CHAPTER 5
SURFACE WATER RESOURCES

This chapter describes the surface water resources in the study area and potential changes that could occur due to implementation of the alternatives. Surface water resources could be affected by changes in the location of facilities on the Sea Bed that would change the presence, elevation, and extent of open water.

STUDY AREA

The study area is defined as the geographical area within which the large majority of potential impacts are expected. The study area for surface water resources includes the Salton Sea and its tributaries, as shown on Figure 5-1. These areas include surface water resources that could be directly affected by construction of the alternatives.

REGULATORY REQUIREMENTS

The regulatory requirements for the Salton Sea watershed related to surface water resources include water rights issued by the State Water Resources Control Board (SWRCB), designation of the Salton Sea as a repository for drainage, and federal and State requirements to protect surface waters applied to this watershed. Regulatory requirements related to surface water quality are described in Chapter 6.

Water Rights

Water rights records have been documented on several streams adjacent to the Salton Sea, as described below.

The SWRCB website (2006) indicates that there are seven appropriative water rights in the area of the Salton Sea, as summarized in Table 5-1. Two of these are held by the U.S. Department of the Interior, Bureau of Land Management. Both of these have a maximum diversion rate of less than 1 cubic foot/second and are located on small tributaries to the Salton Sea (one on an unspecified tributary to the Alamo River and one on Frink Spring near the Imperial Wildlife Area, Wister Unit). Both are designated for fish and wildlife protection and/or enhancement, and one is also designated for recreational uses. The remaining five appropriative water rights in the area of the Salton Sea are held by private individuals. All five have a maximum use of 5 acre-feet/year and are designated for domestic use. All five are located on the east side of the Salton Sea, north of the Imperial Wildlife Area, Wister Unit and near the Coachella Canal. There are also 17 undefined or unutilized water rights in the area of the Salton Sea. Six of these are held by individuals and the remaining 11 are held by public agencies, ranches, corporations, and similar entities.

No water rights were identified on the SWRCB web site for San Felipe Creek or Salt Creek.

In addition to the water rights for diversions adjacent to the Salton Sea, there are many water rights records for diversions from the Whitewater River or its tributaries. Coachella Valley Water District (CVWD) has 187 water rights records on file with the SWRCB. Five are modern appropriative rights, 12 are Statements of Water Diversion and Use (recordations of pre-1914 appropriative right claims or riparian right claims), and the remainder are groundwater recordations. Two of the water rights records are for diversions from the Whitewater River near Interstate 10. One of these water rights is for diversion of 400 cubic feet/second (cfs) from the Whitewater River, and the other water right is for storage of 39,000 acre-feet/year for water from the Whitewater River or its tributaries. CVWD also has water rights to divert water from the Colorado River. Water supplies for CVWD are described in subsequent sections of this chapter.

Table 5-1
Water Rights Allocated in the Vicinity of the Salton Sea

Source	Water Right Holder	Maximum Annual Use	Purpose of Use	Status
Frink Spring, tributary to the Salton Sea	Bureau of Land Management	Not identified-Max direct diversion = less than 1 cfs	Fish and wildlife protection and/or enhancement	Unknown
Unspecified tributary to the Alamo River	Bureau of Land Management	Not identified-Max direct diversion = less than 1 cfs	Fish and wildlife protection and/or enhancement; Recreational	Unknown
Unspecified tributary to the Salton Sea	Private Individual	5 acre-feet	Domestic	License Issued
Unspecified tributary to the Salton Sea	Private Individual	5 acre-feet	Domestic	License Issued
Paradise Lake Creek, Tributary to the Salton Sea	Private Individual	5 acre-feet	Domestic	License Issued
Unspecified tributary to the Salton Sea	Private Individual	5 acre-feet	Domestic	License Issued
Unspecified tributary to the Salton Sea	Private Individual	5 acre-feet	Domestic	License Issued

Source: SWRCB, 2006

Imperial Irrigation District (IID) has eight water rights permits to divert water from the Colorado River. Water supplies for IID are described in subsequent sections of this chapter.

Several water rights records have been recorded on Coyote Creek in San Diego County, a tributary to San Felipe Creek. In addition, the Anza-Borrego Desert State Park Preliminary General Plan and FEIR (CSP, 2004) indicated that there were 13 water rights applications and 26 statements of diversion and use on San Felipe Creek in 1998. These applications were in addition to recorded diversions of 4,423 acre-feet/year on Coyote Creek and 317 acre-feet/year on San Felipe Creek upstream of the Anza-Borrego Desert State Park.

No information was identified during the preparation of this PEIR related to water rights on Salt Creek.

Metropolitan Water District of Southern California (Metropolitan) has applied to divert uncontrolled tailwater or agricultural return flows on the New and Alamo rivers. The initial owner of the water is IID. The application for water on the New River is to divert 700 cfs with a limit of 433,400 acre-feet/year. The application for water on the Alamo River and unnamed tributaries is to divert 800 cfs with a limit of 475,000 acre-feet/year. The SWRCB requires an applicant to complete an analysis of availability of unappropriated water that addresses methods to prevent harm to other legal users of the water or to the environment, including considerations for water released by upstream water users to maintain habitat along the water course, and compliance with the Water Quality Control Plan prepared by the Colorado River Basin Regional Water Quality Control Board (CRBRWQCB). Water rights issued by the SWRCB for return flows or treated wastewater flows generally include a statement that does not guarantee that the flows would be constant or necessarily continue into the future. Following the completion of an application, the SWRCB would initiate preparation of environmental documentation and issue a public notice for a 60-day review period during which protests can be filed. Following responses to protests, if any, supplemental information may be required of the applicant prior to completion and release of the draft environmental documentation for public review. The SWRCB would hold a hearing to consider comments and protests prior to completion of final documentation. Following resolution of comments and protests, if any, the final environmental documentation would be completed and a water rights permit would be issued. The Metropolitan application is currently being reviewed by the SWRCB.

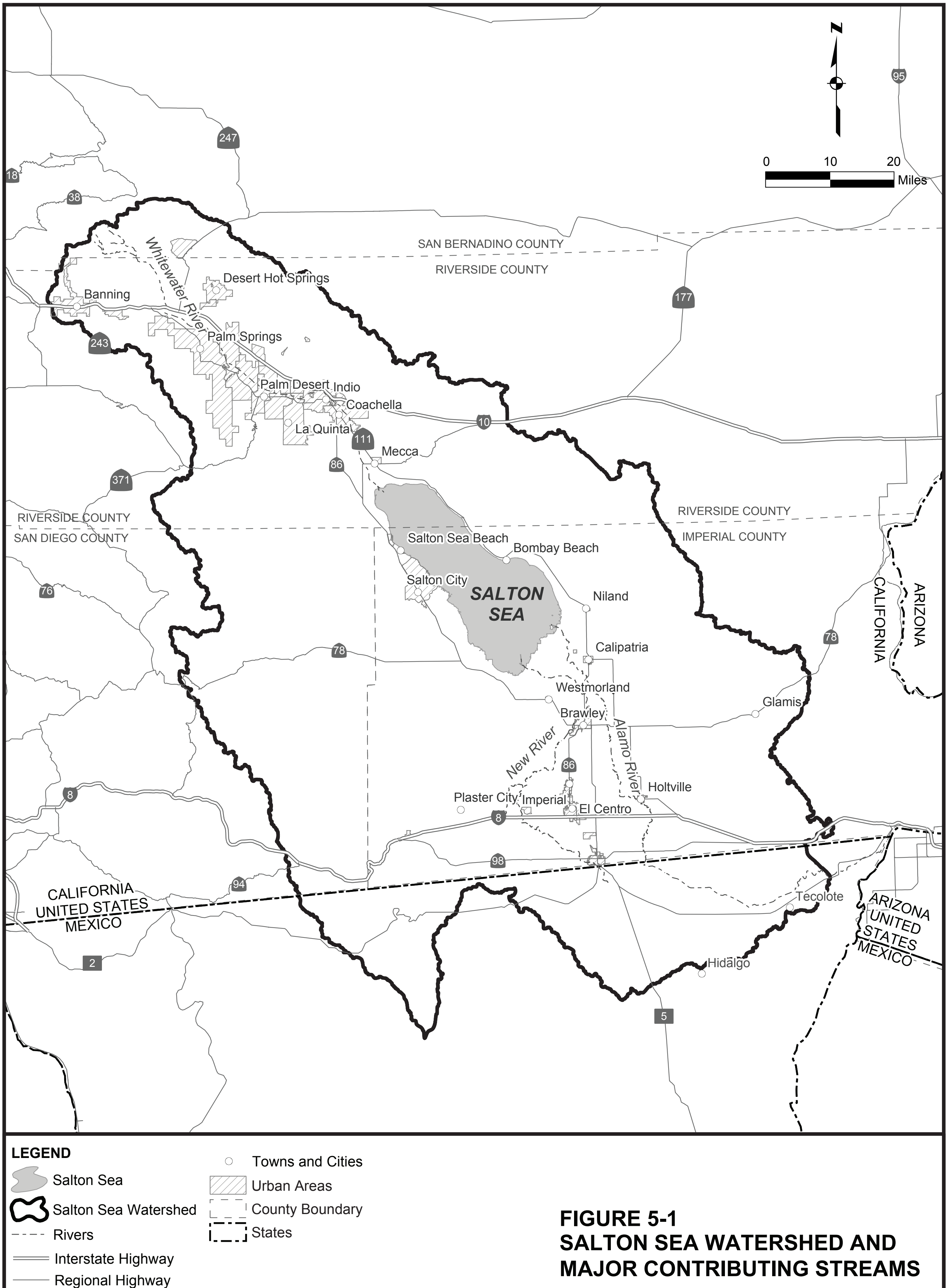

FIGURE 5-1
SALTON SEA WATERSHED AND MAJOR CONTRIBUTING STREAMS

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Salton Sea and Agricultural Drainage

Irrigated agriculture in the Salton Sea watershed has required drainage to remove groundwater and salts from the root zone of the irrigated lands. To protect the agricultural industry in the Salton Sea, President Coolidge declared specific sections of land under the Salton Sea to be withdrawn from settlement, location, sale, or entry, and reserved for the purposes of creating a drainage reservoir. These declarations were provided in Public Water Reserve No. 90-1 signed in March 1924 and Public Water Reserve No. 114 signed in February 1928. These orders designated the lands below -220 feet mean sea level (msl) at the Salton Sea to be used as a repository to receive and store agricultural, surface, and subsurface drainage waters from Imperial and Coachella valleys. In 1968, the California legislature adopted a statute declaring the primary use of the Salton Sea for the collection of agricultural drainage water, seepage, and other flows (Assembly Bill 461, 1968; Statutes 1968, Chapter 392).

Federal Regulations

The Federal Water Pollution Control Act Amendments of 1972, also known as the Clean Water Act, established the institutional structure for the U.S. Environmental Protection Agency (USEPA) to regulate discharges of pollutants into the waters of the United States, establish water quality standards, conduct planning studies, and provide funding for specific grant projects. The Clean Water Act has been amended by Congress several times since 1972. EPA has provided most states with the authority to administer many of the provisions of the Clean Water Act. In California, the SWRCB has been designated by EPA to develop and enforce water quality objectives and implementation plans. The SWRCB has delegated the specific responsibilities for the development and enforcement actions to the CRBRWQCB.

One section in the Clean Water Act, Section 404, requires that an entity obtain permits before discharging dredge or fill material into navigable waters, their tributaries, and associated wetlands. Activities regulated by 404 permits include, but are not limited to, dredging, bridge construction, flood control actions, and some fishing operations. In a recent court case, *Colvin v. United States* (181 F. Supp. 2d 1050, C.D. Cal. 28 December 2001), the court defined the Salton Sea as a navigable water and water of the United States.

State Regulations

The Fish and Game Code (Section 1601) requires an entity to consult with the Department of Fish and Game (DFG) prior to diverting, obstructing, or changing natural flow of a bed, channel, or bank of a river, stream, or lake; or using materials from the streambed; or disposing of materials in a river, stream, or lake. If the action would adversely affect fish and wildlife resources, a Lake and Streambed Alteration Agreement would be needed from DFG.

The Department of Water Resources (DWR), Division of Safety of Dams reviews plans and specifications for the construction of new and existing non-federal dams and reservoirs that meet the requirements of the California Water Code; Division 3, Dams and Reservoirs; Part 1, Supervision of Dams and Reservoirs, as described in Appendix H-4. Some of the structures considered in the PEIR alternatives, such as Barriers and Perimeter Dikes, would be under the jurisdiction of DSOD.

HISTORICAL PERSPECTIVE

The Salton Trough was periodically flooded by flows from the Colorado River, as described in Chapter 1 and Appendix H-2. The current Salton Sea was formed during 1905 to 1907 as a result of a failure of a diversion structure on the Colorado River in which the Colorado River flowed uncontrolled into the Salton Basin (Ogden, 1996; Hely et al., 1966). The water surface elevation of the Salton Sea rose to a maximum of - 195 feet msl by the time the diversion dike was repaired in 1907, but rapidly receded to about - 250 feet msl in 1925 as evaporation exceeded the rate of agricultural drainage flows to the Salton

Sea. In 1925, the elevation of the Salton Sea started to increase due to increased discharge of drainage from agricultural areas in Imperial, Coachella, and Mexicali valleys.

Salinity in the Salton Sea has increased over the years due to accumulation of salts as water evaporates, as described in Chapter 6.

DATA SOURCES

Historical and recent information was collected from a variety of sources including reports collected or prepared by IID, CVWD, Metropolitan, SWRCB, CRBRWQCB, U.S. Department of the Interior, Bureau of Reclamation (Reclamation), U.S. Department of the Interior, Geological Survey (USGS), and the Republic of Mexico.

DATA LIMITATIONS

Historical stream flow information was limited on some streams. In addition, information from several sources for the same stream was slightly different. The information presented in this chapter was selected to maximize the use of the same data sources to provide a similar basis of comparison of the Existing Conditions.

EXISTING CONDITIONS

The selected period of analysis for the description of Existing Conditions was from 1950 to present. This period was selected because it coincides with the period of time in which most of the existing water infrastructure was in place and a reasonably complete data set of inflows could be obtained. This period also represents operations prior to implementation of the Quantification Settlement Agreement (QSA).

Salton Sea Watershed

The Salton Sea watershed encompasses an area of 8,360 square miles from San Bernardino County in the north to the Mexicali Valley (Republic of Mexico) to the south. The Salton Sea lies at the lowest point in the watershed and collects runoff and agricultural drainage from most of Imperial County, a portion of Riverside County, smaller portions of San Bernardino and San Diego counties, as well as the northern portion of the Mexicali Valley. Mountains on the west and northeast rims of the basin reach elevations of 3,000 feet in the Coyote Mountains to over 11,000 feet in the San Jacinto and San Bernardino mountains. To the south, the basin extends to the crest of the Colorado River Delta. About one-fifth of the basin is below or only slightly above mean sea level (Hely et al., 1966). Annual precipitation within the watershed ranges from less than 3 inches near the Salton Sea to 40 inches in the upper San Jacinto and San Bernardino Mountains. The maximum temperature in the basin exceeds 100 degrees Fahrenheit (^{o}F) for more than 110 days/year. Open water surface evaporation rate at the Salton Sea is estimated at about 69 inches/year and average crop reference evapotranspiration rate at Brawley is reported to be about 71 inches/year (DWR, 2005a). Average monthly pattern of the precipitation, temperature, and evapotranspiration near the Salton Sea are shown in Figure 5-2. Detailed information related to precipitation, temperature, and evapotranspiration is presented in Appendix H-2.

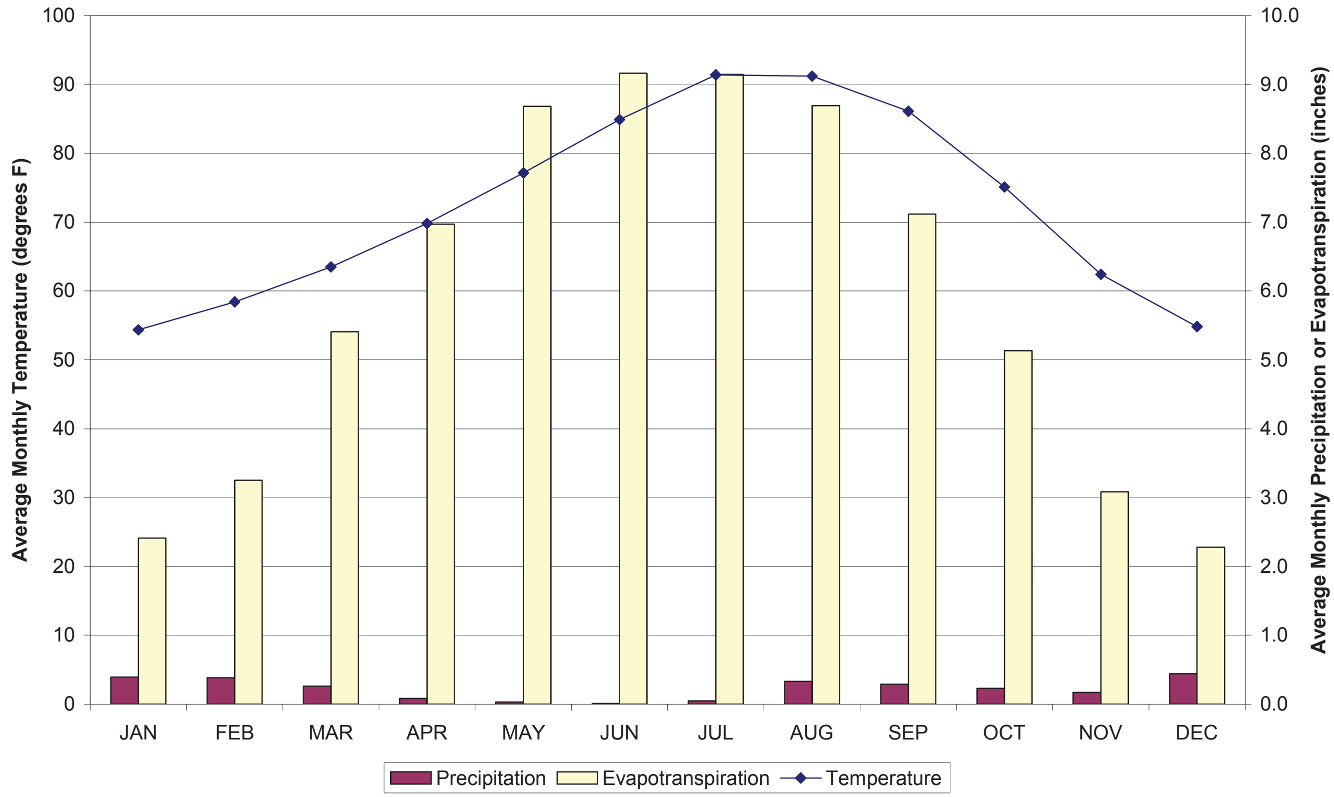

FIGURE 5-2
LONG TERM AVERAGE MONTHLY TEMPERATURE, PRECIPITATION, AND EVAPOTRANSPIRATION AT BRAWLEY

Agriculture in Imperial and Coachella valleys is sustained by Colorado River water diverted at Imperial Dam and delivered via the All-American and Coachella canals. In recent years, total diversions from the Colorado River at the Imperial Dam into these canals have ranged from about 3,000,000 to 3,600,000 acre-feet/year to support irrigated agriculture in the Imperial and Coachella valleys (Reclamation, 1999-2003). Agricultural drainwater from these areas and parts of the Mexicali Valley, as well as municipal and industrial discharges in the watershed, feed the major rivers flowing to the Salton Sea. The principal sources of inflow to the Salton Sea are the Whitewater River to the north, New and Alamo rivers to the south, and direct drainage from agricultural areas in both Imperial and Coachella valleys. Smaller contributions to inflow come from San Felipe Creek to the west, Salt Creek to the east, direct precipitation, and subsurface inflow. Total average inflow to the Salton Sea over the 1950 to 2002 period is estimated to be 1,300,000 acre-feet/year.

Inflows from Mexico

Water used in the Mexicali Valley comes from two primary sources, the Colorado River and groundwater. Under Article 10(a) of the *Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande—Treaty between the United States of America and Mexico* (Treaty) dated February 3, 1944, Mexico is entitled to 1,500,000 acre-feet/year of Colorado River water. Under Article 10(b) of the Treaty, Mexico may schedule up to an additional 200,000 acre-feet when “there exists a surplus of waters of the Colorado River in excess of the amount necessary to satisfy uses in the United States.” Mexico diverts the vast majority of its Colorado River water at Morelos Dam, located on the Colorado River near the northern United States-Mexico border crossing of the Colorado River. Historically, the United States has delivered flows in excess of the Treaty obligations to Mexico due to water not diverted in the United States and flood waters.

Agricultural return flows and municipal and industrial wastewater effluent flow from Mexico to the New and Alamo rivers and become part of the Salton Sea inflows.

New River

The New River originates in Mexico and flows northward across the United States-Mexico border. The New River is supplied by agricultural drain flows from the Mexicali Valley, municipal sewage and industrial discharges from Mexicali, and flood flows from the local drainage. During 1905 to 1907, when the Colorado River flowed into the Salton Sea, a considerable portion flowed through the New River channel (USIBWC, 2002). Discharge in the New River at the United States-Mexico border (USGS Station Number 10254970) is reported by USGS for 1979 to 2004. IID (2003a) estimated the flows at the United States-Mexico border for the period of 1950 to 2002. Minor discrepancies of less than one percent exist between IID estimates and USGS values for flows in the New River at the United States-Mexico border. To provide consistency with other IID data sources and due to a more complete IID data set, the IID reported discharge in the New River at the United States-Mexico border was used rather than USGS values. Average flow in the New River at the United States-Mexico border is 129,523 acre-feet/year with a minimum of 29,505 acre-feet/year in 1954 and a maximum of 267,904 acre-feet/year in 1984. Flow in the New River at the United States-Mexico border is strongly correlated to the volume of flow in the Colorado River at the location north of the United States-Mexico border that is upgradient of the diversion structure for the Mexicali Valley.

Alamo River

The Alamo River originates in the Mexicali Valley and flows north into the United States. Flows at the United States-Mexico border are primarily the result of drainage from irrigated agricultural in the Mexicali Valley. Pursuant to an agreement between the United States and Mexico, a weir was constructed in 1997 at the Alamo River in Mexico, about 100 feet upstream of the United States-Mexico border with the intent of preventing dry weather flows from Mexico from flowing into the Alamo River into the

United States. Although the weir is currently in place, lack of operation and maintenance of drainage channels upstream has caused the water to continue to flow into the United States (CRBRWQCB, 2001). Alamo River flows at the United States-Mexico border have been estimated by IID (2003a), but details regarding the methods and sources are not included in those documents. The United States International Boundary and Water Commission (USIBWC) reports that flows from 1949 to 1992 were estimated based on historical daily measurements of gage height at the Cipolleti weir and rating curves developed from monthly current meter measurements. From 1992 to the present, continuous gage height recordings and daily discharge measurements are available from IID (USIBWC, 2002). The values provided by IID have been adopted for use in this analysis. Average flow in the Alamo River at the United States-Mexico border is 1,646 acre-feet/year with a minimum and maximum of 324 and 2,274 acre-feet/year, respectively.

Inflows from the Imperial Valley

IID is the water supplier for the Imperial Valley. The IID water service area and primary canals and drains in the water service area are shown in Figure 5-3. The IID water service area encompasses 1,061,637 acres (IID, 2005a) including 460,000 irrigated acres. Total average irrigated acres of crops are over 520,000 acres/year due to multiple cropping efforts on the same land.

The IID water supply is diverted from the Colorado River near Imperial Dam and conveyed in the 82-mile long All-American Canal. Several canals convey water from the All-American including the Coachella Canal that diverts water to CVWD. Between 1986 and 1999, 2,400,000 to 3,100,000 acre-feet/year was diverted for use by IID through the All-American Canal.

About 85 percent of the IID diversion (as measured at Pilot Knob) is for agricultural use and 2 percent is delivered to municipal, industrial, and other uses (IID and Reclamation, 2002b). The remaining diverted water seeps into the groundwater, evaporates, or flows into the drainage system. Of the water delivered for on-farm use, 66 percent is used by crops, 3 percent is lost to evaporation from soil or water surfaces, 29 percent is captured in the drains as tailwater and tilewater that flows into the New and Alamo rivers or Salton Sea, and 2 percent seeps into the shallow groundwater and eventually flows into the Salton Sea.

New River

Flows of the New River at the Salton Sea are reported by IID for 1950 to 2002 (IID and Reclamation, 2002b; IID, 2003a). Measured discharge data reported by the USGS spans the period of 1943 to present (USGS, 2005). IID reports that in the past, IID and USGS alternated years for measuring the discharge of the New River near Westmorland (USGS Station Number 10255550), and some minor discrepancies (less than one percent) resulted in the data sets, particularly since 1987 (Eckhardt, 2005). Consistency with other Imperial Valley discharge estimates was provided by using values reported by IID. Since the flow at this location represents combined Mexico and Imperial Valley contributions, the contribution from the Imperial Valley was calculated by subtracting the Mexico contribution from the total flow. Average flow in the New River near the outlet to the Salton Sea is 440,974 acre-feet/year with the Imperial Valley contribution accounting for about 71 percent of the total. Average Imperial Valley contribution to New River discharge is estimated at 311,452 acre-feet/year with a minimum of 229,294 acre-feet/year in 1985 and a maximum of 509,431 acre-feet/year in 1953.

Alamo River

Flows of the Alamo River at the Salton Sea are reported by IID for 1950 to 2002 (IID and Reclamation, 2002b, IID, 2003a). Measured discharge data reported by the USGS spans the period of 1963 to present (USGS, 2005). IID reports that in the past, IID and USGS alternated years for measuring the discharge of the Alamo River

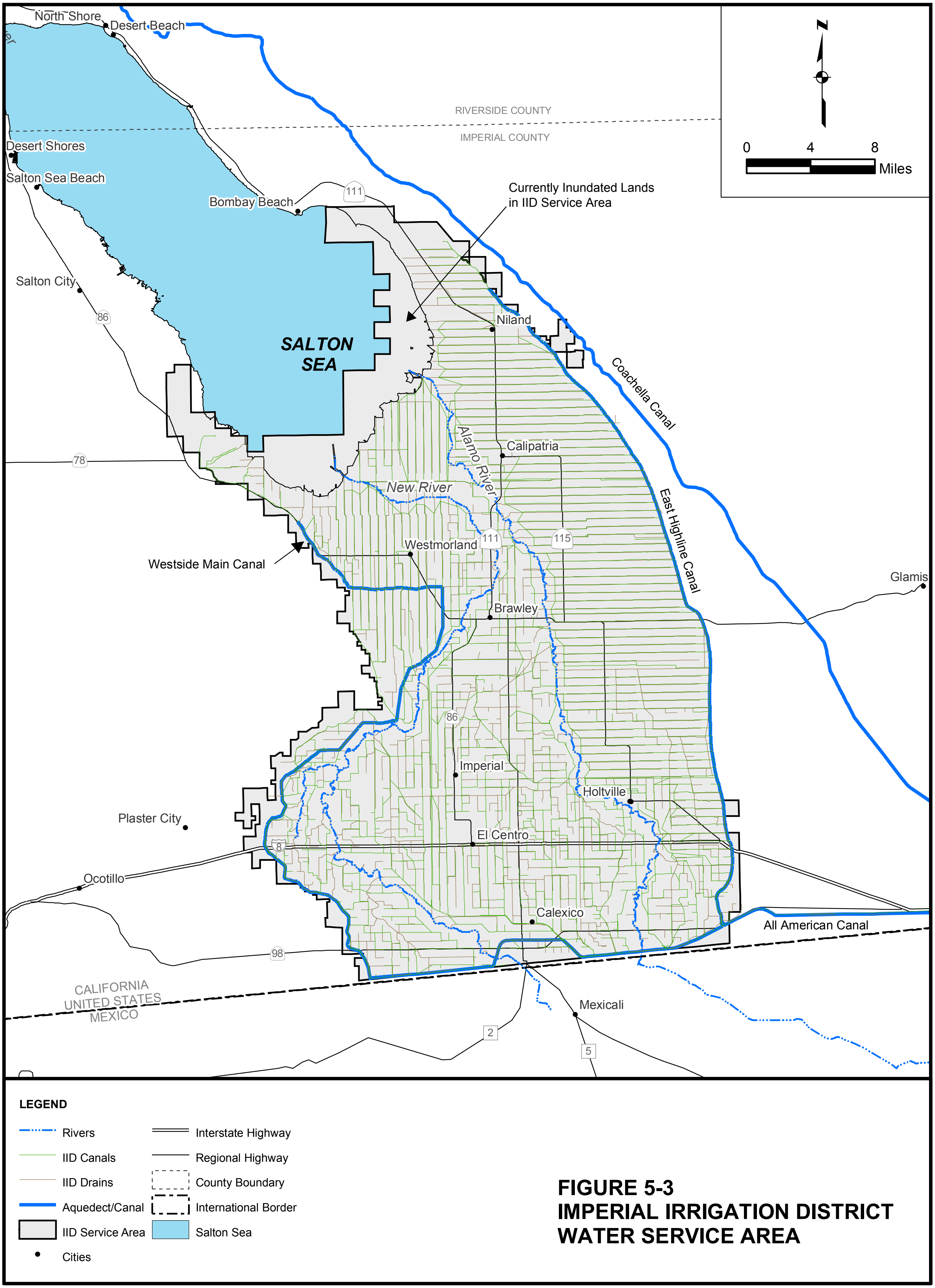

FIGURE 5-3
IMPERIAL IRRIGATION DISTRICT
WATER SERVICE AREA

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Imperial Valley Drains

The IID drainage system includes a network of 1,456 miles of open drains and closed drains (pipelines), 750 surface and subsurface drainage pumps, thousands of miles of subsurface (tile) drains and associated collection pipelines and water recovery systems. Water entering the drainage system can originate from the following sources (Loeltz et al.,1975):

- Delivery system losses, including canal seepage and operational discharge. Canal seepage is water lost to shallow groundwater and intercepted by the drains. Operational discharge is water that has traveled through portions of the distribution system to ensure full farm deliveries and is ultimately discharged to the drains from the surface canals and laterals of the system;
- On-farm tailwater runoff which is surface water runoff from an irrigated field when total water applied exceeds the soil infiltration rate;
- On-farm tilewater which is water that flows through the crop root zone and generally enters a tile drain (also known as leach water);
- Stormwater runoff; and
- Groundwater that flows into the drains.

Except in fields with tailwater recovery systems, tailwater is not available for on-farm use and is discharged into either the drainage system or rivers within the IID water service area.

A portion of the IID drains flow into the New and Alamo rivers and a portion of the drains flow directly into the Salton Sea (IID direct drains), as shown in Figure 5-3. Historical discharge from IID direct drains has been estimated by IID for the period of 1950 to 2002 (IID and Reclamation, 2002b; IID, 2003a). The USGS (Hely et al, 1966), as part of an evaluation of evaporation at the Salton Sea, independently measured flows and provided estimates of total direct IID drain flows to the Salton Sea for years 1961 to 1962. The values reported by the USGS for 1961 to 1962 are significantly higher (about two times greater) than those estimated by IID for the same period. The USGS attributed the differences in discharge estimates primarily to differences in measurement techniques. USGS estimates were based on direct gage measurements of the major drains. IID estimates were based, in part, on gate rating curves and historic gate openings. However, the IID data provides a consistent, long term continuous data set that is consistent with other measurements in the Imperial Valley. The direct drain discharge values reported by IID have been used in this analysis to provide a consistent database. Direct drainage accounts for about 10 percent of total Imperial Valley contributions to the Salton Sea inflow and is estimated at 93,848 acre-feet/year.

Inflows from the Coachella Valley

CVWD is the major water supplier for the Coachella Valley near the Salton Sea. CVWD uses Colorado River water, groundwater, and recycled water to serve about 640,000 acres, including 60,000 irrigated acres and 192,000 people (CVWD et al, 2002). Colorado River water is conveyed in the All-American and Coachella canals to CVWD. The Coachella Canal begins at a turnout on the All-American Canal and terminates at Lake Cahuilla near La Quinta. From 1990 to 1999, CVWD diverted an average of 330,900 acre-feet/year of Colorado River water. The CVWD service area and primary canals in the service area are shown in Figure 5-4. The Colorado River Aqueduct is located along the northern boundary of CVWD. Water allocated to CVWD under a State Water Project entitlement is delivered from the Colorado River Aqueduct through an exchange with Metropolitan.

The main waterbodies in the Coachella Valley are the Whitewater River/Coachella Valley Storm Channel, the Coachella Canal and related facilities, and CVWD drains. The primary sources of flow from the Coachella Valley to the Salton Sea are agricultural return flows, stormwater runoff, and fish farm and municipal wastewater discharges.

Whitewater River/Coachella Valley Storm Channel and Direct Drains

The Whitewater River is the primary river drainage channel of the Coachella Valley and collects stormwater runoff, agricultural return flows, and municipal and fish farm discharges. The Coachella Valley Storm Channel is a 17-mile unlined extension of the Whitewater River and is the principal drainage channel for the lower valley. The channel was constructed to safely pass storm flows and to provide adequate drainage for agricultural lands in the area of semi-perched groundwater. Throughout the lower valley, agricultural drains have been installed to convey shallow groundwater away from the crop root zones. These drains convey water to the Coachella Valley Storm Channel and 25 smaller open channel drains that discharge directly to the Salton Sea (CVWD, 2002a).

Direct discharge of the Whitewater River/Coachella Valley Storm Channel near the Salton Sea has been measured by USGS (Station Number 10259540) since 1960 and has been estimated by CVWD for 1950 to 1959 (IID and Reclamation, 2002b). During this period, the direct drains to the Salton Sea contributed nearly 40 percent of the total annual volume of Coachella Valley discharge. Total Coachella Valley surface flow to the Salton Sea has been estimated for 2000 to 2002 through USGS measurements of Whitewater River/Coachella Valley Storm Channel flow (USGS, 2005) and recent direct drain percentages. Average total surface discharge from the Coachella Valley to the Salton Sea for the historical period is estimated at 113,827 acre-feet/year with a minimum of 53,368 acre-feet/year in 1957 and a maximum of 174,684 acre-feet/year in 1976. In recent years total surface discharge has been less than 90,000 acre-feet/year.

Inflows from the Local Watersheds

The portion of the Salton Sea watershed not tributary to the irrigated areas of Imperial and Coachella valleys is about 2,292 square miles and consists of the drainages of San Felipe Creek, Salt Creek, and other minor channels that discharge to the Salton Sea.

San Felipe Creek

The San Felipe Creek watershed encompasses about 1,693 square miles including much of Anza-Borrego Desert State Park, Borrego and Clark Sinks, and most of the western portion of the Salton Sea watershed. Rainfall and snowmelt runoff from the mountains to the west contribute to streamflow in the upper portions of San Felipe Creek. Some perennial reaches exist in the mountain areas, but San Felipe Creek discharge to the Salton Sea is generally restricted to the summer thunderstorms on the desert floor and heavy winter storms. Discharge from San Felipe Creek, about 4 miles upstream of the Salton Sea, was measured by the USGS (Station Number 10255885) from 1961 to 1991 (USGS, 2005). San Felipe Creek is the most hydrologically variable source of inflow to the Salton Sea, ranging from zero flow for most of the year to a maximum daily discharge of 17,100 cfs on September 10, 1976 (nearly four times greater than any other inflow source to the Salton Sea). The hydrologic data set was extended for the entire historical period by developing a relationship between San Felipe Creek discharge and precipitation at Brawley, as described in Appendix H-2.

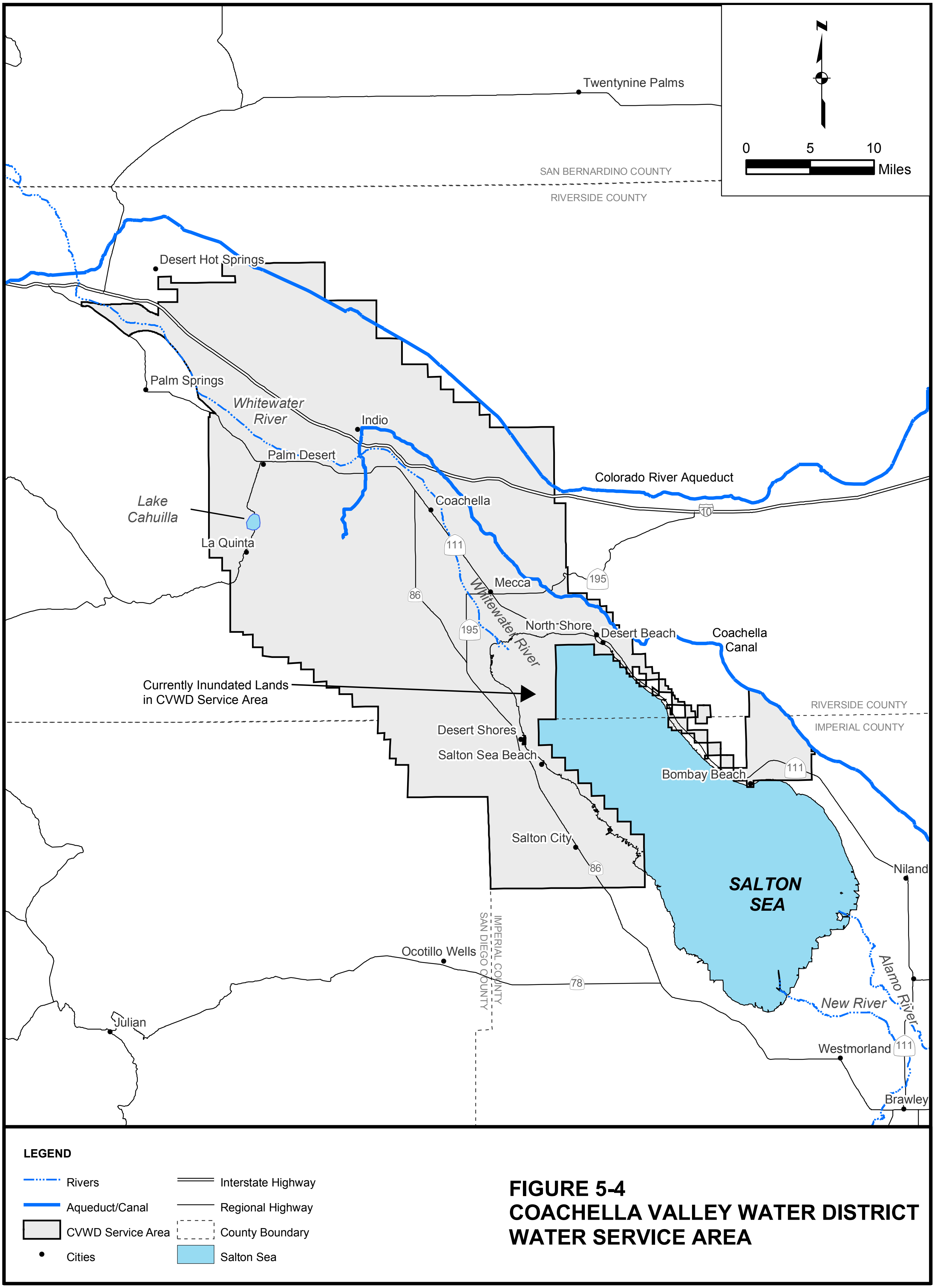

FIGURE 5-4
COACHELLA VALLEY WATER DISTRICT WATER SERVICE AREA

Estimated average discharge from the San Felipe Creek to the Salton Sea for this period is 4,532 acre-feet/year with a minimum of 60 acre-feet/year in 1973 and a maximum of 40,638 acre-feet/year in 1976.

Salt Creek

Salt Creek drains a watershed of about 269 square miles. Salt Creek is a perennial stream supplied by seepage from the Coachella Canal, groundwater discharge downslope of the canal, and occasional rainfall runoff. USGS (2005) has continuously measured discharge at Salt Creek, about 0.3 miles upstream of the Salton Sea (Station Number 10255550) from 1961 to 2004, except for water year 1974. Over time, phreatophyte vegetation has grown steadily in areas upstream of the gaging station and, through consumptive use, has reduced the baseflow at the gage. Baseflow is estimated to have been reduced from about 4,000 acre-feet/year in the early 1960s to less than 600 acre-feet/year between 1996 and 2002. The hydrologic data set was extended for the entire historical period, as described in Appendix H-2. Estimated average total discharge from Salt Creek to the Salton Sea for this period is 3,968 acre-feet/year with a minimum of 486 acre-feet/year in 2002 and a maximum of 17,227 acre-feet/year in 1983. Since 1996, the discharge has not exceeded 700 acre-feet/year.

Other Surface Water Inflows

The remaining 330 square miles of the watershed not tributary to the irrigated areas of Imperial and Coachella valleys or San Felipe and Salt creeks consist of nearly equal areas on the western and eastern shore. No data are available for runoff from these areas. As part of this analysis, the runoff from these areas was estimated, as described in Appendix H-2. The estimated average discharge from these ungaged areas for this period is 2,031 acre-feet/year.

Water Balance at the Salton Sea

The Salton Sea is located in a geographic depression with the deepest elevations at -278 feet msl. The water surface elevation, provisionally estimated as of January 1, 2005, was -228.7 feet msl (USGS, 2005). At this elevation the Salton Sea has a maximum depth of 50 feet, an average depth of 30 feet, and water storage volume of 7,200,000 acre-feet.

Contributions of inflow to the Salton Sea include surface water inflows, as described above, groundwater flow, and direct precipitation on the water surface. Historical groundwater inflows to the Salton Sea from the Imperial and Coachella valleys and local watersheds were estimated to be about 11,000 acre-feet/year, as described in Appendix H-2.

Precipitation on the Salton Sea water surface was estimated using recorded rainfall from Brawley and Mecca (WRCC, 2005), as described in Appendix H-2. Average rainfall between 1950 and 2002 at Brawley and Mecca was 2.55 and 2.65 inches/year, respectively. The average precipitation on the Salton Sea water surface was estimated at 49,142 acre-feet/year.

Evaporation is the single largest hydrologic component in the Salton Sea water budget and the largest outflow factor. Evaporation studies at the Salton Sea have been performed by the USGS (Hughes, 1967; Hely et al, 1966) in which water budget, energy budget, and mass transfer techniques were evaluated and compared to pan evaporation rates. Several methods were used for the PEIR to estimate evaporation rates, as described in Appendix H-2. Average net evaporation is measured by remaining water in an evaporation pan over specified period of time. Therefore, average net evaporation is the difference between the change in water level minus precipitation. The average net evaporation for this area is estimated to be 66.4 inches/year.

The estimated total average inflow to the Salton Sea, not including precipitation directly on the water surface, for the 1950 to 2002 period is estimated at 1,296,023 acre-feet/year with a minimum of 1,145,991 acre-feet/year in 1992 and a maximum of 1,461,736 acre-feet/year in 1953. In recent years the total inflow has been about 1,300,000 acre-feet/year. The total average outflow (through evaporation) for the historic period is estimated at 1,294,124 acre-feet/year, resulting in an increase in water surface elevation. The estimated historical water budget is shown in Figure 5-5. The relative contribution of each source area to the water budget is summarized in Table 5-2.

Table 5-2
Relative Contribution of Inflow Sources to the Salton Sea (1950 to 2002)

Inflow Source to the Salton Sea	Percent of Historical Annual Average Inflow
Mexico	9.8
Imperial Valley	76.5
Coachella Valley	8.5
Local Watershed	1.5
Precipitation directly on the Salton Sea	3.7
TOTAL	100.0

ENVIRONMENTAL CONSEQUENCES

Analysis Methodology

Long term policy and planning analyses of the Salton Sea have typically used the Salton Sea Accounting Model (SSAM) developed by Reclamation (IID and Reclamation, 2002b). The SSAM is a spreadsheet-based, annual time step, water and salt balance model for the Salton Sea.

As part of the preparation of the PEIR, Reclamation and the Resources Agency agreed to investigate a new modeling platform to allow for a more robust evaluation of wide-ranging alternatives. After initial screening of several available models and discussions with the Inflows/Modeling Working Group established for the PEIR, the generalized CALSIM reservoir-river basin simulation model was selected as the platform on which to build a new model for the Salton Sea. The CALSIM model is a generalized reservoir-water allocation model that allows for specification and achievement of user-specified allocation targets, or goals (Draper et al., 2004). The CALSIM model was developed jointly by the DWR and Reclamation and is used extensively for simulation of the State Water Project and Central Valley Project in California. Other applications of the CALSIM model include simulation of the Klamath Project, the American River Basin, and the San Joaquin River Basin.

The application of the generalized CALSIM model to the Salton Sea has been named the SALSA (Salton Sea Analysis) model. The model uses time-step optimization techniques to efficiently route water through a network of nodes that represent water supplies, demands, losses, and storage, as described in Appendix H-2. The SALSA model can be operated under both deterministic and stochastic modes. The deterministic mode of operation simulates the system performance using a single inflow pattern trace or sequence. The stochastic mode of operation allows for consideration of multiple future inflow traces or sequences.

The SALSA model simulated, on a monthly time step, the Salton Sea water surface elevation and salinity using the actual inflows and climate conditions based on the estimated climate conditions of the 1925 to 1999 historical sequence (primarily rainfall, evapotranspiration rates, and evaporation rates). However, even if the climate is consistent with the historical period, the historical sequence would not reproduce identically in the future.

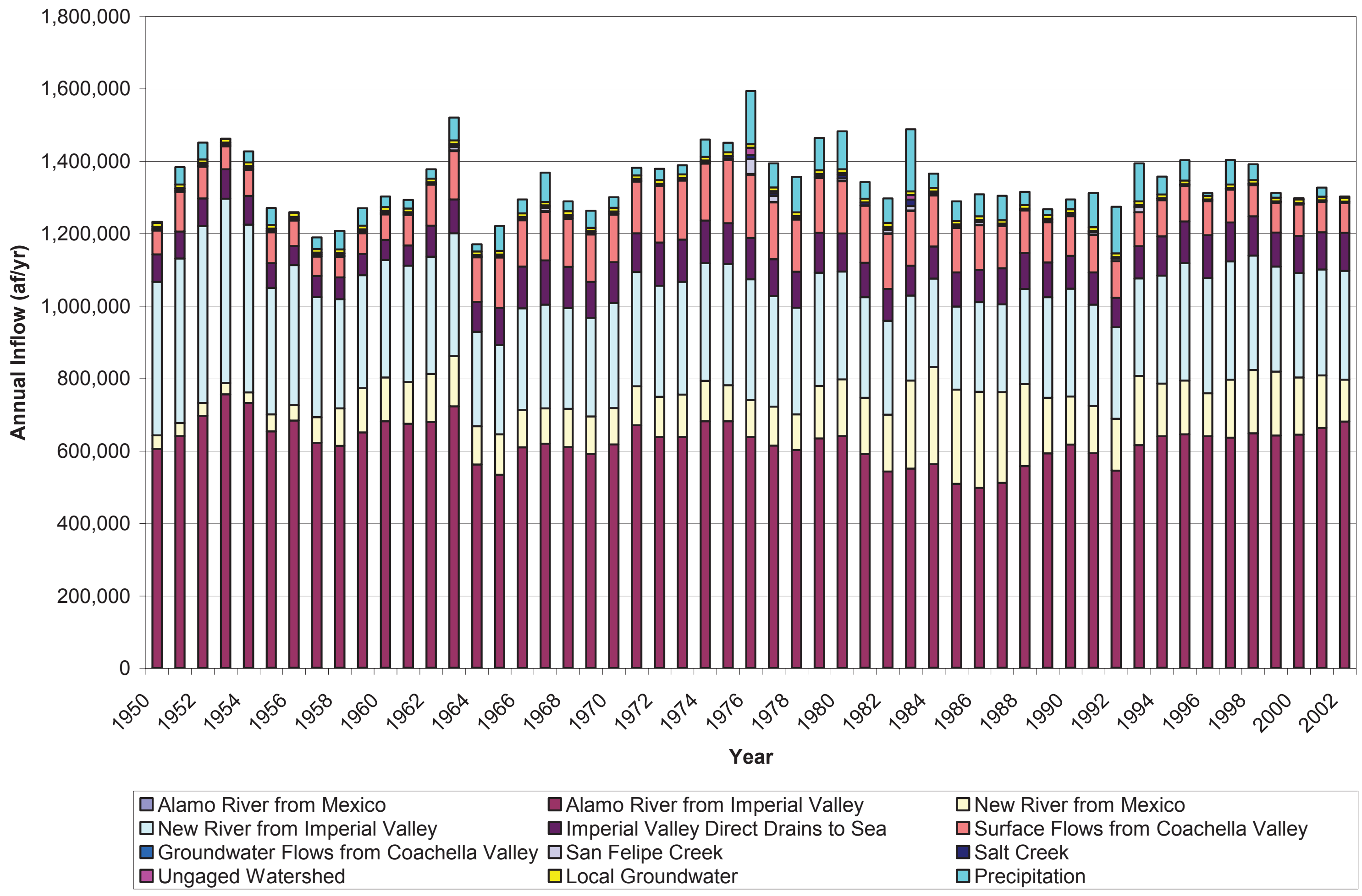

FIGURE 5-5
ESTIMATED HISTORICAL INFLOWS TO THE SALTON SEA

For this reason, the inflow analysis was developed using a statistical approach known as Monte-Carlo analysis to generate many possible future sequences (no adjustment to values, just sequence) based on the historic climate values and patterns. Using the model in the stochastic mode, the results would incorporate variability in climate and other conditions and can be viewed in a probabilistic fashion. This process may be repeated for hundreds or thousands of possible traces and statistics related to the model results have been compiled. Typically, the statistics of interest are the mean, median (50th percentile), standard deviation, inter-quartile (25th and 75th percentiles), and the 5th and 95th percentile values. This mode of operation was added to the standard CALSIM software for the PEIR, as described in Appendix H-2.

The time period of analysis for all projected level simulations was January 2006 through December 2078 (2078 conditions). This period was selected to be consistent with the planning horizon of the QSA.

Significance Criteria

The following significance criteria were based on CEQA and used to determine if changes as compared to Existing Conditions and the No Action Alternative would:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface water runoff, in a manner which would result in substantial erosion, siltation, or flooding, or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems;
- Place structures within a 100-year flood hazard area (as mapped on a federal Flood Hazard Boundary, Flood Insurance Rate Map, or other flood hazard delineation map) that would impede or redirect flood flows or expose people or structures to significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam;
- Create or contribute runoff water that would provide substantial additional sources of polluted runoff; or
- Cause inundation by seiche, tsunami, or mudflow.

Application of Significance Criteria

Significance criteria have been applied to the alternatives considered in the PEIR. The following list summarizes the overall methodology in the application of the criteria to the alternatives:

- **Substantially alter surface water or drainage patterns; or cause water erosion, siltation, or flooding, or contribute to runoff which would exceed the capacity of existing or planned drainage facilities –** The alternatives do not include changes in streambeds or water flows in streams in the watershed that could cause erosion, siltation, flooding, or flows that would impact drainage facilities on the shoreline. Therefore, the potential for impacts due to changes in drainage patterns are focused on changes in the Sea Bed;
- **Place structures within 100-year flood hazard area –** The alternatives do include structures within a flood hazard area in the Sea Bed but not on lands located at elevations above the shoreline. Therefore, the analysis evaluates this issue for structures within the Sea Bed;
- **Create or contribute runoff water that could cause polluted runoff –** The alternatives would cause changes in sediment loads and other constituent loads into the Salton Sea or Brine Sink during construction and operations and maintenance, as discussed in this chapter; and

- **Cause inundation by seiche, tsunami, or mudflow –** The Salton Sea is not located near the ocean where tsunamis occur, therefore, tsunamis are not considered in this chapter. Mudflows are considered as part of the unstable soil conditions evaluated in Chapter 9. Potential inundation by seiche is discussed in this chapter.

Summary of Assumptions

The assumptions related to the descriptions of the alternatives are described in Chapter 3. The specific assumptions related to the analysis of surface water resources are summarized in Table 5-3.

Table 5-3
Summary of Assumptions for Surface Water Resources

Assumptions Common to All Alternatives	
1. Residential, commercial, municipal and other uses would not be allowed within the Sea Bed down gradient of major facilities, such as canals, Sedimentation/Distribution Basins, Saline Habitat Complex cells, Barriers, Perimeter Dikes, and Barriers.	
Assumptions Specific to the Alternatives	
No Action Alternative and Alternatives 1, 2, 3, 4, 5, 6, 7, and 8	No additional assumptions were made.

Summary of Impact Assessment

The impacts shown in Table 5-4 assume implementation of the Next Steps to reduce the adverse impacts.

No Action Alternative

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Pupfish Channels, and Salton Sea. The construction activities would be identical under the No Action Alternative-CEQA Conditions and the No Action Alternative-Variability Conditions. However, surface water conditions would be different in these two scenarios, as described below.

Inflows and Climate Assumptions for No Action Alternative-CEQA Conditions

The projected inflows were developed based upon historical inflows to the Salton Sea and adjusted for actions included in the No Action Alternative-CEQA Conditions. The actions considered in the No Action Alternative-CEQA Conditions are described in Chapter 3. The actions that could affect inflows to the Salton Sea include:

- QSA Projects;
- IID Water Conservation and Transfer Project (and associated required mitigation measures);
- Coachella Canal Lining Project;
- All-American Canal Lining Project;
- Colorado River Basin Salinity Control Program;
- Mexicali wastewater improvements;
- Mexicali power production;
- Total Maximum Daily Loads implementation; and
- Coachella Valley Water Management Plan.

Table 5-4
Summary of Benefit and Impact Assessments to Surface Water Resources

Alternative	Basis of Comparison	Changes by Phase I	II	III	IV	Comments	Next Steps
Criterion: Cause alteration of surface waters that would cause erosion, siltation, or flooding.							
No Action Alternative	Existing Conditions	L	L	L	L	Facilities under the No Action Alternative would be located within the Sea Bed and would not cause alterations of surface water on the shoreline. Surface water elevation and area of the Salton Sea would be less than under the Existing Conditions in all phases. Erosion could occur on the Sea Bed along the extensions of the rivers, creeks, and drains.	During the design, consider Best Management Practices in accordance with the Stormwater National Pollutant Discharge Elimination System permit to reduce the potential for erosion.
	No Action Alternative	NA	NA	NA	NA		
Alternatives 1 - 8	Existing Conditions	L	L	L	L	Similar to No Action Alternative.	Same as No Action Alternative.
	No Action Alternative	L	L	L	L		
Criterion: Cause structures to be placed within 100-year flood hazard area in the Sea Bed.							
No Action Alternative	Existing Conditions	L	L	L	L	Facilities constructed on the Sea Bed would be subject to flooding if future inflows increased to higher volumes than predicted during design.	Define specific locations and use of elevated platforms for facilities on the Sea Bed to protect against flooding.
	No Action Alternative	NA	NA	NA	NA		
Alternatives 1 - 8	Existing Conditions	L	L	L	L	Similar to No Action Alternative.	Same as No Action Alternative.
	No Action Alternative	L	L	L	L		
Criterion: Create or contribute runoff water that could cause polluted runoff.							
No Action Alternative	Existing Conditions	L	L	L	L	Facilities constructed on the Sea Bed could potentially result in polluted runoff due to excavation activities and the use of equipment and vehicles.	Use Best Management Practices in accordance with Stormwater National Pollutant Discharge Elimination System.
	No Action Alternative	NA	NA	NA	NA		
Alternatives 1 - 6 and 8	Existing Conditions	L	L	L	L	Similar to No Action Alternative.	Same as No Action Alternative.
	No Action Alternative	L	L	L	L		

Table 5-4
Summary of Benefit and Impact Assessments to Surface Water Resources

Alternative	Basis of Comparison	Changes by Phase				Comments	Next Steps
		I	II	III	IV		
Alternative 7	Existing Conditions	L	L	L	L	Sludge from the water treatment plants could contain constituents of concern at concentrations that would cause adverse impacts in the Brine Sink.	Collect sludge at the water treatment plant(s) and haul to a certified disposal site.
	No Action Alternative	L	L	L	L		
Criterion: Cause inundation by seiche.							
No Action Alternative	Existing Conditions	B	B	B	B	The potential for seiche less than under Existing Conditions because the surface water area would be less.	None available.
	No Action Alternative	NA	NA	NA	NA		
Alternatives 1 - 8	Existing Conditions	B	B	B	B	Similar to No Action Alternative.	Same as No Action Alternative.
	No Action Alternative	B	B	B	B		

Legend for Types of Benefits or Impacts in Each Phase:
S = Significant Impact
O = No Impact
L = Less Than Significant
B = Beneficial Impact
NA = Not Analyzed

Information provided by Reclamation, IID, CVWD, and the Republic of Mexico was used to develop the SALSA model, as described in Appendix H-2. The model was used to simulate hydrologic conditions and future climate conditions for the 75-year study period, as described in Appendix H-2. The hydrologic analysis was performed on an annual basis for the 2003 to 2078 period that was consistent with the implementation period for the QSA. A second hydrologic analysis was performed for the period 2018 to 2078 that represented conditions following the cessation of (c)(1) water, as described in Chapter 1, and conditions following the construction of major facilities under the alternatives.

Inflows from Mexico were based upon historical patterns adjusted for potential reductions in Colorado River water deliveries that would reduce agricultural return flows into the New and Alamo rivers, wastewater system improvements to the Mexicali II Service Area that would divert effluent to the Gulf of California, and recently constructed power plants that would use a portion of the New River flows for cooling water. Overall, inflows from Mexico under the No Action Alternative-CEQA Conditions are expected to decrease to an average inflow of 98,000 acre-feet/year for the 2003 to 2078 period, and 97,000 acre-feet/year for the 2018 to 2078 period.

Inflows from the Imperial Valley also were based upon historical patterns adjusted for implementation of the QSA and IID Water Conservation and Transfer Project. Under the QSA, the amount of water to be conserved and transferred would increase over the first 24 years until 2026 when the transferred amount would be 303,000 acre-feet/year. The (c)(2) water (mitigation water as described in Chapter1) would minimize the inflow reductions through 2017. Inflows from the Imperial Valley under the No Action Alternative-CEQA Conditions are expected to decrease to an average inflow of 777,000 acre-feet/year for the 2003 to 2078 period and 724,000 acre-feet/year for the 2018 to 2078 period.

Historical inflows from the Coachella Valley also were adjusted for implementation of the QSA related projects and the Coachella Valley Water Management Plan (CVWD, 2002). Under the QSA, IID would conserve water and transfer the water to CVWD. This amount would increase over time to 100,000 acre-feet/year by 2026, and would continue until 2047. After 2047, IID would conserve the first 50,000 acre-feet/year of the water and Metropolitan would provide the second 50,000 acre-feet/year until 2078 (CVWD et al., 2003). The Coachella Valley Water Management Plan includes water conservation measures, acquisition of additional water supplies, water source substitution, and groundwater recharge that would result in a net increase in inflows to the Salton Sea. Total average inflows from the Coachella Valley under the No Action Alternative-CEQA Conditions are expected to increase to 126,000 acre-feet/year for the 2003 to 2078 period and 138,000 acre-feet/year for the 2018 to 2078 period.

Inflows to the Salton Sea from local watersheds under the No Action Alternative-CEQA Condition are expected to be similar to the recent historical inflows, as described above.

The projected total average inflow to the Salton Sea under the No Action Alternative-CEQA Conditions for the 2003 to 2078 period was estimated at about 965,000 acre-feet/year with a minimum of 792,700 acre-feet/year and a maximum of 1,303,300 acre-feet/year. The average inflow for 2018 to 2078 was calculated as 922,000 acre-feet/year. The projected Salton Sea inflows for the No Action Alternative-CEQA Conditions are summarized in Figure 5-6 and described in more detail in Appendix H-2.

The sequence of future climate conditions has been assumed to occur as it did in the past. Projected future 2003 to 2078 conditions for Imperial Valley and local watershed flows to the Salton Sea are based on the estimated climate conditions of the 1925 to 1999 historical sequence (primarily rainfall, evapotranspiration rates, and evaporation rates). Even if the climate is consistent with that during the historical period, the historical sequence would not reproduce identically in the future. For this reason, the inflow analysis for the No Action Alternative-CEQA Conditions was developed using a statistical approach known as Monte-Carlo analysis to generate many possible future sequences (no adjustment to values, just sequence) based on the historic climate values and patterns. Using this approach, the future projections incorporate variability in climate conditions and can be viewed in a probabilistic fashion, as shown in Figure 5-7. The results of this analysis for the estimated No Action Alternative-CEQA Conditions inflows are shown in Figure 5-8. The projected variability of total inflow to the Salton Sea could be up to 200,000 acre-feet in any one year.

Inflows and Climate Assumptions for No Action Alternative-Variability Conditions

To address the level of uncertainty regarding future inflows to the Salton Sea over the 75-year planning horizon, a stochastic analytical approach was developed to approximate the range of possible changes in future conditions as compared to the No Action Alternative-Variability Conditions. The major sources of uncertainty in future inflows were identified and probability distributions were developed for each inflow source. The Monte Carlo simulation technique was used to generate a range of inflow traces that represents the best approximation of a full range of future Salton Sea inflow variability and uncertainty.

Inflows from Mexico beyond those represented in the No Action Alternative-CEQA Conditions were modified for the No Action Alternative-Variability Conditions based upon reductions in New River flows due to increased use of recycled water and agricultural return flows for the Mexicali area and western Baja California, and reductions in agricultural return flows into the New River due to reduced groundwater recharge in the Mexicali groundwater basin following implementation of the All-American Canal lining project and reduced availability of Colorado River surplus flows. Inflows from Mexico under the No Action Alternative-Variability Conditions could be 48,000 acre-feet/year and 40,000 acre-feet/year for the 2003 to 2078 and 2018 to 2078 periods, respectively, based on the mean of all traces generated in the Monte Carlo analysis.

Inflows from Imperial Valley beyond those represented in the No Action Alternative-CEQA Conditions were modified for the No Action Alternative-Variability Conditions based upon potential reductions in agricultural return flows due to implementation of Total Maximum Daily Loads by the CRBRWQCB, potential changes in IID water need estimates, reductions in applied irrigation rates if Colorado River salinity declines, improved water efficiency, changes in cropping patterns, conversion of agricultural lands to urban uses, and reduced availability of Colorado River water supplies. Inflows from the Imperial Valley under the No Action Alternative-Variability Conditions could be 690,000 acre-feet/year and 615,000 acre-feet/year for the 2003 to 2078 and 2018 to 2078 periods, respectively, based on the mean of all traces generated in the Monte Carlo analysis.

Inflows from Coachella Valley beyond those represented in the No Action Alternative-CEQA Conditions were modified for the No Action Alternative-Variability Conditions based upon potential delayed implementation or modifications of the Coachella Valley Water Management Plan and reduced agricultural return flows due to reduced Colorado River salinity. Inflows from the Imperial Valley under the No Action Alternative-Variability Conditions could be 94,000 acre-feet/year and 98,000 acre-feet/year for the 2003 to 2078 and 2018 to 2078 periods, respectively, based on the mean of all traces generated in the Monte Carlo analysis.

Inflows to the Salton Sea from local watersheds under the No Action Alternative-Variability Condition are expected to be similar to the recent historical inflows, as described above.

The issue of climate change has begun to have an increasing role in scientific research and policy decision-making. In recent years, there is a growing scientific consensus that climate changes will be inevitable as the result of increased concentrations of greenhouse gasses (IPCC, 2001; Kiparsky and Gleick, 2003; CalEPA, 2006). The State of California has taken a proactive role in addressing climate change and has recently released a Climate Action Team Report outlining the emission scenarios, uncertainties, impacts, adaptations, and recommendations for reducing emissions (CalEPA, 2006). There is little difference between climate projections prior to 2035 due to inertia of the current climate system, indicating that even under reduced emission paths further climate impacts are inevitable (CalEPA, 2006).

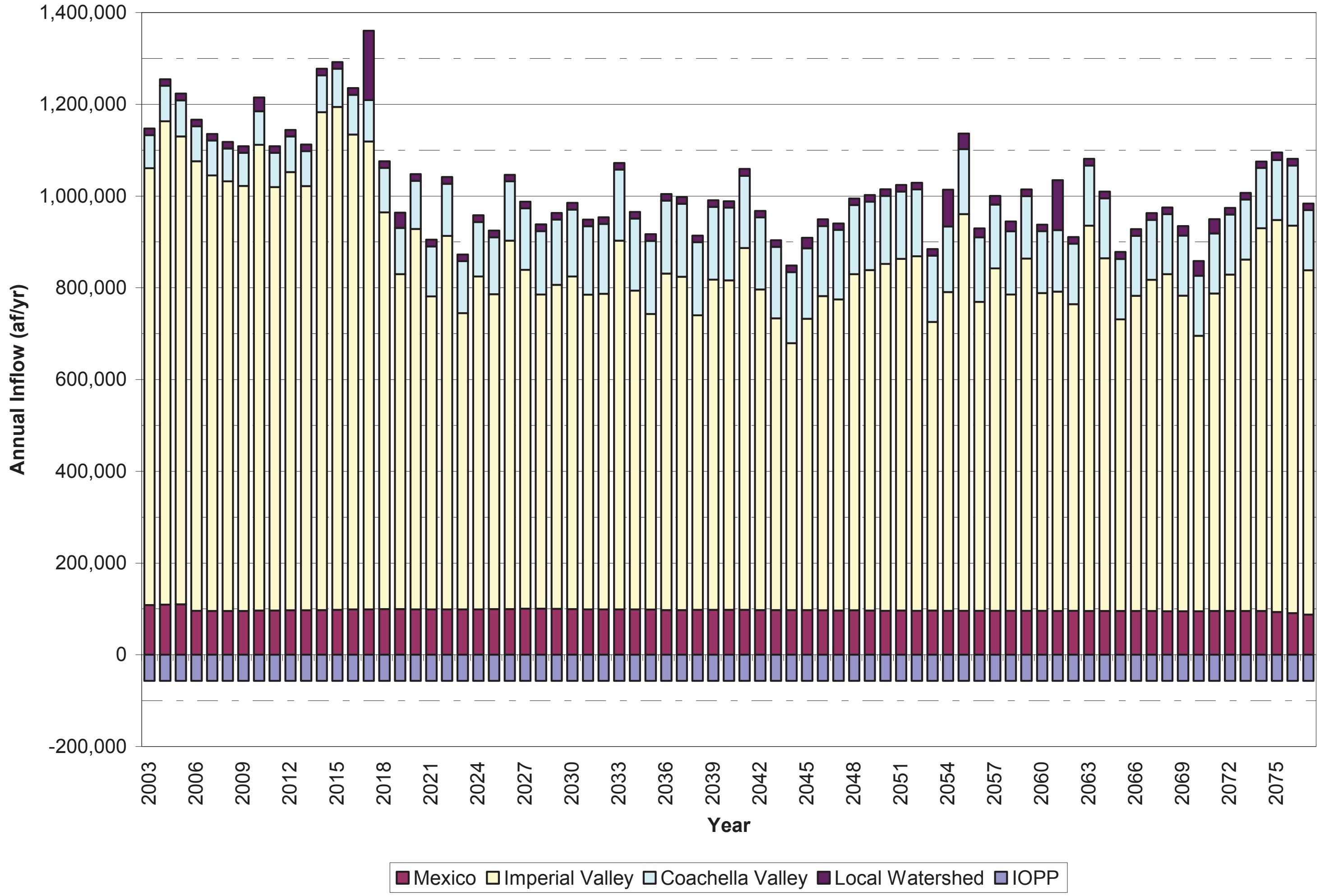

FIGURE 5-6
PROJECTED SALTON SEA INFLOWS FOR NO ACTION ALTERNATIVE-CEQA CONDITIONS

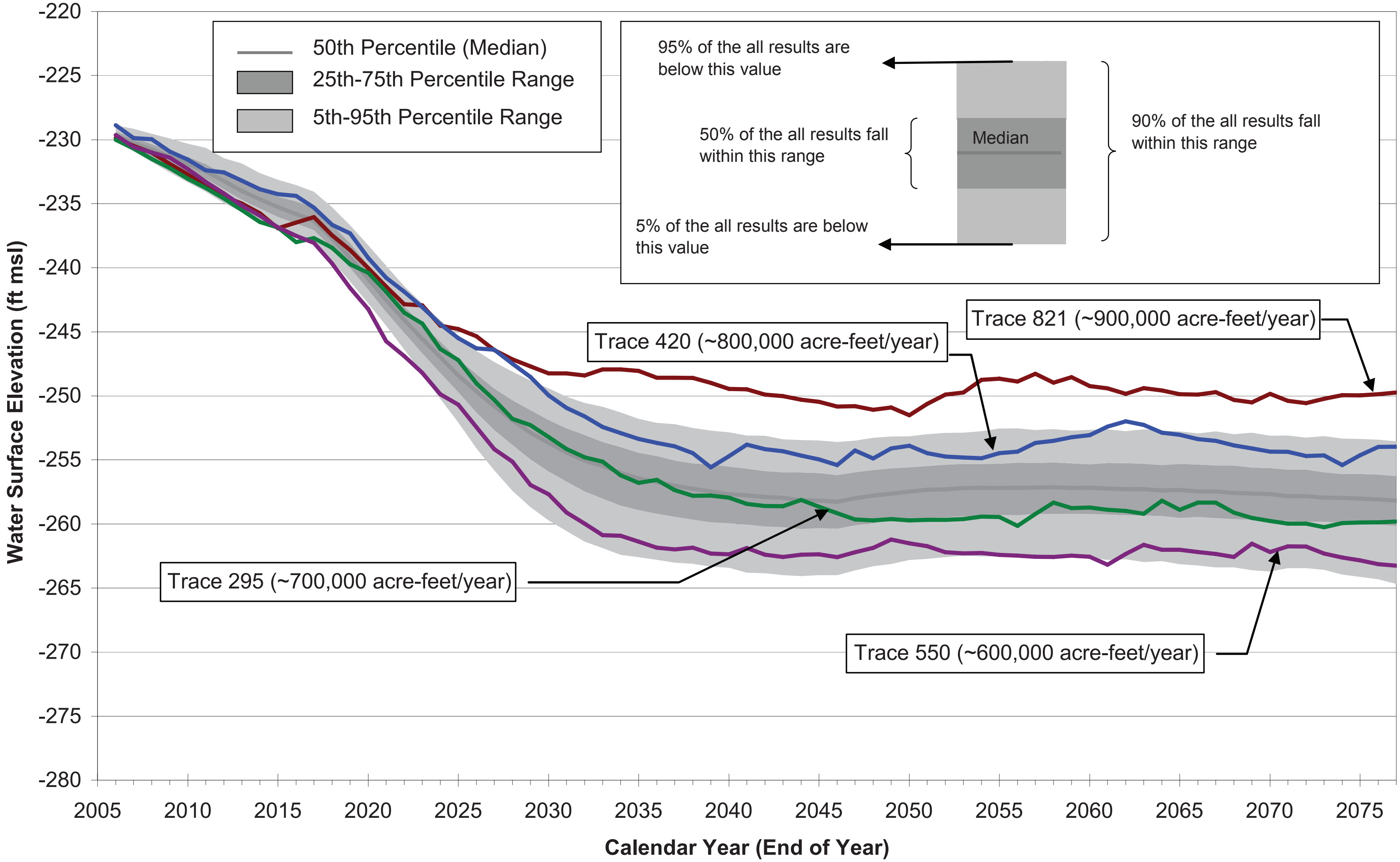

FIGURE 5-7
EXAMPLE OF STOCHASTIC RESULTS

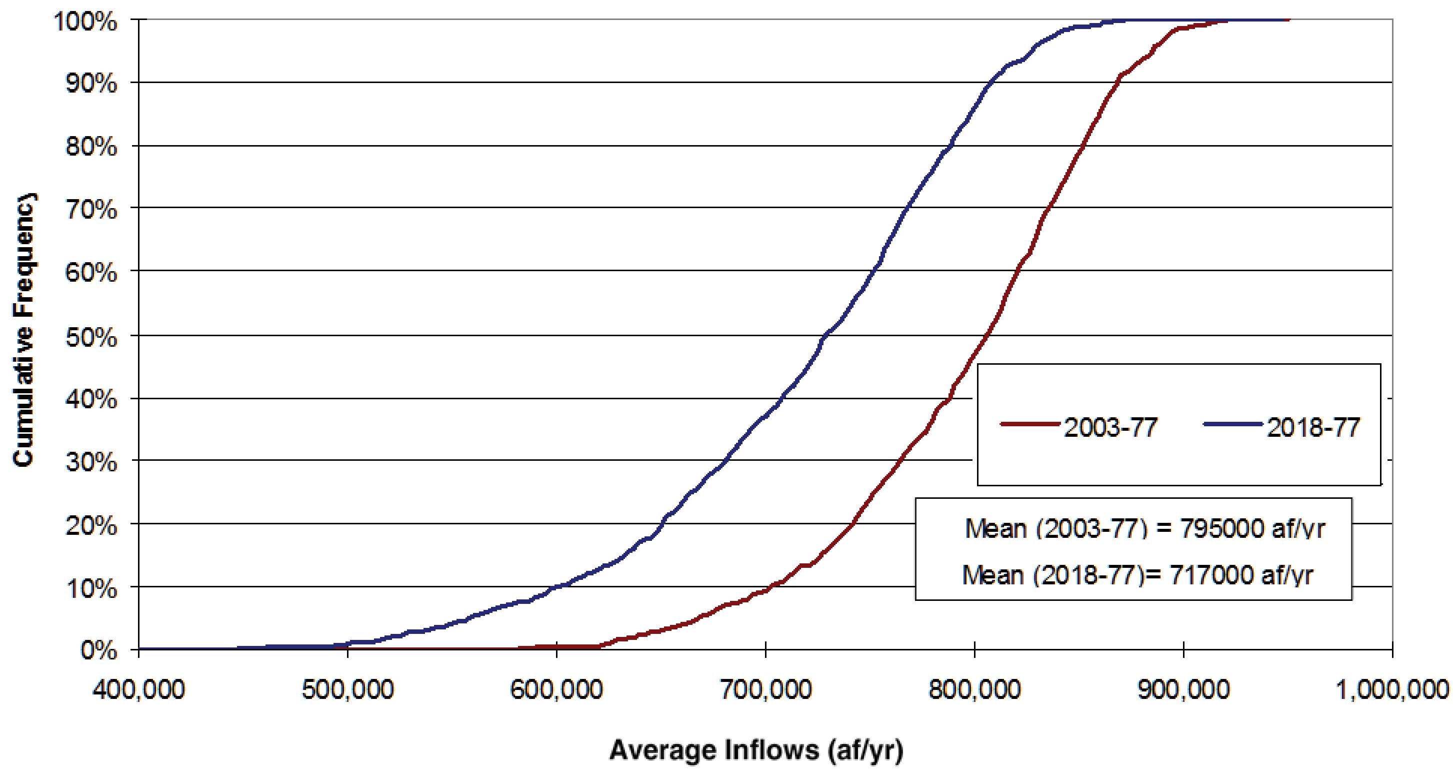

FIGURE 5-8
PROJECTED NO ACTION ALTERNATIVE-VARIABILITY CONDITIONS INFLOWS

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The projected change in California average daily temperature was derived from three climate models with three scenarios of future emissions. Statewide temperature increases of 1.7 to 3.0 degrees Celsius (^{o}C) (3.1 to 5.4^{o}F) represent the low range, 3.1 to 4.3^{o}C (5.6 to 7.7^{o}F) represent the middle range, and 4.4 to 5.8 ^{o}C (7.9 to 10.4^{o}F) represent the high range. The evaporation rate is sensitive to small changes in meteorological conditions which are influenced by long term climate trends. In order to address the potential effects of climate change on future Salton Sea evaporation, an uncertainty analysis similar to that for inflows was applied. Uncertainty was evaluated by relating changes in evaporation to changes in predicted temperature. Four climate projections for grid cells centered near the Salton Sea were provided by Scripps Institute of Oceanography (Cayan, 2006). These projections were developed using two state-of-the-art general circulation models and two future emission scenarios, as described in Appendix H-2. Projections for the regions near the Salton Sea suggest slightly smaller temperature changes than those statewide, ranging from 1.5 to 4.4^{o} C (2.7 to 7.9^{o}F) by the end of the century.

Unlike the strong trend toward increasing temperatures, the projections of future climate conditions do not indicate any clear trends regarding California precipitation. There are considerable differences between models and scenarios for projections of future climate that predict a wide range of conditions. However, the center of the distribution of simulations indicates little change, with a tendency for a slight decrease in precipitation (Cayan et al., 2006).

Under the No Action Alternative-CEQA Conditions, estimated Salton Sea water surface net evaporation rates would average 66.4 inches/year.

Under the uncertainty analysis, considering possible future climate effects, the mean of all traces sampled in the Monte Carlo analysis increased evaporation by 2.3 inches/year by 2035 and 5.3 inches/year by 2078. The equivalent inflow reduction under current water surface elevation would be about 100,000 acre-feet/year by 2078.

The projected total average inflow to the Salton Sea under the No Action Alternative-Variability Conditions for the 2003 to 2078 period and for the 2018 to 2078 period was estimated at about 795,000 acre-feet/year and 717,000 acre-feet/year, respectively, as summarized in Figure 5-9 and described in more detail in Appendix H-2.

Impact Assessment of the No Action Alternative

Changes in inflow patterns for the No Action Alternative would cause the Salton Sea surface water elevation and area to decline and salinity to increase as compared to Existing Conditions. Because the inflow patterns would be different under No Action Alternative-CEQA Conditions and No Action Alternative-Variability Conditions, the surface water elevation and area and salinity would also be different based upon the SALSA model results, as summarized in Table 5-5. The projected changes in Salton Sea surface water elevation based on the stochastic analysis for the No Action Alternative-CEQA Conditions and the No Action Alternative-Variability Conditions are presented in Figures 5-10 and 5-11, respectively. Traces are shown on Figure 5-11 because the No Action Alternative-Variability Conditions results were used to develop Alternatives 1 through 8, and the traces are presented to provide a basis of comparison.

Table 5-5
Surface Water Conditions for No Action Alternative

Surface Water Component	Existing Conditions	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
No Action Alternative-CEQA Conditions					
Salton Sea Elevation	-228 feet msl	-236 feet msl	-246 feet msl	-248 feet msl	-248 feet msl
Salton Sea Surface Area	230,000 acres	217,000 acres	186,000 acres	172,000 acres	172,000 acres
Salton Sea Salinity	48,000 mg/L	65,000 mg/L	103,000 mg/L	129,000 mg/L	138,000 mg/L
No Action Alternative-Variability Conditions					
Salton Sea Elevation	-228 feet msl	-240 feet msl	-254 feet msl	-259 feet msl	-260 feet msl
Salton Sea Surface Area	230,000 acres	208,000 acres	159,000 acres	143,000 acres	140,000 acres
Salton Sea Salinity	48,000 mg/L	76,000 mg/L	164,000 mg/L	249,000 mg/L	308,000 mg/L

Note: No Action Alternative-CEQA Conditions based upon the 922,000 acre-feet/year trace and No Action Alternative-Variability Conditions based on 717,000 acre-feet/year trace.

All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L

Interpretation of the Exceedance Probability Diagrams

In the PEIR, the alternatives are primarily described and evaluated based upon the average inflow of 717,000 acre-feet/year. This value was selected as representative of the median values of the potential range of inflows in the Monte Carlo analysis for the 2018 to 2078 period under the No Action Alternative-Variability Condition assumptions. The Salton Sea Advisory Committee members requested that conditions under each alternative also be discussed based upon the results from a stochastic analysis. Therefore, four conditions were selected (as described below and in Appendix H-2, Attachment 2) to represent the wide range of variability that could occur due to uncertainties in future inflows over the next 75 years.

Figure 5-11 and similar figures included in the remaining sections of this chapter display two different types of information: the band of exceedance probabilities and four example traces. The time series that are shown as bands on this figure are not the result of any one hydrologic trace. For example, the line within the band that shows the 50th percentile is a compilation of points that represent for any given year an elevation for which 50 percent of the outcomes yield an elevation that is less than the elevations shown on that line.

The traces shown on Figure 5-11 provide information on the variability over the study period for a specific average annual inflow. For example, the 900,000 acre-feet/year trace represents a condition that is similar to a 5th exceedance percentile of the range of inflows considered in the Monte Carlo analysis for the period of 2018 to 2078. This is not related to the 5th exceedance percentile of the elevations shown in the band on Figure 5-11. The four traces selected for this analysis were 600,000 acre-feet/year (similar to the 95th exceedance percentile of the range of inflows), 700,000 acre-feet/year (similar to the mean of the range of inflows), 800,000 acre-feet/year (selected as a point between 700,000 and 900,000 acre-feet/year), and 900,000 acre-feet/year (similar to the 5th exceedance percentile). No specific trace should be considered a prediction of future conditions, but the suite of model results and associated range of future outcomes is valuable for long-range planning.

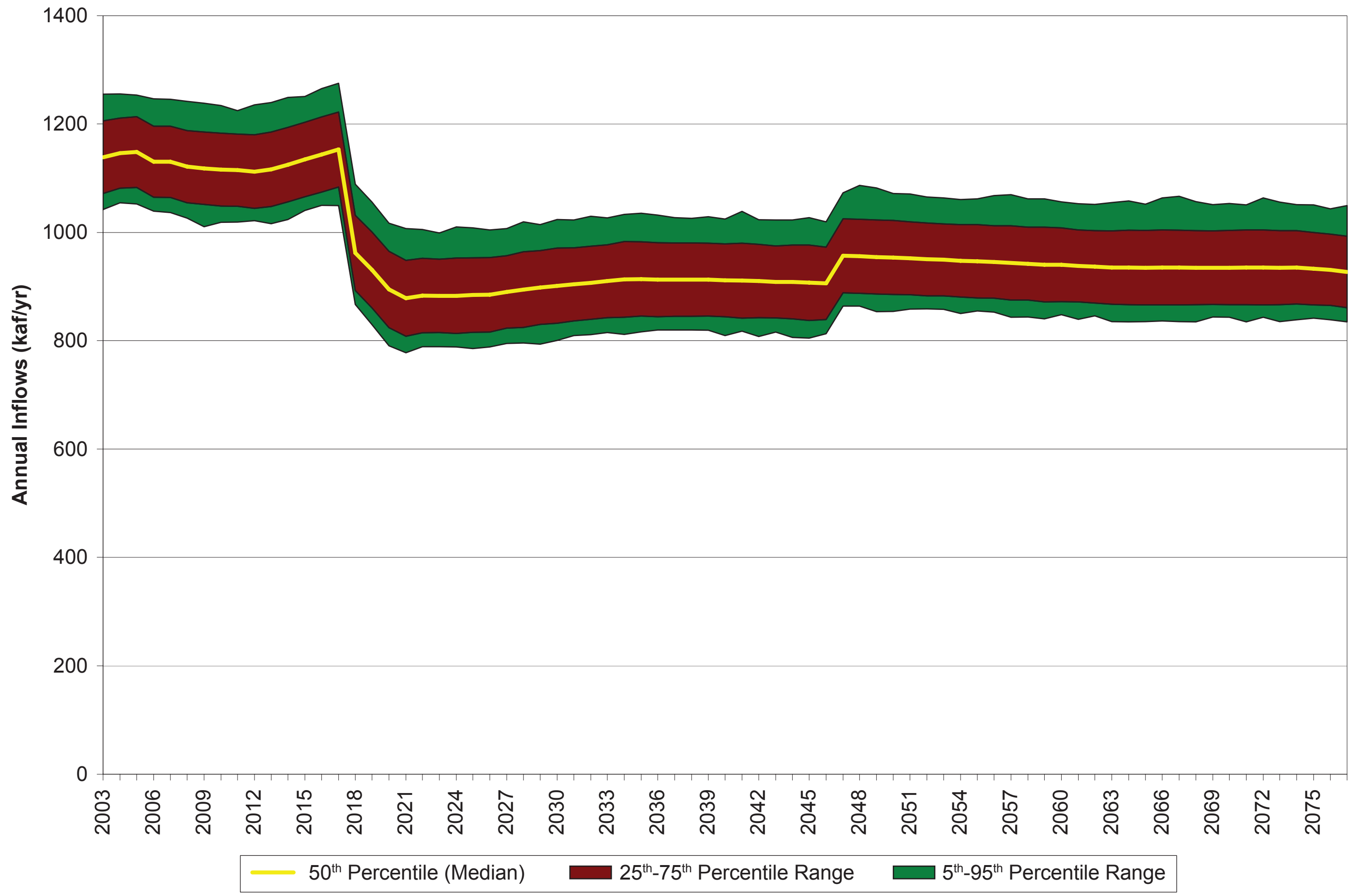

FIGURE 5-9
PROJECTED NO ACTION ALTERNATIVE-CEQA CONDITIONS INFLOWS

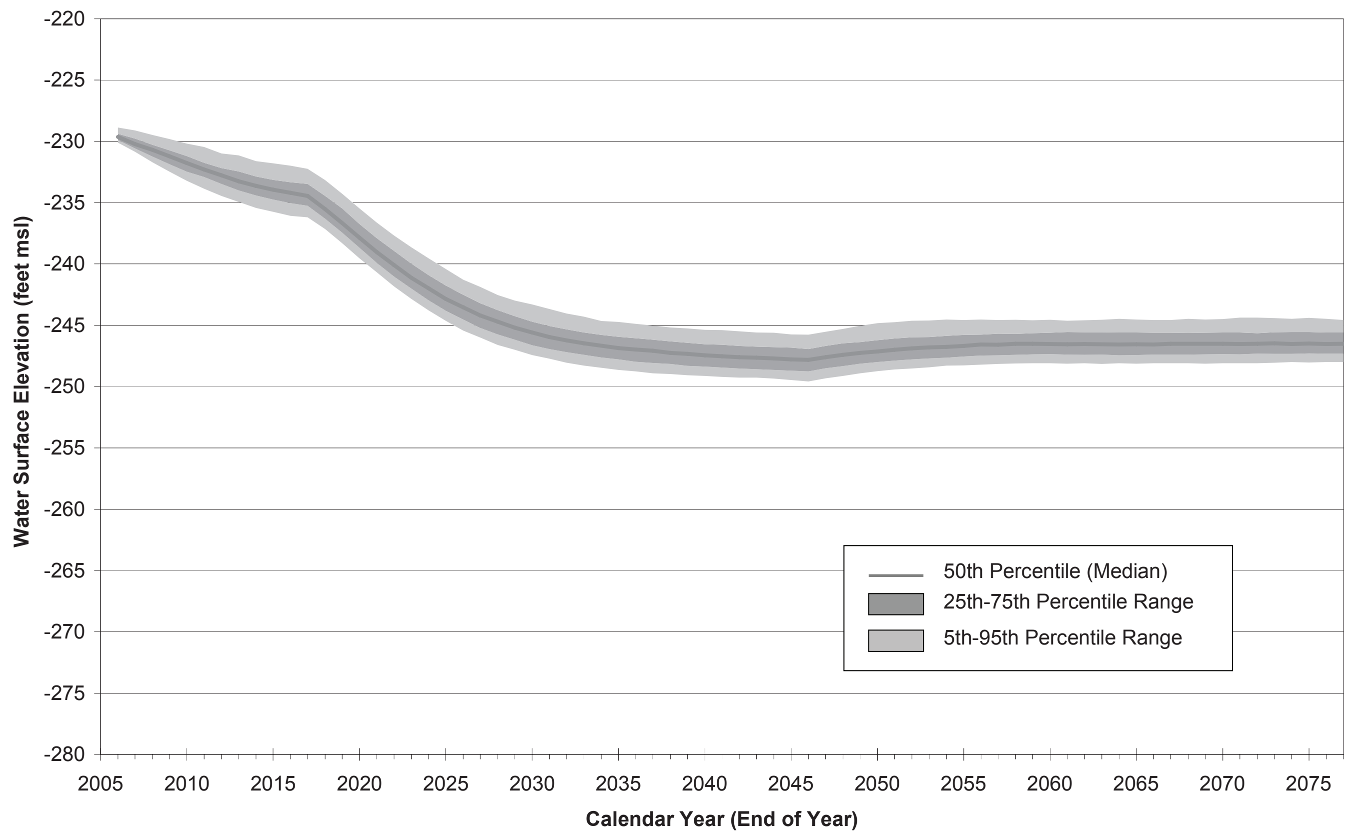

FIGURE 5-10
SALTON SEA SURFACE WATER ELEVATION UNDER THE NO ACTION ALTERNATIVE-CEQA CONDITIONS

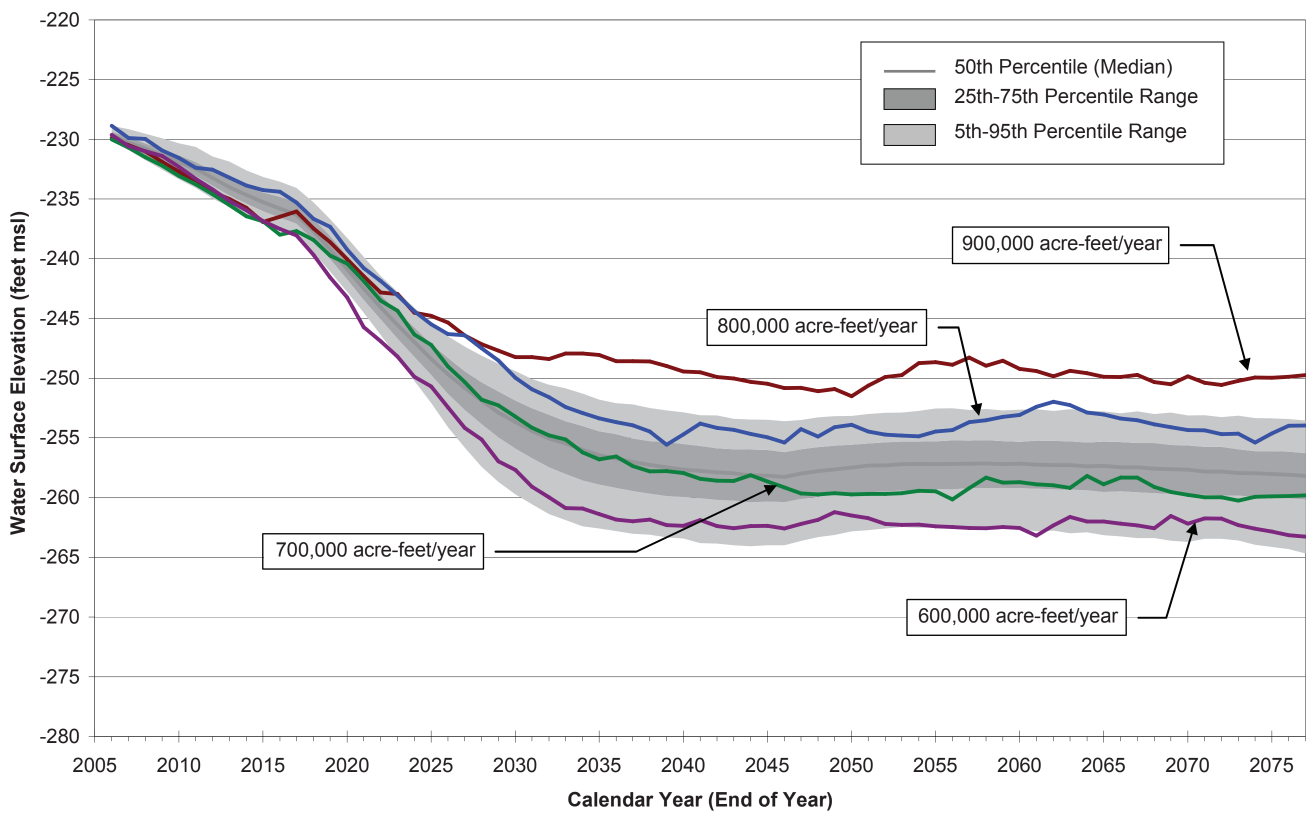

FIGURE 5-11
SALTON SEA SURFACE WATER ELEVATION UNDER THE NO ACTION ALTERNATIVE-VARIABILITY CONDITIONS

Results of Impact Assessment for No Action Alternative-Variability Conditions

As shown in Figure 5-11, the trace that represents inflows of 900,000 acre-feet/year would have an exceedance probability of less than 5 percent of occurring, but would maintain the Salton Sea at an elevation of about -250 feet msl in 2078. The model results indicate that the 600,000 acre-feet/year trace would have about a 95 percent probability of occurring and would result in a Salton Sea at elevations above -265 feet msl in 2078. The trace that was used in the impact assessment was 717,000 acre-feet/year which is representative of the median values.

As described in Chapter 3, facilities to be constructed under the No Action Alternative-CEQA Conditions would be the same as under the No Action Alternative-Variability Conditions. Therefore, potential impacts associated with construction and operations and maintenance of the facilities would be the same under both inflow scenarios. These potential impacts have been determined based upon the identified significance criteria described above.

Reduction in future inflows as compared to Existing Conditions would cause changes in surface water area in the Sea Bed. Soil erosion could occur on the Exposed Playa along the extensions of rivers, creeks, and drains as the water recedes. The related increased silt load would flow into the Salton Sea and would not affect other surface waters. Air Quality Management facilities would be implemented as the Sea Bed becomes exposed to reduce wind erosion and dust, as described in Chapter 10.

Facilities constructed under this alternative, including shoreline canals, would be designed to allow surface waters from the shoreline to flow into the constructed facilities or the Salton Sea without causing backwater flooding on the shoreline. Therefore, the No Action Alternative would not increase flooding potential on the shoreline. Air Quality Management facilities placed on the Sea Bed would be subject to flooding if inflows in the future increased more than the projected annual variations after the facilities were constructed.

Construction activities could cause polluted runoff to the Salton Sea due to excavation activities and the presence of equipment and vehicles on the Sea Bed. Operations and maintenance activities could cause polluted runoff to the Salton Sea due to the presence of equipment and vehicles on the Sea Bed.

A seiche is a large, undulating wave on a lake usually caused by a seismic event or atmospheric conditions. There were no reports of historical seiches at the Salton Sea identified during the preparation of this PEIR. However, due to the proximity of faults in this area, seiches could occur on the 230,000-acre Salton Sea under Existing Conditions. Under the No Action Alternative-CEQA Conditions and No Action Alternative-Variability Conditions, the surface water area of the Salton Sea would decline to 172,000 and 140,000 acres, respectively. Due to the reduction in surface water area and depth under the No Action Alternative, the potential for inundation on the shoreline from seiches would be less than under the Existing Conditions.

Alternative 1 – Saline Habitat Complex I

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Pupfish Channels, Saline Habitat Complex, and Brine Sink.

To provide a consistent basis for comparison of alternatives, components for each alternative were developed assuming inflows as under the No Action Alternative-Variability Conditions. Therefore, the comparison of the characteristics of each alternative is compared to the conditions under the No Action Alternative-Variability Conditions and Existing Conditions, as summarized in Table 5-6. The projected changes in Brine Sink surface water elevation based on the stochastic analysis are presented in Figure 5-12 (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

Table 5-6
Surface Water Conditions for Alternative 1

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	6,000 acres	26,000 acres	26,000 acres	26,000 acres
Brine Sink Elevation	-241 feet msl	-257 feet msl	-264 feet msl	-264 feet msl
Brine Sink Surface Area	207,000 acres	149,000 acres	127,000 acres	123,000 acres
Brine Sink Salinity	78,000 mg/L	210,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Notes:
All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The Brine Sink surface water elevation and area would be less than the Salton Sea under Existing Conditions primarily due to the reductions of inflows. The Brine Sink surface water elevation and area would be less than the Salton Sea under the No Action Alternative because water would be used for the Saline Habitat Complex and not diverted directly to the Salton Sea. The total wetted acreage would be greater under Alternative 1 than under the No Action Alternative because the Saline Habitat Complex would be shallower than the inundated area of the Brine Sink; and, therefore, the same amount of water would have a greater surface area in the shallower portions of the Sea Bed.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative. The potential for polluted runoff during construction could be higher in Alternative 1 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, and deep holes in the Saline Habitat Complex. The potential for polluted runoff during operations and maintenance would primarily be related to the Air Quality Management facilities and would be similar to conditions under the No Action Alternative.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Brine Sink would be smaller than the Salton Sea and the Saline Habitat Complex cells would not be suitable for establishment of seiches.

Alternative 2 – Saline Habitat Complex II

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Saline Habitat Complex, Shoreline Waterway, Saltwater Conveyance, and Brine Sink.

Surface water characteristics of Alternative 2 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-7. The surface water area within the Shoreline Waterway of the Saline Habitat Complex is included as part of the Saline Habitat Complex.

The projected changes in Brine Sink surface water elevation based on the stochastic analysis are presented in Figure 5-13 (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams.).

Under Alternative 2, the Brine Sink surface water elevation and area would be less than the Salton Sea under Existing Conditions and No Action Alternative. Conditions for the wetted areas would be as described under Alternative 1.

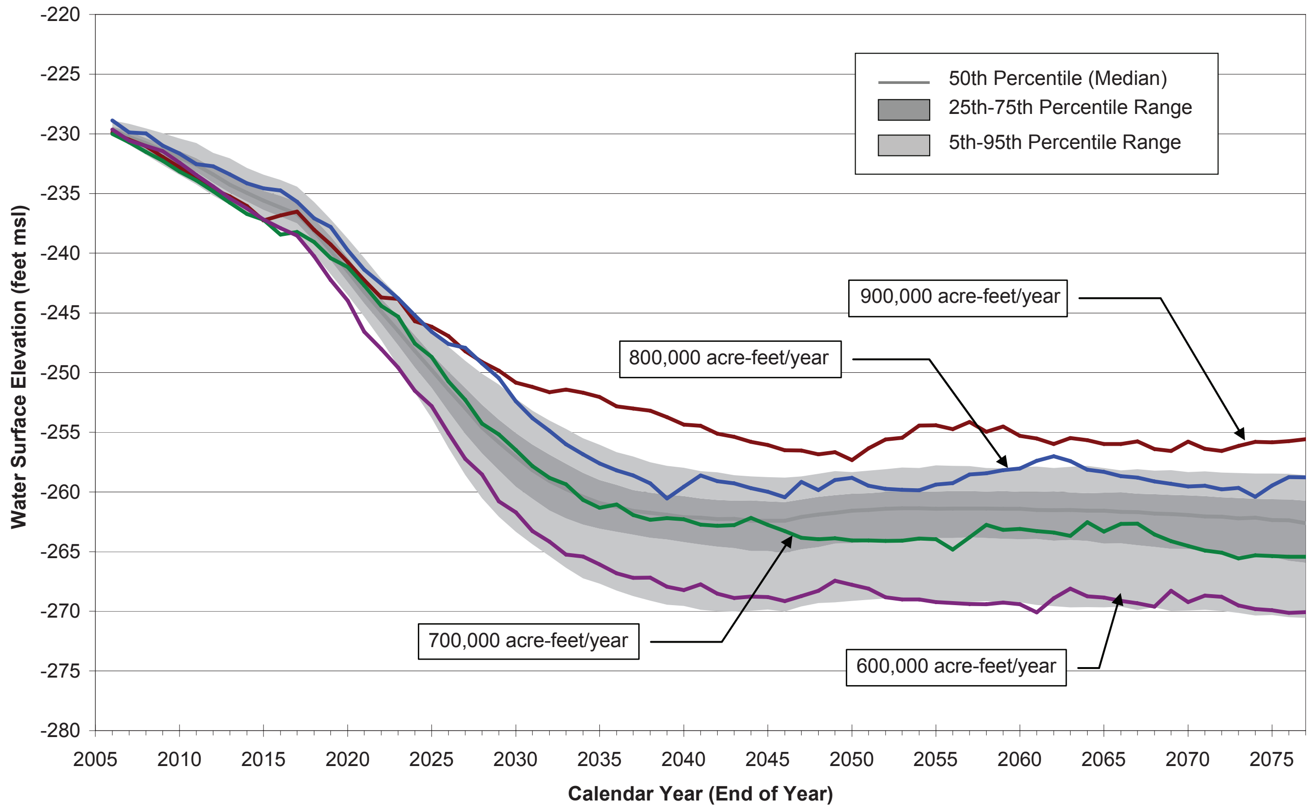

FIGURE 5-12
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 1

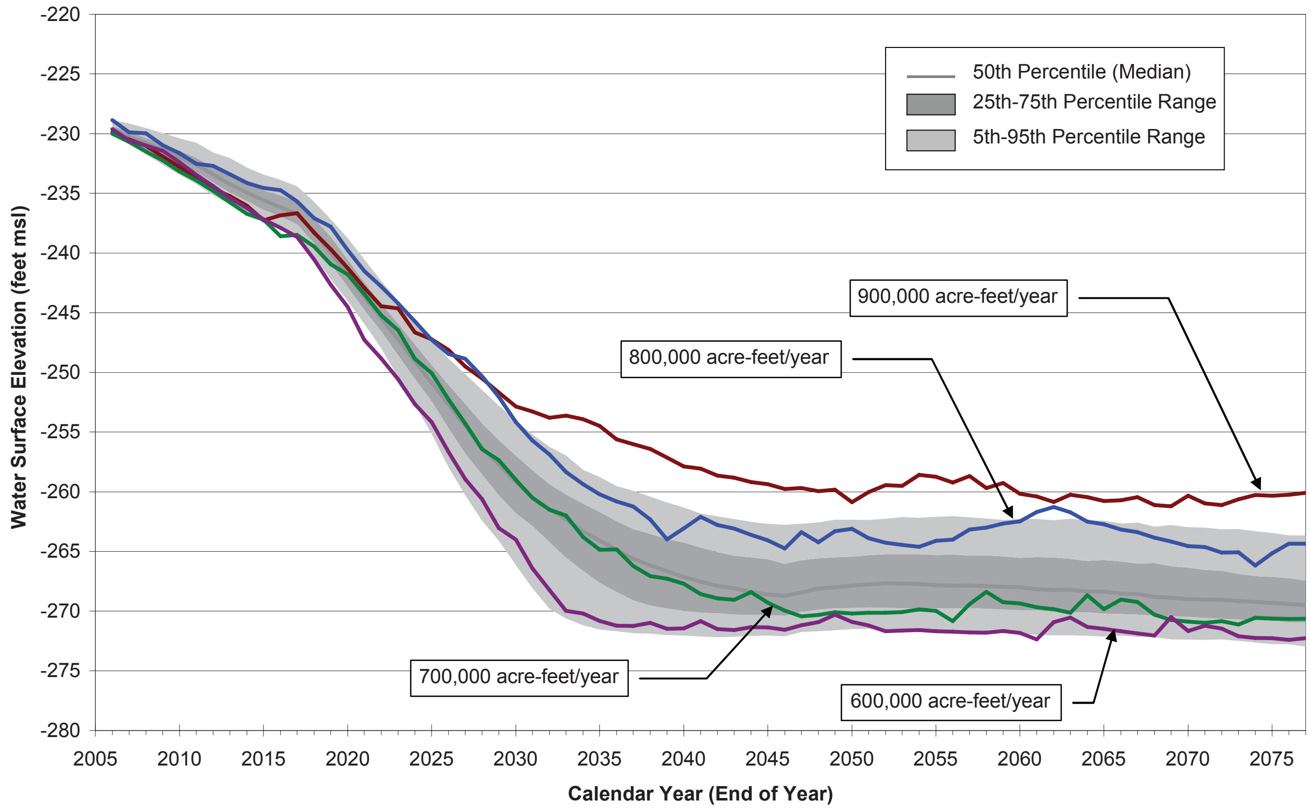

FIGURE 5-13
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 2

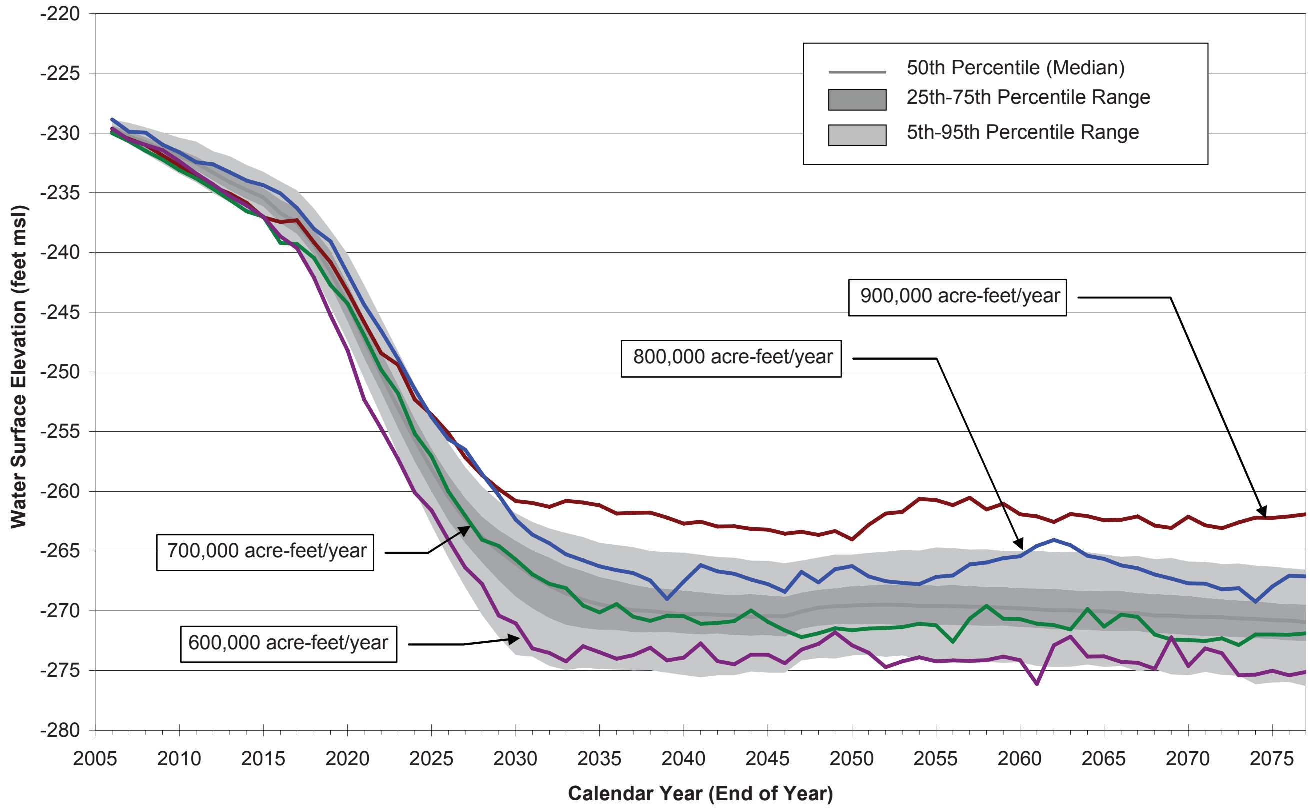

FIGURE 5-14
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 3

Table 5-7
Surface Water Conditions for Alternative 2

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	10,000 acres	42,000 acres	54,000 acres	54,000 acres
Brine Sink Elevation	-241 feet msl	-259 feet msl	-269 feet msl	-271 feet msl
Brine Sink Surface Area	207,000 acres	144,000 acres	105,000 acres	85,000 acres
Brine Sink Salinity	78,000 mg/L	249,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Note: All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative. The potential for polluted runoff during construction could be higher in Alternative 2 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, and deep holes in the Saline Habitat Complex, as described under Alternative 1.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Brine Sink would be smaller than the Salton Sea and the presence of the Saline Habitat Complex cells would not be suitable for establishment of seiches.

Alternative 3 – Concentric Rings

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, First and Second rings, and Brine Sink.

Surface water characteristics of Alternative 3 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-8. The projected changes in Brine Sink surface water elevation based on the stochastic analysis are presented in Figure 5-14 (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

The total wetted acreage would be less under Alternative 3 than under the No Action Alternative or Existing Conditions.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative. The potential for polluted runoff during construction could be higher in Alternative 3 as compared to the No Action Alternative due to construction of Perimeter Dikes.

Table 5-8
Surface Water Conditions for Alternative 3

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	None	None	None	None
First and Second Rings Water Surface Area	25,000 acres	61,000 acres	61,000 acres	61,000 acres
Brine Sink Elevation	-244 feet msl	-267 feet msl	-273 feet msl	-273 feet msl
Brine Sink Surface Area	166,000 acres	115,000 acres	68,000 acres	68,000 acres
Brine Sink Salinity	88,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Note:
All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Brine Sink would be smaller than the Salton Sea and the open water area in the Concentric Rings would not be suitable for establishment of seiches.

Alternative 4 – Concentric Lakes

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins; First, Second, Third, and Fourth lakes; and Brine Sink.

Surface water characteristics of Alternative 4 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-9. The projected changes in Brine Sink surface water elevation based on the stochastic analysis are presented in Figure 5-15 (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

Table 5-9
Surface Water Conditions for Alternative 4

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
First, Second, Third, and Fourth Lakes Water Surface Area	7,000 acres	48,000 acres	88,000 acres[a]	88,000 acres[a]
Brine Sink Elevation	-240 feet msl	-260 feet msl	-271 feet msl	-276 feet msl
Brine Sink Surface Area	205,000 acres	132,000 acres	71,000 acres	22,000 acres
Brine Sink Salinity	79,000 mg/L	299,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Notes:
[a]Fourth Lake would have salinity greater than design objective of 40,000 mg/L until end of Phase IV.

All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The total wetted acreage would be less under Alternative 4 than under the No Action Alternative or Existing Conditions.

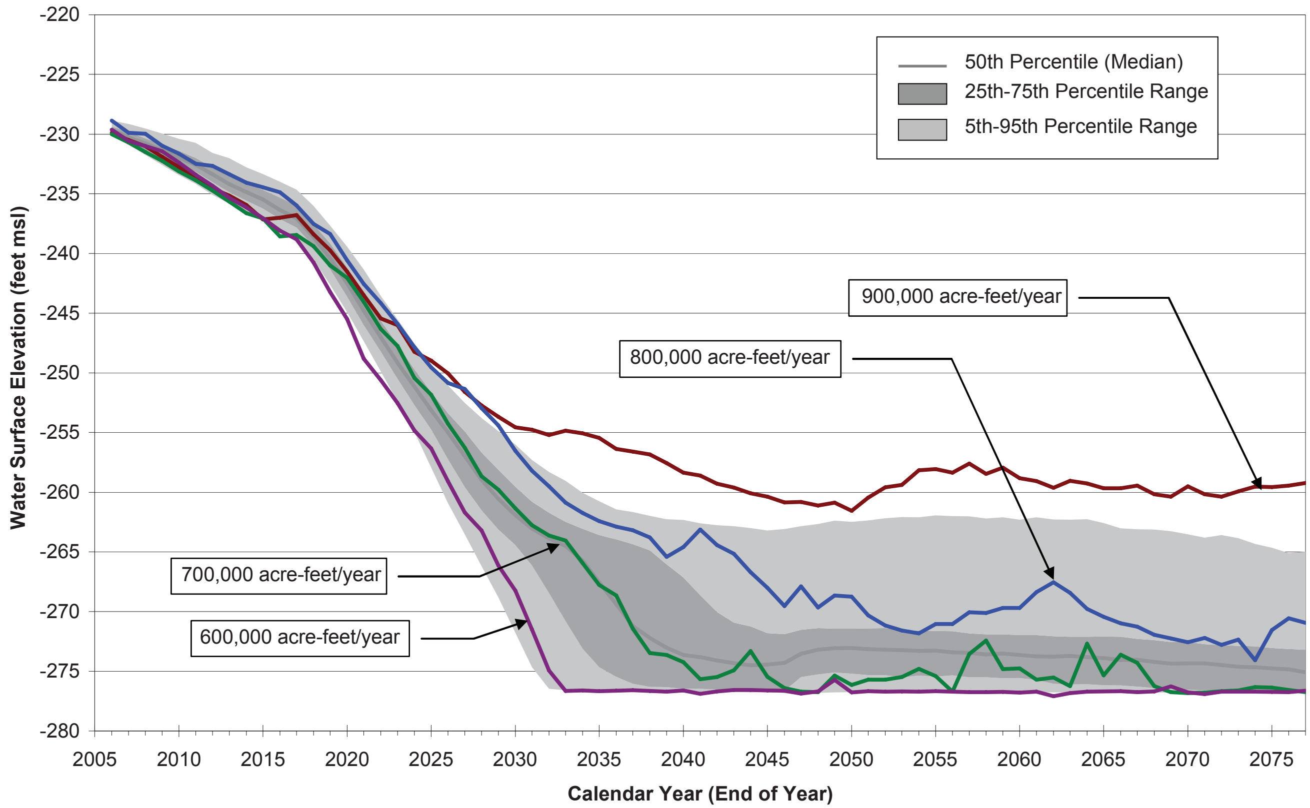

FIGURE 5-15
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 4

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Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative. The potential for polluted runoff during construction could be higher in Alternative 4 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, and deep holes.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Brine Sink would be smaller than the Salton Sea and the open water area in the Concentric Lakes would not be suitable for establishment of seiches.

Alternative 5 – North Sea

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Saline Habitat Complex, Shoreline Waterway, Saltwater Conveyance, Marine Sea, Marine Sea Recirculation Canal, and Brine Sink.

Surface water characteristics of Alternative 5 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-10. The surface water area within the Shoreline Waterway of the Saline Habitat Complex is included as part of the Saline Habitat Complex. The projected changes in Brine Sink and Marine Sea surface water elevations based on the stochastic analysis are presented in Figures 5-16 and 5-17, respectively (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

Table 5-10
Surface Water Conditions for Alternative 5

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	7,500	33,500 acres	33,500 acres	33,500 acres
Marine Sea Water Surface Area	Brine Sink	62,000 acres	62,000 acres	62,000 acres
Brine Sink Elevation	-240 feet msl	-270 feet msl	-275 feet msl	-276 feet msl
Brine Sink Surface Area	207,000 acres	68,000 acres	14,000 acres	13,000 acres
Brine Sink Salinity	76,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Notes:
All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The total wetted acreage would be less under Alternative 5 than under the No Action Alternative or Existing Conditions.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative. The potential for polluted runoff during construction could be higher in Alternative 5 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, deep holes, and the Barrier.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Marine Sea would be smaller than the Salton Sea and the open water areas in the Brine Sink and Saline Habitat Complex would not be suitable for establishment of seiches.

Alternative 6 – North Sea Combined

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basin, Air Quality Management, Pupfish Channels, Saline Habitat Complex, Shoreline Waterway, Saltwater Conveyance, Marine Sea, Marine Sea Mixing Zone, Marine Sea Recirculation Canal, and Brine Sink.

Surface water characteristics of Alternative 6 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-11. The surface water area within the Shoreline Waterway of the Saline Habitat Complex is included as part of the Saline Habitat Complex. The Marine Sea includes the area in the Marine Sea Mixing Zone. The projected changes in Brine Sink and Marine Sea surface water elevations based on the stochastic analysis are presented in Figures 5-18 and 5-19, respectively (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

Table 5-11
Surface Water Conditions for Alternative 6

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	4,000 acres	21,500 acres	21,500 acres	21,500 acres
Marine Sea and Marine Sea Mixing Zone	Not Applicable	74,000 acres	74,000 acres	74,000 acres
Brine Sink Elevation	-240 feet msl	-270 feet msl	-276 feet msl	-276 feet msl
Brine Sink Surface Area	207,000 acres	72,000 acres	11,000 acres	11,000 acres
Brine Sink Salinity	76,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Notes:
All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The total wetted acreage would be less under Alternative 6 than under the No Action Alternative or Existing Conditions.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative. The potential for polluted runoff during construction could be higher in Alternative 6 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, deep holes, Perimeter Dikes, and the Barrier.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Marine Sea would be smaller than the Salton Sea and the open water areas in the Brine Sink and Saline Habitat Complex would not be suitable for establishment of seiches.

Alternative 7 – Combined North and South Lakes

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basin, Air Quality Management using Protective Salt Flat on Exposed Playa below -255 feet msl, Exposed Playa without Air Quality Management above -255 feet msl, Saline Habitat Complex, Recreational Saltwater Lake, Recreational Estuary Lake, Marine Sea Recirculation Canal, IID Freshwater Reservoir, two Treatment Plants, and Brine Sink.

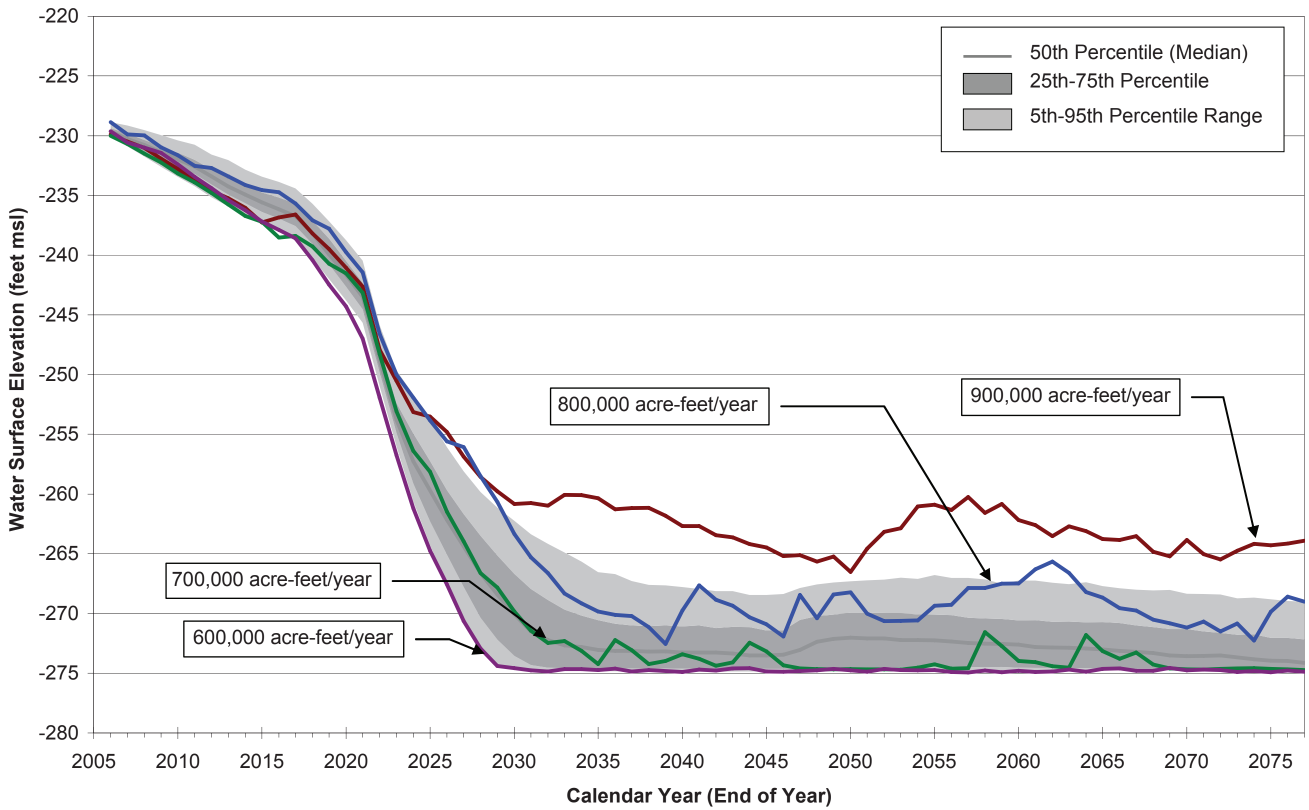

FIGURE 5-16
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 5

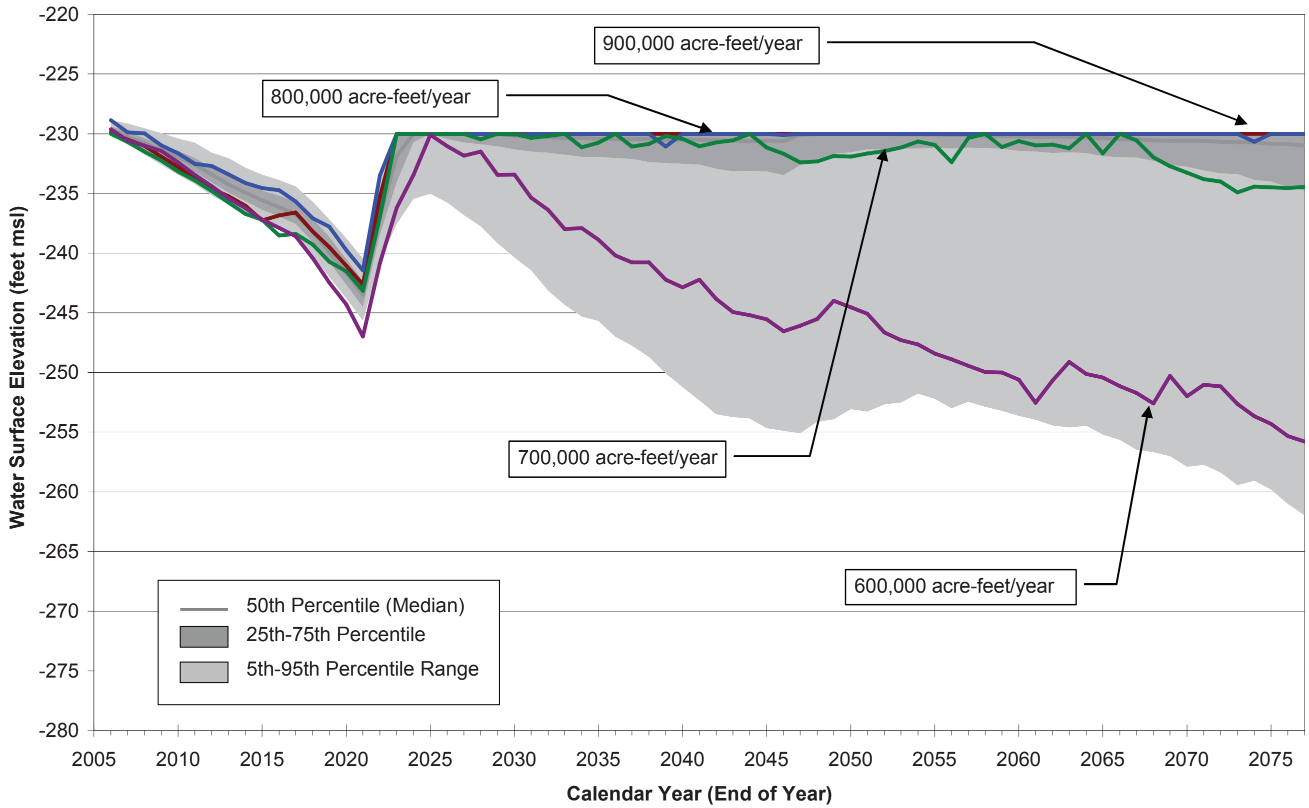

FIGURE 5-17
MARINE SEA SURFACE WATER ELEVATION UNDER ALTERNATIVE 5

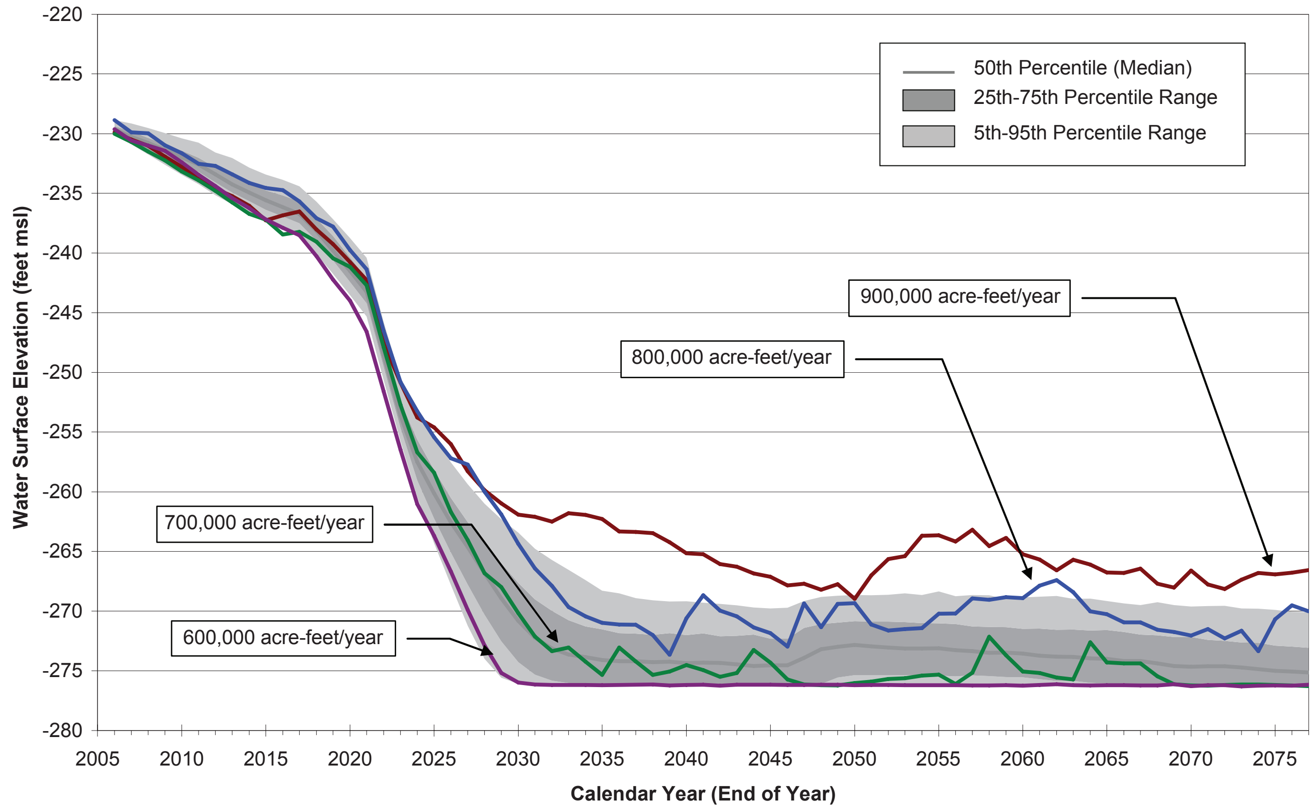

FIGURE 5-18
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 6

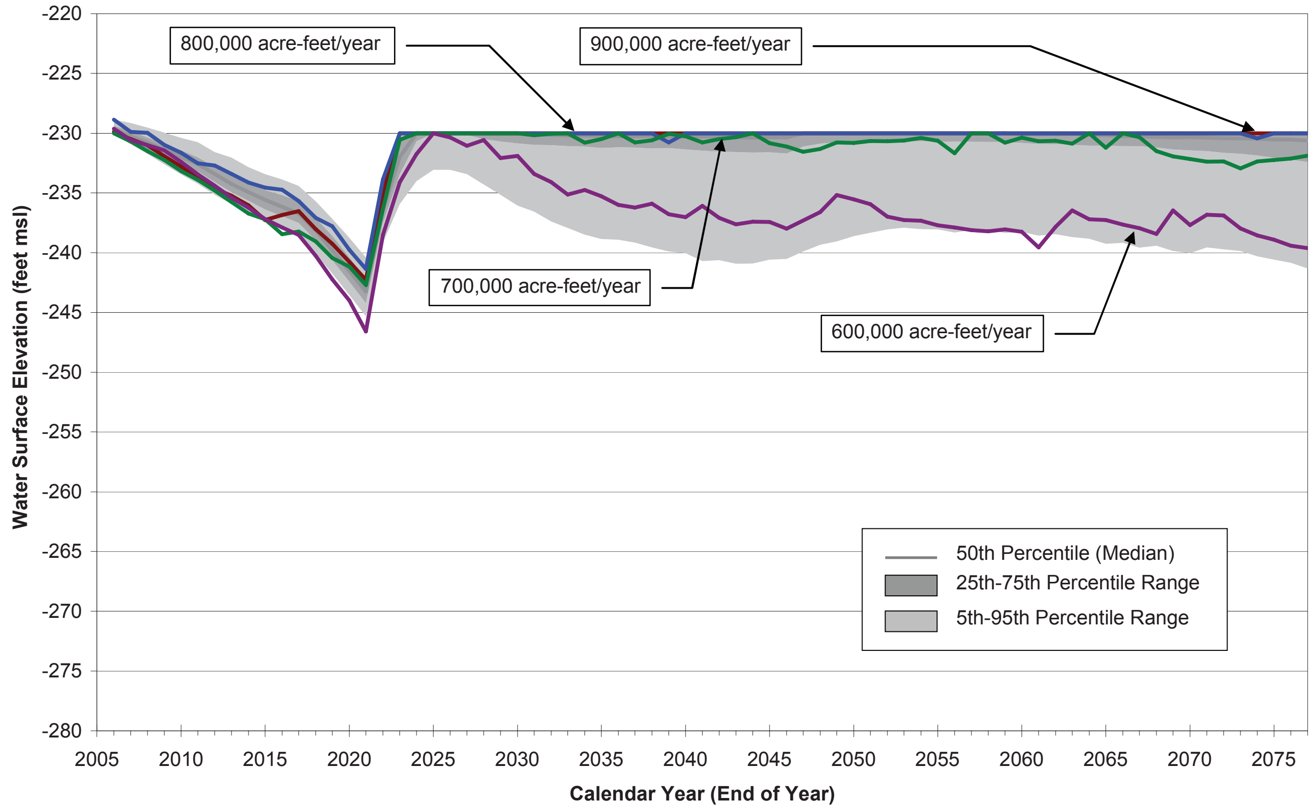

FIGURE 5-19
MARINE SEA SURFACE WATER ELEVATION UNDER ALTERNATIVE 6

Surface water characteristics of Alternative 7 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-12. The Recreational Saltwater Lake includes the area in the Recreational Estuary Lake. The projected changes in Brine Sink and Recreational Saltwater Lake surface water elevations based on the stochastic analysis are presented in Figures 5-20 and 5-21, respectively (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

Table 5-12
Surface Water Conditions for Alternative 7

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	Not Applicable	6,000 acres	6,000 acres	6,000 acres
Recreational Saltwater Lake and Recreational Estuary Lake	Not Applicable	104,000 acres[a]	104,000 acres[a]	104,000 acres[a]
Brine Sink Elevation	-240 feet msl	-272 feet msl	-273 feet msl	-273 feet msl
Brine Sink Surface Area	208,000 acres	28,000 acres	15,000 acres	15,000 acres
Brine Sink Salinity	76,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Notes:
[a]Marine Sea would have salinity greater than design objective of 40,000 mg/L throughout study period.

All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The total wetted acreage would be less under Alternative 7 than under the No Action Alternative or Existing Conditions. It is possible that the Brine Sink would be smaller than projected by the SALSA model (and reported in Table 5-12) because a portion of the brine would be used for stabilization of the Exposed Playa and the water treatment plant sludge could become the major portion of the Brine Sink.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative.

The potential for polluted runoff during construction could be higher in Alternative 7 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, deep holes, Perimeter Dikes, and the Barrier. In addition, if the water treatment plant sludge contains constituents of concern, such as arsenic or selenium, the Brine Sink water quality would be degraded.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Recreational Saltwater and Estuary lakes would be smaller than the Salton Sea and the open water areas in the Brine Sink and Saline Habitat Complex would not be suitable for establishment of seiches.

Alternative 8 – South Sea Combined

As described in Chapter 3, this alternative would involve construction and operations and maintenance activities for the Sedimentation/Distribution Basins, Air Quality Management, Saline Habitat Complex, Shoreline Waterway, Marine Sea, Marine Sea Recirculation Canal, and Brine Sink.

Surface water characteristics of Alternative 8 as compared to the No Action Alternative-Variability Conditions and Existing Conditions are summarized in Table 5-13. The surface water area within the Shoreline Waterway of the Saline Habitat Complex is included as part of the Saline Habitat Complex.

The projected changes in Brine Sink and Marine Sea surface water elevations based on the stochastic analysis are presented in Figures 5-22 and 5-23, respectively (see discussion of the use of the exceedance probability diagram previously described under the Impact Assessment of the No Action Alternative, Interpretation of the Exceedance Probability Diagrams).

Table 5-13
Surface Water Conditions for Alternative 8

Surface Water Component	Phase I (December 2020)	Phase II (December 2030)	Phase III (December 2040)	Phase IV (December 2078)
Saline Habitat Complex Water Surface Area	Not Applicable	13,500 acres	13,500 acres	13,500 acres
Marine Sea	Not Applicable	83,000 acres	83,000 acres	83,000 acres
Brine Sink Elevation	-240 feet msl	-274 feet msl	-277 feet msl	-277 feet msl
Brine Sink Surface Area	207,000 acres	62,000 acres	9,000 acres	9,000 acres
Brine Sink Salinity	76,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L	Greater than 350,000 mg/L

Notes:
All elevation values rounded to nearest foot, all surface area values rounded to nearest 1,000 acres, and all salinity values rounded to nearest 1,000 mg/L, and based upon 717,000 acre-feet/year trace.

The total wetted acreage would be less under Alternative 8 than under the No Action Alternative or Existing Conditions.

Impacts related to erosion and placement of facilities within 100 year flood hazard areas would be similar to those described under the No Action Alternative.

The potential for polluted runoff during construction could be higher in Alternative 8 as compared to the No Action Alternative due to construction of Berms, islands, peninsulas, deep holes, Perimeter Dikes, and the Barrier.

The potential for seiches would be less under this alternative than under the No Action Alternative or Existing Conditions because the large open water area of the Marine Sea would be smaller than the Salton Sea and the open water areas in the Brine Sink and Saline Habitat Complex would not be suitable for establishment of seiches.

Next Steps

During the project-level analyses and design, Best Management Practices would be required to be identified to reduce erosion and polluted runoff during construction and operations and maintenance in accordance with the Stormwater National Pollutant Discharge Elimination System permit. Final design inflow patterns would be defined to determine specific locations of facilities and measures to protect against flood events or increases in future inflows.

The project-level analysis could include an analysis of seiche to define surface water elevation of the Brine Sink or Marine Sea that would avoid inundation of lands above the design surface water elevation.

If water treatment sludge is conveyed to the Brine Sink, periodic laboratory analyses would be completed to identify concentrations of constituents of concern that could adversely affect beneficial use of the Brine Sink. If this occurs, the sludge should be hauled to a certified disposal site.

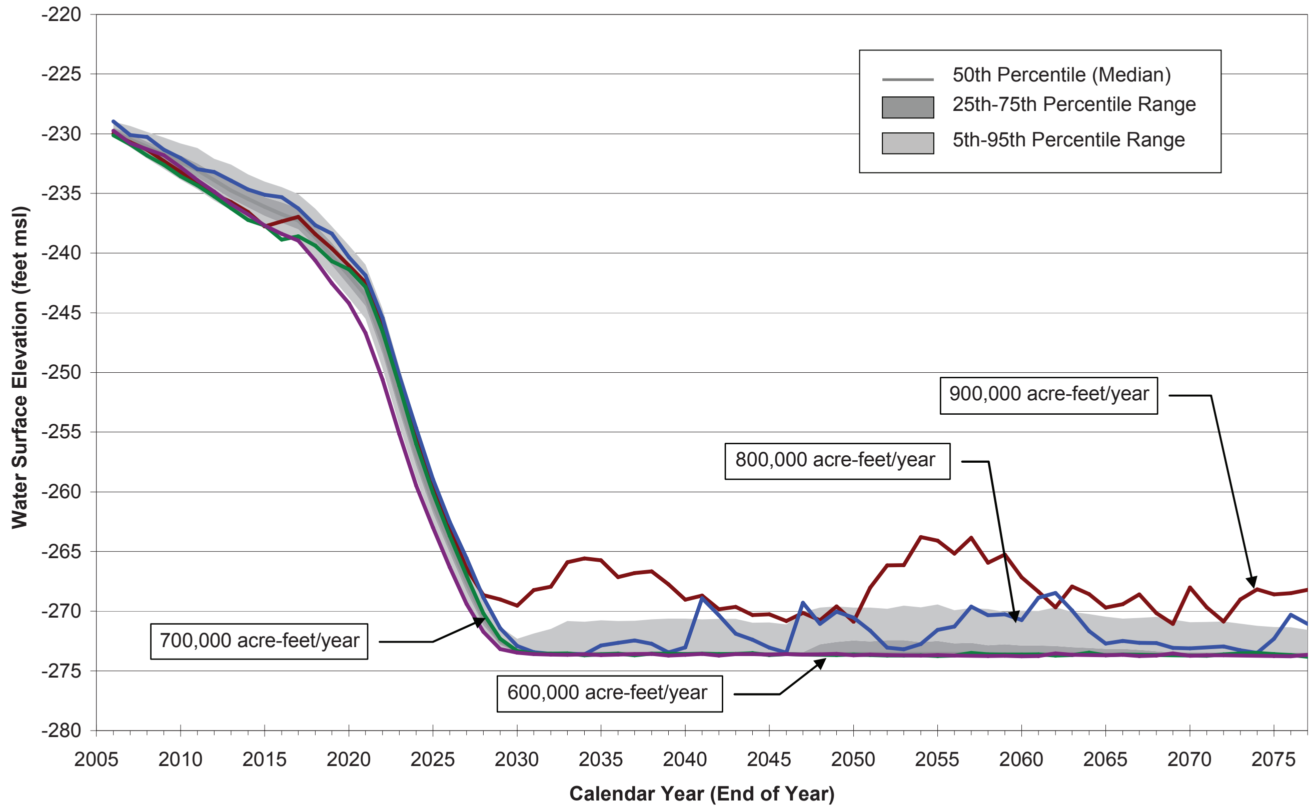

FIGURE 5-20
BRINE SINK SURFACE WATER ELEVATION UNDER ALTERNATIVE 7

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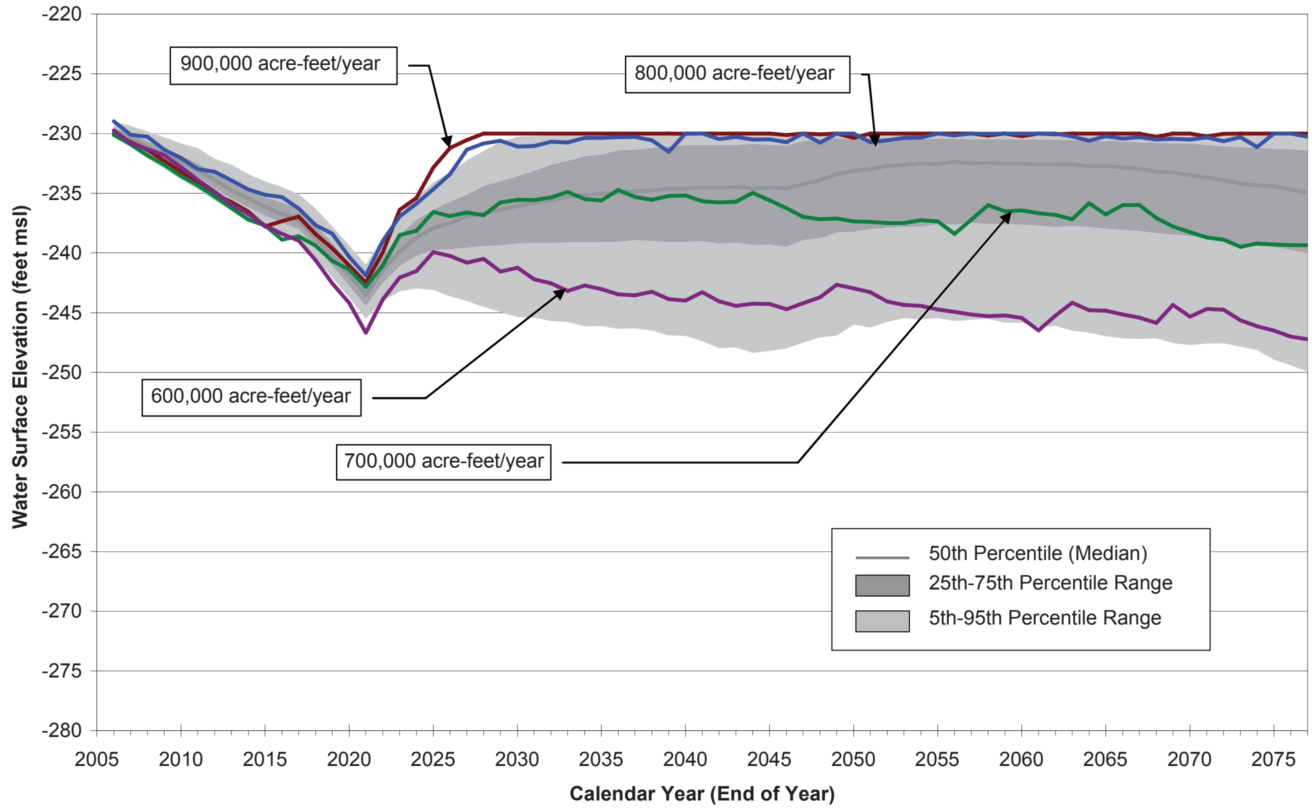

FIGURE 5-21
RECREATIONAL SALTWATER LAKE SURFACE WATER ELEVATION UNDER ALTERNATIVE 7

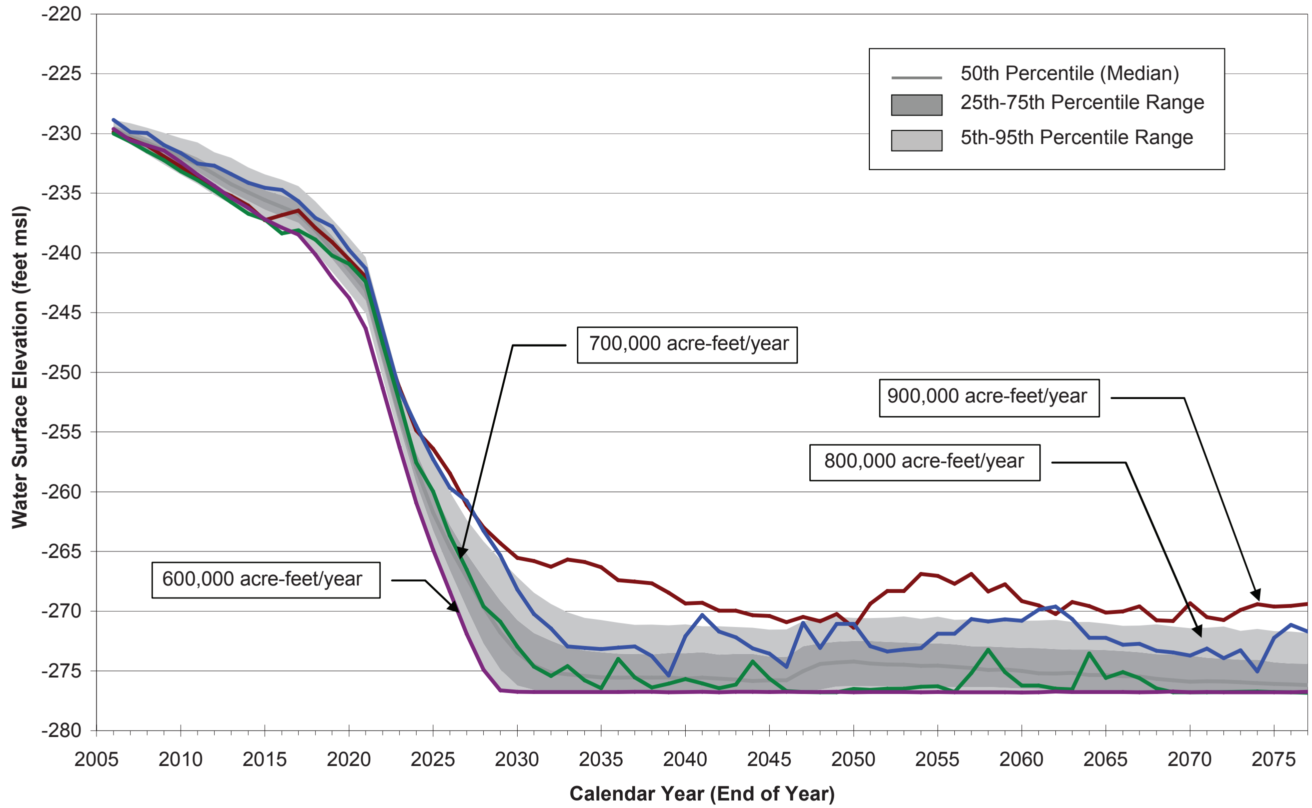

FIGURE 5-22
BRINE SINK SURFACE WATER ELEVATION
UNDER ALTERNATIVE 8

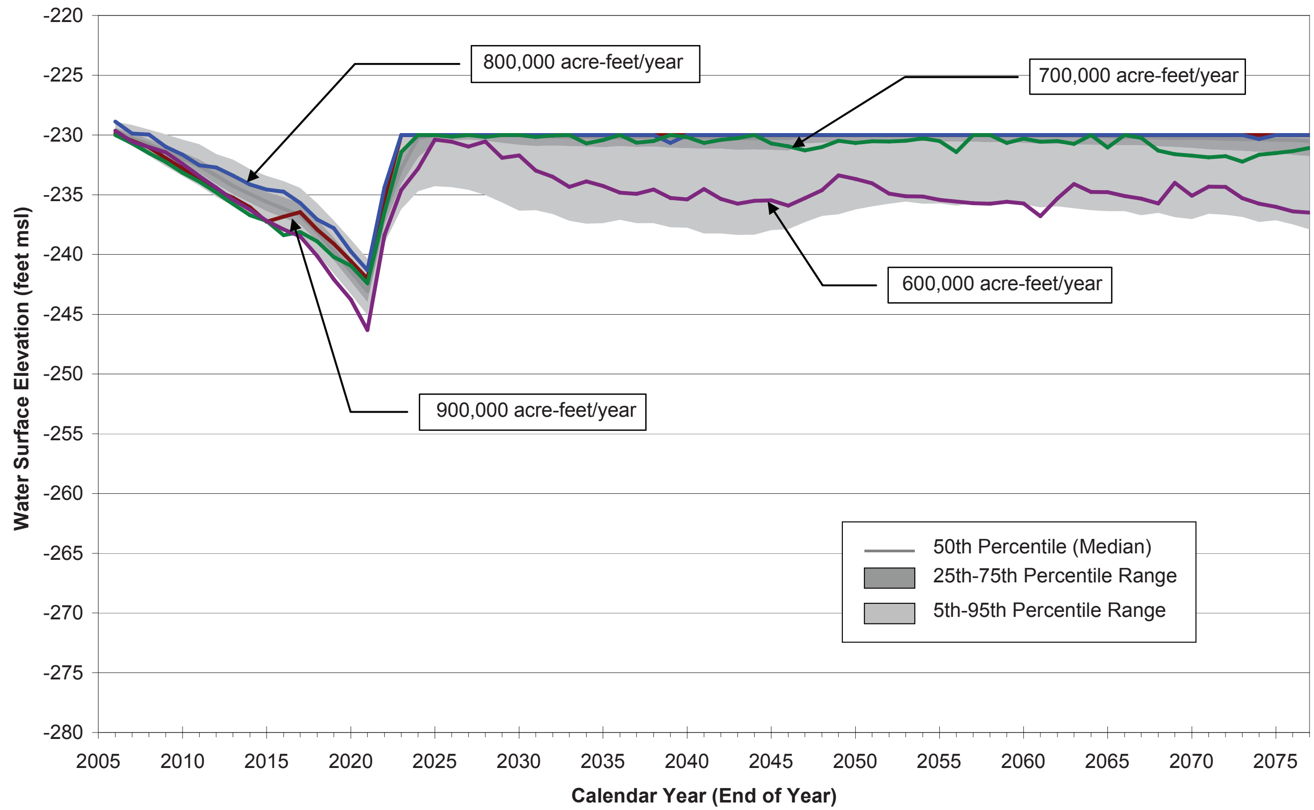

FIGURE 5-23
MARINE SEA SURFACE WATER ELEVATION
UNDER ALTERNATIVE 8