2014 Review

Water Quality Standards for Salinity
Colorado River System

October 2014

Colorado River Basin Salinity Control Forum

2014 Review

WATER QUALITY STANDARDS FOR SALINITY
COLORADO RIVER SYSTEM

October 2014

Prepared by

Colorado River Basin Salinity Control Forum

COLORADO RIVER BASIN SALINITY CONTROL FORUM

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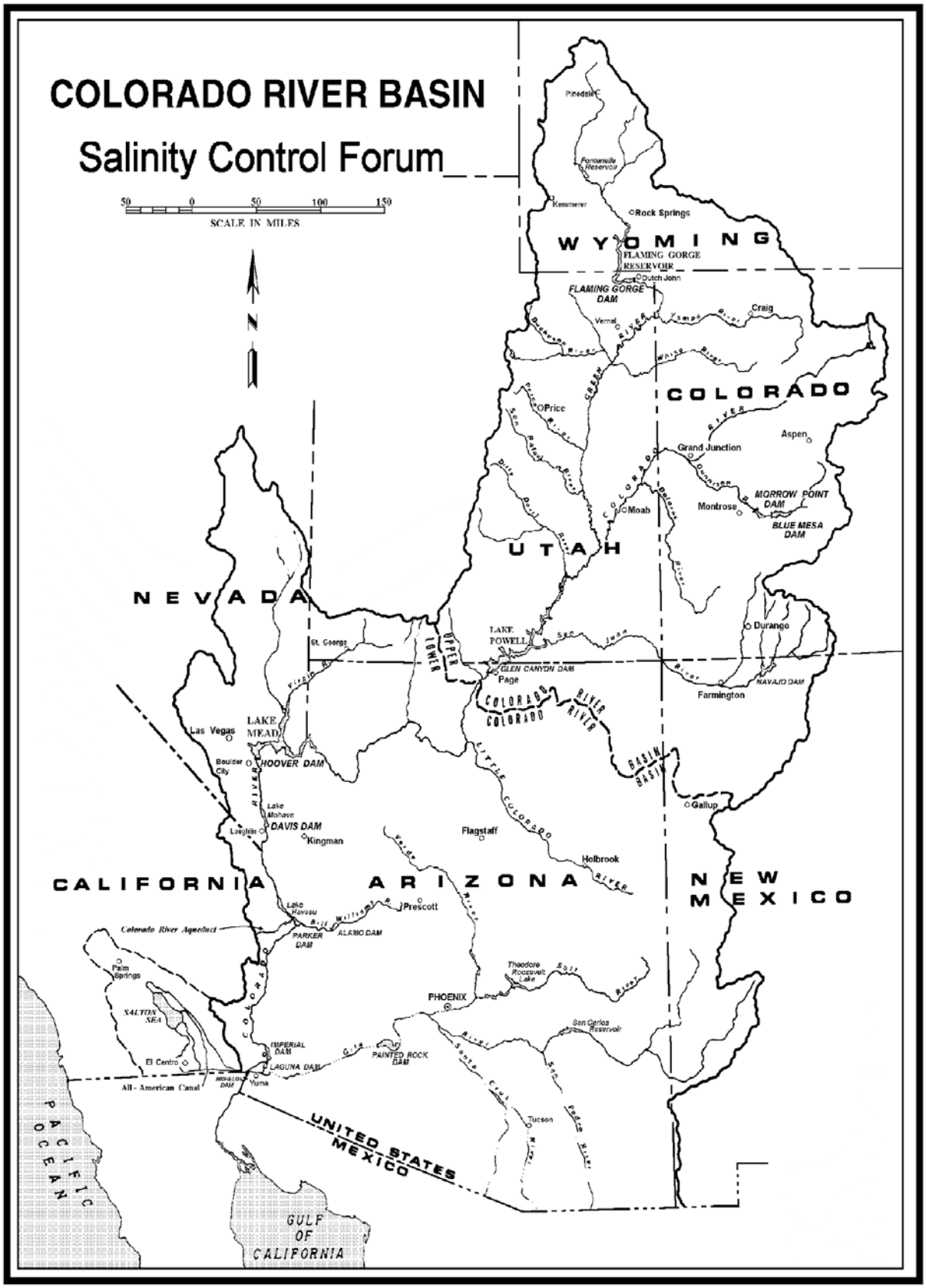
COLORADO RIVER BASIN
Salinity Control Forum
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SCALE IN MILES
N
WYOMING
COLORADO
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NEVADA
CALIFORNIA
ARIZONA
NEW MEXICO
Pinedale
Fontenelle Reservoir
Kemmerer
Rock Springs
FLAMING GORGE RESERVOIR
Dutch John
FLAMING GORGE DAM
Vernal
Craig
Duchesne River
Yampa River
White River
GREEN RIVER
Price
San Rafael River
Aspen
Grand Junction
Gunnison River
COLORADO RIVER
Dolores River
Moab
Montrose
MORROW POINT DAM
BLUE MESA DAM
Durango
LAKE POWELL
San Juan River
GLEN CANYON DAM
Page
Farmington
NAVAJO DAM
St. George
Virgin R.
UPPER
LOWER
LAKE MEAD
Las Vegas
Boulder City
HOOVER DAM
COLORADO RIVER
BASIN
Gallup
Lake Mohave
Laughlin
DAVIS DAM
Kingman
Flagstaff
LITTLE COLORADO RIVER
Holbrook
Lake Havasu
Prescott
Bill Williams R.
Colorado River Aqueduct
PARKER DAM
ALAMO DAM
Palm Springs
Theodore Roosevelt Lake
Salt River
PHOENIX
SALTON SEA
San Carlos Reservoir
IMPERIAL DAM
El Centro
LAGUNA DAM
Gila River
PAINTED ROCK DAM
Santa Cruz River
San Pedro River
All-American Canal
MORELOS DAM
Yuma
Tucson
UNITED STATES
MEXICO
PACIFIC OCEAN
GULF OF CALIFORNIA

TRANSMITTAL LETTERS

The Federal Water Pollution Control Act requires that at least once every three years the Basin States review water quality standards relating to the salinity of the waters of the Colorado River. The states collectively initiated this review under the auspices of the Forum, prepared a proposed Review and, after holding public meetings, prepared this final Review.

Upon the Forum's adoption of the final Review, it is transmitted by letter to the governors of the individual states for their independent action. The following governors in each of the seven Basin States shall receive this Review:

Honorable Janice K. Brewer
Governor of Arizona
State Capitol
Phoenix, AZ 85007

Honorable Susana Martinez
Governor of New Mexico
State Capitol
Santa Fe, NM 87503

Honorable Jerry Brown
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Honorable John W. Hickenlooper
Governor of Colorado
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Denver, CO 80203

Honorable Matthew H. Mead
Governor of Wyoming
State Capitol
Cheyenne, WY 82002

Honorable Brian Sandoval
Governor of Nevada
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Carson City, NV 89701

SUMMARY

This Review is a review of the water quality standards for salinity for the Colorado River. Section 303 of the Clean Water Act amendments to the Federal Water Pollution Control Act require that water quality standards be reviewed from time to time, but at least once during each three-year period. Accordingly, the seven-state Colorado River Basin Salinity Control Forum has reviewed the existing state-adopted and EPA approved water quality standards for salinity consisting of numeric criteria and a Plan of Implementation. Upon adoption by the Forum, this Review will be submitted to each of the Basin States for inclusion in their water quality standards.

The Forum recommends no change in the numeric salinity criteria at the three stations located on the lower main stem of the Colorado River. The numeric criteria at these stations will remain:

Station	Salinity in mg/L[1]
Below Hoover Dam	723
Below Parker Dam	747
At Imperial Dam	879

The Plan of Implementation is intended to maintain the salinity concentrations at or below the numeric criteria while the Basin States continue to develop their compact-apportioned waters. The U.S. Bureau of Reclamation's (Reclamation) computer model runs indicate there is little probability of the numeric criteria being exceeded in the next three years. The Colorado River Basin Salinity Control Act requires the implementation of salinity control programs to reduce the salinity of the Colorado River. Reducing the salinity of the Colorado River water reduces economic damages to its users. While the Plan of Implementation included in this Review ensures the numeric criteria will not be exceeded during the review period, the Forum is also evaluating the opportunity for additional salinity control to further reduce economic damages in the Lower Basin, as well as to provide additional benefits in the Upper Basin.

The Forum's Plan of Implementation includes:

1. Construction of salinity control measures by Reclamation, USDA, the Basin States Program and BLM to the extent that those measures remain viable and appropriately cost-effective.

2. Application of the Forum-adopted policies by each of the states (the text of the policies are included in Appendix B of this Review).

3. Implementation of non-point source management plans developed by the states and approved by EPA.

[1] Flow-weighted average annual salinity

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APPENDICES

LIST OF ABBREVIATIONS

208 Plan	Section 208 of the Clean Water Act amendments of 1972 and 1977 requiring integrated area-wide plans and programs for dealing with water pollution problems
Act	The Colorado River Basin Salinity Control Act (P.L. 93-320) (1974), as amended by P.L. 98-569 (1984), P.L. 104-20 (1995), P.L. 104-127 (1996), P.L. 106-459 (2000), P.L. 107-171 (2002) and P.L. 110-246 (2008)
Basin	Colorado River Basin
Basin Funds	Lower Colorado River Basin Development Fund and Upper Colorado River Basin Fund
Basin States	Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming
BSP	Basin States Program
Basinwide Program	Basinwide Salinity Control Program
BLM	United States Bureau of Land Management
Clean Water Act	P.L. 92-500
Congress	United States Congress
CRSS	Colorado River Simulation System
EQIP	Environmental Quality Incentives Program
EPA	United States Environmental Protection Agency
Forum	Colorado River Basin Salinity Control Forum
maf	million acre-feet
mgd	million gallons per day
mg/L	milligrams per liter
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
Program	Colorado River Basin Salinity Control Program
Reclamation	United States Bureau of Reclamation
Review	2014 Review, *Water Quality Standards for Salinity, Colorado River System*
TDS	Total dissolved solids
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture

PURPOSE OF THE REVIEW

This 2014 Review, *Water Quality Standards for Salinity, Colorado River System*, (Review) is prepared and submitted in response to Section 303(c) of Public Law (P.L.) 92-500 (Clean Water Act) by the seven-state Colorado River Basin Salinity Control Forum (Forum) on behalf of the governors of their respective states. This review of the water quality standards includes the numeric criteria and the Plan of Implementation developed and adopted by the Forum. This is the thirteenth review conducted by the Forum. 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 Review is consistent with the United States Environmental Protection Agency (EPA) approved 1975 standards and deals only with that portion of the Colorado River Basin (Basin) above Imperial Dam. This Review focuses on the 2014 to 2017 period (review period) and evaluates the appropriateness of the standards. Background information and activities regarding historical actions relative to the development and adoption of salinity standards are contained in the Forum report, *Water Quality Standards for Salinity, Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System*, Colorado River Basin Salinity Control Forum, June 1975.

Below Imperial Dam, salinity is controlled as a federal responsibility to meet the terms of the agreement with Mexico contained within Minute No. 242 of the International Boundary and Water Commission entitled "Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River." Minute No. 242 requires that measures be taken to assure that Colorado River water delivered to Mexico upstream from Morelos Dam will have an average annual salinity concentration of no more than 115 ± 30 parts per million total dissolved solids (TDS) higher than the average annual flow-weighted salinity concentration of the Colorado River water arriving at Imperial Dam.

Nothing in this Review shall be construed to alter, amend, repeal, 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 Colorado River Storage Project Act (70 Stat. 105), the Upper Colorado River Basin Compact, or the Treaty with the United Mexican States (Treaty Series 994).

HISTORY AND BACKGROUND

The Colorado River Basin Salinity Control Program (Program) is a unique cooperative watershed effort between several federal agencies and seven states designated to meet national, international and state water quality objectives. The Forum participates with federal, state, local agencies and private participants to ensure the Plan of Implementation is implemented. The Forum also urges Congress to appropriate the funds needed for implementation and recommends legislative changes when necessary.

The Basin is 242,000 square miles[2] (approximately 155 million acres) of the western United States and a small portion of northern Mexico. Currently, about 40 million[3] people in the seven western states of Arizona, California, Nevada (Lower Division States) and Colorado, New Mexico, Utah, and Wyoming (Upper Division States), collectively referred to as the Basin States, rely on the Colorado River and its tributaries to provide some, if not all, of their municipal water needs. Additionally, water from the Colorado River system is utilized to irrigate nearly 5.5 million acres of land[4] in the Basin, producing some 15 percent of the nation's crops and about 13 percent of its livestock, which combined generate many billions of dollars a year in agricultural benefits.

The Colorado River is also the lifeblood for at least twenty-two federally recognized Native American Indian tribes, seven National Wildlife Refuges, four National Recreation Areas, and eleven National Park units. Hydropower facilities along the Colorado River supply more than 4,200 megawatts of electrical capacity to help meet the power needs of the West and reduce the use of fossil fuels. Finally, the Colorado River is vital to Mexico, supporting a thriving agricultural industry in the San Luis and Mexicali Valleys and providing municipal water supplies for communities in the Mexican States of Sonora and Baja California.

The Colorado River system is operated in accordance with the Law of the River[5]. Currently, apportioned water in the Basin exceeds the approximate 100-year record (1906 through 2011) Basin-wide average long-term historical natural flow[6] of about 16.4 million acre-feet (maf). However, the Upper Basin States have not fully developed use of their 7.5 maf apportionment, and total consumptive use and losses in the Basin has averaged approximately 15.3 maf[7] over the last ten years.

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[2] Colorado River System, Consumptive Uses and Losses Report, 1996-2000, Bureau of Reclamation.

[3] About 40 million people are estimated to be within the hydrologic boundaries of the Basin in the United States, as well as in the adjacent areas of the Basin States that receive Colorado River water, by 2015. See Colorado River Basin Water Supply and Demand Study - Technical Report C, U.S. Bureau of Reclamation, 2012.

[4] It is estimated that there will be 5.5 million irrigated acres in the hydrologic boundaries of the Basin in the United States, as well as in the adjacent areas of the Basin States that receive Colorado River water, by 2015. See Colorado River Basin Water Supply and Demand Study - Technical Report C, U.S. Bureau of Reclamation, 2012.

[5] The treaties, compacts, decrees, statutes, regulations, contracts and other legal documents and agreements applicable to the allocation, appropriation, development, exportation and management of the waters of the Colorado River Basin are often collectively referred to as the "Law of the River."

[6] Natural flow represents the flow that would have occurred at the location had depletions and reservoir regulation not been present upstream of that location.

[7] Basin-wide consumptive use and losses estimated over the period 2002-2011, including the 1944 Treaty delivery to Mexico, reservoir evaporation, and other losses due to native vegetation and operational inefficiencies.

Salinity-caused impacts have long been a major concern in the United States and Mexico. The salinity in the river increases as it flows downstream. The Colorado River has carried an average salt load of approximately 9 million tons annually past Hoover Dam, the uppermost location at which numeric criteria have been established.

The salts in the Colorado River system are naturally occurring and pervasive. Many of the saline sediments of the Basin were deposited in prehistoric marine environments. Salts contained within the sedimentary rocks are easily eroded, dissolved, and transported into the river system.

In a 1971 study[8], EPA analyzed salt loading in the Basin and divided it into two categories, naturally occurring and human-caused. EPA concluded that about half (47 percent) of the salinity concentration measured in water arriving at Hoover Dam is from natural causes, including salt contributions from saline springs, groundwater discharge into the river system (excluding irrigation return flows), erosion and dissolution of sediments, and the concentrating effects of evaporation and transpiration. The natural cause category also included salt contributions from non-point (excluding irrigated agriculture) or unidentified sources or from the vast, sparsely populated regions of the drainage, much of which are administered by the United States Bureau of Land Management (BLM) or other governmental agencies. Of the land within the Basin, about 75 percent is owned and administered by the federal government or held in trust for Indian tribes. The greatest portion of the naturally occurring salt load originates on these federally owned and administered lands.

Human activities can influence the rate of natural salt movement from rock formations and soils to the river system and include livestock grazing, wildlife management, logging, mining, oil exploration, road building, recreation and urbanization. Approximately 53 percent of the salinity concentration in the water arriving at Hoover Dam, as identified by EPA, results from various human activities. EPA estimated that out-of-Basin exports account for about 3 percent of the salt concentration at Hoover Dam, with irrigation accounting for 37 percent, reservoir evaporation and phreatophyte use accounting for about 12 percent, and about 1 percent attributed to municipal and industrial uses. Much of the salt load contribution from irrigated agriculture is from federally developed irrigation projects.

In 1972, the federal government enacted the Clean Water Act that mandated efforts to develop and maintain water quality standards in the United States. At the same time, Mexico and the United States were discussing the increasing salinity of the Colorado River water being delivered to Mexico. The Basin States established the Forum in 1973. The Forum is composed of representatives from each of the seven Basin States appointed by the governors of the respective states. The Forum was created for interstate cooperation and to provide the states with the information necessary to comply with Section 303(a) and (b) of the Clean Water Act.

EPA promulgated a regulation in December 1974 which set forth a basinwide salinity control policy for the Basin. The regulation specifically stated that salinity control was to be implemented while the Basin States continue to develop their compact-apportioned water. This regulation also established a standards procedure and required the Basin States to adopt and submit for approval to EPA water quality standards for salinity, including numeric criteria and a Plan of Implementation, consistent with the policy stated in the regulation. In compliance with

[8] The Mineral Quality Problem in the Colorado River, Summary Report, Environmental Protection Agency, Regions VIII and IX, 65pp., 1971

the regulation, the Forum selected three numeric criteria stations on the main stem of the lower Colorado River as being appropriate points to measure the salinity concentrations of the river. These stations are located at the following points: 1) below Hoover Dam, 2) below Parker Dam, and 3) at Imperial Dam. The Forum also adopted a water quality standard for the Colorado River Basin including both a Plan of Implementation and numeric criteria.

With the Plan of Implementation as proposed in this Review in place, the probability of exceeding the numeric criteria during the review period is very low based on Reclamation computer model simulations. The analysis indicates the probability of exceedance of the numeric criteria with the Plan of Implementation in place in each of the next three years at the Hoover Dam, Parker Dam and Imperial Dam stations is 4 percent or less. This low probability of exceedance was an important factor in the Forum's decision to adopt the Plan of Implementation accompanying this Review.

The Colorado River Basin Salinity Control Act (P.L. 93-320) (1974) (Act), established the Colorado River Basin Salinity Control Program under Title II to address the concerns raised by EPA. P.L. 93-320 has been amended several times since its original enactment. P.L. 98-569 (1984) authorized the United States Department of Agriculture's (USDA) on-farm program. P.L. 104-20 (1995) created the United States Bureau of Reclamation's (Reclamation) Basinwide Salinity Control Program (Basinwide Program). The Federal Agriculture Improvement and Reform Act (P.L. 104-127) (1996) (1996 Farm Bill) authorized up-front cost sharing by the Basin States and modified the USDA authorities, including the use of the Environmental Quality Incentives Program (EQIP). P.L. 106-459 (2000) increased the appropriation ceiling. The Food, Conservation, and Energy Act of 2008 (P.L. 110-246) (2008 Farm Bill) created the Basin States Program (BSP). The Agricultural Act of 2014 (P.L. 113-79) (2014) continued the authorization of EQIP.

UNDERSTANDING THE SALINITY OF THE COLORADO RIVER

As with most large rivers, the natural flow of the Colorado River increases from its headwaters to its terminus. Today, however, the flow of the Colorado River decreases below Hoover Dam due to diversions. Imperial Dam is the last major diversion point for uses in the United States. In normal years, only 1.5 maf is scheduled to pass Imperial Dam for deliveries to Mexico.

In general, the salinity concentration of the water in the Colorado River increases from the headwaters to the terminus. Much of the salt is picked up in the Upper Basin, and some of the tributary streams average higher concentrations of salt than the mainstem.

Reclamation has developed a map of the Basin reflecting the relative flows and the corresponding salinity concentrations of the water across the Basin in the calendar year 2011. This map is provided for general illustrative purposes as Figure 1. The average flow of the Colorado River and its important tributaries are indicated by the width of the line, and the salinity concentrations are illustrated by colors coded to ranges in TDS.

Without the Salinity Control Program there would be more yellows and oranges on this map. Nature also has a major impact on the salinity concentrations of the river and its tributaries. In dry years there will be more yellows and oranges on this map. The 2011 version of this map shows much of the river in green and blue colors. This is because 2011 was a very wet year, with the flows of many of the tributary streams well above normal. The inflow to Lake Powell in this year was 15.5 maf which is 145 percent of normal.

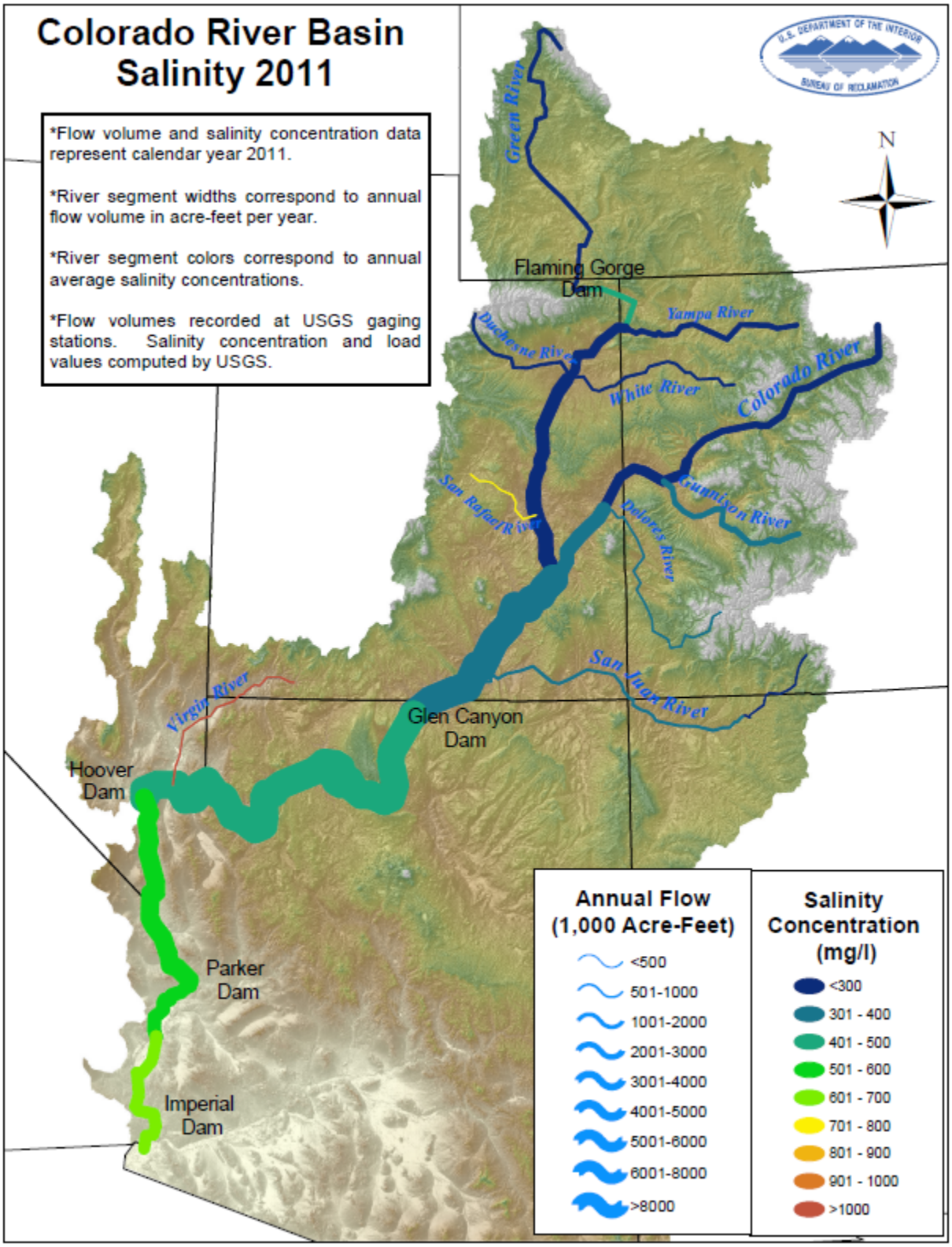

Figure 1 – 2011 (Calendar Year) Generalized Flow and Salinity Concentrations Across the Colorado River Basin

In general, over the last thirty years the salinity concentrations have decreased at all three of the numeric criteria stations (see Figure 2). The values for the Observed Flow-Weighted Average Salinity at the Numeric Criteria Stations are provided in Appendix A. In this Review, the terms "salinity," "TDS" and "concentration" in mg/L are used interchangeably.

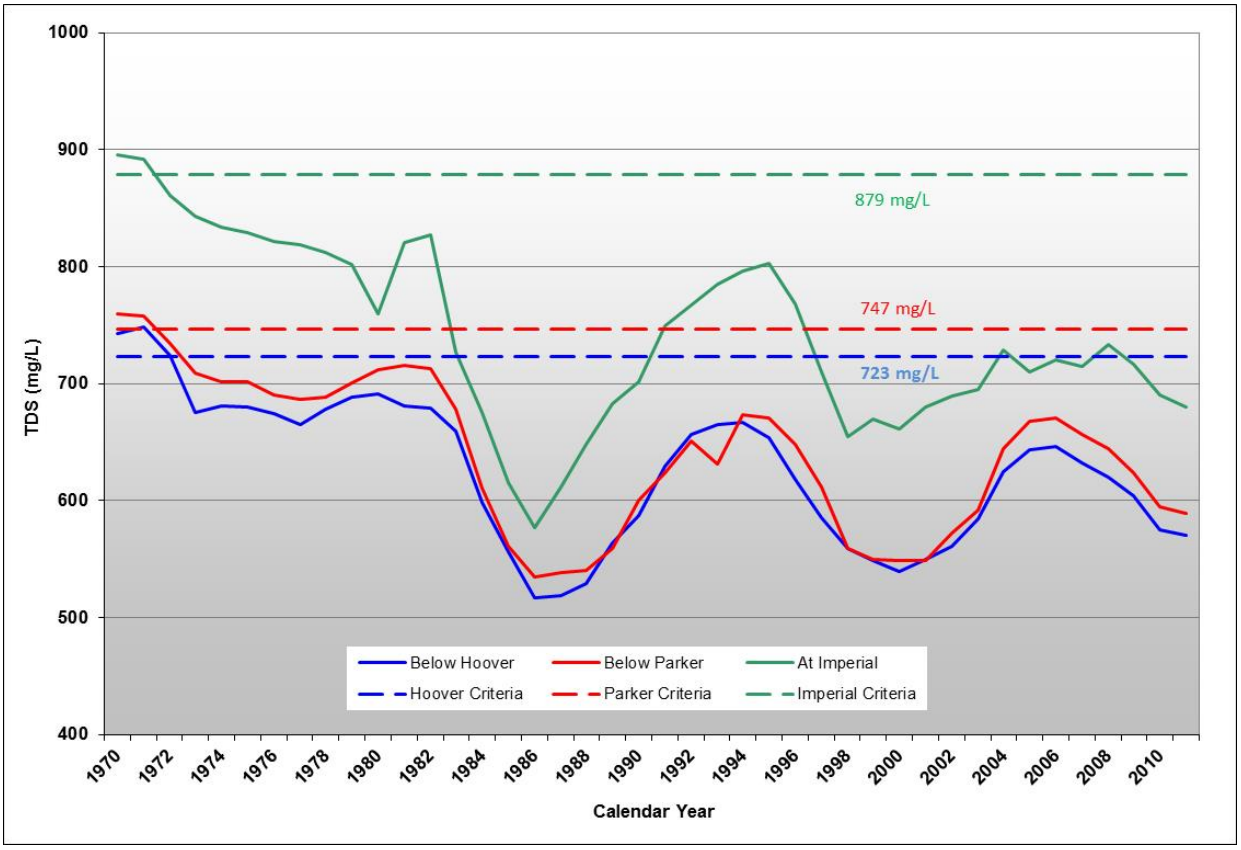

Figure 2 – Flow Weighted Average Annual Salt Concentrations at Numeric Criteria Stations

PROVISION FOR REVIEWING AND REVISING THE STANDARD

The Colorado River water quality standards for salinity and the approach taken by the Basin States in complying with the standards are unique. The salinity concentrations that are projected in the future have not been shown to have adverse effects on human health or wildlife. Thus, the Program is different from most other water quality standard compliance programs. The standards adopted by the Forum and the Basin States and approved by EPA consist of the numeric criteria and the Plan of Implementation. The numeric criteria portion of the water quality standards are established to protect against increases in economic damages to infrastructure and crop production. The Plan of Implementation is designed to maintain the flow-weighted average annual salinity at or below the numeric criteria while the Basin States continue to develop their compact-apportioned water supply through projects and programs to meet water supply needs.

The Program is a basinwide coordinated effort among federal, state and local agencies and participants to control salt loading. 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, stated under Principle 7:

> The Plan of Implementation shall be reviewed and modified as appropriate from time to time, but at least once every three 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.[9]

NUMERIC CRITERIA

EPA promulgated a regulation that set forth a basinwide salinity control policy for the Basin. This policy required that the flow-weighted average annual salinity in the lower main stem of the Colorado River be maintained at or below the 1972 levels. The points in the lower main stem of the Colorado River where the flow-weighted average annual salinity is measured are at the following three stations: 1) below Hoover Dam, 2) below Parker Dam, and 3) at Imperial Dam. The basis for selecting these stations is their proximity to key diversion facilities on the lower Colorado River. Nevada diverts main stem water from Lake Mead for use in the Las Vegas area. The Metropolitan Water District of Southern California and the Central Arizona Project divert water from Lake Havasu, impounded behind Parker Dam, for millions of water users in southern California and central Arizona, respectively. The large agricultural areas in the Imperial and Coachella Valleys in California and the Yuma area in Arizona are served by diversions at Imperial Dam.

The numeric criteria for each of those stations as established in 1972 are as follows:

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

[9] Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System, Colorado River Basin Salinity Control Forum, 1975 Review, p. 133.

While the federal regulations provide for temporary increases above the numeric criteria levels if sufficient control measures are included in the Plan of Implementation, no temporary increases are anticipated during this review period.

The Forum believes the Review is the appropriate setting to recommend any changes to the numeric criteria. The Forum finds the current numeric criteria are adequate for the next three years and recommends no changes at this time. Because of the potential economic benefit to the Basin, the Forum believes there is justification to maintain salinity levels below the numeric criteria and remove additional salt from the Colorado River, thus saving several hundred million dollars in annual damages.

PLAN OF IMPLEMENTATION

General

A purpose of the Plan of Implementation is to offset the salinity effects of future water resource development that will occur in the Basin during the review period.

The Plan of Implementation is designed to keep the flow-weighted average annual salinity concentrations at or below the 1972 numeric criteria levels while the Basin States continue to develop their compact-apportioned water supply. By 2017, the Plan of Implementation would control an additional 67,000 tons of salt per year. Based on this level of control, there is less than a 4 percent probability that the numeric criteria will be exceeded during each year of the review period.

The Plan of Implementation is composed of many actions contemplated by the federal government and many of its agencies, and by each of the seven Basin States and many of their agencies. The plan includes projects that remove the required salt tonnage. This will principally be accomplished by reducing the salt contributions to the Colorado River from existing sources and minimizing future increases in salt load caused by human activities. For this Review, the Plan of Implementation can be briefly summarized as follows:

1. Implementation of salinity control measures by Reclamation, NRCS, the BSP and BLM to the extent that those measures remain viable and appropriately cost effective.

2. Application of the Forum-adopted policies by each of the states. (The texts of the policies are included in Appendix B, and a list of National Pollutant Discharge Elimination System (NPDES) permits issued pursuant to these policies is found in Appendices C and D of this Review.)

3. Implementation of non-point source management plans developed by the states and approved by EPA (see the State Water Quality Management Plans section of this Review).

The Forum participates with federal, state and local agencies and private participants to ensure the Plan of Implementation is implemented. The Forum also urges Congress to appropriate the funds needed for implementation and recommends legislative changes when necessary.

Constructed Measures

Congress enacted Public Law 93-320 in June of 1974 with the Forum's support. Title II of the Public Law created a water quality program for addressing salinity in the Colorado River in the United States above Imperial Dam. Primary responsibility for Title II was given to the Secretary of the Interior, with Reclamation being instructed to investigate and build several salinity control units. The Secretary of Agriculture was also instructed to support the effort within existing authorities.

Public Law 93-320 has been amended several times. The amendments directed the Secretary of the Interior and the Secretary of Agriculture to give preference to the salinity control units with the least cost per unit of salinity reduction. The amendments established a BLM program, a voluntary on-farm salinity control program to be implemented by USDA, including the voluntary replacement of incidental fish and wildlife values foregone on account of the on-farm measures, and the Basin States Program. Through implementation of these programs, many cost-effective salt-load reducing activities have been accomplished.

USDOI-Reclamation

The Act was amended by P.L. 104-20 to authorize the Basinwide Program. The Basinwide Program uses a competitive process that has greatly increased the federal cost effectiveness of salinity control. Reclamation may implement a variety of effective salinity control measures, but most projects concentrate on improving the efficiency of off-farm irrigation delivery systems. Reclamation solicits applications through a Funding Opportunity Announcement (FOA) for projects that will reduce the salinity of the Colorado River. Reclamation evaluates and ranks each application and awards grants to the highest ranking applications. Cost effectiveness is the prime criteria in the evaluation. The timing of the FOA is based on the need for more salinity control projects, and it relates to the amount of federal appropriation Reclamation receives to implement its portion of the Program. P.L. 104-20 and P.L. 106-459 increased the authorization ceiling for Reclamation’s salinity control program.

USDA-NRCS

The NRCS program generally concentrates on improving on-farm systems. NRCS salinity activities fall mainly under the authorities of EQIP. EQIP for Colorado River salinity control was authorized and initially funded under the 1996 Farm Bill and recently reauthorized by the 2014 Farm Bill. NRCS accepts applications under EQIP and evaluates, ranks and selects those applications that best meet the goals of the salinity control program. Based on the applications, NRCS provides technical and financial assistance to the producers. NRCS also offers financial assistance for voluntary replacement of fish and wildlife values forgone.

USDOI - BLM

The goal of the BLM program is to reduce the mobilization of salts to the Colorado River from BLM administered public lands. Salt reduction is achieved by controlling both point and non-point sources of salt contributions; however, the majority of salt derived from public lands is of non-point-source origin. Salt loading from non-point sources is mainly reduced by minimizing soil erosion. BLM uses mainly appropriated funds to achieve salinity control goals through managing land use practices.

Basin States Program

Public Law 110-246 amended the Act and created the BSP through which moneys from the Lower Colorado River Basin Development Fund and the Upper Colorado River Basin Fund (Basin Funds) used for cost sharing in Reclamation and NRCS salinity control programs are administered by Reclamation in consultation with the Colorado River Basin Salinity Control Advisory Council. The Act requires cost share on federal appropriations expended by both Reclamation and NRCS for salinity control in the Basin. The moneys for the Basin Funds come from levies assessed on users of power generated within the Basin. The required cost share on the original salinity control units of Paradox, Grand Valley, and Las Vegas Wash is 25 percent of the project cost. The required cost share on the original units of McElmo Creek and Lower Gunnison, the Basinwide Program, and the NRCS EQIP is 30 percent of the project costs.

For cost-share dollars generated by the federal expenditures under the Basinwide Program, Reclamation expends the required cost-share moneys, together with appropriated funds in the Basinwide Program, using the FOA process. BSP moneys generated by federal appropriations expended in EQIP are managed by Reclamation to administer the BSP and to enter into the following agreements: 1) NRCS for technical assistance, 2) other federal agencies for studies and research, 3) the states of Colorado, Utah and Wyoming to fund approved salinity control activities and projects, and 4) other entities for approved salinity control activities and salinity control projects. BSP moneys received by the states allow the states to enter into contracts with other local entities to achieve salinity control. Each of the state agencies has the same goal of providing salinity control in the most cost-effective manner. The cost-share aspects of the Basin States Program have proven very useful as a means of achieving additional cost effective salinity control.

Accomplishments and Future Control

The Plan of Implementation recognizes that the Forum, participating federal agencies and the Basin States each have specific responsibilities for furthering the Program. The Forum, in conjunction with the Colorado River Basin Salinity Control Advisory Council, will continue to provide overall coordination and a continuing review of salinity changes, program effectiveness, and the need to make further program changes and improvements.

To date, it is estimated that the Program has reduced the salt loading in the Colorado River by approximately 1,326,000 tons per year. Table 1 gives a brief summary of the measures that have been implemented to date, the areas where those measures have occurred and the tons of salt controlled per year associated with each area.

Table 1
Measures in Place through 2014

	Tons/Year		Tons/Year
Agricultural Measures	**1,038,000**	**Other Measures**	**288,000**
Big Sandy	72,000	Paradox Valley Unit	101,000
Grand Valley	276,000	Meeker Dome	48,000
Green River	1,000	Las Vegas Wash	4,000
Henrys Fork	0	Ashley Valley WWTP	9,000
Lower Gunnison	208,000	Nonpoint Sources	111,000
Mancos	5,000	Well-Plugging	15,000
Manila	21,000		
McElmo	53,000		
Muddy Creek	1,000		
Price-San Rafael	153,000		
Silt	2,000		
Uinta	188,000		
Non-project areas	58,000		
TOTAL			**1,326,000**

Note: 2014 values are estimated based on current appropriations

The Plan of Implementation included in this Review anticipates the continuation of the Program through the period of the Review. As shown in Table 2, it is anticipated that an additional 67,000 tons per year will be removed by the Plan of Implementation, resulting in a total of 1,393,000 tons per year reduction by 2017.

Table 2
Tons Removed by Current Plan of Implementation

Funding Source		**Tons/Year**
RECLAMATION (Basinwide Program)		13,000
USDA NRCS (EQIP)		34,000
BLM*		
BASIN STATES PROGRAM (Cost Share)		20,000
Basinwide Program	5,000	
EQIP Related	15,000	
TOTAL		**67,000**

*BLM salinity reduction values are being recalculated pursuant to a review of BLM programs and efforts.

This Plan of Implementation mainly focuses on the improvement of agricultural practices in the Upper Colorado River Basin. These improvements include both on-farm and off-farm activities. The majority of the salt reduction will occur in historically established salinity project areas, but some will occur in areas that are outside those historic areas. Table 3 provides the areas and an estimate of the potential salt reductions for both on-farm and off-farm that could occur in those areas.

Table 3
Potential Salinity Control

	Tons/Year	Tons/Year
Project Areas	**1,066,000**	
Big Sandy	35,000	
Grand Valley	209,000	
Green River	13,000	
Henrys Fork	6,000	
Lower Gunnison	544,000	
Mancos	19,000	
Manila	13,000	
McElmo	35,000	
Muddy Creek	12,000	
Price-San Rafael	63,000	
Silt	19,000	
Uinta	98,000	
Non-project Areas		14,000
Saline Groundwater Sources		150,000
Nonpoint Sources*		
TOTAL		**1,230,000**

*BLM is reviewing nonpoint source control potential.

The potential additional controllable salt remaining in all of the identified areas is estimated to be 1,230,000 tons per year, and thus the potential available tons exceed the 67,000 tons of additional annual salinity control identified by Plan of Implementation.

Forum Policies and NPDES Permits

An important component of the Plan of Implementation for salinity control is the Basin States' activities associated with the control of salt discharge to the Colorado River through Forum policies and NPDES permits. In 1977, the Forum adopted the Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program. This policy provides guidance for the regulation of municipal and industrial point source discharges of saline water. The Forum approved needed changes to its NPDES policy on October 30, 2002. In 1980, the Forum adopted a policy to encourage the use of brackish and/or saline waters for industrial purposes where it is environmentally sound and economically feasible. A third policy dealing with intercepted groundwater was adopted by the Forum in 1982. In 1988, the Forum adopted a fourth policy which addresses the salinity of water discharges from fish hatcheries. These policies are found in Appendix B of this report.

Each of the states has adopted the Forum policies presented in Appendix B. A listing of NPDES permits in force within the Basin is presented in Appendix C. Some NPDES permits are issued by EPA for federal facilities and on Indian reservations. NPDES permits are issued by EPA for New Mexico. Salinity discharge requirements for these permits are reviewed and added where needed during the permit re-issuance process. The Forum policies also apply to these EPA

permits and hence, this EPA effort is a part of the Plan of Implementation. The permits issued by EPA can be found in Appendix D of this report. During the period of this Review, the status of implementation of NPDES permits and water quality management plans in each of the states is as follows:

State Water Quality Management Plans

ARIZONA

Scope

The Colorado River enters Arizona and the Lower Basin near Page and travels through the Grand Canyon before turning southward at Lake Mead (Hoover Dam) and flowing to the Gulf of California. There are four major drainages in Arizona's portion of the Basin: 1) the Little Colorado River; 2) the Virgin River; 3) the Bill Williams River, formed by the Big Sandy and the Santa Maria Rivers at Alamo Lake, which empties into the Colorado River above Parker Dam; and 4) the Gila River, which joins the Colorado River below Imperial Dam. Because the Gila River is below Imperial Dam, facilities that discharge to the Gila River or its tributaries do not require conformance with the Forum policies.

NPDES Permitting

The Water Quality Division of the Arizona Department of Environmental Quality administers the Arizona Pollutant Discharge Elimination System (AZPDES) program on non-Indian country lands. All permits for municipal and industrial discharges, with direct river discharges, are written in conformance with the associated Forum policies. The agency continues to evaluate and revise other discharge permits as information becomes available.

Currently there are 34 active individual discharge permit holders in Arizona's non-tribal portion of the Colorado River system. Of these, 24 permits are for municipal or domestic wastewater discharges. The other 8 permits are for industrial discharges related to fish hatcheries, mines, water treatment or water delivery. A specific listing of the individual permits and the status of compliance with Forum policies is contained in Appendix C.

Water Quality Assessments and TMDLs

In general, surface waters in the Arizona portion of the Basin are of good quality. There are currently only 8 stream segments within the Basin on the state's 2012/2014 CWA 303(d) List (2 – Bill Williams; 4 – Colorado River Mainstem; 2 – Little Colorado River). The primary causes of impairment in the Colorado Mainstem are selenium, sediment, and pathogens. Water quality impairment in the Bill Williams is due to high concentrations of metals, reflecting historic mining in the watershed. The Little Colorado River is impaired primarily for sediment and pathogens. Complete assessment information can be found on the agency's website at: http://www.azdeq.gov/environ/water/assessment/assess.html

Watershed Planning

ADEQ's TMDL Program and the Water Quality Improvement Grant Program utilize comprehensive watershed-based plans, which contain EPA's required nine elements, to help

focus funding to those areas and projects that have the greatest chance for improving water quality. These plans contain implementation strategies for many of the impaired waters, as well as Best Management Practices to address existing and potential issues in the watershed. Recent activities within the Basin have been focused on reducing sediment in the Little Colorado River and the Colorado Mainstem.

Work plans are developed to secure grant funding under the Clean Water Act, Section 319(h) for watershed level planning and implementation. The work plans identify and coordinate efforts by state, federal and local agencies, along with watershed groups and private citizens to reduce or prevent nonpoint source pollution through the use of Best Management Practices and on-the-ground projects.

CALIFORNIA

NPDES Permitting

Pursuant to data from the Colorado River Basin Regional Water Quality Control Board, the California NPDES Permit R7-2007-0037 for the USBR Parker Dam and Power Plant Drinking Water Facility was terminated on June 21, 2012. Currently, there are no NPDES permits issued within the Colorado River drainage portion of California.

Water Quality Management Planning

The Water Quality Control Plan for the Colorado River Basin (Basin Plan) was adopted by the Regional Water Board (State Water Board) in November 1993 and approved by the State Water Resources Control Board in February 1994. The revised plan became effective upon approval by the Office of Administrative Law (OAL) in August 1994. Subsequent Basin Plan updates include amendments adopted by the State and Regional Water Boards and approved by OAL through March 2014. The salinity control component of the Basin Plan is consistent with the Forum's Plan of Implementation for salinity control. The Regional Water Board collaborates with local entities and the Colorado River Board of California to ensure that implementation of the water quality plan is achieved.

Salinity control in ground and surface waters is a high priority for the State Water Board and a very significant concern in arid areas like the Colorado River Basin Region, which relies heavily on water from the lower Colorado River for municipal and agricultural supply. To address rising salinities in groundwater, the State Water Board adopted a *Recycled Water Policy* in February 2009 which requires the development of Salt and Nutrient Management Plans for groundwater basins throughout California. The plans require basin-wide management of salts and nutrients from all sources in a manner that protects groundwater quality and beneficial uses. The salinity of the Colorado River is a critical factor in the development of Salt and Nutrient Management Plans for this region, given the large quantities of water that are diverted from the Colorado River to replenish the Coachella Valley municipal aquifer (over 3.2 million acre-feet to date), and to irrigate crops throughout Imperial, Palo Verde, Bard, and Coachella Valleys.

Controlling nonpoint source pollution generated from agricultural operations is also a top priority of the State and Regional Water Boards. Wastewater discharges from agricultural activities such as irrigation runoff, flows from tile drains and storm water runoff impact water quality by transporting pollutants - pesticides, sediment, nutrients, salts, pathogens, heavy metals, and

others - from cultivated fields into surface waters. To prevent agricultural discharges from impairing waters that receive these discharges, the State Water Board established the *Irrigated Lands Regulatory Program* in 2003. This program regulates discharges from irrigated agricultural lands by issuing waste discharge requirements (WDRs) or conditional waivers of WDRs (Orders) to growers. These Orders contain conditions requiring water quality monitoring of receiving waters and corrective actions when impairments are discovered.

COLORADO

Scope

Colorado's portion of the Colorado River Basin is comprised of six major drainages: 1) the main stem of the Colorado River from the continental divide to the Utah border, 2) the Roaring Fork River Basin, 3) the Yampa/White River Basin which flows to the Green River in Utah, 4) the Gunnison River Basin, 5) the Dolores River which flows to the main stem in Utah, and 6) the San Juan Basin which flows into New Mexico and then to the main stem in Utah.

NPDES Permitting

The Colorado Department of Public Health and Environment, Water Quality Control Division, administers the NPDES permitting program in the Colorado River Basin, with the exception that EPA issues permits for point source discharges on the Southern Ute and Ute Mountain Ute Reservations, as well as for federally owned lands such as National Parks. This would include permits for discharges to groundwater that would contribute salinity to the Colorado River system through a hydrologic connection to surface waters. Permits for industrial and municipal discharges are written in conformance with the associated Forum policies. Colorado continues to issue stormwater permits to construction of oil and gas development sites and related infrastructure (e.g. roads) of one or more acres of disturbance, even though the Energy Policy Act had exempted this activity from the requirement to obtain a permit at the federal level.

Currently there are more than 230 active discharge permits in the Colorado portion of the Colorado River Basin where the salinity requirements have been applied. A specific listing of the individual permits and compliance status is contained in Appendix C.

Water Quality Assessments and TMDLs

The waters in Colorado's portion of the Colorado River Basin, particularly at higher elevation, are generally of good quality. There are 91 stream segments, including provisional listings, in the Colorado River Basin in Colorado (32 – Gunnison, 46 – main stem and tributaries of the Colorado River, and 13 – San Juan) which are included on the 2012 303d List of Impaired Waters. Of these, a significant majority in the lower ends of these basins are impaired for selenium. Water quality impairments in the mountainous portions of these basins are due to high concentrations of metals, primarily caused by the remnants of historic mining activities. No waters are currently listed for salinity related impacts.

The lower portions of each of these basins are underlain by bedrock deposits of the cretaceous period, most notably Mancos Shale and Dakota Sandstone. The Mancos Shale is a marine deposit and, as such, contains significant amounts of readily soluble constituent materials,

including selenium. Groundwater which leaches to the relatively impermeable shale deposits tends to dissolve selenium and, as it flows atop the bedrock strata toward surface drainages, carries elevated levels of dissolved selenium with it. Various anthropogenic activities like sand and gravel extraction and agricultural and urban landscape irrigation accelerate the mobilization and transport of selenium from shale and shale-derived soil to surface water.

Watershed Planning - Colorado River Basin Selenium/Salinity Nonpoint Source Activities

Recent activities in the Basin range from watershed planning to Best Management Practices implementation for selenium and salinity reduction. In 2012 the Gunnison Basin and Grand Valley Selenium Task Force completed a "Selenium Watershed Management Plan Update" with Colorado nonpoint source funding assistance. The watershed plan was developed over several years with significant input and collaboration from Lower Gunnison Basin stakeholders. The Middle Colorado Watershed Plan, for the area from Glenwood Canyon to DeBeque Canyon, is in development and will cover selenium impacted water bodies. The Colorado Water Quality Control Division will begin monitoring of streams and lakes on or tributary to the main stem of the Colorado River in preparation for developing TMDLs for impaired water bodies from DeBeque Canyon to the Utah state line.

Selenium reduction goals are highly dependent upon salinity control efforts occurring in the Basin where selenium is often found in conjunction with salinity. Numerous projects for selenium and salinity control are ongoing in the Basin. The Gunnison River Basin Selenium Management Program provides details of past, current, and planned projects. Salinity reductions associated with this program are attributed to previous and on-going off-farm and on-farm salinity control efforts implemented through the Colorado River Basin Salinity Control Program, Environmental Quality Incentive Program, National Irrigation Water Quality Program, and Colorado Nonpoint Source Program. Of recent note are control activities in sub-basins with limited history of activities such as the North Fork of the Gunnison. These projects benefitted from State of Colorado Species Conservation Trust Funds for engineering assistance.

In 2012 the USGS published a Scientific Investigations Report (SIR 12-5088) on "Flow Adjusted Trends in Dissolved Selenium Load and Concentration in the Gunnison and Colorado Rivers near Grand Junction, Colorado, Water Years 1986-2008." The study was commissioned by selenium stakeholders in order to inform decision makers regarding the status and trends of selenium. The purpose of selecting a flow-adjusted method is to remove the natural variation in load caused by changes in mean-daily stream flows, thus emphasizing human-caused changes in selenium load and concentration. Results of the study showed that the selenium load at the Gunnison River near Grand Junction had decreased from 23,196 pounds in 1986 to 16,560 pounds, a 28.6 percent decrease.

NEVADA

Scope

The Basin within Nevada consists of three major tributaries: 1) the Virgin River, 2) the Muddy River, and 3) the Las Vegas Wash. All of these tributaries flow into Lake Mead and provide nearly all of the inflow to the river from Nevada.

NPDES Permitting

The Nevada Division of Environmental Protection is the EPA delegated authority for the issuance of NPDES Permits. As of December 31, 2013, there were 70 active discharge permits in the Nevada portion of the Colorado River System. The largest dischargers, the City of Las Vegas, the Clark County Water Reclamation District, the City of Henderson, and the City of North Las Vegas are permitted to discharge a maximum flow up to 91 mgd, 150 mgd, 40 mgd, and 25 mgd respectively. The quality of the water affected by these permits is closely monitored and all necessary programs to protect water quality standards are being implemented. Nevada continues to apply the policies adopted by the Forum.

Water Quality Management Planning

Area-wide water quality management planning duties and powers have been vested to certain counties and entities. The Clark County Board of Commissioners was designated the Area-Wide Water Quality Management Planning organization within Clark County. The initial 208 Plan was adopted by the Clark County Board of Commissioners in 1978 and was approved by the EPA. Since that time, several 208 Plan revisions have been made as needed to address changing needs.

TMDLs

In 1987, the Nevada Division of Environmental Protection established total phosphorus and total ammonia Waste Load Allocations (WLAs) in the Las Vegas Wash at Northshore Road as needed to meet the Las Vegas Bay water quality standards. The WLAs set are applicable for only April through September and were based upon target concentrations (0.64 mg/L total phosphorus, 1.43 mg/L total ammonia) and average stream flows.

NEW MEXICO

Scope

New Mexico's portion of the Basin above Imperial Dam is comprised of two major drainages: 1) the Rio Puerco, which is a tributary of the Little Colorado River, and 2) the San Juan River, which is a major tributary of the Colorado River.

NPDES Permitting

In New Mexico, authority for issuing permits is administered by EPA Region 6, except for facilities located on the Navajo Indian Reservation, which are administered by Region 9. All permits for industrial and municipal discharges are written in conformance with the associated Forum policies. Currently, there are 33 discharge permits in the New Mexico portion of the Basin, of which Region 6 administers 20 permits and Region 9 administers 13 Navajo Reservation permits. Of these, 17 permits (13 non-Indian, 4 Navajo) are for industrial discharges and 16 permits (6 non-Indian, 1 Jicarilla Apache, 9 Navajo) are associated with municipal wastewater discharges.

Water Quality Assessment and TMDLs

The New Mexico Water Quality Control Commission has adopted the framework for water quality in New Mexico, which includes the State of New Mexico Water Quality Management

Plan and the New Mexico Nonpoint Source Management Plan. Both plans cover the entire state, except for that portion of the Navajo Reservation lying therein. Planning within the reservation is the sole responsibility of the Navajo Tribe. Much of the Basin in New Mexico falls within the boundaries of the reservation.

The following TMDLs have been adopted by the New Mexico Water Quality Control Commission and approved by EPA within the New Mexico portion of the Basin at this time:

- Animas River: *E. coli*, nutrients
- Gallegos Canyon: selenium
- La Plata River: *E. coli*, siltation, dissolved oxygen
- San Juan River: *E. coli*, sedimentation/siltation

Sample collection for the most recent San Juan Basin Surface Water Quality Survey was completed in 2010 by the Surface Water Quality Bureau of the New Mexico Environment Department.

Watershed Planning

Work plans are developed and grant funding secured under the Clean Water Act, Section 319(h), for watershed-associated development, riparian area restoration, certification of Section 404 permits, spill response, and treatment of abandoned mines. The work plans identify and coordinate efforts by state, federal and local agencies, along with other groups and private citizens, to reduce or prevent non-point source pollution and implement Best Management Practices to reduce non-point source pollutants. The New Mexico Environment Department and the San Juan Watershed Group, an unincorporated citizen and interagency group funded by the Section 319(h) program, are working to improve water quality in the San Juan River by implementing Best Management Practices for non-point source contributors of nutrients and *E. coli*. State Revolving Loan Funds and other funds are authorized and available for use in funding salinity control projects. State actions in support of salinity control include: 1) inclusion of salinity control measures in the Section 208 plans, 2) dissemination of information on salinity sources and control, 3) consultation with industries on potential salinity reduction measures, 4) implementation of Forum policy through NPDES permits, and 5) maintaining a continuous water quality planning program whereby new or additional salinity control measures can be addressed.

UTAH

Scope

Utah's portion of the Colorado River Basin is comprised of ten major sections: 1) the main stem of the Colorado River from the Colorado border to the Arizona Border in Lake Powell, 2) the Green River Basin from the Wyoming state line in Flaming Gorge Reservoir to the confluence with the Colorado River, 3) the Duchesne River Basin, 4) the lower Yampa and White River Basins which flow to the Green River in Utah, 5) the Price and San Rafael River Basins, 6) the Dirty Devil and Escalante Rivers, 7) the lower portion of the San Juan River Basin which flows into the main stem of the Colorado River in Utah, 8) the Paria River, 9) the Kanab Creek Basin to the Arizona State Line, and 10) the Virgin River Basin to the Arizona state line.

NPDES Permitting

The Utah Division of Water Quality (DWQ) within the Utah Department of Environmental Quality administers the NPDES permitting program in Utah. Permits for industrial and municipal discharges within the Colorado River Basin are written in conformance with the associated Forum policies and are available for viewing online at:
www.waterquality.utah.gov/permits/index.htm.

As of December 31, 2013, there are 80 discharge permits as issued by DWQ in the Utah portion of the Colorado River Basin. Of these, 33 are for municipal discharges and 47 are for industrial discharges, of which 5 industrial permits have been recently terminated. A specific listing of the individual permits and their compliance status is contained in Appendix C. By 2006, a total of 5 discharge permits for coal mining operations in Utah were developed to offset salinity contributions from industrial sources in accordance with the Forum policy initially adopted as part of the 2002 Review. The salinity-offset project plans for all 5 coal mine facilities were finalized previously, with projects implemented by 2010 to offset salinity contributions in excess of the one-ton-per-day requirement from those facilities.

Water Quality Assessments and TMDLs

The waters in Utah's portion of the Colorado River Basin are generally of good quality. There have been 23 stream segments listed for impacts from salinity/TDS/chlorides. These segments are generally in the lower reaches of the respective basins and are the result of a combination of natural salt loadings as well as agricultural drainage. TMDLs have been developed to address these salinity/TDS/chloride impairments. For information about the completed studies and to view the current Utah 303(d) list of impaired water bodies please visit the following site.
www.waterquality.utah.gov/TMDL.

Watershed Planning

Utah's Watershed Management and Planning program is focused on protecting and restoring the water quality of its streams, lakes and groundwater resources by employing the following key elements: Stewardship, Monitoring and Assessment, Coordination and Watershed Planning. Although projects exist in other regions, currently the Upper Colorado Basin region in Utah has no watershed planning projects in progress for water quality. The Basin Plans for the Utah State Water Plan include water quality as part of the process and these plans are updated periodically.

WYOMING

Scope

Wyoming's portion of the Basin is comprised of two major main stream drainages: 1) the Little Snake River, which is a tributary of the Yampa River in Colorado, and 2) the Green River, which empties into Flaming Gorge Reservoir on the Wyoming-Utah border.

NPDES Permits

Currently there are 36 active discharge permits in the Wyoming portion of the Colorado River system. All permits for industrial and municipal discharges are written in conformance with

Forum policies. Of the 36 permits, 17 are for industrial discharges related to fish hatcheries, coal mines, power plants or oil and gas production facilities and 19 of the permits are associated with municipal wastewater discharges. These facilities serve a total population of approximately 50,000 people. A specific listing of the individual permits and compliance status is contained in Appendix C.

Water Quality Assessments and TMDLs

In general, water quality in the Upper Colorado River basin in Wyoming is good. There are currently only 11 streams and rivers identified as either impaired or threatened in the State's 2012 Section 303(d) List (12 pollutant/segment combinations on 8 streams/rivers in the Green River Basin and 7 pollutant/segment combinations on 3 streams in the Little Snake River Basin). Of these impaired waters, Bitter Creek in the Green River Basin and Muddy Creek in the Little Snake River Basin are listed for salinity related impacts (chloride). A TMDL for Bitter Creek was initiated in 2012; a TMDL for Muddy Creek is not scheduled for development at this time. Complete assessment information can be found at http://deq.state.wy.us/wqd/watershed/index.asp.

Watershed Planning

Local watershed groups have written watershed plans for the majority of the impaired waters within the Green River and Little Snake River Basins. These groups have worked to implement the watershed plans through Wyoming's Clean Water Act Section 319 Grant Program and other state and federal cost-share programs. In addition, the Wyoming Department of Environmental Quality (WDEQ) is currently in the process of developing TMDLs for five of the 23 water quality impairments in the two basins that are listed on the 2010 303(d) list. These TMDLs include one impairment listing on the Ham's Fork River and four impairment listings on Haggerty and West Fork Battle Creeks. Furthermore, the WDEQ plans to initiate TMDLs on the Blacks Fork River, Smiths Fork River, Willow Creek, Bitter Creek, and Killpecker Creek within the next two to three years. In 2010, the Wyoming Water Development Commission revised the river basin water plan for the Green River and Little Snake River drainages. This report updates information about the current uses and projected future uses of water in the basin and includes other useful information such as irrigated lands delineation, hydrologic modeling of major streams, estimated availability of surface and groundwater for future use, and recommendations and strategies for facing current and future water use challenges. Detailed information can be accessed at: http://waterplan.state.wy.us.

CONCLUSION AND ADOPTION OF THE STANDARDS

The Standards consist of two components, the numeric criteria and the Plan of Implementation. No change has been made in the numeric criteria since their adoption in 1975 by the Basin States and approval by EPA. After having conducted this Review, the Forum has again found the numeric criteria to be appropriate and recommends no changes in these criteria. The Forum also finds that the updated Plan of Implementation is adequate to keep the salinity concentration of the Colorado River below the numeric criteria through 2017, thus providing significant benefits to the Basin. The effect of the Plan of Implementation on the Standard is that the probability of exceeding the numeric criteria is extremely low, less than 4 percent in any given year, for the review period and provides a measurable improvement to the quality of the Colorado River.

The Forum and the States remain committed to continued improvement of the water quality of the Colorado River.

The Program is truly unique and it cannot be successful without the cooperation of a multitude of agencies and governments involved at the local, state and federal levels. First, the Program is reliant upon the cooperation of land owners in implementing important and cost-effective salinity control measures. Secondly, the Program is dependent on a multitude of agreements among the seven Basin States which have always been accomplished by consensus. Lastly, the Program depends upon the cooperation of a number of federal agencies for its success. In addition to the three federal implementing agencies, there are other federal agencies which are involved in the Program, and cooperation and coordination with these agencies is also essential. Three agencies are notable: United States Fish & Wildlife Service, United States Geological Survey and EPA. All the federal agencies are a critical part of the Program. It is expected that by their involvement in the preparation of this Review, those federal agencies will support the Plan of Implementation and its programs.

In June of 2014, the Forum adopted their proposed 2014 Review. During the summer of 2014 comments on the proposed 2014 Review were solicited. Each state sent out notice of the proposed 2014 Review and the proposed 2014 Review was posted on the Forum's website. No comments were received requesting modification of the draft 2014 Review. At the Forum meeting held in Santa Fe, New Mexico, in October 2014, the Forum approved this 2014 Review document.

Each of the seven Basin States will now include the Review as a part of its own water quality standards and, through procedures established by each state, include it as part of its approved water quality standards as approved by EPA. Because the Basin contains portions of three EPA regions, the States of Utah, Colorado and Wyoming submit their triennial reviews to EPA Region 8 in Denver, Colorado; New Mexico to EPA Region 6 in Dallas, Texas; and Nevada, Arizona and California to EPA Region 9 in San Francisco, California. It is anticipated that EPA, by approval of the states' submittals, will fully support this salinity control effort.

FUTURE PROGRAM AND ITS CHALLENGES

As described in earlier sections of this report, the water quality standard for salinity in the Colorado River Basin is expected to be met during the review period (over the next three years, 2014-2017). The probability of exceeding the numeric criteria, while putting into practice the outlined Plan of Implementation, is well below the 50 percent exceedance amount allowed. Nonetheless, as water development continues to occur throughout the Basin, salinity concentrations and the associated economic damages are projected to increase. Therefore, this section will analyze the period 2017 – 2035. The efforts of the Program are to minimize downstream economic damages while the Upper Basin States continue to develop their Compact-apportioned water supplies. This effort, however, is increasingly challenging as economic damage levels and costs increase over time, thus placing greater burdens on Program implementation.

The very wet 2011 water year has sent low salinity water down the system; the lower salinity waters are presently in the Lower Basin Reservoirs. However, the drier than normal 2012 and 2013 water years have placed high-salinity waters in Lake Powell. As the system seeks to normalize over the next several years, salinities are expected to increase relatively dramatically over a period of a few years as the poorer quality water from Lake Powell replaces the better quality waters in Lake Mead and on downstream. If normal runoff then persists, the water quality in Lake Mead and downstream will then slightly improve as the poorer quality waters work their way through the system, following which the downstream water quality will begin to degrade due to upstream water development. Recognizing annual variations can affect the salinity in the short-term but that they are normalized in the longer term, the Forum analyzed the effects on the salinity of the River over a longer term. The salinity of the river was analyzed for the period of 2017 through 2035.

Reclamation used its Colorado River Simulation System (CRSS) model to project salinity levels for the period 2017 through 2035 with the varying levels of Program implementation. The CRSS model simulates 105 separate hydrologic traces for each year and then calculates the average annual salinity. A fuller description of the CRSS model and the model runs made for this Review is found in Appendix E.

The model projects an increase of about 80 mg/L in salinity concentrations over present (2014) levels at Imperial Dam between now and the year 2035 if no new control measures are put in place. It would require approximately 2.3 million tons of salinity control with a total annual Program cost of $93M (federal appropriation and Basin States' cost-share dollars) and identification of significant additional salinity control alternatives in order to maintain salinity at present levels. The Forum believes these levels of funding and salinity control are not practicably attainable at this time.

The Forum requested that Reclamation analyze the effects on the salinity of the River for five levels of program implementation (tons of salt removed). The Forum chose the levels of implementation based on available funding, both federal and state cost share, and the tons of salt available for future control.

Table 4 shows the five Program implementation levels modeled by Reclamation with the tons of annual salinity control in place by the year 2035.

Table 4
Plan of Implementation Levels Modeled by CRSS

Description	Total Control
No additional future controls beyond 2014 (does not implement the Plan of Implementation identified herein	1.33M tons
No additional controls after this review period (i.e. Program ceases after 2017)	1.39M tons
Program reduced to match presently available cost-share dollars from the LCRBDF ($9.2M - $1M for repayment)	1.63M tons
Controls associated with recent Program funding levels (approximately $8M in Basinwide, $5M in O&M and $17M in EQIP plus Basin States cost share)	1.68M tons
Controls anticipated in the 2011 Review	1.85M tons

Note: "No additional future controls" contemplates some continuing O&M expenditures to maintain existing facilities.

It further shows that the difference between no new measures and a Program implementation level of 1.85 million tons is approximately 40 mg/L by the year 2035. These values are summarized in Figures 3, 4 and 5 below for the three numeric criteria points. The *Without Additional Controls 2014: 1.33 M tons* alternative was chosen as the baseline condition. The other alternatives were evaluated against this baseline.

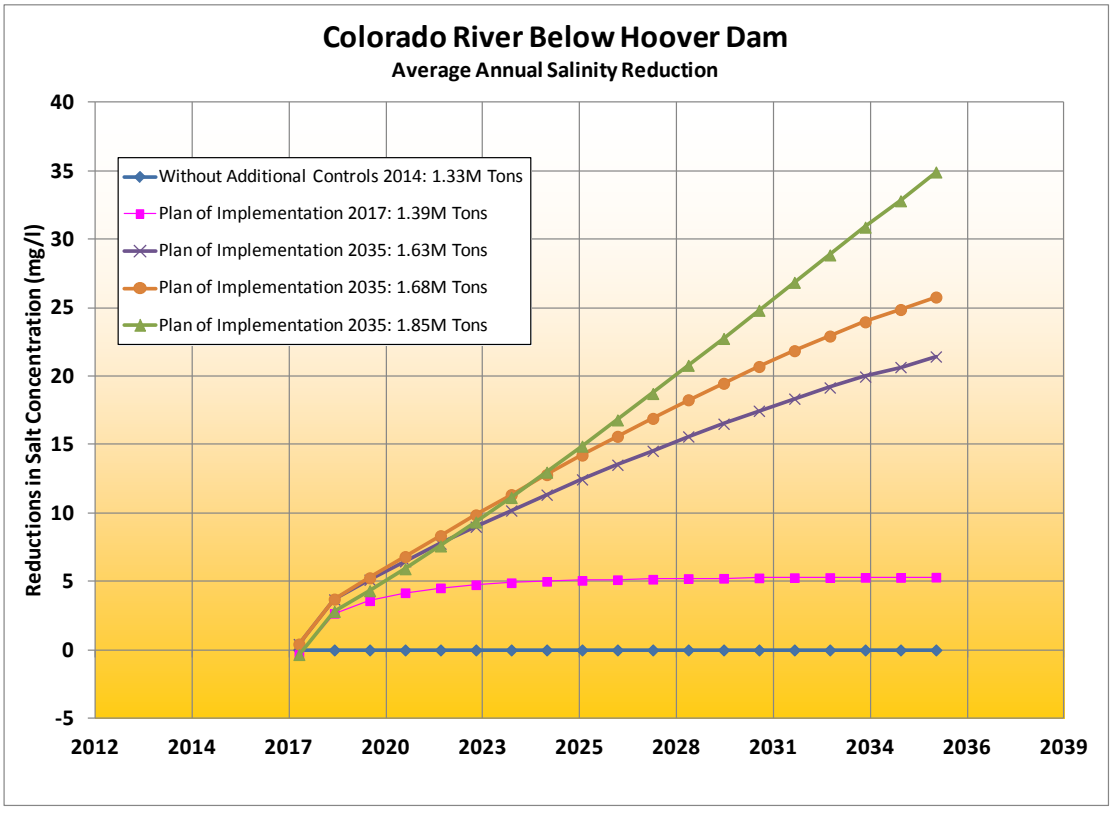

Figure 3

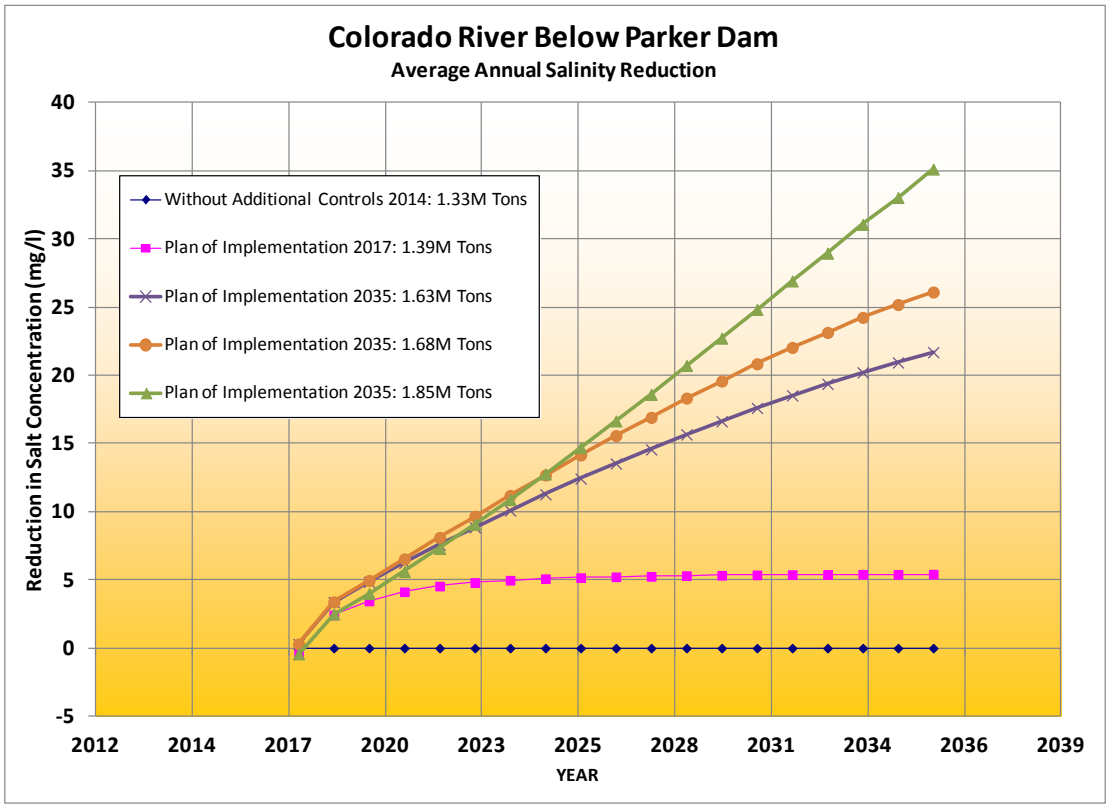

Figure 4

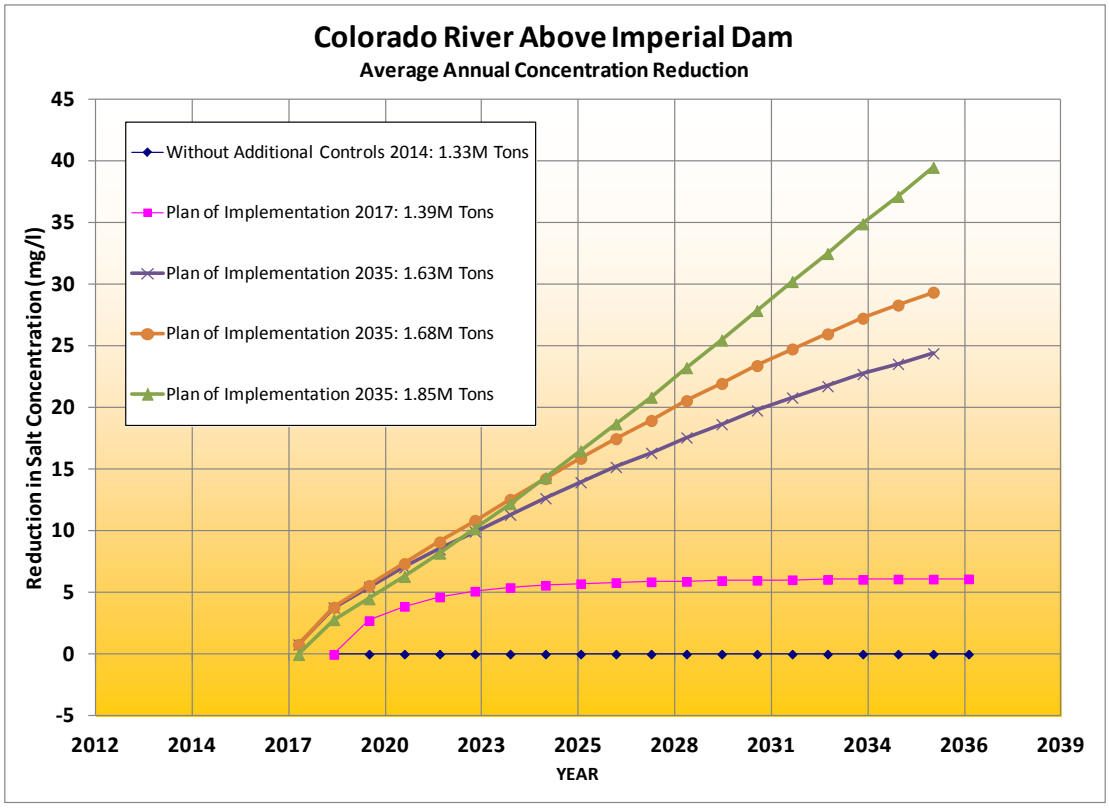

Figure 5

To further understand the impacts of reducing the salinity concentrations in the Lower Basin, the Forum estimated the economic benefits to the Lower Basin from those reductions. To evaluate the economic impact of the Program reducing salinity levels, the Forum relied on Reclamation's economic damages model. That model is described in Appendix F. Using the values in Table 5, the economic damages model was run to determine the economic benefits associated with each of the Program implementation levels. The benefits are determined by calculating the reduction in damages that occurs as the concentration levels at the numeric criteria points are reduced. The model only estimates Lower Basin damages that can be reasonably quantified at the present time (see Appendix F). In addition to the currently unquantified damages in the Lower Basin, there are also benefits from the Program in the Upper Basin that have yet to be quantified. Table 5 shows the projected annual *quantified* damages in the Lower Basin in the year 2035 calculated for each of the Program implementation levels and the difference between the various scenarios and the without-future-additional-controls scenario (1.33M tons removed).

Table 5
Annual Damages and Damage Reductions

Alternative	Total Quantified Damages	Annual Damage Reductions as Compared to No Additional Future Controls Beyond 2014
1.33M tons removed	$614.5M	n/a
1.39M tons removed	$598.3M	$16.2M
1.63M tons removed	$545.1M	$69.4M
1.68M tons removed	$531.1M	$83.4M
1.85M tons removed	$503.2M	$111.3M

From these calculations, it can be seen that as more salinity control is implemented and the concentrations at the numeric criteria points are reduced, the *quantified* economic damages projected to be experienced annually by users in the Lower Basin are also reduced. For example, as indicated in Table 5, with the additional 0.06 million tons of control (the difference between the 1.33 million ton and 1.39 million ton alternatives) annually, the *quantified* economic damages to agricultural and municipal and industrial water users are reduced by approximately $16 million annually.

While it is essential to continue to maintain salinity concentrations at or below the numeric criteria, the Forum will continue to focus on opportunities to further reduce future economic damages. The Forum believes a more robust salinity control program is needed to achieve the reductions indicated in Table 5. Two of the challenges facing the Forum in pursuing such a program are finding cost effective salinity control projects and acquiring the necessary funding to implement those projects. The Forum is committed to continue working with the Federal agencies to continue to identify cost effective projects. The Forum is also committed to working with the Federal agencies and Congress to seek additional appropriations and to generate the cost share revenues needed to support additional Federal expenditures. The Forum determines that all of the alternatives evaluated above are economically justifiable. However, given the current financial constraints, the Forum, for this review period, will pursue a Program designed to remove at least 1.68 million tons annually by the year 2035. This may require legislation to alter the states' cost share or other actions to meet the identified Program levels.

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APPENDIX A

Flow Weighted Salinity Values
at the Three Numeric Criteria Stations

Observed Flow-Weighted Average Salinity at the Numeric Criteria Stations (Total Dissolved Solids in mg/L)[1]

Calendar Year (Numeric Criteria)	Below Hoover Dam (723 mg/L)	Below Parker Dam (747 mg/L)	At Imperial Dam (879 mg/L)
1970	743	760	896
1971	748	758	892
1972	724	734	861
1973	675	709	843
1974	681	702	834
1975	680	702	829
1976	674	690	822
1977	665	687	819
1978	678	688	812
1979	688	701	802
1980	691	712	760
1981	681	716	821
1982	679	713	827
1983	659	678	727
1984	598	611	675
1985	556	561	615
1986	517	535	577
1987	519	538	612
1988	529	540	648
1989	564	559	683
1990	587	600	702
1991	629	624	749
1992	657	651	767
1993	665	631	785
1994	667	673	796
1995	654	671	803
1996	618	648	768
1997	585	612	710
1998	559	559	655
1999	549	550	670
2000	539	549	661
2001	550	549	680
2002	561	572	689
2003	584	592	695
2004	625	644	729
2005	643	668	710
2006	646	671	720
2007	632	657	715
2008	622	646	717
2009	636	659 (Provisional)	721
2010	609	638	686
2011	597	620	687
2012	572	594	683
2013	580	595 (Provisional)	677

[1] Determined by the USGS from data collected by Reclamation and USGS.

Salinity concentrations are based on TDS as the sum of constituents whenever possible. The sum of constituents is defined to include calcium, magnesium, sodium, chloride, sulfate, a measure of the carbonate equivalent of alkalinity and, if measured, silica and potassium.

APPENDIX B

Forum Policies

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

Adopted by
The Colorado River Basin Salinity Control Forum

February 28, 1977
Revised October 30, 2002

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.

In 1977, the states of the Colorado River Basin adopted the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program." 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.

NPDES Policy for Municipal and Industrial Discharges of Salinity in the Colorado River

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.) The objective of the policy, as provided in Sections I.A. and I.B., is to achieve "no salt return" whenever practicable for industrial discharges and an incremental increase in salinity over the supply water for municipal discharges. 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 River from Hoover Dam to Imperial Dam.

In October, 2002, the Forum substantially amended the NPDES policies relating to industrial discharges but made no changes to the procedures for municipal discharges. In the printing of the 2002 Review, however, the section relating to municipal discharges and an additional appendix entitled “Guidance on New Construction Determination” were inadvertently omitted.

Both errors have been corrected in this printing and the Forum reaffirms the validity of all of the policies as they appear in this document.

NPDES Policies Separately Adopted by the Forum

The Forum developed a separate and specific policy for the use of brackish and/or saline waters for industrial purposes on September 11, 1980. The Forum addressed the issue of intercepted ground water and adopted a specific policy dealing with that type of discharge on October 20, 1982. On October 28, 1988, the Forum adopted a specific policy addressing the water use and discharge associated with fish hatcheries. Each of these separately adopted policies is attached hereto.

NPDES Policies for Specified Industrial Discharges – 2002 Amendments

On October 30, 2002, the Forum amended this policy for implementation of Colorado River salinity standards through the NPDES permit program in order to address the following three additional types of industrial discharges: (1) water that has been used for once-through noncontact cooling water purposes; (2) new industrial sources that have operations and associated discharges at multiple locations; and (3) "fresh water industrial discharges" where the discharged water does not cause or contribute to exceedances of the salinity standards for the Colorado River System. This policy was also amended to encourage new industrial sources to conduct or finance one or more salinity-offset projects in cases where the permittee has demonstrated that it is not practicable to prevent the discharge of all salt from proposed new construction.

Discharges Of Once-Through Noncontact Cooling Water

Section I.C. of this policy has been added to address discharges of water that has been used for once-through noncontact cooling water purposes. The policy for such discharges shall be to permit these uses based upon a finding that the returned water does not contribute to the loading or the concentration of salts in the waters of the receiving stream beyond a *de minimis* amount. A *de minimis* amount is considered, for purposes of this policy, as an average annual increase of not more than 25 milligrams per liter (mg/L) in total dissolved solids measured at the discharge point or outfall prior to any mixing with the receiving stream in comparison to the total dissolved solids concentration measured at the intake monitoring point of the cooling process or facility. This policy is not intended to supersede any other water quality standard that applies to the receiving stream, including but not limited to narrative standards promulgated to prohibit impairment of designated uses of the stream. It is the intent of the Forum to permit the return of once-through noncontact cooling water only to the same stream from which the water was diverted. Noncontact cooling water is distinguished from blowdown water, and this policy specifically excludes blowdown or any commingling of once-through noncontact cooling water with another waste stream prior to discharge to the receiving stream. Sections I.A. and I.B. of this policy govern discharges of blowdown or commingled water.

New Industrial Sources with Operations and Discharges at Multiple Locations under Common or Affiliated Ownership or Management

Recently there has been a proliferation of new industrial sources that have operations and associated discharges at multiple locations. An example is the recent growth in the development of energy fuel and mineral resources that has occurred in the Upper Colorado River Basin. This type of industrial development may involve the drilling of relatively closely spaced wells into one or more geological formations for the purpose of extracting oil, gas or minerals in solution. Large-scale ground water remediation efforts involving multiple pump and treat systems operating for longer than one year may share similar characteristics. With such energy and mineral development and ground water remediation efforts there is the possibility of a single major industrial operation being comprised of numerous individual point source discharges under common or affiliated ownership or management that produce significant quantities of water as a waste product or byproduct over a long period. Given the large areal scope of these types of major industrial sources and the often elevated concentrations of salinity in their produced water, the total amount of salt loading that they could generate may be very large in comparison to the Forum's past and present salt removal projects. Relatively small quantities of this produced water could generate one ton per day in discharges to surface waters. Since salinity is a conservative water quality constituent, such discharges of produced water, if uncontrolled, could have an adverse effect on achieving the adopted numeric salinity standards for the Colorado River System.

These kinds of major industrial sources strain the conventional interpretation of the industrial source waiver for new construction set forth in Section I.A.1.a. of this policy, which authorizes a discharge of salinity from a single point source of up to one ton per day in certain circumstances. The Forum adopted this provision in 1977, well before most of the new major industrial sources that have operations and discharges at multiple locations began to appear in the Colorado River Basin. A new category of industrial sources is, therefore, warranted. NPDES permit requirements for New Industrial Sources with Operations and Discharges at Multiple Locations under Common or Affiliated Ownership or Management are set forth in Section I.D. of this policy. These new requirements are intended to apply to new industrial sources with operations that commence discharging after October 30, 2002.

For purposes of interpreting this policy, "common or affiliated ownership or management" involves the authority to manage, direct, superintend, restrict, regulate, govern, administer, or oversee, or to otherwise exercise a restraining or directing influence over activities at one or more locations that result in a discharge of salinity into the Colorado River System. Common or affiliated ownership or management may be through the ownership of voting securities or may be indicated where individual sources are related through one or more joint ventures, contractual relationships, landlord/tenant or lessor/lessee arrangements. Other factors that indicate two or more discharging facilities are under common or affiliated ownership or management include: sharing corporate executive officers, pollution control equipment and responsibilities, common

workforces, administrative functions, and/or payroll activities among operational facilities at different locations.

Fresh Water Industrial Discharges

Sections I.A. and I.B. of this policy have been amended to allow the permitting authority to authorize "fresh water industrial discharges" where the discharged water does not cause or contribute to exceedances of the adopted numeric salinity standards for the Colorado River System. Different end-of-pipe concentrations of salinity as shown in Table 1 of the policy, are appropriate for discharges to tributaries depending upon their location within the Basin. The concept of "benchmark concentrations" has been developed in order to address this need for different end-of-pipe concentrations. These benchmark concentrations are not to be interpreted as water quality standards. Rather, they are intended to serve solely for the establishment of effluent limits for implementing the waiver for "fresh water discharges." The allowance for freshwater discharges is intended to preserve flows from discharges in the Basin, which do not cause significant degradation of existing ambient quality with respect to salinity. Operations or individual discharges that qualify for the freshwater waiver shall not be subject to any further limitation on salt loading under this policy.

Salinity-Offset Projects

This policy has been amended to allow the permitting authority to authorize industrial sources of salinity to conduct or finance one or more salinity-offset projects when the permittee has determined that it is not practicable: (i) to prevent the discharge of all salt from proposed new construction; (ii) to reduce the salt loading to the Colorado River to less than one ton per day or 366 tons per year; or (iii) the proposed discharge is of insufficient quality in terms of TDS concentrations that it could be considered "fresh water" as defined below. Presently, the permitting authority can consider the costs and availability of implementing off-site salinity control measures to mitigate the adverse impacts of the permitted salt load. It is not intended that the applicant be required to develop or design an off-site salinity control project or establish a salt bank, but rather to assess the costs of conducting or buying into such projects where they are available. In the future the Forum or another entity may create a trading/banking institution to facilitate the implementation of a salinity-offset program, basin-wide. This would allow industrial sources to conduct or finance the most cost effective project available at the time an offset project is needed regardless of the project's location in the Basin.

NPDES PERMIT PROGRAM POLICY
FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS

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.) Attachment 1 provides guidance on new construction determination. "A new industrial source with operations and discharging facilities at multiple locations under common or affiliated ownership or management" shall be defined for purposes of NPDES permitting, as an industrial source that commenced construction on a pilot, development or production scale on or after October 30, 2002.

   a. The permitting authority may permit the discharge of salt upon a satisfactory demonstration by the permittee that:

      i. It is not practicable to prevent the discharge of all salt from the new construction or,

      ii. In cases where the salt loading to the Colorado River from the new construction is less than one ton per day or 366 tons per year, or

      iii. The proposed discharge from the new construction is of sufficient quality in terms of TDS concentrations that it can be considered "fresh water" that would have no adverse effect on achieving the adopted numeric standards for the Colorado River System. The permitting authority may consider a discharge to be fresh water if the maximum TDS concentration is: (i) 500 mg/L for discharges into the Colorado River and its tributaries upstream of Lees Ferry, Arizona; or, (ii) 90% of the applicable in-stream salinity standard at the appropriate benchmark monitoring station for discharges into the Colorado River downstream of Lees Ferry as shown in Table 1, below

Table 1

	Benchmark Monitoring Station	Applicable Criteria	Freshwater Discharge (mg/L)
1	Colorado River at Lees Ferry, Arizona	N/A	500
2	Colorado River below Hoover Dam	723	650
3	Colorado River below Parker Dam	747	675
4	Colorado River at Imperial Dam	879	790

b. Unless exempted under Sections I.A.1.a.ii. or iii., above, the demonstration by the applicant must include information on the following factors relating to the potential discharge:

(i) Description of the proposed new construction.

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

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

(iv) 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 groundwater aquifers;

(D) Costs of alternative plans in dollars per ton of salt removed; and

(E) Unless the permitting authority has previously determined through prior permitting or permit renewal actions that it is not practicable to prevent the discharge of all salt from the new construction in accordance with Section I.A.1.a.i., the applicant must include information on project options that would offset all or part of the salt loading to the Colorado River associated with the proposed discharge or that would contribute to state or interstate salinity control projects or salt banking programs.

(v) A statement as to the one plan among the alternatives for reduction of salt discharge that is recommended by the applicant and also information as to which of the other evaluated alternatives are economically infeasible.

(vi) 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 under I.A.1.a.i., above, the permit issuing authority shall consider, but not be limited to the following:

(i) The practicability of achieving no-discharge of salt from the new construction.

(ii) 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.

(D) If applicable under I.A.1.b.(iv)(E), costs and practicability of offsetting all or part of the salt load by the implementation of salt removal or salinity control projects elsewhere in the Colorado River Basin. The permittee shall evaluate the practicability of offsetting all or part of the salt load by comparing such factors as the cost per ton of salt removal for projects undertaken by the Colorado River Basin Salinity Control Forum and the costs in damages associated with increases in salinity concentration against the permittee's cost in conducting or buying into such projects where they are available.

(iii) With regard to subparagraphs, (b) and (c) above, the permit issuing authority shall consider the compatibility of state water laws with either the complete elimination of a salt discharge or any plan for minimizing a salt discharge.

B. Existing Facilities or any discharging facility, the construction of which was commenced before October 18, 1975

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, 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.(ii), 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:

a. The discharge of salt is less than one ton per day or 366 tons per year; or

b. The permitting authority determines that a discharge qualifies for a "fresh water waiver" irrespective of the total daily or annual salt load. The maximum TDS concentration considered to be fresh water is 500 mg/L for discharges into the Colorado River and its tributaries upstream of Lees Ferry, Arizona. For discharges into the Colorado River downstream of Lees Ferry the maximum TDS concentration considered to be afresh water shall be 90% of the applicable in-stream standard at the appropriate benchmark monitoring station shown in Table 1, above.

C. Discharge of Once-Through Noncontact Cooling Water

1. Definitions:

a. The terms "noncontact cooling water" and "blowdown" are defined as per 40CFR 401.11 (m) and (n).

b. "Noncontact cooling water" means water used for cooling that does not come into direct contact with any raw material, intermediate product, waste product or finished product.

c. "Blowdown" means the minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentration in amounts exceeding limits established by best engineering practice.

d. "Salinity" shall mean total dissolved solids as the sum of constituents.

2. Permits shall be authorized for discharges of water that has been used for once-through noncontact cooling purposes based upon a finding that the returned water does not contribute to the loading of salts or the concentration of salts in the waters of the receiving stream in excess of a *de minimis* amount.

3. This policy shall not supplant nor supersede any other water quality standard of the receiving stream adopted pursuant to the Federal Clean Water Act, including but not limited to impairment of designated uses of the stream as established by the governing water quality authority having jurisdiction over the waters of the receiving stream.

4. Noncontact cooling water shall be distinguished from blowdown, and Section 1.C. of this policy specifically excludes blowdown or any commingling of once-through noncontact cooling water with another waste stream prior to discharge to the receiving stream. Sections I.A. and I.B of this policy shall in all cases govern discharge of blowdown or commingled water.

5. Once-through noncontact cooling water shall be permitted to return only to the same stream from which the water was diverted.

6. Because the increase in temperature of the cooling water will result in some evaporation, a *de minimis* increase in the concentration of dissolved salts in the receiving water may occur. An annual average increase in total dissolved solids of not more than 25 milligrams per liter (mg/L) measured at the intake monitoring point, as defined below, of the cooling process or facility, subtracted from the effluent total dissolved solids immediately upstream of the discharge point to the receiving stream, shall be considered *de minimis*.

7. At the time of NPDES discharge permit issuance or reissuance, the permitting authority may permit a discharge in excess of the 25 mg/L increase based upon a satisfactory demonstration by the permittee pursuant to Section 1.A.1.a.

8. Once-through demonstration data requirements:

   a. Description of the facility and the cooling process component of the facility.

   b. Description of the quantity, salinity concentration and salt load of intake water sources.

   c. Description of the discharge, covering location, receiving waters, quantity of salt load and salinity concentration of both the receiving waters and the discharge.

   d. Alternative plans for minimizing salt discharge from the facility which shall include:

      (i) Description of alternative means to attain no discharge of salt.

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

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

9. If, in the opinion of the permitting authority, the database for the salinity characteristics of the water source and the discharge is inadequate, the permit will require that the permittee monitor the water supply and the discharge for salinity. Such monitoring program shall be completed in two years and the permittee shall then present the once-through demonstration data as specified above.

10. All new and reissued NPDES permits for once-through noncontact cooling water discharges shall require at a minimum semiannual monitoring of the salinity of the intake water supply and the effluent, as provided below.

    a. The intake monitoring point shall be the point immediately before the point of use of the water.

    b. The effluent monitoring point shall be prior to the discharge point at the receiving stream or prior to commingling with another waste stream or discharge source.

    c. Discrete or composite samples may be required at the discretion of the permitting authority, depending on the relative uniformity of the salinity of the water supply.

    d. Analysis for salinity may be either total dissolved solids or electrical conductivity where a satisfactory correlation with total dissolved solids

has been established. The correlation shall be based on a minimum of five different samples.

D. Discharges of Salinity from a New Industrial Source with Operations and Discharging Facilities at Multiple Locations

1. The objective for discharges to surface waters from a new industrial source with operations and discharging facilities at multiple locations shall be to assure that such operations will have no adverse effect on achieving the adopted numeric salinity standards for the Colorado River System.

2. NPDES permit requirements for a new industrial source with operations and discharging facilities at multiple locations shall be defined, for purposes of establishing effluent limitations for salinity, as a single industrial source if these facilities meet the criteria:

   a. The discharging facilities are interrelated or integrated in any way including being engaged in a primary activity or the production of a principle product; and

   b. The discharging facilities are located on contiguous or adjacent properties or are within a single production area e.g. geologic basin, geohydrologic basin, coal or gas field or 8 digit hydrologic unit watershed area; and

   c. The discharging facilities are owned or operated by the same person or by persons under common or affiliated ownership or management.

3. The permitting authority may permit the discharge of salt from a new industrial source with operations and discharging facilities at multiple locations if one or more of the following requirements are met:

   a. The permittee has demonstrated that it is not practicable to prevent the discharge of all salt from the industrial source. This demonstration by the applicant must include detailed information on the factors set forth in Section I.A.1.b of the Policy for implementation of Colorado River Salinity Standards through the NPDES permit program; with particular emphasis on an assessment of salinity off-set options that would contribute to state or interstate salinity control projects or salt banking programs and offset all or part of the salt loading to the Colorado River associated with the proposed discharge.

   b. In determining what permit conditions shall be required under I.A.1.a.i., above, the permit issuing authority shall consider the requirement for an offset project to be feasible if the cost per ton of salt removal in the offset project options (i.e. the permittee's cost in conducting or buying into such projects where they are available) is less than or equal to the cost per ton

of salt removal for projects undertaken by the Colorado River Basin Salinity Control Forum or less than the cost per ton in damages caused by salinity that would otherwise be cumulatively discharged from the outfalls at the various locations with operations controlled by the industrial source; or

c. The pemittee has demonstrated that one or more of the proposed discharges is of sufficient quality in terms of TDS concentrations to qualify for a "fresh water waiver" from the policy of "no salt return, whenever practical." An individual discharge that can qualify for a fresh water waiver shall be considered to have no adverse effect on achieving the adopted numeric salinity standards for the Colorado River System.

4. For the purpose of determining whether a freshwater waiver can be granted, the quality of water discharged from the new industrial source with operations and discharging facilities at multiple locations, determined as the flow weighted average of salinity measurements at all outfall points, must meet the applicable benchmark concentration in accordance with Section I.A.1.a.iii., as set forth above.

5. Very small-scale pilot activities, involving 5 or fewer outfalls, that are sited in areas not previously developed or placed into production by a new industrial source operations and discharges at multiple locations under common or affiliated ownership or management, may be permitted in cases where the discharge of salt from each outfall is less than one ton per day or 366 tons per year. However, no later than the date of the first permit renewal after the pilot activities have become part of a larger industrial development or production scale effort, all discharging facilities shall be addressed for permitting purposes as a single industrial source with operations and discharges at multiple locations under common or affiliated ownership or management.

6. The public notice for NPDES permits authorizing discharges from operations at multiple locations with associated outfalls shall be provided promptly and in the most efficient manner to all member states in the Colorado River Basin Salinity Control Forum in relation to this policy.

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 discharge 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 366 tons per year. Evaluation will 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 be 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.

Attachment 1

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:

I. Significant site preparation work such as major clearing or excavation; and/or

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

III. 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.

IV. Contractual 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

Adopted 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 main stem 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 the 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 page 32 of the Forum's 1978 Revision of the Water Quality Standards for Salinity state: "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 (WPRS) 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 a 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:

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

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

III. 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 the state above that which would otherwise occur.

IV. The WPRS, with the assistance of the states, encourages and promotes 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.

V. The WPRS considers a federal contribution to the costs 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.

POLICY FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM FOR INTERCEPTED GROUND WATER

Adopted by
The Colorado River Basin Salinity Control Forum

October 20, 1982

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 ground waters. 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 ground water.

The discharge of [1]intercepted ground water 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 ground waters are intercepted with resultant changes in ground-water 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 366 tons per year. Evaluation will be made on a case-by-case basis.

II. Consideration should be given to the possibility that the ground water, 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 ground-water flow; chemical quality and quantity of ground water; and the location, quality, and quantity of surface streams and springs that might be affected. If the information adequately demonstrates that the ground water to be intercepted normally would reach the river system in a reasonable time frame and would contain approximately the same or greater salt load than if intercepted, and if no significant localized problems would be created, then the permitting agency may waive the "no-salt" discharge requirement.

[1]The term "intercepted ground water" means all ground water encountered during mining or other industrial operations.

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 ground-water flow, chemical quality and quantity of ground water, 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 ground-water 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 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 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. 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 ground water for industrial processes, dust control, etc. whenever it is economically feasible and environmentally sound.

POLICY FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM FOR FISH HATCHERIES

Adopted by
The Colorado River Basin Salinity Control Forum

October 28, 1988

The states of the Colorado River Basin in 1977 adopted the "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program." The objective was for "no-salt return" whenever practicable for industrial discharges and an incremental increase in salinity over the supply water for municipal discharges. The Forum addressed the issue of intercepted ground water under the 1977 policy, and adopted a specific policy dealing with that type of discharge.

A specific water use and associated discharge which has not been here-to-fore considered is discharges from fish hatcheries. This policy is limited exclusively to discharges from fish hatcheries within the Colorado River Basin. The discharges from fish hatcheries need to be addressed in a manner consistent with the 1977 and 1980 Forum policies.

The basic policy for discharges from fish hatcheries shall permit an incremental increase in salinity of 100 mg/L or less above the flow weighted average salinity of the intake supply water. The 100 mg/L incremental increase may be waived if the discharged salt load reaching the Colorado River system is less than one ton per day, or 366 tons per year. Evaluation is to be made on a case-by-case basis.

I. The permitting authority may permit a discharge in excess of the 100 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 100 mg/L limit.

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

A. Description of the fish hatchery and facilities.

B. Description of the quantity and salinity of intake water sources.

C. Description of salt sources in the hatchery.

D. Description of water rights, including diversions and consumptive use quantities.

E. Description of the discharge, covering location, receiving waters, quantity salt load, and salinity.

F. Alternative plans for minimizing salt discharge from the hatchery. Alternative plans should include:

1. Description of alternative means of salt control.

2. Cost of alternative plans in dollars per ton, of salt removed from discharge.

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

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

A. The practicability of achieving the 100 mg/L incremental increase.

B. Where the 100 mg/L incremental increase is not determined to be practicable:

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

2. Costs per ton of salt removed from discharge of each alternative plan.

3. Capability of minimizing the salt discharge.

IV. If, in the opinion of the permitting authority, the database for the hatchery is inadequate, the permit will contain the requirement that the discharger monitor the water supply and the discharge for salinity. Such monitoring program shall be completed within two years and the discharger shall then present the information as specified above.

V. All new and reissued NPDES permits for all hatcheries shall require monitoring of the salinity of the intake water supply and the effluent at the time of peak fish population.

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

APPENDIX C

States NPDES Permits List

LEGEND

NPDES PERMITS
EXPLANATION CODES

COLORADO RIVER BASIN SALINITY CONTROL FORUM
January 1, 2011 through December 31, 2013

NPDES permits are reviewed under two different criteria under Forum policy; these being municipal and industrial. In order for a permittee to be in compliance under the municipal criteria, the increase in concentration between inflow and outflow cannot be greater than 400 mg/L. Forum industrial criteria requires that no industrial user discharges more than 1.00 ton/day. Under Forum policy there can be granted exceptions to these limitations by the states. The following gives an explanation of the current status of the NPDES permits. Because at any given time many of the permits identified in this list are being reviewed, reissued, and/or terminated, and new discharge permits are being filed, this list must be considered as being subject to frequent change.

MUNICIPAL

(M) Municipal user in compliance with Forum policy.

(M-A) Municipal user in compliance with the 400 mg/L incremental increase provision.

(M-B) Municipal user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(M-1)* Permit has expired or been revoked. No discharge.

(M-2) Permittee did not discharge during the reporting period.

(M-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both inflow and outflow when the permit is reissued.

Measurements of inflow are not consistent with Forum policy;

(M-4A) Therefore, it is not known whether or not this municipal user is in compliance.

(M-4B) However, since outflow concentration is less than 500 mg/L it is presumed that this permit is not in violation of the ≤400 mg/L increase.

(M-5) Permittee is in violation of Forum policy in that there is an increase in concentration of >400 mg/L over the source waters. No provision has been made allowing this violation of Forum policy.

(M-5A) The state and/or EPA is currently working to bring permittee into compliance.

(M-5B) Though discharge is >400 mg/L over source waters, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(M-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(M-7) Insufficient data to know the current status of this permit.

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* Permits that have been expired or revoked and listed with the M-1 and I-1 explanation codes shall be removed from the NPDES list during the subsequent triennial review.

INDUSTRIAL

(I) Industrial user in compliance with Forum policy.

(I-A) Industrial user in compliance with the Forum's salinity offset policy.

(I-B) Industrial user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(I-1)* Permit has expired or been revoked. No discharge.

(I-2) Permittee did not discharge during the reporting period.

(I-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both volume and concentration of outflow when the permit is reissued.

(I-4) Either concentration or volume of outflow are not currently being reported, thus the permittee is in violation of Forum policy. It is not known if the discharge is in excess of the <1.00 ton/day requirement.

(I-5) Permittee is in violation of Forum policy in that discharge of salts is >1.00 ton/day. No provision has been made allowing this violation of Forum policy.

(I-5A) The state and/or EPA is currently working to bring permittee into compliance.

(I-5B) Though discharge is >1.00 ton/day, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(I-5C) The use of ground water under this permit is for geothermal energy and only heat is extracted. The intercepted salt and water are naturally tributary to the Colorado River System and hence, this discharge does not increase salt in the river. The permit is covered by the Forum's policy on intercepted ground waters.

(I-5D) This permit is in compliance with the Forum's policy for fish hatcheries. The use of the water is a one-time pass through, and the incremental increase in salinity is ≤ 100 mg/l.

(I-5E) This permit is for the interception and passage of ground waters and thus is excepted under the Forum's policy on intercepted ground waters.

(I-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(I-7) Insufficient data to know the current status of this permit.

LEGEND (continued)

NPDES PERMITS
REACH DEMARCATIONS

COLORADO RIVER BASIN SALINITY CONTROL FORUM

In order to provide a better understanding of the location of the various NPDES permits and the geographical sequence in the Colorado River System, each of the following NPDES permits is identified with a Colorado River reach number. The reach numbers have their origin in the old CRSS river model. Though this model is no longer used, the reach numbers assist in understanding the general location of the permits. The reaches are defined as:

100	Upper Main Stem	from headwaters of Colorado River to Colorado River near Cameo
190	Taylor Park	from headwaters of Gunnison River to above Blue Mesa Reservoir
200	Blue Mesa	from above Blue Mesa Reservoir to below Blue Mesa Dam
210	Morrow Point	from below Blue Mesa Dam to Crystal Reservoir
220	Lower Gunnison	from Crystal Reservoir to confluence with Colorado River
300	Grand Valley	from Colorado River near Cameo to confluence with Green River
310	Dolores River	from headwaters of Dolores River to confluence with Colorado River
401	Fontenelle	from headwaters of Green River to Green River near Green River, WY
411	Flaming Gorge	from Green River near Green River, WY to confluence with White and Duchesne Rivers
500	Yampa River	from headwaters of Yampa River to confluence with Green River
510	White River	from headwaters of White River to confluence with Green River
600	Green River	Green River from confluence with White and Duchesne Rivers to confluence with Colorado River
610	Duchesne River	from headwaters of Duchesne River to confluence with Green River
700	Lake Powell	Colorado River from confluence of with Green River to Lees Ferry
710	San Rafael River	from headwaters of San Rafael River to confluence with Green River
801	Upper San Juan River	from headwaters of San Juan River to San Juan near Bluff
802	Lower San Juan River	from San Juan near Bluff to confluence with Lake Powell
900	Glen Canyon to Lake Mead	Colorado River from Lees Ferry to backwaters of Lake Mead
905	Virgin River	from headwaters of Virgin River to backwaters of Lake Mead
910	Lake Mead	from backwaters of Lake Mead to Colorado River below Hoover Dam
920	Lake Mohave	Colorado River from below Hoover Dam down to I-40 bridge
930	Lake Havasu	Colorado River from I-40 bridge to below Parker Dam
940	Parker Dam to Imperial Dam	Colorado River from below Parker Dam to above Imperial Dam
945	Imperial Dam	Colorado River from above Imperial Dam to Gila and Yuma users

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2011 through December 31, 2013

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
Arizona						
AZ0025224	900	APACHE-SITGREAVES NATIONAL FOREST BLACK MESA RANGER STATION WASTEWATER TREATMENT PLANT	350	0.01	0.0133	M
AZ0025399	900	BISON RANCH	375	0.006	0.0085	M
AZ0024015	900	CANYON-VALLE AIRPORT WWTP	-	-	-	M-2
AZ0025755	900	CITY OF WILLIAMS WWTP	400	0.27	0.4089	M
AZ0023639	900	FLAGSTAFF, CITY OF RIO DE FLAG POTW	370	2	2.8009	M-4B
AZ0020427	900	FLAGSTAFF, CITY OF WILDCAT HILL POTW	470	3.05	5.4260	M-4B
AZ0024279	900	HIGH COUNTRY PINES	500	0.036	0.0681	M
AZ0025542	900	HOLBROOK, CITY OF PAINTED MESA POTW	-	-	-	M-2
AZ0025437	900	PINETOP LAKESIDE SANITARY DISTRICT WWTP	-	-	-	M-1
AZ0024422	900	SANDERS SCHOOL DISTRICT NO. 6 WWTP	840	0.04	0.1272	M
AZ0023841	900	SHOW LOW, CITY OF POTW	310	0.915	1.0736	M-4B
AZ0026034	900	SNOWFLAKE, CITY OF POTW	-	-	-	M-2
AZ0023477	900	SOUTH GRAND CANYON SANITARY DISTRICT WWTP, TUSAYAN WASTEATER TREATMENT PLANT	660	0.1	0.2498	M
AZ0026069	900	USBR/GLEN CANYON CRSP	1075	0.0054	0.0114	M
AZ0025666	900	USBR/GLEN CANYON SUMPS	450	0.35	0.5962	I
AZ0023612	900	USNPS/GRAND CANYON/ DESERT VIEW	515	0.016	0.0312	M
AZ0023621	900	USNPS/GRAND CANYON/INDIAN GARDENS	172	1.25	0.8138	I
AZ0110426	900	USNPS/GRAND CANYON/NORTH RIM	510	0.052	0.1004	M
AZ0022152	900	USNPS/GRAND CANYON/SOUTH RIM WWTP	528	0.25	0.4996	M
AZ0025755	900	WILLIAMS, CITY OF POTW				M-1
AZ0023833	900	WINSLOW, CITY OF POTW	1000	0.9	3.4065	M-B
AZ0023655	905	VIRGIN RIVER DOMESTIC WASTEWATER IMP DISTRICT	800	0.04	0.1211	M
AZ0025160	910	USBR/HOOVER DAM	810	0.03	0.0920	M
AZ0000132	910	USFWS/WILLOW BEACH NATIONAL FISH HATCHERY	550	4	8.3270	I-5D
AZ0110248	920	USBR/DAVIS DAM	-	-	-	I-2
AZ0023523	920	USNPS/KATHERINE'S LANDING WTP	16.5	0.0330	0.0021	I
AZ0023035	930	BLUE BEACON OF KINGMAN	-	-	-	I-1
AZ0023990	930	CAWCD-HAVASU PUMPING PLANT	480	0.055	0.0999	I
AZ0026018	930	KINGMAN, CITY OF DOWNTOWN POTW	750	0.25	0.7097	M
AZ0022756	930	PETRO STOP CENTER/KINGMAN	1600	0.0800	0.4845	M
AZ0022268	930	PHELPS DODGE BAGDAD COPPER DIV	-	-	-	I-3
AZ0023752	940	QUARTZSITE, CITY OF POTW	1000	0.162	0.6132	M
California						
CA7000005	940	USBR Parker Dam & Power Plant DWF(R7-2007-0037)	560	0.009	0.02	M-1
Colorado						
CO0000010	510	Rangely Town of	652.0000	0.2085	0.5669	M-A
CO0000051	100	POC-1 LLC	1987.0000	0.9118	7.2926	I-5
CO0000132	220	Oxbow Mining LLC	1123.0000	0.0673	0.2795	I-B
CO0000213	310	Western Fuels - Colorado LLC	2245.7647	0.4115	4.1818	I-5B
CO0000221	500	Seneca Coal Co LLC	2357.9970	0.2559	2.1029	I-5B
CO0000230	100	Climax Molybdenum Company	0.0000	0.0000	0.0000	I-2
CO0000248	100	Climax Molybdenum Company	933.2000	17.8736	78.4299	I-5B
CO0000540	310	Tri-State Generation &Transmission Assn Inc	1535.2500	0.2702	1.7273	I-5
CO0020443	190	Crested Butte Town of	200.1250	0.2007	0.1755	M-A
CO0020451	100	Frisco Sanitation District	372.6190	0.5771	0.8628	M-A
CO0020699	100	Granby Sanitation District	301.7500	0.3282	0.4120	M-A
CO0020826	100	Silverthorne/Dillon Joint Sewer Authority	386.2727	1.2821	2.1233	M-A
CO0020834	500	Steamboat Springs City of	338.6250	2.3222	3.4230	M-A
CO0020907	220	Olathe Town of	1891.1667	0.2591	2.1161	M-5B
CO0021369	100	Eagle River Water & Sanitation Dist	409.1333	1.3825	2.4277	M-A
CO0021385	100	Red Cliff Town of	208.3333	0.0423	0.0493	M-A
CO0021539	100	Upper Blue Sanitation Dist	0.0000	1.2440	0.0000	M-7
CO0021598	100	Copper Mountain Consolidated Metro Dist	325.4074	0.2177	0.2992	M-A
CO0022756	190	Homestake Mining Co	703.4167	0.3676	1.1278	I-5B

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2011 through December 31, 2013

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
CO0022969	220	Morrison Creek Metropolitan Water and Sanitation District	431.5455	0.0589	0.1045	M-A
CO0023086	100	Snowmass Water Sanitation Dist	278.8710	0.7383	0.8846	M-A
CO0023485	300	Grand Mesa Metro Dist 2	457.4286	0.0224	0.0426	M-A
CO0023876	100	Dundee Realty USA LLC	640.0000	0.0085	0.0241	M-5/M-B
CO0024007	310	Naturita Town of	609.8000	0.0400	0.1032	M-A
CO0024431	100	Eagle River Water & Sanitation Dist	528.0000	2.0000	4.4035	M-A
CO0026051	100	Winter Park Water and Sanitation District	317.0000	0.1774	0.2328	M-A
CO0026387	100	Aspen Consolidated Sanitation District	585.6061	1.2806	3.2289	M-A
CO0027146	300	Snowcap Coal Company Inc	1295.5556	0.4099	2.2356	I-5B
CO0027154	500	Twentymile Coal LLC	2202.1265	0.1535	1.3852	I-5B
CO0027171	190	Mt Crested Butte Water and Sanitation District	291.9286	0.3392	0.4234	M-A
CO0029955	100	Snake River WWTF	341.7857	0.5212	0.7900	M-A
CO0030449	220	West Montrose Sanitation District	566.0000	0.2976	0.6850	M-A
CO0030635	500	Yampa Town of	408.4500	0.0305	0.0536	M-A
CO0031062	500	Whiteman School	285.0000	0.0025	0.0029	M-A
CO0031984	220	Cedaredge Town of	336.2917	0.1481	0.2010	M-A
CO0032115	500	Trapper Mining Inc	1581.8723	0.1483	0.9699	I-B
CO0032638	500	Chevron Mining Inc	4221.0000	0.5190	8.8431	I-5B
CO0033791	300	Clifton Sanitation District	709.5294	1.1740	3.4360	M-A
CO0034142	500	Moffat County Mining LLC	1343.0588	0.6781	2.8795	I-5
CO0035394	190	U S Energy Corp	750.0000	0.6035	1.9114	I-5
CO0035556	500	Steamboat Lake Water and Sanitation Dist	441.4545	0.0468	0.0927	M-A
CO0036251	310	Cotter Corp	0.0000	882.0000	0.0000	I-4
CO0036684	500	Twentymile Coal LLC	3632.3750	0.0269	0.5057	I-B
CO0037206	220	Mount Sneffels Mining Co LLC	140.1111	0.0202	0.0058	I-B
CO0037311	100	Eagle River Water & Sanitation Dist	615.6552	0.9946	2.5200	M-5
CO0037681	100	Three Lakes Water and Sanitation District	288.5455	0.4762	0.5799	M-A
CO0037729	220	Crawford Town of	281.8333	0.3039	0.0350	M-A
CO0038024	510	Blue Mountain Energy Inc	783.3333	0.0055	0.0191	I-B
CO0038342	100	McClane Canyon Mining LLC	1501.3317	0.0341	0.0183	I-B
CO0038598	100	Sunlight Inc	0.0000	0.0040	0.0000	I-B
CO0038776	220	Mountain Coal Co LLC	1867.0588	0.0544	0.4519	I-B
CO0039624	220	Montrose City of	1068.8333	2.0675	0.0000	M-5/M-B
CO0039641	220	Delta City of	1312.3824	1.0292	5.5531	M-5
CO0040037	500	Craig City of	480.8000	0.9163	1.9111	M-5
CO0040053	300	Mesa Co/Grand Junction City of	808.4848	8.4755	27.0023	M-5
CO0040142	100	Fraser Town of	313.4667	0.7406	0.9444	M-A
CO0040487	100	Collbran Town of	859.5000	0.0704	0.2561	M-5/M-B
CO0040673	200	Lake City Town of	302.6000	0.0587	0.0719	M-A
CO0040959	500	Hayden Town of	551.5642	0.1924	0.4545	M-5/M-B
CO0041106	500	Oak Creek Town of	507.4545	0.1494	0.3391	M-5/M-B
CO0041530	220	Gunnison City of	373.2941	1.2077	1.7411	M-A
CO0042161	500	Twentymile Coal LLC	3560.5000	0.0769	0.1166	I-B
CO0042447	100	Tri-State Generation and Transmission Association Inc	1875.8750	0.0158	0.1083	I-B
CO0042480	100	CBS Operations Inc	3500.6942	0.4139	6.3515	I-5B
CO0042617	220	Volunteers of America Care Fac	350.0000	0.0078	0.0114	M-A
CO0043397	220	Ouray City of	773.3330	0.1533	0.4830	M-5/M-B
CO0044750	100	Roaring Fork Water and San District	839.5000	0.0603	0.2102	M-A
CO0044776	220	Bowie Resources LLC	731.6667	0.0143	0.0445	I-B
CO0044903	220	Hotchkiss Town of	1081.3583	0.1688	0.7120	M-5/M-B
CO0045161	500	Colowyo Coal Co LP	2144.0189	0.0593	0.5970	I-B
CO0045217	190	Brookway Irwin LLC	0.0000	0.0000	0.0000	M-2
CO0045411	100	Young Life Campaign Inc	953.7500	0.0084	0.0325	M-5/M-B
CO0045420	100	Upper Blue Sanitation Dist	297.4923	0.6120	0.7592	M-A

NPDES PERMITS

Colorado River Basin Salinity Control Forum

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NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
CO0045501	100	Tabernash Meadows Water and Sanitation Dist	309.2500	0.0356	0.0457	M-A
CO0045802	100	Oak Meadows Service Company	955.7500	0.0129	0.5511	M-A
CO0046124	100	Spring Valley Sanitation Dist	778.9167	0.0309	0.0996	M-4A
CO0046175	100	Fruita Development LLC	0.0000	0.0000	0.0000	I-2
CO0046370	100	Redstone Water Sanitation Dist	0.0000	0.0152	0.0000	M-2
CO0046566	100	Colorado Mountain Resort Investors LLC	385.4211	0.0114	0.1874	M-A
CO0047139	510	Meeker Sanitation District	644.2333	0.1534	0.4226	M-A
CO0047431	220	Paonia Town of	867.8333	0.2280	0.9058	M-5/M-B
CO0047449	500	Routt County	599.0909	0.0128	0.0343	M-A
CO0047562	300	Energy Fuels Resources Corp	0.0000	0.0000	0.0000	I-2
CO0048119	100	LKA International Inc	0.0000	0.0000	0.0000	I-2
CO0048135	100	DeBeque Town of	1105.6364	0.0374	0.1180	M-4A
CO0048143	300	Mesa Water Sanitation Dist	0.0000	0.0141	0.0000	M-2
CO0048151	100	Rifle City of	1110.3529	0.8393	4.0047	M-4A
CO0048233	100	Minrec Inc	0.0000	0.0500	0.0000	I-B
CO0048241	100	Eagle Town of	649.2387	0.4712	1.2715	M-A
CO0048275	500	Peabody Sage Creek Mining LLC	3251.4069	0.4444	6.3884	I-5B
CO0048437	100	Kremmling Sanitation District	261.2727	0.1516	0.1641	M-A
CO0048577	100	Pitkin Iron Corp	0.0000	0.0000	0.0000	I-2
CO0048623	500	Sidney Peak Ranch	2252.2222	0.0176	0.1684	I-B
CO0048739	510	BOPCO LP	0.0000	0.0000	0.0000	I-2
CO0048815	100	Glenwood Springs City of	3851.3333	0.0035	0.0562	I-B
CO0048816	100	Occidental Oil Shale Inc	2200.0000	0.0039	0.0371	I-B
CO0048823	100	Avalanche Ranch Cabins & Antiques	2076.7368	0.1222	1.6433	I-5
CO0048830	100	Gypsum Town of	288.6667	0.4117	0.4989	M-A
CO0048847	100	Colorado Retail Ventures Services LLC	411.0000	0.0029	0.0039	I-B
CO0048852	100	Glenwood Springs City of	637.4667	0.7974	2.0377	M-5
CO0048854	300	Fruita City of	523.5043	0.8486	1.7358	M-A
CO0048859	510	Shell Frontier Oil & Gas Inc	426.0000	0.0091	0.0167	I-B
CO0048866	100	ACA Moltz/JV	374.0000	0.0019	0.0000	I-B
COG130001	100	Colorado Parks and Wildlife	352.3000	5.4294	7.0934	I-5D
COG130004	190	Colorado Parks and Wildlife	142.7000	4.1182	2.5753	I-5D
COG130006	190	Colorado Parks and Wildlife	202.7000	5.5544	4.5947	I-5D
COG130007	100	Colorado Parks and Wildlife	182.3000	2.3920	1.7344	I-5D
COG130011	100	Colorado Parks and Wildlife	381.1500	6.1461	10.0901	I-5D
COG315285	100	Bargath LLC	884.3000	0.0117	0.0430	I-B
COG500003	100	Lafarge West Inc	1653.3333	0.0950	0.6550	I-B
COG500010	190	Oldcastle SW Group Inc	399.6667	1.0256	2.0646	I-7
COG500088	100	LaFarge West Inc	1237.2889	38.0711	2.4985	I-7
COG500119	100	Oldcastle SW Group Inc	1332.8000	0.4970	2.9745	I-7
COG500127	220	Whitewater Building Materials	2068.0000	0.0400	0.3533	I-B
COG500210	220	Elam Construction Inc	869.5000	0.0000	0.0000	I-B
COG500216	100	Oldcastle SW Group Inc	3815.8333	0.3299	3.8894	I-7
COG500243	500	Duckels Construction Inc	265.0000	0.4800	0.5304	I-B
COG500255	190	United Companies of Mesa County	2460.0000	0.7910	8.1142	I-7
COG500267	500	Lafarge North America	341.5000	16.9743	0.3636	I-B
COG500299	100	Oldcastle SW Group Inc	7576.6667	0.3216	10.7369	I-7
COG500312	500	Peabody Sage Creek Coal Mining LLC	190.0000	0.2376	0.1883	I-B
COG500350	500	Connell Resources Inc	370.0000	0.3263	0.4582	I-B
COG500356	100	Colorado Stone Quarries Inc	182.3333	0.1084	0.0824	I-B
COG500364	300	Grand Junction Pipe and Supply	1962.2222	0.2900	2.3426	I-7
COG500380	100	MA Concrete Construction Inc	6525.2222	0.6500	18.1631	I-7
COG500396	500	Precision Excavating Inc	276.3333	2.2291	2.8876	I-7
COG500397	190	Oldcastle SW Group Inc	627.3333	0.2867	0.7545	I-B

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COG500419	500	3B Enterprises LLC	1291.0636	0.7567	3.4116	I-7
COG500420	190	Oldcastle SW Group	267.0000	3.0150	2.0300	I-7
COG500433	100	Everist Materials LLC	526.5000	0.4333	1.3551	I-7
COG500437	100	Oldcastle SW Group Inc	2572.5000	0.2768	3.2726	I-7
COG500458	220	Diamond Lazy L Ranch	1515.0000	0.4463	4.5274	I-7
COG500464	190	Oldcastle SW Group Inc	1413.3333	2.4209	12.0151	I-7
COG500467	100	Oldcastle SW Group Inc	1193.2500	0.8249	5.8553	I-7
COG500482	100	Lafarge West Inc	702.6120	0.1375	0.3246	I-B
COG500484	510	Connell Resources Inc	1155.0833	0.1323	0.8362	I-B
COG500493	100	Silt Sand and Gravel LLC	1015.0000	0.5945	3.9786	I-1
COG500497	100	Oldcastle SW Group Inc	638.0000	1.0768	2.0258	I-7
COG500498	190	Oldcastle SW Group Inc	2291.8182	0.0000	10.3361	I-7
COG501505	300	Grand Junction Pipe and Supply	757.0000	0.4575	1.6399	I-7
COG501510	190	Oldcastle SW Group Inc	912.6000	0.7478	3.1795	I-7
COG501513	100	MA Concrete Construction Inc	548.0000	0.6500	12.1322	I-7
COG501522	500	Connell Resources Inc	1630.7500	0.3243	2.9774	I-7
COG501524	500	Northwest Aggregates Inc	470.6667	0.7000	1.3739	I-7
COG501542	300	Oldcastle SW Group Inc	2237.0000	0.2300	2.1455	I-7
COG588006	100	Riverbend Water and Sewer Company	1937.8333	0.0173	1.4548	M-5
COG588008	100	West Glenwood Springs Sanitation Dist	322.6667	0.2768	0.3958	M-A
COG588012	190	Almont Sewage Hereafter In Transit Plant	412.2300	0.0108	0.0271	M-A
COG588029	100	El Rocko Mobile Home Park	462.8333	0.0020	0.0039	M-A
COG588032	220	Delta Correctional Center	446.2000	0.0322	0.5549	M-A
COG588035	100	H Lazy F LLC	667.4000	0.2191	0.0576	M-A
COG588041	100	Allegient Management	91.3333	0.0086	0.0027	M-A
COG588045	190	Crested Butte South Metro District	325.9392	0.0915	0.0940	M-A
COG588046	100	Silt Town of	773.0833	0.2102	0.6778	M-A
COG588047	310	Ridgway Town of	522.6667	0.0822	0.1820	M-A
COG588049	100	Independence Environmental Services	354.7273	0.0357	0.0533	M-A
COG588050	100	Carbondale Town of	332.0000	0.5626	0.7415	M-A
COG588051	100	Ranch at Roaring Fork	356.8218	0.0411	0.0526	M-A
COG588052	200	L and N Inc	695.0500	0.0417	0.0127	M-A
COG588061	100	Talbott Enterprises Inc	1611.6667	0.0557	0.3799	M-5/M-B
COG588062	100	New Castle Town of	788.3083	0.2178	0.7216	M-5/M-B
COG588063	100	Basalt Sanitation District	331.0000	0.4028	0.5126	M-A
COG588066	220	Riversbend HOA	767.2727	0.0016	0.0051	M-A
COG588067	100	Colorado Dept of Transportation	761.3083	0.0016	0.0387	M-A
COG588070	100	Hermes Group	456.5000	0.0168	0.0334	M-A
COG588072	100	C Lazy U Ranch Holdings LLC	296.2250	0.0054	0.0055	M-A
COG588074	100	Blue Creek Ranch LLC	762.6033	0.0100	0.0338	M-5/M-B
COG588075	100	Colorado Dept of Transportation	1191.0250	0.0009	0.0048	M-5/M-B
COG588076	100	Colorado Dept of Transportation	589.0000	0.0015	0.0033	M-A
COG588079	100	East River Regional Sanitation District	261.9808	0.0479	0.0626	M-A
COG588081	100	Weiss & Associates	1301.9167	0.0383	0.0623	M-A
COG588083	100	Rock Gardens MHP	417.7500	0.0020	0.0036	M-A
COG588084	100	Hot Sulphur Springs Town of	400.9091	0.0802	0.1354	M-A
COG588085	100	Aspen Village Inc	385.5455	0.0344	0.0559	M-A
COG588086	300	SW Mesa County Rural Public Improvement District	950.7750	0.0140	0.0483	M-5/M-B
COG588103	100	Woody Creek Mobile HOA	346.3333	0.0134	0.0187	M-A
COG588105	100	Mid Valley Metro District	408.9167	0.3242	0.5065	M-A
COG588109	190	Ute Trail Ranch Foundation	409.9355	0.0016	0.0027	M-A
COG588112	220	Camp Gunnison Inc	361.7538	0.0039	0.0051	M-A
COG588116	100	Roundup River Ranch	1355.9091	0.0019	0.0055	M-5/M-B
COG588123	310	Camp Red Cloud	428.1667	0.0023	0.0000	M-A

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COG589026	500	Routt County Phippsburg	569.0909	0.0168	0.0414	M-A
COG589040	500	Moffat County Improvement District	409.3333	0.0054	0.0091	M-A
COG589067	100	Nucla Town of	1018.4727	0.0787	0.3666	M-5/M-B
COG589083	300	Palisade Town of	477.2857	0.2000	0.3981	M-A
COG589086	100	Battlement Mesa Metro Dist	695.9167	0.4449	1.2645	M-A
COG589094	100	Fruita City of	614.6000	0.7192	1.8432	M-A
COG589110	100	Wastewater Treatment Service LLC	847.6364	0.0611	0.2259	M-A
COG589128	300	Palisade Town of	421.0000	0.2080	0.3666	M-A
COG600308	100	Glenwood Hot Springs	19005.0000	3.0375	236.3407	I-7
COG600544	220	Ouray City of	1783.9091	0.6350	4.6861	I-7
COG600603	500	Old Town Hot Springs	833.8182	0.0080	0.0267	I-B
COG603009	220	Montrose City of	1103.5455	8.3453	37.9356	I-7
COG603045	500	Catamount Metro District	248.0000	0.0023	0.0023	I-B
COG603050	100	Aspen City of	351.0000	0.0020	0.0029	I-B
COG603068	100	West Frisco Gateway Center LLC	198.0000	0.1802	0.0000	I-B
COG603076	100	Vail Resorts Inc	265.3091	0.3960	0.7924	I-B
COG603117	100	Frisco Sanitation District	233.0500	0.5511	0.5611	I-B
COG603127	100	Ritz Carlton Residences and Club at Vail	529.7429	0.8640	1.9086	I-7
COG603140	100	Copper Mountain Inc	230.5106	0.9793	1.0054	I-7
COG603147	100	OSP Condominiums at Apres Ski Way Owners Association	871.4545	0.0057	0.0199	I-B
COG603151	100	Rock Resorts Intl	595.7727	1.2240	3.1789	I-7
COG603155	100	Solaris Property Owner LLC	757.0909	0.2006	0.6469	I-B
COG603205	100	Vail Corporation The	475.6000	162.7304	419.8184	I-7
COG603216	100	Eagle Valley Clean Energy LLC	1239.6000	5.0000	0.0000	I-B
COG603217	100	Base Village Company	496.6667	9.5000	38.8219	I-7
COG603219	100	Vail Resorts Inc	120.3333	122.0000	0.0000	I-B
COG603220	100	Vail Resorts Inc	135.6250	461.0000	66.6449	I-7
COG603222	100	Manor Vail Lodge	710.0000	1430.0000	4174.1700	I-7
COG603223	100	Vail Resorts Inc	114.5000	1600.0000	834.0000	I-7
COG605009	100	Covered Bridge Building Assoc Inc	299.7778	0.2714	0.5316	I-B
COG641006	100	Dillon Town of	146.3900	0.0536	0.0389	I-B
COG641015	220	Cedaredge Town of	57.6000	0.0593	0.0157	I-B
COG641019	100	Hot Sulphur Springs Town of	178.1818	0.0055	0.0040	I-B
COG641052	100	Glenwood Springs City of	155.3333	0.0444	0.0288	I-B
COG641066	100	Aspen City of	307.2000	0.0324	0.0320	I-B
COG641067	100	Frisco Town of	39.9091	0.0052	0.0032	I-B
COG641068	300	Battlement Mesa Metro Dist	202.0000	0.0660	0.0000	I-B
COG641072	100	Gateway Metro District	958.2222	0.0124	0.0483	I-B
COG641081	220	Orchard City Town of	66.2911	0.2173	0.0722	I-B
COG641092	100	New Castle Town of	580.0000	0.0000	0.0000	I-B
COG641095	100	Basalt Town of	96.1818	0.0033	0.0014	I-B
COG641104	220	USCDWUA	112.9167	0.0295	0.0128	I-B
COG641105	100	Upper Eagle Regional Water Authority	234.0000	0.0150	0.0146	I-B
COG641108	100	Rifle City of	207.9167	0.2113	0.2041	I-B
COG641112	100	Silt Town of	585.8333	0.0134	0.0324	I-B
COG641119	100	Breckenridge Ski Resort	25.7143	0.0004	0.0000	I-B
COG641135	100	Holland Creek Metro Dist	622.2500	0.0115	0.0289	I-B
COG840002	100	GreenBack Produced Water Recovery LLC	210.6000	0.0199	0.0000	I-B
COG840009	510	AG Andrikopoulous Resources Inc	3968.3158	12.0063	213.0964	I-5
COG850008	500	Hayden Gulch Terminal Inc	1040.0000	0.0176	0.0763	I-B
Nevada						
NV0000060	910	Titanium Metals Corporation	665.7	3.784	10.505	I
NV0020133	910	City of Las Vegas	1050.6	42.780	187.430	M-4A

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NV0020192	910	NDOW - Lake Mead Fish Hatchery	583.4	0.283	0.689	I - 5D
NV0021261	910	Clark County Water Reclamation District - AWT Plant	1085.0	99.720	451.270	M-4A
NV0021563	910	Clark County Water Reclamation District - Laughlin Plant	1044.0	2.049	8.921	M-4A
NV0021750	910	Las Vegas Hilton Hotel and Casino Parking Garage		0.004		I-7
NV0022098	910	Kurt Segler Water Reclamation Facility - City of Henderson	1139.5	13.391	63.631	M-4A
NV0022195	910	Valley Hospital Medical Center		0.008		I-5E
NV0022691	910	Lake Las Vegas Resort (Dam)	0.0	0.000	0.000	I-2
NV0022772	910	Sterling/Squire/Crescendo HOA (formerly Saxton)				I-5E
NV0022781	910	Shanghai Partners - Tomiyasu Residence	730.3	0.076	0.231	I-5E
NV0022837	910	Conoco Phillips Company - Circle K Store No. 0695	1829.4	0.002	0.016	I-5E
NV0022845	910	Harrah's Las Vegas Hotel & Casino	0.0	0.000	0.000	I-2
NV0022870	910	7-Eleven Store # 19653	0.0	0.000	0.000	I-2
NV0022888	910	Las Vegas Sands-Venetian Casino Resort	1621.5	0.029	0.197	I-5E
NV0022942	910	Lloyd D. George Federal Courthouse	2455.7	0.000	0.000	I-5E
NV0022985	910	Planet Hollywood Resort Casino (formerly Aladdin Resort)	480.4	0.000	0.000	I-5E
NV0022993	910	Golden Nugget Hotel and Casino	1324.2	0.000	0.000	I-5E
NV0023035	910	Neonopolis Project	990.0	0.027	0.112	I
NV0023043	910	Maryland Villas Apartment Complex	1694.0	0.855	6.037	I
NV0023060	910	Tronox LLC	5275.0	1.311	28.840	I
NV0023094	910	Former Union 76 Station No. 4616	0.0	0.000	0.000	I
NV0023159	910	Clark County Regional Justice Center	1513.2	0.006	0.040	M
NV0023183	910	City Center Place	1356.0	0.005	0.026	M
NV0023191	910	Caesar's Palace Hotel and Casino	2273.8	0.007	0.069	I
NV0023221	910	7-Eleven Store # 27607	0.0	0.000	0.000	I-2
NV0023230	910	Kinder Morgan Las Vegas Terminal	591.0	0.003	0.008	I
NV0023248	910	Riviera Hotel and Casino	0.0	0.000	0.000	I-2
NV0023256	910	The Stirling Club	2487.5	0.027	0.276	I
NV0023311	910	7-Eleven Store # 25586	0.0	0.000	0.000	I-2
NV0023396	910	7-Eleven Store # 20826	937.1	0.002	0.008	I
NV0023477	910	Sky Las Vegas Master Association	541.0	0.013	0.030	I
NV0023485	910	Las Vegas Academy	2340.0	0.002	0.021	M
NV0023507	910	NNSA/NSO North Las Vegas Facility	1211.0	0.002	0.012	M
NV0023515	910	The Cosmopolitan Resort & Casino	2016.7	0.009	0.074	I
NV0023523	910	Terrible's Hotel and Casino	2583.0	0.000	0.001	I
NV0023558	910	Panorama Towers	2214.5	0.007	0.069	I
NV0023566	910	Fountainbleau Casino and Resort	2421.2	0.260	2.626	I-5E
NV0023604	910	Howard Hughes Office Complex	2736.4	0.006	0.069	I
NV0023621	910	Echelon Resort	2533.3	0.309	3.265	I-5E
NV0023647	910	City of North Las Vegas Water Reclamation Facility	873.5	13.844	50.427	M-4A
NV0023663	910	Former Conoco Station No. 28003	1326.7	0.002	0.011	I
NV0023671	910	Former Cappy's Cleaners	6018.2	0.016	0.405	I
NV0023701	910	City Center Land	2416.7	0.029	0.293	I
NV0023736	910	Bowman Reservoir & Muddy River Outfalls	590.0	4.164	10.252	M
NV0023744	910	Baymont Inn and Suites (formerly Holiday Inn Hotel)				I-5A
NV0023761	910	McCarran International Airport	1245.8	0.0321	0.167	I
NV0023787	910	Tesoro Refining & Marketing Co LLC #05326	3234.1	0.0042	0.056	I
NV0023809	910	Terrible Herbst #225	905.1	0.0024	0.009	I
NV0023817	910	Alfred Merritt Smith WTF	596.1	0.0677	0.168	M
NV0023833	910	Southern Nevada Water Authority - 5 Upper Wash Weirs	3360.0	0.0462	0.648	I
NV0023841	910	Hudson Cleaners	2378.8	0.0446	0.443	I
NV0023876	910	SNWA - Three Kids (Demonstration Replacement) Weir	0.0	0.0000	0.000	I-2
NV0023914	910	SNWA - Historic Lateral Weir Expansion	3523.6	0.4689	6.890	I-7
NV0023931	910	Mendenhall Center - UNLV	2954.7	0.0035	0.043	I-7

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NV0023949	910	Former Texaco Service Station	655.3	0.0012	0.003	I
NV0024074	910	7-Eleven Store # 29643		0.0157		I-5E
NV0024082	910	Whitney Mesa Trails & Trailhead	0.0	0.0000	0.000	I-2
NV0024112	910	American Pacific Corp AGTS	2860.0	0.4563	5.442	I-7
NV0024121	910	City of North Las Vegas Utilities Water System O&M		0.1100	-	I-3
NV0024139	910	City of Henderson Water Systems and Facilities		0.0216	-	I-3
NV0024155	910	Pecos Express Sinclair	1868.0	0.0142	0.111	I-7
NV0024180	910	Maryland Parkway Lift Station Decommissioning	1873.0	0.0234	0.183	I-7
NV0024198	910	Tropicana East Shopping Center		0.0021	-	I-3
NV0024200	910	Central Plant Membranes Phase 2	0.0	0.0000	0.000	I-2
NV0024202	910	Sunset Regional Park Splash Pad				I-7
NV0024206	910	The Waterhole	5187.0	0.0130	0.281	I-7
NV0024209	910	Section Seven Community Association				I-7
NV0024210	910	Las Vegas Wash Channel Improvement Project	0.0	0.0000	0.000	I-2
NV0024211	910	Cooper Street Bridge Improvements		0.0000		I-2
New Mexico*						
NM0028762	801	Aztec, City of / WTP	407.5	0.1625	0.1614	I
NM0020168	801	Aztec, City of / WWTP	253	0.584	0.61	M
NM0029319	801	Central Consolidated School District	0	0	0	I-1
NM0020770	801	Bloomfield, City of / WWTP	315	0.85	1.11	M
NM0000043	801	Farmington, City of / Animas Steam Plant	471.33	11.56	22.59	I-7
NM0031135	801	Farmington Electric Utiltiy System (FEUS)				I-7
NM0028258	801	Farmington Sand & Gravel Co.	0	0	0	I-2
NM0020583	801	Farmington WWTP	420.54	5.15	9.03	M-5A
NM0020672	900	Gallup WWTP	-	2.25	9.97	M-4A
NM0029025	801	Harper Valley Subd.	372.4	0.4	0.05	M-5A
NM0030953	801	Navajo Dam DWC & NSW, Inc	0	0	0	I-2
NM0027995	801	Oldcastle SW Group, Inc.		0.7	1.5	I-7
NM0028606	801	Public Service Co of NM - San Juan	0	0	0	I-2
NM0020524	900	Quivira Mining Company - Church Rock	0	0	0	I-7
NM0023396	900	Ramah Water & Sanitation Dist.	580	0.03	0.045	M-5
NM0029505	801	San Juan Coal Company - La Plata	0	0	0	I-2
NM0028746	801	San Juan Coal Company - San Juan	0	0	0	I-2
NM0029432	801	Yampa Mining Co. (De-na-zin Mine)	0	0	0	I-7
NM0029475	801	Yampa Mining Co. (Gatew.)	0	0	0	I-7
***Permits in New Mexico are issued by the U.S. EPA and certified by the State of New Mexico Environmental Department.**						
Utah						
UTG040027	900	Alton Coal Development	1037	0.00775	0.05	I-1
UT0025992	900	Alton Coal Development	1037	0.00775	0.05	I
UTG040007	600	Andalex Wildcat Loadout	-	-	0.05	1
UT0025674	600	Andalex-Pinnacle Coal Mine	-	0	0	I-1
UTG640027	411	Ashely Valley WTP	-	-	-	M-6
UTG640003	411	Ashley Springs WTP	-	-	-	M-6
UT0025348	411	Ashley Valley Water & Sewer, Mechanical	541	2.7	6.09	M-5B
UTG640019	802	Blanding Culinary Water Treatment	-	-	-	M-6
UTG040011	600	Canyon Fuel Co.- Banning Loadout	-	0	0	I-2
UT0024759	600	Canyon Fuel Co.- Dugout Mine	560	0.06	0.14	I-A
UT0023540	600	Canyon Fuel Co.- Skyline Mine	428	5.62	11.8	I-A
UT0022918	700	Canyon Fuel Co.- SUFCo Mine	650	2.88	7.8	I-5A
UT0023680	600	Canyon Fuel Co.-Soldier Creek Coal	186.5	0.002	0.009	I
UT0025828	300	Canyonlands by Night	548.4	0.00132	0.003	I
UT0025798	700	Capital Reef National Park	-	0	0	I-2
UTG040028	600	Carbon Resources-Kinney No. 2 Mine	-	0	0	I-2
UT0023663	710	Castle Valley SSD-Castle Dale	4877	0.119	2.42	M-B

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2011 through December 31, 2013

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
UT0020052	710	Castle Valley SSD-Ferron	-	0	0	M-2
UT0021296	710	Castle Valley SSD-Huntington	3073	0.15	1.92	M-B
UTG040026	700	Consolodated Coal Co.-Hidden Valley Mine Site	-	0	0	I-2
UT0022616	700	Consolodated Coal Co.-Underground	2867	3.27	15.78	I-5B
UTG040006	700	Hiawatha Coal Co.-Bear Canyon Mine	913	0.528	0.452	I
UT0020095	610	Duchesne City Corp.	-	0	0	M-2
UT0025801	610	Duchesne Valley	-	-	-	M-7
UTG640028	610	Duchesne Valley WTP	-	-	-	M-6
UTG640014	411	Dutch John WTP	-	-	-	M-6
UTG640012	600	E. Carbon City-Sunnyside CWTP	-	-	-	M-6
UTG640030	710	Emery WTP	-	-	-	M-6
UT0025712	300	Energy Queen Mine	-	0	0	I-2
UTG640039	710	Ferron WTP	-	-	-	M-6
UT0024368	710	Genwal Resources, Inc.-Crandall Canyon Mine	585	0.75	1.73	I-A
UTG640017	600	Green River WTP	-	-	-	M-6
UT0025771	600	Green River, City of	5250	0.833	18.2	M-B
UTG790021	905	Haycock Petroleum Remediation Site	4179	0.003245	0.063	I-1
UT0023094	600	Hiawatha Coal Co.	636	0.263	1.743	I-5B
UTG040019	600	Horizon Coal	262	0.00014	0.008	I
UTG640040	710	Huntington WTP	-	-	-	M-6
UT0024015	411	Intermountain Concrete	190.81	0.012	0.01	I-B
UT0023922	300	International Uranium Dension Mines	346	-	0.13	I
UTG040024	600	UEI Lila Canyon Mine	-	0	0	I-2
UT0025534	710	James Canyon Well System	-	0	0	I-2
UTG640023	411	Manilla WTP	-	-	-	M-6
UT0020419	300	Moab, City of	379	0.968	1.53	M
UT0024503	802	Monticello	-	0	0	M-2
UTG640015	802	Monticello City (Culinary WTP)	-	-	-	M-6
UTG640008	610	Myton Community Water System	-	-	-	M-6
UTG040010	600	NEICO	-	0	0	I-2
UT0023001	610	Neola Town Water & Sewer Assoc.	-	0	0	M-2, M-3
UTG790014	600	Olsen-Durrant (Former Bulk Fuel Facility)	1630	0.0072	0.05	I
UTG790029	600	Former Circle C Store In Price	-	0	0	I-1
UTG790028	600	Bill Barrett Corp-Nine Mile Compressor Station	460	0.0282	0.054	I
UTG640031	710	Orangeville WTP	-	-	-	M-6
UT0000094	600	PacifiCorp-Carbon Plant	2249	2.085	19.5	I-5B
UT0023604	710	PacifiCorp-Deer Creek Mine	547	1.54	3.5	I-5B
UTG040009	710	PacifiCorp-Hunter Plant Coal Prep & Blend Facility	-	0	0	I-2
UT0025607	710	PacifiCorp-Huntington Plant	-	0	0	I-2
UT0023728	710	PacifiCorp-Trail Mountain Mine	-	0	0	I-2
UT0022896	710	PacifiCorp-Wilberg Mine	718	0.034	0.101	I
UTG640035	600	Price City WTP	-	-	-	M-6
UT0021814	600	Price River Water Imp. Dist.	1173	1.63	7.97	M-A
UTG640034	600	Price River WID	-	-	-	M-6
UTG040005	600	Savage Industries Coal Terminal (CV-Spur)	-	0	0	I-2
UT0025224	905	Springdale	980	0.97	3.96	M-A
UTG640021	905	St. George WTP	-	-	-	M-6
UT0024686	905	St. George, City of	1262	9.2	48.4	M-5B
UTG040025	600	Star Point Refuse Pile(Sunnyside Cogen)	-	0	0	I-2
UT0024759	600	Sunnyside Cogen.	-	0	0	I-2
UTG640002	610	Tridell-Lapoint Water IDWTP	-	-	-	M-6
UTG130003	700	UDWR-Egan/Bicknell Fish Hatchery	120.6	11.87	5.97	I-5D
UTG130007	700	UDWR-Loa Fish Hatchery	155.2	8.44	5.46	I-5D
UTG130012	610	UDWR-Whiterocks Fish Hatchery	236.8	5.28	5.21	I-5D
UT0020338	411	USBOR-Flaming Gorge Dam	918	0.00053	0.002	M
UTG130001	411	USFWS-Jones Hole Fish Hatchery	188	6.7	5.25	I-5D
UTG640006	700	USNPS-Capitol Reef WTP	-	-	-	M-6
UTG640004	700	USNPS-Glen Canyon Hite WTP	-	-	-	M-6
UT0025810	300	Velvet Mine	-	0	0	I-2
UT0025640	600	West Ridge Resources Mine	809.73	2.642	8.92	I-A
UT0000035	411	Western Energy Operating-Ashley Valley Lease	1179.5	1.35	6.64	I-5B
UT0021768	411	Western Energy Operating-T.Hall Lease	-	0	0	I-1
UT0000124	411	Western Energy Operating-Pan American Lease	-	0	0	I-2

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2011 through December 31, 2013

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
Wyoming						
WY0000027	401	Green River-Rock Springs JPB Water Plant			0	M-2
WY0000086	401	Daniel Fish Hatchery	11		0	I-1
WY0000094	401	Boulder Rearing Station	0		0	I-5D
WY0020133	401	Big Piney Wastewater Lagoon	93.3	0.07	0.03	M-A
WY0020656	401	Pinedale Wastewater Lagoons	166	0.73	0.51	M-4B
WY0021806	401	Superior Waste Water Lagoon	225		0	M-4B
WY0021997	401	Marbleton Wastewater Lagoon	231	0.3	0.3	M-A
WY0022080	401	LaBarge Wastewater Lagoon	578	0.024	0.06	M-B
WY0022128	401	B & R Mobile Home Village	239	0.05	0.05	M-A
WY0022357	401	Rock Springs WWTP	812	2.41	8.45	M-5B
WY0023124	401	Daniels Mobile Home Park			0	M-2
WY0023825	401	Stansbury Mine			0	I-2
WY0028886	401	Leucite Hills Mine			0	I-2
WY0030261	401	Black Butte Mine		0	0	I-2
WY0030350	401	Jim Bridger Mine	1558		1	I-B
WY0051152	401	James Hodder Feed Lot			0	I-1
WY0052515	401	Boulder Oilfield Waste Recycling Facility			0	I-2
WY0054224	401	Jensen Disposal Facility - New Fork Discharge	128	0.17	0.09	I
WY0054232	401	Jensen Disposal Facility - Sand Draw Discharge			0	I-2
WY0020443	411	Green River Wastewater Lagoon	355	1.05	1.61	M-A
WY0056499	411	Pioneer Cryogenic Gas Plant	2000	0.025	0.22	I
WY0022896	411	Mountain View Wastewater Lagoon	393	0.2	0.34	M-A
WY0044199	411	Silver Eagle Refinery			0	I-1
WY0000051	411	Kemmerer Mine			0.264	I-B
WY0000116	411	Kemmerer Water Treatment Plant	735	0.31	0.98	M-B
WY0020117	411	Lyman Wastewater Lagoon	508	0.3	0.66	M-B
WY0020311	411	Naughton Plant	1300	2.32	19	I-5B
WY0020320	411	Kemmerer Wastewater Treatment	735	0.31	0.95	M-B
WY0022071	411	Fort Bridger Sewer District	562	0.2	0.315	M-B
WY0022373	411	Granger Wastewater Lagoon			0	M-2
WY0023132	411	Company's Green River Plant(Church & Dwight)			0	I-6
WY0032697	411	Carter Creek Gas Plant			0	I-2
WY0036153	411	Ft. Bridger Travel Stop		0	0	M-2
WY0094811	411	Haystack Coal				I-2
WY0021938	500	Dixon Wastewater Lagoon	269	0.05	0.04	M-A
WY0022888	500	Baggs Wastewater Lagoons	733	0.06	0.19	M-B
WY0042145	500	Cow Creek Unit	2130	0.05	0.46	I
WY0054038	500	Cow Creek CBNG Project			0	I-2
WY0056847	500	Morgan Run Unit II			0	I-2

APPENDIX D

EPA NPDES Permits List

LEGEND

NPDES PERMITS
EXPLANATION CODES

COLORADO RIVER BASIN SALINITY CONTROL FORUM
January 1, 2011 through December 31, 2013

NPDES permits are reviewed under two different criteria under Forum policy; these being municipal and industrial. In order for a permittee to be in compliance under the municipal criteria, the increase in concentration between inflow and outflow cannot be greater than 400 mg/L. Forum industrial criteria requires that no industrial user discharges more than 1.00 ton/day. Under Forum policy there can be granted exceptions to these limitations by the states. The following gives an explanation of the current status of the NPDES permits. Because at any given time many of the permits identified in this list are being reviewed, reissued, and/or terminated, and new discharge permits are being filed, this list must be considered as being subject to frequent change.

MUNICIPAL

(M) Municipal user in compliance with Forum policy.

(M-A) Municipal user in compliance with the 400 mg/L incremental increase provision.

(M-B) Municipal user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(M-1)* Permit has expired or been revoked. No discharge.

(M-2) Permittee did not discharge during the reporting period.

(M-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both inflow and outflow when the permit is reissued.

Measurements of inflow are not consistent with Forum policy;

(M-4A) Therefore, it is not known whether or not this municipal user is in compliance.

(M-4B) However, since outflow concentration is less than 500 mg/L it is presumed that this permit is not in violation of the ≤400 mg/L increase.

(M-5) Permittee is in violation of Forum policy in that there is an increase in concentration of >400 mg/L over the source waters. No provision has been made allowing this violation of Forum policy.

(M-5A) The state and/or EPA is currently working to bring permittee into compliance.

(M-5B) Though discharge is >400 mg/L over source waters, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(M-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(M-7) Insufficient data to know the current status of this permit.

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* Permits that have been expired or revoked and listed with the M-1 and I-1 explanation codes shall be removed from the NPDES list during the subsequent triennial review.

INDUSTRIAL

(I) Industrial user in compliance with Forum policy.

(I-A) Industrial user in compliance with the Forum's salinity offset policy.

(I-B) Industrial user in compliance with the 1 ton per day or 366 tons per year provision for intermittent discharges.

(I-1)* Permit has expired or been revoked. No discharge.

(I-2) Permittee did not discharge during the reporting period.

(I-3) Measurement of TDS is not currently required, but the state and/or EPA plans to require measurements of both volume and concentration of outflow when the permit is reissued.

(I-4) Either concentration or volume of outflow are not currently being reported, thus the permittee is in violation of Forum policy. It is not known if the discharge is in excess of the <1.00 ton/day requirement.

(I-5) Permittee is in violation of Forum policy in that discharge of salts is >1.00 ton/day. No provision has been made allowing this violation of Forum policy.

(I-5A) The state and/or EPA is currently working to bring permittee into compliance.

(I-5B) Though discharge is >1.00 ton/day, in keeping with Forum policy the permittee has demonstrated the salt reduction is not practicable and the requirement has been waived.

(I-5C) The use of ground water under this permit is for geothermal energy and only heat is extracted. The intercepted salt and water are naturally tributary to the Colorado River System and hence, this discharge does not increase salt in the river. The permit is covered by the Forum's policy on intercepted ground waters.

(I-5D) This permit is in compliance with the Forum's policy for fish hatcheries. The use of the water is a one-time pass through, and the incremental increase in salinity is ≤ 100 mg/l.

(I-5E) This permit is for the interception and passage of ground waters and thus is excepted under the Forum's policy on intercepted ground waters.

(I-6) This permit requires no discharge or discharge only under rare and extreme hydrologic conditions. Thus, flow and concentration measurements are not required.

(I-7) Insufficient data to know the current status of this permit.

LEGEND (continued)

NPDES PERMITS
REACH DEMARCATIONS

COLORADO RIVER BASIN SALINITY CONTROL FORUM

In order to provide a better understanding of the location of the various NPDES permits and the geographical sequence in the Colorado River System, each of the following NPDES permits is identified with a Colorado River reach number. The reach numbers have their origin in the old CRSS river model. Though this model is no longer used, the reach numbers assist in understanding the general location of the permits. The reaches are defined as:

100	Upper Main Stem	from headwaters of Colorado River to Colorado River near Cameo
190	Taylor Park	from headwaters of Gunnison River to above Blue Mesa Reservoir
200	Blue Mesa	from above Blue Mesa Reservoir to below Blue Mesa Dam
210	Morrow Point	from below Blue Mesa Dam to Crystal Reservoir
220	Lower Gunnison	from Crystal Reservoir to confluence with Colorado River
300	Grand Valley	from Colorado River near Cameo to confluence with Green River
310	Dolores River	from headwaters of Dolores River to confluence with Colorado River
401	Fontenelle	from headwaters of Green River to Green River near Green River, WY
411	Flaming Gorge	from Green River near Green River, WY to confluence with White and Duchesne Rivers
500	Yampa River	from headwaters of Yampa River to confluence with Green River
510	White River	from headwaters of White River to confluence with Green River
600	Green River	Green River from confluence with White and Duchesne Rivers to confluence with Colorado River
610	Duchesne River	from headwaters of Duchesne River to confluence with Green River
700	Lake Powell	Colorado River from confluence of with Green River to Lees Ferry
710	San Rafael River	from headwaters of San Rafael River to confluence with Green River
801	Upper San Juan River	from headwaters of San Juan River to San Juan near Bluff
802	Lower San Juan River	from San Juan near Bluff to confluence with Lake Powell
900	Glen Canyon to Lake Mead	Colorado River from Lees Ferry to backwaters of Lake Mead
905	Virgin River	from headwaters of Virgin River to backwaters of Lake Mead
910	Lake Mead	from backwaters of Lake Mead to Colorado River below Hoover Dam
920	Lake Mohave	Colorado River from below Hoover Dam down to I-40 bridge
930	Lake Havasu	Colorado River from I-40 bridge to below Parker Dam
940	Parker Dam to Imperial Dam	Colorado River from below Parker Dam to above Imperial Dam
945	Imperial Dam	Colorado River from above Imperial Dam to Gila and Yuma users

EPA ADMINISTERED NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2011 through December 31, 2013

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
* Permit issued to a federal agency or an Indian tribe and the responsibility of EPA						
** Issued by a tribal entity with delegation of the NPDES program						
Region 6 Permits						
NM0030520	801	Dulce, Village of	222	0.6	0.56	M-B*
Region 8 Permits						
CO0000086*	220	HOTCHKISS NTL. FISH HATCHERY		4.31		I-5D
CO0022853*	801	SOUTHERN UTE INDIAN TRIBE(E)	323	0.321	0.432	M
CO0034398*	801	USDINPS-MESA VERDE NAT PARK (E)	326	0.034	0.046	M
CO0034622*	801	USDINPS-MESA VERDE NAT PARK (E)		0.044		M-3
CO0034665*	801	FOUR CORNER MATERIALS	154	1.251	0.803	I
CO0034959*	801	IGNACIO PEAK WASTEWATER LAGOON				M-6
CO0034967*	801	SOUTHERN UTE WATER TRTMNT PLNT				M-2
CO0034975*	190?	USNPS - Colorado National Monument				M-6
COG589201*	801	TOWAOC WASTEWATER LAGOON				M-6
COG589202*	801	WHITE MESA WASTEWATER LAGOONS				M-6
COG589203*	801	TOWAOC WASTEWATER LAGOON 2				M-6
UT0000167*	510	American Gilsonite Co.	2,714	0.385	4.357	I-7
UT0025259*	510	American Gilsonite Co.				I-2
UT0023868*	510	Ziegler Chemical and Mineral				I-1
Region 9 Permits						
AZ0021415*	940	COLORADO RIVER JOINT VENTURE	<400	1.2		M
AZ0022560*	900	BIA/KEAMS CANYON		0.03		M-6
AZ0024619*	900	HOPI INDIAN NATION/ UPPER VILLAGE OF MOENKOPI WWTP				M
NN0020133	803	NACOGDOCHES OIL & GAS	<400	0.01		I-1
NN0020265**	802	NTUA/CHINLE	<400	0.783		M-
NN0020281**	802	NTUA/KAYENTA	<400	0.9		M
NN0020290**	900	NTUA/TUBA CITY	<400	1.1		M-6
NN0021555**	900	NTUA/WINDOW ROCK-FT.DEFIANCE	<400	1.32		M-6
NN0021610**	900	CAMERON TRADING POST		0.054		M-6
NN0022179**	900	PEABODY WESTERN COAL COMPANY/BLACK MESA COMPLEX				I
NN0022195**	900	NTUA/GANADO	<400	0.4		M
NN0024228**	900	NTUA/PINON WWTP				M
NN0030337**	900	BIA/LOW MOUNTAIN BOARDING SCHOOL	<400	0.014		M
NN0030339**		BIA/LUKACHUKAI COMMUNITY SCHOOL				M-6
NN0030341**		BIA/TORREON DAY SCHOOL				M-6
NN0110043**	802	BIA/NAZLINI BOARDING SCHOOL	<400	0.013		M
NN0110094**	801	BIA/~~TEEC NOS POS~~ TI'IS NAS BAZ SCHOOL	<400	0.08		M
NN0110167**	900	BIA/HUNTERS POINT SCHOOL	<400	0.014		M
NN0110183**	900	BIA/SEBA DALKAI BOARDING SCHOOL	<400	0.01		M
NN0000019	801	APS Four Corners Power Plant				I-7
NN0028193	801	BHP Navajo Mine				I-7
NN0020869	801	BIA Crystal Boarding School		0.015		M-7
NN0021016	801	BIA Lake Valley Boarding School		0.012		M-7
NN0020800	801	BIA Nenahnezad Community School		0.024		M-7
NN0020991	801	BIA Pueblo Pintado		0.016		M-7
NN0020958	900	BIA Wingate School		0.1		M-7
NN0029386	900	Chevron Mining, Inc. / McKinley Mine				I-7
NN0028584	801	Consolidation Coal Co Burnham Mine				I-7
NN0020621	801	NTUA Shiprock		1		M-7
NN0030335	900	NTUA Navajo Townsite		0.32		M-7
NN0030325	900	Ramah Navajo School Board - Pine Hill		0.035		M-7
NN0025178	900	RJG Inc. - Gouldings Lodge		0.072		M-6
NN0030342	900	NTUA Cane Valley		0.001		M-6
NN0030343	801	NTUA Northern Edge Casino		0.03		M-7
NN0030344		NTUA Twin Arrows Casino		0.13		

APPENDIX E

Colorado River Simulation System Model Description

COLORADO RIVER SIMULATION SYSTEM MODEL DESCRIPTION

The Colorado River Simulation System (CRSS) is the official long-term basin-wide planning model used by Reclamation's Upper Colorado and Lower Colorado Regions to simulate future Colorado River system conditions. The model framework used for this process is commercial software called RiverWare™, a generalized river basin modeling software package developed by the University of Colorado through a cooperative arrangement with Reclamation, the Tennessee Valley Authority and the U.S. Army Corps of Engineers.

CRSS was originally developed by Reclamation in the early 1970s and was implemented in RiverWare™ in 1996. The model projects future river and reservoir conditions on a monthly timestep over a period of decades into the future. CRSS has been used for most major modeling studies on the Colorado River, including several National Environmental Policy Act Environmental Impact Statements (EIS), most recently the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead EIS. CRSS was also the primary modeling tool for system projections in Reclamation's recently released Colorado River Basin Water Supply and Demand Study under WaterSMART.

There are numerous inputs to, and assumptions made by, CRSS with respect to future conditions on the Colorado River. The input data for CRSS includes hydrologic inflows, various physical process parameters such as the evaporation rates for each reservoir, initial reservoir conditions, and the future diversion and depletion schedules for entities in the Basin States and for Mexico. These future schedules are based on demand and depletion projections prepared and submitted by the Basin States. The rules of operation of the Colorado River mainstream reservoirs, including Lake Powell and Lake Mead, are also provided as input to the model. These sets of operating rules describe how water is released and delivered under various hydrologic and system conditions.

As the period of analysis increases, the uncertainty in these inputs and assumptions also increases. Therefore, a large amount of uncertainty in the corresponding outputs is expected. Consequently, CRSS is not used to predict future conditions, but rather to simulate what might occur. CRSS is particularly useful in making a relative comparison between hydrologic impacts from different operational alternatives by holding constant most inputs, as well as other key modeling assumptions, so as to isolate the differences due to each alternative. Also, sensitivity analyses that answer the question, "What is the sensitivity of the output to a particular set of inputs or assumptions?" are commonly performed.

Future conditions of the Colorado River system are most sensitive to assumptions with respect to future inflows. Because it is impossible to predict the actual future inflows into the system, a range of possible future inflows are analyzed and used to quantify the probability of occurrences of particular events (e.g., higher or lower lake elevations). This technique involves running multiple hydrologic sequences for each scenario or operational alternative. These sequences can be derived from a number of techniques.

Reclamation has used techniques based on (1) the historical observed natural flow record (1906-2010), (2) the paleo record derived from tree-rings (762-2005), and (3) 112 downscaled Global Climate Model (GCM) projections based on 16 unique GCMs.

The CRSS RiverWare™ model includes a salinity module to analyze salinity concentrations throughout the Colorado River Basin. The salinity model simulates the effects of water development projects and the salinity control program (SCP) on future salinity concentration levels in the Colorado River. The salinity control criteria are purposely designed to be long-term and non-degradational goals, rather than exceedance standards such as those used for industry or drinking water. Efforts of the SCP are designed to meet the criteria by implementing, as needed, the most cost effective salinity control projects. This ensures that the salinity control numeric criteria will continue to be met in the future, even with the salinity impacts produced by increasing Upper Basin depletions.

Salinity module inputs include salinity accompanying hydrologic inflows, initial reservoir salinity concentrations and estimates of salt loading due to agricultural return flows. Model results simulate annual average salinity concentrations at the numeric criteria stations downstream of Hoover Dam and Parker Dam and at Imperial Dam and can be used to analyze the probability of exceeding the numeric criteria in future years.

The salinity module within CRSS is intended for long-term (15 to 20 years) simulation and it is highly sensitive to initial conditions during the first 10 to 12 years. The model assumes salinity is a conservative water quality parameter, and reservoirs are modeled as fully mixed systems.

Modeling Assumptions for the 2014 Triennial Review

The following lists major modeling assumptions in a bulleted format for the 2014 Triennial Review. These assumptions reflect the January 2014 Configuration of CRSS. Documents referenced in these assumptions include the Final Environmental Impact Statement (Final EIS), Record of Decision (ROD) for Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead and Prairie and Rajagopalan's (2007) article entitled "A basin wide stochastic salinity model." Refer to these documents for additional detail regarding specific assumptions. All runs were performed using the Colorado River Simulation System (CRSS) long-term planning model.

<u>Key Assumptions Common to All Scenarios Updated Since the 2011 Triennial Review</u>

- Simulations performed from January 2014 through December 2035 at a monthly time step
- Initial conditions for all reservoirs are 2013 end-of-calendar year (EOCY) actual values
    - Includes pool elevation and reservoir salt concentration
- For modeling purposes, certain provisions (i.e., Shortage, Surplus, and Coordinated Operations) of the Interim Guidelines as adopted in the ROD (Section XI.G.) were extended from 2026 through 2035

- Future water demands for Upper Division water users are based on depletion projections prepared by the Upper Division states in coordination with the Upper Colorado River Commission (UCRC) dated December 2007
- Intentionally Created Surplus (ICS)
    - ICS creation and delivery schedules were updated in December 2009 by the Lower Division states. Initial ICS balances were updated January 2012
    - Rules for ICS activity remain unchanged from the ROD
- Water Quality Improvement Projects (WQIP) have been updated to reflect historical and projected control levels

Description of 2014 Triennial Review Scenarios

1) Scenario 1
- Salinity controls currently built or under construction BUT without additional controls
- 1,330,000 tons of control

2) Scenario 2
- Salinity controls currently built or under construction AND with Plan of Implementation through 2017
- 1,390,000 tons of control

3) Scenario 3
- Salinity controls currently built or under construction AND with Plan of Implementation through 2017 and projected future controls through 2035
- 1,850,000 tons of control

4) Scenario 4
- Salinity controls currently built or under construction AND with Plan of Implementation through 2017 and projected future controls through 2035
- 1,630,000 tons of control

5) Scenario 5
- Salinity controls currently built or under construction AND with Plan of Implementation through 2017 and projected future controls through 2035
- 1,680,000 tons of control

Other Assumptions Common to All Scenarios

1) Future hydrologic inflows are generated at 29 separate inflow points or nodes in the Colorado River watershed using the Indexed Sequential Method (Final Interim Guidelines EIS, Chapter 4.2.5). This technique is applied to the 105-year (1906 through 2010) historical record of calculated natural flows to produce 105 hydrologic inflow sequences or traces for each scenario.

2) Future salinity concentrations are generated at 20 nodes in Colorado River watershed using Reclamation's nonparametric natural salt model. The natural salt model includes annual (Upper Basin) and monthly (Lower Basin) regressions built with 1971-2010 natural flow and salt mass data. The natural salt model provides salt mass based on flows. Salt concentrations are computed from flow and salt mass. Prairie and Rajagopalan (2007) describes the methods used in the basin-wide salinity modeling framework.

3) Annual salt loading values from agriculture are assumed constant throughout the simulation horizon. Variations in salt mass resulting from variation in flow conditions (high and low) are not considered; therefore, when computing natural salt we expect negative natural salt values.

4) Reservoirs upstream of Lake Powell are generally operated to meet monthly storage targets or downstream demands (Final EIS, Appendix A).

5) Lake Mead flood control procedures are always in effect.

6) Except during flood control conditions, Lake Mead is operated to meet downstream demands under the applicable water supply condition (Normal, Surplus, or Shortage).

7) If Lake Mead elevation falls below 1,000 feet, delivery to the Southern Nevada Water Authority (SNWA) is reduced to zero for that month.

8) Lake Mohave and Lake Havasu are operated in accordance with their existing rule curves.

9) Future water demands for Lower Division water users are based on depletion schedules prepared by the Lower Division states for the Final EIS (Final EIS, Appendix D).

10) Future water deliveries to Mexico are made as follows:

    a. CRSS accounts for the entire delivery to Mexico at the Northerly International Boundary (NIB)

    b. Mexico's annual delivery schedule is set to 1,500 kaf

    c. An additional 7 kaf[1] is delivered at the NIB for a total annual delivery to Mexico of 1,507 kaf

    d. Mexico's annual delivery schedule is set to 1,700 kaf during Flood Control

11) Brock Reservoir is assumed to operate every year and is assumed to conserve approximately 90 percent of the historical average of non-storable flows from 1964 through 2012 (excluding flood years). This reduces the volume of non-storable flows arriving at the NIB from 73 kaf to 7 kaf annually.

12) Bypass of return flows from the Wellton-Mohawk Irrigation and Drainage District to the Cienega de Santa Clara in Mexico is assumed to be 109 kaf annually (historical average from 1990 through 2010), and is not counted as part of the 1944 Treaty delivery to Mexico.

13) Yuma Desalting Plant is assumed to not operate.

[1] The estimated annual average volume of non-storable (excess) flows with the Brock Reservoir in operation

APPENDIX F

Colorado River Salinity Damage Model

COLORADO RIVER SALINITY DAMAGE MODEL

The Salinity Damage Model (SDM) estimates monetary damages incurred in metropolitan and agricultural areas in the Lower Colorado River Basin where Colorado River water is used. The SDM estimates damages to six economic sectors of local economies including damages to household water-using appliances, water-using or water-treatment facilities in the commercial, industrial, and utilities sectors, changes in agricultural crop revenues, and additional costs related to meeting statewide water quality standards for groundwater and recycled water use for the Metropolitan Water District of Southern California (MWD) service area.

The SDM was updated to 2014 price levels where possible for the 2014 Review. Population projections in the model were updated starting in 2010 and going to 2040 for the MWD service areas, the Central Arizona metropolitan areas, the Las Vegas/Clark County area, and the communities along the lower portion of the Colorado River in Nevada, Arizona and California. Water demands and sources of supplies were updated over the 2010–2040 time period for the MWD portion of the SDM. Agricultural acres were updated for Imperial County and eastern Riverside County. Prices received for crops were updated to 2013 for southern California and all of the Arizona counties that are included in the model. Water treatment costs for the commercial, industrial, and water utilities sectors were indexed from a 2008 basis to a 2014 basis.

The SDM estimates damages arising from salinity levels greater than 500 TDS. The model does not account for on-farm management costs related to high salinity levels or the costs associated with replacing low salt-tolerance crops with high salt-tolerance crops in the Lower Basin agricultural areas. Preliminary investigations have been conducted on the impact of high salinity levels on golf course turf in the southwestern portion of the United States. Currently, Reclamation and MWD are working to update and enhance the MWD portion of the salinity damage model. This cooperative effort hopes to identify other salinity damages that are not currently identified within the present model. Other areas for future research could include estimating the costs or damages due to salinity contribution to groundwater areas in the southwest and the management costs associated with brine removal.

The Colorado River Salinity Damage Model consists of a number of EXCEL spreadsheets which include the inputs used by the model, the damage equations associated with each economic sector, and the outputs of the model. The initial worksheet displays some overall input data and the summary of quantifiable monetary damages by economic sector and primary agricultural and metropolitan areas that receive Colorado River water.

I. Summary Salinity Input and Monetary Damage Output Sheet

The upper portion of this spreadsheet contains the salinity levels of the lower Colorado River that are measured at Hoover, Parker and Imperial dams. This data can come from actual sampling at these sites, or projected values can be obtained from the CRSS hydrologic salinity model. Also, this portion of the spreadsheet contains input data for present valuing damages that may occur in the future. The present value data consists of the latest Reclamation planning interest rate, base dollar year, and the projected year the damages are to be calculated.

The remaining portion of this spreadsheet displays the salinity levels and total damages (based on a 500 TDS salinity baseline) for each primary agricultural and metropolitan area that receives Colorado River water. There are six economic sectors: agriculture, households, commercial, water utilities, industrial and policy related (groundwater and recycled water requirements). The agricultural areas currently in the model are the Central Arizona Project, Arizona; La Paz County, Arizona; Yuma County, Arizona; Imperial County, California; Riverside County (non MWD), California; and the MWD service area (covers all or portions of six southern California counties). The metropolitan areas currently in the model are: Maricopa County/Phoenix; Pima County/Tucson; Yuma, Arizona metropolitan area; Clark County/Las Vegas; the MWD service area; and the lower Colorado River communities of Blythe, CA; Needles, CA; Parker, AZ; Lake Havasu City, AZ; and Laughlin, NV.

II. Summary Damage Calculation Sheet

In this spreadsheet, the dollar damages from each of the sectors and areas are displayed for the baseline salinity level (500 TDS) and the current or projected salinity levels. It is a rather large spreadsheet because it is linked to all the calculation spreadsheets. For example, the household damages are listed by metropolitan area and by household item for the baseline and current or projected salinity levels. Displaying the damage estimates in this manner aids in identifying particular household items or crops that are impacted by salinity damage functions differently or where salinity levels are higher in a particular area. The differences in dollar damages between the 500 TDS salinity level and the current or projected salinity level are summed by sector and by Lower Basin areas. This procedure estimates the current or projected damages which are greater than the damages at the 500 TDS level. To estimate the benefits of the Colorado River Salinity Control Program, a series of model runs are made based on the concept of "with versus without" additional salinity control projects being implemented in the Program. This application of the model uses salinity levels provided by the CRSS salinity model. The procedure is to estimate the difference in dollar damages from the 500 TDS baseline and TDS levels based on no additional salinity control projects and then estimate the difference in dollar damages based on TDS levels which include additional salinity control projects. With the inclusion of additional projects, salinity levels are less than the "without project" TDS levels and this results in lower dollar damages in the Lower Basin areas. The difference in dollar damages based on the "with versus without" project conditions are identified as the avoided damages, or simply the benefits of the Salinity Control Program with the implementation of the projects.

To convert the avoided damages (benefits) to a mg/L or tons of salt removed basis, the damages by area are summed for each numeric criteria diversion site, i.e., Hoover Dam, Parker Dam and Imperial Dam. For Hoover Dam, the difference in total dollar damages for the Las Vegas/Clark County area are converted to a mg/L basis using the difference in TDS levels for Hoover. This approach is done for the areas that receive Colorado River water at Parker Dam and at Imperial Dam and then summed to a total avoided damage per mg/L for the Lower Basin average. To convert the avoided dollar damages per mg/L to a per ton of salt removal basis, a conversion factor in tons per mg/L is used for each diversion point to calculate the avoided damages per ton of salt. The conversion factors for the diversion points are 13,100 tons/mg/L at Hoover, 9,900 tons/mg/L at Parker, and 8,300 tons/mg/L at Imperial. Again this is done for each diversion

point and then summed to a total benefit value per ton of salt removed from the Lower Colorado Basin area.

III. Additional Input Data Sheets

The next two spreadsheets contain input data. The first spreadsheet contains data to calculate weighted average salinity levels based on different water sources with differing salinity levels for the MWD service area and the Central Arizona area. The blending of water sources has a significant impact on the overall water quality that is used by residences, commerce, and industry as well as meeting groundwater and recycled water requirements. The second spreadsheet contains population and number of households projections for each of the metropolitan areas. This data contains the most current and projected population estimates. The population and household data is primarily used in the calculation of household and commercial damages.

IV. Damage Calculation Spreadsheets

The next six spreadsheets are linked to the other input spreadsheets to actually calculate the salinity damages for each sector and area covered by the model. Salinity crop yield or useful life functions are contained in these spreadsheets, which tie salinity levels to crop yields or product use. Below is a brief explanation of each damage spreadsheet:

A. Household Damage Spreadsheet

This spreadsheet consists of three parts. The first part (Part A) consists of the household items per unit average costs (e.g. water heater cost plus installation), number of units per household, and the salinity-useful life functions for each household item considered in the model. There are ten household items that are included in the model. These are: galvanized water pipe systems (older houses), water heaters, faucets, garbage disposals, clothes washers, dishwashers, bottled water, water softeners, water treatment systems, and soaps and detergents. Unit cost prices for each household item were obtained from sources on Internet websites such as Sears, Home Depot, Lowes or supermarkets in the local area. The number of units per household was obtained from the latest Census data for each metropolitan area considered in the model. Salinity useful life functions were developed to estimate the average life of a household appliance based on a given salinity level. Most of the useful life functions were taken from previous salinity research and can be found in the Milliken-Chapman study (1988). MWD had contracted for additional research of bottled water use, water softeners, and water treatment systems and found a relationship between these household items and salinity.

The second part (Part B) of this spreadsheet is the calculation of the useful life and average household costs based on a given salinity level that has been calculated in the input spreadsheet for weighted average salinity values of each metropolitan area in the model and the salinity functions in Part A.

The third part (Part C) of this spreadsheet takes the information from the other sections of the spreadsheet and calculates the total annual cost per household item for each of the

areas considered by the model. From the input spreadsheet on population and number of households, the number of households per area is multiplied by the average cost per household item and then divided by the average life of the item or percentage of household use for that item at a given salinity level. The costs are summed for each metropolitan area and are linked to the summary damage spreadsheet.

B. Commercial Damage Spreadsheet

This spreadsheet has been changed from the original Milliken-Chapman study model when commercial damages were calculated as a percentage of household damages and added to the total household damage estimate. MWD and their contractor, Bookman and Edmonson, did some research based on the relationship between salinity and water use for commercial and institutional activities in their service area. MWD was able to collect commercial water use for particular uses such as sanitary, cooling, irrigation, kitchen, and other uses. Based on the type of commercial water use, salinity cost functions were developed. From MWD water resource management plans, projected commercial water use was used to calculate salinity damages in future years. From their research on household and commercial salinity costs, it was estimated that the percentage of commercial salinity related damages to household damages is approximately 26 percent. For the Phoenix area, a similar methodology was used to estimate commercial salinity damages. The advantage of the commercial water use methodology is that it ties salinity damages to actual commercial water use for a given area. Due to the lack of available data for types of commercial water use in the other metropolitan areas, the 26 percent of household damages is used as an estimate for commercial damages in those areas. Ongoing research is attempting to better estimate the commercial related salinity damages for the Las Vegas/Clark County area.

C. Industrial Damage Spreadsheet

From research done for the MWD Salinity Management Study, salinity damages can be calculated for industrial water use. Salinity damage functions were developed based on three major types of industrial water use: process water, boiler feed water, and cooling water. MWD was able to estimate the amount of water used for these industrial types of production. Related salinity costs are on a dollar per acre-foot per mg/L basis. A change in salinity from the 500 TDS baseline would show a change in salinity costs as it relates to industrial water use. This methodology was applied to the Phoenix and Tucson metropolitan areas to estimate industry salinity costs.

D. Utility Damage Spreadsheet

The MWD research estimated the per capita costs for capital investments in replacement of water production and distribution facilities. The salinity useful life functions that were developed for the Milliken-Chapman study model are used in this spreadsheet. The methodology is similar to the household damage spreadsheet. The per capita costs for water production and distribution costs are divided by the average life of the facilities,

based on the given salinity level, and then multiplied by the metropolitan population for time period.

E. Agricultural Damage Spreadsheet

This spreadsheet estimates the change in gross revenue due to a change in crop yields of salt sensitive crops that receive Colorado River water in the Lower Basin. The agricultural areas considered by the model are irrigated lands in the Central Arizona Project; La Paz County, Arizona; Yuma County, Arizona; Imperial County, California; Riverside County (non MWD), California; and MWD service area irrigated lands. This spreadsheet consists of three parts in calculating the salinity costs associated with crop yields.

The first part consists of the salinity-crop yield functions that were derived from a 1998 Reclamation study, *Final Report, Crop Salinity Estimation Procedures*. For the MWD, ten salinity-crop yield functions were used to estimate changes in crop yield due to changing salinity conditions of irrigation water in the service area. For the remaining irrigated areas in the Lower Basin, fourteen salinity-crop yield functions were selected due to their lower tolerances to salinity.

The next part of the spreadsheet consists of the irrigated crop acreages and crop prices. These were updated to year 2013 prices and acreages for the Central Arizona areas and Imperial County and Riverside County outside of the MWD service area.

The final part takes the above data and estimates the gross crop revenue based on the crop yield per acre at a given salinity level and the price per unit per acre times the total irrigated acres for that crop. This method is done to estimate the gross crop revenue at the 500 TDS baseline salinity level and the given salinity level to estimate the salinity damages.

Research data from the Central Arizona Salinity Study (CASS) was collected for CAP irrigated acres in the Phoenix area to identify for management costs associated with flushing out salts that build up in the soil. This would reduce the impact on yield but would add to the costs of salinity due to the additional purchase of water. It is hoped that more research can be conducted to identify these types of costs in other agricultural areas in the Lower Basin.

F. Policy Related Spreadsheet.

This spreadsheet is based on research conducted by MWD for their *Salinity Management Study* (June, 1999). One of the purposes of the MWD study was to conduct extensive research on the costs associated to meet groundwater and recycling requirements within their service area. The model calculates the costs of removing salts to maintain water quality requirements for groundwater and recycled water that is used extensively in their service area. MWD was able to estimate the amount of water that drains into the groundwater system and the amount that is used for recycled water purposes. To meet

regional water quality standards for these types of water sources, MWD was able to develop salinity cost functions (costs to desalt these sources of water) that could estimate the costs at given salinity levels. As of now, this methodology has not been extended to other metropolitan areas in the model.