

2022 Groundwater Monitoring Program
to Support Implementation of the Santa Ana Basin Plan

PREPARED FOR

Basin Monitoring Program Task Force,
administered by the Santa Ana Watershed Project Authority



PREPARED BY



2022 Groundwater Monitoring Program

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administered by the Santa Ana Watershed Project Authority

Project No. 986-80-21-1-01

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1.0 INTRODUCTION

This report documents the 2022 Groundwater Monitoring Program (2022 GMP) for the Santa Ana River (SAR) Watershed and was prepared by the Basin Monitoring Program Task Force (Task Force) that is administered by the Santa Ana River Watershed Project Authority (SAWPA). The 2022 GMP was prepared pursuant to the requirements in the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan), as amended by the Santa Ana Regional Water Quality Control Board (Santa Ana Water Board) in December 2021.¹

1.1 Purpose and Report Organization

The purpose of the 2022 GMP is to (i) document the current groundwater monitoring program that is implemented by the Task Force to comply with the Basin Plan, (ii) define the scope of work to perform the assessment of ambient water quality (AWQ) and assimilative capacity due in 2023, and (iii) provide the framework for the Task Force's ongoing work to implement the Basin Plan Total Dissolved Solids and Nitrogen Management Plan (hereafter referred to as the Basin Plan SNMP) from fiscal year 2022/23 through 2020/29. The 2022 GMP report documents:

1. The groundwater monitoring networks of the 35 groundwater management zones (GMZs) in the SAR Watershed
2. The GMZs with potential data gaps for which additional information needs to be compiled and reviewed to confirm data gaps in the monitoring networks
3. The additional information needed to fill potential data gaps in the monitoring network and the process and schedule to obtain the information and fill any data gaps
4. The scope of work to perform the 2021 Ambient Water Quality Pilot Study (AWQ Pilot Study), the objective of which is to explore improved and/or alternative methods to periodically recompute AWQ and determine the assimilative capacity of the 35 GMZs
5. The schedule of work to be performed by the Task Force and its members from now through April 2029, which is the Santa Ana Water Board's deadline for completing its second five-year review of the Basin Plan SNMP

This 2022 GMP is organized into the following sections:

Section 1 – Introduction. This introductory section describes the purpose and organization of the report, the study area location, the Task Force, the regulatory setting that establishes the requirement for this 2022 GMP, and the 2022 GMP goals.

Section 2 – Groundwater Monitoring Program Approach. This section describes the collaborative approach that was implemented to educate the Task Force members as to the history and outcomes of the existing groundwater monitoring program and obtain input and feedback to determine the appropriate changes or additions to the current program that should be considered for inclusion in the 2022 GMP.

¹ As of the writing of this report, the Basin Plan amendment (approved by the Santa Ana Water Board in December 2021, and by the State Water Resources Control Board in May 2022) is pending final approval by the Office of Administrative Law.



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Section 3 – Groundwater Management Zone Monitoring Networks and Potential Data Gaps. This section documents the current monitoring network in each GMZ, identifies the potential data gaps for which additional information needs to be compiled and reviewed to confirm data gaps in the monitoring networks, and identifies the process to obtain the information and fill any data gaps that do exist.

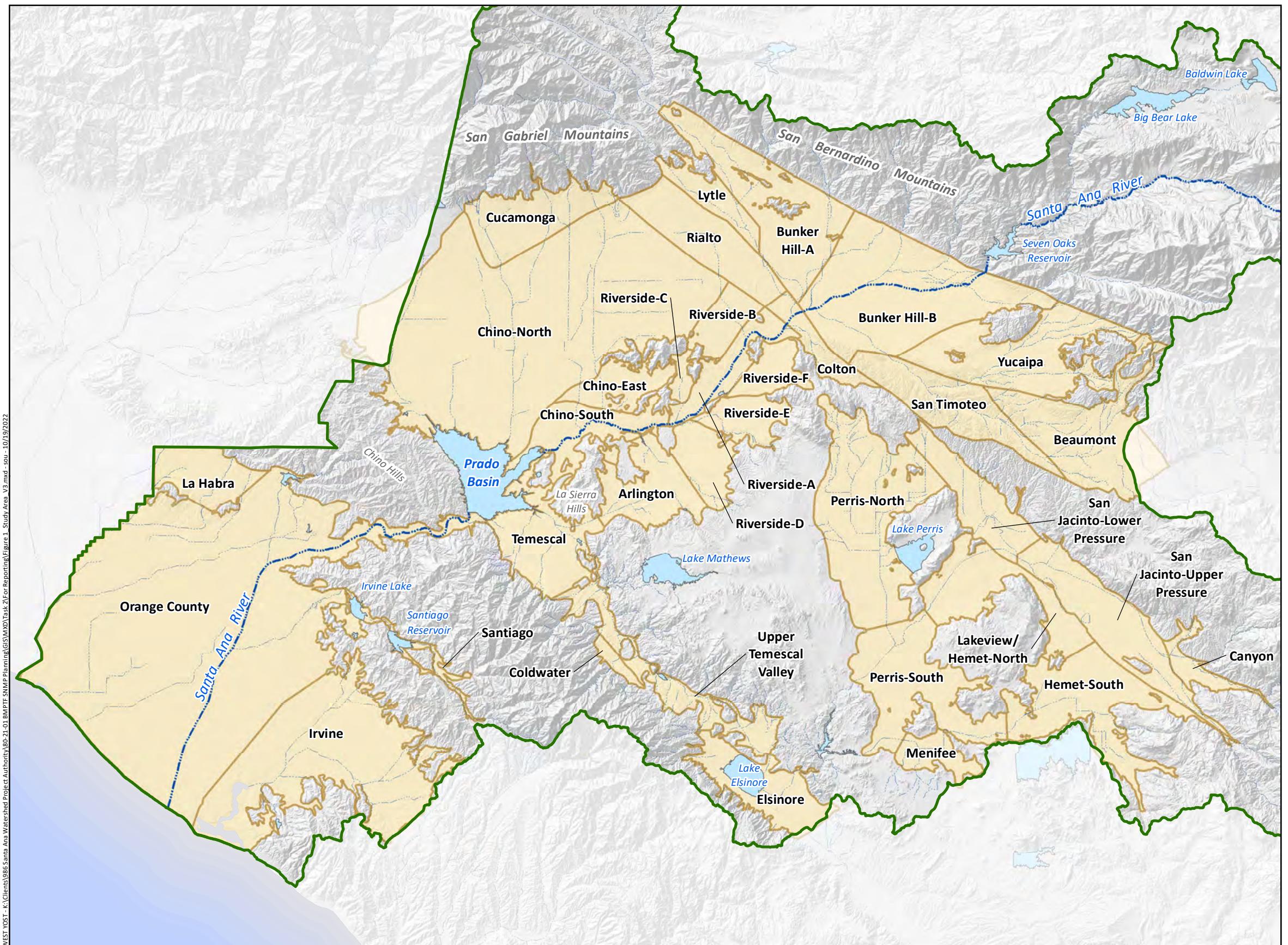
Section 4 – 2021 Ambient Water Quality Pilot Study. This section describes the scope of work to perform the AWQ Pilot Study, including the purpose and objectives of the study and the intended outcomes and deliverables of the work to be submitted to the Santa Ana Water Board by October 2023.

Section 5 – Implementation Plan. This section describes the work that will need to be performed by the Task Force and its members through fiscal year 2028/29 to comply with the Basin Plan SNMP.

Section 6 – References. This section lists the references cited in this 2022 GMP.

1.2 Santa Ana River Watershed Location

The SAR watershed is located in southern California and covers approximately 2,840 square miles within portions of San Bernardino County, Riverside County, Orange County, and a small area of Los Angeles County. The SAR is the major drainage of the Watershed, extending over 100 miles in length from its headwaters in the San Bernardino Mountains to the point of discharge to the Pacific Ocean, in Huntington Beach, CA. The tributaries of the SAR originate in the San Bernardino, San Gabriel, San Jacinto, and Santa Ana Mountains. Figure 1-1 shows the SAR Watershed boundary, the SAR, and the boundaries of the 35 GMZs within the SAR watershed that are identified in the Basin Plan.



- Santa Ana River Watershed
- Groundwater Management Zone
- Santa Ana River
- Streams & Flood Control Channels
- Flood Control/Conservation Basins, Lakes, and Reservoirs



Prepared by:



Prepared for:

Santa Ana Watershed
Project Authority
Basin Monitoring Program Task Force
Groundwater Monitoring Plan



Study Area

Santa Ana River Watershed and
Groundwater Management Zones

Figure 1-1



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1.3 Basin Monitoring Program Task Force

In 1995, the TIN/TDS Task Force was formed to provide oversight, supervision, and approval of a study to evaluate the impacts of total dissolved solids (TDS) and nitrogen (nitrate as nitrogen [nitrate] and total inorganic nitrogen [TIN]) on water resources in the SAR Watershed. The work culminated in a 2004 Basin Plan amendment to include an updated, comprehensive salt and nutrient management plan for the SAR Watershed (refer to Section 1.4 of this report for a discussion on the Basin Plan SNMP). The Task Force agencies were named in the Basin Plan amendment as the responsible parties for implementing the various groundwater and surface water monitoring and reporting programs to support the implementation of the Basin Plan SNMP. An agreement was executed by the agencies to formalize the ongoing task force as the Basin Monitoring Program Task Force.

The Task Force is administered and led by SAWPA staff. SAWPA contracts with policy and technical experts on behalf of the Task Force to develop planning priorities for compliance with the Basin Plan and support the implementation of its work. The current Task Force members² include:

- Beaumont Cherry Valley Water District
- Chino Basin Watermaster
- City of Banning
- City of Beaumont
- City of Corona
- City of Redlands
- City of Rialto
- City of Riverside
- Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority
- Eastern Municipal Water District
- Elsinore Valley Municipal Water District
- Inland Empire Utilities Agency
- Irvine Ranch Water District
- Jurupa Community Services District
- Orange County Water District
- San Bernardino Valley Municipal Water District
- San Gorgonio Pass Water Agency
- Temescal Valley Water District
- Wester Riverside County Regional Wastewater Authority
- Yucaipa Valley Water District

² The members are those agencies funding Task Force operations.



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Staff of the Santa Ana Water Board also participate in the Task Force as advisory members. Information about the Task Force activities, including agendas and minutes of its meetings are available on SAWPA's website at: <https://sawpa.org/task-forces/basin-monitoring-program-taskforce>.

1.4 Regulatory Setting

The quality of the SAR Watershed's water resources is regulated by the Santa Ana Water Board pursuant to the Basin Plan. The Santa Ana Water Board's principal means of achieving the water quality objectives and protecting the beneficial uses specified in the Basin Plan is the development, adoption, issuance, and enforcement of waste discharge requirements. By regulating the quality of wastewaters discharged, and in other ways controlling the discharge of wastes that may impact surface and ground water quality, the Santa Ana Water Board works to protect the Region's water resources. The regulatory tools utilized by the Santa Ana Water Board include:

- National Pollutant Discharge Elimination System (NPDES) permits
- Waste Discharge Requirements (WDRs)
- Water Reclamation Requirements
- Waste Discharge Prohibition

The Basin Plan SNMP is the program to address compliance with the surface and ground water TDS and nitrate Basin Plan objectives established for the SAR and GMZs. The current program was initially adopted and amended into the Basin Plan in January 2004, and has been amended several times since. The Basin Plan SNMP is documented in *Chapter 5 – Implementation* of the Basin Plan, and all amendments since 2004 are posted on the Santa Ana Water Board's website.³

1.4.1 Basin Plan SNMP

The principal TDS and nitrogen regulatory tool employed by the Santa Ana Water Board is the adoption of appropriate TDS and nitrogen limitations in NPDES or WDRs issued for the discharge, reuse, and/or recharge of recycled water (and other high-TDS/nitrogen discharges, as appropriate). The discharge requirements must specify limitations that, when met, will assure that Basin Plan water quality objectives will be achieved. And, where the quality of the water receiving the discharge is better than the established objectives, the Board must assure that the discharge is consistent with the State Water Resources Control Board's (State Board) antidegradation policy (State Board Order 68-16).

In 1983 and 1995, the Santa Ana Water Board conducted modeling studies to support the then-current Basin Plan SNMP. These studies were not designed to validate or revise the TDS or nitrogen objectives established in the first Basin Plan, but were instead focused on how best to meet the objectives established in prior Basin Plans. However, in 1995, numerous water supply and wastewater agencies in the region identified that adoption of the 1995 Basin Plan would cost the agencies several billion dollars to comply with the objectives, and in many cases, it would hinder the reuse of locally reliable recycled

³ Weblink:

https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/docs/2019/New/Chapter_5_June_2019.pdf Accessed October 1, 2022.



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water supplies. In response, the Santa Ana Water Board identified the review of these objectives as a priority and the Task Force agreed to provide the resources to perform the requisite studies.

The Task Force study culminated in the Santa Ana Water Board's adoption of a Basin Plan amendment in January 2004 (2004 Basin Plan amendment). The 2004 Basin Plan amendment included new GMZ boundaries (they had previously been referred to as subbasins); new TDS and nitrate objectives for the GMZs; TDS and nitrogen Wasteload Allocations; surface water reach designations; and TDS and nitrate objectives and beneficial uses for specific surface waters. The technical work supporting the 2004 Basin Plan amendment is summarized in *TIN/TDS Phase 2A: Tasks 1 through 5, TIN/TDS Study of the Santa Ana Watershed* (WEI, 2000).

The new TDS and nitrate objectives for the GMZs in the SAR Watershed were established to ensure that water quality is maintained pursuant to the State's antidegradation policy, and thus, were termed "antidegradation" objectives. In some GMZs, alternative "maximum-benefit" objectives were established, enabled by GMZ-specific salt and nutrient management programs (e.g. Maximum Benefit SNMPs), which would allow the lowering of water quality based on demonstrations by the sponsoring agencies that beneficial uses would be protected and the programs would provide maximum benefit to the people of California. Maximum Benefit SNMPs were adopted as part of the 2004 Basin Plan amendment for the Beaumont, Chino-North, Cucamonga, San Timoteo, and Yucaipa GMZs. Subsequent Maximum Benefit SNMPs were amended into the Basin Plan for the San Jacinto Upper Pressure GMZ (2010) and Elsinore GMZ (2021).

To track compliance with the Basin Plan TDS and nitrate objectives, the Basin Plan SNMP includes monitoring program requirements for both surface water and groundwater, including the collection of TDS and nitrogen monitoring data and submittal of periodic reports that analyze the monitoring results and compare them to the relevant objectives. Specifically for groundwater, the Basin Plan SNMP requires that current AWQ and assimilative capacity within each GMZ be analyzed triennially (every three years) to determine if any new or revised regulatory actions are required to address the current water quality conditions. Currently the data compilation and reporting programs are implemented cooperatively by the Task Force on behalf of all the responsible parties in accordance with the GMP accepted by the Santa Ana Water Board in 2005 (2005 GMP). The 2005 GMP is discussed further in Sections 1.5 and 2 of this report.

1.4.2 Recycled Water Policy and Declaration of Conformance

In 2009, the State Board adopted the *Water Quality Control Policy for Recycled Water* (Recycled Water Policy). The purpose of the policy was to encourage increased use of recycled water statewide in a manner that implements state and federal water quality laws. The policy defined: mandates for the use of recycled water; the implementation roles of the State Board, Regional Water Quality Control Boards, and other state agencies; requirements and guidelines for the development of SNMPs; provisions for streamlining the permitting of recycled water landscape irrigation projects; requirements for permitting of recycled water recharge projects; antidegradation requirements for recycled water use; and a process to convene a Science Advisory Panel to provide guidance on monitoring constituents of emerging concern (CECs) in recycled water. Notably, the Recycled Water Policy required water and recycled water management agencies across the state to develop detailed SNMPs.

A testament to the innovation of the SAR Watershed in its work to revise the Basin Pan SNMP in 2004 was the fact that it served as a template for the development of state-wide guidelines for SNMPs within the Recycled Water Policy. The Recycled Water Policy required that the SNMPs include: current AWQ and assimilative capacity findings; projections of future changes in AWQ; characterization of the relative



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impacts of recycled water reuse on compliance with groundwater quality objectives; and a monitoring and reporting program to track changes in groundwater quality over time. While other Regional Water Quality Control Boards across the state were working to encourage the formation of stakeholder groups to prepare the requisite SNMPs, the only action that was necessary by the Santa Ana Water Board was to adopt its *Declaration of Conformance with the Recycled Water Policy* (R8-2010-0012), which outlined how the Basin Plan SNMP complies with the Policy. The finding of conformance was based on the collective work of the Task Force.

1.4.2.1 2019 Recycled Water Policy

In December 2016, the State Board adopted Resolution No. 2016-0061, which directed staff to propose amendments to the Recycled Water Policy, in part, to improve the SNMP guidelines based on lessons learned over the first seven years of implementation. On December 11, 2018, the State Board adopted amendments to the policy, which became effective in April 2019. The 2019 Recycled Water Policy included provisions to:

- Define new compliance schedules for prioritizing groundwater basins and completing SNMPs in areas where they had either not been prepared or approved by the Regional Water Boards.
- Define a process for the Regional Water Boards to review and accept SNMPs.
- Refine the SNMP monitoring protocols and require annual reporting of data from the SNMP monitoring programs.
- Require review and assessment of the SNMP monitoring program data every five years and determine if an SNMP should be updated based on the assessment.

The 2019 Recycled Water Policy further requires that for any SNMP adopted as a Basin Plan amendment or accepted by a Regional Water Quality Control Board prior to April 8, 2019 must be evaluated pursuant to the new five-year data assessment requirements by April 8, 2024. The five-year review requirements include evaluating the SNMP monitoring data to determine whether potential updates to the SNMP may be warranted. The assessment must include and consider:

- Observed trends in groundwater salinity as compared to any predicted trends assumed in the SNMP
- The ability of the SNMP monitoring network to adequately characterize groundwater quality
- Potential new data gaps
- The ability of any relied-upon models to adequately simulate groundwater quality
- Available assimilative capacity based on observed trends and the most recent water quality data
- The impact of new projects that are reasonably foreseeable at the time of the assessment

Given that the Santa Ana Basin Plan SNMP was adopted prior to April 2019, the Santa Ana Water Board must complete its first five-year assessment in accordance with the 2019 Recycled Water Policy by April 2024.



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1.4.2.2 2021 Basin Plan Amendment

As part of its evaluation of the existing SNMP the Santa Ana Water Board will need to determine if the basin-wide monitoring program is consistent with the monitoring provisions contained in Section 6.2.4.1. of the 2019 Recycled Water Policy. In December 2021, the Santa Ana Water Board amended the Basin Plan SNMP, in part, to enable its five-year assessment under the 2019 Recycled Water Policy.⁴

The Basin Plan amendment established that:⁵

"No later than August 1, 2022, ... [the Task Force members] ... shall submit to the Santa Ana Water Board for approval, an updated watershed-wide TDS and nitrogen monitoring program that will provide data necessary to implement the TDS/Nitrogen management plan. Data to be collected and analyzed shall address, at a minimum: (1) determination of current ambient quality in groundwater management zones; (2) determination of compliance with TDS and nitrate-nitrogen objectives for the management zones; (3) evaluation of assimilative capacity findings for groundwater management zones; (4) assessment of the effects of recharge of surface water POTW discharges on the quality of affected groundwater management zones; and (5) any other additional requirements specified in the State Board's 2019 Recycled Water Policy. The determination of current ambient quality can be accomplished using methodology consistent with that employed by the Nitrogen/TDS Task Force (20-year running averages) to develop the TDS and nitrogen water quality objectives included in this Basin Plan, or an alternative method approved by the Executive Officer of the Santa Ana Water Board. The determination of current ambient groundwater quality must be reported by October 1, 2023 and, at a minimum, every five years thereafter unless the Santa Ana Water Board revises this schedule."

Details to be included in the proposed monitoring program shall include, but not be limited to:

- *monitoring program goals*
- *responsible agencies*
- *groundwater sampling locations*
- *water quality parameters*
- *sampling frequency*
- *QA/QC*
- *database management*
- *data analysis and reporting*

Within 30 days of Santa Ana Water Board approval of the proposed monitoring plan, the updated monitoring plan must be implemented."

1.5 Groundwater Monitoring Program Update Requirements and Goals

This 2022 GMP was prepared to meet the regulatory requirements of the 2019 Recycled Water Policy and the 2021 Basin Plan amendment. It was developed in consideration of the nearly two decades of Task

⁴ The Basin Plan amendment addressed various other changes to the Basin Plan SNMP, including incorporation of the latest Wasteload Allocation and requirements for updating the surface water monitoring program.

⁵ The Santa Ana Water Board granted the Task Force an extension of the due date to December 1, 2022 due to the substantial progress and stakeholder engagement in completing the monitoring program update.



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Force experience in implementing the 2005 GMP and extensive input by the Task Force, including the participating staff from the Santa Ana Water Board. The 2005 GMP and the 2022 GMP requirements and goals are described below. The stakeholder process to obtain feedback to develop the 2022 GMP is described in Section 2 of this report.

1.5.1 2005 GMP

The 2005 GMP was developed by the Task Force pursuant to the requirements in the 2004 Basin Plan amendment and was approved by the Santa Ana Water Board in 2005 (Resolution No. R8-2005-0063). The 2005 GMP describes a work plan to collect and use all available data across the SAR Watershed GMZs to recompute ambient TDS and nitrate in each GMZ for the 20-year period of 1994 to 2003, utilizing the same detailed statistical methodology developed and used by the Task Force to compute the ambient TDS and nitrate concentrations for the antidegradation objective setting period (1954 to 1973). In effect, the existing Basin Plan SNMP monitoring program is defined as follows:

1. Every three years, collect and utilize all available data (TDS, nitrate, and other select analytes) from the monitoring network to determine AWQ and assimilative capacity for the preceding 20-year period
2. The monitoring network is defined as every monitored well in the SAR Watershed with TDS and/or nitrate data during each 20-year period of analysis.

1.5.2 2022 GMP Requirements

In accordance with the 2021 Basin Plan amendment, the 2022 GMP must address the monitoring provisions in Section 6.2.4.1 the Recycled Water Policy. The monitoring provisions require:

- Defining an appropriate network of monitoring locations that:
 - Provide a reasonable, cost-effective means of determining whether water quality in the basin is consistent with applicable water quality objectives
 - Consider basin-specific conditions in establishing the number, type, or density of monitoring locations to be sampled
 - Target areas with surface and ground water connectivity, where applicable
 - Include existing wells that are located and screened appropriately to determine water quality throughout the most critical areas of the basin
 - Leverage the wells in other regulatory programs, such as those defined for compliance with the Sustainable Groundwater Management Act
- Identifying the stakeholders responsible for conducting, compiling, and reporting monitoring data
- Reporting all monitoring data annually in a form that is compatible with the Groundwater Ambient Monitoring & Assessment (GAMA) information system.

Additionally, the 2021 Basin Plan amendment lists the required elements of the monitoring program to include, at a minimum: the monitoring program goals, responsible agencies, groundwater sampling locations, water quality parameters, sampling frequency, QA/QC, database management, data analysis and reporting.

Table 1-1 summarizes how and where each of the required elements is addressed in this 2022 GMP.



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Table 1-1. How the 2022 Groundwater Monitoring Plan Addresses the Required Elements of the 2019 Recycled Water Policy and the 2021 Basin Plan Amendment	
Required Elements	How the Report Addresses the Required Element
Recycled Water Policy (Section 6.2.4.1)	
Define an appropriate network of monitoring locations that:	
Provide a reasonable, cost-effective means of determining whether water quality in the basin is consistent with applicable water quality objectives	<ul style="list-style-type: none">The 2022 GMP defines a monitoring network that includes all wells in each GMZ that are monitored for TDS and/or nitrate. In GMZs with potential data gaps, a stepwise process has been defined to confirm the data gaps prior to investing money in new well construction. Both of these approaches ensure a cost-effective means of collecting the monitoring data needed to assess AWQ and assimilative capacity every five years.
Consider basin-specific conditions in establishing the number, type, or density of monitoring locations to be sampled	<ul style="list-style-type: none">Local conditions were considered. Due to the complexity, variability, and diversity of aquifer conditions and uses across the SAR Watershed, a qualitative approach to determining the sufficiency of the monitoring network was applied. The analysis of potential data gaps is described in Section 3.3 and the potential data gaps in each GMZ are identified in Appendix C
Target areas with surface and ground water connectivity, where applicable	<ul style="list-style-type: none">Because monitoring network includes all wells in each GMZ that are monitored for TDS and/or nitrate, and potential data gaps are identified, the 2022 GMP sufficiently addresses this criteria.
Include existing wells that are located and screened appropriately to determine water quality throughout the most critical areas of the basin	<ul style="list-style-type: none">The 2022 GMP defines a monitoring network that includes all wells in each GMZ that are monitored for TDS and/or nitrate, including all municipal groundwater supply wells. Thus, the most critical areas of the GMZs are covered.
Leverage the wells in other regulatory programs, such as those defined for compliance with the Sustainable Groundwater Management Act	<ul style="list-style-type: none">The 2022 GMP defines a monitoring network that includes all wells in each GMZ that are monitored for TDS and/or nitrate.
Identify the stakeholders responsible for conducting, compiling, and reporting monitoring data	<ul style="list-style-type: none">The agencies responsible for monitoring the wells in the GMZ monitoring network are listed in the tables in Appendix A.The agencies responsible for compiling and submitting the monitoring data to the Task Force are listed in the tables in Appendix A.The agencies responsible for addressing the potential data gaps shown in Appendix C are identified in Table 3-1 of Section 3.3.2



2022 Groundwater Monitoring Program

Table 1-1. How the 2022 Groundwater Monitoring Plan Addresses the Required Elements of the 2019 Recycled Water Policy and the 2021 Basin Plan Amendment

Required Elements	How the Report Addresses the Required Element
All monitoring data must be reported annually in a form that is compatible with the Groundwater Ambient Monitoring & Assessment (GAMA) information system.	<ul style="list-style-type: none">The deliverable for the 2021 AWQ Pilot Study will include a scope of work that the Task Force will perform to comply with the Basin Plan SNMP through Fiscal Year 2029. The 2021 AWQ Pilot Study is described in Section 4 of this Report. It will include a plan to annually collect the monitoring data.The preliminary schedule for starting annual data compilation is June 2025, following completion of the first five-year assessment of the Basin Plan SNMP. The preliminary schedule is shown in Table 5-1.
2021 Basin Plan Amendment	
The monitoring program must include:	
Monitoring program goals	<ul style="list-style-type: none">The monitoring program goals are described in Section 1.5.3
Responsible agencies	<ul style="list-style-type: none">The agencies responsible for monitoring the wells in the GMZ monitoring network are listed in the tables in Appendix A.The agencies responsible for compiling and submitting the monitoring data to the Task Force are listed in the tables in Appendix A.The agencies responsible for addressing the potential data gaps shown in Appendix C are identified in Table 3-1 of Section 3.3.2
Groundwater sampling locations	<ul style="list-style-type: none">The wells included in the monitoring network of each GMZ are provided in Appendix A. For each GMZ, there is a table and map identifying each well in the monitoring network.
Water quality parameters	<ul style="list-style-type: none">The water quality parameters are named in Section 3.1 and include TDS and nitrate.
Sampling frequency	<ul style="list-style-type: none">The TDS and nitrate sampling frequency of each well is identified in the GMZ monitoring network tables in Appendix A.
Quality assurance/quality control (QA/QC)	<ul style="list-style-type: none">The 2021 AWQ Pilot Study includes protocols for QA/QC of all data used to assess AWQ and assimilative capacity, and provides for establishing long-term methods to manage data that will include QA/QC protocols. The 2021 AWQ Pilot Study is described in Section 4 of this Report.



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Table 1-1. How the 2022 Groundwater Monitoring Plan Addresses the Required Elements of the 2019 Recycled Water Policy and the 2021 Basin Plan Amendment

Required Elements	How the Report Addresses the Required Element
Database management	<ul style="list-style-type: none">The deliverable for the 2021 AWQ Pilot Study will include a scope of work that the Task Force will perform to comply with the Basin Plan SNMP through Fiscal Year 2029. The 2021 AWQ Pilot Study is described in Section 4 of this Report. It will include a plan to annually collect the monitoring data and manage it in a database.The preliminary schedule for starting annual data compilation is June 2025, following completion of the first five-year assessment of the Basin Plan SNMP. The preliminary schedule is shown in Table 5-1.
Data analysis and reporting	<ul style="list-style-type: none">Section 4 of this report describes the 2021 AWQ Pilot Study, which includes the analysis and reporting of AWQ and assimilative capacity.Section 5 of this report summarizes the tasks and schedule for data analysis and reporting tasks through Fiscal Year 2029. The work tasks and schedule will be refined as part of the 2021 AWQ Pilot Study.

1.5.3 2022 GMP Goals

It has been 27 years since the Task Force was formed and 18 years since the adoption of the current Basin Plan SNMP. Since 2004, AWQ has been recomputed six times. The last 18 years of implementation of the Basin Plan SNMP have led to a better understanding of water quality, how TDS and nitrate concentrations are changing in GMZs, and the factors that are driving those changes. For example, in many GMZs, the AWQ has exceeded the Basin Plan Antidegradation Objectives since 2004 (examples: Menifee, Perris-South, and Chino-South GMZs) and very few of these GMZs have overall water quality trends that suggest assimilative capacity can be achieved in the near-term. At this stage of implementation of the Basin Plan SNMP, and in consideration of the 2019 Recycled Water Policy requirements and guidelines, it is appropriate to look back at what the Task Force has learned in implementing the 2005 GMP and leverage the lessons into developing a more efficient, yet robust, approach to the 2022 GMP. Accordingly, the goals of the 2022 GMP are to:

1. Document the groundwater monitoring network in each of the 35 GMZs
2. Address potential data gaps, including:
 - a. Assess each GMZ monitoring network to identify potential data gaps
 - b. Define the additional information needs to confirm data gaps in the GMZ monitoring networks
 - c. Define a process and schedule to obtain the information and fill any data gaps



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3. Identify potential modifications to the technical methods used to compute AWQ and assimilative capacity and a plan to pilot them and formalize the ongoing technical methods, including:
 - a. Document the key lessons learned from past technical work
 - b. Document stakeholder input on the improved and/or alternative methods that should be considered
 - c. Define the scope of work to perform a pilot study of the potential methodologic and process improvements (AWQ Pilot Study)
4. Identify the work the Task Force will need to perform to comply with the SNMP (including anticipated amendments to conform with the 2019 Recycled Water Policy) and to support the Santa Ana Water Board's 5-year SNMP assessments that are due in April 2024 and April 2029

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2.0 GROUNDWATER MONITORING PROGRAM REVIEW

This section describes (i) the approach that was implemented to educate the Task Force members and solicit input and feedback to inform the 2022 GMP, (ii) the data review and analysis that was performed to support the Task Force workshops and GMP update, (iii) the key findings and lessons learned over the history of implementing the 2005 GMP, and (iv) the stakeholder feedback received and relied on to prepare the 2022 GMP.

2.1 Approach to Obtain Task Force Input

The current technical methods utilized to collect data and compute AWQ and assimilative capacity were developed through a collaborative stakeholder process with the Task Force that culminated in the 2004 Basin Plan amendment (see Section 1.4 of this Report). To prepare the 2022 GMP, it was important to rely on a similar collaborative approach to obtain feedback from the Task Force members on potential adaptations to the current program in a manner that will meet the requirements and goals of the 2022 GMP. From August 2021 through October 2022, West Yost led a series of workshops to educate the Task Force members and solicit questions and input on the groundwater monitoring networks, how to address potential data gaps, the technical approach to performing the AWQ, and the work to be performed by the Task Force over the next seven years to comply with the Basin Plan SNMP. The workshop presentations covered a range of regulatory, policy, and technical topics. The content for the workshops was derived from existing reports, regulatory documents, and new data characterizations utilizing information from the recent 2018 AWQ Recomputation (WSC, 2020).

Table 2-1 lists the meeting dates, presentation titles, and a brief explanation of the main presentation content. Appendix D of this report contains the presentation materials from each workshop (if applicable).

Table 2-1. Task Force Workshops to Support Development of the 2022 GMP

Date	Presentation Title	Presentation Contents
August 24, 2021 ^(a)	Recycled Water Policy and How Does Santa Ana River Salt & Nutrient Management Plan Measure Up?	Presented on the Santa Ana Water Board requirement to prepare the 2022 GMP, the 2019 Recycled Water Policy, and an overview of how the current Basin Plan SNMP aligns with the Recycled Water Policy requirements
September 23, 2021 ^(b)	Data Request	Provided an overview of the data request that will be sent to the Task Force members to compile information about their ongoing monitoring efforts
October 28, 2021 ^(a)	Critical Analysis of SAR SNMP Ambient Water Quality and Alternative Methods to Comply Pt. 1: What Have We Learned in 17 Years of Implementation?	Provided an overview of the technical methodology utilized to compute AWQ, the lessons learned about the methods and state of water quality in the Watershed, highlighted the areas that the current program does well, and recommended features of the methods that could be updated and improved



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Table 2-1. Task Force Workshops to Support Development of the 2022 GMP

Date	Presentation Title	Presentation Contents
December 13, 2021 ^(a)	Critical Analysis of SAR SNMP Ambient Water Quality and Alternative Methods to Comply Pt. 2: Consideration of Alternative Methods	Continuation of previous topic where an overview of detailed questions for consideration in updating the ongoing methods and data collection process were reviewed with the Task Force to elicit feedback, citing specific examples of data and results to support obtaining feedback
January 27, 2022 ^(b)	Task 2 of the BMPTF 2021-2022 Planning Priorities, Progress and Next Steps	Provided an update on the status of collecting data and information from the Task Force members on the current monitoring efforts and reminded members to schedule meetings to discuss input and feedback on the information presented to date
February 22, 2022 ^(a)	Task 2 of the BMP TF 2021-2022 Planning Priorities, Progress and Next Steps	Provided an update on the status of collecting data and information from the Task Force members on the current monitoring efforts and reminded members to schedule meetings to discuss input and feedback on the information presented to date
April 11, 2022 ^(a)	Critical Analysis of AWQ Methods – Pt. 3 The Case for Prioritization	(1) Provided an overview of the feedback received to date on the considerations for updating the data collection and AWQ methods and (2) presented data and evidence to support methodological/process updates that could improve the workflow of the AWQ process through prioritization of analytical efforts, including concepts for piloting these ideas for the 2021 AWQ recomputation
May 24, 2022 ^(a)	Groundwater Monitoring Plan and AWQ Methods – Status Update	Presented on (1) the proposed outline of the 2022 GMP, (2) the next step for identifying potential data gaps in GMZs now that all the Task Force monitoring information is collected and deemed complete, and (3) the draft conceptual scope of work for the 2021 AWQ Pilot Study
June 22, 2022 ^(a)	Groundwater Monitoring Plan and AWQ Methods – Status Update	Presented on the remaining work to do to complete development of the 2022 GMP and provided a brief overview of how potential data gaps are being identified
August 30, 2022 ^(a)	Groundwater Monitoring Program Data Gaps	Presented on the process of identify areas of potential data gaps in the GMZs, the draft process for addressing potential data gaps, and the draft matrix of responsible parties

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Table 2-1. Task Force Workshops to Support Development of the 2022 GMP

Date	Presentation Title	Presentation Contents
September 27, 2022 ^(a)	Recap and Recommended 2021 Ambient Water Quality Pilot Study	Provided a recap of the purpose of the project and regulatory requirements, an overview of all Task Force input received, presented a revised draft scope of work for the 2021 AWQ Pilot Study, and presented the vision of the future Task Force work through Fiscal Year 2028/29 to comply with the Basin Plan SNMP
October 31, 2022 ^(c)	2022 Groundwater Monitoring Program	Presented an overview of the draft 2022 GMP report and how to provide feedback
<p>(a) Presentation slides for this workshop are included in Appendix D.</p> <p>(b) Verbal update and no slides were presented.</p> <p>(c) Future meeting, presentation to be included in final draft of report.</p>		

During the course of the development of this 2022 GMP, West Yost participated in additional meetings with SAWPA, the Santa Ana Water Board, and Task Force members to obtain input. Meetings included:

- Meetings with Task Force members. West Yost invited all interested Task Force members to discuss input and feedback into the process, in addition to discussing the ongoing groundwater monitoring efforts.
- Periodic Meetings with the Task Force administrator (Mark Norton), Task Force policy consultant (Tess Dunham, KSC), and Santa Ana Water Board Staff (Cindy Li, Keith Person, and/or Eric Lindberg). The purpose of these meetings was to ensure that any policy interpretations were consistent with the Santa Ana Water Board staff understanding and the 2022 GMP would meet the Santa Ana Water Board's requirements and expectations.
- One meeting with Task Force's Scoping Committee, including Santa Ana Water Board Staff. The purpose of this meeting was to help refine the scope of work for the 2021 AWQ Pilot Study.

The input received in these meetings was considered in the development of this plan together with the feedback from the Task Force workshops and agency meetings.

2.2 Data Collection, Review, and Analysis to Support 2022 GMP Update

Two of the key objectives of this 2022 GMP were to (1) document the ongoing groundwater monitoring that will be performed to support the Basin Plan SNMP and (2) identify the opportunities and approaches for modifying the current technical approach for the triennial recomputation of AWQ and assimilative capacity. To support these objectives, it was necessary to do a critical review of the data collection process, the data used in the analysis, and the analytical methods. The purpose of the review was to identify and understand the opportunities for improving the process and technical methods to better achieve the regulatory objectives and perform the work more efficiently over time. This report does not provide a detailed overview of the technical methodology used to compute AWQ. For a detailed understanding of the current methods, refer to the 2018 Recomputation of Ambient Water Quality report (WSC, 2020).



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The data collection, review, and analysis process involved:

1. Reviewing and summarizing the findings and recommendations of the AWQ recomputations performed to date, including:
 - a. Assessing AWQ trends and the state of assimilative capacity since 2004
 - b. Assessing the advancements in the interpretive tools employed to (1) characterize the drivers and trends in water quality over time and (2) assess the longevity of the groundwater monitoring networks
2. Summarizing historical and ongoing monitoring efforts, including:
 - a. Creating summary tables, by GMZ, of all the wells with data in the 2018 AWQ analysis
 - b. Coordinating with the Task Force members to identify which wells in each GMZ will continue to be monitored into the future, including identifying for each well: who performs the well sampling, how often TDS and nitrate data are analyzed, and who has been responsible to report the data to SAWPA and the Task Force in prior data collection efforts. This also involved outreach to numerous parties that are well owners, but are not members of the Task Force. The ongoing monitoring efforts comprise the groundwater monitoring network that is documented in Section 3 of this Report.
3. Assessing the spatial distribution of the historical and ongoing monitoring network by comparing the location of wells with data points used to contour TDS and nitrate relative to:
 - a. The spatial distribution of ambient TDS concentrations in the GMZ
 - b. The distribution of groundwater in storage within the GMZ boundary
 - c. The location of wells that continue to be monitored

The key take-aways from these reviews are discussed in Section 2.3.

2.3 Summary of Key Findings and Lessons Learned

2.3.1 Assimilative Capacity

As of 2022, there are a total of 35 GMZs in the SAR Watershed.⁶ Seven of the GMZs have maximum-benefit based TDS and nitrate objectives,⁷ and the rest are regulated via the antidegradation objectives established by the 2004 Basin Plan amendment. Figures 2-1 and 2-2 show the state of assimilative capacity for TDS and nitrate, respectively as of 2018.

With respect to TDS (Figure 2-1):

- Eleven GMZs have assimilative capacity for TDS. Of these,

⁶ In December 2020, a Basin Plan amendment was approved that consolidated the Bedford, Lee Lake, and Warm Springs GMZs into the Upper Temescal Valley GMZ. The Upper Temescal Valley GMZ has its own GMZ-specific SNMP that addresses the unique hydrogeology of the GMZ, the historical challenges in assessing AWQ and assimilative capacity, and provides an implementation plan that enables recycled water use and discharge in the GMZ by the Eastern Municipal Water District and Elsinore Valley Municipal Water District.

⁷ In December 2021, Basin Plan amendment was approved to incorporate maximum benefit objectives and a Maximum Benefit SNMP for the Elsinore GMZ.



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- six GMZ are Maximum Benefit GMZs with alternative objectives that were set to intentionally create assimilative capacity and enable recycled water use.
- 20 GMZs have no assimilative capacity for TDS. Of these,
 - 14 GMZs have had no assimilative capacity since the 2003 AWQ recomputation
 - Six GMZs lost assimilative capacity between the 2006 and 2018 AWQ recomputation
- Four GMZs have no assimilative capacity findings due to lack of data

With respect to nitrate (Figure 2-2):

- 10 GMZs have assimilative capacity for nitrate. Of these,
 - four GMZs are Maximum Benefit GMZs with alternative objectives that were set to intentionally create assimilative capacity and enable recycled water use.
- 20 GMZs have no assimilative capacity for nitrate. Of these,
 - 19 GMZs have had no assimilative capacity since the 2003 AWQ recomputation
 - One GMZ lost assimilative capacity between the 2006 and 2018 AWQ recomputation
- Four GMZs have no assimilative capacity findings due to lack of data

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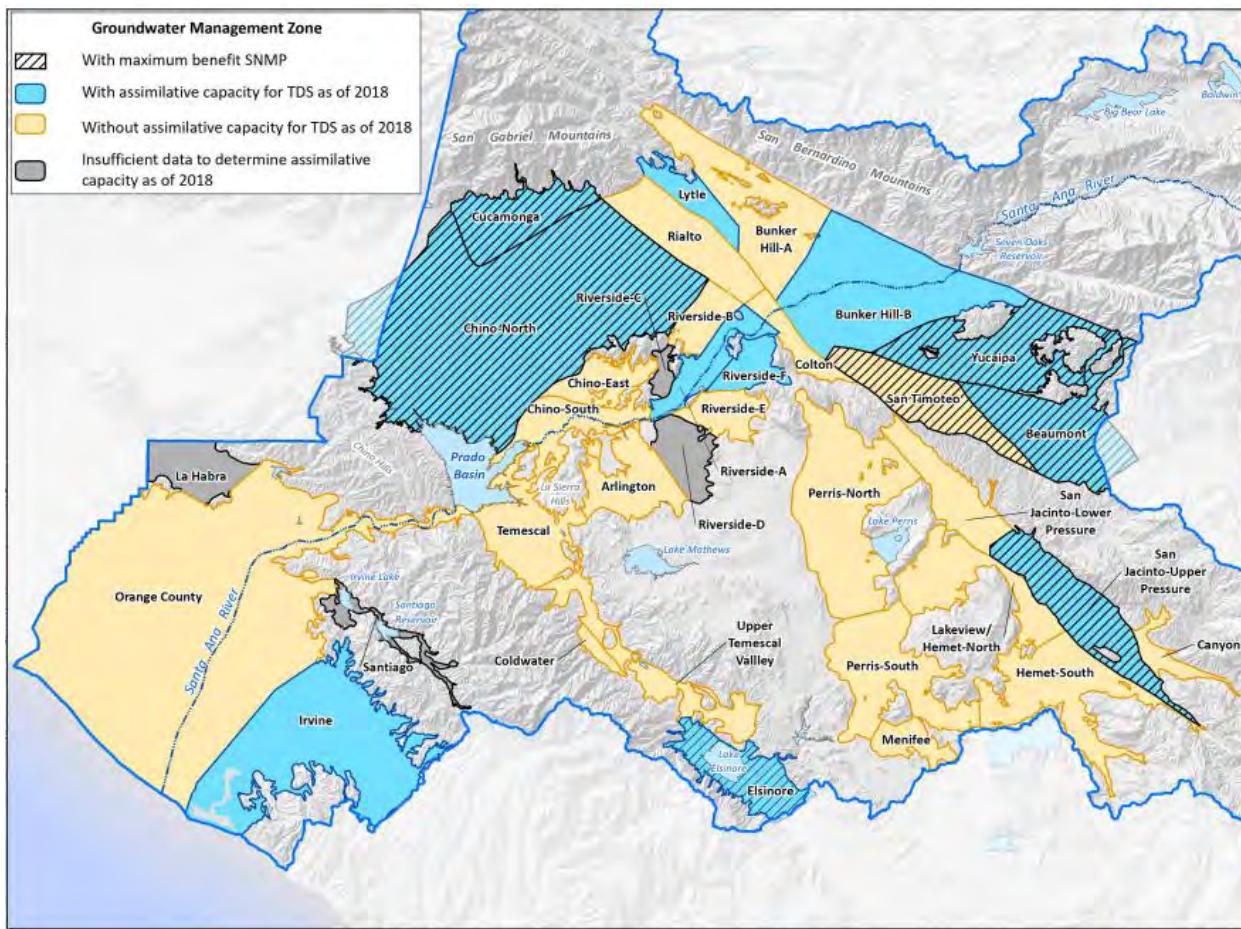


Figure 2-1 Groundwater Management Zones with Assimilative Capacity for TDS

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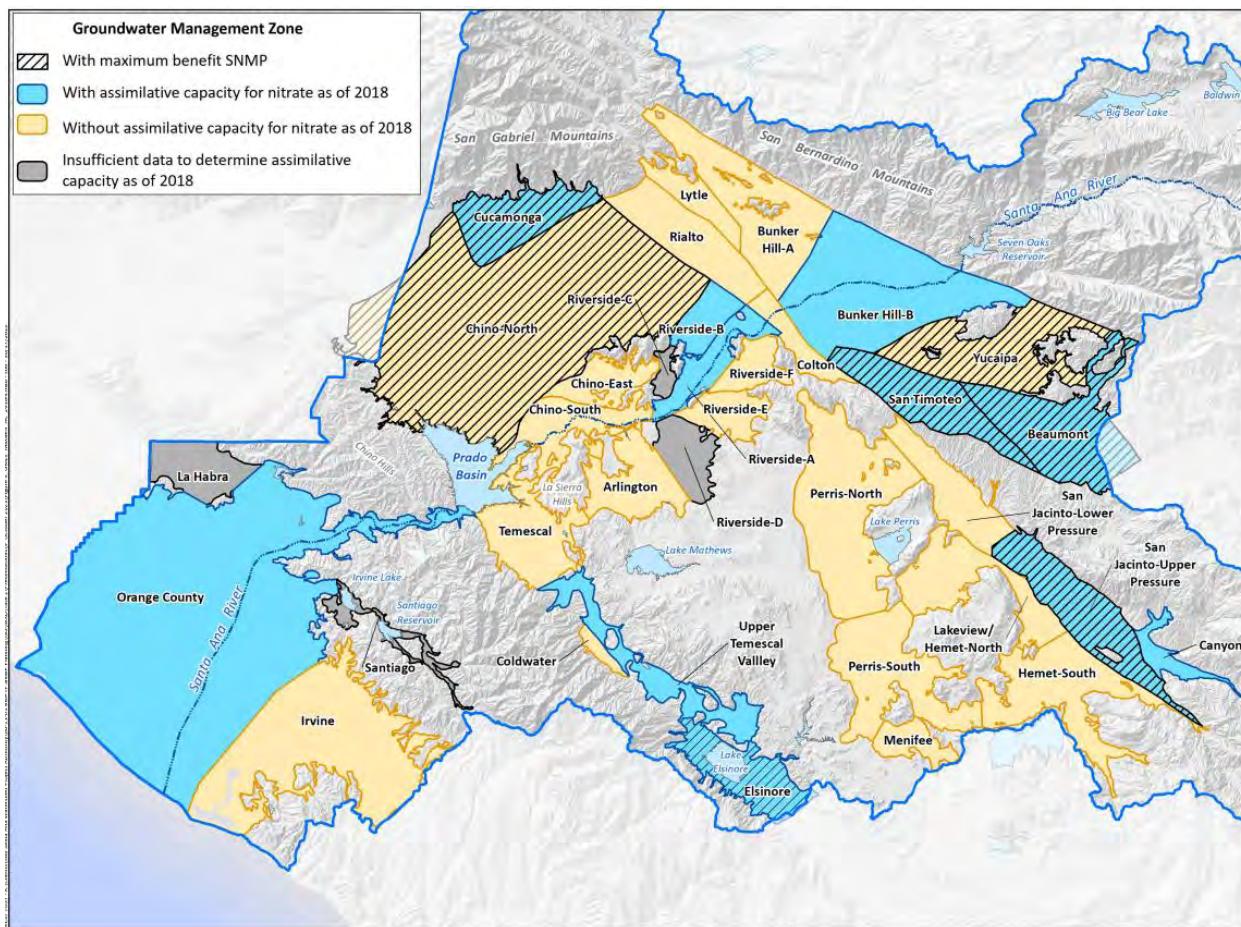


Figure 2-2. Groundwater Management Zones with Assimilative Capacity for Nitrate

The key takeaways from the history of AWQ and assimilative capacity findings are:

- The methods used to compute AWQ and assimilative capacity are producing consistent results over time, and thus groundwater quality is well understood across most of the SAR Watershed (e.g. where AWQ is able to be computed)
- Groundwater quality is relatively stable – although many GMZs do not have assimilative capacity for TDS or nitrate, concentrations are changing slowly
- If the TDS and nitrate concentrations and trends remain similar, it would be possible to make a quick qualitative assessment of AWQ for GMZs. For example, Figure 2-3 shows that the Perris South GMZ has never had assimilative capacity for TDS, ambient TDS is significantly above the antidegradation objective, and TDS concentrations have slowly been improving over time. If new data collected at the wells in the Perris-South GMZ continue to show the same magnitude and rate of change in TDS concentrations, it can easily be estimated that there remains no assimilative capacity in the GMZ. The history of information will be potentially very valuable in simplifying the determination of assimilative capacity, at least in some GMZs.

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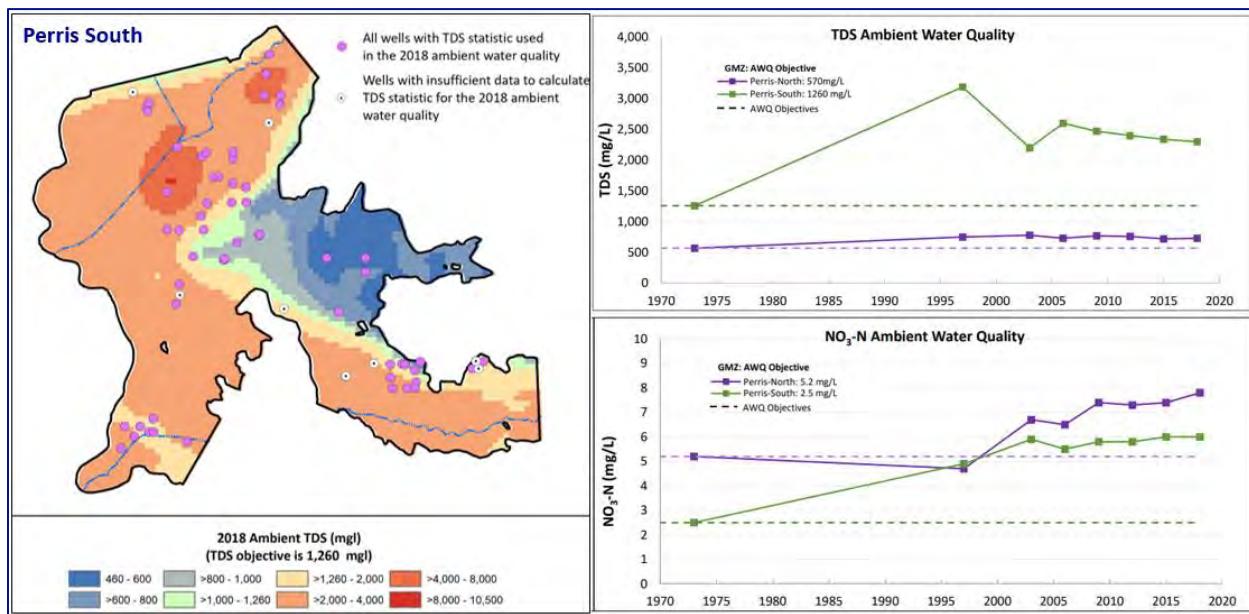


Figure 2-3. Ambient TDS Concentrations in the Perris South GMZ

2.3.2 Tools to Assess Changes in AWQ Over Time

Over the years, a series of interpretive tools was added to the AWQ recomputation project to better understand the drivers of changing water quality over time. The tools applied include:

- **Change maps.** The maps were introduced to illustrate the spatial distribution of changes in TDS and nitrate concentrations from one recomputation period to the next (e.g., from 2015 AWQ to 2018 AWQ).
- **Key well trend analysis.** This tool was used to compare changes in concentrations at wells relative to changes in AWQ concentrations. The robustness of the trend analysis has improved over time, from qualitative visual inspection of time history charts at a subset of key wells to the application of statistical methods to test for trends (Mann-Kendall trend analysis). And over time, the technology used to support the project was enhanced so the trends could be evaluated at all wells, not just a subset of key wells.
- **Well attrition analysis.** This tool was used to evaluate which wells would need to be sampled over the next three-year period to avoid creating potential data gaps in the monitoring network. The concern was that if wells are no longer sampled, they fall out of the analysis, and, if not replaced it will alter interpretation and interpolation of water quality statistics and reduces understanding of how basin is changing.
- **Other pilot exploratory tasks:**
 - Aquifer storage model update. In 2015, a pilot study was performed on the impact of updating the aquifer storage model on the AWQ result. This work was only performed once, for one GMZ (Chino-North).



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- Addressing potential data gaps. In 2015, a pilot effort to find new monitoring wells to fill data gaps was performed, but did not yield significant addition of wells to the monitoring network.
- Web tools for exploring data. In 2018, a new web-based exploratory tool was developed to improve review and QA/QC of data, and provide valuable information to the Task Force members related to TDS and nitrate concentrations and trends in the GMZs.

Some of the key observations from review of past AWQ recomputation include:

- The findings consistently note that changes in GMZ AWQ over time are driven by both systemic (physical) processes and analytical methodologies (e.g. more data). Thus, changes in ambient concentrations may not be actual changes in water quality, but rather a result of improvements or losses in the monitoring network. This illustrates the importance of having a well-defined groundwater monitoring network that is adequately distributed across the GMZ.
- The ambient concentration change maps have helped to illustrate where hot spots of concentrations may be occurring. Thus, understanding the spatial distribution of change can be important in understanding TDS and nitrate trends.
- The AWQ report recommendations have consistently identified that the GMZ aquifer properties should be updated as they are outdated in many GMZs and that the project could be streamlined through annual data collection.
- Well attrition analysis alone has not successfully yielded an improvement in the monitoring needed in critical areas of GMZs.

2.3.3 Spatial Distribution of the Historical and Ongoing Monitoring Network

Appendix B of this report contains maps for each GMZ that illustrate the spatial distribution of the historical and ongoing monitoring locations relative to ambient TDS concentrations and aquifer storage. The maps were used to support the assessment of potential data gaps. The maps in Appendix B are divided into two panels:

- The top panel shows the TDS concentration distribution raster for the GMZ based on the 2018 AWQ results and the location of wells with data used in the analysis for the 20-year period of 1999 to 2018. This map provides an understanding of the spatial coverage of data in the most recent analysis. The location of wells with data used to develop the raster are shown as follows:
 - **Green Circles** are wells that had enough data to compute a TDS *and* nitrate statistic in 2018.
 - **White circles** are wells that only had a TDS or nitrate statistic. There was only enough qualifying data for one of the two constituents.
 - **Purple triangles** are wells that had insufficient data available to calculate the AWQ statistic.
- The bottom panel shows the storage volume distribution raster for the GMZ and a characterization of the relative time period of available data at each well location. Note that areas in grey and dark brown have no to limited aquifer volume. The wells are further characterized as follows:

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- Wells shown as an **open circle filled with a purple circle** are wells whose qualifying data to generate statistics included data in the last three years of the 20-year analysis period: 2016, 2017 and/or 2018. This was an initial indication that the well location is still being monitored. If there is a **black check mark in the center of the purple circle**, it was confirmed the well continues to be monitored.
- Wells shown as an **open black circle only** are wells whose qualifying data to generate statistics was limited to the time period from 1999 to 2015. This was an initial indication that the well location is no longer monitored. As time progresses, these points will be lost as statistics since they are now confirmed to no longer be monitored.
- Wells shown as an **open circle with a black check mark (no purple circle)** are wells whose qualifying data to generate statistics was limited to the time period from 1999 to 2015 even though new data was available for the well in 2016, 2017, and/or 2018. This means that the data was not collected for the 2018 analysis. See for example maps of San Jacinto Upper Pressure, Beaumont, and Lytle GMZs.
- Wells shown as a **black check mark only** are wells that are currently being monitored as of 2022, but did not have sufficient data to qualify for the 2018 analysis.

The key takeaways from review of the 2018 AWQ data, the ongoing monitoring network, and the maps included in Appendix C were:

- There is an enormous amount of data that needs to be collected each year. Without a defined monitoring network to compare the data collected to, it can be easy to miss data.
- Data is being collected at wells that are not within the saturated aquifer system of the GMZs. If these wells are used to interpolate and extrapolate contours contiguously with wells in the saturated system, it could result in inaccurate representations of the spatial distribution of water quality.
- The maps produced in the AWQ report display water quality concentrations out beyond the extent of the saturated aquifer system. This can be misleading as the “concentrations” in these areas are not contributing to the AWQ finding because there is no water volume in these areas.
- Many GMZs have very limited data relative to the spatial extent of the saturated aquifer. This results in extrapolation of TDS and nitrate concentrations over large areas. This could lead to over or under-estimation of AWQ and available assimilative capacity.
- A lot of data is collected for monitoring wells associated with landfills and clean-up sites. Many of the wells are outside the saturated aquifer system. There are two potential issues:
 - Collection, QA/QC, and management of data is time consuming and expensive. The effort to perform data collection could be reduced by limiting the wells to only those that are within the saturated aquifer system.
 - Often the landfill wells have high TDS and thus if used in contouring could be biasing the results by extrapolating between points that are not both within the saturated system.

2.4 Task Force Input and Feedback

All of the analysis and observations documented in Section 2.3 were included in the Task Force workshop presentations to educate the stakeholders and to generate conversation around the methods for defining the monitoring network and the recomputation of AWQ and assimilative capacity. A series of questions



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to explore with the Task Force were developed based on the observations to guide the following components of the 2022 GMP:

1. The composition of the groundwater monitoring networks
2. The identification of potential data gaps
3. The development of a process to address potential data gaps
4. The scope of work for the 2021 AWQ Pilot Study

Table 2-1 summarizes the considerations explored with the Task Force, the inputs provided by the Task Force members, and the recommended approach to including the considerations, or not, into the above listed components of this 2022 GMP.

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Table 2-2. Summary of Considerations, Inputs from the Task Force, and Recommendations for the Update of the Groundwater Monitoring Network and Ambient Water Quality Method

Question for Consideration by the Task Force	Input from the Task Force	Recommendation
Groundwater Monitoring Network and Procedure to Add Wells to the Monitoring Network		
Should the monitoring network be reduced by only including key wells and removing non-key wells?	No, many GMZs are too complex to do this effectively. We should focus on adequate spatial distribution of ongoing monitoring, and periodic check to fill data gaps as wells are lost.	<ul style="list-style-type: none"> Define the initial monitoring network of all wells that are actively being monitored or planned to be monitored. Identify areas of potential data gaps in each GMZ.
Should landfill wells be included in the monitoring network?	Only include landfill wells that are within the saturated aquifer system and include those wells that are isolated by slurry walls and outside of the saturated aquifer system.	<ul style="list-style-type: none"> Identify the wells that are in the saturated zone of each GMZ for inclusion in the monitoring program. Collect and process the data from only the wells identified in the monitoring program going forward each year.
Should the wells with high TDS concentrations located along the Pacific Coast of the Orange County GMZ be included in the monitoring program and in the ambient concentration?	Yes, they are located within the saturated zone of the aquifer system.	<ul style="list-style-type: none"> Include these wells in the monitoring program.
Can a qualitative approach be applied to identify potential data gaps?	<p>A quantitative approach to defining the number of wells should be considered similar to the BMPs established by DWR for SGMA compliance.</p> <p>Yes, but it needs to be clear that the gaps are potential data gaps, not actual data gaps. We know that the GMZ aquifer properties have been updated, as an example, so therefore the gaps might not be real.</p>	<ul style="list-style-type: none"> Due to the diversity and varying complexity of the GMZs, it is unreasonable to define a strict quantitative approach to identifying data gaps. Potential data gaps will be assessed qualitatively in consideration of areas where wells have been lost, large spatial gaps, and gaps in areas of GMZs with large amounts of water in storage.
Should new wells be constructed to fill data gap areas?	No, a tiered approach to fill data gap areas will need to be developed to allow 1) time to identify existing wells that could be incorporated into the monitoring program, 2) well siting feasibility analysis to fill remaining gaps, and 3) construct wells if feasible	<ul style="list-style-type: none"> Finalize procedure to fill data gaps and implement this procedure over the next several years. The procedure does not need to be specific in order to create flexibility in defining ways to address data gaps.
Should addressing data gaps be prioritized? If yes, how?	Yes, prioritize based on if there is assimilative capacity and recycled water discharge/permits, and drinking water wells located in the GMZ. However, there should be exceptions for prioritization if there is a very small volume of recycled water use or use is very spatially concentrated in the GMZ. If analysis demonstrates there are new data gaps during the ambient water quality recomputation, data gap prioritization will need to be reassessed.	<ul style="list-style-type: none"> Finalize criteria for deferring filling data gaps. It is proposed that the data gaps do not need to be filled until there is planned recycled water discharge/use or imported water recharge in the GMZ within the next five-year period. Reassess data gaps during the ambient water quality recomputation which will be performed every five-year.
Who should be responsible for addressing data gaps?	The agencies that 1) use or discharge recycled water in the affected GMZs and 2) has water supply wells located in the affected GMZs.	<ul style="list-style-type: none"> Create and finalize a matrix that identifies responsible parties for each GMZ in the watershed.

Table 2-2. Summary of Considerations, Inputs from the Task Force, and Recommendations for the Update of the Groundwater Monitoring Network and Ambient Water Quality Method

Question for Consideration by the Task Force	Input from the Task Force	Recommendation
Ambient Water Quality Methods		
Should the computation continue to use water quality data from the last 20-year period?	Generally yes because more data will become available as the monitoring program is improved for the long-term. However, the Task Force is open to exploring alternative time periods since data have improved through the years.	<ul style="list-style-type: none"> Continue to utilize the 20-year period and do not pilot different analysis period.
Should the computation continue to rely on the statistical analysis method developed in 2004?	Generally yes but the Task Force is opened to pilot other method or identify ways to streamline the analysis. Some GMZs may warrant case-specific changes (i.e., Upper Temescal Valley SNMP) but this should be done as part of the recomputation required in the SNMP.	<ul style="list-style-type: none"> Continue to rely on the statistical analysis method developed in 2004 to prepare point statistics at wells and compute volume-weighted ambient water quality, where warranted per the outcomes of the 2021 AWQ Pilot Study
Ambient Water Quality Methods		
Should we prioritize wells with recent data that are still being monitored in statistical analysis (e.g. only include these data in the analysis)?	No, the computation should continue to use all data and focus on improved monitoring network going forward that deals with data gaps.	<ul style="list-style-type: none"> Use all available data for all wells within the saturated zone of the GMZs, even if the well is no longer monitored. Fill identified data gaps to ensure sufficient spatial coverage of GMZ in the future when the wells with historical data are no longer in the 20-year timeframe of the analysis
Should we prioritize GMZs to perform ambient water quality recomputation based on historical results, current water quality, and regulatory compliance factors to reduce the level of effort to perform the analysis?	Yes, this should be piloted, but there needs to be a focus to continue collecting data in all GMZs, and long-term cost of methods should be less than the current method	<ul style="list-style-type: none"> Pilot procedures to make the standard method more efficient. Pilot alternative approaches based on historical trends and statistics and use this information to determine if a full analysis per standard method is appropriate (e.g. because change in trend)
Should we consider the extent of the saturated aquifer system in contouring, statistical analysis, and map presentations?	Yes, we should limit the analysis to wells located in the saturated aquifer system and only extent the interpolation within the saturated area.	<ul style="list-style-type: none"> Develop contours, rasters, and other characterizations that do not extrapolate beyond the boundaries of the saturated system.
Should the aquifer parameters defined in 2004 be updated?	<p>Yes; however, we should not update all the aquifers properties for multiple GMZs simultaneously. It may be more cost effective to 1) do this one by one or only a few at a time over time and 2) determine when to update based the next required update of the aquifer parameters for the GMZ (e.g. Chino Basin updates the model every five years).</p> <p>We also need to be cognizant of the impact to the Basin Plan objectives if we update the aquifer parameters</p>	<ul style="list-style-type: none"> The 2021 AWQ Pilot Study deliverable should 1) update aquifer parameters for maximum-benefit GMZs, if timing is appropriate and 2) include a plan and schedule to complete the update of aquifer parameters in remaining GMZs before the next 5-year assessment is due in April 2029.
What other updates should be considered for the method?	Ideas for improving the efficiency and reducing the cost of the routine analyses.	<ul style="list-style-type: none"> Use the 2021 Ambient Water Quality Pilot Study as an opportunity to pilot using existing water level contours prepared for the GMZs by others to reduce data collection, processing, and analysis costs (e.g. water level contours prepared for SGMA annual reporting). Use the 2021 Ambient Water Quality Pilot Study as an opportunity to develop processes (e.g. coding for automation) to reduce analysis time.
	The pilot study can use ISARM to calculate ambient water quality	<ul style="list-style-type: none"> This could be considered; however, not enough information was provided on how to do this to be included in the recommended pilot study.



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3.0 GROUNDWATER MANAGEMENT ZONE MONITORING NETWORKS AND POTENTIAL DATA GAPS

This section, together with Appendix A and Appendix C, documents the current monitoring network in each GMZ, identifies the potential data gaps for which additional information needs to be compiled and assessed to confirm the potential data gaps, and identifies the process to obtain the information and fill any data gaps that do exist.

3.1 Groundwater Management Zone Monitoring Network

This 2022 GMP defines a monitoring network that includes all known wells in each GMZ that are monitored for TDS and/or nitrate. Extensive work was performed to identify every well that is planned to be sampled for TDS and/or nitrate in the future. If a well owner could not be contacted, or status of sampling could not be verified, it was not included in the monitoring network.

Appendix A defines the monitoring network for 32 of the 35 GMZs in the SAR Watershed. For each GMZ, Appendix A includes:

Table A – Groundwater Monitoring Network. The table lists each well in the monitoring network. For each well, the table identifies:

- **Well ID.** This is the Well ID in the 2018 AWQ Database, if the well was in existence for that project. If the well is new, the Well ID shows as “NA”. The Well IDs will need to be updated after the well information are collected and a Well ID is assigned.
- **Owner.** This is the owner of the well.
- **Well Name.** This is the name of the well as provided by the owner, or monitoring entity.
- **Well Label (Figure A)⁸.** In the case of long well names, this is the abbreviated well name used to label the wells in Figure A.
- **Sampling Frequency.** This is the current sampling frequency for TDS and nitrate concentrations at the well. Sampling frequencies vary from monthly to triennially.
- **Agency Responsible for Water Quality Monitoring.** This is the agency that physically visits the well to collect water quality samples. The monitoring agency may not be the same as the well owner, or the agency responsible to compile and deliver the data to the Task Force.
- **Agency Responsible to Compile and Deliver Data to Task Force.** This is the agency responsible to compile and deliver the TDS and nitrate data to the Task Force, when requested.

Figure A – Groundwater Monitoring Network. Figure A is a map of the groundwater monitoring network. The wells are labeled by the “Well Label” name shown in Table A and are symbolized by monitoring agency.

⁸ For GMZs with many wells, the table and map exclude the Well Label. Due to the number and density of wells, labeling them was not practical. GMZs without well labels include Chino-North, Irvine, and Orange County.



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There are three GMZs with no monitored wells: La Habra, Riverside-D, and Santiago. These GMZs do not appear in Appendix A.

3.2 Potential Data Gaps

As described in Section 2, the prior interpretive tools task of the AWQ project did not yield the desired outcomes of addressing future potential data gaps. Although the wells at risk of being lost from the analysis were identified and the well owners were contacted and asked to resume sampling, few if any wells were added to the monitoring networks. One of the goals of this 2022 GMP was to provide a comprehensive framework for addressing potential data gaps in the GMZ monitoring network to better enable the agencies responsible (Responsible Agencies) to take actions to resolve them.

Methods to (1) identify potential data gaps in each GMZ and (2) resolve the potential data gaps, was developed, in part, based on feedback from the Task Force members. The assessment and process are described below.

3.2.1 Assessment to Identify Potential Data Gaps

Due to the diversity and varying complexity of the GMZs, it was deemed unreasonable to define a strict quantitative approach to identifying data gaps. An example of a quantitative approach to determining if you have a sufficient monitoring network is to define a target number of wells per area (e.g., per square mile). As an alternative approach, potential data gaps were identified qualitatively as follows, supported by the information mapped in the figures in Appendix B.:

- In areas where the storage raster shows significant aquifer volume and there are either no wells monitored or there are large spatial gaps between monitored wells, there is a potential data gap
- In areas with high TDS concentrations (hot spots) where a spatial gap is created by well(s) with data that have generated statistics in the past but are no longer monitored, there is a potential data gap
- In areas where a significant spatial gap is created by wells with data that have generated statistics in the past but are no longer monitored, there is a potential data gap
- If a well with data that generated statistics in the past is no longer monitored but occurs in an area with limited aquifer storage (grey and brown areas in the Appendix B figures), it was not deemed a potential data gap.
- If a well is no longer monitored, but is reasonable in proximity to wells that continue to be monitored, it was not deemed a potential data gap.

The data gaps are considered “potential” at this stage for two reasons:

1. The GMZ boundaries and aquifer storage properties were defined in the early 2000s and in many GMZs, there are improved aquifer characterizations. Thus, what is seen as a data gap relative to the 2004 GMZ delineations may actually not represent a real gap based on today's understanding of the aquifer system. It was not possible in the scope of work for this project to learn enough about the specifics of updated hydrogeologic characterizations in every GMZ.
2. Though considerable efforts were made to contact as many well owners as possible in developing this 2022 GMP, it was not possible to reach all owners. And, in some cases existing



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wells were identified that could fill potential data gaps, but those wells are not currently monitored. There is the potential to do additional outreach to the owners to arrange to have the wells monitored for water quality.

For these reasons, there needs to be a process whereby the potential data gaps can be investigated in greater detail. The investigations will be implemented in a stepwise approach to evaluate options that could avoid the cost of filling data gaps with new well construction. The investigations to address the potential data gaps are best addressed by the agencies operating in the GMZs, as was noted in the feedback from the Task Force members (see Table 2-2). The process to investigate potential data gaps is described in Section 3.2.2.

Appendix C contains a map of each GMZ that shows the location of any potential data gaps identified. The area of the potential data gap is shown as a red circled area on the map. If no potential data gaps were identified, then the map indicates “no data gaps”. Note that if there is no existing monitoring network in a GMZ (e.g., there are no monitored wells in the GMZ), then no map was prepared. As noted in Section 3.1 there are three GMZs with no monitoring networks: La Habra, Riverside-C, and Santiago. For these GMZs, Table 3-1 indicates that two to four potential data gaps need to be addressed, if appropriate based on the below stepwise process.

3.2.2 Process to Investigate Potential Data Gaps

Table 3-1 lists the GMZs in the SAR Watershed and for each GMZ shows the number of potential data gaps identified and the Responsible Agencies identified to address them. Also shown in Table 3-1 are four features that could be used to assess the importance of filling the potential data gaps. The four features shown in Table 3-1 are:

- Recycled water that is discharged to the SAR or its tributaries recharges into the GMZ
- Recycled water is used for direct non-potable use or recharge in the GMZ
- Imported water is recharged in the GMZ
- GMZ used for municipal or domestic supply

Potential data gaps would be important to fill when there are recycled water (or other discharge) permitting decisions that need to be made based on the AWQ findings, if imported water is recharged in the GMZ and the Responsible Agencies perform modeling in accordance with the Cooperative Agreement, and/or if the groundwater in the GMZ is used for municipal or domestic water supply. If none of these features are relevant, then the potential data gaps need not be investigated immediately, as described in the following stepwise process.

Table 3-1. Number of Potential Data Gaps in Each GMZ and the Parties Responsible to Address Them

Groundwater Management Zones	GMZ Features				Number of Potential Data Gaps Identified	Responsible Agencies for Addressing Potential Data Gaps																				
	Recycled water that is discharged to the SAR or its tributaries recharges	Recycled water is used for direct non-potable use or recharge in the GMZ	Imported water recharge in GMZ	GMZ used for municipal or domestic supply		Eastern MWD	Beaumont Cherry Valley WD	City of Banning	City of Beaumont	San Gorgonio Pass WA	Yucaipa Valley WD	San Bernardino County Special Districts Department	San Bernardino Valley MWD	City of Redlands	East Valley WD	City of Rialto	City of Colton	City of San Bernardino	City of Riverside	Western Municipal WD	Cucamonga Valley WD	Chino Basin Watermaster	Inland Empire Utilities Agency	Jurupa CSD	Elsinore Valley MWD	Lee Lake Water District
San Jacinto Basins																										
Canyon		X	X		1	X																				
San Jacinto Upper Pressure	X	X	X		0	X																				
San Jacinto Lower Pressure	X				1	X																				
Hemet South	X		X		2	X																				
Lakeview/Hemet North	X		X		0	X																				
Perris North		X		X	0	X																			X	
Perris South				X	0	X																				
Menifee		X		X	1	X																				
Beaumont/Yucaipa Plain																										
Beaumont	X	X	X	X	1		X	X	X	X	X															
San Timoteo	X			X	0					X	X															
Yucaipa		X	X	X	2							X														
San Bernardino Basin																										
Lytle		X		X	1							X	X													
Bunker Hill-A	X	X	X		1							X	X													
Bunker Hill-B	X	X	X	X	1									X	X	X										
Rialto				X	0									?			?									
Colton	X			X	1									?			?	?	?							
Riverside and Arlington Basins																										
Riverside-B		X		X	2													X								
Riverside-C					3 - 4																			X		
Riverside-A	X				2													X	X	X						
Riverside-F				X	2														X							
Riverside-E				X	1														X							
Riverside-D					2 - 3													X								

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Last Revised: xx-xx-xx

Table 3-1. Number of Potential Data Gaps in Each GMZ and the Parties Responsible to Address Them

Groundwater Management Zones	GMZ Features				Number of Potential Data Gaps Identified	Responsible Agencies for Addressing Potential Data Gaps																				
	Recycled water that is discharged to the SAR or its tributaries recharges	Recycled water is used for direct non-potable use or recharge in the GMZ	Imported water recharge in GMZ	GMZ used for municipal or domestic supply		Eastern MWD	Beaumont Cherry Valley WD	City of Banning	City of Beaumont	San Gorgonio Pass WA	Yucaipa Valley WD	San Bernardino County Special Districts Department	San Bernardino Valley MWD	City of Redlands	East Valley WD	City of Rialto	City of Colton	City of San Bernardino	City of Riverside	Western Municipal WD	Cucamonga Valley WD	Chino Basin Watermaster	Inland Empire Utilities Agency	Jurupa CSD	Elsinore Valley MWD	Lee Lake Water District
Arlington		X		X	2																					
Chino and Cucamonga Basins																										
Cucamonga			X		3																					
Chino-North		X	X	X	2																					
Chino-East				X	3																					
Chino-South	X			X	3												X	X	X							
Elsinore and Temescal Valleys																				X						
Elsinore		X		X	2																					
Upper Temescal Valley	X	X		X	0	X																				
Coldwater				X	0																					
Temescal	X	X		X	2																					
Orange County																				X						
La Habra					2 - 3																				X	
Orange County	X	X	X	X	0																				X	
Santiago					2 - 3																				X	
Irvine		X		X	0																				X	

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For GMZs where potential data gaps were identified, the Responsible Parties will follow a four-step process to guide them through addressing the potential data gaps. For each step, a question is posed, and the answer determines if the Responsible Agency has satisfied the potential data gap or if additional steps must be taken. The steps are:

- Step 1. Determine if it is important to address the potential data gaps now
- Step 2. Eliminate Potential Data Gaps with Additional Hydrogeologic Information
- Step 3. Eliminate Potential Data Gaps by Monitoring Existing Wells
- Step 4. Fill data gaps with construction of new monitoring wells

Step 1. Determine if it is important to address the potential data gaps now

Does the GMZ with the identified potential data gaps have any of the four features shown in Table 3-1 that suggest it is important to fill the potential data gaps?

No – Potential data gaps do not need to be addressed until one or more of the four features will become relevant within the next five-year period (e.g., new recycled water reuse projects, or development of potable water supply). Responsible Agencies for the GMZ must (1) notify the Santa Ana Water Board and Task Force in writing of this finding and (2) update Santa Ana Water Board every five years as to any changes that would trigger the need to address data gaps.

Yes – Responsible Agencies Proceed to Step 2 of addressing potential data gaps.

Step 2. Eliminate Potential Data Gaps with Additional Hydrogeologic Information

Do the Responsible Agencies have new hydrogeologic information developed after 2004 that could refute the finding that a potential data gap exists? (For example, is there a new hydrogeologic conceptual model that illustrates that the AWQ storage model is outdated and would impact the identification of data gaps?)

No – Responsible Agencies Proceed to Step 3 of addressing data gaps.

Yes – Prepare a technical memorandum (TM) that summarizes the hydrogeologic evidence that the identified potential data gaps do not need to be addressed. The TM must include: (1) characterization of evidence with references cited, (2) a proposed updated delineation of aquifer/GMZ boundary (if appropriate), and (3) shapefiles of new aquifer storage properties (including layers, if appropriate). Submit TM to Santa Ana Water Board and Task Force.

Step 3. Eliminate Potential Data Gaps by Monitoring Existing Wells

Can data gaps be addressed by sampling existing wells not initially identified as part of the GMZ monitoring network?

No – Data gap exists. Responsible Agencies Proceed to Step 4.

Yes – Responsible Agencies prepare TM documenting expanded monitoring with newly identified existing wells and submit to the Santa Ana Water Board and Task Force. The TM must include: (1) updated map and table of the monitoring program, including identification of monitoring entities,



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(2) commitment to annual sampling of new wells that have not previously been monitored for the first three years of monitoring, and (3) identify if all potential data gaps are not fully addressed with existing wells.

Step 4. Fill data gaps with construction of new monitoring wells

Responsible Party to perform a well siting study. Can remaining data gaps be filled through construction of new wells?

No – if a finding is made that new wells cannot be constructed, the Responsible Agencies must provide evidence to enable Santa Ana Water Board to determine if that data gap cannot be reasonably addressed. Findings must be documented and submitted to the Santa Ana Water Board and Task Force. Such a finding may trigger additional technical studies at the Santa Ana Water Board's discretion.

Yes – Responsible Parties prepare a monitoring well construction plan/schedule. The plan must include: (1) well location(s) and technical specifications, (2) detailed schedule to construct well(s), (3) commitment to annual sampling of new well for the first three years of monitoring. Responsible Agencies proceed to implement construction plan and schedule following Santa Ana Water Board approval.

3.2.3 Schedule to Investigate Potential Data Gaps

Responsible Parties will have two years to complete Steps 1 through 4. The two-year clock begins upon approval of this 2022 GMP by the Santa Ana Water Board Executive Officer, but not later than January 1, 2023. Therefore, the steps must be completed by December 31, 2025.



4.0 2021 AMBIENT WATER QUALITY PILOT STUDY

This section describes the scope of work the Task Force will implement to perform the 2021 AWQ Pilot Study. The study is being prepared to comply with the 2021 Basin Plan amendment requirement that states:

...The determination of current ambient groundwater quality must be reported by October 1, 2023 and, at a minimum, every five years thereafter unless the Santa Ana Water Board revises this schedule....

The scope of work is written at a level of detail that will enable the Task Force to procure a scope of work proposal from technical consultants to perform the work.

4.1 Objectives and Intended Outcomes

In accordance with the 2021 Basin Plan amendment, the determination of AWQ may be accomplished as follows:

The determination of current ambient quality can be accomplished using methodology consistent with that employed by the Nitrogen/TDS Task Force (20-year running averages) to develop the TDS and nitrogen water quality objectives included in this Basin Plan, or an alternative method approved by the Executive Officer of the Santa Ana Water Board.

The objectives and intended outcomes of the 2021 AWQ Pilot Study are to:

- Update the Task Force's database by collecting the TDS and nitrate data for all wells defined in the 2022 GMP monitoring program for the years 2019, 2020, and 2021
- Pilot alternative methods to compute AWQ and assimilative capacity in 11 GMZs, including:
 - A simplified method based on an analysis of historical trends, current statistics, and spatial distribution of TDS and nitrate in four GMZs
 - The four GMZs are: Bunker-Hill B, Perris-South, Riverside-A, and Temescal
 - A modified version of the standard methodology employed by the Task Force in prior AWQ recomputations for the seven GMZs with Maximum Benefit SNMPS
 - The seven GMZs are: Beaumont, Chino-North, Cucamonga, Elsinore, San Jacinto Upper Pressure, San Timoteo, and Yucaipa
- Pilot the process to update the aquifer storage model in one GMZ (Yucaipa GMZ)
 - This includes computing the AWQ for 2021 with the new and old storage models, and the AWQ for the objective setting period of 1954 to 1973 with the new storage model
 - The results will be used help the Santa Ana Water Board (1) understand the potential regulatory impacts that a revised model could produce and (2) define the actions that should follow any update to the GMZ aquifer storage models
- Pilot the process to map land use, recycled water, recharge facilities, and other relevant groundwater management activities to support the interpretation of data trends in one GMZ (select one of the 11 GMZs included in the Pilot Study)
- Define the recommended technical methodology for future AWQ and assimilative capacity assessments

- Refine the schedule and scope of work that needs to be performed by the Task force from fiscal year 2023/24 through fiscal year 2028/29 to comply with the Basin Plan SNMP, which could include a recommended schedule to:
 - Perform annual data collection and management
 - Compute AWQ and assimilative capacity based on findings of the Pilot Study
 - Update the remaining GMZ aquifer storage models (if needed)
 - Complete the five-year update of the AWQ and assimilative capacity assessment due to the Santa Ana Water Board on October 1, 2028
 - Perform other work to support the Santa Ana Water Board's five-year assessment of the Basin Plan SNMP that is due April 2029, which will include, at a minimum, reassessing new data gaps in the monitoring network
- Submit the 2021 AWQ Pilot Study Report to the Santa Ana Water Board on October 1, 2023.

The final 2021 AWQ Pilot Study Report will include the following sections:

Section 1 – Introduction. This introductory section will describe the purpose of the Pilot Study, the regulatory setting that establishes the requirement for computing AWQ, the project approach, and an overview of the organization of the report.

Section 2 – Data Collection and Review. This section will describe the data collection and data QA/QC protocols that were performed to support the project.

Section 3 – Ambient Water Quality: TDS/N Concentrations, Trends, and Statistics. This section will describe the first of two methods piloted to compute AWQ in selected GMZs. It will document the technical methodology and present the results and key findings.

Section 4 – Ambient Water Quality: Volume-weighted TDS/N Concentrations. This section will describe the second of two methods piloted to compute AWQ in selected GMZs. It will document the technical methodology and present the results and key findings.

Section 5 – Recommended Technical Methodology to Compute Ambient Water and Assimilative Capacity. This section will describe the recommended technical methodology to be used in future AWQ and assimilative capacity assessments. The methodology will be documented in sufficient detail to enable easy development of scope of work specifications to support engagement of technical consultants to perform the work.

Section 6 – Task Force SNMP Implementation Plan. This section will describe the schedule of work that will need to be performed by the Task Force from fiscal year 2023/24 through fiscal year 2028/29 to comply with the Basin Plan SNMP, through the completion of the next five-year update of AWQ.

4.2 Scope of Work

The scope of work to complete the 2021 AWQ Pilot Study includes five tasks:

Task 1 – Data Collection and Review

Task 2 – Pilot Assessment of Ambient Water Quality in Select GMZs



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Task 3 – Develop Technical Approach and SNMP Implementation Plan

Task 4 – Prepare Final Report

Task 5 – Task Force Workshops and Project Management

The scope of work and deliverables of each task are described in the following subsections. The schedule and budget-level cost estimate to complete the work are described in Sections 5.3 and 5.4, respectively.

4.2.1 Task 1 – Data Collection and Review

The objective of this task is to collect updated TDS and nitrate data⁹ for the wells in the groundwater monitoring networks of all 35 GMZs, as defined in Appendix A of this 2022 GMP (See Section 3 of this report for details on the monitoring networks). The data should be collected for the period from January 1, 2019 through December 31, 2021. The subtasks include:

- Prepare data request letters and send to all responsible parties defined in the Groundwater Monitoring Networks defined in Appendix C
- Collect and process TDS and nitrate data into standardized formats
- Append data to 2018 AWQ database
- Perform QA/QC of data by review of TDS and nitrate time history charts
- Collect shapefiles of groundwater level elevations for GMZs with Maximum Benefit SNMPS
- Prepare draft Section 2 of the 2021 AWQ Pilot Study report, including recommended scope of work to improve data management and implement annual data collection

The deliverables of this Task include:

- Database file of TDS and nitrate results for 2002 through 2021
- TDS and nitrate time history charts of TDS and nitrate, by well
- Two PowerPoint presentations of the data collection process/status to review at a Task Force workshop
- Draft Section 2 of 2021 AWQ Pilot Study report

4.2.2 Task 2 – Pilot Assessment of Ambient Water Quality in Select GMZs

The objective of this task is to produce AWQ and assimilative capacity findings for 11 GMZs using alternative methods (standard and simplified). The subtasks include:

- Prepare TDS and nitrate summary statistics for wells in all 11 GMZs
- Perform Mann Kendall trend analysis for wells in all 11 GMZs
- Compute 20-year AWQ statistic for wells in all 11 GMZs
- Perform simplified AWQ approach in four GMZs, including preparing an integrated explanatory graphic to illustrate the current AWQ and assimilative capacity finding.

⁹ Per discussions with the Santa Ana Water Board staff, the Task Force may focus its efforts exclusively on TDS and nitrate data.



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- Update storage model for the Yucaipa GMZ, this includes:
 - Compute AWQ for the 2021 period using the new and old storage models
 - Recompute AWQ for the objective setting period of 1954-1973
- Perform modified standard approach for seven GMZs, including pilot of:
 - Use of readily available water level contours to compute storage
 - GIS-supported procedure to contour TDS and N concentrations in at least one GMZ
 - Limit contouring and map displays to of the extent of the saturated portion of aquifer within the GMZ boundary
- Pilot the mapping of land use, recycled water, recharge facilities, and other relevant groundwater management activities to support the interpretation of data trends in one GMZ.

For each pilot approach, the work will be performed in one GMZ and will be reviewed with the Task Force prior to proceeding to complete the analysis for the remaining GMZs.

The deliverables of this Task include:

- Tables summarizing statistics (summary statistics, Mann Kendall, and AWQ statistic)
- Exhibits and maps displaying the AWQ and assimilative capacity results for the 11 GMZs analyzed
- Four PowerPoint presentations for review at a Task Force workshop
- Draft Sections 3 and 4 of 2021 AWQ Pilot Study report
- GIS shapefiles of relevant work products (TDS contours/rasters, storage grids, etc.)

4.2.3 Task 3 – Develop Technical Approach and SNMP Implementation Plan

The objective of this task is to (1) define the recommended technical methodology for future AWQ and assimilative capacity assessments based on the analysis and results of work performed for Task 2 and (2) prepare a refined schedule and scope of work that needs to be performed by the Task Force from fiscal year 2023/24 through fiscal year 2028/29 to comply with the Basin Plan SNMP.

The deliverables of this Task include:

- Two PowerPoint presentations for review at a Task Force workshop
- Draft Sections 5 and 6 of 2021 AWQ Pilot Study report

4.2.4 Task 4 – Prepare Final Report

The objective of this task is to prepare a complete draft and final report that documents the work performed for the 2021 Ambient Water Quality Pilot Study. The draft report will be the compilation of all prior report sections produced in Tasks 1 through 3, and will have addressed any comments received on the draft sections. Following a review period by the Task Force, a final report will be prepared, including a response to comments appendix. The report will be the deliverable submitted to the Santa Ana Water Board to comply with the Basin Plan requirement to complete the AWQ update by October 2023.

The deliverables of this Task include:



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- One PowerPoint presentations for review at a Task Force workshop
- Draft 2021 AWQ Pilot Study report
- Final 2021 AWQ Pilot Study report

4.2.5 Task 5 – Task Force Workshops and Project Management

The objective of this task is to (1) hold up to ten Task Force workshops to present the work of the Pilot Study and (2) perform project management tasks to keep the SAWPA project manager inform of progress toward completion of the project on budget and schedule.

4.3 Schedule

Table 4-1 shows the schedule to complete the 2021 AWQ Pilot Study from January through November 2023.

Task and Subtask	Task Duration										
	2023										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Task 1 - Data Collection and Review											
Task 2 – Pilot Assessment of Ambient Water Quality in Select GMZs											
Task 3 - Develop Technical Approach and SNMP Implementation Plan											
Task 4 – Prepare Final Report								D		F	
Task 5 – Task Force Workshops and Project Management	W	W	W	W	W	W	W	W	W	W	*

Notes:

D = Draft Report

F = Final Report

W = Task Force Workshop

* Project management only

4.4 Budget Level Cost Estimate

Table 4-2 presents a budget-level cost estimate to perform the 2021 AWQ Pilot Study.



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Table 4-2. Budget Level Cost Estimate to Perform the 2021 Ambient Water Quality Pilot Study

Task	Cost Estimate
Task 1 – Data Collection and Review	\$76,000
Task 2 – Perform Pilot Ambient Water Quality Analysis	\$128,000
Task 3 – Develop AWQ Technical Approach and AWQ Work Plan	\$41,000
Task 4 – Prepare Final Report	\$35,000
Task 5 – Task Force Workshops and Project Management	\$40,000
Total	\$320,000

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5.0 IMPLEMENTATION PLAN

The Task Force was formed to support implementation of the Basin Plan SNMP and ensure its member agencies comply with the monitoring and reporting requirements. One of the goals of this 2022 GMP was to identify the work that the Task Force, its member agencies, and the Santa Ana Water Board will need to perform through fiscal year 2028/29 to comply with the Basin Plan SNMP, including anticipated activities that will address the 2019 Recycled Water Policy. For each work item, a brief summary is provided. Table 5-1 shows a schedule for when the work items generally need to be performed. The final report that will be prepared for the 2021 AWQ Pilot study will help to refine the scope and schedule of the future work items.

Complete the 2021 AWQ Pilot Study. The 2021 AWQ Pilot Study is required by the Basin Plan (2021 amendment). The objectives, scope of work, schedule, and budget are described in detail in Section 4 of this 2022 GMP. The 2021 AWQ Pilot Study must be completed by October 1, 2023.

Complete the First Five-Year Assessment of the Basin Plan SNMP. This is a task that must be completed by the Santa Ana Water Board by April of 2024. The Task Force's role is to support the development of (1) the approach and document that demonstrates the Basin Plan's conformance with the 2019 Recycled Water Policy and (2) any associated Basin Plan amendments to modify the SNMP.

Address Potential Data Gaps. The Responsible Parties identified in Table 3-1 will follow the process outlined in Section 3.2.2 of this report to address the potential data gaps documented in Appendix C. The potential data gaps must be resolved before the next round of technical work for the five-year assessment of the Basin Plan SNMP begins.

Annual Data Collection. To comply with the 2019 Recycled Water Policy, the Task Force will need to annually compile the data used in the five-year AWQ and assimilative capacity assessments. This work is assumed to begin after the Santa Ana Water Board completes its first five-year review of the Basin Plan SNMP in April 2024. Each July the Task Force will need to compile and process the water quality data from the preceding calendar year into a centralized database for use in future five-year data assessments.

Update GMZ Aquifer Storage Properties. The Santa Ana Water Board has identified that GMZ aquifer storage properties are a high priority and must be resolved before the 2026 AWQ and assimilative capacity assessment. Following completion of the 2021 AWQ Pilot Study, the Task Force should begin this work. The initial steps to implement will likely consist of (1) identifying the GMZs that require updates and (2) preparing a schedule to complete the updates for all applicable GMZs. Depending on the project cost, it may be prudent to distribute the work over multiple years to manage the cost of the work.

Second Five-Year Assessment of the Basin Plan SNMP. Pursuant to the 2019 Recycled Water Policy, the Basin Plan SNMP must provide for a five-year assessment of the data, monitoring networks, and SNMP. This work will be performed in the following steps:

Identify New Potential Data Gaps. The Task Force will review the status of the monitoring networks and identify any new potential data gaps to be addressed.

Complete the 2026 Ambient Water Quality and Assimilative Capacity Assessment. The Task Force will perform the 2026 AWQ and assimilative capacity assessment pursuant to the methodology defined in the 2021 AWQ Pilot Study report. This must be completed by October 1, 2028.



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Complete the Five-Year Assessment of the Basin Plan SNMP. This is a task that must be completed by the Santa Ana Water Board by April of 2029 – it could be in the form of an approval of a report prepared by the Task Force at the Executive Officer level, or an action by the Santa Ana Water Board. This is to be determined in the future. The Task Force's role is to support the development of any documents or Santa Ana Water Board staff reports that describe the outcomes of the latest five-year data assessments.

Table 5-1 shows the estimated schedule to complete the work to comply with the Basin Plan SNMP through Fiscal Year 2028/29 as well as the entity leading the effort.

Table 5-1. Task Force Schedule of Work to Comply with the Basin Plan SNMP

Task (Task Lead)	Task Duration						
	Fiscal Year						
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29
2021 Ambient Water Quality Pilot Study (Task Force)	Start: Jan 2023	Finish: Oct 2023					
Complete First Five-Year Assessment of the Basin Plan SNMP (Santa Ana Water Board, with Task Force Support)	Start: Jul 2023	Finish: April 2024					
Perform Four-Step Process to Address Potential Data Gaps Identified in 2022 GMP (Responsible Parties)		Start: Jan 2023		Finish: Dec 2025			
Annual Data Collection (Task Force)			Jul-Dec 2024	Jul-Dec 2025	Jul-Dec 2026	Jul-Dec 2027	Jul-Dec 2028
Update GMZ Aquifer Storage Models (Task Force)			Start: Jul 2024		Finish: Jun 2027		
Identify New Potential Data Gaps (Task Force)					Jan-Jun 2027		
Compute AWQ and Assimilative Capacity (Task Force)						Start: Jul 2027	Finish: Oct 2028
Complete Second Five-Year Assessment of the Basin Plan SNMP (Santa Ana Water Board, with Task Force Support)							Oct 2028 - Apr 2029



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6.0 REFERENCES

- California Water Resources Control Board (State Board) California Environmental Protection Agency. 2019. Water Quality Control Policy for Recycled Water. Adopted December 11, 2018.
- State Board. 2019. Water Quality Control Policy for Recycled Water. Adopted February 3, 2009.
- State Board. 2019. State Board Order 68-16. Statement of Policy with Respect to Maintaining High Quality of Waters in California. October 28, 1968.
- California Regional Water Quality Control Board, Santa Ana Region, 2004. R8-2004-0001 Updated Total Dissolved Solids (TDS) and Nitrogen Management Plan. January 22, 2004.
- Santa Ana Water Board, 2005. Resolution No. R8-2005-0063. Resolution Approving the Surface Water and Groundwater Monitoring Program Proposals Required in the Total Dissolved Solids and Nitrogen Management Plan Specified in the Water Quality Control Plan for the Santa Ana River Basin. April 15, 2005
- Santa Ana Water Board, 2010. Resolution No. R8-2010-0012. Declaration of Conformance with the Recycled Water Policy. March 18, 2010.
- Santa Ana Water Board, 2021. Resolution No. R8-2021-0025. Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Revise and Update the Total Dissolved Solids and Nitrogen Management program (TDS/N Management Program). December 10, 2021.
- Wildermuth Environmental Inc. (WEI), 2000. TIN/TDS Phase 2A: Tasks 1 through 5. TIN/TDS Study of the Santa Ana Watershed. Technical Memorandum. July 2000.
- Water Systems Consulting, Inc. (WSC), 2020. Recomputation of Ambient Water Quality in the Santa Ana River Watershed for the Period 1999 to 2018. Prepared for the Santa Ana Watershed Project Authority Basin Monitoring Task Force.