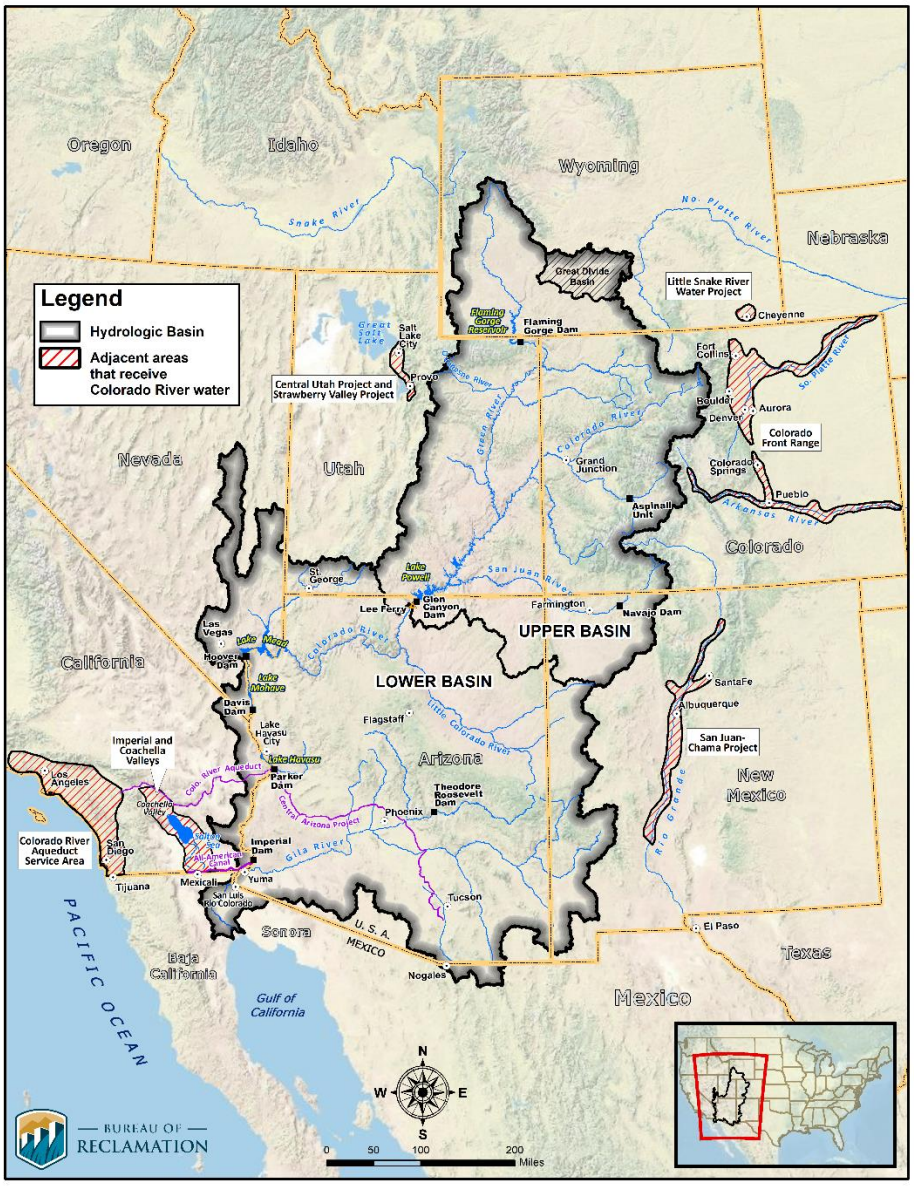
2020 Review

Water Quality Standards for Salinity
Colorado River System



October 2020

Colorado River Basin Salinity Control Forum

2020 Review

WATER QUALITY STANDARDS FOR SALINITY
COLORADO RIVER SYSTEM

October 2020

Prepared by

Colorado River Basin Salinity Control Forum

COLORADO RIVER BASIN SALINITY CONTROL FORUM

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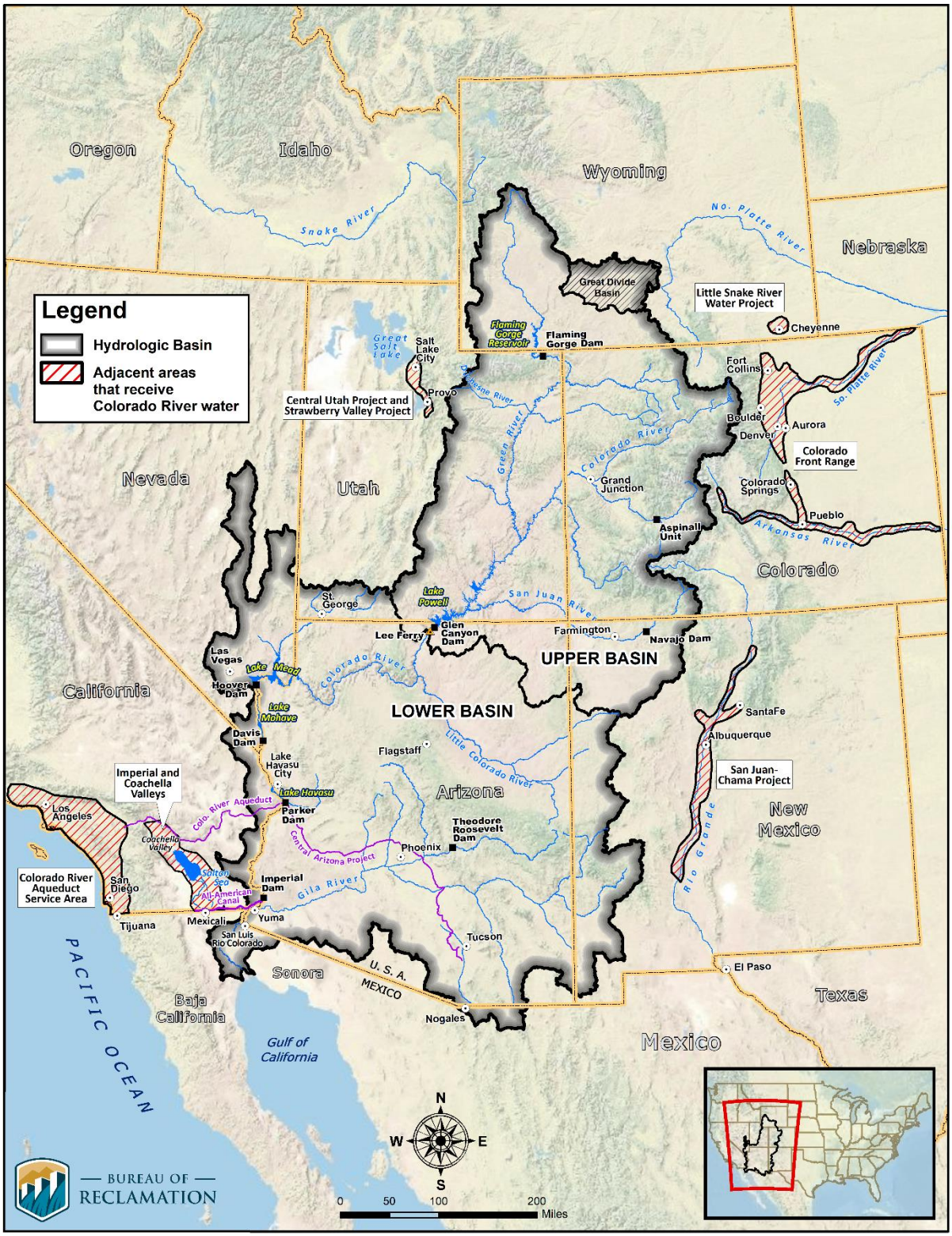

The Colorado River Basin

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 Colorado River. The states collectively initiated this review under direction of the Forum. The Forum prepared a draft review and, after providing an opportunity for public comment, prepared this final 2020 Review.

With the adoption of this final review, copies are being sent to the Colorado River Basin State Governors listed below for inclusion within their individual state water quality standards.

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Governor of Arizona
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Honorable Michelle Lujan Grisham
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Honorable Gavin Newsom
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Honorable Mark Gordon
Governor of Wyoming
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Honorable Steve Sisolak
Governor of Nevada
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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
kaf	thousand acre-feet
Ktons	thousand tons (of salt)
maf	million acre-feet
mgd	million gallons per day
mg/L	milligrams per liter
Mtons	million tons (of salt)
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	Triennial Review, *Water Quality Standards for Salinity, Colorado River System*
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WWTP	Wastewater Treatment Plant

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SUMMARY

This document is a review of the water quality standards for salinity in the Colorado River. Section 303 of the Clean Water Act amendments to the Federal Water Pollution Control Act require that water quality standards are reviewed every three years. 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 the governors of each of the Basin States for inclusion in their state 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 modeling indicates less than 5 percent probability of exceeding the numeric criteria 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 impacts 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 will continue to evaluate opportunities for additional salinity control that will (1) increase the economic benefits realized in the Lower Basin, and (2) provide additional direct and indirect benefits to 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. State implementation of the Forum's adopted policies for effluent limitations under the National Pollutant Discharge Elimination System (Appendix B of this Review).

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

Item 1 of the plan listed above is to be implemented by federal agencies in conjunction with state, local and private participants. The Forum works jointly with federal agencies on developing

[1] Flow-weighted average annual salinity

measures to be implemented. Items 2 and 3 are primarily implemented by the Colorado River Basin states.

The current Plan of Implementation approved by the Forum anticipates an additional 62,400 tons of annual salinity control over the next three years. The program to date has controlled over 1.22 million tons of salt annually and the current program funding levels would control 1.70 million tons annually by 2040. Reclamation's numerical modeling indicates that there is less than 5 percent probability of exceeding the numeric criteria over the next three years with the current and planned salinity control projects. The Salinity Control Program continues to be a successful federal and state partnership that has environmental and economic benefits for users of Colorado River water.

PURPOSE OF THE REVIEW

The 2020 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 16th 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 [of the Environmental Protection Agency].

The scope of this Review is limited to the portion of the Colorado River Basin (Basin) above Imperial Dam and how this area of the Basin is in compliance with the water quality standards approved by the United States Environmental Protection Agency (EPA) in 1975 (Standards). This Review focuses on the 2021 to 2023 period (review period) and evaluates the appropriateness of the Standards in the Basin. 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 and local agencies and private participants to ensure the successful execution of the triennial Plan of Implementation through on-the-ground activities and encouraging legislative support for federal funding.

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 Basin States) and Colorado, New Mexico, Utah, and Wyoming (Upper Basin 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 also serves as the lifeblood for twenty-nine[5] 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[6], which apportions a total of 16.5 million acre-feet (maf) between the Basin States and Mexico. However, the Upper Basin States have not fully developed use of their 7.5 maf apportionment. Currently, the 10-year (2009 through 2018) basinwide average historical natural flow[7] of 14.2 maf is less than the consumptive uses and losses in the Basin, which have averaged 14.7 maf.[8]

Salinity-caused impacts have long been a major concern in the United States and Mexico. The salinity in the river generally increases as it flows downstream. The Colorado River has carried an

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

[3] About 40 million people were 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, in 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 were 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, in 2015 based on interpolated acreage data from Scenario A Current Projections. See Colorado River Basin Water Supply and Demand Study - Technical Report C, U.S. Bureau of Reclamation, 2012.

[5] Colorado River Basin Ten Tribes Partnership, Tribal Water Study Report, December 2018.

[6] 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."

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

[8] Basinwide consumptive use and losses estimated over the period 2009-2018, including the 1944 Treaty delivery to Mexico, reservoir evaporation, and other losses due to operational inefficiencies.

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[9], 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 sources, 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. Other natural sources include salt contributions from non-point (excluding irrigated agriculture) or unidentified sources or from the vast, sparsely populated regions of the Basin, many 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, including livestock grazing, wildlife management, logging, mining, oil exploration, road building, recreation and urbanization can influence the rate of natural salt movement from rock formations and soils to the river system. EPA estimated that out of Basin exports (3 percent), agricultural irrigation (37 percent), reservoir evaporation and phreatophyte use (12 percent), and municipal and industrial uses (1 percent) account for 53 percent of the salinity concentration in water arriving at Hoover Dam. 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 engaged in discussions to address the issue of increasing salinity in 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 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 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,

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

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 exceeding the numeric criteria with the Plan of Implementation in place in any of the next three years at the Hoover Dam, Parker Dam and Imperial Dam stations is 5 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. The Act also created the Colorado River Basin Salinity Control Advisory Council to advise the federal agencies regarding administration of the Program. 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 Improvement Act of 2018 (P.L. 115-334) 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, 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 tributary streams average higher concentrations of salt than the main stem.

Reclamation has developed a map of the Basin showing the average flows and the corresponding salinity concentrations for the years 2014-2018. 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.

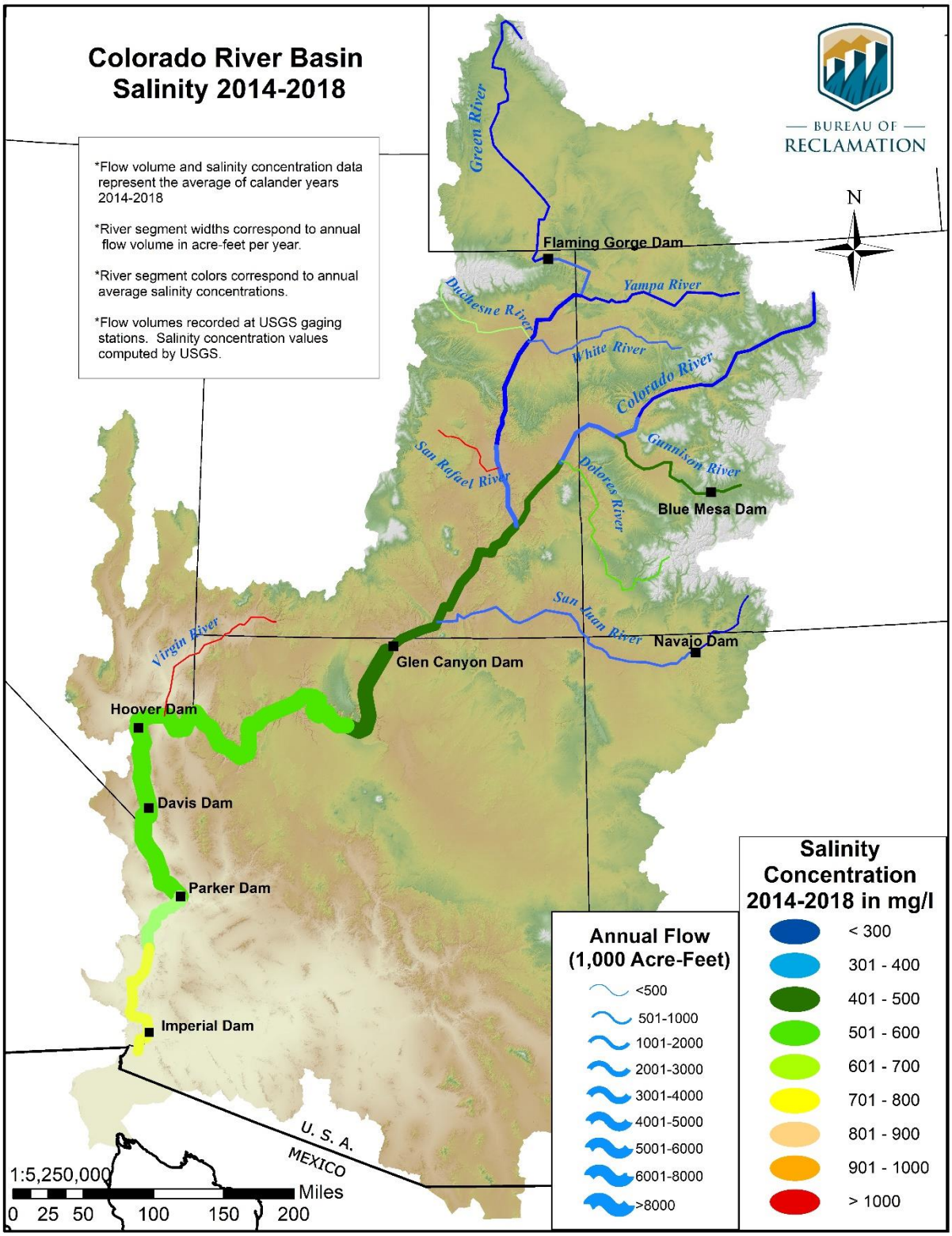

Figure 1 – 2014-2018 Average Generalized Flow and Salinity Concentrations across the Colorado River Basin

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," each in mg/L, are used interchangeably.

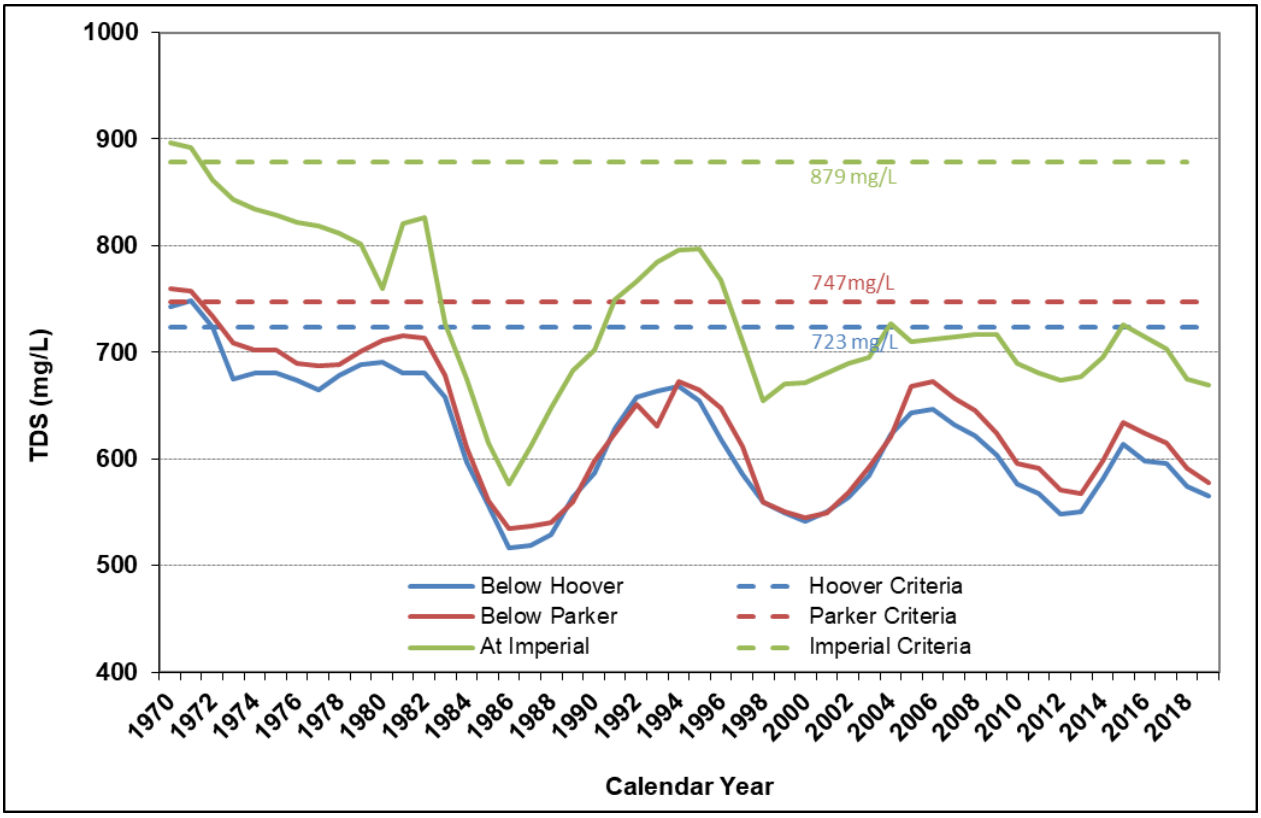

Figure 2 – Flow Weighted Average Annual Salt Concentrations at Numeric Criteria Stations

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 is 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.

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.[10]

NUMERIC CRITERIA

EPA promulgated a regulation that set forth a 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

[10] 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

The Plan of Implementation goal 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. Measures in place are controlling 1.22 million tons of salt annually[11]. The Plan of Implementation would implement practices to control an additional 62,400 tons of salt per year by 2023. Based on this level of control, Reclamation estimates there is less than an 11 percent probability that the numeric criteria will be exceeded in any year during the review period.

The Plan of Implementation is composed of many actions contemplated by the federal and state agencies and includes projects that remove the required salt tonnage to meet the Plan goal. 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, Natural Resources Conservation Service (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.)

[11] Pumping operations at the Paradox Valley Unit (PVU) were suspended in March 2019 following earthquake activity. Concerns about new seismic activity have called into question the remaining useful life of the existing brine injection well. Reclamation is investigating alternatives for brine disposal and is preparing an Environmental Impact Statement. A preferred alternative will be identified in the final EIS in July 2020. The ROD, anticipated in late summer 2020, will officially present the Department of the Interior's decision on brine disposal at the PVU. For the purposes of modeling, it has been assumed that 0 tons of control will occur in 2020, 50,000 tons/year in 2021-2026 and 100,000 tons in 2027-2040.

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 executed. 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 the Paradox Valley, Grand Valley, Las Vegas Wash and Crystal Geyser 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 as a result 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 Agricultural Improvement Act of 2018 (P.L. 115-334) (2018). 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. Under the Agricultural Improvement Act of 2018, NRCS may also now enter into EQIP contracts with "water management entities" including states, irrigation districts, and similar entities to implement water conservation and efficiency practices. 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, recognizing that 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.

Basin States Program

Public Law 110-246 amended the Act and created the BSP through which money from the Lower Colorado River Basin Development Fund and the Upper Colorado River Basin Fund (Basin Funds) is used for cost sharing in Reclamation and NRCS salinity control programs. These are administered by Reclamation in consultation with the Colorado River Basin Salinity Control Advisory Council. Cost share on federal appropriations expended by both Reclamation and NRCS for salinity control in the Basin is required by the Act. The money for the Basin Funds comes 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. Salinity control units and programs implemented subsequent to the original units require a 30 percent cost share from the Basin Funds.

For cost-share dollars generated by the federal expenditures under the Basinwide Program, Reclamation expends the required cost-share funding, together with appropriated funds in the Basinwide Program, through a public grant process. BSP funding generated by federal appropriations expended in EQIP is 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. 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 BSP have proven very useful as a means of achieving additional cost-effective salinity control. The BSP complements the NRCS and Reclamation programs in a comprehensive manner and facilitates local water user participation.

Accomplishments and Future Control

The Plan of Implementation recognizes that the Forum, participating federal agencies and the Basin States each have specific responsibilities for addressing salinity on the Colorado River. 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 conditions and

program effectiveness, and will advise the participating federal agencies regarding the implementation of salinity control efforts.

To date, it is estimated that the Program has reduced the annual salt loading in the Colorado River by approximately 1,218,000 tons, resulting in approximately 100 mg/L reduction in salinity concentrations in the Lower Basin. Figures 3 – 5 show the comparison of measured salinity levels as compared to what salinity levels would have been without implementation of the Program at the three numeric criteria stations. 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. Figure 6 shows the salinity areas where these measures have been implemented.

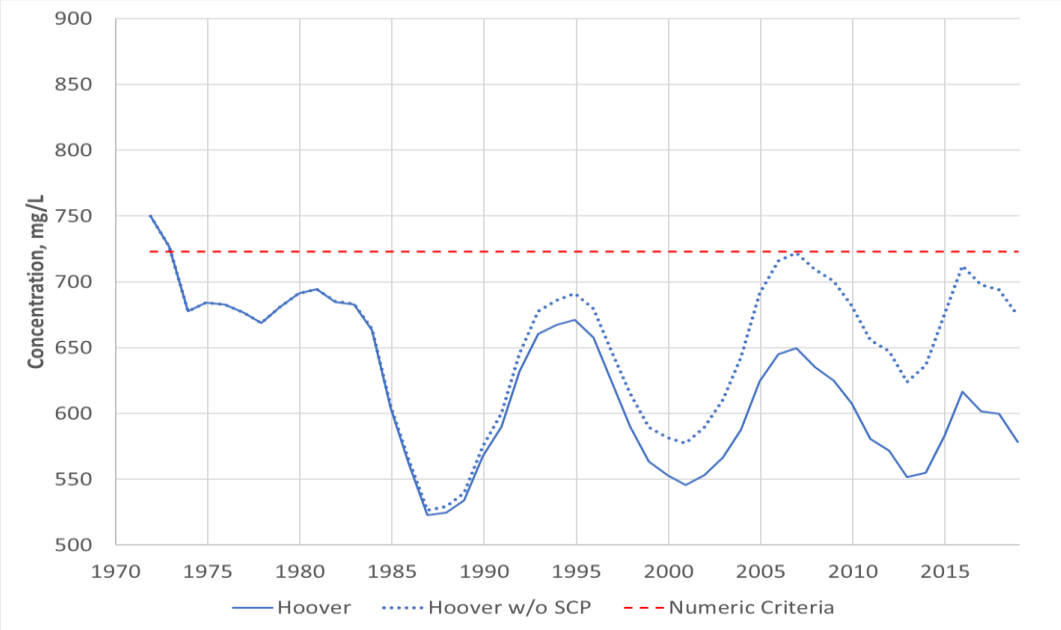

Figure 3 – Salinity Control Program impact on average annual concentration of the Colorado River below Hoover Dam 1971-2018. Historical flow-weighted salinity concentrations with and without Salinity Control Program.

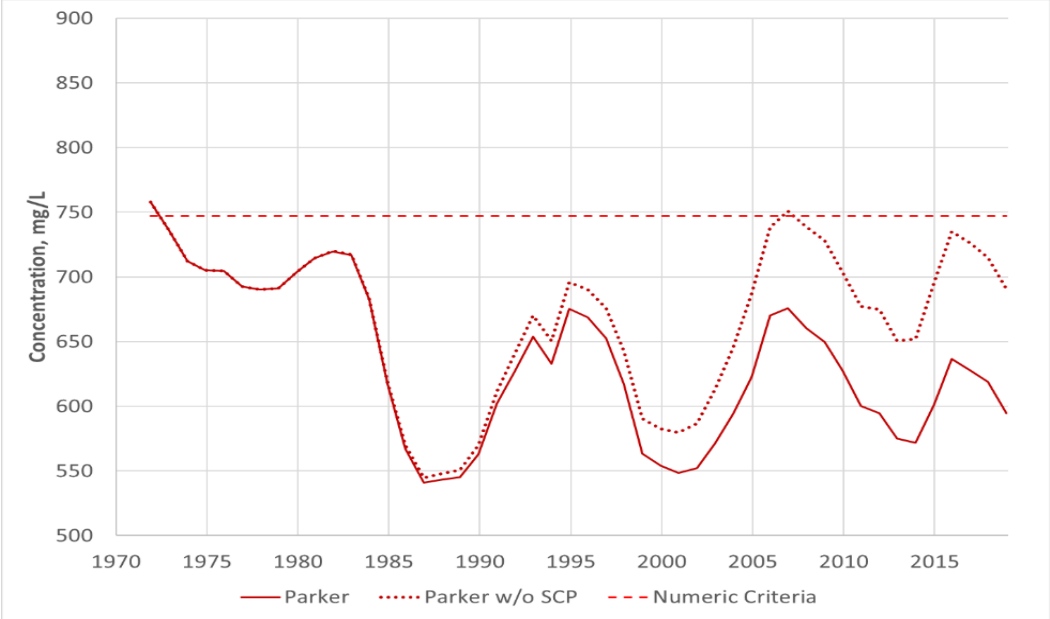

Figure 4 –Salinity Control Program impact on average annual concentration of the Colorado River below Parker Dam 1971-2018. Historical flow-weighted salinity concentrations with and without Salinity Control Program.

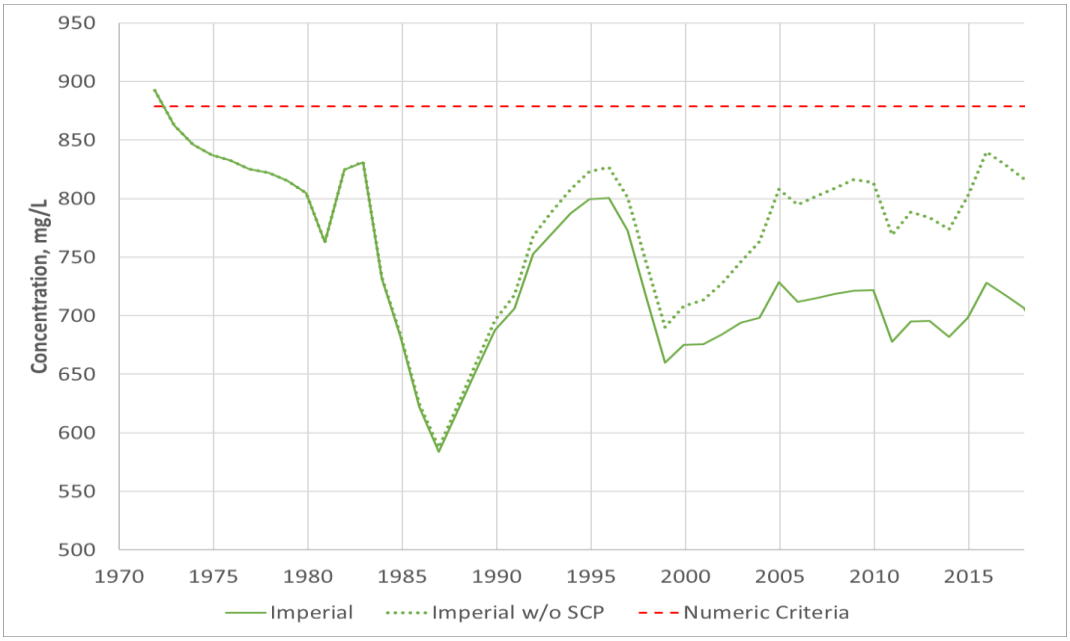

Figure 5 – Salinity Control Program impact on average annual concentration of the Colorado River at Imperial Dam 1971-2018. Historical flow-weighted salinity concentrations with and without Salinity Control Program.

Table 1
Control Measures in Place in 2020

Tons/Year		Tons/Year	
Agricultural Measures	**1,142,500**	**Non-Agricultural Measures**	**75,500**
Big Sandy	71,400	Paradox Valley Unit	0**
Blacks Fork	1,100	Meeker Dome	48,000
Grand Valley	282,600	Las Vegas Wash	3,800
Green River	2,700	Ashley Valley WWTP	9,100
Henrys Fork	500	BLM Point Source*	14,600
Lower Gunnison	256,000		
Mancos	6,100		
Manila	23,300		
McElmo (Dolores)	56,500		
Muddy Creek	2,700		
Paria	1,800		
Price-San Rafael	161,500		
San Juan	52,700		
Silt	2,600		
Uinta	212,700		
USDA Tier 2	8,300		
TOTAL			**1,218,000**

** See footnote 11 on page 10
*BLM Nonpoint Source controls not included herein

The Plan of Implementation assumes that measures currently in place continue to operate through the 2020 Review period (through 2023) and beyond. Improved water delivery and irrigation systems will need to be continually maintained and efficiently operated to provide reliable salinity control. Much of the financial burden of O&M and replacement of irrigation systems falls to salinity program participants who are the agricultural producers in the basin. The Forum acknowledges the need for producers to maintain their improved irrigation practices through continued efforts and financial investment. The same is true for the non-agricultural measures as well. The best example may be the Paradox Valley Unit (PVU). The expected life and continued effectiveness of the PVU project is a matter of study by Reclamation and the Forum. The current PVU EIS process and corresponding alternatives studies is near completion, after which the Forum expects an alternative will be selected that has the potential to maintain or increase the levels of salt control currently in place for the PVU.

It should be noted that Table 1 includes 14,600 tons of salinity control implemented by BLM through the plugging of abandoned, flowing oil and gas wells. Most of BLM's salinity control activities center around efforts to reduce saline soil erosion such as improving grazing and watershed management efforts, or mitigation after oil and gas development, fire, or OHV damage. Therefore, activities are more of an offset to ongoing causes of salinity rather than an improvement from 1972 conditions when the Program was initiated. As such, though critically important to the Program and the overall water quality of the Colorado River System, these activities are not included in Tables 2 and 3 which show potential gains or improvements over 1972 conditions.

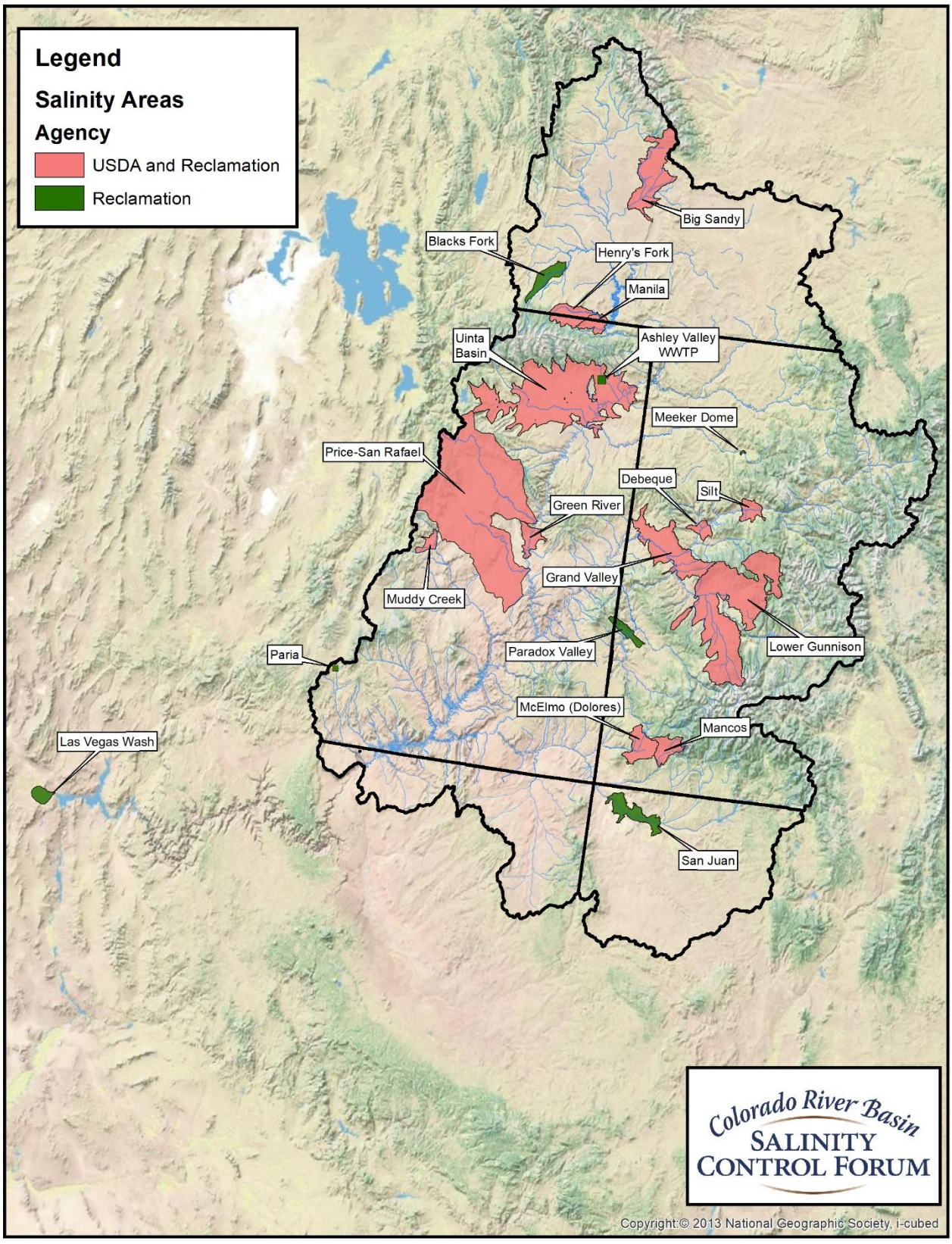

Figure 6 – Colorado River Basin Salinity Control Areas

The Plan of Implementation anticipates the continuation of the Program through the period of the Review. As presented in Table 2, it is anticipated that an additional 62,400 tons annually will be controlled by the Program as set forth in the 2020 Plan of Implementation, resulting in a total of 1,330,400 tons of annual reduction by 2023[11].

Table 2
Additional Controls - Plan of Implementation 2023**

Funding Source	Tons/Year as of 2023
RECLAMATION (Basinwide Program)*	27,800
USDA NRCS (EQIP)	30,100
BASIN STATES PROGRAM (BSP)	4,500
TOTAL**	**62,400**

*Includes cost-share dollars from Basin States Program
** BLM Nonpoint Source controls not included herein

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 established salinity project areas, but some will occur outside those areas. Table 3 provides existing and some potential salinity control project areas and an estimate of the potential salt reductions for both on- and off-farm projects that could occur in those areas.

Table 3
Remaining Potential Salinity Control (2021-2040)*

Project Area	Total Tons/year	Percent remaining
Big Sandy	35,760	33%
Black's Fork	26,900	96%
Grand Valley	213,860	43%
Green River	11,000	80%
Henrys Fork	17,620	97%
Lower Gunnison	496,000	66%
Mancos	17,600	74%
Manila	11,300	33%
McElmo (Dolores)	41,340	42%
Muddy Creek	10,360	79%
Paria	30	2%
Price-San Rafael	47,290	23%
San Juan	9,830	16%
Silt	9,460	78%
Uinta	73,800	26%
USDA Tier 2	7,710	48%
TOTAL	**1,029,860**	

*BLM Nonpoint Source controls not included herein

The potential additional controllable salt remaining in all the identified areas is estimated to be 1,029,860 tons annually, and thus the potential available tons exceed the 62,400 tons of additional annual salinity control identified by the Plan of Implementation. Additional salinity control areas may be identified in the future.

Forum Policies and NPDES Permits

Important components of the Plan of Implementation are the Forum policies and NPDES permits which guide Basin States activities associated with the control of salt discharge to the Colorado River. 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. 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. The Forum subsequently updated its NPDES policy in 2002 to clarify the Forum policies for consistent implementation among the Basin States. In 2015, a Forum subcommittee found that the States are consistently implementing the policies. These policies are found in Appendix B of this report.

Each of the states has adopted the Forum policies presented in Appendix B. Salinity discharge requirements for these permits are evaluated and practicable controls are required during the permit process. A listing of NPDES permits and level of compliance of discharge facilities within the Basin are presented in Appendix C. Some NPDES permits are issued by EPA for federal facilities and on Indian reservations. The EPA also issues NPDES permits for the state of New Mexico, which are then adopted by the New Mexico Environment Department. Forum policies also apply to EPA-issued NPDES permits and hence, become a part of the Plan of Implementation. The NPDES 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 (ADEQ) administers the Arizona Pollutant Discharge Elimination System (AZPDES) program on non-Indian country lands. All permits for domestic wastewater and industrial discharges, with direct river discharges, are written in conformance with associated Forum policies. ADEQ continues to evaluate and revise other discharge permits as information becomes available.

Currently there are 25 active individual discharge permit holders and one minor wastewater treatment plant with general permit coverage in Arizona's non-tribal portion of the Colorado River system. Of these, 20 permits are for municipal or domestic wastewater discharges. The other 5 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.

There are currently 10 stream segments in the Basin that are listed in the state's 2018 Section 303(d) list as impaired in the following watersheds: Bill Williams (2), Colorado River Grand Canyon (5), Colorado River Lower Gila (2), Little Colorado River (1). No waters are currently listed for salinity, which only applies to the Colorado River. The primary causes of impairment are selenium (7), suspended sediment (3), *E. Coli* (3), copper (1), beryllium and ammonia (1). Complete assessment information can be found on ADEQ's website.

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 Grand Canyon.

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

Water Quality Management Planning

The Water Quality Control Plan for the Colorado River Basin (Basin Plan) was adopted by the California Regional Water Quality Control Board, Colorado River Basin (Regional Water Board) in November 1993 and approved by the State Water Resources Control Board (State Water 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, as necessary, through January 2019. 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 and Regional Water Boards 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 basinwide 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 the 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. The Regional Water Board adopted general WDRs for Palo Verde Valley and Bard Unit in 2019. Agricultural discharges in these areas are discharged to drains that are tributaries to the Colorado River. 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 300 active discharge permits and permit certifications in the Colorado portion of the Colorado River Basin where the salinity requirements have been addressed. A specific listing of these permits 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 177 water quality impaired stream segments, including provisional listings, in the Colorado River Basin in Colorado (Gunnison River Basin: 70 impaired segments; Upper and Lower Colorado River Basin: 74 impaired segments; San Juan River Basin: 33 impaired segments) which are included on the 2018 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.

The Colorado Water Quality Control Division prioritized developing selenium Total Maximum Daily Loads (TMDLs) for several impaired tributaries within the Colorado River basin. One of the primary reasons for prioritizing these TMDLs is the impact the selenium loading is having on threatened and endangered fish habitat. Additional water quality monitoring and TMDL development for tributaries from Glenwood Springs to the Utah state line is underway with completion targeted before 2022. Activities are also ongoing to address the nonpoint source contributions that will be identified in these TMDLs.

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. The TMDLs being developed for the tributaries to the Colorado main stem from Glenwood Springs to the Utah state line will be the basis for a revised watershed plan for the area referred to as the Grand Valley. Grand Valley

stakeholders continue to work with the Colorado Water Quality Control Division and the United States Geological Survey (USGS) to develop the watershed plan, a plan that will focus on reducing nonpoint sources of selenium.

Salinity control techniques are generally thought to reduce selenium loading because seepage and deep percolation of water into the local Mancos Shale and associated soils is a primary source of both salt and selenium loading. Numerous projects for selenium and salinity control are ongoing in the Basin with a primary emphasis in the Lower Gunnison, the largest contributing tributary. The Gunnison River Basin Selenium Management Program, which was developed in response to the 2009 USFWS Gunnison Basin Programmatic Biological Opinion, provides details of past, current and planned selenium control projects. Selenium 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 Incentives Program, National Irrigation Water Quality Program, Natural Resources Conservation Service Regional Conservation Partnership Program, Colorado Department of Natural Resources Species Conservation Trust Program, and Colorado Nonpoint Source Program Clean Water Act Section 319. One example of these efforts is the pending implementation of additional irrigation lateral piping with the assistance of Nonpoint Source Section 319 funding. Recent USGS studies have shown that irrigation efficiency efforts are contributing to a downward trend in selenium loading (https://pubs.er.usgs.gov/ publication/sir20185001).

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, 2019, there were 52 active discharge permits in the Nevada portion of the Colorado River System. The largest dischargers, the City of Las Vegas with a permitted discharge maximum flow of up to 101 mgd (91 mgd from the Water Pollution Control Facility and 10 mgd from the Durango Hills Facility), the Clark County Water Reclamation District with a permitted discharge maximum flow of up to 150 mgd, the City of Henderson with a permitted discharge maximum flow of up to 48 mgd (40 mgd from the Kurt R. Segler Water Reclamation Facility and 8 mgd from the Southwest Water Reclamation Facility), and the City of North Las Vegas with a permitted discharge maximum flow up to 25 mgd. 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. Permits for industrial and municipal discharges are written in conformance with the associated Forum policies. The State of New Mexico Water Quality Standards for Interstate and Intrastate Surface Waters 20.6.4.54 adopt the standards of the Colorado River Basin Salinity Control Forum by reference. Currently, there are 35 discharge permits (active and inactive) in the New Mexico portion of the Basin, of which Region 6 administers 22 permits and Region 9 administers 13 Navajo Reservation permits. Of these, 18 permits (14 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 tribal and pueblo lands lying therein. Planning within the reservations is the sole responsibility of the Tribes and Pueblos. Much of the Basin in New Mexico falls within the boundaries of the Navajo Tribe's 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:

Gallegos Canyon (San Juan to Navajo boundary)	selenium
San Juan River (Animas River to Canon Largo)	sedimentation, E.coli
Animas River (San Juan River to Estes Arroyo)	temperature, E.coli
Animas River (San Juan River to Estes Arroyo)	total nitrogen, total phosphorus
Animas River (Estes Arroyo to Southern Ute)	E.coli, total phosphorus
La Plata River (McDermott Arroyo to CO border)	E.coli
La Plata River (McDermott Arroyo to CO border)	dissolved oxygen
La Plata River (San Juan River to McDermott Arroyo)	sedimentation, E.coli
San Juan River (Navajo and at Hogback to Animas River)	E.coli

Sample collection for the most recent San Juan Basin Surface Water Quality Survey was conducted in 2017 and 2018 by the Surface Water Quality Bureau of the New Mexico Environment Department. These data are being analyzed to determine the potential impairments and for the future TMDL development. These surveys are normally scheduled throughout the various watersheds and basins in the state on a 7- to 8-year cycle.

Watershed Planning

Work plans have been developed and grant funding secured under 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:
https://deq.utah.gov/water-quality/updes-permitting-program#individual.

As of December 31, 2019, there are 75 discharge permits as issued by DWQ in the Utah portion of the Colorado River Basin. Of these, 32 are for municipal discharges and 43 are for industrial discharges, of which 7 industrial permits have been recently terminated. A specific listing of the individual permits and their compliance status is contained in Appendix C. Multiple 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 Triennial Review. The salinity-offset project plans have been finalized previously, with projects implemented 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 30 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 and 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:
https://deq.utah.gov/water-quality/watershed-monitoring-program/watershed-management-program.

Watershed Planning

Utah's Watershed Protection 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, Implementation of Best Management Practices and Watershed Planning. Although projects exist in other regions, currently the Upper Colorado Basin region in Utah has no watershed planning projects in progress to specifically address Total Dissolved Solids. 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 mainstream 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 32 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 32 permits, 13 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 8 streams and rivers identified as impaired within the basin in the State's draft 2020 Section 303(d) List. 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). Water quality monitoring and data analysis by WDEQ are ongoing in Bitter Creek to support future TMDL development or proceed with alternative approaches to address the issue. A TMDL for Muddy Creek is not scheduled for development at this time.

Watershed Planning

Local conservation districts have conducted watershed planning and restoration activities for several of the impaired waterbodies within the Green River and Little Snake River Basins. Detailed information is available in the 2018 Wyoming Watersheds Progress Report, prepared by the Wyoming Association of Conservation Districts and available in ArcGIS Story Map format at https://arcg.is/10vb4b. Some highlights are noted below.

Coordinated resource management in the Little Snake River Basin led to successful restoration of three impaired waterbodies in the Muddy Creek watershed through improved grazing management, stream stabilization projects, and wetlands development (https://www.epa.gov/nps/success-stories-about-restoring-water-bodies-impaired-nonpoint-source-pollution#wy). Little Snake River Conservation District continues to lead restoration activities on other impaired waterbodies in the basin. In addition, the District has led several river restoration projects to reduce erosion and sedimentation in the Little Snake River.

In the Green River Basin, Sublette County Conservation District completed a watershed-based plan for an impaired segment of the Little Sandy River in 2018. The plan identifies ways that excessive erosion and sedimentation in the impaired segment could be addressed through best management practices and river restoration.

Sweetwater County Conservation District completed a stream restoration project on Bitter Creek in 2018 that stabilized a headcut by replacing a failing drop structure with an improved structure that promotes channel stability. In 2019, the District began efforts to prepare a watershed-based plan for bacterial impairments in Bitter and Killpecker creeks, using information from the recently completed TMDLs.

Other entities have also been actively pursuing stream and river restoration projects in the Green River Basin. For example, Wyoming Game and Fish Department (WGFD) has launched efforts to restore degraded sections of the New Fork River. Information about this and other WGFD projects in the basin can be found in the 2018 Strategic Habitat Plan Annual Report available at https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Strategic%20Habitat%20Plan/SHPAnnualReport2018-Website.pdf. The above activities have been supported by Wyoming's Clean Water Act Section 319 and Section 604(b)/205(j) funding, as well as numerous other federal, state and local funding sources.

In 2010, the Wyoming Water Development Commission (WWDC) 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.

In 2012, the WWDC completed a study to identify a consistent viewpoint and accounting process for environmental and recreational water demands and to help guide river basin planning efforts in moving forward. The study identified the need for available data sources to be defined and analyzed in a way that would assess their interactions with traditional water uses throughout the State of Wyoming. The methodologies developed in the 2012 study are currently being employed in the Green River Basin. This study was completed in June of 2018. A copy of the report can be found here: http://waterplan.state.wy.us/plan/green/envrec/Green_EnvRecReport.html

CONCLUSION AND ADOPTION OF THE STANDARDS

The water quality standards for salinity control in the Colorado River consist of two components: the numeric criteria and the Plan of Implementation. No changes have been made to the numeric criteria since their adoption by the seven Basin States in 1975 and subsequent approval by EPA. Following their 2020 Triennial Review, the Forum again concludes that the numeric criteria are appropriate and recommends no changes. The Forum also finds that the updated Plan of Implementation is adequate for maintaining salinity concentrations below the numeric criteria through 2023, thus providing significant benefits to the Colorado River Basin. If the Plan of Implementation is executed successfully, the probability of exceeding the numeric criteria is predicted to be less than 11 percent in any given year of the review period, thereby providing a measurable improvement to the quality of the Colorado River.

The Program cannot be successful without the cooperation of many agencies and governments at the local, state and federal levels. First, the Program relies on landowners to implement cost-effective salinity control measures. Second, the Program is dependent on a multitude of agreements among the seven Basin States which have always been accomplished by consensus. Last, the Program depends on the three federal agencies that implement salinity control, as well as other federal agencies such as the United States Fish & Wildlife Service, United States Geological

Survey and EPA. Based on their involvement in the preparation of this Review, it is expected that cooperating federal agencies will support the Plan of Implementation and its programs.

In June of 2020, the Forum adopted the proposed 2020 Triennial Review. During the summer of 2020, the Forum and seven Basin States solicited comments on the Review from the public and cooperating agencies. Each state sent out notice for comment and the Forum posted the proposed Review to its website. One public comment was received from the Coachella Valley Water District expressing appreciation for the program and urging the Basin States to continue implementation of the program at its highest level. At the Forum meeting held on October 28, 2020, the Forum approved this 2020 Review.

With the approval of this Review by the Forum, each of the seven Basin States will include these standards as a part of their own water quality standards through their respective procedures. The states will obtain approval of their water quality standards from EPA based on their respective regions. The State of New Mexico will submit its triennial review to EPA Region 6 in Dallas, Texas; Colorado, Utah and Wyoming will submit to EPA Region 8 in Denver, Colorado; and Arizona, California and Nevada will submit to EPA Region 9 in San Francisco, California. It is anticipated that EPA will fully support this salinity control effort by approval of each state's submittals.

FUTURE PROGRAM

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, 2021-2023). Given average hydrology in the basin, the probability of exceeding the numeric criteria, while putting into practice the outlined Plan of Implementation, is well within the established water quality standard. Nonetheless, as water development continues to occur throughout the Basin, salinity concentrations and the associated economic damages are projected to increase. Therefore, this section analyzes the comparative changes in Colorado River salinity under different implementation scenarios from the present through 2040. 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 is increasingly challenging as economic damage levels and costs increase over time, thus placing greater burdens on Program implementation.

Reclamation used its Colorado River Simulation System (CRSS) model to project salinity levels for the period 2020 through 2040 with the varying levels of Program implementation. The CRSS model simulates 88 separate hydrologic traces for each year (1931-2018) and then calculates the average annual salinity. A detailed description of the CRSS model and the model runs made for this Review are found in Appendix F.

The Forum requested that Reclamation analyze the effects on the salinity of the River for four levels of program implementation (tons of salt removed). The Forum chose the levels of implementation based on different assumptions regarding federal funding, state cost share and the tons of salt available for future control. These scenarios require different levels of anticipated funding to support implementation.

Scenario 1 shows no additional salinity control measures implemented after 2020.

Scenario 2 shows controls associated with current projected program funding levels through 2040. Reclamation's Basinwide program maintains 2019 program funding levels ($8 million) through 2040. NRCS funding follows the agency's 3-year funding plan for 2020-2022 and is reduced to $12 million 2023-2025 and then $10 million through 2040.

Scenario 3 shows controls associated with the Plan of Implementation through 2040. Reclamation's Basinwide program maintains an annual target of 9,250 tons/year of additional control at increasing cost due to inflation and increased cost per ton of controls. NRCS funding follows the agency's 3-year funding plan for 2020-2022 with 2022 funding levels ($15.7 million) maintained through 2040.

Scenario 4 shows controls associated with controlling maximum potential identified salt load by 2040 (Table 3) and is shown as an upper bound, not a practical plan of implementation.

Table 4 shows the four scenarios modeled by Reclamation with the tons of annual salinity control in place by the year 2040.

Table 4
Plan of Implementation Levels Modeled by CRSS

Description	Total Control
Scenario 1 - No additional controls beyond 2020 (does not implement the Plan of Implementation identified herein)	1.22M tons**
Scenario 2 - Controls associated with current projected program funding levels through 2040	1.59M tons
Scenario 3 - Controls associated with Plan of Implementation through 2040	1.70M tons
Scenario 4 - Controls associated with controlling maximum potential identified salt load by 2040	2.35M tons

Note: "No additional controls" contemplates some continuing O&M expenditures to maintain existing facilities.
** See footnote 11 on page 10

The modeling shows that the difference between no additional salinity controls (Scenario 1) and the proposed plan of implementation of 1.70 million tons (Scenario 3) is approximately 35-50 mg/L by the year 2040. These values are summarized in Figures 7, 8 and 9 below for the three numeric criteria points.

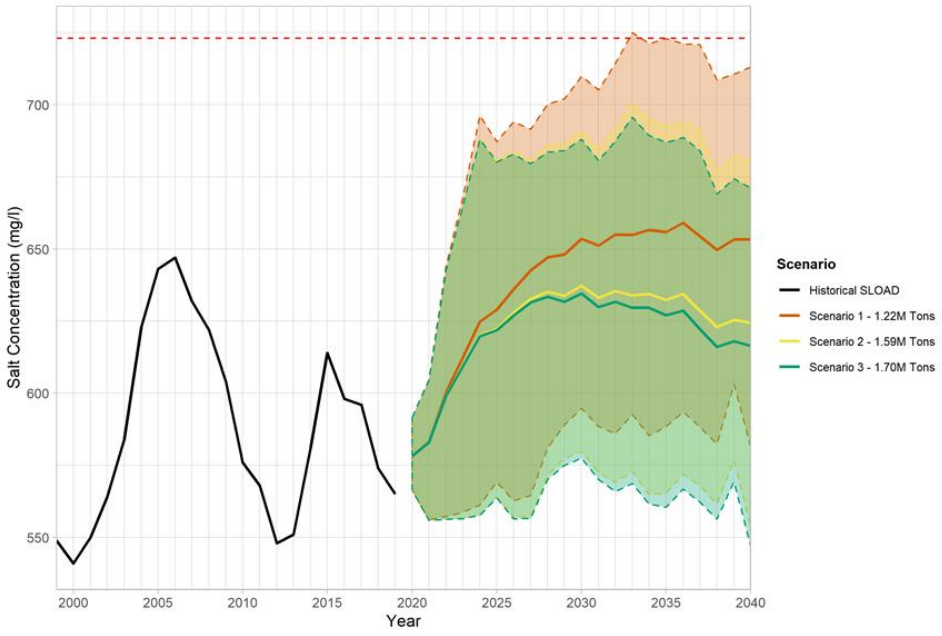

Figure 7 – Projected average annual salinity concentration below Hoover Dam. The colored solid lines are the means and the shaded cloud area represents the 10th to 90th percentiles of each scenario's annual values. The black line represents the historical observed concentration from the SLOAD program. The red dotted line represents the numeric criteria.

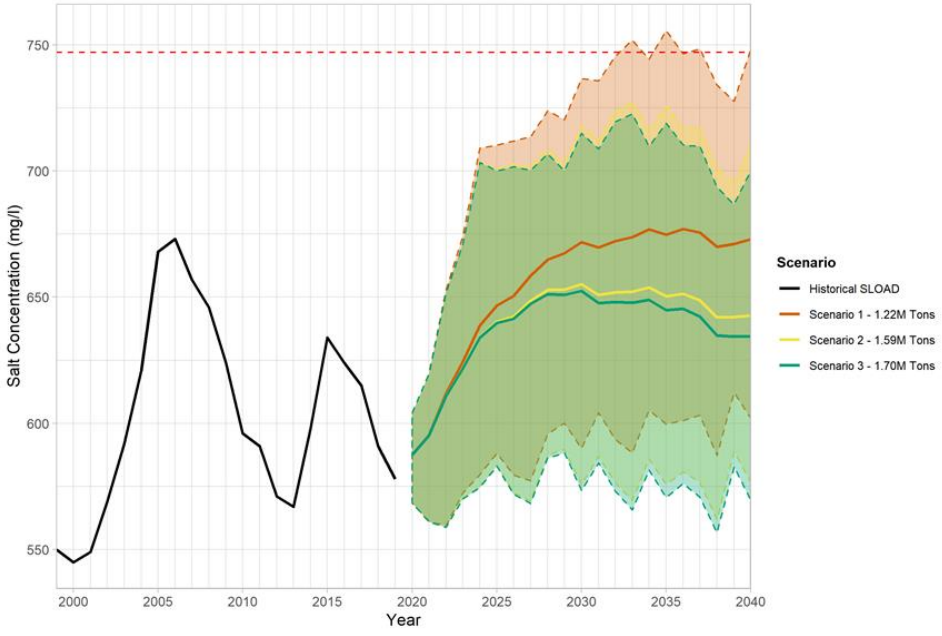

Figure 8 – Projected average annual salinity concentration below Parker Dam. The colored solid lines are the means and the shaded cloud area represents the 10th to 90th percentiles of each scenario's annual values. The black line represents the historical observed concentration from the SLOAD program. The red dotted line represents the numeric criteria.

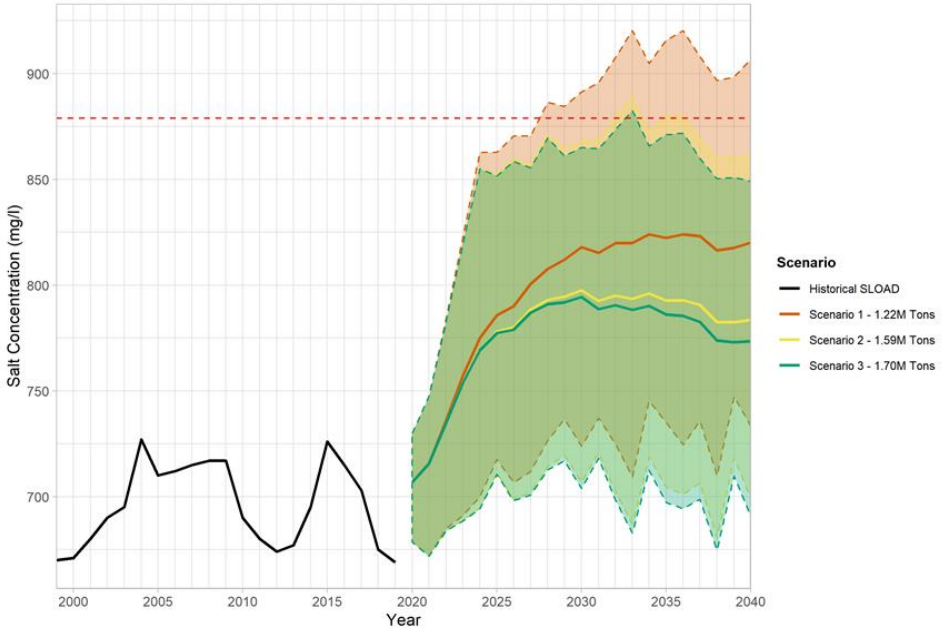

Figure 9 – Projected average annual salinity concentration at Imperial Dam. The colored solid lines are the means and the shaded cloud area represents the 10th to 90th percentiles of each scenario's annual values. The black line represents the historical observed concentration from the SLOAD program. The red dotted line represents the numeric criteria.

To further understand the impacts of reducing the salinity concentrations in the Lower Basin, the Forum used Reclamation's Salinity Economic Impact Model (SEIM), which is described in Appendix F, to estimate damages under the four Plan of Implementation alternatives. Damage estimates for each alternative are listed in Table 5 under the heading "Total Quantified Damages." Estimated damage reductions resulting from lower salinity concentrations projected under each alternative were derived by subtracting the "Total Quantified Damages" from the base case of 1.22M tons removed, or $670.6M. These estimates are listed in Table 5 as "Annual Damage Reductions." The SEIM model only estimates damages to the Lower Basin 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
Annual Damages and Damage Reductions for Plan of Implementation Alternatives

Alternative	Salinity Reduction at Imperial Dam in 2040 (mg/L)	Total Quantified Damages ($M, 2019 Dollars)	Annual Damage Reductions as Compared to No Additional Future Controls Beyond 2020 ($M)
1.22M tons removed	--	670.6	--
1.59M tons removed	36	567.6	103.0
1.70M tons removed	47	537.5	133.1
2.35M tons removed	106	370.0	300.6

All damage and reduced-damage estimates correspond to year 2040.

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 480,000 tons of control (the difference between the 1.22 million ton and 1.70 million ton alternatives) annually, the *quantified* economic damages to agricultural and municipal and industrial water users are reduced by approximately $133.1 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 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 1.70 million tons annually by the year 2040. 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

Observed Flow-Weighted Average Salinity
at the Numeric Criteria Stations

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

Calendar Year	Below Hoover Dam	Below Parker Dam	At Imperial Dam
(Numeric Criteria)	(723 mg/L)	(747 mg/L)	(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	711	760
1981	681	716	821
1982	680	713	826
1983	658	678	727
1984	597	611	675
1985	556	561	615
1986	517	535	577
1987	519	537	612
1988	529	540	648
1989	564	559	683
1990	587	598	702
1991	629	624	749
1992	658	651	767
1993	664	631	785
1994	668	673	796
1995	655	665	797
1996	618	648	768
1997	585	612	710
1998	559	559	655
1999	549	550	670
2000	541	545	671
2001	550	549	680
2002	564	569	690
2003	584	592	695
2004	623	621	727
2005	643	668	710
2006	647	673	712
2007	632	657	715
2008	622	646	717
2009	604	624	717
2010	576	596	690
2011	568	591	680
2012	548	571	674
2013	551	567	677
2014	581	598	695
2015	614	634	726
2016	598	624	715
2017	596	615	703
2018 [2]	574	591	675
2019 [2]	565	578	669

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

[2] 2018-2019 values are provisional

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.

F. 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.

G. 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.

H. 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

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

localized problems would be created, then the permitting agency may waive the “no-salt” discharge requirement.

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

A. Description of the topography, geology, and hydrology. Such information must include the location of the development, direction and rate of 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, 2017 through December 31, 2019

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, 2017 through December 31, 2019

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	375	0.0025	0.0039	M
AZ0026697	900	BISON RANCH			0.0000	M
AZ0024015	900	CANYON-VALLE AIRPORT WWTP			0.0000	M-2
AZ0025755	900	CITY OF WILLIAMS - WASTEWATER TREATMENT PLANT	278	0.16	0.1855	M
AZ0023639	900	FLAGSTAFF, CITY OF RIO DE FLAG POTW	210	1.25	1.0946	M-4B
AZ0020427	900	FLAGSTAFF, CITY OF WILDCAT HILL POTW	550	1.15	2.6375	M-A
AZ0026263	900	HIGH COUNTRY PINES			0.0000	M
AZ0025542	900	HOLBROOK, CITY OF PAINTED MESA POTW			0.0000	M-2
AZ0026034	900	SNOWFLAKE, CITY OF POTW	413	0.26	0.4478	M-2
AZMW23477	900	TUSAYAN WASTEWATER RECLAMATION FACILITY	687	0.09	0.2578	M
AZ0026069	900	USBR/GLEN CANYON WWTP	1048	0.015	0.0656	M
AZ0025666	900	USBR/GLEN CANYON PPDS	566	0.85	2.0062	I
AZ0023612	900	USNPS/GRAND CANYON/ DESERT VIEW	1090	0.009	0.0409	M
AZ0023621	900	USNPS/GRAND CANYON/INDIAN GARDENS	166	1.25	0.8653	I
AZ0110426	900	USNPS/GRAND CANYON/NORTH RIM	599	0.15	0.3747	M
AZ0022152	900	USNPS/GRAND CANYON/SOUTH RIM WWTP	688	0.26	0.7459	M
AZ0023833	900	WINSLOW, CITY OF POTW	1003	0.2	0.8365	M-B
AZ0023655	905	VIRGIN RIVER DOMESTIC WASTEWATER IMP DISTRICT	840	0.015	0.0525	M
AZ0025160	910	USBR/HOOVER DAM	876	0.03	0.1096	M
AZ0000132	910	USFWS/WILLOW BEACH NATIONAL FISH HATCHERY	748	7.63	23.7992	I-5D
AZ0110248	920	USBR/DAVIS DAM			0.0000	I-2
AZ0023990	930	CAWCD-HAVASU PUMPING PLANT	584	0.017	0.0414	I-B
AZ0026018	930	KINGMAN, CITY OF DOWNTOWN POTW	716	0.238	0.7106	M
AZ0022756	930	PETRO STOP CENTER/KINGMAN	720	0.0300	0.0901	M
AZ0022268	930	FREEPORT-McMoRan BAGDAD Inc.			0.0000	I-3
AZ0023752	940	QUARTZSITE, CITY OF POTW	1234	0.2	1.0292	M-A
Colorado						
CO0000230	100	Henderson Mill				I-2
CO0000248	100	Climax Mine	1130.0	21.685	102.182	I-5B
CO0020451	100	Frisco Sanitation District WWTF	406.0	0.613	1.037	M-A
CO0020699	100	Granby Sanitation District		0.314		M-7
CO0020788	100	Walden WWTF				M-2
CO0020826	100	Blue River WWTF	460.6	1.360	2.611	M-A
CO0021369	100	Vail WWTF	443.6	1.294	2.393	M-A
CO0021385	100	Red Cliff WWTF	297.6	0.033	0.042	M-A
CO0021539	100	Farmers Korner WWTF	372.7	1.424	2.214	M-A
CO0021598	100	Copper Mtn Cons Metro District WWTF	377.5	0.239	0.376	M-A
CO0023086	100	Snowmass Water Sanitation Dist WWTF	278.0	0.769	0.891	M-A
CO0023876	100	Arapahoe Basin Ski Area	701.3	0.011	0.032	M-5/M-B
CO0024431	100	Avon WWTF				M-2
CO0026051	100	Winter Park Water and Sanitation District WWTF		0.165		M-7
CO0026069	100	Eisenhower Tunnel		0.280		I-4
CO0026387	100	Aspen Consolidated San Distrct WWTF	608.2	1.312	3.326	M-A
CO0029955	100	Summit County Snake River WWTF	281.5	0.604	0.709	M-A
CO0037311	100	Edwards WWTF	658.7	1.007	2.767	M-5
CO0037681	100	Willow Creek Lagoons	325.0	0.414	0.561	M-A
CO0038342	100	Mcclane Canyon Mine		0.001		I-4
CO0038598	100	Sunlight WWTF	718.0	0.004	0.013	I-B
CO0040142	100	Upper Fraser Valley Treatment Plant		0.688		M-7
CO0042447	100	Rifle Station	2113.1	0.026	0.232	I-B
CO0042480	100	Eagle Mine Remediation WWTF	2860.0	0.280	3.342	I-5B
CO0044750	100	Roaring Fork Water and San District WWTF	780.7	0.083	0.269	M-A
CO0045411	100	Crooked Creek Ranch	1137.4	0.008	0.036	M-5/M-B
CO0045420	100	Iowa Hill Water Reclamation	383.4	0.406	0.649	M-A
CO0045501	100	Tabernash Meadows WSD WWTF		0.038		M-7
CO0045802	100	Oak Meadows WWTF	759.5	0.019	0.060	M-A
CO0046124	100	Spring Valley Sanitation Dist WWTF	801.0	0.040	0.132	M-A
CO0046175	100	Gilsonite Refinery Sand And Gravel Facility				I-2

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2017 through December 31, 2019

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
CO0046370	100	Redstone Water Sanitation Dist WWTF	478.5	0.026	0.051	M-B
CO0046566	100	Devil's Thumb Ranch	522.5	0.010	0.022	M-A
CO0048119	100	Golden Wonder Mine	997.7	0.052	0.216	I-B
CO0048135	100	Debeque WWTF	1070.4	0.032	0.144	M-B
CO0048151	100	Rifle Regional WW Reclamation Facility	1120.4	0.853	3.984	M-4A
CO0048233	100	North Thompson Creek Mines				I-2
CO0048241	100	Eagle WWTF	597.5	0.531	1.322	M-A
CO0048437	100	Kremmling Sanitation District WWTF	267.9	0.127	0.142	M-A
CO0048577	100	Redstone Well 21-9 Geothermal Project		0.480		I-4
CO0048815	100	South Canyon Landfill	3500.0	0.006	0.088	I-B
CO0048823	100	Avalanche Ranch	1159.5	0.122	0.592	I-B
CO0048830	100	Gypsum WWTF	352.7	0.526	0.773	M-A
CO0048847	100	Cameo Eagle Travel Center	548.0	0.002	0.006	I-B
CO0048852	100	Glenwood Springs Regional WWTF		0.973		M-7
CO0048901	100	Eagle Valley Clean Energy LLC	3.7	0.386	0.006	M-A
CO0048952	100	Lib 4	244.2	0.170	0.173	I-B
CO0048958	100	Glenwood Hot Spgs Lodge and Pool		3.919		I-4
CO0048972	100	Coal Ridge 1 Underground Mine				M-2
CO0049022	100	CR 5001 WWTF		0.419		M-7
CO0049026	100	Mid Valley Metro Dist WWTF	393.4			M-7
CO0049036	100	Frost Creek Clubhouse WWTF				M-2
COG130001	100	Crystal River Fish Hatchery	393.1	5.752	9.429	I-5D
COG130011	100	Rifle Falls Fish Hatchery		5.990		I-5D
COG500003	100	Latham-Burkett Pit	3421.3	0.084	1.205	I-2
COG500088	100	Eagle West Pit	1495.4	0.343	2.138	I-5
COG500114	100	Silt Pit				I-2
COG500119	100	Rifle Pit (Chambus Pit)	1378.9	1.676	9.635	I-5
COG500216	100	River Road Pit	3776.0	0.372	5.850	I-5
COG500229	100	West Rifle Pit				I-2
COG500252	100	Loesch Pit				I-2
COG500263	100	Orchard Grove Industrial Park 23 1/4 Road Pit	5590.0	1.350	31.469	I-5
COG500267	100	Sievers Ranch Pit	336.0	0.260	0.364	I-B
COG500299	100	Railhead Gravel Pit		0.117		I-4
COG500342	100	Gypsum Ranch Pit				I-2
COG500348	100	23 Road Pit				I-2
COG500356	100	Yule Marble Quarry				I-2
COG500364	100	Soaring Eagle Gravel Pit	1884.3	0.432	3.395	I-5
COG500380	100	Monument View Gravel Pit	6288.8	0.650	17.046	I-5
COG500408	100	Mamm Creek Gravel Pit				I-2
COG500433	100	Maryland Creek Ranch Pit	200.0	4.615	3.850	I-5
COG500437	100	15 Road Pit	1896.8	2.626	20.768	I-5
COG500467	100	Glens Pit	1290.1	0.283	1.524	I-5
COG500482	100	North Bank Pit	886.9	1.534	5.672	I-5
COG500491	100	20 Road Gravel Pit				I-2
COG501510	100	Scott Pit	1113.0	1.988	9.227	I-5
COG588006	100	Riverbend Subdivision	1307.7	0.006	0.033	M-B
COG588008	100	West Glenwood Springs Sanitation Dist WWTF	305.0	0.254	0.323	M-A
COG588029	100	El Rocko Mhp	477.2	0.005	0.011	M-A
COG588035	100	H Lazy F Mhp WWTF	860.4	0.014	0.048	M-A
COG588041	100	Ouray Ranch Homeowners Assn WWTF	185.8	0.007	0.005	M-A
COG588046	100	Silt WWTF	682.4	0.217	0.618	M-A
COG588049	100	Lazy Glen HOA WWTF	449.1	0.028	0.052	M-A
COG588050	100	Carbondale WWTF	330.2	0.504	0.694	M-A
COG588051	100	Ranch At Roaring Fork HOA WWTF	366.8	0.047	0.072	M-A
COG588061	100	Talbott Enterprises WWTF	1295.7	0.053	0.285	M-5/M-B
COG588062	100	New Castle WWTF	754.5	0.232	0.729	M-5/M-B
COG588063	100	Basalt Sanitation District WWTF	355.8	0.431	0.640	M-A
COG588066	100	Riversbend Apartments	824.9	0.001	0.003	M-A
COG588067	100	Grizzly Creek Rest Area WWTF	1043.4	0.002	0.007	M-A
COG588070	100	Two Rivers Village Metro Dist WWTF	452.5	0.032	0.061	M-A
COG588072	100	C Lazy U Ranch	347.1	0.007	0.010	M-A

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COG588074	100	Blue Creek Ranch	860.2	0.015	0.052	M-5/M-B
COG588075	100	Bair Ranch Rest Area	1392.5	0.001	0.006	M-5/M-B
COG588076	100	Hanging Lake Rest Area WWTF	932.1	0.002	0.006	M-A
COG588079	100	East River Regional Sanitation Dist WWTF	396.0	0.062	0.103	M-A
COG588083	100	Rock Gardens MHP & Campground	508.8	0.004	0.009	M-A
COG588084	100	Hot Sulphur Springs WWTF	376.1	0.055	0.087	M-A
COG588085	100	Aspen Village	422.7	0.029	0.052	M-A
COG588103	100	Woody Creek Mobile Home Park	365.1	0.017	0.026	M-5/M-B
COG588116	100	Roundup River Ranch WWTF	662.5	0.003	0.007	M-A
COG589086	100	Battlement Mesa Metro Dist WWTF	583.0	0.321	0.781	M-A
COG589110	100	Cottonwood Springs Mhp WWTF	976.6	0.030	0.123	M-A
COG603008	100	Founders Garage Eagle	523.5			I-4
COG603013	100	Winter Park Base Area	10.0			I-4
COG603022	100	Fidelity Mtge				I-2
COG603031	100	Parking Garage Pitkin Co	518.5			I-4
COG603050	100	Little Nell Well City Well 4	251.5			I-4
COG603117	100	Frisco Sanitation District WWTP	244.0			I-4
COG603127	100	Ritz-Carlton Residences And Club At Vail	270.3			I-4
COG603151	100	Arrabelle Hotel	582.0			I-4
COG603155	100	Solaris	981.9			I-4
COG603170	100	Fraser Crossing Founders Pointe	10.0			I-4
COG603205	100	Passport Parking Garage	307.4			I-4
COG603219	100	Springs Lodge	143.5			I-4
COG603220	100	Keystone Lodge And Argentine Condos				I-4
COG603222	100	Manor Vail Lodge	613.5			I-4
COG603223	100	Red Hawk Lodge	135.7			I-4
COG603295	100	Strata Vail Residences				I-2
COG603333	100	Residences at the Little Nell	240.4			I-4
COG603370	100	Fraser Town of Well 8				I-2
COG605009	100	Covered Bridge Building	315.5	0.015	2.779	I-5
COG605015	100	Main St Station Breckenridge		0.113		I-7
COG641001	100	Walden WSD WTP				M-2
COG641006	100	Dillon Straight Creek WTP	169.5	0.447	0.316	I-B
COG641019	100	Hot Sulphur Springs WTP	105.7	0.031	0.014	I-B
COG641027	100	Nettle Creek WTF	58.0			I-4
COG641031	100	Brush Creek WTP				I-2
COG641044	100	Big Mac Water Treatment Plant				I-2
COG641052	100	Red Mountain WTP				I-2
COG641058	100	Upper Eagle Regional WTR Auth				I-2
COG641066	100	Castle Creek WTP	331.6	0.057	0.079	I-B
COG641067	100	Wayne Bristol WTP	71.1	0.023	0.007	I-B
COG641072	100	Gateway Metro WTP	962.9	0.003	0.012	I-B
COG641087	100	Little Mac WTF				I-2
COG641092	100	New Castle WTP	332.0	11604.197	16063.863	I-5
COG641094	100	Roaring Fork WTP				I-2
COG641095	100	Basalt Springs WTP	149.5	0.004	2.779	I-5
COG641105	100	Edwards WTP				I-2
COG641112	100	Silt WTP	589.6	0.002	0.004	I-B
COG641114	100	Mosher Plant	146.4	0.403	0.246	I-B
COG641135	100	Red Sky Ranch WTP	947.2	0.014	0.054	I-B
COG641154	100	Hamilton Creek Metropolitan District		0.058		I-4
COG641181	100	Peak 9 Water Plant	77.0	0.058	0.019	I-B
COG840002	100	Greenback Schaeffer Ranch				I-2
COG840015	100	Parachute Treatment Facility				I-2
CO0020443	190	Crested Butte WWTF		0.215		M-7
CO0022756	190	Pitch Reclamation Project	857.5	0.465	1.663	I-5B
CO0027171	190	Mt Crested Butte WSD WWTF	227.4	0.293	0.278	M-A
CO0035394	190	Mt Emmons Project	721.8	0.576	1.734	I-5
CO0040673	190	Lake City WWTF	331.0	0.097	0.135	M-A
CO0041530	190	Gunnison WWTF	313.8	1.087	1.422	M-A
CO0045217	190	Irwin Mountain Lodge				M-2

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CO0048900	190	Bear Ranch	415.4	0.003	0.005	M-B
CO0048983	190	Ouray Hot Springs Pool	1532.5	0.231	2.779	I-5
CO0049023	190	Upper Gold Links Mine				I-2
CO0049024	190	Sacramento Access Tunnel				I-2
COG130004	190	Pitkin State Fish Hatchery	62.6	4.533	1.184	I-5D
COG130006	190	Roaring Judy Fish Hatchery	235.1	4.188	4.105	I-5D
COG500010	190	Gunnison Pit	393.0	0.278	0.455	I-B
COG500420	190	Sea Horse No 2 Pit	243.0	1.720	1.743	I-5
COG500464	190	Anderson Pit	1393.5	1.590	9.241	I-5
COG500498	190	Tri County Pit	2115.4	0.312	2.756	I-5
COG588012	190	Almont WWTF	364.6	0.014	0.021	M-A
COG588045	190	Crested Butte South Metro Dist WWTF	251.7	0.073	0.077	M-A
COG588052	190	L and N Inc	999.8	0.004	0.015	M-A
COG588109	190	Ute Trail Ranch	341.8	-2.634	-3.754	M-A
COG588112	190	Camp Gunnison Church Camp	282.6	0.003	0.003	M-A
COG588123	190	Camp Red Cloud				M-2
COG588132	190	Vickers Horse River Ranch	434.7	0.001	0.001	M-5/M-B
COG588138	190	Taylor River Canyon LLC	606.8	0.000	0.001	M-A
COG641170	190	Dos Rios WTF				I-2
COG589091	200	Elk Meadows	440.2	0.004	0.008	M-A
COG603287	200	Montrose Community Recreation Center and Park	2457.8			I-4
COG603285	210	Town of Hotchkiss Drain Seep Line	156.8			I-4
CO0000003	220	Revenue Mine				I-2
CO0000132	220	Sanborn Crk & Elk Crk Mines				I-2
CO0020907	220	Olathe WWTF	1323.4	0.159	0.875	M-5B
CO0030449	220	West Montrose Sanitation Dist WWTF	545.5	0.317	0.721	M-A
CO0031984	220	Cedaredge WWTF		0.160		M-7
CO0037206	220	Ruby Trust Mine	480.1	0.173	0.346	I-B
CO0037729	220	Crawford WWTF	258.6	0.026	0.028	M-A
CO0038776	220	West Elk Mine		0.004		I-4
CO0039624	220	Montrose WWTF	884.2	2.114	7.795	M-5/M-B
CO0039641	220	Delta WWTF	1225.4	1.014	5.184	M-5
CO0042617	220	Horizon Health Care & Retirement Community	300.9	0.010	0.012	M-A
CO0043397	220	Ouray WWTF	731.4	0.183	0.559	M-5/M-B
CO0044776	220	Bowie No. 2 Mine	132.8	0.020	0.011	I-B
CO0044903	220	Hotchkiss WWTF	1003.5	0.144	0.602	M-5/M-B
CO0047431	220	Paonia WWTF	742.0	0.145	0.449	M-5/M-B
CO0048873	220	Somerset Central WTF				M-2
CO0049041	220	Boullion King Mine				M-2
COG500127	220	No 500 Pit	994.4	0.650	2.697	I-5
COG500210	220	Mule Farm Gravel Pit				I-2
COG500439	220	Bennett Gravel Pit				I-2
COG500444	220	Delta Paving Pit				I-2
COG500458	220	Janet Pit	1404.7	0.357	2.088	I-5
COG501532	220	Gunnison River Gravel Pit 5		0.624		I-4
COG501545	220	Warren Gravel Pit				I-2
COG501559	220	Uncompahgre Pit				I-2
COG501615	220	Western Gravel Inc				I-2
COG501955	220	Reynolds Pit	1326.6	0.063	0.349	I-B
COG588032	220	Delta Correctional Center	338.2	0.026	0.036	M-A
COG588047	220	Ridgway WWTF	519.3	0.083	0.180	M-A
COG603009	220	Montrose WWTP				M-2
COG641015	220	Cedaredge WTP	57.5	0.009	0.002	I-B
COG641081	220	Orchard City WTP	64.2	0.515	0.138	I-B
COG641104	220	Spaulding Peak Treatment Plant	91.6	0.034	0.013	I-B
COG641134	220	Paonia WTP aka Lower Plant				I-2
COG850028	220	Terror Creek Loadout				I-2
COG850043	220	Bowie No 1 Mine				I-2
CO0000012	300	Palisade WWTF	388.0	0.170	0.275	M-B
CO0023485	300	Grande Mesa Metro Dist 2 WWTF	238.5	0.008	0.008	M-A
CO0027146	300	Roadside North & South Mines	1239.0	0.346	1.789	I-5B

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CO0033791	300	Clifton Sanitation District WWTF	576.9	0.950	2.285	M-A
CO0040053	300	Persigo WWTF	838.5	8.752	30.602	M-5
CO0040487	300	Valleywide Sewerage System	759.3	0.053	0.167	M-5/M-B
CO0047562	300	Whirlwind Project				I-2
CO0048143	300	Mesa Water And San Dist WWTF	710.2	0.008	0.024	M-B
CO0048854	300	Fruita Wastewater Reclamation Facility	594.3	0.896	2.221	M-A
COG500161	300	South Fruita Pit Arcuby Pit				I-2
COG500308	300	Feuerborn Gravel Pit				I-2
COG500429	300	De Beque Gravel Pit				I-2
COG500435	300	D Road Gravel Pit	3607.5	0.614	9.237	I-2
COG501505	300	Una Pit	806.8	1.265	4.254	I-5
COG501513	300	32 Rd Gravel Pit				I-2
COG501542	300	Debeque Pit No 2	3406.0	1.665	23.648	I-5
COG501567	300	Otter Creek Pit	6527.8	0.337	9.163	I-5
COG501617	300	5 Mile Pit				I-2
COG588086	300	SW Mesa County Rural Public Improvement District WWTF	774.8	0.014	0.044	M-A
COG589139	300	Canyon Creek Estates	873.7	0.010	0.035	M-B
COG603260	300	Bank of the West GJ	6600.4			I-4
COG603314	300	Xcel Energy Mesa Service Center Groundwater Management	4200.0			I-4
COG603380	300	Corner Square Building 3	2270.0			I-4
COG641037	300	Palisade WTF and Tank				I-2
COG641068	300	Battlement Mesa Metro Dist WTP				I-2
COG850062	300	New Horizon North Mine				I-2
CO0000213	310	New Horizon Mine	2622.1	0.737	8.062	I-5B
CO0000540	310	Nucla Station	1015.5	0.088	0.374	I-5B
CO0024007	310	Naturita WWTF	448.0	0.021	0.040	M-A
CO0036251	310	Jd-7 And Jd-9 Mines				I-2
CO0041840	310	Telluride Regional WWTF				M-2
CO0046931	310	Silver Bell				I-2
CO0048945	310	Nucla WWTF	1112.9			M-7
COG315382	310	Hotel Ajax				I-2
COG315539	310	225 S Oak				I-2
COG501755	310	Tomcat Pit		0.141		I-4
COG588005	310	Last Dollar WWTF				I-2
COG588021	310	Lawson Hill				I-2
COG588033	310	St Barnabas Church Camp				I-2
COG589078	310	Norwood San Dist WWTF				M-2
COG641024	310	Still Well WTF				I-2
COG641111	310	Mustang WTF				I-2
CO0000051	500	Iles Dome Unit Production	1811.0	0.722	5.455	I-5
CO0000221	500	Seneca Mine Complex	2368.4	0.149	1.467	I-5B
CO0020834	500	Steamboat Springs WWTF	362.1	2.738	4.134	M-A
CO0022969	500	Morrison Creek Metro WSD WWTF	26181.9	0.058	6.362	M-A
CO0027154	500	Mines 1&2 And Eckman Park Mine	3848.1	0.092	1.476	I-5B
CO0030635	500	Yampa WWTF	528.6	0.030	0.066	M-A
CO0031062	500	Whiteman School	295.3	0.003	0.004	M-A
CO0032115	500	Trapper Mine		0.480		I-4
CO0034142	500	Williams Fork Mine	1840.8	0.010	0.078	I-B
CO0035556	500	Steamboat Lake Water & Sanitation Dist WWTF	455.2	0.036	0.068	M-A
CO0036684	500	Fish Creek Tipple	3752.5	0.016	0.253	I-B
CO0040037	500	Craig WWTF	843.4	0.790	2.779	M-4B
CO0040959	500	Hayden WWTF	485.8	0.190	0.386	M-5/M-B
CO0041106	500	Oak Creek WWTF	550.2	0.151	0.346	M-5/M-B
CO0042161	500	Foidel Creek Mine	3550.3	0.097	1.440	I-5
CO0045161	500	Colowyo Mine	2296.5	0.171	1.634	I-5
CO0047449	500	Milner Community WWTF	597.3	0.018	0.044	M-A
CO0048275	500	Sage Creek Mine Complex	4362.3	0.141	2.572	I-5B
CO0048623	500	Barn Spring WTP	2060.0	0.013	0.109	I-B
CO0048999	500	Steamboat Springs Health and Recreation Association	801.2	0.265	0.887	M-B
COG130007	500	Finger Rock Rearing Unit	214.9	1.893	1.697	I-5D
COG500001	500	Bunn Ranch Pit				I-2

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COG500062	500	Williams Fork Pit	1290.0	3.456	18.589	I-2
COG500243	500	Hogue River Pit	338.7	0.594	0.839	I-B
COG500312	500	Mesa Gravel Pit				I-2
COG500350	500	Tellier Pit	562.3	0.022	0.051	I-B
COG500396	500	Camilletti Milner Pit No2	303.1	0.808	1.022	I-5
COG500419	500	Deakins Pit	1826.0	1.000	7.614	I-5
COG501522	500	Lyster Pit	1902.9	0.137	1.089	I-5
COG501524	500	Wand Pit				I-2
COG501525	500	Gehrman Pit	298.0	0.840	1.044	I-5
COG501528	500	Frentress Gravel Pit				I-2
COG501534	500	Steamboat Sand and Gravel Fisker Trail	202.9	0.084	0.071	I-B
COG501590	500	Hayden Pit	364.0	0.187	0.284	I-B
COG501614	500	Breeze Basin Sand and Gravel Pit				I-4
COG502149	500	Bear River Sand and Gravel	471.0	1.728	3.394	I-5
COG588141	500	Phippsburg WWTF Routt County	621.7	0.012	0.031	M-5/M-B
COG589040	500	Maybell WWTF				M-2
COG589146	500	Timbers WSD WWTF				I-2
COG603012	500	Ski and Bike Kare Project	335.4			I-4
COG603041	500	Howelsen Place				I-2
COG603045	500	Lake Catamount WWTF	245.8			I-4
COG603128	500	Trailhead Lodge Steamboat				I-2
COG850008	500	Hayden Gulch Loadout				I-2
COG850051	500	Peabody Twentymile 6 Main N Shaft				I-2
COG850054	500	Foidel Creek Mine				I-2
CO0000010	510	Rangely WWTF	608.4	0.179	0.454	M-A
CO0038024	510	Deserado Mine	4371.9	0.137	2.497	I-5
CO0047139	510	Meeker Sanitation District WWTF	723.4	0.116	0.350	M-A
CO0048739	510	Bopco Lp Yellow Creek Water Management Facility				I-2
COG315481	510	A27 CDP Liquids Line Release Remediation Project	665.3	46.091	127.876	I-5
COG500225	510	Blair Mesa Pit				I-2
COG500484	510	White River City Pit	1161.9	0.055	0.266	I-B
COG501517	510	Piceance Pit				I-2
COG603373	510	Meeker Water Supply Improvements				I-2
COG588105		Mid Valley Metro Dist WWTF	385.8	0.416	0.670	M-A
COG589026		Routt County for Phippsburg Community WWTF	580.0	0.011	0.026	M-A
COG589067		Nucla WWTF	1031.5	0.088	0.379	M-5/M-B
COG600544		Ouray Hot Springs Pool	1496.0	0.195	1.216	I-5
CO0046914		Aspen Institute WWTF		0.067		M-7
COG589103		Saguache WWTF		0.121		M-7
Nevada						
NV0000060	910	Titanium Metals Corporation	696.0	1.623	4.710	I
NV0020192	910	NDOW - Lake Mead Fish Hatchery	573.8			I - 5D
NV0021750	910	Las Vegas Hilton Hotel and Casino Parking Garage		0.003		I-7
NV0022195	910	Valley Hospital Medical Center		0.005		I-5E
NV0022691	910	Lake Las Vegas Resort (Dam)	0.0	0.000	0.000	I-1
NV0022772	910	Sterling/Squire/Crescendo HOA (formerly Saxton)	5173.33	0.375	8.090	I-5E
NV0022781	910	Shanghai Partners - Tomiyasu Residence	1194.7	0.088	0.438	I-5E
NV0022837	910	Conoco Phillips Company - Circle K Store No. 0695	3072.5	0.000	0.003	I-5E
NV0022870	910	7-Eleven Store # 19653	0.0	0.000	0.000	I-1
NV0022888	910	Las Vegas Sands-Venetian Casino Resort	1736.0	0.063	0.456	I-5E
NV0022942	910	Lloyd D. George Federal Courthouse	2536.7	0.025	0.264	I-5E
NV0022985	910	Planet Hollywood Resort Casino (formerly Aladdin Resort)	332.7	0.001	0.001	I-5E
NV0023035	910	Neonopolis Project	1070.0	0.027	0.120	I
NV0023043	910	Maryland Villas Apartment Complex	1699.7	0.023	0.163	I
NV0023060	910	Tronox LLC	4200.0	1.721	30.142	I
NV0023159	910	Clark County Regional Justice Center	1531.9	0.008	0.051	M
NV0023191	910	Caesar's Palace Hotel and Casino	2179.4	0.037	0.336	I
NV0023221	910	7-Eleven Store # 27607	0.0	0.000	0.000	I-1
NV0023256	910	The Stirling Club	2463.6	0.055	0.565	I

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2017 through December 31, 2019

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
NV0023477	910	Sky Las Vegas Master Association		0.002		I
NV0023485	910	Las Vegas Academy	2766.7	0.003	0.035	M
NV0023515	910	The Cosmopolitan Resort & Casino	1700.0	0.048	0.340	I
NV0023523	910	Terrible's Hotel and Casino	2550.0	0.000	0.001	I
NV0023558	910	Panorama Towers	2092.5	0.006	0.052	I
NV0023566	910	Fountainbleau Casino and Resort	2580.4	0.178	1.915	I-5E
NV0023604	910	Howard Hughes Office Complex	2308.2	0.007	0.067	I
NV0023621	910	Echelon Resort	1280.1	0.156	0.833	I-5E
NV0023647	910	City of North Las Vegas Water Reclamation Facility	408.0	17.825	30.327	M-4A
NV0023663	910	Former Conoco Station No. 28003	5475.0	0.000	0.002	I
NV0023701	910	City Center Land	2275.0	0.019	0.180	I
NV0023744	910	Baymont Inn and Suites (formerly Holiday Inn Hotel)		0.010		I-5A
NV0023761	910	McCarran International Airport	1289.58	0.029	0.156	I
NV0023809	910	Terrible Herbst #225	1598.3	0.0080	0.053	I
NV0023841	910	Hudson Cleaners	2197.6	0.0240	0.220	I-5E
NV0023931	910	Mendenhall Center - UNLV	2907.6	0.0050	0.061	I-7
NV0024112	910	American Pacific Corp AGTS		1.0360		I-7
NV0024202	910	Sunset Regional Park Splash Pad	591.4	0.0850	0.210	I-7
NV0024206	910	The Waterhole	5858.75	0.0060	0.147	I-7
NV0024210	910	Las Vegas Wash Channel Improvement Project		0.9230		I-2
NV0020133	910	City of Las Vegas	967.9	41.3600	166.942	M-A
NV0021261	910	Clark County Water Reclamation District - AWT Plant	1047.8	99.100	432.992	M-A
NV0021563	920	Clark County Water Reclamation District - Laughlin Plant	1105.3	1.811	8.347	M-A
NV0022098	910	Kurt Segler Water Reclamation Facility - City of Henderson	1113.9	15.145	70.350	M-A
NV0022993	910	Golden Nugget Hotel and Casino	1212.9	0.007	0.035	I-1
NV0023311	910	7-Eleven Store # 25586	0.0	0.000	0.000	I-2
NV0023671	910	Former Cappy's Cleaners	0.0	0.000	0.000	I
NV0023736	910	Bowman Reservoir & Muddy River Outfalls	1175.3	1.2230	5.994	M-1
NV0024121	910	City of North Las Vegas Utilities Water System O&M		0.2190		I-7
NV0024139	910	City of Henderson Water Systems and Facilities		0.0680		M-B
NV0021911	910	Las Vegas Valley MS4				I-7
NV0024214	910	Las Vegas Wash & Flamingo Wash	3364.4	4.7470	66.599	I-5A
NV0024222	910	Low Lake Level Pumping Station	0.0	0.0000	0.000	M-B
NV0024104	910	LVVWD/SNWA Operations and Maintenance		1.5290		M-A
NV0024201	910	STATEWIDE VAULT MAINTENANCE DEWATERING	0.0	0.0000	0.000	I-7
NV0024220	910	VILLAGE SHOP #4/SINCLAIR STATION	1179.25	0.0030	0.015	I-7
NV0024227	910	Former PJs Cleaners	3322.5	0.0120	0.166	I
NV0024231	910	Boulder Hwy Storm Drain	0	0.0000	0.000	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
NM0020770	801	Bloomfield, City of / WWTP	315	0.85	1.11	M
NM0000043	801	Farmington, City of / Animas Steam Plant	0	0	0	I-1
NM0031135	801	Farmington Electric Utiltiy System (FEUS)-Bluff View	NA	NA	2000	I
NM0028258	801	Farmington Sand & Gravel Co.	0	0	0	I-1
NM0020583	801	Farmington WWTP	420.54	5.15	9.03	M-5A
NM0029025	801	Harper Valley Subd.	372.4	0.4	0.05	I-1
NM0030953	801	Navajo Dam DWC & NSW, Inc	0	0	0	I-2
NM0031194	801	US BOR Cutter Lateral Water Treatment Plant	0	0	0.00	I-2
NM0024163		Reserve, Village of WWTP				
NM0029505	801	Westmoreland San Juan Mining LLC - La Plata	0	0	0	I-3
NM0028746	801	Wesmoreland San Juan Mine LLC - San Juan	0	0	4000	I
NM0029432	801	Yampa Mining Co. (De-na-zin Mine)	0	0	0	I-1
NM0029475	801	Yampa Mining Co. (Gatew.)	0	0	0	I-1
NM0031160	801	Bloomfield, City of- Primary Raw Water Source	0	0	0	I-1
NM0020672	900	Gallup WWTP	NA	2.25	9.97	M-4A
NM0020524	900	Quivira Mining Company - Church Rock	0	0	0	I-1
NM0023396	900	Ramah Water & Sanitation Dist.	580	0.03	0.045	M-5
***Permits in New Mexico are issued by the U.S. EPA and certified by the State of New Mexico Environmental Department.**						
Utah						
UT0025828	300	Courthouse Wash Water	788	0.02	0.066	I-B

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
UT0025712	300	Energy Queen Mine	-	0	0	I-2
UT0025917	300	Harley Dome	-	-	-	I-1
UT0020419	300	Moab, City of	364	0.987	1.49	M
UT0023922	300	Rim Mine	-	0	0	I-2
UT0025810	300	Velvet Mine	-	0	0	I-2
UTG640027	411	Ashely Valley WTP	-	-	-	M-6
UTG640003	411	Ashley Springs WTP	-	-	-	M-6
UT0025348	411	Ashley Valley Water & Sewer, Mechanical	494	2.8	5.77	M
UTG640014	411	Dutch John WTP	-	-	-	M-6
UT0000035	411	Ashley Valley Operating	1235	1.09	5.61	I-5B
UT0024015	411	Intermountain Concrete	257.9	0.018	0.019	I-B
UTG640023	411	Manilla WTP	-	-	-	M-6
UT0020338	411	USBOR-Flaming Gorge Dam	856	0.0012	0.004	M
UTG130001	411	USFWS-Jones Hole Fish Hatchery	188	6.38	5.001	I-5D
UTG040007	600	Coal Energy Group-Wildcat Loadout	-	0	0	I-2
UTG790028	600	Bill Barrett Corp-Nine Mile Compressor Station	-	-	-	I-1
UTG040011	600	Canyon Fuel Co.- Banning Loadout	-	0	0	I-2
UT0025593	600	Canyon Fuel Co.- Dugout Mine	894.7	0.658	2.455	I-A
UT0023540	600	Canyon Fuel Co.- Skyline Mine	509.3	4.71	10.003	I-A
UT0023680	600	Canyon Fuel Co.-Soldier Creek Coal	-	0	0	I-2
UTG040028	600	Carbon Resources-Kinney No. 2 Mine	-	0	0	I-1
UTG040030	600	Coal Energy Group-Kinney No. 2 Mine	-	0	0	I-2
UTG640012	600	E. Carbon City-Sunnyside CWTP	-	-	-	M-6
UTG640017	600	Green River WTP	-	-	-	M-6
UT0025771	600	Green River, City of	4841	0.95	19.2	M-B
UT0023094	600	Hiawatha Coal Co.	721	0.205	0.616	I-B
UTG040019	600	Horizon Mine	-	-	-	I-1
UT0026018	600	Lila Canyon Mine (Sanitary System)	-	0	0	I-2
UTG040024	600	Lila Canyon Mine	2046	0.393	3.35	I-A
UTG040010	600	Price River Terminal/Wellington Coal Prep Plant	-	0	0	I-2
UT0000094	600	PacifiCorp-Carbon Plant	-	-	-	I-1
UTG640035	600	Price City WTP	-	-	-	M-6
UT0021814	600	Price River Water Imp. Dist.	1085	1.52	6.87	M-A
UTG640034	600	Price River WID	-	-	-	M-6
UTG040005	600	Savage Industries Coal Terminal (CV-Spur)	-	0	0	I-2
UTG040025	600	Star Point Caol Refuse Pile (Sunnyside Cogen)	-	0	0	I-2
UT0024759	600	Sunnyside Cogeneration Plant	-	0	0	I-2
UTG040029	600	Andalex Tower Mine	-	0	0	I-2
UT0025640	600	West Ridge Resources Mine	-	0	0	I-2
UT0020095	610	Duchesne City Corp.	-	0	0	M-2
UT0025801	610	Duchesne Valley WTP	352.8	0.147	0.216	M-B
UTG640008	610	Myton Community Water System	-	-	-	M-6
UT0023001	610	Neola Town Water & Sewer Assoc.	-	0	0	M-2
UTG640002	610	Tridell-Lapoint Water WTP	-	-	-	M-6
UTG130012	610	UDWR-Whiterocks Fish Hatchery	246	4.9	5.01	I-5D
UT0022918	700	Canyon Fuel Co.- SUFCo Mine	803.2	3.06	10.25	I-A
UT0025798	700	Capital Reef National Park	-	-	-	I-2
UTG040026	700	Bronco Utah Operations-Hidden Valley Mine	-	0	0	I-2
UT0022616	700	Bronco Utah Operations-Emery Mine	2659	0.164	1.82	I-5B
UTG130003	700	UDWR-Egan/Bicknell Fish Hatchery	131	9.43	5.16	I-5D
UTG130007	700	UDWR-Loa Fish Hatchery	158	8.18	5.41	I-5D
UTG640004	700	USNPS-Glen Canyon Hite WTP	-	-	-	M-6
UT0023663	710	Castle Valley SSD-Castle Dale	591	0.25	0.616	M-B
UT0020052	710	Castle Valley SSD-Ferron	-	0	0	M-2
UT0021296	710	Castle Valley SSD-Huntington	3905	0.216	3.52	M-B
UTG640030	710	Emery WTP	-	-	-	M-6
UTG640039	710	Ferron WTP	-	-	-	M-6
UT0024368	710	Genwal Resources -Crandall Canyon Mine	548	0.43	0.98	I-A
UTG640040	710	Huntington WTP	-	-	-	M-6
UT0025534	710	James Canyon Well System	-	0	0	I-1
UTG640031	710	Orangeville WTP	-	-	-	M-6
UTG040006	710	Bear Canyon Mine	1033	0.0576	0.248	I
UT0023604	710	PacifiCorp-Deer Creek Mine	-	0	0	I-2
UTG040009	710	Hunter Plant Coal Prep & Blend Facility	-	0	0	I-2
UT0023728	710	Fossil Rock-Trail Mountain Mine	-	0	0	I-2
UT0022896	710	PacifiCorp-Wilberg Mine	950	0.035	0.277	I
UTG640019	802	Blanding Culinary Water Treatment	-	-	-	M-6
UT0024503	802	Monticello	-	0	0	M-2
UTG640015	802	Monticello City (Culinary WTP)	-	-	-	M-6
UT0025992	900	Alton Coal Development	1084	0.265	1.198	I-A
UT0025224	905	Springdale	959	0.42	1.68	M-A
UTG790070	905	St. George Costco	-	0	0	I-1

NPDES PERMITS

Colorado River Basin Salinity Control Forum

January 1, 2017 through December 31, 2019

NPDES PERMIT#	REACH	NAME of Discharging Facility	TDS Conc. AVG.(Mg/L)	Flow Rate AVG.(MGD)	Salt Load Tons/Day	Explanantion Code
UTG640021	905	St. George WTP	-	-	-	M-6
UT0024686	905	St. George, City of	1218	9.3	47.3	M-5B
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-B
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	400	0.05	0.08	M-B
WY0022357	401	Rock Springs WWTP	812	2.41	8.16	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
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	0.33	M-B
WY0000051	411	Kemmerer Mine			0.26	I-B
WY0000116	411	Kemmerer Water Treatment Plant	500	0.31	0.98	M-4B
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-5B
WY0022071	411	Fort Bridger Sewer District	562	0.2	0.47	M-B
WY0022373	411	Granger Wastewater Lagoon			0	M-2
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	0.44	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, 2017 through December 31, 2019

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, 2017 through December 31, 2019

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						
Permits in New Mexico are issued by the U.S. EPA and certified by the State of New Mexico Environmental Department as reported in Appendix C.						
Region 8 Permits						
CO0034975*	190	USNPS - Colorado National Monument				M-6
CO0000086*	220	HOTCHKISS NTL. FISH HATCHERY	19	4.31	0.341	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
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.			19.080	I-2
Region 9 Permits						
AZ0024619*	900	HOPI INDIAN NATION/ UPPER VILLAGE OF MOENKOPI WWTP				M
AZ0021415*	940	COLORADO RIVER JOINT VENTURE	<400	1.2		M
NN0000019	801	APS Four Corners Power Plant		4.2		I-7
NN0028193	801	NTEC Navajo Mine				I-7
NN0020869	801	BIA Crystal Boarding School		0.015		M-6
NN0020800	801	BIA Nenahnezad Community School		0.024		M-6
NN0020991	801	BIA Pueblo Pintado		0.016		M-6
NN0020621	801	NTUA Shiprock		1		M-6
NN0020265**	802	NTUA/CHINLE	<400	0.783		M
NN0020281**	802	NTUA/KAYENTA	<400	0.9		M
NN0020133	803	NACOGDOCHES OIL & GAS	<400	0.01		I-1
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
NN0020958	900	BIA Wingate School		0.1		M-6
NN0029386	900	Chevron Mining, Inc. / McKinley Mine				I-7
NN0030335	900	NTUA Navajo Townsite		0.32		M-6
NN0030325	900	Ramah Navajo School Board - Pine Hill		0.035		M-6
NN0025178	900	RJG Inc. - Gouldings Lodge		0.072		M-6
NN0030339**		BIA/LUKACHUKAI COMMUNITY SCHOOL				M-6
NN0030343		NTUA Northern Edge Casino		0.03		M
NN0030344		NTUA Twin Arrows Casino		0.13		M
NN0030345		Navajo Engineering & Construction Authority (NECA)				M
NN0030346		Mariano Lake Waterline Project				M
NNG990001		General Permit for Low Threat Discharges in Navajo Nation		Varies		Varies

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), 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 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 Lakes Powell and 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 especially useful in making a relative comparison between hydrologic and salinity concentration impacts from different alternatives by holding constant most inputs, as well as other key modeling assumptions, so as to isolate the differences due to each alternative. Additionally, 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 the historical observed natural flow record (1906-2018). This natural flow record has been further subdivided into (ii) "Pluvial Removed" (1931-2018) and (ii) "Stress Test" (1988-2018). Flows during the 1906-1930

period are believed to be less likely to occur in the future and therefore the workgroup adopted the use of the "Pluvial Removed" (1931-2018) record. A comparison of the modeling results using the resampled 1906-2018 and the 1931-2018 records is seen in Figure E-1. The workgroup will continue to investigate the impacts of input hydrology in future reviews.

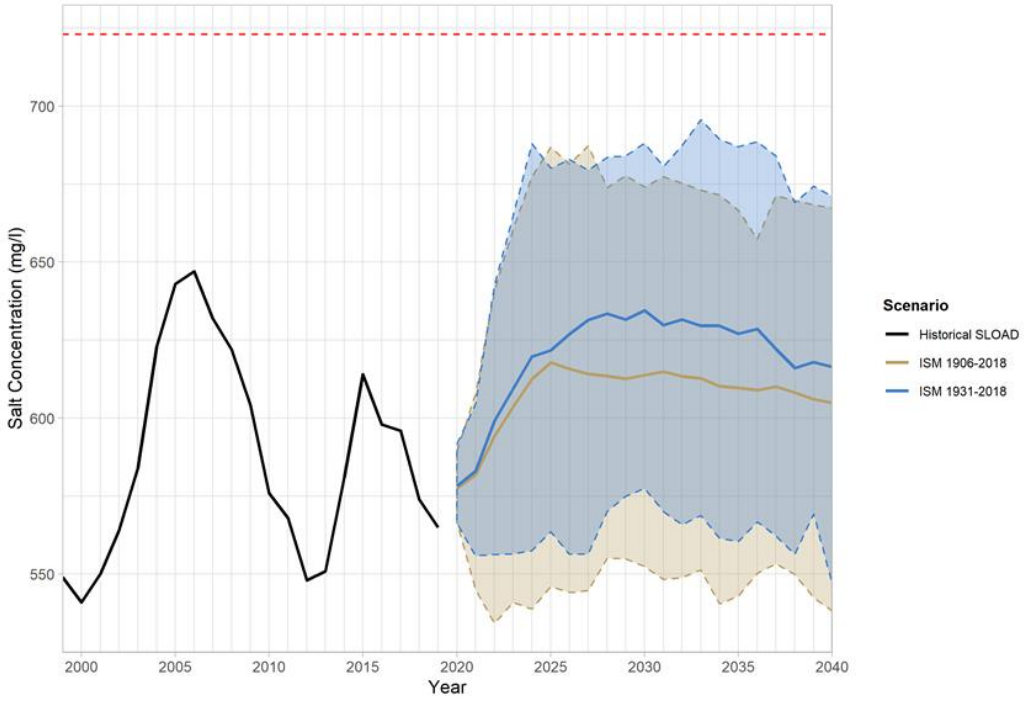

Figure E-1 – Projected average annual salinity concentration below Hoover Dam comparing the 1906-2018 resampled record to the 1931-2018 "Pluvial Removed" modeling results. The colored solid lines are the means and the shaded cloud area represents the 10th to 90th percentiles of each scenarios' annual values. The black line represents the historical observed concentration from the SLOAD program. The red dotted line represents the numeric criteria.

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, estimates of salt loading due to agricultural return flows and salt removed by salinity control projects. 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 2020 Triennial Review

The following lists major modeling assumptions in a bulleted format for the 2020 Triennial Review. These assumptions reflect the January 2020 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 the Prairie and Rajagopalan (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 CRSS long-term planning model.

Key Assumptions Common to All Scenarios Updated Since the 2017 Triennial Review

- Simulations performed from January 2020 through December 2040 at a monthly time step
- Initial conditions for all reservoirs are 2019 end-of-calendar year (EOCY) actual values
  - Includes pool elevation and reservoir salt concentration
- For modeling purposes, the Interim Guidelines as adopted in the ROD (Section XI.G.), the Drought Contingency Plans and Mexico's Binational Water Scarcity Contingency Plan were extended from 2026 through 2040.
- 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.
- Future water demands for the Lower Division States (during Normal Conditions) are according to the schedules provided for the 2007 FEIS for the Colorado River Interim Guidelines modeling with updates to Nevada's demands in December 2016.
- Intentionally Created Surplus (ICS)
  - ICS creation and delivery schedules and logic were updated in 2009, 2012, 2016 and 2019 by the Lower Division states. Initial ICS balances were updated in January 2020
  - Rules for ICS activity remain unchanged from the ROD
- Water Quality Improvement Projects (WQIP) have been updated to reflect historical and projected control levels. See Table 4 for descriptions of the current modeling scenarios.

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 88-year (1931 through 2018) historical record of calculated natural flows to produce 88 hydrologic inflow sequences or traces for each scenario.

2. Future salinity concentrations are generated at 20 nodes in the 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 1989-2018 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. Salt concentrations on reaches are limited to their historical minimum and maximums with the remainder being stored for later release when concentrations are again within these bounds.

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

6. Lake Mead flood control procedures are always in effect.

7. Except during flood control conditions, Lake Mead is operated to meet downstream demands under the applicable provisions of the ROD, the Drought Contingency Plans and Mexico's Binational Water Scarcity Contingency Plan.

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

9. Non-storable flows arriving at NIB are assumed to be 70 kaf (1964 through 2015 average excluding flood years) for all years except the first year of the model simulation. In the first model year, the non-storable flows arriving at NIB are assumed to be 30 kaf. Bypass of return flows from the Wellton-Mohawk Irrigation and Drainage District to the Cienega de Santa Clara in Mexico is assumed to be 113 kaf annually (historical average from 1990 through 2016) and is not counted as part of the 1944 Treaty delivery to Mexico.

10. Yuma Desalting Plant is assumed to not operate.

APPENDIX F

Salinity Economic Impact Model Description

SALINITY ECONOMIC IMPACT MODEL DESCRIPTION

SEIM Background

The Salinity Economic Impact Model (SEIM) estimates the annual quantified damages (economic impacts) incurred in metropolitan and agricultural areas in the Lower Colorado River Basin (LCRB) that depend, either wholly or in part, on Colorado River water.

The SEIM is the current version of a salinity model that was originally developed in the late 1980s by the Milliken Chapman Research Group, Inc. (Lohman, 1988) to quantify the economic impacts of salinity from projects improving water efficiency in the Lower Colorado River Basin. Strategies to improve agricultural water efficiency included concrete-lining canals and retrofitting flood irrigation systems with drip or sprinkler irrigation systems. Prior to the use of salinity models such as the SEIM, the impacts of the salinity reduction on the economies of Lower Colorado River water users were unknown.

The model development in the 1980s was funded by the Bureau of Reclamation to quantify the efforts of the Colorado River Basin Salinity Control Advisory Council (Advisory Council). The Advisory Council's function is to:

> *"…advise the Secretaries of the Departments of the Interior and Agriculture…on all matters relating to efficient and timely planning and execution of salinity control measures…specified in the Colorado River Basin Salinity Control Act."*

The original salinity model estimated the economic impact due to salinity by considering five economic sectors that may be impacted by high-salinity Colorado River water. Over time, the original salinity model was updated and modified as new data became available. Brummer and Yahnke (1999) provided improved agricultural economic impact procedures for all areas except the Metropolitan Water District (MWD) service area. The MWD service area improvements are documented in MWD and Bureau of Reclamation (1999) and included updated procedures and data across all economic sectors.

A second salinity model was developed in the early 2000s based on this revised salinity model to improve the representation of the Central Arizona portion of the original model and support salinity economic impact analysis for the Central Arizona Salinity Study (Bureau of Reclamation, 2003). From 2003 until 2016, these two salinity models were run in tandem whenever an economic impact analysis was needed. In 2016, these two models were combined into a single Excel workbook model or the SEIM.

Beginning in 2015, the SEIM was reviewed by representatives from Arizona, California and Nevada to provide recommendations on redefining model regions and updating data for use in the 2017 Triennial Review. Another objective of the SEIM review was to improve usability, efficiency and transparency of the SEIM.

SEIM Methodology

The SEIM estimates the economic impact attributed to areas receiving Colorado River water with salinity levels greater than a baseline value of 500 mg/L[1] total dissolved solids (TDS) or areas increasing local TDS concentrations due to blending with Colorado River Water higher than 500 mg/L on residential water-using appliances, the treatment and infrastructure replacement costs in the commercial, industrial, and water utilities sectors, and income losses to agriculture. It also estimates the additional costs related to meeting California water quality standards for groundwater and recycled water use in the MWD service area. The model does not calculate an absolute value of the economic impacts due to salinity. Rather, the model estimates salinity impacts from the baseline condition (500 mg/L) and then calculates the change in economic impacts when salinity concentrations rise above or decline below the baseline condition. A few subareas, such as the North West subarea within MWD, typically do not receive Colorado River supplies. As a result, these subareas are not affected by changing Colorado River salinity levels and do not contribute damages to the overall total in the model.

Where possible, published cost data have been used in the SEIM. In some cases, current published cost data are not available, so historical cost data have been indexed to 2019 dollars using either the Bureau of Labor Statistics, 2020b or the Bureau of Labor Statistics, 2020a. One exception is the agricultural crop prices for the MWD and Lower Colorado subareas. These are 2014-2018 and 2015-2019 average prices, respectively.

Reclamation uses the Colorado River Simulation System (CRSS) to project future salinity levels in the river. These projections incorporate the effect of current and future salinity control projects implemented mainly in the Upper Colorado River Basin through the Colorado River Basin Salinity Control Forum (Forum). In addition to these projected salinity concentrations, SEIM model inputs include projected population, housing, and employment statistics along with projected residential, commercial, and industrial water demands obtained from Forum members. The model currently projects annual economic impacts due to elevated salinity for any year between 2020 and 2040.

The SEIM accepts projected salinity concentrations from the CRSS at three diversion points along the mainstem of the Lower Colorado River. Quantified damages due to salinity concentration are estimated for seven economic sectors across five regions. Table 1 summarizes the diversion points, economic sectors and regions that are included in the SEIM.

Table 2 lists the regions and their subareas as represented in the model. It should be noted that some subarea names are county names and the subarea may not include the entire county, only the portion that received Lower Colorado River mainstem waters. The SEIM estimates the annual quantitative damages by diversion point and economic sector for each region and subarea listed above. Table 3 presents the impacted items that are included in each economic sector's categories.

[1] U.S. EPA's secondary drinking water quality standard

Table 1
Names of Locations, Damage Sectors, and Regions Included in SEIM

Diversion Points	Economic Sectors	Regions
Hoover Dam	Agriculture	Central Arizona
Parker Dam	Residential	Mainstem Arizona
Imperial Dam	Commercial	Mainstem Nevada
	Utility	Mainstem California, Non-MWD
	Industrial	MWD Service Area
	Groundwater[2]	
	Recycling[2] & POTW	

Table 2
Subareas within Each Region in SEIM

Region	Subarea
Central Arizona	Phoenix AMA[3], Pinal AMA, Tucson AMA
Mainstem Arizona	Mohave County, La Paz County, Yuma County
Mainstem Nevada	Clark County
Mainstem California Non-MWD	Imperial County, San Bernardino County, Riverside County
MWD	Northwest, Los Angeles, West Basin, Central Basin, San Gabriel, Chino Basin, Orange County, Western Riverside, San Diego, Eastern Riverside

Table 3
Economic Sector Impact Category Items Included in the SEIM

Economic Sector	Impact Category Items
Residential	Water Pipes, Water Heater, Faucet, Garbage Disposal, Clothes Washer, Dishwasher, Water Softener, Detergent
Commercial	Sanitary, Cooling, Irrigation, Kitchen, Laundry, Misc.
Industrial	Process Water, Cooling Tower, Boiler, Sanitation, Irrigation
Water Utilities	Treatment Plant, Distribution System
Groundwater	Direct Recharge, Indirect Recharge, Incidental Recharge
Recycled Water	Irrigation, Direct Groundwater Recharge, Indirect Groundwater Recharge
Agriculture	**MWD Subareas Crops:** Strawberry, Nursery, Cut Flowers, Misc. Vegetable, Citrus, Avocado, Vineyard, Pasture/grain, Deciduous, Field Crops **All Other Subareas Crops:** Head Lettuce, Leaf Lettuce, Romaine Lettuce, Broccoli, Cauliflower, Alfalfa Hay, Onions, Avocados, Cantaloupe, Carrots, Oranges, Tangerines, Lemon/Limes, Grapefruit, Table Grapes, Potatoes, Corn, Wheat, Cotton, Barley, Olives, Honeydews, Tomatoes, Leaching Management Costs

The SEIM estimates damages (economic impact) on residential, industrial, commercial, water utility, and agriculture sectors, as well as on groundwater and recycled water. A general description

[2] Only applies to MWD Service Area
[3] These are active management areas (AMA) in Central Arizona in which groundwater use is strictly regulated by the Arizona Department of Water Resources. Nearly 80% of Arizona's population resides in these 3 AMAs.

of how each sector is calculated in the SEIM model is provided below.

Figure 1 presents a map of the regions included in the SEIM with shading indicating the portion of each subarea that receives Colorado River mainstem waters, along with the economic sectors impacted within each respective subarea.

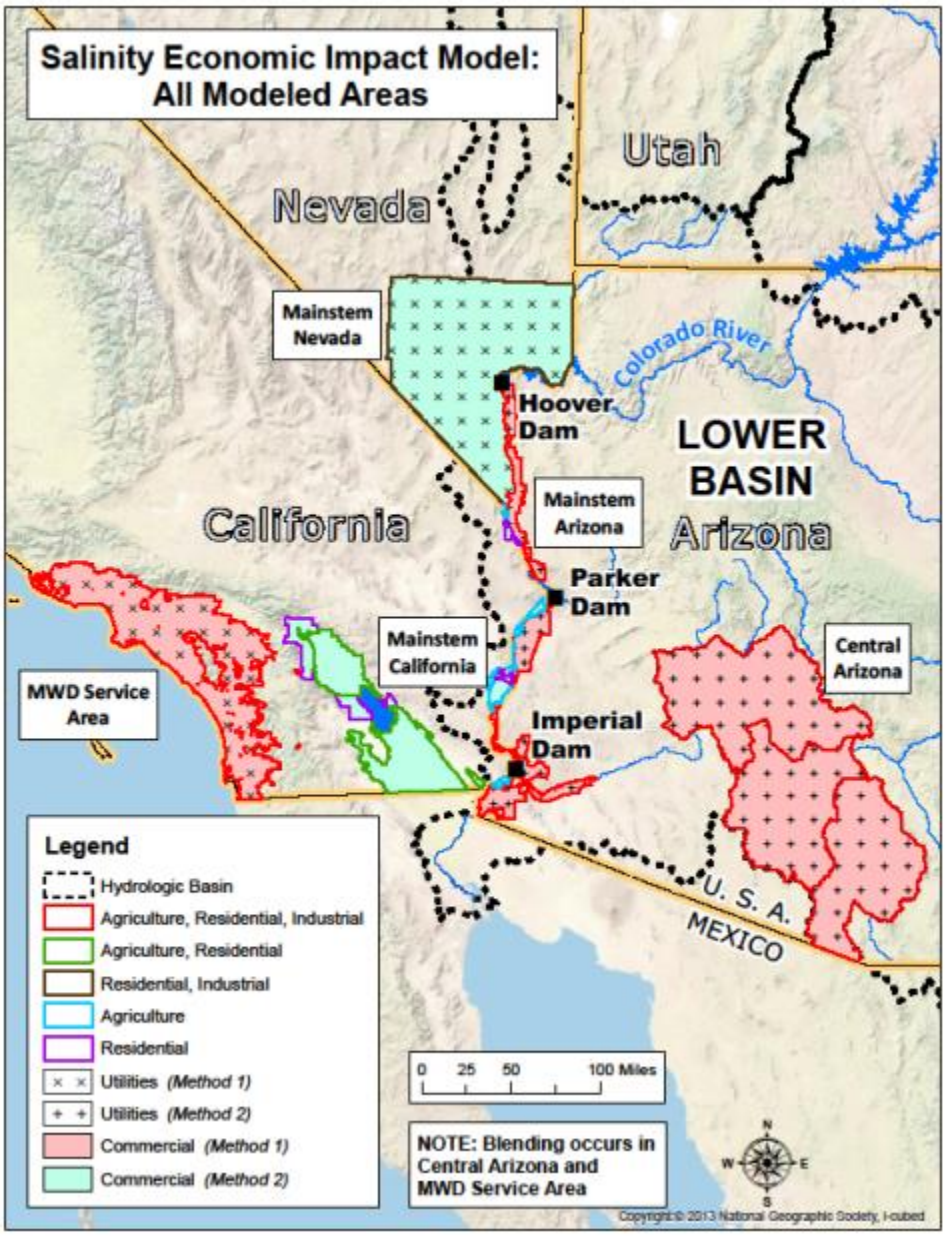

Figure 1 – Economic Sectors for the Regions Included in the SEIM

Residential Damage Calculation

The SEIM model estimates damages for 10 household items that have reduced useful life due to salinity. Each subarea in the model was updated in 2016 with the best available data for the number of units per household and average cost per unit. Useful life functions based on given salinity values were developed from previous salinity research and can be found in the Milliken-Chapman

study (1988). The SEIM model estimates the annual cost per household for each subarea based on the reduced useful life from increased salinity during the year of interest.

Commercial Damage Calculation

Commercial damages are calculated using one of two methods, which is determined by the data available for commercial water users. Method 1: Subareas where commercial water use data resolution aligned with the six SEIM commercial categories are calculated as the product of the annual water use and the salinity cost function for each commercial category. The salinity cost functions were developed by MWD specifically for the SEIM. Method 2: Subareas without the commercial water use data resolution required to use the salinity cost functions use an alternative approach based on the relationship between commercial and household water use. The relationship is the average ratio of annual commercial water use to annual residential water use. The commercial costs for these subareas are calculated as the product of the commercial water use ratio and the cost of residential damages.

Industrial Damage Calculation

Salinity damages are estimated in the SEIM for five major types of industrial water use. Damage functions developed for these categories are applied to the amount of industrial water use by category for each subarea in the model. Industries with processes requiring better quality water have larger costs associated with increasing salinity.

Water Utilities Damage Calculation

The SEIM estimates the damages to water utilities using two methods, depending on whether per capita or total capital investment replacement costs are available. Method 1: In subareas with per capita costs for capital improvement replacement of water production and distribution facilities due to salinity, the damages are estimated using useful life functions for water production and distribution facilities developed by MWD. The per capita costs for water production and distribution are divided by the average life of the facilities based on the given salinity level and then multiplied by the metropolitan population for the year of interest. Method 2: In subareas with total capital improvement costs (i.e., not per capita costs), the damages are estimated using only the useful life functions for distribution facilities developed by MWD. The total distribution costs are divided by the average life of the facilities based on the given salinity level. Under Method 2, water utility distribution replacement costs are not available.

Agriculture Damage Calculation

Agriculture damages are estimated in the SEIM through changes in gross revenue due to reduced crop yields of salt-sensitive crops. Crop yield functions for the most common types of agriculture were developed or used from available research. The number of acres and current crop price per acre were updated with best available data in the current SEIM model. The gross crop revenue is estimated based on the crop yield per acre at a given salinity level and the price per acre for that crop. The revenue computed in the SEIM from the projected salinity concentrations is compared to the revenue computed from baseline conditions to determine the change in revenue from increases in salinity for each subarea in the model. Subareas with more acres of crops sensitive to salinity changes have the largest amount of damages from reduced crop yields.

Groundwater, Recycling and Wastewater

The SEIM calculates the costs of removing salts to maintain water quality requirements for groundwater and recycled water that are used extensively in the MWD service area. MWD estimates the amount of water and wastewater that drains into the groundwater system and the amount that is used for recycled water purposes. Salinity cost functions (costs to desalt these sources of water) are used to estimate the costs at given salinity levels.

SEIM Results

The latest SEIM dated 5/8/20 was used during the 2020 Triennial Review to estimate quantified damages in the Lower Colorado River Basin. Table 4 presents the diversion point projected salinity concentrations from CRSS and the SEIM average annual quantified damages for the years 2020 and 2040. Table 5 presents the annual reduction in salinity concentration and quantified damages as of 2040, relative to Scenario 1, at each diversion point and as a LCRB total. Scenarios represented in Tables 4 and 5 are as follows:

- 2020 Conditions: Salinity controls as of 2020.
- Scenario 1 - No additional controls beyond 2020 (does not implement the Plan of Implementation identified herein)
- Scenario 2 - Controls associated with current projected program funding levels through 2040
- Scenario 3 - Controls associated with Plan of Implementation through 2040
- Scenario 4 - Controls associated with controlling maximum potential identified salt load by 2040

Table 4
Average Annual Colorado River Salinity Concentrations and Annual Quantified Damages, 2020 and 2040

2020							
	Average Annual Concentration (mg/L)			Average Annual Quantified Damages ($ millions)			
Scenario	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
Scenario 1	578	588	707	$37.9	$116.9	$198.8	$353.7
Scenario 2	578	588	707	$37.9	$116.9	$198.8	$353.7
Scenario 3	578	588	707	$37.9	$116.9	$198.8	$353.7
Scenario 4	578	587	707	$37.9	$115.5	$198.8	$352.3

2040							
	Average Annual Concentration (mg/L)			Average Annual Quantified Damages ($ millions)			
Scenario	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
Scenario 1	653	673	820	$95.4	$256.2	$318.9	$670.6
Scenario 2	624	643	784	$77.3	$209.1	$281.1	$567.6
Scenario 3	616	634	773	$72.3	$195.6	$269.6	$537.5
Scenario 4	569	585	714	$42.9	$119.3	$207.7	$370.0

Table 4 shows that average annual salinity concentrations and average annual quantified damages due to salinity at the three key locations (Hoover, Parker, and Imperial) will increase between 2020 and 2040 under all scenarios except Scenario 4. For example, under Scenario 3 (Controls associated with the Plan of Implementation through 2040) salinity concentrations would increase from 588 mg/L to 634 mg/L by 2040 at Parker, and total annual quantified damages would increase from $353.7 to $537.5 million.

Table 5
<u>Reduction</u> in Average Annual Colorado River Salinity Concentration and Annual Quantified Damages in 2040, Relative to Scenario 1 ("No Additional Controls Beyond 2020")

2040							
	Annual Concentration Reduction relative to Scenario 1 (mg/L)			Annual Quantified Damage Reduction relative to Scenario 1 ($ millions)			
Alternative	Hoover	Parker	Imperial	Hoover	Parker	Imperial	Total
Scenario 1	0	0	0	$0.0	$0.0	$0.0	$0.0
Scenario 2	29	30	36	$18.1	$47.1	$37.8	$103.0
Scenario 3	37	39	47	$23.1	$60.6	$49.3	$133.0
Scenario 4	84	88	106	$52.5	$136.9	$111.2	$300.6

Table 5 shows that all scenarios with funding and salinity controls greater than 2020 levels (i.e., Scenarios 2, 3, and 4) would reduce average annual salinity concentrations and annual quantified damages relative to Scenario 1, which would hold funding and salinity control at 2020 levels. For example, Scenario 3 (Controls associated with the Plan of Implementation through 2040) would reduce 2040 average annual salinity concentrations by 39mg/L at Parker, relative to Scenario 1, and would reduce 2040 total annual quantified damages by $133.0 million, relative to Scenario 1.

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