HABITAT CONSERVATION PLAN

For the

ISSUANCE OF AN INCIDENTAL TAKE PERMIT UNDER SECTION 10(a)(1)(B) OF THE ENDANGERED SPECIES ACT

For the

FEDERALLY THREATENED SANTA ANA SUCKER

On

THE RAPID INFILTRATION AND EXTRACTION (RIX) FACILITY CITY OF COLTON, SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

San Bernardino Municipal Water Department
397 Chandler Place
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October 2023

EXECUTIVE SUMMARY

The Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority (Authority) and San Bernardino Municipal Water Department (SBMWD) propose this Habitat Conservation Plan (HCP) to support US Fish and Wildlife Service (USFWS) Endangered Species Act (ESA) authorization for incidental take (capture, mortality) of the listed threatened Santa Ana sucker (SASU) during the continued operation of the Rapid Infiltration and Extraction (RIX) Tertiary Treatment Facility (RIX Facility). The RIX Facility, operational since 1996, is a permitted 40 million gallons per day (mgd) regional tertiary wastewater treatment plant that supports the cities of San Bernardino and Colton. An essential public service, the RIX Facility is operated by the SBMWD on behalf of the Authority and includes over 83,000 residential, commercial, and industrial connections (approximately 38,400 SBMWD; 20,500 East Valley Water District; 5,300 City of Loma Linda; 14,500 City of Colton; and 4,800 City of Grand Terrace). The RIX Facility treatment process includes conventional filtration of secondary treated wastewater and the infiltration of secondary treated wastewater into a series of ponds under conditions of wet and dry cycles, extraction of the infiltrated wastewater (including over-extraction of some groundwater to assure wastewater capture), and disinfection of the extracted/filtered water by ultraviolet (UV) irradiation prior to the discharge into the Santa Ana River (SAR), Reach 4, pursuant to National Discharge Elimination System (NPDES) permits issued to the Authority by the California Regional Water Quality Control Board, Santa Ana Region.

The sustained release of water at the RIX Facility Outfall (Outfall) contributes to the functional quality of the SAR downstream from the RIX Facility as habitat for the federally threatened SASU. The Outfall and SAR Reach 4 are within USFWS final designated critical habitat for SASU.

Operation of the RIX Facility requires periodic shutdowns of varying duration, which historically occurred up to 112 times per year. However, over the past five years, the number of shutdowns has averaged 7 per year and has been 10 or fewer since 2018. Scheduled shutdowns occur for necessary maintenance (typically biannual, and generally lasting no more than four hours). In addition, unscheduled shutdowns occur during unforeseen emergencies due to loss of power to the RIX Facility, electrical storms, accidental damage, or automatic plant shutdown due to water quality issues, to avoid releasing contaminated, or non-compliant water into the SAR based on NPDES permit conditions. A substantial factor contributing to past unplanned shutdowns was the UV Disinfection System. The average duration of shutdowns for the past five years has been just over two hours. The shutdowns result in a significant decrease or cessation of the discharge to the RIX Outfall water flow, which can result in a reduction or loss of surface flows downstream of the RIX Facility when certain conditions exist (extended drought, low groundwater levels, etc.), negatively affecting or killing SASU.[1]

In 2017, the UV Disinfection system at the RIX Facility was rehabilitated, significantly reducing the number of unplanned shutdowns. Most significantly, the RIX Facility now

[1] Past experience indicates that during shutdowns the flow from the City of Rialto discharge was sufficient to maintain surface flow in the SAR to the MWD Crossing.

contains repurposed production wells that are equipped with backup generators (the RIXES Wells). The RIXES Wells are capable of supplying approximately 16 cfs to the Santa Ana River during shutdowns. This flow is optimal and may vary with hydrogeological conditions and equipment efficiencies. The RIXES Wells and the significant plant upgrades mentioned above represent a $9.0 million investment to reduce mortality and capture of SASU during routine and emergency shutdowns. In addition, the Rialto Tank project, which is being implemented by the San Bernardino Valley Municipal Water District, is expected to be capable of delivering flows of 21 cfs to the Rialto Channel for up to five hours during periods of RIX shutdown. Permittee is working with San Bernardino Valley Municipal Water District to coordinate operation of the Rialto Tank and RIXES Wells backup system to maximize flows in the SAR Reach 4 during periods of RIX shutdown.

During future shutdowns (both planned and emergency/unplanned shutdowns) Permittee will coordinate with the USFWS, the Riverside-Corona Resource Conservation District (RCRCD), and San Bernardino Valley Municipal Water District (Valley District) to monitor flow conditions downstream of the RIX discharge point to a point 0.65 miles downstream of the Riverside Ave. bridge. Over a period of time (assume a few years) a more realistic picture of downstream circumstances will be obtained and used to refine the SASU management plan associated with RIX operations.

Since routine operation and maintenance of the RIX Facility, including scheduled and unscheduled shutdowns and current and future use of augmentation flows from the RIXES Wells may affect SASU, the continued operation of RIX requires a permit issued by the USFWS to authorize incidental take of this protected species.

The purpose of this HCP is to allow continued operation of the RIX Facility, including periodic shutdown as required, while minimizing impacts to SASU. The HCP identifies a series of measures to avoid, minimize, and mitigate impacts to SASU that result from periodic shutdowns, including measures proactively implemented, such as the RIXES wells.

The principal change to RIX Facility operations with this HCP is the use of pumped groundwater to augment RIX Facility discharge into the SAR during times of RIX Facility shutdowns, whether scheduled or unscheduled. This groundwater discharge will minimize impacts to SASU while allowing critical maintenance and/or repair to occur at the RIX Facility.

Covered Activities

This HCP provides conservation and all practicable mitigation for impacts to SASU from the following activities (Covered Activities):

1) Ongoing operation of the RIX Facility, including treatment and discharge of all influent received at RIX;
2) Necessary scheduled maintenance shutdowns of the RIX Facility

3) Unforeseen emergency shutdowns of the RIX Facility
4) Supply of groundwater to provide water during RIX Facility shutdowns

Covered Activities include normal fluctuations in effluent volume that occur due to fluctuations in RIX Facility influent (such as from drought, water conservation or economic conditions), which are outside of Permittee's control, but do not include the diversion, recycling or sale of tertiary treated effluent. SBMWD will obtain separate authorization for incidental take prior to any diversion, recycling or sale of tertiary treated effluent.

Goals and Objectives

In accordance with the USFWS "Five Point" policy[2], biological goals were established as the broad, guiding principles for the operating conservation program of the HCP. The biological goals provide the rationale behind the minimization and mitigation strategies. Pursuant to USFWS guidance, the biological goals have biological objectives as a measurable target for achieving the goal of the operating conservation program.

The biological goals and objectives for this HCP are as follows:

Avoidance Goal 1*: Avoid impacts to SASU in the HCP Area from the continued operation of the RIX Facility.*

Avoidance Objective 1: Maintain and operate the RIX UV Disinfection system to avoid unplanned shutdowns associated with the UV system.

Avoidance Objective 2: Avoid planned shutdowns during the spawning season (mid-February through July), unless shutdowns coincide with low numbers of larvae and high flows driven by rainfall.

Minimization Goal 1*: Minimize impacts to SASU in the HCP Area from the continued operation of the RIX Facility.*

Minimization Objective 1: Minimize frequency and duration of shutdowns to the extent feasible by continually evaluating and planning maintenance activities, and schedule shutdowns (when feasible) to coincide with rainfall that increases flows in the stream reach from the RIX outfall to 0.65 mi downstream of Riverside Ave.

Minimization Objective 2: Coordinate fish salvage efforts during planned shutdowns, and if practicable, during unplanned shutdowns.

Minimization Objective 3: Ensure a supply of replacement water during RIX Facility shutdowns, when necessary, to reduce SASU stranding.

[2] Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, U.S. Fish and Wildlife Service/National Oceanic & Atmospheric Administration, May 2000

Avoidance, Minimization and Mitigation Measures

Avoidance measures are designed to ensure the continued safe operation of the RIX Facility in a manner than would avoid impacts to SASU. The avoidance measures are the following:

> **Avoidance Measure 1**: Ensure adequate maintenance of the RIX UV Disinfection System to minimize unplanned shutdowns.
>
> **Avoidance Measure 2**: Avoid scheduled, routine maintenance activities that require a shutdown during SASU spawning season (typically mid-February through July), unless storm runoff has increased river flow and caused most of the vulnerable individuals (i.e., eggs, larvae) to move downstream of the Drydown Area. If scheduled maintenance is required during this time, close coordination with USFWS will occur prior to any shutdown.

The following steps identify minimization measures for Project-related impacts to the listed species.

> **Minimization Measure 1:** Ensure that shutdowns coincide with higher river flows during/after rainstorms, to the extent practicable. If shutdowns must occur during spawning season, relative rarity of fish larvae will be confirmed with surveys prior to the event. The feasibility of a step down in flows is also being explored.
>
> **Minimization Measure 2**: Coordinate with Riverside-Corona Resource Conservation District (RCRCD) and USFWS prior to shutdowns, so that stranded fish can be salvaged during planned shutdowns, and if practicable, during unplanned shutdowns.
>
> **Minimization Measure 3**: Ensure a supply of replacement water during shutdowns from the four RIXES Wells.

The measures to be implemented to mitigate for unavoidable impacts include the following:

> **Mitigation Measure 1**: Coordinate with USFWS and other partners to use RIXES Wells and planned shutdowns to facilitate management and removal of invasive fishes in the SAR within the HCP Area.
>
> **Mitigation Measure 2:** Contract w/ RCRCD or other entity approved by the Service to engage in monitoring and rescue operations during planned shutdowns and unplanned shutdowns in daylight hours that are expected to exceed 1.5 hrs in duration. Follow-up reporting will accompany all shutdowns when personnel are present on the river.

Monitoring Requirements

Monitoring tracks compliance with the terms and conditions of the HCP and Permit and determines adaptive management strategies.

Compliance Monitoring

1) **Compliance Monitoring Measure 1 – Right to Access**. With prior notification from USFWS, Permittee shall ensure that USFWS is given the right to access and inspect all properties owned or operated by Permittee for compliance with the project description and the terms and conditions of the Take Permit during the implementation of the HCP.

2) **Compliance Monitoring Measure 2 – Notification**. In order to report on the incidental take of SASU within the HCP Area, Permittee will notify USFWS in advance of planned shutdowns and will notify USFWS as soon as is practicable for an emergency shutdown. This will allow a rescue response and an estimation of capture and mortality. Permittee will provide notification of the posting of the publicly accessible (online) monthly, quarterly, and annual Discharge Monitoring Report (DMR) or De Minimis Permit Report as submitted to the Santa Ana RWQCB. These reports will include summaries of the number of shutdowns (routine and emergency) throughout the reporting period. Information will include duration of shutdown, reason for shutdown, and number of SASU captures and mortalities (if known).

Effects Monitoring

1) **Effects Monitoring Measure 1 - Water Quality Monitoring**. During each release of the replacement water, basic parameters will be recorded such as volume and flow rate and temperature. Results of water quality sampling performed in compliance with NPDES permit requirements will be retained and made available for USFWS review upon request.

2) **Effects Monitoring Measure 2 – Water Distribution Monitoring**. The SAR has a mobile bed and a multi-thread channel form, and the materials in the valley bottom create conditions ideal for infiltration into underlying aquifers. The longitudinal distance over which the RIXES Wells water remains as surface flow and the distribution of water in individual threads can be affected by bedload, high flow events, climate, and activities of other water users in the basin. Therefore, during each scheduled shutdown for the first year, the longitudinal extent of backup flow and its distribution in individual channel threads will be recorded, along with distribution of baseline flows in individual channel threads. This will provide valuable information on how to maximize the success of rescue operations during planned and unplanned shutdowns.

Effectiveness Monitoring

1) **Effectiveness Monitoring Measure 1 – Scientific Study of RIX Operational Effects on SAS**. Conduct a study that summarizes SASU population trends in the river before and after the completion and use of the RIXES Wells. This study will assess effectiveness of the RIXES Wells by examining shutdown statistics before and after backup system completion and their apparent effects on demographic rates such as survival of adults and larvae and population age structure (i.e., incidence of larger, more fecund individuals). Currently, larval fish surveys occur monthly during spawning season and an annual population survey of adult fish occurs in fall. Demographic rates will be estimated from these data and compared before and after completion of the RIXES Wells. Annual estimates of demographic rates and their examination in light of the shutdowns that have occurred, including those that involved deliberate dewatering of the channel for nonnative species removal, will help ensure that demographic rates are not significantly harmed by RIX operations. This measure will be conducted contingent on availability of population estimate and length-frequency data from 2015 through 2022.

2) **Effectiveness Monitoring Measure 2 – Description of conditions in the SAR during shutdowns with replacement water**. Prepare a study describing the conditions in the SAR during shutdowns when replacement water is being provided. This study should occur during a planned shutdown and should document changes in flow, temperature, and other parameters as determined prior to the shutdown. A field sampling plan will be drafted and sent to USFWS for review, and a summary of sampling results will be provided in a Water Dispersion Monitoring Report. The need for further field sampling during shutdowns will be determined based on the results of the study described above.

Performance and Success Criteria

This section describes the success criteria for each biological objective, and the annual performance criteria that identifies that the operating conservation strategy is continuing to move toward meeting the success criteria. The USFWS guidance identifies that performance criteria and success be quantitative; if quantitative measures are not available, develop qualitative measures.

Avoidance Goal 1*: Avoid impacts to SASU in the HCP Area (see Section 1.4) from the continued operation of the RIX Facility.*

> **Avoidance Objective 1**: Operate and maintain the RIX UV Disinfection System to eliminate a significant number of unplanned shutdowns.
>
> > **Performance Criterion 1 for Objective 1**: Provide continued maintenance of and feasible upgrades to the RIX UV Disinfection System, its UV lamps, and its associated control systems to maximize system reliability and minimize the number of unplanned shutdowns.

Performance Criterion 2 for Objective 1: Include in recurring publicly available Discharge Monitoring Reports (DMRs) and/or De Minimis Discharge Reports incident reports for every RIX Facility shutdown, documenting the root cause of the shutdown and identify what, if any, measures can be taken to reduce future unscheduled shutdowns. Evaluate these reports annually for Capital Improvement Program planning.

Avoidance Objective 2: Avoid planned shutdowns during the SASU spawning period, unless shutdowns can coincide with higher, rainfall-driven flows in the river, and it is confirmed that a low number of larvae are present in the river or if an emergency shutdown is needed to resolve an unforeseeable condition and cannot be postponed.

Performance Criterion for Avoidance Objective 2: Lack of planned shutdowns during spawning season, unless the shutdown can be coordinated with a rainfall event or in the wake of a larval survey indicating that few larvae are present in the Drydown Area. Planned shutdowns since 2018 have all occurred outside of the spawning season, when larvae would be likely present in the Drydown Area. It is therefore unlikely that a planned shutdown would need to occur during spawning season under current conditions.

Minimization Goal 1: Minimize impacts to SASU in the HCP Area from the continued operation of the RIX Facility.

Minimization Objective 1: Schedule shutdowns (when feasible) to coincide with storm flows in the HCP Area and/or minimal presence of larval fish; or in coordination with USFWS as part of a species recovery action (e.g., non-native species removal).

Performance Criterion for Minimization Objective 1: Planned shutdowns coordinated with rainfall events/high flows and/or species recovery action to the extent feasible.

Minimization Objective 2: Coordinate fish salvage/rescue efforts prior to planned shutdowns, and during unplanned shutdowns (if practicable).

Performance Criterion for Minimization Objective 2: Begin preparation of a SASU Rescue Plan within 60 days of HCP approval. The plan should be developed in coordination with the Riverside-Corona Resource Conservation District and identify timing, procedures, equipment, personnel and reporting responsibilities that will result in the greatest possibility for a successful rescue. The draft plan should be submitted to the USFWS for comment within 180 days of HCP approval.

Minimization Objective 3: Ensure a supply of replacement water during RIX Facility shutdowns that will reduce or eliminate SASU stranding.

Performance Criterion for Minimization Objective 3: Prepare a Water Replacement Operations Plan that identifies the procedures for groundwater well operations in the event of a shutdown. The plan should identify timing, procedures, equipment, personnel, training plans, and reporting responsibilities that will occur to ensure a supply of replacement water will be discharged into the SAR. The Water Replacement Operations Plan is already in place, as RIX staff are familiar with and trained for shutdown procedures, and a comprehensive formal document will be produced to describe this Plan. The draft plan should be submitted to the USFWS for comment within 180 days of HCP approval.

Reporting

Annual reports to the USFWS will include:

1. Brief summary or list of project activities accomplished during the reporting year.
2. Brief description of conservation strategy implemented.
3. Monitoring results (compliance, effects and effectiveness monitoring) and survey information (if applicable)
4. Description of any take that occurred for SASU (includes cause of take, form of take, take amount, location of take and time of day, and deposition of dead or injured individuals).
5. Description of any circumstances that made adaptive management necessary and how it was implemented, including a table of the cumulative totals by reporting period of all adaptive management changes to the rescue and/or water replacement plans, including a very brief summary of the actions.
6. Description of any changed or unforeseen circumstances that occurred and how they were dealt with.
7. Funding expenditures related to HCP compliance.
8. Description of any minor or major amendments that have been approved by the USFWS.

The HCP proposes a successful conservation strategy for SASU as it relates to the continued operation of the RIX Facility, an essential public service, in that it includes (1) an integrated framework for biological goals and objectives; (2) avoidance, minimization and mitigation measures proven to be effective; (3) a monitoring framework to measure results, (4) an evaluation process to assess results, and (5) a systematic learning process to use what will be learned to improve future decisions regarding management of the RIX Facility.

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1 INTRODUCTION

1.1 Background

The Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority (Authority) and San Bernardino Municipal Water Department (SBMWD) (together, "Permittee") propose this Habitat Conservation Plan (HCP) to support US Fish and Wildlife Service (USFWS) Endangered Species Act (ESA) authorization for incidental take of the listed threatened Santa Ana sucker (SASU) during the continued operation of the Rapid Infiltration and Extraction (RIX) Tertiary Treatment Facility (RIX Facility). The RIX Facility, operational since 1996, is a permitted 40 million gallons per day (mgd) regional tertiary wastewater treatment plant that supports the cities of San Bernardino and Colton, as well as the flows from the satellite collection systems operated by the East Valley Water District and the cities of Loma Linda and Grand Terrace. It is operated by the SBMWD on behalf of the Authority. The RIX Facility treatment process includes conventional filtration of secondary treated wastewater and the infiltration of secondary treated wastewater into a series of ponds under conditions of wet and dry cycles, extraction of the infiltrated wastewater (including over-extraction of some groundwater to assure wastewater capture), and disinfection of the extracted/filtered water by ultraviolet (UV) irradiation prior to the discharge into the Santa Ana River (SAR), Reach 4, pursuant to National Discharge Elimination System (NPDES) permits issued to the Authority by the California Regional Water Quality Control Board, Santa Ana Region.

The sustained release of water at the RIX Facility Outfall (Outfall) contributes to the functional quality of the SAR downstream from the facility as habitat, for the federally threatened SASU. The Outfall and SAR Reach 4 are within USFWS final designated critical habitat for SASU.

Historically, periodic shutdowns have occurred during operations of the RIX Facility. Over the period of operations, a maximum of 112 shutdowns occurred in one year, but incidence has decreased dramatically with recent improvements in operations. Over the past five years, the number of shutdowns has averaged 7 per year, with 10 or fewer shutdowns per year since 2018. Scheduled shutdowns occur for necessary maintenance (typically biannual). In addition, unscheduled shutdowns occur during unforeseen emergencies due to loss of power to the RIX Facility, electrical storms, accidental damage, or automatic plant shutdown due to water quality issues, to avoid releasing contaminated, or non-compliant, water into the SAR. The shutdowns vary in duration and can result in significant decrease or cessation of the discharge to the RIX outfall water flow, which can reduce or eliminate surface flows in the river resulting in die-off of some SASU in occupied habitat downstream of the RIX Facility. Past experience (i.e., since 2008) indicates that during most shutdowns, the flow from the City of Rialto discharge was sufficient to maintain surface flow in the SAR to the MWD Crossing. However, drought conditions and area groundwater pumping have affected surface flows, and because the SAR is a wide, shallow, braided system, some smaller side channels become dry during flow reductions.

Since the routine operation of the RIX Facility may affect SASU, a permit issued by the USFWS to authorize incidental take of this protected species is being sought. To this end, the Permittee already has completed substantial facility enhancements and improvements in coordination with the USFWS. The first major upgrade was the completion of the RIX UV Disinfection System Rehabilitation Project. This involved replacement of UV lamps and associated control systems to reduce the number of unplanned shutdowns of the RIX facility. Improvements to operating software are also being explored. The second major upgrade involved the construction of the RIXES Wells. The RIX facility now contains repurposed production wells that are equipped with backup generators (the RIXES Wells backup system). The RIXES Wells are capable of supplying approximately 16 cfs to the SAR during shutdowns. This flow is optimal and may vary with hydrogeological conditions and equipment efficiencies. These recent improvements represent a $9.0 million investment to reduce capture and mortality of SASU during routine and emergency shutdowns.

In addition to its commitments under this HCP, Permittee is participating in the proposed Upper Santa Ana River HCP, a regional comprehensive program that is intended to provide a framework to protest, enhance and restore habitat for multiple species, including SASU affected by water resource management in the Upper Santa Ana River watershed.

1.2 Purpose of the Habitat Conservation Plan

Permittee is seeking a permit for incidental take of SASU in the course of otherwise lawful activities associated with the operation of the RIX Facility. Such authorization is necessary because notwithstanding the significant facility improvements by Permittee, activities associated with the operation of the facility may result in incidental take due to the reduction of treated water discharge into the SAR, resulting in a dewatered channel and subsequent stranding of SASU. This HCP defines measures to avoid, minimize, and mitigate the potential take of SASU, including SASU mortality, as a direct result of shutdown, and/or take that may occur during salvage efforts.

This HCP has been prepared in consultation with the USFWS to fulfill the requirements of a Section 10(a)(1)(B) permit application for the continued operation of the RIX Facility, which is an essential public service. Through a cooperative conservation strategy, Permittee proposes to continue operation of the RIX Facility while continuing to discharge treated water into the SAR in compliance with its National Pollutant Discharge Elimination (NPDES) Permits (CA8000304 Order No. R8-2013-0032 and CAG998001 Order No.R8-20150-0004), at a point known to be occupied by SASU in order to maximize SASU conservation and recovery. Specifically, Permittee intends that this HCP will:

- Specify avoidance, minimization, and mitigation measures consistent with the ESA that support the long-term conservation needs of the SASU.

- Comply with requirements of the ESA to ensure conservation of important natural resources while allowing for continued operation of the RIX Facility. This will be

accomplished by securing a permit for the incidental take of SASU during Covered Activities (described in Section 2).

- Provide a means to standardize mitigation and compensation requirements that will lessen or avoid direct and cumulative impacts to SASU occurring within the area potentially impacted by the operation of the RIX Facility.

1.3 Permit Holder/Duration

The Authority, as owner of the RIX Facility, along with the SBMWD, the lead operating entity for the RIX Facility, submit this application for a Section 10(a)(1)(B) Incidental Take Permit. The Authority and SBMWD are referred to collectively as "Permittee."

The duration of the Section 10(a)(1)(B) Incidental Take Permit (Permit) for the RIX Facility is 50 years from the date of issuance. This Permit allows the Permittee or its successor to incidentally take SASU within the geographical boundaries identified in this HCP over that time period. This geographical boundary will be referred to as the HCP Area throughout this document. The Permit may only be transferred consistent with 50 CFR part 13 section 13.25, which requires that 1) the Permittee and proposed transferee apply for a permit transfer (through the submission of an assumption agreement between the two parties), 2) the proposed transferee meets all the qualifications for holding a permit, 3) the transferee provides written assurances that it can meet the financial obligations and will implement the terms and conditions of the Permit, including any outstanding mitigation requirements, and 4) that the transferee provides any additional information the USFWS deems necessary. After expiration of this Permit, any "take" within the said geographic boundaries requires re-authorization.

1.4 Permit Boundary/Covered Lands

The boundary of the area covered by this HCP is restricted to a section of the SAR approximately 2 miles long, extending from the Outfall structure (34° 2.474'N, 117° 21.268'W), downstream to a point approximately 0.65 miles downstream of the Riverside Avenue Bridge (34° 1.027'N, 117° 22.142'W) (HCP Area or Permit Boundary). The entire lateral extent of the active SAR floodplain along this section of the river is included in the HCP Area. This encompasses all the area that is anticipated to be impacted when discharge from the RIX Facility is temporarily halted during a shutdown. The extent of the Area has been selected based on the following: first, upwelling was observed by USFWS and RCRCD within 0.5 mi downstream of Riverside Avenue. And second, the influence of the RIXES Wells tends to decrease in a downstream direction because infiltration rates are affected by background conditions, including natural infiltration during drought and other users in the basin. The HCP Area is identified on Figure 1 but may need to be refined as more data are collected.

Justification for the extent of the potentially impacted area within the SAR is based on the fact that the RIX Facility cannot produce sufficient water from its facility or the RIXES Wells to compensate for natural infiltration into the aquifer during drought and the

activities of other water users in the basin. Based on recent use of the RIXES Wells, flows appear to reach to 0.65 mi downstream of Riverside Avenue under current conditions. The extent of flow during shutdowns mediated by the RIXES Wells may increase, given that recent rains may have recharged the underlying aquifer and reduced infiltration rates, but it could also decrease in response to continued drought, groundwater overextraction, or climate change.

1.5 Species to be Covered by Permit

The following species are referred to as "covered species" related to the Incidental Take Permit if it is issued. This is species that will be listed on the 10(a)(1)(B) Permit and for which "no surprises" assurances will be given.

Covered Species	***Federal Status***
Santa Ana Sucker (*Catostomus santaanae*)	Threatened – Federal

1.6 Regulatory Requirements

1.6.1 Federal Endangered Species Act

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the Act prohibits the take of endangered and threatened species, without special authorization. Take is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct.” Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Pursuant to section 11(a) and (b) of the ESA, any person who knowingly violates Section 9 of the ESA or any permit, certificate, or regulation related to Section 9, may be subject to civil penalties of up to $25,000 for each violation or criminal penalties up to $50,000 and/or imprisonment of up to one year.

Individuals and State and local agencies proposing an action that is expected to result in take of federally listed species are encouraged to apply for an Incidental Take Permit under Section 10(a)(1)(B) of the ESA to be in compliance with the law. Such permits are issued by the USFWS when take is not the intention of and is incidental to otherwise legal activities. An application for an Incidental Take Permit must be accompanied by a HCP. The regulatory standard under Section 10(a)(1)(B) of the ESA is that the effects of authorized incidental take must be minimized and mitigated to the maximum extent practicable. Under Section 10(a)(1)(B) of the ESA, a proposed project also must not appreciably reduce the likelihood of the survival and recovery of the species in the wild, and adequate funding for a plan to minimize and mitigate impacts must be ensured.

Section 7 of the ESA requires Federal agencies to ensure that their actions, including issuing permits, do not jeopardize the continued existence of listed species or destroy or adversely modify listed species' critical habitat. "Jeopardize the continued existence of…" pursuant to 50 CFR 402.2, means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. Issuance of an Incidental Take Permit under Section 10(a)(1)(B) of the ESA by the USFWS is a Federal action subject to Section 7 of the ESA. As a federal agency issuing a discretionary permit, the USFWS is required to consult with itself (i.e., conduct an internal consultation). Delivery of the HCP and a Section 10(a)(1)(B) permit application initiates the Section 7 consultation process within the USFWS.

The requirements of Section 7 and Section 10 substantially overlap. Elements unique to Section 7 include analyses of impacts on designated critical habitat, analyses of impacts on listed plant species, if any, and analyses of indirect and cumulative impacts on listed species. Cumulative effects are effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area, pursuant to Section 7(a)(2) of the ESA. The action area is defined by the influence of direct and indirect impacts of covered activities. The action area may or may not be solely contained within the HCP Area. These additional analyses are included in this HCP to meet the requirements of Section 7 and to assist the USFWS with its internal consultation.

1.6.2 The Section 10(a)(1)(B) Process – HCP Requirements and Guidelines

The Section 10(a)(1)(B) process for obtaining an Incidental Take Permit has three primary phases: 1) the HCP development phase; 2) the formal permit processing phase; and 3) the post-issuance phase. During the HCP development phase, the project applicant prepares a plan that integrates the proposed project or activity with the protection of listed species. An HCP submitted in support of an Incidental Take Permit application must include the following information:

- Impacts likely to result from the proposed taking of the species for which permit coverage is requested;
- Measures that will be implemented to avoid, minimize, monitor, and mitigate impacts; funding assurances that will be made available to undertake such measures; and procedures to deal with unforeseen circumstances;
- Alternative actions considered that would not result in take; and
- Additional measures USFWS may require as necessary or appropriate for purposes of the plan.

The HCP development phase concludes, and the permit processing phase begins when a complete application package is submitted to the appropriate permit-issuing office. A complete application package consists of: 1) an HCP, 2) a permit application, and 3) a $100 fee from the applicant. The USFWS must also publish a Notice of Availability (NOA) of the HCP package in the Federal Register to allow for public comment. The

USFWS also prepares an Intra-Service Section 7 Biological Opinion; and prepares a Set of Findings, which evaluates the Section 10(a)(1)(B) permit application in the context of permit issuance criteria (see below). HCPs that will have not have more than negligible environmental effects may qualify for a categorical exclusion under the National Environmental Policy Act (NEPA). A Section 10(a)(1)(B) Incidental Take Permit is granted upon a determination by the USFWS that all requirements for permit issuance have been met. Statutory criteria for issuance of the permit specify that:

- The taking will be incidental to an otherwise lawful action;
- The impacts of incidental take will be minimized and mitigated to the maximum extent practicable;
- Adequate funding for the HCP and procedures to handle unforeseen circumstances will be provided;
- The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild;
- The applicant will provide additional measures that the USFWS requires as being necessary or appropriate; and
- The USFWS has received assurances, as may be required, that the HCP will be implemented.

During the post-issuance phase, the Permittee and other responsible entities implement the HCP, and the USFWS monitors the Permittee's compliance with the HCP as well as the long-term progress and success of the HCP. The public is notified of permit issuance by means of the Federal Register.

1.6.3 National Environmental Policy Act

The purpose of the NEPA is two-fold: to ensure that Federal agencies examine environmental impacts of their actions (in this case deciding whether to issue an Incidental Take Permit) and to utilize public participation. NEPA serves as an analytical tool on direct, indirect, and cumulative impacts of the proposed project alternatives to help the USFWS decide whether to issue an Incidental Take Permit (ITP or Section 10(a)(1)(B) permit). NEPA analysis must be done by the USFWS for each HCP as part of the Incidental Take Permit application process; however, HCPs that will not have more than a negligible effect on the environment may qualify for a categorical exclusion under NEPA.

1.6.4 National Historic Preservation Act

All Federal agencies are required to examine the cultural impacts of their actions (e.g., issuance of a permit). This may require consultation with the State Historic Preservation

Office (SHPO) and appropriate American Indian tribes. All Incidental Take Permit applicants are requested to submit a Request for Cultural Resources Compliance form to the USFWS. To complete compliance, the applicants may be required to contract for cultural resource surveys and possibly mitigation.

1.6.5 Critical Habitat

The USFWS listed the SASU as threatened on May 12, 2000, and designated 21,129 acres of critical habitat for the SASU in 2004 (USFWS 2000 and 2004). The USFWS then revised the critical habitat designation in 2005 and again in 2010, reducing designated critical habitat to 9,331 acres in portions of creeks and rivers in San Bernardino, Los Angeles, and Riverside counties (USFWS 2005 and 2010).

The SAR critical habitat Unit (Unit 1) totals 1,559 acres divided into three subunits. Subunit B, in which the RIX Facility Outfall structure is located, is occupied by SASU and has been determined by the USFWS to be essential to its conservation. Unit 1 includes upper, main stem and lower portions of the SAR as well as portions of the Rialto Channel and Sunnyslope Creek. The Rialto Channel/SAR confluence is located approximately 0.22 miles upstream of the Outfall structure and contributes to the surface flows within the HCP Area.

1.6.6 Recovery Plans

Section 4(f) of the ESA requires the development and implementation of recovery plans for all species listed as endangered or threatened unless it is determined that a plan will not further the recovery of the species. Recovery plans and associated recovery unit boundaries are separate from Critical Habitat. A recovery plan identifies and assigns priorities to actions required for the recovery of a species. The goal of recovery is to restore a listed species to the point where it is no longer endangered or threatened. However, recovery plans are advisory in nature and do not require any party or governmental entity to undertake specific tasks.

Areas that are considered necessary for the recovery of the SASU and provide redundancy in order to maintain its historical population and habitat distributions, as well as protection of the genetic variability, were grouped into three Recovery Units (RUs) by USFWS: the SAR, Los Angeles River, and San Gabriel River RUs. The SAR Watershed RU (SARW-RU) includes the SAR, tributaries, and areas being considered for possible reintroduction. The HCP Area is within the Prado Reach of the SARW-RU, which includes the section of the SAR between Prado Dam and the drop-structure at South La Cadena Drive and its connecting tributaries (USFWS 2010).

The goal of the SASU Recovery Plan is to control or reduce threats to SASU to the extent that it no longer requires protections afforded by the Act and therefore, warrants delisting (USFWS 2014). Specifically, the four Recovery Plan objectives are to:

1) Develop and implement a range wide monitoring protocols to accurately and consistently document populations, occupied habitat, and threats.

2) Conduct research projects specifically designed to inform management actions and recovery.

3) Increase the abundance and develop a more even distribution of SASU within its current range by reducing threats to the species and its habitat.

4) Expand the range of the SASU by restoring habitat (if needed), and reestablishing occurrences within its historical range.

In addition to the four Recovery Plan objectives listed above, recovery actions including, but not limited to, the following actions were recommended by USFWS in the SASU Recovery Plan:

- Develop range wide monitoring protocols that would include metrics related to the status of the SASU population, the suitability of habitat for each life stage of SASU, and the status of threats to SASU.

- Determine the sensitivity of SASU to water quality variables that may be altered by hydrological modification or regulated discharges.

- Determine what modified hydrological processes are necessary to maintain breeding, feeding, and sheltering habitat for the species, including the timing and magnitude of flows that will maintain the complex diversity of habitat variables necessary to support each life stage.

- In areas with modified hydrology, evaluate sediment sources and transport to determine if sufficient sediment is available to maintain appropriate gradient and substrate composition for the species.

- Based on the results of hydrology, sediment transport, and life history studies, secure sufficient water flows and sediment to maintain habitat for all life stages of SASU. Natural hydrological functions should be mimicked to the extent possible, and habitat managed to simulate natural processes as necessary in areas with regulated discharge to maintain suitable habitat for the species.

- Reduce barriers to fish passage within currently occupied habitat to restore connectivity between populations and access to suitable habitat. Barriers to fish movement also have the potential to directly impact habitat for SASU by changing the stream gradient and altering hydrology. Determine which barriers to remove or modify to improve connectivity and reduce impacts to fish dispersal and sediment transport; implement removal or modification of identified barriers.

- Based on the results of water quality studies, ensure the water quality of flows altered by hydrological modification and regulated discharges are improved, as necessary, to provide water quality suitable for SASU.

- Manage nonnative predators as necessary, to reduce impacts caused by these species by such strategies as periodically increasing flow releases when there is an abundance of nonnative species, reducing the extent of habitat available to support nonnative predators, and reducing the introduction of nonnative predators into habitat for SASU.

- Manage nonnative vegetation, as necessary, to reduce impacts to SASU habitat.

- Ameliorate impacts to habitat from recreational activities through such strategies as limiting the number of activity permits issued and implementing timing restrictions, reducing the number of access points, increasing the number of trash facilities and the frequency of trash collection, installing signs that inform the public of authorized activities, patrolling and issuing tickets for unauthorized activities, and developing educational programs and brochures.

- Assess habitat within the historical range that can be restored and made suitable for passive range expansion or reintroduction of SASU.

- Plan and implement habitat restoration and reintroductions using data obtained from habitat assessments of potential range expansion areas.

2 COVERED ACTIVITIES

2.1 Project Description

The Project is the continued operation of the RIX Facility, including treatment and discharge of all influent received at RIX, components of which include scheduled and unscheduled shutdowns as required for safe operation in compliance with its NPDES permits. Another component includes discharging groundwater during times of shutdown.

2.2 Background

The RIX Facility has been operating since approximately March 1996. The rapid infiltration and extraction process is deemed equivalent to tertiary wastewater treatment. The RIX Facility currently discharges approximately 28.5 mgd of tertiary treated effluent directly into the SAR. The discharge consists of about 21 mgd from SBMWD's Water Reclamation Plant (which serves the cities of San Bernardino and Loma Linda and the East Valley Water District), about 5 mgd from the City of Colton's Water Reclamation Facility (which serves the cities of Colton and Grand Terrace), and about 2.5 mgd of local groundwater necessary to ensure adequate capture and water quality. The tertiary treated water released from RIX at this point has been treated by a combination of conventional filters, percolation basins, and ultraviolet (UV) disinfection to ensure water released meets EPA NPDES permit levels.

The SAR also receives an average of approximately 6 mgd of tertiary treated water from the City of Rialto's Municipal Wastewater Treatment Plant, which enters the SAR approximately 1,000 feet upstream of the RIX Outfall structure.

This combined discharge provides water that maintains surface flow that would either not be present or would be severely reduced without the RIX Facility's operation. This source of perennial flow provides critical habitat for SASU inhabiting the SAR. The channel morphology in the Drydown Area has changed substantially over time, which is unsurprising for a sand-bed river. Between 2018 and 2023, the SAR has largely transitioned from a multi-thread, braided channel to a simplified, single-thread channel in the Drydown Area. The simplified habitat in this single-thread channel is not preferred by SASU. Additionally, a change in channel alignment occurred at the mouth of the Rialto channel in 2021, so that flows no longer combine with RIX discharge (RCRCD 2023). Instead, flows from the Rialto Channel travel southward across the floodplain and infiltrate into the sand bed. Despite these recent changes in habitat, the treated effluent from the RIX facility still provides a critical water source to the SAR.

While the RIX Facility maintains a year-round flow schedule based upon the amount of wastewater received, several events can lead to temporary halts in water discharges, potentially impacting SASU as a result. These halts in discharge have ranged from two minutes to 15 hours; however, most recently (the past five years), the average duration of the halts in discharge have been less than 1.5 hours.

This HCP allows for the continued operation of the RIX Facility by including conservation and mitigation for the components of the operation that impact SASU. The components of the operation that impact SASU include the following (Covered Activities):

1) Necessary scheduled maintenance shutdowns of the RIX Facility;

2) Unforeseen, unscheduled emergency shutdowns of the RIX Facility;

3) Supply of groundwater to provide water during RIX Facility shutdowns.

RIX Facility Maintenance Shutdowns

The RIX Facility conducts necessary maintenance, typically twice a year. These semi-annual facility maintenance activities typically last no more than four hours, with some of that time consisting of reduced or halted discharge, which can reduce flow in the SAR for approximately 2 miles downstream of the outfall structure to a point approximately 0.65 mi downstream of Riverside Ave. Whenever this occurs, the RIX Facility coordinates shutdown times with the USFWS, the Riverside-Corona Resource Conservation District (RCRCD), and the San Bernardino Valley Municipal Water District (SBVMWD) so that SASU rescue efforts can be coordinated and SASU can be rescued, minimizing potential stranding and death of SASU. Although flow changes have the potential to affect SASU habitat downstream of the defined HCP Area, those changes are lessened with inflows from groundwater at the Riverside Narrows. That, combined with the concentration of the SASU population within two miles of RIX and the larger changes in flow/habitat in this area, justifies concentrating rescue efforts in this area.

Emergency RIX Facility Shutdowns

Loss of power to the RIX Facility, (typically as a result of unforeseen conditions in the electrical utility), or accidental damage may result in effluent flow shutdown and cause the SAR, or portions of it, to dry up below the outfall structure. The length of time the RIX Facility is shutdown varies based on the cause of the shutdown.

Water quality issues, and a variety of possible system component failures, may also trigger automatic RIX Facility shutdown to avoid releasing contaminated, or non-compliant, water into the SAR until the water quality issue/component failure is resolved.

In the event of a power outage that causes the RIX Facility to shut down, the facility previously remained in shutdown mode on some occasions, even after the power was restored so that facility operators could perform the necessary equipment safety checks. Power outage-related shutdowns average approximately 2 hours; the longest shutdown, which occurred in 2001, lasted 15 hours.

The number of planned and emergency shutdowns has dropped significantly in the last two years. From 2008 through 2020, the RIX facility experienced between one and nine planned shutdowns and between 4 and 30 unplanned shutdowns annually. However, since 2018, ten or fewer *total* shutdowns have occurred per year. Previously, 38 to 88% of the

shutdowns were caused by issues with the ultraviolet light treatment system. However, upgrades to the UV system in February 2017 have resulted in far fewer shutdowns related to the UV treatment system (Table 1); the improvements to the system reduced the annual shutdowns to one to four per year from 2017 through 2020. The UV upgrades involved the following elements:

- Replacement of all electronic components and software upgrades.
- New equipment such as ballasts, control boards, and sensors
- Rehabilitation of all lamp racks (including spares) and purchase of new assemblies.
- New AC units (spares included) to cool electronics, replacement of transformer compartment ventilation fans with larger units, and replacement of cabinet insulation.
- Repositioning of water level sensors to reduce risk of high water level alarms during rainstorms. Addition of new equipment to reduce or prevent water intrusion into electronics during rain or periods of heavy condensation.
- Modification of operations to reduce incidence of alarms that cause shutdowns.
- Ongoing control software modifications to optimize operations.

Table 1.- Summary of RIX Shutdowns, 2008 - 2023

Year	Shutdowns			Reason for Emergency Shutdowns		
	Planned	Emergency	Total	UV	Power	Other
2008	1	17	18	15	1	1
2009	8	25	33	21	1	3
2010	8	26	34	15	3	8
2011	5	25	30	13	3	9
2012	8	22	30	16	2	4
2013	7	30	37	21	2	7
2014	9	16	25	10	2	4
2015	5	26	31	10	4	12
2016	2	13	15	2	8	3
2017	2	13	15	2	4	7
2018	3	7	10	3	2	2
2019	1	5	6	4	0	1
2020	1	4	5	1	2	1
2021	0	8	8	1	7	0
2022	2	4	6	2	2	0
2023	1	8	9	1	3	4

Supply of Replacement Water During Shutdown

Recent, significant upgrades to the RIX Facility included the installation of four pumps in 2017 that deliver water from shallow wells to the SAR in the event that a scheduled or unscheduled shutdown occurs at the RIX Facility. The point of release is the existing RIX Outfall. This pumped groundwater is used to supply water for the SASU during the times of facility shutdowns (when stream flow without the RIX discharge is inadequate) in order to reduce the impacts to SASU. It is estimated that the replacement groundwater will

constitute approximately 74 acre-feet per year (based on 30, 1.65-hour shutdowns per year) that will be discharged into the SAR.

The groundwater is supplied from a series of four groundwater wells. The Permittee equipped three previously developed test wells located at the RIXES property for use as production wells and developed a fourth well; all four wells are designed to discharge to piping connected to the existing Outfall diversion structure. All wells are connected to the existing RIX Supervisory Control and Data Acquisition (SCADA) system, to interlock their operation with the RIX Facility operations and to allow an automatic start at the initiation of a shutdown or upon sensing the RIX discharge has fallen below the prescribed setpoint. Combined, the four wells are currently capable of producing approximately 16 cfs. This flow is optimal and may vary with hydrogeological conditions and equipment efficiencies.

Wellfield equipping included installation of a back-up generator to ensure power to the pumps during an outage at the RIX Facility. The improvements were located within a man-made, engineered environmental setting that is less than 5 acres (2.5 to 4.5 acres). The RIXES Wells performed as expected during testing and maintained surface flows in the SAR during a planned shutdown (for RIXES Wells testing) in December 2017, and during all subsequent planned and unplanned shutdowns. The RIXES Wells pump water into the SAR for the duration of the shutdown.

3 ENVIRONMENTAL SETTING/BIOLOGICAL RESOURCES

3.1 Environmental Setting

3.1.1 Location

The RIX Facility is located in the City of Colton in San Bernardino County, California. The RIX Facility is shown on Section 36, Township 1S, Range 5W, San Bernardino Base Meridian on the San Bernardino South USGS 7.5' Quadrangle map. More specifically, the RIX Facility is located on the northwest side of the SAR, southeast of Agua Mansa Road and east (and southeast and south) of Miguel Bustamante Parkway and a Wal-Mart distribution center. Surrounding land uses include industrial use to the west, commercial development to the north, and open space to the south and east.

3.1.2 Climate

The climate of Southern California is governed largely by the strength and location of the semi-permanent high-pressure center over the Pacific Ocean and the moderating effects of the nearby vast oceanic heat reservoir. Local climatic conditions are characterized by very warm summers, mild winters, infrequent rainfall, moderate daytime onshore breezes, and comfortable humidity levels. These same climatic conditions that create such a desirable living climate combine to severely restrict the ability of the local atmosphere to disperse the large volumes of air pollution generated by the population and industry in the area.

The climate and geography of the State of California also present a unique challenge to the management and delivery of water. While most of the State's precipitation falls on the northern portion of the State, most of California's population resides in the semi-arid, southern portion of the State. Water is diverted, stored, and then transferred from the water-rich north to the more arid central and southern sections of the state through the California State Water Project (SWP), the Central Valley Project, and the Los Angeles Aqueduct. In addition to the projects that transport water from the north to the south, many communities on the southern coastal plain rely on water imported through The Metropolitan Water District of Southern California's (Metropolitan) Colorado River Aqueduct.

3.1.3 Topography and Soils

The approximately 2-mile-long section of the SAR potentially impacted by the Covered Activities ranges in elevation from 866 above mean sea level (amsl) at the Outfall structure to 820 feet amsl at approximately 0.65 mile downstream of the Riverside Avenue Bridge. This section of the SAR gradually slopes downward from north to south and consists of a series of braided channels within the approximately 0.17- to 0.22-mile-wide SAR main channel. Soils within the impact area consist primarily of Psamments, Fluvents, and frequently flooded soils derived from sandy alluvium.

3.1.4 Natural Communities

The riverbank just downstream of the Outfall is primarily lined to the water's edge with willow woodland and dense stands of non-native/invasive giant reed (*Arundo donax*), which stabilize the banks of the SAR (Allen, 2003).

3.1.5 Hydrology

Historically, flows in the SAR have been characterized by high flow in the winter and spring associated with storm events and low flow during the dry seasons of summer and fall. Today, the river is still subject to high flow during the winter months. However, these flows can be more short-lived but greatly increased in intensity over historic levels, as much of the watershed has been developed (Allan 2002). Development within the region has eliminated the buffering capacity of the natural landscape, creating a compressed hydrograph during storm events (Allan 2002). In contrast, summer flows have been greatly reduced due to diversion of water from the river to supply ever-increasing human demand. These diversions have left sections of the river dry, interrupting the continuity of what once was connected aquatic habitat (Allan 2002). However, even taking diversions into consideration, the data indicate that the river maintains perennial flow between RIX and the Riverside Narrows, and that an increase in water table elevations maintains perennial flow downstream of the Narrows. The exception to this situation occurs when interruptions caused by RIX shutdowns can lead to the channel going dry between RIX and the Narrows.

The SAR is located in a wide, unconfined alluvial valley, and its streambanks and stream bed both contain a high proportion of sand. As a result, the stream channel migrates laterally on a regular basis and is often multi-thread or braided. Even though the main channel (i.e., the largest braid) flows perennially, some of the smaller braids are shallow and can lose flow with small reductions in overall stream flow.

Year-round surface flow within the SAR downstream of the Outfall is dependent upon releases of treated wastewater from the RIX Facility, as well as releases from the Rialto Municipal Wastewater Treatment Facility (by way of the Rialto Channel) located upstream of the Outfall. Combined, these facilities discharge approximately 24,000 gallons per minute (35 mgd). These releases support SASU by providing perennial flow to the SAR between RIX and the Riverside Narrows, a section of the SAR that would otherwise be dry most of the year.

3.1.6 Existing Land Uses

The HCP Area is comprised of river wash and riverbank, with vacant property immediately adjacent to the riverbank. Flood control structures line the flood plain throughout the HCP Area to protect adjacent development and downstream infrastructure.

3.2 Covered Species

SASU is the only federally listed species likely to be directly impacted by the Covered Activities. SASU is one of only a few native fishes currently extant in southern California, and its distribution has been reduced in all three of its native watersheds, including the SAR.

3.2.1 Species Description

The SASU is a small, short-lived member of the sucker family of fishes (Catostomidae), named so because of the downward orientation and anatomy of their mouth parts, which allow them to consume algae, small invertebrates, and other organic matter with their fleshy, protrusible (extendable) lips (Moyle 2002).

The SASU is generally less than 6.3 inches (in) (16 centimeters [cm]) in length, is silvery-white ventrally and darker along the dorsal side, with irregular dorsal blotches on the sides and faint patterns of pigmentation arranged in lateral stripes; the membranes connecting the rays of the caudal (tail) fin are pigmented (Moyle 2002). Their jaws have cartilaginous scraping edges inside the lips. SASU use their subterminal (i.e., downturned) mouth to scrape algae, diatoms, and detritus from cobbles and small boulders, which makes up approximately 98 percent of their diets as young fish (Greenfield et al. 1970, Moyle 2002). As they grow in size, aquatic insects make up a greater proportion of their diet (Greenfield et al. 1970 and Moyle 2002).

Spawning tubercles (raised growths on sexually mature fish), particularly at the beginning of the breeding season, are present on most parts of the body of breeding males and are heaviest on the anal fin, caudal fin, and lower half of the caudal peduncle (narrow region of body immediately in front of the caudal fin). Female suckers grow tubercles on the caudal fin and caudal peduncle (Moyle 2002). Spawning may occur between mid-March to early July, with peak activity usually in April (Moyle 2002). Spawning in Rialto Channel has been documented as early as mid-February (J.M. Wood, personal observation, February 18, 2015). For a small species of the sucker family, fecundity of SASU is high and increases linearly with body weight, ranging from 4,423 to 16,515 eggs in females measuring 3.1 to 6.2 in (78 to 158 millimeters [mm]) standard length, respectively (Greenfield et. Al. 1970, Moyle 2002). Spawning takes place over gravelly riffles where fertilized eggs adhere to the substrate and hatch within 15 days (Greenfield et al. 1970, Moyle 2002). Larvae measure approximately 0.63 in (1.6 cm) (Greenfield et al. 1970). SASU generally mature during their second summer and die at the end of their third summer at 3 to 4.3 in (7.5 to 11 cm) standard length. However, some individuals have been observed to survive to a fourth summer reaching a size of 5.5 to 6.3 in (14 to 16 cm) standard length (Moyle 2002).

Fertilized eggs adhere to the substrate and hatch within 360 hours at 13°C (55°F) (Greenfield *et al.* 1970; Moyle 2002). Larvae are approximately 0.28 in (7 mm) at hatching. Greenfield *et al.* (1970, p. 170) found no gravid female SASU smaller than 1.9 in (49 mm) or 0.07 ounce (2.05 grams).

3.2.2 Range

The historical range of the SASU included the rivers and larger streams emanating from the San Gabriel and San Bernardino Mountains, primarily in the counties of Ventura, Los Angeles, Orange, Riverside, and San Bernardino, including the main stems and tributaries from near the Pacific Ocean to the uplands of the Los Angeles, San Gabriel, and SAR systems (USFWS 2000). The species is currently known to occur in three watersheds: (1) The SAR (San Bernardino and Riverside Counties), (2) the San Gabriel River (Los Angeles County), and (3) Big Tujunga Creek, a tributary of the Los Angeles River (Los Angeles County) (USFWS 2009). The SASU population in the SAR below Prado Dam is considered by many to be extirpated. SASU have not been observed in this reach of the SAR in over six years and numerous focused surveys have been conducted at various locations in that time.

The species is also found in the Santa Clara River watershed; however, it is not considered part of the listed entity because there is speculation that SASU was introduced into that system (USFWS 1999), and the current populations are hybridizing with the introduced Owens sucker (*Catostomus fumeiventris*) (Chabot et al. 2009, as cited in USFWS 2011). The most recent analysis of SASU genetics suggests that the Santa Clara River population are likely native to the watershed and only portions of the population are interbreeding with Owens sucker (Richmond 2016). Although the SAS in the Santa Clara River are not protected under the current federal listing, research on SASU in this watershed helped establish much of the baseline understanding of the species (USFWS 2014).

3.2.3 Distribution and Status

The SASU has been extirpated from approximately 80 percent of its historical range in the Los Angeles River watershed, 75 percent in the San Gabriel River watershed, and 70 percent in the SAR watershed (USFWS 2000). There are nine historical occurrences within these three watersheds, six of which are currently extant (USFWS 2011). The upper limit of SASU in the Santa Ana, Los Angeles, and San Gabriel (West Fork) Rivers is generally restricted by artificial barriers preventing their movement, such as artificial dams or grade control structures. Thus, the current range of the species in these watersheds is restricted or curtailed compared to what it was historically (USFWS 2014).

There is an approximately 3-mile section of channel in the SAR upstream of the Rialto Drain that experiences intermittent flow primarily during above-average rainfall years. CNDDB records indicate the most upstream record of SASU (occurrence #27, 95 juveniles in 1998) was observed immediately west of the La Cadena Drive Bridge approximately 1.4 miles upstream of Rialto Drain. SASU also occur seasonally in the natural-bottomed portion of Rialto Channel extending approximately 0.3-mile upstream of the confluence with SAR but do not occur in the concrete-lined portion upstream of Agua Mansa Road. It is unknown if, and to what extent, SASU are present seasonally or year-round in the SAR upstream of Rialto Drain.

The primary threat to SASU is range-wide habitat loss and degradation resulting from hydrological modifications. The loss of available habitat (caused by dams, changes in water

allocations, and other hydrological modifications) combined with other increasing threats (such as water quality degradation, impacts to habitat from recreation, and potential effects of nonnative vegetation and predators) have a cumulative effect on SASU and its habitat. Additionally, isolation of populations by impassable barriers or unsuitable habitat limits gene flow, thus increasing the vulnerability of small populations to a range of environmental and genetic stochastic factors (USFWS 2014).

The SASU was federally listed as Threatened under the Endangered Species Act of 1973 in 2000 (USFWS 2000). The USFWS designated Critical Habitat for SASU on February 26, 2004 (USFWS 2004). On December 14, 2010, critical habitat for the species was revised, designating critical habitat in Los Angeles, Orange, Riverside, and San Bernardino Counties, California (USFWS 2010). The designated critical habitat includes approximately 9,331 acres (3,776 hectares) of Federal, State, and private lands. Three units were designated: Unit 1: SAR, Unit 2: San Gabriel River, and Unit 3: Big Tujunga Creek (Los Angeles River) (USFWS 2014).

3.2.4 Habitat Requirements

SASU are capable of occupying diverse habitats from smaller mountain streams to larger rivers in alluvial floodplains (Swift et al. 1993, Moyle 2002). The streams that SASU typically inhabit are perennial, with water ranging in depth from a few inches to several feet and with currents ranging from slight to swift (Smith 1966, as cited in USFWS 2014). These streams are naturally subject to periodic severe flooding (Moyle 2002) and may experience extended periods of low flow from drought conditions that are typical of Southern California climate cycles (CRWQCB 1995, as cited in USFWS 2014). However, there are also areas within the range of SASU that experience periods of no flow as a result of past and current hydrological modifications to the watershed (for example dams, diversions, channelization, or recharge basins) (CRWQCB 1995, as cited in USFWS 2014). Adequate water quantity and quality are important for the persistence of SASU throughout urbanized areas. Not only is the presence of water vital to SASU, the volume and flow rate are important in shaping the watershed and facilitating delivery of coarse substrates to occupied areas. Periodic high-flow events are essential because they deliver new, coarse substrates (gravel and cobble) to currently occupied areas, remove in-channel silt, and reshape the channel to create the complex habitat needed to support all life history stages. Additionally, perennial flows with suitable water quality and substrate are needed to support breeding, feeding, and sheltering (USFWS 2014).

SASU utilize different substrate types throughout each life stage. Optimal stream conditions consist of a combination of coarse substrates, including gravel, cobble, or a mixture of gravel or cobble with sand, and both shallow riffle areas and deeper runs and pools (Haglund et al. 2001; Haglund and Baskin 2003; Thompson et al. 2010, as cited in USFWS 2014).

This species also prefers habitat containing in-stream or bank-side riparian vegetation that provides shade and cover for larval and juvenile fish. However, vegetation is less important for adults because they utilize larger, deeper pools, while riffles are more frequently utilized by larvae and juveniles (Moyle and Yoshiyama 1992; Moyle 2002, as cited in

USFWS 2014). Open stream reaches with shifting sandy substrates are typically less suitable for algae (lithic diatoms), an important food source (Saiki et al. 2007, as cited in USFWS 2014) and hence, less suitable as habitat for SASU. Therefore, a stream system that contains adequate coarse substrates with some larger cobbles or boulders to provide space for successful reproduction and juvenile development and growth of lithic diatom algae is important for a viable population of SASU (USFWS 2014). Recent long-term studies of SASU in the Big Tujunga Wash showed that adult SASU abundance was highest in portions of the creek with < 20% canopy cover and high riffle and cobble habitat. This was likely due to increased diatom production and availability on cobble and boulder substrates found in the reaches studied, with concurrent high diatom feeding for SASU sampled within the system (Demetropoulos and Stewart, *in prep*.).

SASU are most abundant in clear water at temperatures that are typically less than 72 ºF (22 ºC) (Moyle 2002). Mortality has been observed where water temperatures become elevated. High mortalities have been recorded in recent years in conjunction with extremely high air and water temperatures in both the SAR (water temperature of 91.0°F (32.8°C) during summer 2010 (SMEA 2010b, as cited in USFWS 2014) and Big Tujunga Creek (water temperatures above 80°F (26.7°C)) during summer 2011 (C. Galst 2011, pers. obs.; T. Hovey 2011, pers. comm., as cited in USFWS 2014). The continued presence of SASU in the SAR demonstrates that they are able to tolerate elevated temperatures in the summer months, shifting sand substrates, and turbid conditions associated with high flows (Chadwick and Associates, Inc. 1992; Saiki 2000; Moyle 2002). However, research in Big Tujunga Wash has found that when water temperatures are elevated, adequate dissolved oxygen (DO > 8 mg/l), likely through increased agitation, is important in supporting greater SASU abundance (Demetropoulos & Stewart, *in prep.*).

3.2.5 Status of Covered Species within the HCP Area

SASU in the main stem of the SAR, within the HCP Area, have been studied extensively over the past thirty years. Recent work by the U.S. Geological Survey (USGS), USFWS, San Bernardino Valley Municipal Water District (SBVMWD), and others has increased our knowledge of this section of the SAR and highlighted its importance for the SASU population overall.

The abundance and distribution of SASU in the Santa Ana River (including in the HCP Area) vary widely among years (Table 2); these fluctuations appear to be a result of biotic and abiotic factors. Total population estimates spanned four orders of magnitude between 2015 and 2022 (Table 2). Population estimates in the Drydown Area span five orders of magnitude, and they have decreased consistently since 2016, concurrent with increases in Largemouth Bass (*Micropterus salmoides*) populations (Huntsman et al. 2022). Between 2015 and 2022, SASU population estimates for the reach from the Rialto Channel to Riverside Ave. declined from 48,631 individuals (in 2015) to 3 individuals (in 2022). Conversely, Largemouth Bass populations increased from 26 in 2015 to 2,275 in 2020 (Huntsman et al. 2022). While SASU numbers were decreasing prior to the completion and initial operation of the RIXES Wells in late 2017, Largemouth Bass numbers remained low until 2018. This suggests that the continuous flows provided by the RIXES Wells benefit Largemouth Bass, which did not evolve in environments with variable, unpredictable flow

regimes. Concurrent habitat changes in the area between the RIX Facility and the Riverside Ave. Bridge may also have affected SASU. The habitat in this area has shifted from a multi-thread, braided system to a predominantly single-thread system; single-thread systems with well-defined channels are not the preferred habitat for SASU.

Table 2. – Population estimates for Santa Ana Sucker in the entire main stem of the SAR and in a reach that approximates the Drydown Area. Estimates are from USGS annual surveys, and raw data were provided by USGS.

Year	Total Population	Population in Drydown Area	Percent of Population in Drydown Area
2015	103,345	48,631	47.1%
2016	66,224	16,632	25.1%
2017	33,612	8,424	25.1%
2018	3,861	811	21.0%
2019	13,882	694	5.0%
2020	515	34	6.6%
2021	3,874	12	0.3%
2022	19,264	3	< 0.1%

Population estimates conducted by USGS from 2015 through 2023 show substantial fluctuations. However, fluctuations in the immediate vicinity of the RIX facility appear to only be weakly correlated with RIX operations from 2015 through 2022. For exploratory purposes, two correlation analyses were performed to determine the possibility of a significant relationship between the number of annual shutdowns and the population size of SAS in the river. The first explored the correlation between the number of shutdowns in a given year and the population estimate from that same year. The second explored the correlation between the number of shutdowns in a given year and the population change from that year to the next. Analysis results showed that correlations are not statistically significant. The correlation between the number of shutdowns and the population size is weak and positive ($\rho = 0.4826$, $p = 0.4103$). The correlation between the number of shutdowns in a given year and the population change in the next year was also positive and weak ($p = 0.2300$, $p = 0.7699$). The effects of the RIXES Wells on the SAS population will be analyzed in more detail and presented in a report to USFWS to fulfill monitoring requirements (see Section 5.4), but simply reducing the number of annual shutdowns at the facility has not increased SAS population sizes as originally hypothesized. Regardless, the RIXES Wells present a major opportunity for adaptive flow management in the vicinity of the facility – this can be addressed as part of the Adaptive Management Strategy that is required as part of this HCP.

A study conducted in the SAR in 2003 near the HCP Area demonstrated both juvenile and adult SASU were not randomly distributed within a given reach of the river, but the two life stages were both strongly associated with microhabitats containing cobble and gravel substrate (Haglund et al. *unpublished report,* Thompson et al. 2010). This was also seen in the Big Tujunga Wash SASU population (Demetropoulos and Stewart, *in prep.*). However, Saiki *et. al.* (2007) found SASU in this portion of the SAR occurred almost exclusively (99%) in shallow glides with an average depth of 0.22 m and the average water velocity of

0.41 m/sec. This finding contrasts slightly with higher SASU abundance in deeper, more diverse habitat (more evenly distributed among glides, riffles, and pools) with an average depth of 0.37 m and lower average water velocity of 0.29 m/sec in the San Gabriel River population. These findings illustrate that habitat preferences of SASU can vary depending on other environmental factors at different locations throughout their range.

SASU spawning success is also believed to depend upon larger substrates such as gravel and cobbles. SASU produce demersal (i.e., sinking), adhesive eggs thought to be adapted to spawning habitat with boulders, cobble, and gravel rather than shifting sands or mud (Greenfield *et al*. 1970. Moyle 1976). This spawning activity has also been observed in other reaches of the SAR (Haglund et al. *unpublished report*; J. Baskin, *pers. obs*.) and this is likely the case with the HCP Area. SASU spawning activity in the main stem of the SAR is limited by a predominance of sand substrates, but spawning has occurred downstream of the RIX Outfall, where hard substrate is present. Spawning has also been observed in nearby tributaries such as Rialto Channel (J.M. Wood, *pers. obs*, February 18, 2015). Presence of larval fish indicate that spawning also occurred in the vicinity of Riverside Narrows in 2018 (K. Palenscar and A. Ficke, *pers. obs.*, April 23, 2018).

It can be assumed that spawning will occur in the HCP Area between mid-February to early July, with peak activity in April, and will typically occur in cobble/gravel beds (Swift 2001, Moyle 2002). Unmitigated shutdowns during the spawning season can have significant impacts to the SASU population; since larvae select very shallow habitats (often less than 1 inch deep), small changes in water levels can result in mortalities through stranding (K. Palenscar, USFWS, *pers. obs*.).

Observations in 1999 showed that the majority of the SASU population in this area belonged to two age classes (age-0 and age-1) and that the number of larger individuals (>100 mm SL) declined between June and September (Saiki et al. 2007). Young of the year (YOY) attained lengths of 63-65 mm SL by December, and Age-1 SASU averaged 115 mm SL by December. They also found SASU had a lower body condition in this area relative to SASU found in the San Gabriel River. An additional study found SASU in the Drydown Area also had a lower body condition than those in Big Tujunga Wash (Demetropoulos & Stewart, *in prep.*). Saiki et al. (2007) postulated that the lower body condition in SASU from the HCP Area of the SAR could be the result of an inadequate food supply, relatively warm water temperatures, and other potential stressors. They noted that periphyton and insects were scarce on the shifting sand substrate and ambient water temperatures were proportionally higher, presumably increasing metabolic requirements in this area.

SASU in the HCP Area were usually captured within 1-2 m of the shoreline and rarely mid-channel. This was likely because riparian vegetation, aquatic macrophytes, and other potential cover occurred almost exclusively onshore or adjacent to shore (Saiki et al. 2007). Their observations were consistent with Moyle and Yoshiyama (1992), concluding that while overhanging riparian vegetation provides cover for SASU, this species can use the entire stream and does not require streamside cover when larger, deeper holes and riffles are available.

One of the primary limiting factors for SASU in the SAR is the availability of coarse substrates for spawning and feeding. Open stream reaches with shifting sandy substrates are less suitable for lithic diatoms, and therefore less suitable for SASU (Saiki et al. as cited in USFWS 2014). The most suitable habitat currently available in the main stem of the SAR was formerly located within the first 0.8 miles downstream of the Outfall, but the distribution of SASU in the river has shifted significantly since then in response to multiple factors (Huntsman et al. 2022). Nevertheless, in the past, this reach has supported as much as 47 percent of the total SASU abundance in the SAR (Table 2).

Several deep pools (>100 cm.) are present in this section of the SAR and are likely to provide refuge for SASU during shutdowns. Importantly, future high flows following large storm events will likely cause heavy influxes of fine sediments, which will cover the coarser substrates and may fill in these refuge pools, resulting in significant negative impact on SASU (Thompson et al. 2010).

The diets of SASU in the HCP Area have been studied heavily over the past several years. Diatoms appear to make up a large portion of the SASU diet, and four genera (*Cocconeis, Gomphonema, Navicula, and Rhoicosphenia*) have been documented as known food sources in Big Tujunga Creek (Dudek 2018). Benthic macroinvertebrates were very scarce in the fecal material and likely make up a minimal portion of their diet, similar to what was observed in the Santa Clara River (Greenfield et al. 1970, as cited in Moyle 2002).

4 IMPACT ASSESSMENT AND LEVEL OF TAKE

This section quantifies incidental take (i.e., capture and mortality) levels anticipated to occur based on a potential highest-impact scenario assessment in the event of an emergency facility shutdown. This is necessary to assess the potential impacts of the HCP on SASU, as required by 16 U.S.C. 1539(a)(2)(A)(i) and implementing regulations.

4.1 Direct and Indirect Impacts

RIX provides a majority of the perennial flow in the portion of the Upper SAR in the HCP Area; therefore, shutdowns of the facility have the potential to negatively affect SASU. Dewatering and discontinuous flow in the SAR below the RIX outfall have typically been caused by ultraviolet (UV) disinfection bank (the treatment system) malfunctions and power outages. Other causes include software issues, false alarms, and true occurrences of water quality standard exceedances. If at any point the RIX Facility's automatic water quality system detects exceedances of applicable water quality standards in the effluent, or if the automatic disinfection system senses a problem that could result in un-disinfected effluent release, an immediate shutdown is triggered, which halts the release of all water. This ensures the RIX Facility meets the quality levels established in the NPDES permits issued to the RIX Facility. Automated shutdown is a computer-controlled process. Shutdowns vary in length, as they require the cause of the issue to be identified and corrected by facility personnel after the automatic systems are triggered.

From 2008 through 2015, the RIX Facility was off-line for an average of 27 times annually. RIX Facility staff have improved operations to reduce the frequency of shutdowns; as a result, there were only 15 such shutdowns in 2016 and 2017. From 2018 through 2023, there were nine or fewer unplanned annual shutdowns, and the RIXES Wells provided sufficient water to maintain surface flows during all occasions. Due to the variable nature of the potential causes of a change in water quality and the complexity of the disinfection system, it is difficult to predict the number of shutdowns in a year and their respective durations. In any case, unplanned shutdowns are considered the highest-impact scenarios.

There are two main implications associated with the modeled population trends in SASU and Largemouth Bass and with the habitat changes in this reach of the Santa Ana River. First, it appears that the steady supply of water provided by the RIXES Wells potentially benefited Largemouth Bass between 2018 and 2022, to the detriment of the Santa Ana Sucker. While this was unexpected, it also implies that the pattern of shutdowns and the operation of the RIXES Wells is a powerful management tool that can be used to sustain SASU and to manage Largemouth Bass. Second, since SASU numbers were declining throughout the SAR prior to initial operation of the RIXES Wells and rebounded significantly in 2022 (Table 2, see column 1) without a substantial change in how the Wells were used, it is apparent that RIX Facility operations have a limited capacity to affect SASU populations. This emphasizes the need for an adaptive management plan to determine how best to operate the RIX Facility to the benefit of the SASU while ensuring the proper operating parameters for the Facility.

Analysis of raw data collected from the RIX Outfall to Riverside Ave from 2015 through 2020 showed that 75% or more of the population consisted of individuals less than 110 mm in length in five of six years. Thus, it appears that the installation and operation of the RIXES Wells in late 2017 has had no effect on the length-frequency distributions of the SASU in the Drydown Area.

USFWS report from the 2015 RIX Facility scheduled maintenance stated that a four-hour maintenance shutdown resulted in approximately 1.5 miles of the river becoming completely dewatered (USFWS 2015). In 2015, the 48,631 estimated individuals in the Drydown Area could have been lost due to the shutdowns, assuming a worst-case scenario where no individuals in the affected reach survived. However, SASU have demonstrated historically that they follow the water downstream or seek shelter in deep pools and ponded areas (Allan 2002, A. Ficke, pers. Obs.), so assuming the loss of this many fish is also unrealistic given the available data for the Drydown Area and the entire occupied reach of the SAR (Table 2).

Planned shutdowns have had a much lower impact on SASU in the HCP Area in contrast to an unpredictable, unmanaged shutdown event such as one arising from a water quality component failure or power issue. Salvage data from 2015 through 2022 (RCRCD 2023) indicate that mortality of SASU during planned shutdowns ranged from 0 to 182 individuals, with the majority of encountered individuals being released alive (Table 3). Planned shutdowns with replacement water began in 2018 and tend to result in zero captures or mortalities, because replacement water is provided and because the shutdowns can be planned for times outside of the SASU reproductive season. For example, the final planned shutdown of RIX in 2018 was performed in late November under ideal conditions. The necessary routine maintenance and cleaning of the plant occurred during a significant rain event, when flows in the SAR were 3,330 cfs. RCRCD personnel were on site, and observations indicated that no dewatering occurred during the shutdown. Planned shutdowns during high flow events do not appear to have resulted in any mortality of SASU. Planned shutdowns for nonnative species removal present a slightly higher risk, because the river is deliberately dewatered to increase the capture efficiency of nonnative fishes. Nonnative species removals were coordinated with USFWS, CDFW, and RCRCD in 2019 and 2022. In 2019, a total of 182 SASU mortalities occurred because of difficulties in holding over 3,000 captured SASU during the maintenance period. No mortalities were detected in 2022.

The incidental mortality of invasive aquatic species during planned (and unplanned) shutdowns should also be considered as part of this HCP, as it potentially benefits SASU. From 2018 through 2022, the number of nonnative species removed from the Drydown Area ranged from 84 to 5,969. Species that were stranded and not rescued included Western Mosquitofish *Gambusia affinis*, Catfish *Ameiurus sp* or *Ictalurus spp*, Largemouth Bass, and Bullfrog tadpoles *Rana catesbiana*. The City of San Bernardino regularly coordinates planned winter shutdowns of the RIX Facility so that they can coincide with nonnative fish removal efforts. This removal of potential predators and competitors likely benefits the

SASU population, even though some stranded individual SASU die or are subjected to handling stress during the planned shutdowns.

Table 3. – Fish rescue data during shutdowns at the RIX Facility, 2015 – 2022.

Year	Total Population	Released Alive	Mortalities	Nonnative Individuals Removed
2015	103,345	1,273	82	913
2016	66,224	1,080	77	5,652
2017	33,612	208	6	1,428
2018[1]	3,861	80	2	84
2019[2]	13,882	3,530	182	1,566
2020	515	1	0	1,348
2021	3,874	0	0	1,212
2022	19,264	0	0	5,969

[1]Includes native larvae, which were not identified to species.
[2]All SASU in 2019 were encountered during a nonnative species removal effort, when the river was completely and deliberately dewatered.

4.2 Anticipated Take on Covered Fish Species

This section describes the type of take (i.e., capture and mortality) and quantifies the level of take anticipated for SASU for the covered activities. Pursuant to USFWS, the take described below may be expressed as a number of individual animals, as habitat acres, or other appropriate measures. Shutdowns during spawning season may also jeopardize eggs and larvae.

There are few available data to indicate the impact of unscheduled and unmitigated shutdowns (i.e., the worst-case scenario) on the SASU population. Since the SASU population has not been extirpated by over 100 emergency shutdowns previous to the installation of the RIXES Wells, it is not reasonable to assume extirpation or estimates of mortality that would roughly equal the population size. Instead, estimated take for the various RIX shutdown scenarios can be based on the 2015-2022 population estimates, data on the number of shutdowns that occurred between the two population estimates, and rescue information from 2015 through 2022. These estimates can be refined when more data become available. Mortality and capture estimates only include juvenile and adult fish because of the practical difficulties of estimating impacts on larvae and eggs.

Shutdowns of the RIX Facility with Replacement Water from RIXES Wells

Prior to the installation and operation of the RIXES Wells, detected annual mortality during planned shutdowns ranged from 6 to 82 SASU (Table 3). Subsequent scheduled shutdown events from 2018 through 2022 resulted in zero stranded SAS, perhaps largely because some of the braids in the system are no longer inundated due to recent changes in bed morphology. The 182 mortalities in 2019 occurred during a planned nonnative removal effort, and they are not considered in this estimate. The deliberate dewatering of the SAR in the Drydown Area is a management action designed to benefit SASU and is not

explicitly part of the necessary daily operating procedures at RIX. The risks and benefits of deliberate channel dewatering will be addressed as part of the Adaptive Management Strategy that is required by this Habitat Conservation Plan (See Section 5.6).

While it is apparent that take has been significantly reduced by the release of replacement water during planned shutdowns, Permittee will assume some take will occur during RIX shutdowns as any activated braids in the multi-thread channel could still dry completely during periods of reduced flow. RIX operations usually require two scheduled shutdowns annually for maintenance. Therefore, for scheduled RIX Facility maintenance that is coordinated with the RCRCD and USFWS, the Permittee will assume annual capture and mortality to equal to the that from the events during the five years where the RIXES Wells have been operational. During this time period, 80 adult SASU were captured and released alive, and two adult SASU mortalities were detected. This gives an annual average of 16 captured SASU and 1 mortality (Table 4).

Emergency Shutdowns of the RIX Facility with RIXES Wells Malfunction

The worst-case scenario for SASU capture and mortality would occur if an unscheduled shutdown occurred, along with a RIXES Well malfunction. However, this scenario is unlikely. Any facility shutdown in an unforeseen emergency requires Permittee to discharge replacement water. Performance tests on December 20, 2017, indicated that the RIXES Wells can deliver approximately 16 cfs to the SAR. Monitoring of flows by USFWS and the RCRCD during the December test indicated that while flows were reduced and one small braid dried completely, two larger braids contained flow 0.65 mi downstream of Riverside Ave. Furthermore, the backup system has come online and maintained surface flows throughout the HCP area during all planned and unplanned shutdowns through the third quarter of 2023. The longest shutdown had a duration of nearly 22 hours, and stream flows were maintained for the duration of the shutdown. In the last six years, five to ten total shutdowns have occurred annually. This is a 73% reduction in shutdown frequency compared to the average for the previous 10 years (2008-2017). The performance of the RIXES Wells and the reduced frequency of RIX shutdowns indicate that an emergency shutdown with a RIXES Wells malfunction is extremely unlikely.

Regardless, an approximate take of SASU from an unmitigated shutdown (i.e., with backup well malfunction) was calculated by examining the difference in annual apparent mortality between the entire occupied range of the Santa Ana River and the Drydown Area. The difference in percent annual mortality was averaged for the years 2015 through 2017 (i.e., before the RIX Wells were operational) and multiplied by the average number of individuals in the Drydown Area from 2015 through 2022. This provided an annual mortality estimate for the Drydown Area that accounts for 1.) the lack of backup wells, and 2.) the lower number of SASU in the Drydown Area from 2018 through 2022. Using these data, an average annual mortality of 1,088 SASU was estimated for unmitigated shutdowns. The estimate of 1,088 SASU is similar to the average number of fish that were found stranded during rescue and dewatering/nonnative species removal operations from 2018 through 2023 (n = 762 per year). It should be noted that this estimated loss of SASU is an overestimate of the potential effects of an unmitigated shutdown for two reasons.

First, the assumption that all increases in mortality are attributable to RIX operations is not correct, especially because nonnative predators such as Largemouth Bass are concentrated in this area and have a devastating effect on SASU (e.g., Huntsman et al. 2022). Second, this estimate is of apparent mortality, which does not account for emigration from the Drydown Area into other reaches of the Santa Ana River.

Because the wells have provided continuous surface water for all shutdowns from December 2017 to the present, there is no reason to believe that they will not continue to do so. With an average of seven annual shutdowns from 2018 through 2022 (see Table 1), each unmitigated shutdown could result in the mortality of 156 SASU (Table 4). This take estimate assumes a maximum of one unmitigated shutdown per year.

Supply of Replacement Water During Shutdowns

While the installation of the RIXES Wells did not have the hypothesized effect of increasing population sizes of SAS in the vicinity of the facility, they clearly have reduced the probability of take during planned and unplanned shutdowns. During scheduled and unscheduled shutdowns, when the normal discharge of treated wastewater ceases, a series of groundwater wells activate and pump approximately 16 cfs into the SAR at the outfall. The pump system is equipped with emergency backup power and will still activate during a power outage. A total of nine million dollars has been invested in this system to mitigate the effects of RIX shutdowns on SASU. Field observations indicate that the RIXES Wells can maintain 1-13 cfs throughout the Drydown Area (to approximately 3,430 feet downstream of the Riverside Avenue Bridge), with flows decreasing via infiltration in a downstream direction. Therefore, based on this information and the fact that some flow was maintained throughout the above-mentioned reach during planned shutdown events in December 2017 and March 2018, Permittee assumes this replacement source of water will be sufficient to minimize impacts to SASU during shutdowns (WEI 2016).

Table 4. – Summary of impacts to covered species by covered activities, adult SASU only.

Covered Activity	Species Affected	Type of Impact	Quantity or Take Impact Annually
Shutdowns with supply of water from RIXES Wells	SASU	Capture/Release[1] **Mortality**	16 **1**
Emergency shutdowns with RIXES Wells malfunction	SASU	Capture/Release[2] **Mortality**	0 **156**
Supply of water from RIXES Wells	SASU	Capture/Release **Mortality**	0 **0**

[1]Average of annual captures and mortalities from 2018-2022.

[2]Estimated through calculated annual mortality rates (see text). Assumes one event per year.

4.3 Effects on Critical Habitat

The HCP Area is located within Critical Habitat for SASU (USFWS 2010). There is no impact anticipated to Critical Habitat because the Project, as proposed, is designed to ensure the continued operation of discharge of a facility that existed and where emergency and scheduled shutdowns operated at the time of Critical Habitat designation. The continued operation of the existing RIX Facility includes construction of one new groundwater well, which will be within existing disturbed area that is not within critical habitat for SASU.

4.4 Cumulative Impacts

Past, present and reasonably foreseeable future actions within the SAR watershed have resulted and will likely continue to result in significant cumulative impacts to SASU. The HCP will have a beneficial impact to SASU relative to other past, present and reasonably foreseeable future actions with adverse effects to SASU by avoiding and minimizing the extent and effects of historic SAR flow reductions associated with operation of the RIX Facility. Due to its beneficial effect, the Project does not add cumulatively to the potential loss of SASU. The HCP will combine with other actions in the HCP area that are expected to improve conditions for SASU, including the USAR HCP (currently being prepared). Future management of the Project area groundwater basins resulting from implementation of the Sustainable Groundwater Management Act (SGMA) also are expected to have a beneficial impact on SASU, by preventing substantial decline in groundwater levels and if groundwater levels rise due to management under SGMA.

4.5 Anticipated Impacts of the Taking

Take of SASU within the HCP Area could include several types, as described in the ESA. The direct loss or mortality of SASU would be the greatest concern and could result from individuals being stranded during shutdowns, trampled by biologists during the salvage operation, or becoming prey for wading birds and other predatory species. The second type of take would be the relocation of fish from drying sections of the channel to deeper pools, or temporary housing containers, which would likely result in stress to the fish and may result in both short-term and long-term impacts to individuals. SASU salvage during shutdowns would result in stranded individuals being captured with seine nets, dip nets, or by hand and being placed into buckets. These fish would then either be placed quickly into nearby deep pools or held in insulated aerated storage containers until surface flows return.

A potential form of take may be related to effects on adults, larvae, and eggs due to the groundwater temperature being 2 to 3.8º C cooler than the effluent from the RIX Facility. The actual temperature is anticipated to be a blend of groundwater and the treated water that is constantly discharged from the Rialto Drain, located approximately 1,000 feet upstream of the RIX outfall. Although there are few data to indicate how the temperature may impact the SASU, a review of relevant literature indicates that impacts to any life stage of SASU are unlikely. According to available data from RIX, the temperature range

of the RIXES Wells is 23º to 28º C, with an average of 26º C. These temperatures are often lower than RIX discharge, but all temperatures are higher than the thermal preference of the SASU, which is 22º C (Moyle 2002). The SASU is clearly eurythermal; despite its thermal preferences, the population in the SAR experiences temperatures in excess of 30º C in summer (USGS gage 11066460). Depressed thermal regimes have been shown to decrease survival and slow growth of larval and juvenile large-bodied desert fishes (Clarkson and Childs 2000). However, temperatures shown to be detrimental were well below 20ºC and existed throughout the summer months, as they were due to hypolimnetic dam releases (Robinson and Childs 2001). Eggs of the SASU hatch in the SAR, where temperatures vary from less than 10 to over 30 ºC during spawning season (USGS gage 11066460), and they have been hatched in a laboratory at 13ºC (Greenfield et al. 1970). Therefore, the minor temperature changes expected with initiation of flows from RIXES Wells is not expected to have detrimental effects on SASU. Desert fishes such as the SASU are adapted to a thermal regime that can vary rapidly, and the temperature changes associated with well discharge are likely similar to or less than those that would occur if adults or drifting larvae were to encounter cooler groundwater or tributary input in the river or temperature changes due to cooler, early season rainfall.

5 CONSERVATION PROGRAM AND MEASURES TO MINIMIZE AND MITIGATE FOR IMPACTS

This section presents the HCP or conservation strategy proposed by Permittee to support continued operation and maintenance of the RIX Facility. The HCP includes a description of the biological goals and objectives, general measures to avoid or minimize impacts to SASU, species-specific measures to avoid or minimize impacts, measures to mitigate unavoidable impacts, monitoring and reporting requirements, and funding assurances.

5.1 Biological Goals

Section 10(a)(2)(A) of the ESA requires that an HCP specify the measures that the Permittee will take to minimize and mitigate to the maximum extent practicable the impacts of the taking of any federally listed animal species as a result of activities addressed by the plan.

As part of the "Five Point" Policy adopted by the USFWS in 2000, HCPs must establish biological goals and objectives (65 Federal Register 35242, June 1, 2000). The purpose of the biological goals is to ensure that the operating conservation program in the HCP is consistent with the conservation and recovery goals established for the species. The goals are also intended to provide to the applicant an understanding of why these actions are necessary. These goals are developed based upon the species' biology, threats to the species, the potential effects of the Covered Activities, and the scope of the HCP.

In accordance with the "Five Point" policy, biological goals are the broad, guiding principles for the operating conservation program of the HCP. Biological goals provide the rationale for the minimization and mitigation strategies. Biological goals are not meant to repeat the conservation measures, but rather establish what the conservation measures are intended to achieve.

The biological goals for this HCP are as follows:

> *Goal 1: Avoid impacts to SASU in the HCP Area from the continued operation of the RIX Facility (See Section 5.3.1).*
>
> *Goal 2: Minimize impacts to SASU in the HCP Area from the continued operation of the RIX Facility (See Section 5.3.2).*

5.2 Biological Objectives

Pursuant to the USFWS Guidance, each biological goal has biological objectives as a measurable target for achieving the goals of the operating conservation program:

Avoidance Objectives:

Avoidance Objective 1: Maintain and operate the RIX UV Disinfection System to avoid unplanned shutdowns associated with the UV system.

Avoidance Objective 2: Avoid planned shutdowns during the spawning season (mid-February through July), unless shutdowns coincide with low numbers of larvae and high flows driven by rainfall.

Minimization Objectives:

Minimization Objective 1: Minimize frequency and duration of shutdowns to the extent feasible by continually evaluating and planning maintenance activities, and schedule shutdowns (when feasible) to coincide with rainfall that increases flows in the stream reach from the RIX outfall to 0.65 miles downstream of Riverside Ave.

Minimization Objective 2: Coordinate fish salvage efforts during planned shutdowns, and if practicable, during unplanned shutdowns.

Minimization Objective 3: Ensure a supply of replacement water during RIX Facility shutdowns, when necessary, to reduce SASU stranding.

5.3 Avoidance, Minimization and Mitigation Measures

5.3.1 Measures to Avoid Impacts

Avoidance measures are designed to avoid impacts to ensure the continued safe, compliant, operation of the RIX Facility in a manner than would avoid impacts to SASU. The avoidance measures are the following:

Avoidance Measures:

Avoidance Measure 1: Ensure adequate maintenance of the RIX UV Disinfection System sufficient to minimize unplanned shutdowns.

Avoidance Measure 2: Avoid scheduled, routine maintenance activities that require a shutdown during SASU spawning season (typically mid-February through July), unless storm runoff has increased river flow and caused most of the vulnerable individuals (i.e., eggs, larvae) to move downstream of the Drydown Area. If scheduled maintenance is required during this time, close coordination with USFWS will occur prior to any shutdown. [3]

[3] Emergency shutdowns may still be needed to resolve an unforeseeable condition and such shutdowns cannot be postponed.

5.3.2 Measures to Minimize Impacts

The following steps identify minimization measures for impacts to SASU from continued operation of the RIX Facility.

Minimization Measure 1: Ensure that shutdowns coincide with higher river flows during/after rainstorms, to the extent practicable. If shutdowns must occur during spawning season, relative rarity of fish larvae will be confirmed with surveys prior to the event. The feasibility of a step down in flows is also being explored.

Minimization Measure 2: Coordinate with Riverside-Corona Resource Conservation District (RCRCD) and USFWS prior to shutdowns, so that stranded fish can be salvaged during planned shutdowns, and if practicable, during unplanned shutdowns.

Minimization Measure 3: Ensure a supply of replacement water during shutdowns from the four RIXES Wells.

5.3.3 Measures to Mitigate Unavoidable Impacts

The measures to be implemented to mitigate for unavoidable impacts include the following:

Mitigation Measure 1: Coordinate with USFWS and RCRCD to use RIXES Wells and planned shutdowns to facilitate management and removal of invasive fishes in the SAR within the HCP Area.

Mitigation Measure 2: Contract w/ RCRCD or other entity approved by the Service to engage in monitoring and rescue operations during planned shutdowns and unplanned shutdowns in daylight hours that are expected to exceed 1.5 hrs in duration. Follow-up reporting will accompany all shutdowns when personnel are present on the river.

5.4 Monitoring

Monitoring tracks compliance with the terms and conditions of the HCP and Permit. There are three types of monitoring:

(1) *compliance monitoring* tracks the Permit holder's compliance with the requirements specified in the HCP, and permit;

(2) *effects monitoring* tracks the impacts of the covered activities on SASU; and

(3) *effectiveness monitoring* tracks the progress of the conservation strategy in meeting the HCP's biological goals and objectives (includes species surveys, reproductive success, etc.).

Such monitoring provides information for making adaptive management decisions. The monitoring measures that will be implemented to evaluate compliance, determine if the biological goals and objectives are being met, and provide feedback information for the adaptive management strategy include the following:

Compliance Monitoring

1) **Compliance Monitoring Measure 1 – Right to Access**. With prior notification from USFWS, Permittee shall ensure that USFWS is given the right to access and inspect access all properties owned or operated by Permittee for compliance with the Project description and the terms and conditions of the Take Permit during the implementation of the implementation of the HCP.

2) **Compliance Monitoring Measure 2 –Notification**. In order to report on the incidental take of SASU within the HCP Area, Permittee will notify USFWS in advance of planned shutdowns and will notify USFWS as soon as is practicable for an emergency shutdown. This will allow a rescue response and an estimation of mortality and capture. Permittee will provide notification of the posting of the publicly accessible (online) monthly, quarterly, and annual Discharge Monitoring Report (DMR) or De Minimis Permit Report as submitted to the Santa Ana RWQCB. These reports will include summaries of the number of shutdowns (routine and emergency) throughout the reporting period. Information will include duration of shutdown, reason for shutdown, and number of SASU taken (if known).

Effects Monitoring

1) **Effects Monitoring Measure 1 - Water Quality Monitoring**. During each release of the replacement water, basic parameters will be recorded such as volume and flow rate and temperature. Results of water quality sampling performed in compliance with NPDES permit requirements will be retained and made available for USFWS review upon request.

2) **Effects Monitoring Measure 2 – Water Distribution Monitoring**. The SAR has a mobile bed and a multi-thread channel form, and the materials in the valley bottom create conditions ideal for infiltration into underlying aquifers. The longitudinal distance over which the RIXES Wells water remains as surface flow and the distribution of water in individual threads can be affected by bedload, high flow events, climate, and activities of other water users in the basin. Therefore, during each scheduled shutdown for the first year, the longitudinal extent of backup flow and its distribution in individual channel threads will be recorded, along with distribution of baseline flows in individual channel threads. This will provide valuable information on how to maximize the success of rescue operations during planned and unplanned shutdowns.

Effectiveness Monitoring

1) **Effectiveness Monitoring Measure 1 – Scientific Study of RIX Operational Effects on SAS**. Conduct a study that summarizes SASU population trends in the river before and after the completion and use of the RIXES Wells. This study will assess effectiveness of the RIXES Wells by examining shutdown statistics before and after backup system completion and their apparent effects on demographic rates such as survival of adults and larvae and population age structure (i.e., incidence of larger, more fecund individuals). Currently, larval fish surveys occur monthly during spawning season and an annual population survey of adult fish occurs in fall. Demographic rates will be estimated from these data and compared before and after completion of the RIXES Wells. Annual estimates of demographic rates and their examination in light of the shutdowns that have occurred, including those that involved deliberate dewatering of the channel for nonnative species removal, will help ensure that demographic rates are not significantly harmed by RIX operations. This measure will be conducted contingent on availability of population estimate and length-frequency data from 2015 through 2022.

2) **Effectiveness Monitoring Measure 2 – Description of conditions in the SAR during shutdowns with replacement water**. Prepare a study describing the conditions in the SAR during shutdowns when replacement water is being provided. This study should occur during a planned shutdown and should document changes in flow, temperature, and other parameters as determined prior to the shutdown. A field sampling plan will be drafted and sent to USFWS for review, and a summary of sampling results will be provided in a Water Dispersion Monitoring Report. Information on how the shutdowns proceed in the presence of functional backup wells will be instrumental in preparing a relevant adaptive management plan for operations and potential projects at RIX. The need for further field sampling during shutdowns will be determined based on the results of the study described above.

This combination of avoidance and minimization measures and associated monitoring represents all possible mitigation for the continued operation and maintenance of RIX. Additional mitigation for planned and unplanned shutdowns should not be needed.

5.5 Performance and Success Criteria

This section describes the success criteria for each biological objective, and the annual performance criteria that identifies that the operating conservation strategy is continuing to move toward meeting the success criteria. The USFWS guidance identifies that performance criteria and success be quantitative; and if quantitative measures are not available, develop qualitative measures.

Avoidance Goal 1: Avoid impacts to SASU in the HCP Area from the continued operations of the RIX Facility.

Avoidance Objective 1: Minimize shutdowns to the extent possible by continually evaluating and planning operations and maintenance activities, and schedule shutdowns (when feasible) to coincide with storm flows in the HCP Area.

Performance Criterion 1 for Avoidance Objective 1: Continued maintenance of and feasible upgrades to the RIX UV Disinfection System, its UV lamps, and its associated control systems to maximize system reliability and minimize the number of unplanned shutdowns. While major upgrades have been completed on the RIXES Wells, software improvements are still ongoing.

Performance Criterion 2 for Avoidance Objective 1: Inclusion of incident reports for every RIX Facility shutdown in recurring publicly available Discharge Monitoring Reports (DMRs) and/or De Minimis Discharge Reports, documenting the root cause of the shutdown and identifying what, if any, measures can be taken to reduce future unscheduled shutdowns. Evaluation of these reports annually for Capital Improvement Program planning.

Avoidance Objective 2: Avoidance of planned shutdowns during the SASU spawning season (mid-February through July), unless shutdowns can coincide with higher rainfall driven flows in the river, and it is confirmed that a low number of larvae are present in the river.

Performance Criterion for Avoidance Objective 2: Lack of planned shutdowns during spawning season, unless the shutdown can be coordinated with a rainfall event or in the wake of a larval survey indicating that few larvae are present in the Drydown Area. Planned shutdowns since 2018 have all occurred outside of the spawning season, when larvae would be likely present in the Drydown Area. It is therefore unlikely that a planned shutdown would need to occur during spawning season under current conditions.

Minimization Goal 1: Minimize impacts to SASU in the HCP Area from the continued operations of the RIX Facility.

Minimization Objective 1: Schedule shutdowns (when feasible) to coincide with storm flows in the HCP Area and/or minimal presence of larval fish; or in coordination with USFWS as part of a species recovery action (e.g., non-native species removal).

Performance Criterion for Minimization Objective 1: Planned shutdowns coordinated with rainfall events/high flows and/or species recovery action to the extent feasible.

Minimization Objective 2: Coordination of SASU rescue efforts prior to scheduled shutdowns (and unscheduled shutdowns, if practicable).

Performance Criterion for Minimization Objective 2: Prepare a SASU Rescue Plan with input from RCRCD and USFWS within 60 days of HCP approval. The plan should identify timing, procedures, equipment, personnel and reporting responsibilities that will occur to ensure a successful rescue. The draft plan should be submitted to the USFWS for comment within 180 days of HCP approval.

Minimization Objective 3: Ensure a supply of replacement water during RIX Facility shutdowns, when necessary, that will reduce or eliminate SASU stranding.

Performance Criterion for Minimization Objective 3: Preparation of a Water Replacement Operations Plan that identifies the procedures for groundwater well operations in the event of a shutdown. The plan should identify timing, procedures, equipment, personnel, training plans, and reporting responsibilities that will occur to ensure a supply of replacement water will be released into the SAR. The Water Replacement Operations Plan is already in place, as RIX staff are familiar with and trained for shutdown procedures, and a comprehensive formal document will be produced to describe this plan. The draft plan should be submitted to the USFWS for comment within 180 days of HCP approval.

5.6 Adaptive Management Strategy

For some HCPs, the adaptive management strategy will be an integral part of an operating conservation program that addresses the uncertainty in the conservation of a species covered by an HCP. Adaptive management should identify and address the uncertainty, incorporating a range of previously agreed-upon alternatives for addressing those uncertainties, integrating a monitoring program that detects the necessary information, and incorporating a feedback loop that links implementation and monitoring to a decision-making process that result in appropriate changes in management. Adaptive management should help the Permittee achieve the biological goals and objectives of the HCP.

The focus of this HCP is to allow for the continued operation of the RIX Facility, including periodic shutdowns that disrupt a large proportion of the perennial flow in this reach of the SAR. Permittee will implement the following actions to avoid and minimize impacts to SASU: operate and maintain the upgraded RIX UV system; plan shutdowns outside of spawning season; coordinate shutdowns with rainfall/high flow events to the extent possible, implement a fish rescue effort during shutdowns, and provide water to the river during shutdowns through the RIXES Wells.

As the UV upgrades and the RIXES Wells are both relatively new, their positive effects are not fully characterized or analyzed. Therefore, adaptive management strategies will be developed following the first year of implementation, as effects become clearer. For

example, recent fish population surveys of the SAR in the HCP Area indicate that nonnative predatory fish such as Largemouth Bass are increasing, perhaps due to the more predictable flow regime downstream of RIX. Thus, the operation of the RIXES Wells may be adjusted to facilitate management of invasive species that are negatively affecting SAS. The manner in which the RIXES Wells serve as a part of a long-term solution to the viability of SASU in the SAR, as well as serving to benefit the goals of the Upper Santa Ana River Habitat Conservation Plan (Upper SAR HCP) will be explored as part of the adaptive management strategy. The timing and nature of coordination with USFWS and RCRCD will also be explored in an adaptive management framework. However, the current mitigation measures already dictate that personnel from RCRCD or other entities approved by the Service are on site during all planned shutdowns and any unplanned shutdowns during daylight hours that are expected to last more than 1.5 hours.

5.7 Reporting

Annual reports to the USFWS will include:

1. A description of the planned and unplanned shutdowns during the reporting year.
2. A description and outcome of monitoring and rescue efforts.
3. Monitoring results (compliance, effects and effectiveness monitoring) and survey information (if applicable)
4. Description of any take that occurred for SASU (includes cause of take, form of take, take amount, location of take and time of day, and deposition of dead or injured individuals).
5. Discussion of any circumstance or activity that did not minimize or avoid take of sucker as expected and recommendations for adaptive changes to those activities or actions. A table of the cumulative totals by reporting period of all adaptive changes to the HCP, including a very brief summary of the actions will also be included.
6. Description of any changed or unforeseen circumstances that occurred and how they were dealt with.
7. Funding expenditures related to HCP compliance. For example, an annual budget item will be included; an annual actual expenditure will be included; and the budget adjusted each year to address whether budget was exceeded or was underrun
8. Description of any minor or major amendments that have been approved by the USFWS.

6 PLAN IMPLEMENTATION

Section 10 regulations as codified in 50 Code of Federal Regulations (C.F.R.), Sections 17.22(b)(2) and 17.32(b)(2))], require that an HCP specify the procedures to be used for dealing with changed and unforeseen circumstances that may arise during the implementation of the HCP. In addition, the Department of Interior's "Habitat Conservation Plan Assurances Final Rule", issued February 23, 1998. (Federal Register vol. 63, no. 35) ("No Surprises Policy", codified at 50 C.F.R. §§17.22 (b)(5) and 17.32 (b)(5)) describes the obligations of the Permittee and the USFWS. The purpose of the No Surprises Policy is to provide assurance to the non-Federal landowners participating in habitat conservation planning under the ESA that no additional land or natural resource restrictions or financial compensation will be required for species adequately covered by a properly implemented HCP, in light of unforeseen circumstances, without the consent of the Permittee.

6.1 Changed Circumstances

Pursuant to the provision of the "No Surprises Policy", in the event unforeseen circumstances affect a species covered by this HCP, the Permittee will not be required to provide additional mitigation which requires the commitment of additional financial compensation, or additional restrictions on lands or other natural resources. Should Unforeseen Circumstances arise, changes will be limited to modifications to the HCP's operating conservation program for the covered species and will maintain the original terms of the HCP to the maximum extent possible. The assurances contained in the "No Surprises Policy" apply only if the Permittee (Applicant) has complied with its obligations under the HCP.

Changed circumstances are defined in 50 C.F.R. section 17.3 as changes in circumstances affecting a species or geographic area covered by an HCP that can reasonably be anticipated by plan developers and the USFWS, and for which contingency plans can be prepared (e.g., the new listing of species, a fire, or other natural catastrophic event in areas prone to such event). Pursuant to the No Surprises Policy, if additional conservation and mitigation measures are deemed necessary to respond to changed circumstances and these additional measures were already provided for in the plan's operating conservation program (e.g., the conservation management activities or mitigation measures expressly agreed to in the HCP), then the Permittee will implement those measures as specified in the plan. However, if additional conservation management and mitigation measures are deemed necessary to respond to changed circumstances, and such measures were not provided for in the plan's operating conservation program, the USFWS will not require these additional measures absent the consent of the Permittee, provided that the HCP is being "properly implemented" (properly implemented means the commitments and the provisions of the HCP have been or are fully implemented).

6.1.1 Summary of Circumstances

"Changed circumstances" for this HCP means changes in circumstances affecting SASU or the geographic area covered by the HCP that can reasonably be anticipated by Permittee and reasonably be planned for in the HCP (e.g., the listing of a new species, or a fire or other natural catastrophic event in areas prone to such event). Changed circumstances are not Unforeseen Circumstances.

Reasonably foreseeable circumstances that may impact SASU include the following:

- HCP implementation and Covered Activity effects to SASU
- Newly listed species
- Severe flooding or natural disaster within the HCP boundary
- Natural conditions (changes in timing or volume of river flows due to drought, heavy rains or climate change)
- Human-caused impacts (such as fires in the river, toxic spill release, homeless encampments)
- Changes in groundwater or surface water management beyond the control of Permittee.

6.1.2 Newly listed species

If a new species that is not covered by the HCP, but may be affected by activities covered by the HCP, is listed under the ESA during the term of the Section 10(a)(1)(B) Permit, the Section 10 Permit will be reevaluated by the USFWS, and the HCP covered activities may be modified, as necessary, to ensure that the activities covered under the HCP are not likely to jeopardize or result in the take of the newly listed species or adverse modification of any newly designated critical habitat. The Permittee shall implement the modifications to the HCP Covered Activities identified by the USFWS as necessary to avoid the likelihood of jeopardy to, or take of, the newly listed species or adverse modification of newly designated critical habitat. Permittee shall continue to implement such modifications until such time as Permittee has applied for and the USFWS has approved an amendment of the Section 10(a)(1)(B) permit, in accordance with applicable statutory and regulatory requirements, to cover the newly listed species or until the USFWS notifies the Permittee in writing that the modifications to the HCP covered activities are no longer required to avoid the likelihood of jeopardy of the newly listed species or adverse modification of newly designated critical habitat.

Additionally, in the event that a non-covered species that may be affected by the RIX Facility's operation becomes listed under the ESA, Permittee will implement "no take/no jeopardy" measures identified by the USFWS until the permit is amended to include such species, or until the USFWS notifies Permittee that such measures are no longer needed to avoid jeopardy to, take of, or adverse modification of critical habitat of the non-covered species.

6.1.3 Severe Flooding or Natural Disaster within the HCP Area

The SASU is an aquatic species that is dependent upon specific substrate types. The HCP Area is located within the SAR. The SAR has not experienced a catastrophic flood event since 1938.

A typical flow regime includes future high flows following large storm events that can cause a heavy influx of fine sediments, which will cover the coarser substrates and may fill in refuge pools, resulting in potentially significant negative impacts on SASU (Thompson et al. 2010). Furthermore, if these refuge pools are filled in with sediment and minimized during future storm events, the impacts of sudden changes to habitat composition and complexity on the highly concentrated population of SASU will likely be compounded by unmitigated future shutdowns.

One of the primary limiting factors for SASU in the SAR is the availability of coarse substrates for spawning and feeding. Speaking to the resiliency of the SAR, the SASU have persisted in the SAR despite, and potentially in part due to flooding that may alternatively result in an influx of coarse substrate. Therefore, it is anticipated that there could be flooding within the HCP reach during the life of the Permit. And, as with historical events, it is anticipated that the SASU will also persist.

Other disasters include vegetation fire that could strip the banks of the vegetation that help anchor the substrate and/or provide woody debris that contributes to habitat complexity. Loss of vegetation would reduce shade and contribute to overall warming of water temperatures.

6.1.4 Other Natural or Human –Caused Factors

Other changed circumstances that can be identified but for which specific impacts cannot be identified at this time include, but are not limited to, the following:

- Fluctuations in RIX Influent
- Drought
- Climate change
- Hazardous material spill
- Off-road vehicle use in Santa Ana River bed
- Occupation by homeless encampments
- Water resources management
- Aquifer depletion
- Introduction of predatory fish and/or amphibians
- Overpopulation of algae (such as, *Compsopogon caeruleus*)
- Overpopulation of non-native vegetation

These circumstances cannot be controlled or mitigated by RIX operations or by Permittee. Thus, while contingency plans that detail responses to events such as these could be

developed, Permittee is not responsible for mitigating impacts to SASU that occur from events beyond its control.

6.2 Unforeseen Circumstances

Unforeseen Circumstances are discussed in the No Surprises Policy. Pursuant to the provisions of the No Surprises Policy, in the event unforeseen circumstances affect a species covered by this HCP, the Permittee will not be required to provide additional mitigation that requires the commitment of additional land, water, or other natural resources or financial compensation, or additional restrictions on the use of land, water or other natural resources beyond the level otherwise agreed upon for the species covered by the HCP without the consent of Permittee. Should unforeseen circumstances arise, changes will be limited to modifications within conserved habitat areas, if any, or the HCP's operating conservation program for SASU, and will maintain the original terms of the HCP to the maximum extent possible. The assurances contained in the "No Surprises Policy" apply only if the Permittee has complied with its obligations under the HCP.

6.3 Amendments

6.3.1 Minor Amendments

Any party may propose minor modifications to the HCP by providing notice to all other parties. Such notice shall include a statement of the reason for the proposed modification and an analysis of its environmental effects, including its effects on operations under the HCP and on SASU. Minor amendments are permissible without amending the underlying Section 10(a)(1)(B) Permit provided that the USFWS determines that the changes do not 1) cause additional take of SASU that was not analyzed in connection with the original HCP; (2) result in operations under the HCP that are significantly different from those analyzed in connection with the original HCP, or (3) have adverse effects on the environment that are new or significantly different from those analyzed in connection with the original HCP.

Minor amendments to this HCP may include corrections of typographic, grammatical, and similar editing errors that do not change the intended meaning or corrections to any maps or exhibits to correct errors in mapping or to reflect previously approved changes in the Permit or HCP. All minor amendments proposed by the Permittee to this HCP will be submitted to the USFWS in writing.

6.3.2 Major Amendments

Amendments that do not fit the definition of a minor amendment will be processed as formal amendments in accordance with all applicable legal requirements, including but not limited to the ESA, NEPA, and the USFWS's permit regulations. Formal permit amendments require written notification to the USFWS and the same justification and supporting information for compliance with a standard Incidental Take Permit application, including conservation planning requirements and compliance with issuance criteria.

When the USFWS or Permittee believes that a formal amendment to the HCP is required, consultation with the USFWS will include the USFWS's Pacific Southwest Region Office. Permittee will prepare the appropriate documentation for submission to the USFWS. The documentation will include a description of the event or activity and an assessment of its impacts. The amendment will describe changes to the mitigation measures to ensure that SASU is appropriately protected.

6.4 Renewal/Extension of the Section 10(a)(1)(B) Permit

The Permit may be renewed or extended with the approval of the USFWS. The request to renew or extend the Permit must be submitted in writing by the applicant and reference the Permit number; certify that all statements and information in the original application are still correct or include a list of changes; and provide specific information concerning what take has occurred under the existing Permit and what portions of the Project are still to be completed. The request must be made to the USFWS's Carlsbad Fish and Wildlife Office at least 30 days prior to the Permit's expiration date. As long as the request is received within 30 days prior to the Permit expiration date, the Permit shall remain valid while the renewal or extension is being processed. The renewal or extension may be approved in writing by the Deputy Manager of the USFWS's California/Nevada Operations Office. Changes to the HCP that would qualify as a formal amendment will be handled in accordance with section 6.2.

6.5 Permit Transfer

A transfer of the Permit is not anticipated during the life of the Permit because the RIX Facility is owned and operated by public agencies. However, in the event of a sale or transfer of ownership or operation of the Facility during the life of the Permit, the following will be submitted to the USFWS by the new owner(s)/operator(s): a new permit application, permit fee, and written documentation providing assurances pursuant to 50 CFR 13.25 (b)(2) that the new owner(s)/operator(s) will provide sufficient funding for the HCP and will implement the relevant terms and conditions of the permit, including any outstanding minimization and mitigation. The new owner(s)/operator(s) will commit to all requirements regarding the take authorization and mitigation obligations of this HCP unless otherwise specified in writing and agreed to in advance by the USFWS.

6.6 Other Measures

Section 10(a)(2)(A)(iv) of the ESA states that a HCP must specify other measures that the Director may require as being necessary or appropriate for purposes of the plan. The Permittee has discussed the proposed elements of this conservation plan with the USFWS, and no such additional elements or required measures have been identified for the Project.

7 FUNDING

7.1 Cost of HCP Implementation

This section identifies costs associated with implementing the HCP, including the conservation strategy, minimization and mitigation measures, monitoring and reporting. These costs are provided as one-time, reoccurring (e.g., annual), and total costs. These estimated costs are present day values with an annual inflation rate of 2%.

Table 5 HCP Estimated Cost Breakdown – Minimization Measures

Item/Activity	Unit Cost	One-Time Cost	Re-occurring Costs	Total (x # of years)
Conservation Strategy				
Avoidance Measure 1: Minimize unscheduled/emergency shutdowns by evaluating root causes of each emergency shutdown and schedule repairs and/or preventative maintenance to reduce a recurring incident. Upgrade UV system to reduce number of shutdowns.	-	$1,200,000	$337,000	annually
Avoidance Measure 2: Schedule shutdowns outside of SASU spawning season to prevent loss of vulnerable life stages.	-	-	$3,200	annually
Minimization Measure 1: Coordinate planned shutdowns to coincide with rainfall events to the extent possible.	-	-	$11,200	annually
Minimization Measure 2: Implement a SASU Rescue Plan during unscheduled and scheduled shutdowns	-	-	$22,000	annually
Minimization Measure 3: Minimization Measure 3: Ensure a supply of replacement water during shutdowns up to approximately 8,100 gpm (18 cfs).	-	$8,850,000	$45,000	annually
Subtotal	-	$10,050,000	$418,400	annually

Table 6 HCP Estimated Cost Breakdown – Monitoring Measures

Item/Activity	Unit Cost	One-Time Cost	Re-occurring Costs	Total (x # of years)
Compliance Monitoring Measure 1 USFWS inspections	-	-	$900	annually
Compliance Monitoring Measure 2 Report incidental take within 8 hours after a shutdown event occurs	-	-	$1,800	annually
Effects Monitoring 1 Water Quality Monitoring.	-	-	$4,900	annually

Effects Monitoring Measure 2 Water Dispersion Monitoring.	-	$20,000	-	-
Effectiveness Monitoring Measure 1 Scientific Study for First Year.	-	$100,000	-	-
Effectiveness Monitoring Measure 2 Collaboration with Stakeholders.	-	$25,000	-	-
Subtotal	-	$145,000	$7,600	annually

Table 7 HCP Estimated Cost Breakdown – Reporting

Reporting	Unit Cost	One-Time Cost	Re-occurring Costs	Total (x # of years)
Annual Report	-	-	$5,000	annually
Subtotal	-	-	$5,000	annually

Table 8 HCP Estimated Cost Breakdown – Total Activities

Item/Activity	Unit Cost	One-Time Cost	Re-occurring Costs	Total (x # of years)
Conservation Strategies Subtotal	-	$10,050,000	$418,400	annually
Monitoring Subtotal	-	$145,000	$7,600	annually
Reporting Subtotal	-	-	$5,000	annually
GRAND TOTAL	-	$10,195,000	$431,000	annually

7.2 Funding Source(s)

The RIX Facility is funded by the City of San Bernardino and City of Colton wastewater utility organizations. Major modifications to the RIX Facility, such as equipping and adding additional groundwater wells, are part of the cities' Capital Improvement Program budget.

7.3 Funding Mechanism and Management

The Authority was formed as a California Special District by the Cities of San Bernardino and Colton through a joint powers authority agreement on August 2, 1994. The purpose of this agreement was to provide for the design and construction of a regional tertiary treatment plant known as the RIX Project. Under the agreement, the members of the authority also are to remain owners and operators of RIX. This authority is governed by a separate board consisting of four members: two appointed by the City of San Bernardino through the City of San Bernardino's Water Board and two appointed by the City Council of the City of Colton. Construction of RIX was administered by the Santa Ana Watershed Project Authority and was substantially completed during 1996. Administration and operation were turned over to the Authority at that time pursuant to the existing agreement. Per the agreement, the cities of San Bernardino and Colton each have a measurable equity interest in the net position of RIX in proportion to its contributions, which are based on an

80% / 20% split, respectively. Substantially all of the assets of RIX are in the form of capital assets. Annual revenues (primarily in the form of contributions from the two member agencies) are equal to annual expenses. The Authority has no employees and does not have any outstanding debt. Any debt associated with funding of member contributions toward RIX projects are liabilities of the respective member. Such debt is payable solely from the revenue of each member's sewer fund.

The Authority reports its activities in an enterprise fund used to account for operations that are financed and operated in a manner similar to a private business enterprise, where the intent of the Authority is that the costs (including depreciation) of providing goods or services to the general public on a continuing basis be financed or recovered primarily through user charges. Revenues and expenses are recognized on the accrual basis. Revenues are recognized in the accounting period in which they are earned, and expenses are recognized in the period incurred, regardless of when the related cash flow takes place.

Operating revenues, such as charges for services (water sales, sewer services and water services) result from exchange transactions associated with the principal activity of the Authority. Exchange transactions are those in which each party receives and gives up essentially equal values. Non-operating revenues, such as property taxes and investment income, result from non-exchange transactions or ancillary activities in which the Authority gives (receives) value without directly receiving (giving) equal value in exchange.

When both restricted and unrestricted resources are available for use, the Authority uses restricted resources and then unrestricted resources.

The Authority maintains one fund, the RIX Utility Enterprise Fund, which is used to account for the operations of the Authority.

The Authority annually adopts an operating and capital budget prior to the new fiscal year. The budget authorizes and provides the basis for reporting and control of financial operations and accountability for the Authority's functions. The budget and reporting treatment applied to a fund is consistent with the accrual basis of accounting and the financial statement basis. Each year, the Authority adopts a balanced budget.

Permittee is responsible for the administration of the RIX Facility, and its management is responsible for the establishment and maintenance of the internal control structure that ensures that the assets of the Authority are protected from loss, theft or misuse. The internal control structure also ensures that adequate accounting data are compiled to allow for the preparation of financial statements in conformity with generally accepted accounting principles. SBMWD's internal control structure is designed to provide reasonable assurance that these objectives are met. The concept of reasonable assurance recognizes that (1) the cost of a control should not exceed the benefits likely to be derived and (2) the valuation of costs and benefits requires estimates and judgments by management.

8 ALTERNATIVES TO THE PROPOSED ACTION CONSIDERED

8.1 Summary

Section 10(a)(2)(A)(iii) of the Endangered Species Act of 1973, as amended, [and 50 CFR 17.22(b)(1)(iii) and 17.32(b)(1)(iii)] requires that alternatives to the taking of species be considered and reasons why such alternatives are not implemented be discussed.

The following presents the Alternatives Analysis for continued operation of the RIX Facility. This analysis investigates three alternatives, including a No Project alternative. An alternative is practicable "if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes."

8.2 Alternative 1 – Revise NPDES Permit Conditions

Under this alternative, the Regional Water Quality Control Board (RWQCB) would revise the RIX Facility NPDES permit to allow for the discharge of secondary water quality to prevent SAR dewatering during times of tertiary treatment facility shutdown at times when the computers senses that the water quality is below the standards of the NPDES permit. Due to homeless encampments in the area in which people may drink or bathe in the degraded water, this alternative may pose a risk to public health and thus is unlikely to be approved by the RWQCB. Additionally, it is unknown how the SASU may react to the secondary treated water. For these reasons, this alternative is not considered feasible.

In addition, this alternative is contrary to governing federal law. The basic requirements of the federal Clean Water Act were adopted by Public Law 92-500 in 1972. (33 U.S.C. § 1251 *et seq*.) The goals and objectives are set forth in section 101. (33 U.S.C. § 1251.) Section 101(a)(1) states that “it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985.” (33 U.S.C. § 1251(a)(1).) Bypassing the tertiary treatment processes, including disinfection, will certainly result in the discharge of undesirable pollutants.

8.3 Alternative 2 – Construct a Pipeline from the Rialto Drain to the RIX Outfall

This alternative would transfer all of the discharge from the Rialto Drain (from City of Rialto Wastewater Treatment Plant) to the RIX Outfall during times of shutdown by constructing approximately 1,000 feet of a new pipeline in the SAR from Rialto Drain to the RIX Outfall. The pipeline construction may impact other species habitat and alter the hydrology of the SAR in this reach. This alternative would also require agreements with various agencies and require state and federal permits and environmental compliance. The water from the Rialto Drain already mixes with the water at the RIX Outfall. The purpose of the pipeline would be for the water to travel to the RIX Outfall and downstream areas faster than it would under normal conditions without the pipeline. This alternative was deemed not feasible due to the high cost and little benefit since the water will reach this portion of the SAR anyway. Additionally, the Rialto Channel is a documented location for

SASU spawning and diverting the flow will likely eliminate approximately 2,900 feet of habitat.

8.4 Alternative 3 – "No Project" Alternative

This alternative assumes that the RIX Facility would continue operate under an existing SASU salvage plan, and no water would be pumped into the SAR to benefit SASU during shutdowns. This alternative could result in higher levels of take than the proposed action, which is to continue to operate RIX, which includes periodic planned and unplanned shutdowns, and the additional activity of pumping groundwater into the SAR during the shutdowns.

9 CONCLUSION

The Project will effectively avoid and minimize effects associated with planned and unplanned RIX Facility shutdowns and incorporates all practicable mitigation. There are no less damaging practicable alternatives to the continued operation of the RIX Facility that would fulfill the purpose and need of the proposed Project. All investigated alternatives were more damaging, not practicable, or did not meet the purpose and needs of the Project.

10 DEFINITIONS

Endangered Species – "…any species [including subspecies or qualifying distinct population segment] which is danger of extinction throughout all or a significant portion of its range." [Section 3(6) of ESA]'

Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1513-1543) - Federal legislation that provides means whereby the ecosystems upon which endangered species and threatened species depend may be conserved and provides a program for the conservation of such endangered and threatened species.

Habitat – The location where a particular taxon of plant or animal lives and its surroundings, both living and non-living; the term includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.

Habitat Conservation Plan (HCP) – Under Section 10(a)(2)(A) of the ESA, a planning document that is a mandatory component of an Incidental Take Permit application, also known as a HCP.

Implementing Agreement – An agreement that legally binds the permittee to the requirements and responsibilities of a conservation and Section 10 permit. It may assign the responsibility for planning, approving, and implementing the mitigation measures under the HCP.

Incidental take – Take of any federally listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities (see definition for "take") [ESA Section 10(a)(1)(B)].

Incidental take permit – A permit that exempts a permittee from the take prohibition of section 9 of the ESA issued by the FWS pursuant to Section 10(a)(1)(B) of the ESA.

Listed species – Species including subspecies and distinct vertebrate populations, of the fish, wildlife, or plants, listed as either endangered or threatened under section 4 of the ESA.

Mitigation – Under NEPA regulations, to moderate, reduce or alleviate the impacts of a proposed activity, including: a) avoiding the impact by not taking a certain action or parts of an action; b) minimizing impacts by limiting the degree or magnitude of the action; c) rectifying the impact by repairing, rehabilitating or restoring the affected environment; d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; e) compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

National Environmental Policy Act (NEPA) – Federal legislation establishing national policy that environmental impacts will be evaluated as an integral part of any major Federal action. Requires the preparation of an EIS (Environmental Impact Statement) for all major Federal actions significantly affecting the quality of the human environment (42 U.S.C. 4321-4327).

Take – Under section 3(18) of the ESA, "… to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" with respect to federally listed endangered species of wildlife. Federal regulations provide the same taking prohibitions for threatened wildlife species [50 CFR 17.31(a)].

11 REFERENCES

Allen, B.C. 2002. Evaluation of Santa Ana sucker (*Catostomus santaanae*) Habitat and Water Quality Changes in the Santa Ana River as a Result of Temporary Shutdowns at the Rapid Infiltration and Extraction Plant (RIX). Unpublished report prepared for the San Bernardino Municipal Water Department.

Allen, B.C. 2003. Evaluation of Santa Ana sucker (*Catostomus santaanae*) Spawning Success in the Santa Ana River and the Potential Effects of Temporary Shutdowns at the Rapid Infiltration and Extraction Plant (RIX). Unpublished report prepared for the San Bernardino Municipal Water Department.

Brown, L.R. and J.T. May. In Preparation. Native Fish Population and Habitat Study, Santa Ana River, California: Annual Report, July 2015 to June 2016. Unpublished report being prepared by the USGS California Water Science Center.

California Regional Water Quality Control Board – Santa Ana Region. December 16, 2016. Board Item 11: Colton/San Bernardino Regional Tertiary Treatment Rapid Infiltration and Extraction Facility: Update on Operational Impacts to Santa Ana Sucker.

Chadwick and Associates, Inc. (C&A). 1992. Santa Ana River Use-attainability analysis, Volume 2: aquatic biology, habitat & toxicity analysis. Report prepared for the Santa Ana Watershed Project Authority, Riverside, California.

Clarkson, R. W. and M. R. Childs, 2000. Temperature effects of hypolimnial release dams on early life stages of Colorado River basin big river fishes. Copeia 2000:401-412.

Demetropoulos, C.L. and S. Stewart. Developing a Predictive Model for the Distribution and Abundance of Federally Threatened Santa Ana Sucker, *Catostomus santaanae*, in the Big Tujunga Creek; Influence of Physical Habitat.

Demetropoulos, C.L. and S. Stewart. Developing a Predictive Model for the Distribution and Abundance of Federally Threatened Santa Ana Sucker, *Catostomus santaanae*, in the Big Tujunga Creek; Foraging and Dietary Strategies.

Dudek. 2018. Santa Ana Sucker Translocation Plan. Prepared for San Bernardino Valley Municipal Water District.

GEI Consultants. November 17, 2016. Draft Technical Memorandum, Projected Effects of RIX Transition to Groundwater Induced Temperature Change on the Santa Ana Sucker. (On file at the San Bernardino Municipal Water District).

Greenfield, D. W., S. T. Ross, and G. D. Deckert. 1970. Some aspects of the life history of the Santa Ana Sucker, *Catostomus* (*Pantosteus*) *santaanae* (Snyder). California Fish and Game 56(3):166-179.

Moyle, P. B. 2002. Inland fishes of California, revised and expanded. University of California Press, Berkeley, California, USA. 517 pp.

Natural Resources Conservation Service (NRCS). 2016. Web Soil Survey. Map Unit Descriptions. San Bernardino County Area, California. Available at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm. (Accessed: October 9, 2016).

Richmond, J.Q. 2016. Genetic Diversity of Santa Ana Sucker (*Catostomus santaanae*). Presentation given to the Santa Ana Sucker Translocation Plan Team by Geneticist Jonathan Richmond of the Western Ecological Research Center.

Riverside County Resource Conservation District (RCRCD). 2023. Native and non-native removal and rescue efforts – Rialto/RIX events.

Robinson, A. T., and M. R. Childs. 2001. Juvenile growth of native fishes in the Little Colorado River and in a thermally modified portion of the Colorado River. North American Journal of Fisheries Management 21:809-815.

Santa Ana Watershed Association. 2014. Habitat variability and distribution of the Santa Ana sucker, *Catostomus santaanae*, in the Santa Ana River from the confluence of the Rialto channel to the Prado Basin. Unpublished report prepared by the Santa Ana Watershed Association, Riverside, California.

[SMEA] San Marino Environmental Associates. 2001. Results of the Year 1 Implementation of the Santa Ana Sucker Conservation Program for the Santa Ana River. Final Report.

[SMEA] San Marino Environmental Associates. 2011. Santa Ana Sucker Population Monitoring 2001-2011. Final Report Memo, prepared for the Santa Ana Sucker Conservation Team.

Riverside-Corona Resource Conservation District. Undated. Executive Summary of Fish Rescue and Salvage RIX Plant Maintenance – Scheduled Shutdown November 16, 2016.

Swift, C.C. 2001. The Santa Ana sucker in the Santa Ana River: distribution, relative abundance, spawning areas, and impact of exotic predators. Unpublished report prepared for the Santa Ana Water Project Authority, Riverside, California.

Thompson, A. R., J. N. Baskin, C. C. Swift, T. R. Haglund, and R. J. Nagel. 2010. Influence of habitat dynamics on the distribution and abundance of the federally threatened Santa Ana Sucker, *Catostomus santaanae*, in the Santa Ana River. *Environmental Biology of Fishes* 87:321-332.

US Department of the Interior, Bureau of Reclamation. August 2013. Climate Change Analysis for the Santa Ana River Watershed, Santa Ana Watershed Basin Study, California Lower Colorado Region

[USFWS] U.S. Fish and Wildlife Service. 1999. 64 FR 3915. Endangered and threatened wildlife and plants; proposed threatened status for the Santa Ana sucker. Federal Register 64: 3915-3922.

[USFWS] U.S. Fish and Wildlife Service. 2000. 65 FR 19686. Endangered and threatened wildlife and plants; threatened status for the Santa Ana sucker. Federal Register 65: 19686–19698.

[USFWS] U.S. Fish and Wildlife Service. 2004. Endangered and threatened wildlife and plants; proposed rule to designate critical habitat for the Santa Ana sucker (*Catostomus santaanae*); proposed rule. Federal Register 69: 8911-65087.

[USFWS] U.S. Fish and Wildlife Service. 2005. Endangered and threatened wildlife and plants; critical habitat designation for Santa Ana sucker (*Catostomus santaanae*); final rule. Federal Register. Volume 70, Number 2:426-458.

[USFWS] U.S. Fish and Wildlife Service. 2009. 74 FR 65056. Endangered and threatened wildlife and plants; revised critical habitat for the Santa Ana sucker (*Catostomus santaanae*); proposed rule. Federal Register 74: 65056-65087.

[USFWS] U.S. Fish and Wildlife Service. 2010. 75 FR 77962. Endangered and threatened wildlife and plants; revised critical habitat for Santa Ana sucker (*Catostomus santaanae*); final rule. Federal Register 75: 77962–78027.

[USFWS] U.S. Fish and Wildlife Service. 2011. Santa Ana sucker (*Catostomus santaanae*) 5-Year Review: Summary and Evaluation. Carlsbad Fish and Wildlife Office, Carlsbad, California.

[USFWS] U.S. Fish and Wildlife Service. 2017. Recovery Plan for Santa Ana sucker (*Catostomus santaanae*). Region 8 U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. 92 pp.

[USFWS] U.S. Fish and Wildlife Service. 2015. FWS-SB-16B0030-16E00134: RIX Maintenance Shutdown, Santa Ana River Monitoring, and Native Fish Rescue September 3, 2015.

WEI. August 3, 2016. Letter Report – Characterization of the Santa Ana River surface water and groundwater response to RIX Expansion Site groundwater production during RIX temporary shutdown events. (On file at the San Bernardino Municipal Water District).

Wood, J.M. 2015. Personal observation of Santa Ana sucker (*Catostomus santaanae*) spawning in Rialto Channel on February 18, 2015. Observation made by Justin M. Wood, Senior Biologist at Aspen Environmental Group.