confidence in the simulation system and resulting projections. Bureau of Reclamation Commissioner Robert Olson's statement describes the recent research activities of that agency.

Because of the ongoing process, a comparison of the salinity projections made in 1972 with the salinity concentrations measured in the lower main stem subsequent to 1972 would be of relatively little value.

COMMENT

It was brought to the Forum's attention that the 1977 "Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program" and the 1980 "Policy for Use of Brackish and/or Saline Waters for Industrial Purposes" are included only by reference in the 1984 Review. It was suggested that, for the convenience of each state in its review process, and those persons who do not have copies of the earlier three year reviews that the above policies be included in this supplement.

RESPONSES

The Forum agrees. The policies are included in this supplement.

ADDITIONAL STATEMENTS

A number of agencies submitted statements supporting the report and made no recommendations for changes. The agencies are: Imperial Irrigation District, San Diego County Water Authority, Palo Verde Irrigation District, Coachella Valley Water District, The Metropolitan Water District of Southern California, Los Angeles Department of Water and Power, Colorado River Board of California, Bureau of Reclamation, Soil Conservation Service, and the International Boundary and Water Commission.

TELEPHONE 619-339-9200

IMPERIAL IRRIGATION DISTRICT

OPERATING HEADQUARTERS • IMPERIAL, CALIFORNIA 92251

IIDGM

June 20, 1984

Mr. Jack A. Barnett
Colorado River Basin Salinity
  Control Forum
106 West 500 South, Suite 101
Bountiful, UT 84010

Dear Mr. Barnett:

Imperial Irrigation District, being one of the major beneficiaries of salinity control and being subject to damages due to adverse effects of salinity, is in full support of the Colorado River Basin Salinity Control Forum in its efforts to control salinity in the Lower Colorado River region.

The Department of the Interior and Department of Agriculture projects which are designed to maintain the numeric salinity criteria in the Lower Colorado River should be carried out expediently, particularly the completion of construction of Paradox Valley and Grand Valley Salinity Control Units.

To summarize, we have examined the proposed report on the "1984 Review - Water Quality Standards for Salinity - Colorado River System" and agree with its content. This District is eager to see the various facets of these criteria maintained.

Yours truly,

Charles L. Shreves

CHARLES L. SHREVES
General Manager

San Diego County Water Authority
2750 Fourth Avenue, San Diego, California 92103 (619) 297-3218
(A Public Agency Organized June 9, 1944)

June 20, 1984

Mr. Jack A. Barnett
Executive Director
Colorado River Basin Salinity
Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Dear Mr. Barnett:

The San Diego County Water Authority agrees with the recommendations of the Forum as described in its proposed report on the "1984 Review-Water Quality Standards for Salinity, Colorado River System". We see no reason to recommend changes in the numeric salinity criteria for the "Below Hoover Dam", "Below Parker Dam", and "Imperial Dam" stations.

We concur that the described plan of implementation should be carried out, especially the completion of construction of the Paradox Valley and Grand Valley Units listed in Section 202, Title II of Public Law 93-320. Further, we believe that work should proceed with the other Departments of the Interior and Agriculture projects described in the plan of implementation.

Please have this letter introduced in the hearing scheduled for Wednesday, June 27, 1984 in Las Vegas.

Very truly yours,

Lawrence R. Michaels

Lawrence R. Michaels
General Manager and Chief Engineer

LRM:jmr

120,500 ACRES LOCATED ALONG COLORADO RIVER

PALO VERDE IRRIGATION DISTRICT

Office Address
180 West 14th Avenue
Blythe, California

Mailing Address
P.O. Box 1199
Blythe, California 92226

Telephone (714) 922-3144

June 20, 1984

Mr. Jack A. Barnett, Executive Director
Colorado River Basin
Salinity Control Forum
106 West 500 South, Suite 100
Bountiful UT 84010

Dear Mr. ~~Barnett~~ Jack:

The Palo Verde Irrigation District concurs with the 1984 Review and recommended revisions of the "Water Quality Standards for Salinity - Colorado River System", May 1984, as prepared by the Colorado River Basin Salinity Control Forum.

Yours very truly,
PALO VERDE IRRIGATION DISTRICT

Virgil L. Jones

VLJ/elc

ESTABLISHED IN 1918 AS A PUBLIC AGENCY

COACHELLA VALLEY WATER DISTRICT

POST OFFICE BOX 1058 • COACHELLA, CALIFORNIA 92236 • TELEPHONE (714) 398-2651

June 18, 1984

Jack A. Barnett
Executive Director
Colorado River Basin Salinity Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Dear Mr. Barnett:

Subject: 1984 Review of Water Quality Standards of Salinity for the Colorado River System

The Coachella Valley Water District concurs with the seven state Colorado River Basin Salinity Control Forum's findings, particularly with regard to the numeric salinity criteria and plan of implementation for salinity control for the Colorado River system. We see no reason to recommend changes in the numeric salinity criteria.

The plan of implementation is endorsed by this District.

Yours very truly,

Lowell O. Weeks

Lowell O. Weeks
General Manager-Chief Engineer

LOW:bas

The Metropolitan Water District of Southern California

Office of the General Manager

June 18, 1984

Mr. Jack A. Barnett
Executive Director
Colorado River Basin Salinity
Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Dear Mr. Barnett:

Report on the
1984 Review of the Colorado River Salinity
Standards and Implementation Plan

We have reviewed the proposed report on the 1984 Review of the Colorado River salinity standards and implementation plan. The Metropolitan Water District of Southern California wishes to commend the Colorado River Basin Salinity Control Forum on its continuing efforts regarding salinity control. The Forum's efforts in maintaining interstate cooperation and support for the program, and its overall coordination and ongoing monitoring of salinity changes and program effectiveness are also to be commended.

The District is pleased to see that more attention is being given to control of the largest man-made source, irrigated agriculture. The on-farm salinity control measures appear to be one of the most cost-effective means of maintaining the numeric criteria.

The Metropolitan Water District appreciates this opportunity to comment on the Forum's 1984 Review report. We endorse the report and its recommendations for the salinity standards and the plan of implementation, and we urge their adoption by each of the concerned states.

Very truly yours,

Carl Boronkay

Carl Boronkay
General Manager

MBH/ub

1111 Sunset Boulevard, Los Angeles, Calif. / Mailing address: Box 54153, Los Angeles, Calif. 90054 / Telephone: (213) 250-6000

June 25, 1984

Mr. Jack A. Barnett
Executive Director
Colorado River Basin Salinity
Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Dear Mr. Barnett:

Proposed Report on the 1984 Review -
Water Quality Standards for Salinity
Colorado River System

This is in response to the June 7, 1984 invitation by the California members of the Colorado River Basin Salinity Control Forum to make comments and suggestions on the above titled report. We are in general agreement with all points covered in the report and support the report's recommendations.

Of particular importance are the recommendations to expedite completion of two salinity control units, the Paradox Valley and Grand Valley Units, authorized by Section 202, Title II, of Public Law 93-320, the Colorado River Basin Salinity Control Act. In addition, we support the implementation of the Department of the Interior and Department of Agriculture salinity control projects described in the plan of implementation. We believe these salinity control units are essential in minimizing the salinity of the Colorado River and in making a better quality water available for delivery to the City of Los Angeles and other users of Metropolitan Water District's water supply in the future.

We appreciate the opportunity to review and comment upon the report.

Sincerely,

Duane L. Georgeson
DUANE L. GEORGESON
Assistant General Manager - Water

cc: Vernon E. Valantine

111 North Hope Street, Los Angeles, California ☐ *Mailing address:* Box 111, Los Angeles 90051
Telephone: (213) 481-4211 *Cable address:* DEWAPOLA

R E S O L U T I O N

of

COLORADO RIVER BOARD OF CALIFORNIA

in Support of the

1984 Review, Water Quality Standards for Salinity,

Colorado River System

WHEREAS, the salinity of the Colorado River is of great concern to the nearly thirteen million people in California who rely in full or in part on water from the river and to those who farm over 650,000 acres of irrigated lands; and

WHEREAS, water quality standards for salinity, including numeric criteria and a plan of implementation, were established by the seven-state Colorado River Basin Salinity Control Forum in 1975, adopted by the seven Basin states, and approved by the Environmental Protection Agency as a basinwide approach to controlling salinity in the Colorado River; and

WHEREAS, Section 303 of the Clean Water Act of 1977 requires that the water quality standards be reviewed from time to time, but at least once during each 3-year period; and

WHEREAS, pursuant to Section 303 of the Clean Water Act, reviews of the Colorado River water quality standards for salinity were conducted in 1978 and 1981, wherein it was found that the 1975 numeric criteria were still appropriate and wherein the plan of implementation was reviewed and modified to accommodate changes; and

WHEREAS, the proposed Colorado River Salinity Control Forum's 1984 review of the water quality standards for salinity recommends that no changes be made in the 1975 numeric criteria but that the plan of implementation be modified to reflect changes since 1981; and

WHEREAS, there is no reason to believe that the numeric criteria will be exceeded during the next 3-year review period;

NOW, THEREFORE, BE IT RESOLVED that the Colorado River Board of California fully supports the proposed 1984 Review, Water Quality Standards for Salinity, Colorado River System.

Unanimously adopted June 13, 1984

State of California)
) ss
County of Los Angeles)

I, DENNIS B. UNDERWOOD, Executive Secretary of the Colorado River Board of California, do hereby certify that the foregoing is a true copy of a resolution adopted by said Board at a Regular Meeting thereof, duly convened and held in Los Angeles, California, on the 13th day of June 1984, at which a quorum of said Board was present and acting throughout.

Dated this 13th day of June 1984.

Dennis B. Underwood

DENNIS B. UNDERWOOD
Executive Secretary

STATEMENT ON BEHALF OF ROBERT L. OLSON, ACTING COMMISSIONER, BUREAU OF RECLAMATION, FOR PRESENTATION BEFORE THE PUBLIC MEETING RELATING TO THE PROPOSED 1984 REVIEW - WATER QUALITY STANDARDS FOR SALINITY IN THE COLORADO RIVER SYSTEM - ROCK SPRINGS, WYOMING, JUNE 25, 1984, AND LAS VEGAS, NEVADA, JUNE 27, 1984.

Colorado River salinity standards are of special importance to the Department of the Interior and the Bureau of Reclamation. We are charged with planning and constructing many of the principal physical components of the plan of implementation to maintain the adopted standards for the Colorado River System. Thus, the standards have a direct bearing on Reclamation's particular share of responsibilities associated with development and management of the water resources of the Colorado River Basin.

The Bureau of Reclamation endorsed the salinity standards proposed by the Colorado River Basin Salinity Control Forum, adopted by the Basin States, and approved by the Environmental Protection Agency in 1975. We have been continuously kept informed of the progress of the Forum during the current review of the water quality standards. We appreciate having had the opportunity to work with the Forum in this endeavor.

We believe the Forum's approach of considering the total basin as a single operating entity is the most logical and workable method to meet the overall objective of maintaining salinity levels in the lower main stem at or below 1972 levels, while water resource development continues throughout the Basin. Our own independent analyses support the Forum's conclusion that salinity levels at the three numeric criteria stations will not exceed the 1975 criteria (i.e., 1972 salinity levels) or the proposed 1984 criteria during the next 3 years. In the long term, the Forum salinity projections appear reasonable for the assumptions made.

A one-year Reclamation study to determine long-term trends and salinity streamflow relationships was completed in 1984. The effect of construction of major reservoirs on ion concentration was evaluated, and a theoretical model for describing ion concentration/streamflow relationships was developed and tested. This study demonstrated that there appears to be no major long term trends in the total salt load of the system, but rather that the apparent shifts are related to time delays in the reservoir system.

Another research study performed under contract to Reclamation involved development of a two-dimensional research model to predict changes in temperature and salinity concentrations, and associated salt precipitation in Lake Powell and Lake Mead. This model will increase the reliability of long-range salinity projections. This study showed that the maximum amount of salt precipitation that may be expected in Lakes Powell and Mead is on the order of 50,000 tons, or less than 1 percent of the throughput.

Reclamation activities associated with the plan of implementation for meeting Colorado River salinity standards include the construction of two authorized projects, feasibility studies leading to possible authorization and construction of 10 additional salinity control units, advance planning on the authorized Las Vegas Wash Unit, and steps to encourage beneficial industrial use of saline and/or brackish waters.

We are making significant progress on construction of the Grand Valley salinity control unit. Construction of Stage One is substantially complete. Monitoring continues on the Stage One laterals for flow fluctuations and associated operational problems. The moss and debris removal structure was installed in 1983, approximately one year ahead of schedule. Monitoring of the Stage One area has shown a reduction in salt load for 1983 of 15,600 tons, of which 14,200 was related to the canal and lateral lining and 1,400 tons to the USDA onfarm program. A recommended plan has been identified in the Stage Two draft supplement to the Definite Plan Report. This plan would reduce salinity concentration at Imperial Dam by 14.6 mg/L and result in an overall cost-effectiveness of $766,000 per mg/L reduction at Imperial Dam. The draft Environmental Statement is scheduled for completion in mid-1985.

Paradox Valley salinity control unit has suffered delays in developing the deep well injection plan. Information obtained by the deep well drilling consultant resulted in a decision not to attempt rehabilitation of the abandoned Conoco Well in Paradox Valley. This change necessitated revising the deep well drilling specifications and delayed the contract award until early in 1985.

In the Las Vegas Wash Unit, a contract was awarded to construct the 3.5 mile Pittman bypass pipeline with the completion date established for November 28, 1984. Pending verification, it appears a cost-effective strategy using ground water barriers in other areas of the Wash may be viable for further reductions. A verification effort has been proposed to test the ground water barrier concept with a monitoring program to assess results.

In recent years, feasibility investigations under the Colorado River Water Quality Improvement Program have been continuing essentially on schedule. Advance planning studies are in progress on the Lower Gunnison Basin Unit, under the two-stage planning process, and an advance planning study is planned for the Big Sandy River Unit in FY 85. Advance planning can begin on three others when funding becomes available. Recommendations have been made to suspend studies on the LaVerkin Springs Unit studies because of limited salinity control opportunity and high costs. The Glenwood-Dotsero Springs Unit studies are nearing completion and further studies will begin when an industrial use option is identified.

The Saline Water Use and Disposal Opportunities Unit involves the study of Aquatrain, a proposed pipeline system to divert water from saline point and diffuse sources to industrial uses and to transport coal and other products from mines to points of use. Also, a saline water cooling system verification program is being programed for FY 1985. Saline water cooling system technology will be tested at an existing powerplant. This appears to be the most cost-effective way to verify the use of saline water to provide salinity control benefits and to address industries' concerns regarding equipment reliability.

In summary, we believe the Proposed 1984 Review - Water Quality Standards for Salinity, Colorado River System, which confirms the numeric criteria and updates the plan of implementation for salinity control, is an excellent review of the established standards. We concur in the adequacy of the numeric criteria for the next 3 years and in the plan of implementation. We look forward to continued close cooperation with the Forum, the Basin States, and Federal agencies in implementing the control program.

United States Department of Agriculture

Soil Conservation Service

P.O. Box 2890
Washington, D.C.
20013

JUN 27 1984

Mr. Jack Barnett
Executive Director
Colorado River Basin
Salinity Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Dear Mr. Barnett:

On behalf of the Department of Agriculture (USDA), we have reviewed the report on the 1984 Review of Water Quality Standards for Salinity, Colorado River System. The document is comprehensive and well prepared.

We concur with the recommendations in the proposed implementation plan to accelerate the more cost-effective USDA onfarm salinity control projects. Our recent legislative and budget initiatives have been directed toward that objective.

USDA recognizes the short-term beneficial impacts of high runoff excessive flow conditions on reducing salinity concentrations, but hasten to advise that total salt loadings have most probably increased.

The potential for severe long-term impacts and increasing salinity levels remain almost inevitable without upstream salinity control efforts.

We appreciate the Forum's legislative initiative to expand PL-93-320 and the efforts to accelerate salinity control throughout the Colorado River Basin.

Sincerely,

Edgar H. Nelson

EDGAR H. NELSON
USDA Salinity Control Liaison
Office

cc:
Mr. David Robbins, Chairman, CRBSC Forum
Mr. Ernie Weber, Chairman, Forum Work Group

WO-AS-1
10-79

OFFICE OF THE COMMISSIONER
UNITED STATES SECTION

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO
IBWC BUILDING
4110 RIO BRAVO
EL PASO, TEXAS 79902

JUN 29 1984

Mr. Jack A. Barnett
Executive Director
Colorado River Basin
Salinity Control Forum
106 West 500 South, Suite 101
Bountiful, Utah 84010

Dear Jack:

Thank you for your letter of June 11, 1984 enclosing a copy of the proposed report on the "1984 Review of Water Quality Standards for Salinity Colorado River System" prepared by the Colorado River Basin Salinity Control Forum pursuant to P.L. 92-500.

We note in the 1984 review that the Forum finds no reason to recommend changes in the numeric salinity criteria at the three lower main stem stations and that there is no reason to believe that the numeric criteria will be exceeded during the next 3-year review period.

I appreciate the good work of the Forum and commend you on the excellent report.

Sincerely yours,

J.F. Friedkin
Commissioner

MODIFICATIONS

On the basis of statements made at the regional public meetings held in Rock Springs, Wyoming, on June 25, 1984, and Las Vegas, Nevada, on June 27, 1984, and on written comments dated June 30, 1984 or before; and to correct minor errors, the following modifications to the "1984 Review - Water Quality Standards for Salinity, Colorado River System" were approved by the Colorado River Basin Salinity Control Forum on July 25, 1984.

Page 14, Figure 2: Bottom scale on graph should read "Calendar Year" rather than "Fiscal Year".

Page 27, 2nd paragraph under Temporary Increases: The sentence should read: "The salinity control plan is designed to keep any temporary increases above the numeric criteria to a minimum as well as reduce the duration of such temporary increases".

Attached are: 1) "Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program", 1977 and; 2) Policy for Use of Brackish and/or Saline Waters for Industrial Purposes", 1980.

Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program

Prepared by

The Colorado River Basin Salinity Control Forum

February 28, 1977

In November 1976, the United States Environmental Protection Agency Regional Administrators notified each of the seven Colorado River Basin states of the approval of the water quality standards for salinity for the Colorado River System as contained in the document entitled "Proposed Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System, June 1975," and the supplement dated August 25, 1975. The salinity standards including numeric criteria and a plan of implementation provide for a flow weighted average annual numeric criteria for three stations in the lower main stem of the Colorado River: below Hoover Dam, below Parker Dam, and at Imperial Dam.

The Plan of Implementation is comprised of a number of Federal and non-Federal projects and measures to maintain the flow-weighted average annual salinity in the Lower Colorado River at or below numeric criteria at the three stations as the Upper and Lower Basin states continue to develop their compact-apportioned waters. One of the components of the Plan consists of the placing of effluent limitations, through the National Pollutant Discharge Elimination System (NPDES) permit program, on industrial and municipal discharges.

The purpose of this policy is to provide more detailed guidance in the application of salinity standards developed pursuant to Section 303 and through the NPDES permitting authority in the regulation of municipal and industrial sources. (See Section 402 of the Federal Water Pollution Control Act.) This policy is applicable to discharges that would have an impact, either direct or indirect on the lower main stem of the Colorado River System. The lower main stem is defined as that portion of the main river from Hoover Dam to Imperial Dam.

I. Industrial Sources

The Salinity Standards state that "the objective for discharges shall be a no-salt return policy whenever practicable." This is the policy that shall be followed in issuing NPDES discharge permits for all new industrial sources, and upon the reissuance of permits for all existing industrial sources, except as provided herein. The following addresses those cases where no-discharge of salt may be deemed not to be practicable.

A. New Construction

1. New construction is defined as any facility from which a discharge may occur, the construction of which is commenced after October 18, 1975. (Date of submittal of water quality standards

as required by 40 CFR 120, December 11, 1974.) Appendix A provides guidance on new construction determination.

a. The permitting authority may permit the discharge of salt upon a satisfactory demonstration by the permittee that it is not practicable to prevent the discharge of all salt from proposed new construction.

b. The demonstration by the applicant must include information on the following factors relating to the potential discharge:

   (1) Description of the proposed new construction.

   (2) Description of the quantity and salinity of the water supply.

   (3) Description of water rights, including diversions and consumptive use quantities.

   (4) Alternative plans that could reduce or eliminate salt discharge. Alternative plans shall include:

      (a) Description of alternative water supplies, including provisions for water reuse, if any.

      (b) Description of quantity and quality of proposed discharge.

(c) Description of how salts removed from discharges shall be disposed of to prevent such salts from entering surface waters or ground water aquifers.

(d) Costs of alternative plans in dollars per ton of salt removed.

(5) Of the alternatives, a statement as to the one plan for reduction of salt discharge that the applicant recommends be adopted.

(6) Such other information pertinent to demonstration of non-practicability as the permitting authority may deem necessary.

c. In determining what permit conditions shall be required, the permit issuing authority shall consider, but not be limited to the following:

(1) The practicability of achieving no discharge of salt.

(2) Where no discharge is determined not to be practicable:

(a) The impact of the total proposed salt discharge of each alternative on the lower main stem in terms of both tons per year and concentration.

(b) Costs per ton of salt removed from the discharge for each plan alternative.

(c) Capability of minimizing salinity discharge.

(3) With regard to both points, one and two above, the compatibility of state water laws with either the complete elimination of a salt discharge or any plan for minimizing a salt discharge.

(4) The no-salt discharge requirement may be waived in those cases where the salt load reaching the main stem of the Colorado River is less than one ton per day or 350 tons per year, whichever is less. Evaluation will be made on a case-by-case basis.

B. Existing Facilities

1. The permitting authority may permit the discharge of salt upon a satisfactory demonstration by the permittee that it is not practicable to prevent the discharge of all salt from an existing facility.

2. The demonstration by the applicant must include information, in addition to that required under Section I, A, 1, b; the following factors relating to the potential discharge:

(a) Existing tonnage of salt discharged and volume of effluent.

(b) Cost of modifying existing industrial plant to provide for no salt discharge.

(c) Cost of salt minimization.

3. In determining what permit conditions shall be required, the permit issuing authority shall consider the items presented under I, a, 1, c (2), and in addition; the annual costs of plant modification in terms of dollars per ton of salt removed for:

   a) No salt return.

   b) Minimizing salt return.

4. The no-salt discharge requirement may be waived in those cases where the salt load reaching the main stem of the Colorado River is less than one ton per day or 350 tons per year, whichever is less. Evaluation will be made on a case-by-case basis.

II. Municipal Discharges

The basic policy is that a reasonable increase in salinity shall be established for municipal discharges to any portion of the Colorado River stream system that has an impact on the lower main stem. The incremental increase in salinity shall be 400 mg/l or less, which is considered to be a reasonable incremental increase above the flow weighted average salinity of the intake water supply.

A. The permitting authority may permit a discharge in excess of the 400 mg/l incremental increase at the time of issuance or reissuance of a NPDES discharge permit, upon satisfactory demonstration by the permittee that it is not practicable to attain the 400 mg/l limit.

B. Demonstration by the applicant must include information on the following factors relating to the potential discharge:

1. Description of the municipal entity and facilities.
2. Description of the quantity and salinity of intake water sources.
3. Description of significant salt sources of the municipal wastewater collection system, and identification of entities responsible for each source, if available.
4. Description of water rights, including diversions and consumptive use quantities.
5. Description of the wastewater discharge, covering location, receiving waters, quantity, salt load, and salinity.
6. Alternative plans for minimizing salt contribution from the municipal discharge. Alternative plans should include:

(a) Description of system salt sources and alternative means of control.

(b) Cost of alternative plans in dollars per ton, of salt removed from discharge.

7. Such other information pertinent to demonstration of non-practicability as the permitting authority may deem necessary.

C. In determining what permit conditions shall be required, the permit issuing authority shall consider the following criteria including, but not limited to:

1. The practicability of achieving the 400 mg/l incremental increase.

2. Where the 400 mg/l incremental increase is not determined to be practicable:

(a) The impact of the proposed salt input of each alternative on the lower main stem in terms of tons per year and concentration.

(b) Costs per ton of salt removed from discharge of each alternative plan.

(c) Capability of minimizing the salt discharge.

D. If, in the opinion of the permitting authority, the data base for the municipal waste discharger is inadequate, the permit will contain the requirement that the municipal waste discharger monitor the water supply and the wastewater dischahrge for salinity.

Such monitoring program shall be completed within 2 years and the discharger shall then present the information as specified above.

E. Requirements for establishing incremental increases may be waived in those cases where the incremental salt load reaching the main stem of the Colorado River is less than one ton per day or 350 tons per year, whichever is less. Evaluation ill be made on a case-by-case basis.

F. All new and reissued NPDES permits for all municipalities shall require monitoring of the salinity of the intake water supply and the wastewater treatment plant effluent in accordance with the following guidelines:

Treatment Plant Design Capacity	Monitoring Frequency	Type of Sample
<1.0 MGD	Quarterly	Discrete
1.0 - 5.0 MGD	Monthly	Composite
>5.0 - 50.0 MGD	Weekly	Composite
50.0 MGD	Daily	Composite

1. Analysis for salinity may be either as total dissolved solids (TDS) or by electrical conductivity where a satisfactory correlation with TDS has been established. The correlation should be based on a minimum of five different samples.

2. Monitoring of the intake water supply may be at a reduced frequency where the salinity of the water supply is relatively uniform.

APPENDIX A

GUIDANCE ON NEW CONSTRUCTION DETERMINATION

For purposes of determining a new construction, a source should be considered new if by October 18, 1975, there has not been:

(1) Significant site preparation work such as major clearing or excavation; and/or

(2) Placement, assembly, or installation of unique facilities or equipment at the premises where such facilities or equipment will be used; and/or

(3) Any contractual obligation to purchase unique facilities or equipment. Facilities and equipment shall include only the major items listed below, provided that the value of such items represents a substantial commitment to construct the facility:

- (a) structures; or
- (b) structural materials; or
- (c) machinery; or
- (d) process equipment; or
- (e) construction equipment.

(4) Contractural obligation with a firm to design, engineer, and erect a completed facility (i.e., a turnkey plant).

Policy for Use of Brackish and/or Saline Waters for Industrial Purposes

by

The Colorado River Basin Salinity Control Forum
September 11, 1980

The States of the Colorado River Basin, the federal Executive Department, and the Congress have all adopted as a policy that the salinity in the lower mainstem of the Colorado River shall be maintained at or below the flow-weighted average values found during 1972 while the Basin states continue to develop their compact-apportioned waters. In order to achieve this policy, all steps which are practical and within the framework of the administration of states' water rights must be taken to reduce the salt load of the river. One such step was the adoption in 1975 by the Forum of a policy regarding effluent limitations for industrial discharges with the objective of no-salt return wherever practicable. Another step was the Forum's adoption in 1977 of the "Policy for Implementation of Colorado River Salinity Standards through NPDES Permit Program." These policies are part of the basinwide plan of implementation for salinity control which has been adopted by the seven Basin states.

The Forum finds that the objective of maintaining 1972 salinity levels would be served by the exercise of all feasible measures including, wherever practicable, the use of brackish and/or saline waters for industrial purposes.

The summary and on page 32 of the Forum's 1978 Revision of the Water Quality Standards for Salinity states "The plan also contemplates the use of saline water for industrial purposes whenever practicable, ..." In order to implement this concept, and thereby further extend the Forum's basic salinity policies, the Colorado River Basin states support the Water and Power Resources Service appraisal study of saline water collection, pretreatment and potential industrial use.

The Colorado River Basin contains large energy resources, which are in the early stages of development. The WPRS study should investigate the technical and financial feasibility of serving as significant portion of the water requirements of the energy industry and any other industries by the use of Basin brackish and/or saline waters. The Forum recommends that:

1) The Colorado River Basin states, working with federal agencies, identify, locate and quantify such brackish and/or saline water sources.

2) Information on the availability of these waters be made available to all potential users.

3) Each state encourage and promote the use of such brackish and/or saline waters, except where it would not be environmentally sound or economically feasible or would significantly increase consumptive use of Colorado River System water in that State above that which would otherwise occur.

4) The U.S. Water and Power Resources Service with the assistance of the States encourage and promote the use of brackish return flows from federal irrigation projects in lieu of fresh water sources except where it would not be environmentally sound or economically feasible or would significantly increase consumptive use of Colorado River System water.

5) The U.S. Water and Power Resources Service consider a federal contribution to the cost of industrial use of brackish and/or saline water where cost effective as a joint private-government salinity control measure. Such activities shall not delay the implementation of the salinity control projects identified in Title II of P.L. 93-320.