Poway Valley Groundwater Basin

Salt and Nutrient Management Plan

Prepared for:

CITY OF POWAY
THE CITY IN THE COUNTRY
Incorporated 1980

in Collaboration with:

The City *of* SAN DIEGO

WOODARD &CURRAN

December 2018

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ACRONYMS AND ABBREVIATIONS

µmhos/cm	micromhos per centimeter
µg/L	micrograms per liter
AF	acre-feet
AFY	acre-feet per year
AGR	Agricultural Supply
Basin Plan	San Diego Regional Water Quality Control Board Basin Plan
bgs	below ground surface
BMP	Best Management Practice
BPTC	Best Practicable Treatment or Control
C	Centigrade degrees
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
CEC	Constituents of Emerging Concern
CEQA	California Environmental Quality Act
City	City of Poway
DWR	California Department of Water Resources
EC	electrical conductivity
EC_{ct}	salt tolerance threshold
EDF	Electronic Deliverable Format
ETc	Crop evapotranspiration
ETo	reference evapotranspiration
F	Fahrenheit degrees
FOG	Fats, Oils, and Grease
GAMA	Groundwater Ambient Monitoring and Assessment
GIS	Geographic Information System
gpd	gallons per day
gpcd	gallons per capita per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IND	Industrial Service Supply
IRWM	Integrated Regional Water Management
JURP	Jurisdictional Urban Runoff Management Program
Kc	unique crop factor
lbs/acre	pounds per acre
lbs/year	pounds per year
MCL	maximum contaminant level
mgd	million gallons per day
mg/L	milligram per liter
MUN	Municipal and Domestic Supply
N	nitrate as nitrogen

NA	not applicable
N/A	not available
NAC	No Assimilative Capacity
NCWRP	North City Water Reclamation Plant
ND	Not detected
NUE	Nitrogen Update Efficiency
OWTS	Onsite Wastewater Treatment Systems
PVGB	Poway Valley Groundwater Basin
RWQCB	San Diego Regional Water Quality Control Board
Q&A	Questions and answers
QA/QC	Quality Assurance/Quality Control
SCSC	Southern California Salinity Coalition
SDCWA	San Diego County Water Authority
SED	Substitute Environmental Documentation
SGMA	Sustainable Groundwater Management Act
SMCL	secondary maximum contaminant level
SNMP	Salt and Nutrient Management Plan
SSO	Sanitary Sewer Overflow
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
UAN	Urea Ammonium Nitrate Solution
USDA	United States Department of Agriculture
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
WQO	Water Quality Objectives
WTP	water treatment plant
WWTP	wastewater treatment plant

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1. INTRODUCTION

1.1 Purpose

This Salt and Nutrient Management Plan (Plan or SNMP) was prepared for the Poway Valley Groundwater Basin (PVGB) pursuant to requirements established in San Diego Regional Water Quality Control Board (RWQCB) within Special Provision VI.A of Order No. R9-2016-0117, which regulates the use of recycled water within the City of Poway (City). Special Provision VI.A of Order No. R9-2016-0117 requires the City to fulfill SNMP requirements established by the State Water Resources Control Board (SWRCB) within the Policy for Water Quality Control for Recycled Water (Recycled Water Policy). The Recycled Water Policy requires that stakeholder-prepared SNMPs be developed for each groundwater basin to manage salts, nutrients, and other significant chemical compounds on a watershed- or basin-wide basis. The SNMPs are intended to help streamline the permitting of new recycled water projects while ensuring compliance with water quality objectives and protection of beneficial uses.

The SNMP was led by the City of Poway in partnership with the City of San Diego for the PVGB in a collaborative process with local and regional stakeholders, in accordance with the Recycled Water Policy. The primary purpose of the SNMP is to assist the City of Poway and stakeholders in complying with the Recycled Water Policy regarding the use of the recycled water from municipal wastewater treatment facilities as a source of water supply while managing salts and nutrients from all sources on a sustainable basis that considers beneficial uses as well as the existing water quality of the basin.

The PVGB supports a limited number of existing beneficial uses in the Plan area. Beneficial uses of individual water bodies in the Plan area are designated and maintained by the RWQCB and the San Diego Region Water Quality Control Plan (Basin Plan). The communities overlying the PVGB include mainly urban areas as well as rural lands. Imported surface water is used as the primary supply source in the Plan area, in addition to small quantities of groundwater pumping from private wells used mainly for irrigation of residential parcels. Recycled water generated by the City of San Diego's North City Water Reclamation Plant (NCWRP) is currently used within the City of Poway service area to irrigate the Poway Business Park, located outside of the basin. Recycled water supply is projected to increase in the future. Stormwater is not currently being captured for beneficial use in the Plan area, due to the limited groundwater use. This SNMP is intended to inform future decisions for use of recycled water and help streamline permitting of future recycled water projects while managing salts and nutrients.

The Poway Valley SNMP was developed by:

1) gathering available water quality information to evaluate the groundwater quality conditions of the basin;
2) identifying potential sources of salt and nutrients and develop loading estimates for identified sources;
3) estimating the assimilative capacity of the groundwater basin based on hydrologic and geologic characteristics;
4) developing a preliminary water quality monitoring and reporting program;
5) identifying and recommending most appropriate methods and best management practices for reducing and or maintaining salt and nutrient loading; and
6) proposing an implementation plan that will satisfy the requirements of the Antidegradation Policy and Recycled Water Policy.

This SNMP includes an analysis of the existing land uses and practices, as well as potential changes to land uses, and usage of recycled water for managing salt and nutrients in a sustainable manner. Also contained herein is a preliminary monitoring plan for implementation to evaluate the effects of salt and nutrient sources on the PVGB with respect to beneficial uses supported within the basin and applicable water quality objectives.

1.2 Regulatory Background

The State of California adopted the Recycled Water Policy in 2009. The goals of the Recycled Water Policy are to encourage recycled water use, maximize consistency in regulation, and provide direction to RWQCBs in the regulation of recycled water projects. To this end, the Recycled Water Policy requires that stakeholder-driven SNMPs be prepared for each groundwater basin to identify means for ensuring consistency between recycled water use, protecting beneficial uses, and achieving Basin Plan water quality objectives. The SNMP process provides a platform for identifying how to manage salts, nutrients, and other significant chemical compounds on a watershed- or basin-wide basis.

1.2.1 SWRCB Recycled Water Policy

The SWRCB's Recycled Water Policy requires that SNMPs be completed and submitted to the local RWQCB. SNMPs are to be developed in a cooperative and collaborative manner among water and wastewater agencies and other stakeholders overlying a given groundwater basin or watershed. The purpose of the Recycled Water Policy is to increase the use of recycled water from municipal wastewater sources that meets the definition in Water Code Section 13050(n) in a manner that implements state and federal water quality laws. When used in compliance with the Recycled Water Policy, California Code of Regulations (CCR) Title 22, and all applicable state and federal water quality laws, the SWRCB finds that recycled water is safe for the approved uses, and strongly supports recycled water as a safe alternative to potable water for such approved use.

The Recycled Water Policy was amended in 2013 to specify monitoring requirements for constituents of emerging concern (CECs) in recycled water for groundwater recharge projects. In December 2016, the SWRCB adopted Resolution No. 2016-0061, which directed staff to update its recommendations for monitoring CECs in recycled water and update the Recycled Water Policy considering changes that have taken place since 2013. The proposed amendment to the Recycled Water Policy was released in May 2018 for public comment. A public hearing was held on June 19, 2018 with a written letter submittal deadline of June 26, 2018. Revised proposed amendment was released for a second public comment on August 27, 2018 and the comment period ended on September 10, 2018. The SWRCB will prepare responses to the public comments and prepare a revised proposed amendment.

1.2.2 San Diego Regional Water Quality Control Board

The Recycled Water Policy requires RWQCBs to review SNMPs and consider for adoption as basin plan amendments (or other official action) within one year of submission. The San Diego RWQCB, Region 9, is responsible for protecting water quality within the PVGB and oversees the development and implementation of the SNMP for the PVGB in accordance with the Recycled Water Policy. This SNMP was developed in a collaborative effort with local and regional stakeholders, including the San Diego RWQCB. The RWQCB has been part of the SNMP development by receiving announcements / workshop invitations and participating in a focused RWQCB meeting conducted on August 20, 2018 (with City staff, its consultant, and RWQCB members). This meeting provided a forum for explaining the SNMP development, data findings, approaches and progress made; it also provided an opportunity to receive feedback from the RWQCB on the overall methodology proposed for completing the Plan. Regulatory coordination with the RWQCB is further described in Section 2 as part of the stakeholder outreach process.

1.2.3 Water Quality Control Plan for the San Diego Basin (Basin Plan)

The Water Quality Control Plan for the San Diego Basin (Basin Plan; RWQCB, 2016) provides the basis for the regulatory guidelines and specific beneficial uses and water quality objectives for groundwater and surface water within the San Diego Region and provides implementation plans that describe permitting options, waste discharge prohibitions, monitoring and enforcement, salt and nutrient controls, and other control measures to preserve and protect water quality objectives and beneficial uses for groundwater and surface waters.

1.2.3.1 Tier C Requirements

Based on the complexity, size, and use of San Diego Region groundwater basins, the Southern California Salinity Coalition (SSCS) and San Diego County Water Authority (SDCWA) coordinated with the RWQCB and prepared the Proposed Guidelines Salinity/Nutrient Management Planning in the San Diego Region (referred to as September 2010 Guidelines herein) based on a tiered approach and framework for developing SNMPs (SSCS and SDCWA 2010).

The September 2010 Guidelines (Table 3-4) assigned the PVGB to Tier B. In a letter dated June 8, 2017, the City requested that the RWQCB reassign the PVGB from Tier B to Tier C. In a letter dated August 16, 2017 from the RWQCB, the PVGB was downgraded to Tier C category and preparing the SNMP for the basin utilizing the Tier C criteria was found appropriate. The development of the Poway Valley SNMP was in accordance with Tier C requirements.

Suggested approach and tasks for the Tier C basins are outlined in Appendix C of the September 2010 Guidelines and summarized in Table 1. Common features found in the Tier C basins include the followings, as described in the September 2010 Guidelines:

- Smaller, shallow groundwater aquifers (capacities of less than 20,000 acre-feet (AF))
- Unconsolidated sediments within urbanized or agricultural areas
- Basin Plan groundwater total dissolved solids (TDS) objectives range from 500 milligrams per liter (mg/L) to 1,100 mg/L
- Wastewater and recycled water agencies may experience periodic noncompliance with Basin Plan groundwater quality objectives
- Storage capacities and well yields are modest or small
- Fewer studies and resources exist to characterize basin hydrogeology, groundwater quality, and groundwater transport
- Groundwater use in the basin is limited to private use; no public water agency groundwater supply development occurs
- Potential exists for expanded recycled water use
- Concerns may exist among recycled or wastewater water agencies regarding recycled water compliance with Basin Plan salinity/nutrient requirements.

Table 1: Region 9 Tier C Requirements for SNMP

Beneficial Use	Tasks
Initial Basin Characterization	• Identify and delineate basin and study area • Identify, collect, and review existing studies • Stakeholder identification and outreach approach • Document beneficial uses • Characterize groundwater quality and occurrence • Identify salinity & nutrient constituents of concern
Identify and Quantify Salinity/Nutrient Sources	• Identify salinity and nutrient sources • Quantify salinity and nutrient source loads • Develop salinity and nutrient source load assessment tools
Supplemental Monitoring	• Develop plan for data gaps • Collect data and refine basin characterization
Assess Salinity/Nutrient Management Strategies	• Identify management goals • Identify available management strategies • Assess load reduction/water quality improvement • Evaluate alternative management strategies • Assess basin plan modifications needs • Assess CEQA/NEPA compliance
Assess Plan Effectiveness	• Identify metrics and develop monitoring program • Salinity/nutrient management plan audit

1.2.3.2 Beneficial Uses

The beneficial uses of groundwater in the PVGB were reported in the 2016 Basin Plan, as summarized in Table 2.

Table 2: Beneficial Uses of Groundwater in Poway Valley Groundwater Basin

Beneficial Use	Status[1]	Use Class Description
Municipal and Domestic Supply (MUN)	Existing	Includes uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
Agricultural Supply (AGR)	Existing	Includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
Industrial Service Supply (IND)	Potential	Includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

Note: 1. Beneficial Uses are defined as existing uses if they were "attained in the surface or ground water on or after November 28, 1975".
Source: Water Quality Control Plan for the San Diego Basin, California RWQCB (2016).

1.2.3.3 Water Quality Objectives

The designated beneficial uses are the basis for the designation of water quality objectives within the Basin Plan. The water quality objectives for groundwater in the Basin Plan are not to be exceeded more than 10 percent of the time during any one-year period. The Basin Plan includes the following water quality objectives for groundwater in the PVGB:

- **Phenolic Compounds** - Water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of phenolics in excess of 1.0 micrograms per liter (µg/L).

- **Chemical Constituents** - Groundwaters designated as MUN shall not contain concentrations of chemical constituents in excess of the primary maximum contaminant limit (MCL) or secondary MCL (SMCL) based upon drinking water standards specified in the following provisions of CCR Title 22, which are incorporated by reference into the Basin Plan: Table 64431-A of Section 64431 (Inorganic Chemicals), Table 64444-A of Section 64444 (Organic Chemicals), Table 64449-A of Section 64441 (Natural Radioactivity), and 64449-A of Section 64449 (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits). This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect. Waters designated as AGR shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses (i.e., agricultural purposes).

- **Trihalomethanes** - Groundwaters designated as MUN shall not contain concentrations of trihalomethanes in excess of the limits specified in Section 64439 (Trihalomethanes) of CCR Title 22, which is incorporated by reference into the Basin Plan. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

- **Taste and Odor** - Groundwaters shall not contain taste or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. For groundwaters designated as MUN, at a minimum, concentrations shall not exceed adopted SMCLs specified in Table 64449-A of Section 64449 (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits), and Table 64449-B of Section 64449 (Secondary Maximum Contaminant Levels-Ranges) of CCR Title 22, which is incorporated by reference into the Basin Plan. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

Specific to salts and nutrients within the PVGB, the numerical water quality objectives for groundwater are 45 mg/L for nitrate (NO_3) or 10 mg/L for nitrate-nitrogen (nitrate-N). TDS has a water quality objective of 1,000 mg/L in areas west of the SDCWA First Aqueduct and 750 mg/L for areas east of the SDCWA First Aqueduct (see Section 3, Figure 3 for the location of the First Aqueduct). Most of the basin lies west of the aqueduct. This SNMP evaluated the assimilative capacity of the PVGB based on the water quality objective of 1,000 mg/L for TDS and 10 mg/L for nitrate-N, as presented in Table 3.

Table 3: Basin Plan Objectives for TDS and Nitrate-N

Constituent	Basin Plan Objective
TDS	1,000 mg/L (West of SDCWA First Aqueduct)[1] 750 mg/L (East of SDCWA First Aqueduct)
Nitrate-N	10 mg/L

Note: 1. Used for the assimilative capacity of the PVGB.

1.2.4 Antidegradation Policy Summary

State Water Resources Control Board Resolution 68-16, known as the Antidegradation Policy, requires that the RWQCB regulate the discharge of waste materials to maintain the high quality of waters of the state. Waste Discharge Requirements for facilities must insure that beneficial uses of groundwater are not unreasonably affected. In addition, the facility must meet a standard of Best Practicable Treatment or Control (BPTC) for discharged wastes.

The "Statement of Policy with Respect to Maintaining High Quality of Waters in California," known as the Antidegradation Policy, adopted in 1968, requires the continued maintenance of existing high-quality waters. It provides conditions under which a change in water quality is allowable. A change must:

- Be consistent with maximum benefit to the people of the State,
- Not unreasonably affect present and anticipated potential beneficial uses of water, and
- Not result in water quality less than that prescribed in water quality control plans or policies.

The Recycled Water Policy requires that SNMPs contain an antidegradation analysis demonstrating that the projects included within the Plan will, collectively, satisfy the requirements of Resolution No. 68-16.

1.3 Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act (SGMA) was passed into California law in 2014 and took effect in January 2015. SGMA requires that state-designated high and medium priority groundwater basins must form one or more Groundwater Sustainability Agencies (GSAs) by June 30, 2017 and that the GSAs must develop and implement one or more Groundwater Sustainability Plans (GSPs) by January 31, 2020 for critically overdrafted groundwater basins, or by January 31, 2022 for non-critically-overdrafted groundwater basins. GSPs are considered a roadmap for how groundwater basins will reach and maintain long-term sustainability.

Prior to the passage of SGMA, the California Department of Water Resources (DWR) developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. The CASGEM priorities were used to rank the priority of each groundwater basin in California as either very low, low, medium, or high.

The PVGB has been designated as a very low priority groundwater basin; thus, the agencies within the Plan area are not subject to SGMA GSA and GSP requirements. In addition, DWR identified the basins and subbasins that are in conditions of critical overdraft. Twenty-one basins and subbasins were identified; the PVGB was not identified as a critically-overdrafted basin. While low and very low priority groundwater basins are not the focus of SGMA at this time, it is anticipated that they may need to develop GSAs and GSPs at a later time as determined by DWR and the SWRCB.

1.3.1 Document Organization

This SNMP is organized with the SWRCB's draft SNMP guidelines and suggested elements.

- Section 1, Introduction provides information on the purpose of the SNMP development, regulatory background, and document organization.
- Section 2, Stakeholder Involvement presents information on the stakeholder involvement and outreach, stakeholder meetings, and regulatory coordination during the SNMP development.
- Section 3, Plan Area presents background information of the Plan area with respect to climate, land use, water resources, current and future water supply demand, and other planning efforts undertaken in the Plan area.

- Section 4, Basin Characterization presents a summary description of the basin hydrogeology and water quality conditions with respect to salt and nutrients in the Plan area.
- Section 5, Recycled Water and Stormwater Goals describes the recycled water and stormwater goals within the PVGB.
- Section 6, Salt and Nutrient Loading Analysis presents the approach and methodology used for characterization of salt and nutrients, loading analysis, and findings.
- Section 7, Antidegradation Analysis presents the approach and methodology used for antidegradation assessment and findings.
- Section 8 Monitoring Plan describes a preliminary monitoring plan developed for the SNMP to evaluate the effects of salt and nutrient sources on the PVGB.
- Section 9, Plan Implementation presents groundwater management strategies and projects to manage salt and nutrients from potential sources on a sustainable basis to protect beneficial uses and water quality objectives of the basin in the context of potential changes to future land use, groundwater resources, and recycled water use.
- Section 10, Conclusions summarizes the key findings of the SNMP.
- Section 11, References provides a list of documents referenced in the SNMP.

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2. STAKEHOLDER INVOLVEMENT

The Recycled Water Policy states that development of a SNMP shall be a stakeholder-driven process. The Poway Valley SNMP was developed in a collaborative setting with input from a wide range of stakeholders through two workshops. The stakeholder workshops were utilized to communicate with stakeholders, obtain input on technical analysis and direction of the Plan, and guide the development of the Plan. This section contains descriptions of the process used to identify stakeholders, stakeholder group composition, meetings, and regulatory coordination.

2.1 Outreach and Engagement Goals

A *Public Outreach and Engagement Strategy* was developed at the outset of the SNMP planning process to establish a robust stakeholder process. The primary objective of the *Public Outreach and Engagement Strategy* was to inform and engage local residents and private well owners in the PVGB. The strategy distinguished between stakeholder outreach and stakeholder engagement. The goals of stakeholder engagement in the Poway Valley SNMP included contribution of private well water quality data to the basin characterization effort and participation in the development of SNMP management goals and strategies.

Stakeholder communication focused on three key messages:

1. The purpose of an SNMP is to evaluate and manage groundwater quality (as required by the San Diego RWQCB).
2. The Cities of Poway and San Diego need stakeholders to help them understand existing groundwater quality (via participation in a Water Well Sampling Program for sampling private wells).
3. The Cities of Poway and San Diego are seeking stakeholder participation and engagement in development of salinity/nutrient goals and identification of basin management strategies.

2.2 Stakeholder Composition

The *Public Outreach and Engagement Strategy* identified agencies, organizations, private well owners, and other parties that would have potential interest in the development and implementation of the SNMP. These stakeholders were identified by the Cities of Poway and San Diego, who are familiar with local organizations and interested parties. The list of stakeholders that were invited to participate in the Poway Valley SNMP is provided in Table 4.

2.3 Outreach Methods

The *Public Outreach and Engagement Strategy* established seven methods for communicating with stakeholders about the Poway Valley SNMP. Primarily, the mailer, website, and email blasts were used to communicate with stakeholders between workshops. Phone and in-person communications were also used, as needed, to spread awareness of the SNMP and engage potential stakeholders in the Water Well Sampling Program.

Distribution channels for outreach materials included:

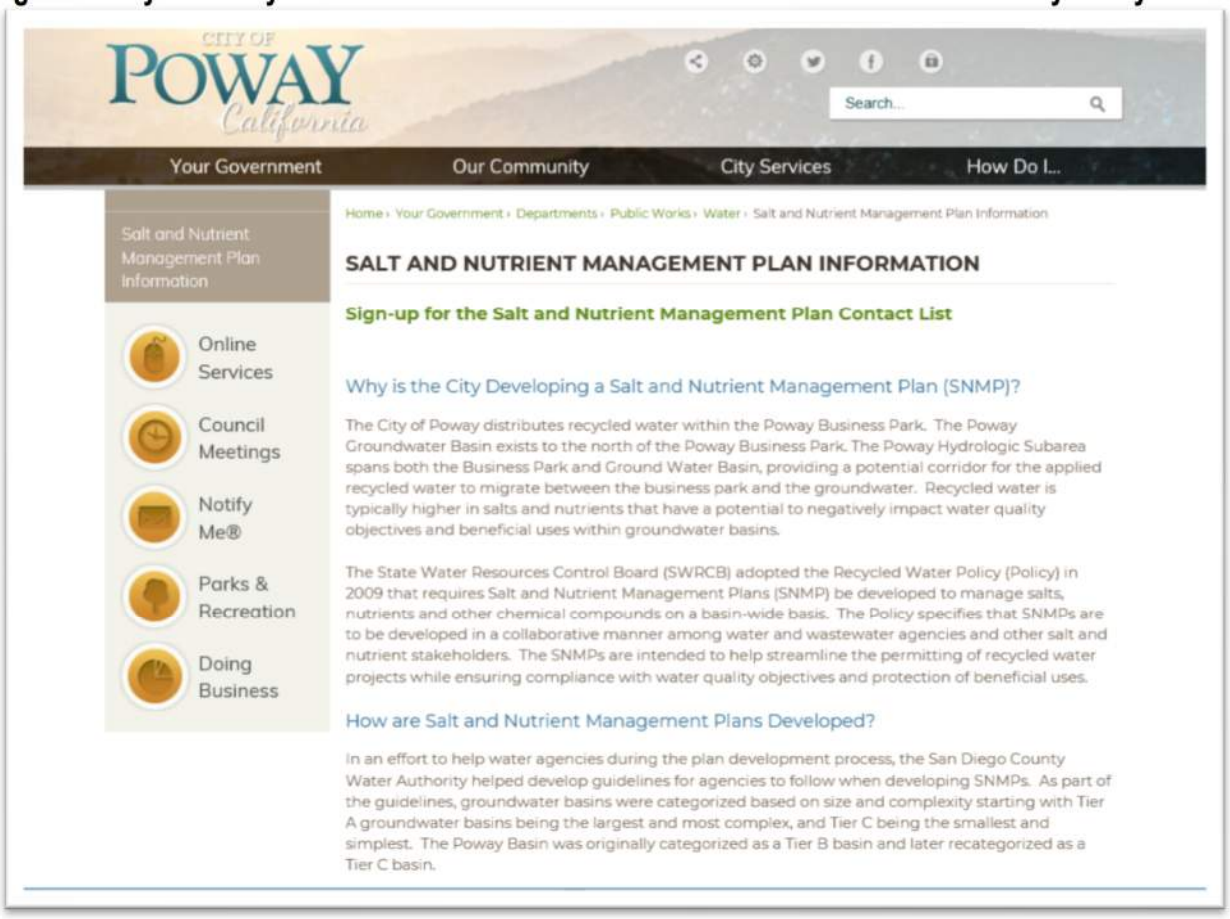
1. Mailer to private well owners
2. Email blast(s) to stakeholders
3. Webpage on City of Poway website
4. Social media post on the City of Poway Facebook page
5. Social media post on Nextdoor
6. Targeted email/phone outreach to interested parties and planning groups

Table 4: SNMP Stakeholders

Entity Type	Agencies and Organizations
Water and Wastewater Agencies	City of Poway: Department of Public Works City of Poway: Lester Berglund Water Treatment Plant (WTP) City of San Diego: Public Utilities Department City of San Diego: North City Water Reclamation Plant San Diego County Water Authority
Municipal and County Governments	San Diego County: Department of Environmental Health
Community and Environmental Groups	Poway Road Corridor Specific Plan Planning Group
Local Businesses and Industry Organizations	Poway Business Park Association Poway Chamber of Commerce Recycled water customers in Poway Business Park Equestrian / stable owners Agricultural site owners
State Agencies	Regional Water Quality Control Board, San Diego Region
Private Well Owners	As obtained through the City of Poway's assessor parcel database

The City of Poway website provided an avenue for stakeholders to find information about the SNMP effort (http://poway.org/936/Salt-and-Nutrient-Management-Plan-Inform). The website helped facilitate overall stakeholder coordination and promoted two-way communication between the City and the stakeholders by allowing group members to review information about the SNMP and obtain contact information for any questions or concerns (Figure 1). The webpage, managed by the City of Poway, also provided an avenue for the public to download maps of the PVGB.

Figure 1: City of Poway's Website Contains Information for Stakeholders about Poway Valley SNMP



2.4 Stakeholder Engagement

Stakeholders are an important part of the SNMP development process. Stakeholder involvement ensures the SNMP is developed to incorporate the interests of a variety of stakeholders, including non-profit groups, public agencies, organizations, and individuals. Stakeholders are not required to provide financial contributions to be engaged in the regional planning effort. Instead, they are encouraged to participate in the SNMP development through providing information and participating at stakeholder meetings and in working groups.

2.4.1 Water Well Sampling Program

The City of Poway requested the participation in its Water Well Sampling Program by private well owners within the PVGB. The City of Poway initially requested one-time access to the groundwater well(s) operated on private property. As part of their participation in the effort, the well owner received information on the water quality in their well. The water quality data collected through this effort was used to better understand and manage groundwater quality in the PVGB, augmenting an extremely limited existing groundwater quality dataset.

A survey letter was distributed to well owners to gauge their interest in participating in the Water Well Sampling Program. The survey was targeted towards private well owners to participate in a one-time well sampling program to sample their wells and collect data on TDS and nitrate to be used to better understand and manage groundwater quality of the basin. The City of Poway informed the well owners that as part of their participation in the effort, the well owner

would receive information on the water quality in their well. The survey letter was also made available at the City's website (http://poway.org/DocumentCenter/View/5407/Letter-to-Well-Owners-within-the-Basin).

Well sampling program was further expanded to identify private wells that could be proposed for the SNMP-specific monitoring plan. The City of Poway sent a letter to private well owners requesting their long-term participation for annual groundwater well sampling program in support of the SNMP. In addition to letters, the City also followed-up with calls to contact private well owners to gauge their interest. As part of the proposed monitoring, the City would coordinate with the private well owner to arrange a day and time for a City of Poway water quality technician to visit the property to sample the well. As part of this participation, well owners would receive information on the water quality in their wells, similar to the initial one-time sampling program.

2.4.2 Stakeholder Workshops

Stakeholder workshops were a key component in the SNMP development as they provided an opportunity for stakeholders to contribute information, express concerns, provide recommendations, and relay information to and from their organizations. Stakeholder workshops (including dates and locations) are summarized in Table 5. Meeting dates and locations were announced on the City's website, through mailers sent to private well owners, email blasts to the stakeholder contact list, and other means described above.

Table 5: Stakeholder Workshops

Workshop Topic	Date and Time	Location
SNMP Plan Development, Stakeholder Process, Groundwater Data Collection, and Outreach	May 22, 2018 at 6:00pm	Poway City Hall Council Chambers
SNMP Overview, Loading Analysis Methodology and Results, and Antidegradation Findings	November 13, 2018 at 6:00pm	Poway City Hall Council Chambers

Each workshop consisted of a 30-minute presentation and a 30-minute question-and-answer (Q&A) session. After the presentation and Q&A, there was a 30-minute resource fair to provide targeted information to audience groups such as private well owners, recycled water users, business owners, etc., in order to personally interact with stakeholders and ensure long-term engagement. A summary of each workshop is presented in the following sections. Appendix A contains the Workshop #1 and Workshop #2 presentations.

2.4.2.1 Workshop #1

At Workshop #1, held on May 22, 2018, the City of Poway introduced the stakeholders to the SNMP purpose, goals and process, and explained the importance of their participation in the SNMP planning and management efforts. The stakeholders were presented with existing data and analysis that characterized the basin. The workshop's Q&A session included a robust discussion of historical land uses, water sources, and changes in groundwater quality over time. The group also discussed potential impacts of stormwater runoff and vegetated areas in groundwater quality, along with potential solutions including the two retention basins located in the Poway Business Park. City staff and its consultants explained that the quality of recycled water stays steady over time. Even if residents are not drinking the groundwater from their private wells, they should be sampled so that irrigation and fertilizer practices can be adjusted to accommodate the existing groundwater quality.

2.4.2.2 Workshop #2

At Workshop #2, held on November 13, 2018, the City of Poway provided the stakeholders with a refresher on the SNMP and a review of the basin characterization results. The presentation included an overview of the water well sampling results, the loading analysis, and the antidegradation findings. The presentation also reviewed the City's existing suite of management strategies that help to reduce loading to the basin, along with several future efforts that will support improved groundwater quality. The proposed long-term Water Well Sampling Program will provide monitoring results showing continued stability of groundwater quality levels in the basin. No members of the general public were in attendance at Workshop #2 and no Q&A were recorded.

2.4.3 Other Stakeholder Coordination and Meetings

The Poway Business Park Association and Poway Chamber of Commerce were contacted and informed of the SNMP and the upcoming workshops. In May 2018, the Poway Business Park Association and the Poway Chamber of Commerce sent a blast email to all its members explaining the SNMP to each member and inviting them to Workshop #1. In May and October 2018, the City of Poway offered to present the Poway Valley SNMP to the Poway Business Park Association meetings. Although the Association did not take the City up on its offer, outreach was done to ensure that the recycled water users in the Poway Business Park understood the SNMP purpose and had the City's contact information available should questions arise.

2.5 Regulatory Coordination with San Diego Regional Water Quality Control Board

The San Diego RWQCB has been an active part of the SNMP development process. The City met with the San Diego RWQCB in early 2017 prior to the development of the SNMP to discuss the SNMP approach. In June 2017, the City requested the RWQCB reassign the PVGB from Tier B to Tier C category. In a letter dated August 16, 2017 from the RWQCB, the PVGB was downgraded to Tier C. Based on the coordination between the City and the RWQCB, the development of the Poway Valley SNMP was in accordance with Tier C requirements.

During the SNMP development, a meeting in August 2018 was conducted with RWQCB (with City of Poway staff, its consultant, and RWQCB staff) to provide an update on the SNMP development process, discuss the timeline for SNMP completion, and coordinate with the RWQCB regarding the review and approval timeline of the SNMP. This meeting included a brief presentation on various aspects of the SNMP development, including data collection efforts, potential management actions, and concurrence on the compliance approach proposed for the SNMP. San Diego RWQCB responded to the City in an email dated September 13, 2018 to provide recommendations regarding the SNMP development for the PVGB. The SNMP was completed according to the proposed approach discussed with and submitted to the San Diego RWQCB on December 14, 2018 for review and approval. Appendix B presents the coordination between the City and the San Diego RWQCB regarding the development of the Poway Valley SNMP.

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3. PLAN AREA

This section provides a description of the Plan area covered by this SNMP, including the physical setting and water resources. Current and future water demand and supply conditions and other planning efforts undertaken within the City and the region are also described briefly.

3.1 Plan Area Description

The Plan area includes the area within the PVGB as shown in Figure 2. The PVGB lies mainly within the City of Poway (92 percent), with a small portion in the west that lies in the City of San Diego (8 percent). Figure 2 shows the locations of the PVGB and surrounding groundwater basins as defined by DWR Bulletin 118 (DWR 2003). There are no other groundwater basins adjacent to the PVGB as defined by DWR Bulletin 118.

3.2 Poway Valley Groundwater Basin

The PVGB underlies a portion of Poway Valley in west-central San Diego County, approximately 10 miles east of the Pacific Ocean. PVGB covers approximately 2,470 acres and is approximately 5.1 miles long, and 0.4 miles wide at the western end; 2.5 miles wide through the protrusion in the center; and approximately 0.7 miles wide through the eastern end. The SDCWA First Aqueduct runs north to south through the Plan area (Figure 3). The First Aqueduct separates the water quality objectives in the PVGB, with different water quality objectives for TDS concentration for the east and west side of the First Aqueduct, as discussed in Section 1 of this SNMP.

Groundwater use within the PVGB is very limited. Groundwater is not pumped for municipal water supply in the PVGB and imported water provides for most of the water used in the PVGB. Private domestic wells located in the PVGB serve individual users mainly for irrigation of residential parcels. No active municipal water supply wells or groundwater replenishment projects occur in the Plan area.

Data for the basin characterization is limited. A description of the PVGB is summarized in Section 4, based on a previous study conducted by U.S. Geological Survey (USGS) (1989) and DWR Bulletin 118 (DWR 2003).

Figure 2: Poway Valley and Nearby Groundwater Basin Boundaries

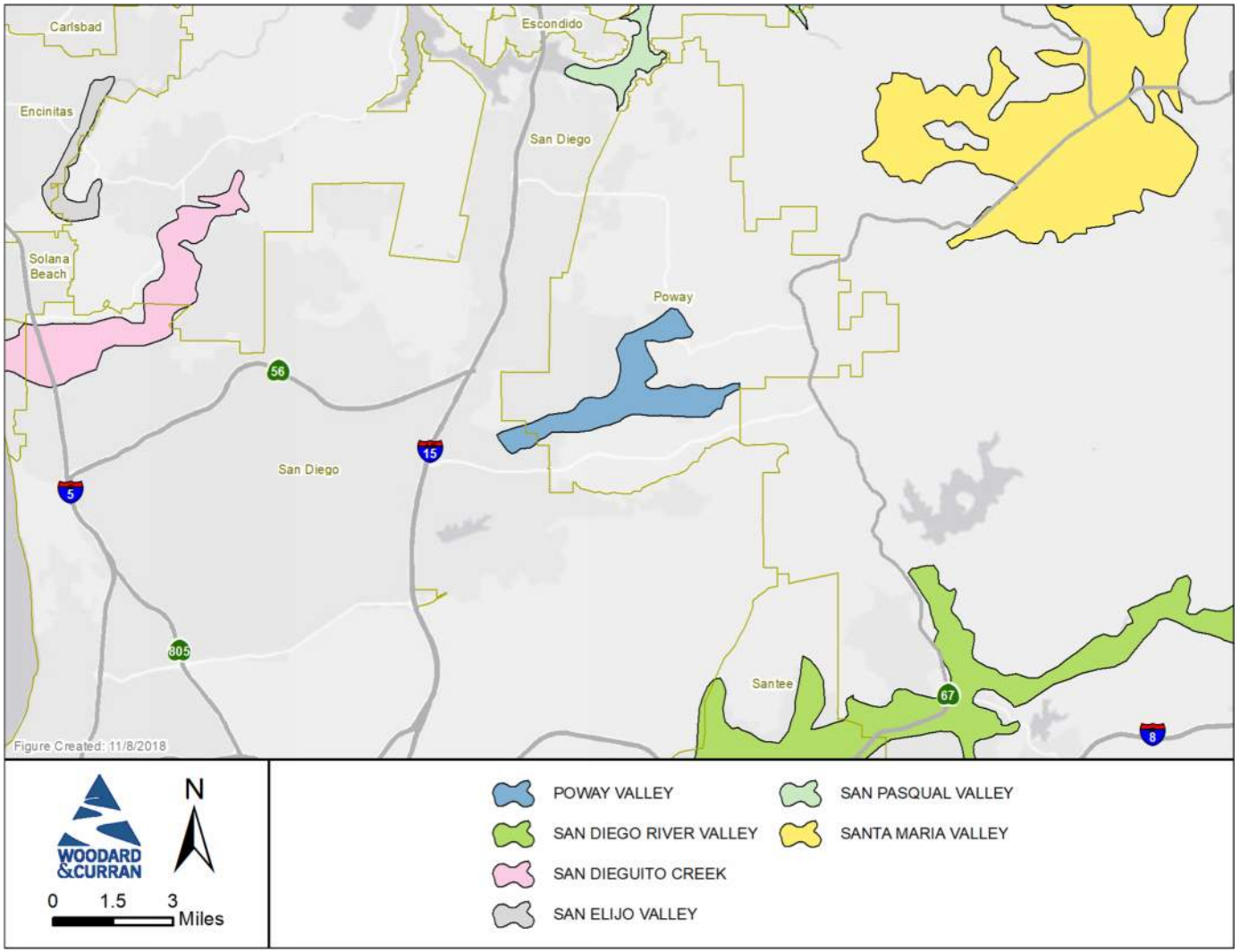
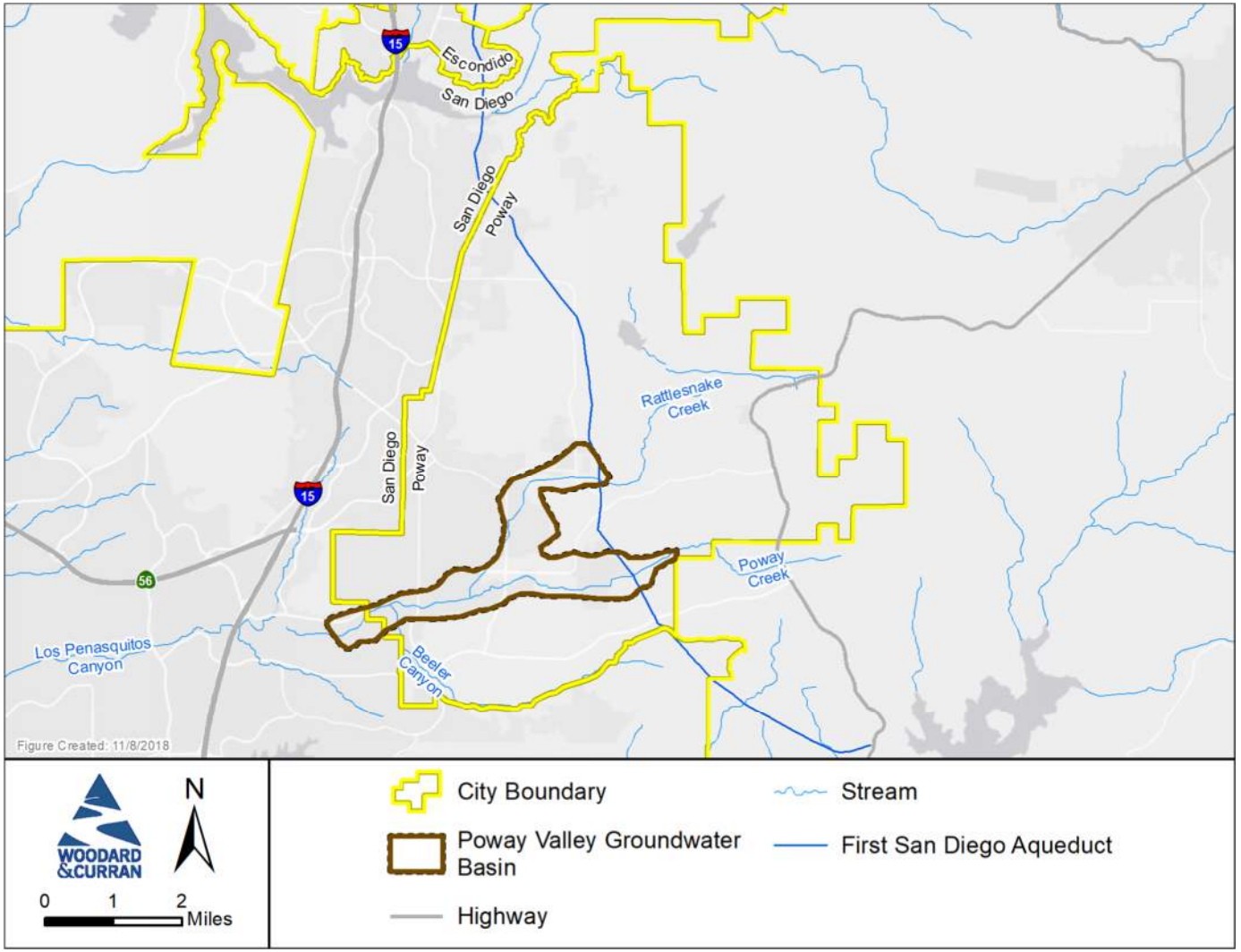


Figure 3: Poway Valley Groundwater Basin Boundary



3.3 Climate

Climate in the Plan area is considered to be semi-arid with hot, dry summers and a relatively short rainy season. Located approximately 10 miles east of the Pacific Ocean, the Poway area enjoys mild-to-moderate temperatures, marine breezes, and low humidity. The average temperature is 72 Fahrenheit (F) degrees. Average annual rainfall is approximately 13 inches. Most of the rainfall occurs between October and April each year (Table 6).

Table 6: Average Monthly Climate Data in the Poway Valley Groundwater Basin

Month	Average Rainfall (inches)[1]	Average Maximum Temperature (F)[2]	Average Minimum Temperature (F)[2]
January	2.5	67	41
February	2.7	66	43
March	2.2	67	44
April	1.0	72	48
May	0.3	74	54
June	0.1	81	56
July	0	86	60
August	0.1	86	62
September	0.2	84	58
October	0.5	79	50
November	1.4	72	43
December	1.9	67	39

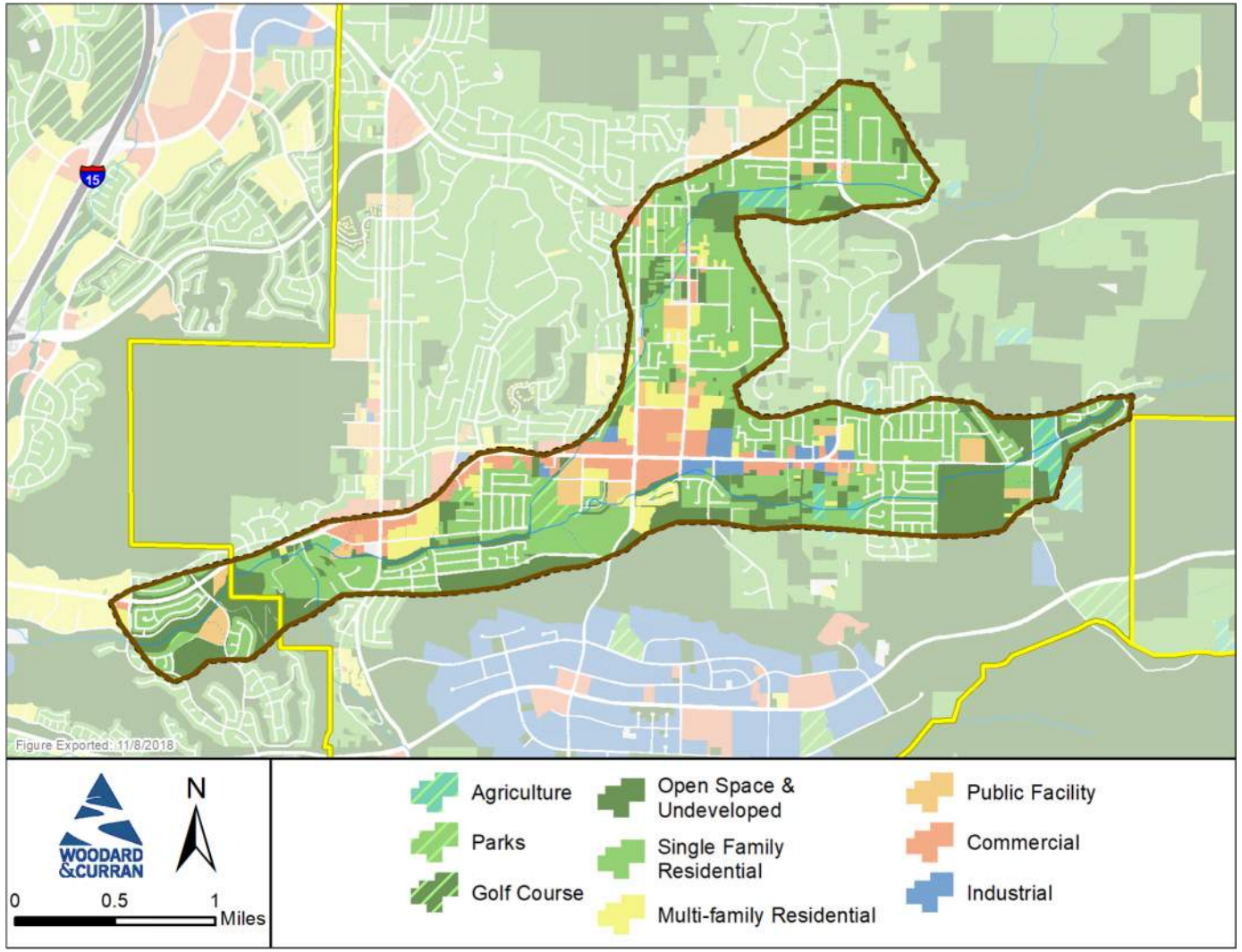
Notes: 1. NOAA station in Poway Valley (#7111) based on monthly data from 1956-2013.
2. Western Regional Climate Center period of record monthly climate summary, 1893-2015 as reported in the City of Poway 2015 Urban Water Management Plan (2016).

3.4 Land Use

The Plan area is mainly located within the City of Poway. Single family housing is the dominant land use within the basin. Multi-family, commercial and industrial lands are concentrated near the center of the basin along Poway Road (Figure 4).

The City of Poway has historically been identified by its agricultural land uses, primarily devoted to farms and livestock ranches (City of Poway 2000), but these uses have largely converted to urban uses over time. According to the existing land use database, there are approximately seven parcels categorized as intensive agriculture, but none appears to be used as such according to the aerials as described in Table 7. Agricultural land use designations were also compared based on the US Department of Agriculture (USDA) CropScape data for 2013-2017 (https://nassgeodata.gmu.edu/CropScape/) that identified no crops within the basin. According the County Agricultural Crop Commodities data layer 2013, two crops were identified (avocados and citrus) near the basin outside of the basin boundary (http://www.sangis.org/download/index.html).

Figure 4: Existing Land Use in the Plan Area



Note: Areas indicated as agricultural on the land use map are not actively being farmed.

Table 7: Agricultural Land Use Categorization in Poway Valley Groundwater Basin

Parcels Identified as Agriculture in County Land Use Layer	Category by County Land Use Data Layer	Category by CropScape Data Later	Land Use based on Aerial Imagery
One parcel in the northern basin	Intensive agriculture	Mixed and include grass/pasture and shrubs	Appears to be a horse stable property
One parcel near western basin south of Poway Road	Intensive agriculture	Developed	A rock and aggregate wholesaler
Two parcels near the eastern edge of the basin	Orchard or vineyard	Mixed and include grass/pasture, shrubland and developed	Appears to be currently unused/vacant
Three parcels in the southern basin south of Poway Road	Field crops	Mixed and include grass/pasture, shrubland and developed	Appears to be currently unused/vacant

The City of Poway's General Plan and land use priority is to preserve a balance between the community's rural character and well-planned residential/commercial/industrial development. The General Plan, adopted in November 1991, calls for maintaining a majority of the City's land as open space to provide the community with a natural buffer (City of Poway 1991). The majority of open space is located in the foothills that surround the City of Poway. Land use within the Plan area is predominantly non-agricultural, including developed and undeveloped portions of the City of Poway, as well as a small developed portion of the City of San Diego. Parcel based land use datasets obtained from the City of San Diego that covers the PVGB contain several hundred discrete land use categories, which were consolidated into the following land use groups for the Plan area for the purpose of loading analysis in Section 6:

- Single-family Residential
- Commercial
- Agriculture
- Mixed Use
- Multi-family Residential
- Industrial
- Parks
- Public Facility
- Military
- Open Space / Undeveloped

Future land use changes within the City of Poway and within the PVGB are anticipated to be small and would include mainly redevelopment of already developed areas along the Poway Road. Overall, approximately 14 acres would convert from vacant or non-irrigated land to urban, as presented in Table 8. These small redevelopment changes do not include parks or golf courses and are not anticipated to significantly affect future salt and nutrient loading.

Table 8: Proposed Future Development in Poway Valley Groundwater Basin

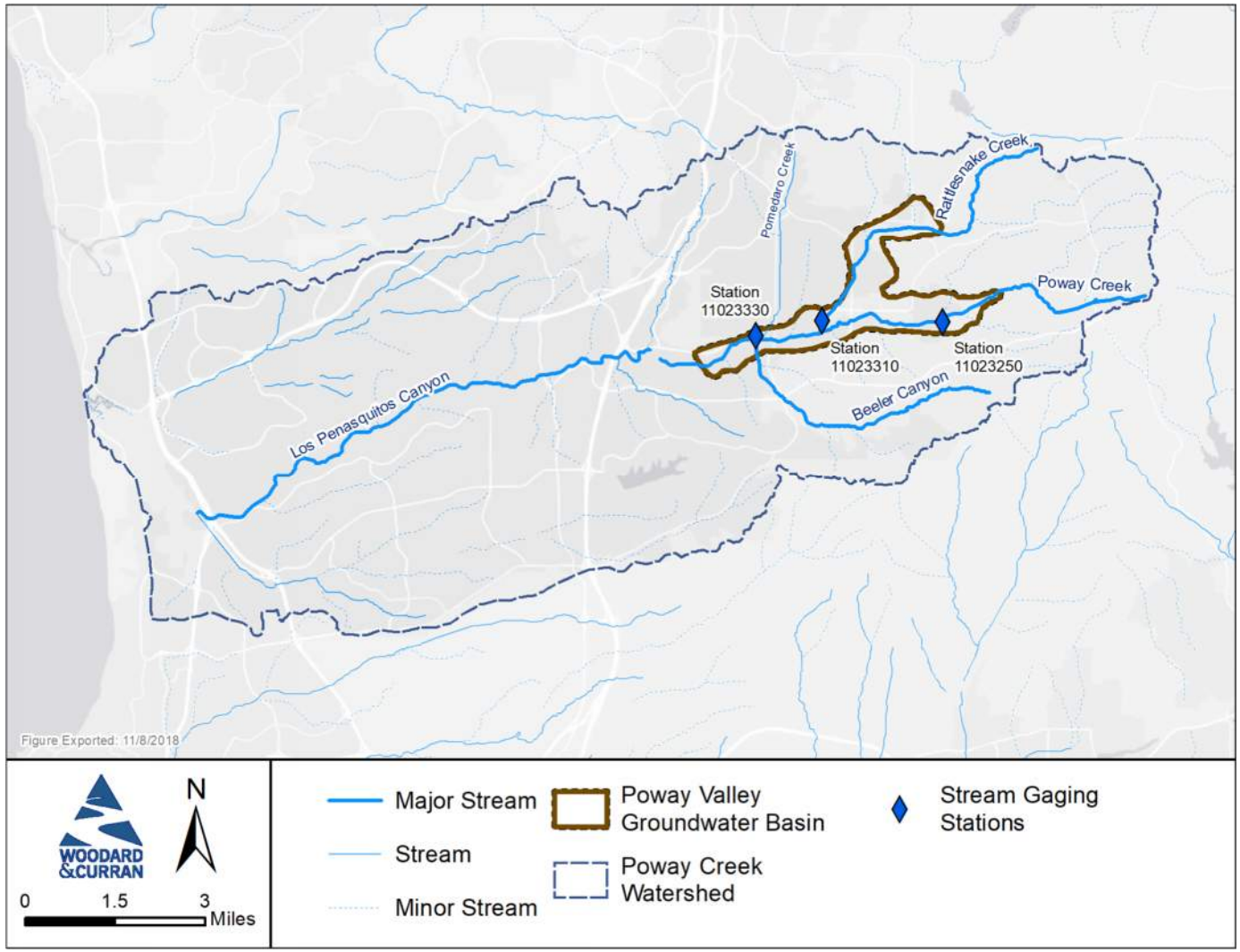
Address	Current Land Use	Future Land Use	Approximate Acres
12341 Oak Knoll Rd	Commercial (Parking Lot)	54 Residential Units	10
12941-12857-12845 Poway Road	Commercial Shops	110 Residential Apartment Units	7
13021 Poway Rd	Empty Lot	142 Residential Units	3
13029 Poway Rd	Commercial Shops	52 Residential Units	0.5
Agsten Lane	Empty Lot	44 Residential Units	1

3.5 Poway Creek Watershed

The Poway Creek Watershed includes the entire PVGB, covering approximately 60,300 acres (Figure 5). The watershed extends approximately 10 miles west, 2 miles east, 1 mile north, and 2 miles south of the PVGB. The majority of the City's stormwater is tributary to Poway Creek in the south (City of Poway 2000).

Poway Creek runs east to west through the PVGB. Rattlesnake Creek runs north to south in the PVGB and joins with Poway Creek before leaving the basin boundary to the west as Los Penasquitos Canyon Creek. Pomerado Creek joins with Poway Creek from the north just upstream of the confluence with Beeler Canyon from south. After leaving the City's boundary, collected runoff flows approximately 13 miles through Penasquitos Canyon to the Pacific Ocean.

Figure 5: Poway Creek Watershed



3.6 Water Resources

According to the 2015 City of Poway Urban Water Management Plan (UWMP; City of Poway 2016), the City imports 99 percent of its water supply. The main water supply in the Plan area is raw water purchased by the City from SDCWA, which is treated at the Berglund WTP for distribution in the City's potable water system (Figure 6). Lake Poway captures a small amount of rain and surface runoff during rain events. Since the quantity of Lake Poway runoff is relatively minimal and not reliable (as well as off-set by naturally-occurring evaporation and seepage), it is not considered as a planned water supply source. Additionally, the City of Poway purchases a small quantity of recycled water from the City of San Diego for irrigation in the Poway Business Park, located outside the PVGB, to the south. Table 9 presents the City's 2015 water supplies.

Table 9: City of Poway Water Supplies

Water Supply	Water Supply Description	2015 Volume (AF)	
		Actual Volume	Water Quality
Purchased or Imported Water	Purchased raw water from SDCWA	8,712[1]	Raw water
Recycled Water	Purchased recycled water from City of San Diego	363	Recycled water
	TOTAL	**9,075**	

Note: 1 Represents total volume imported from SDCWA, not total volume distributed to customers.
Source: City of Poway 2015 UWMP (2016), Table 5-7.

3.6.1 Imported Water Supply

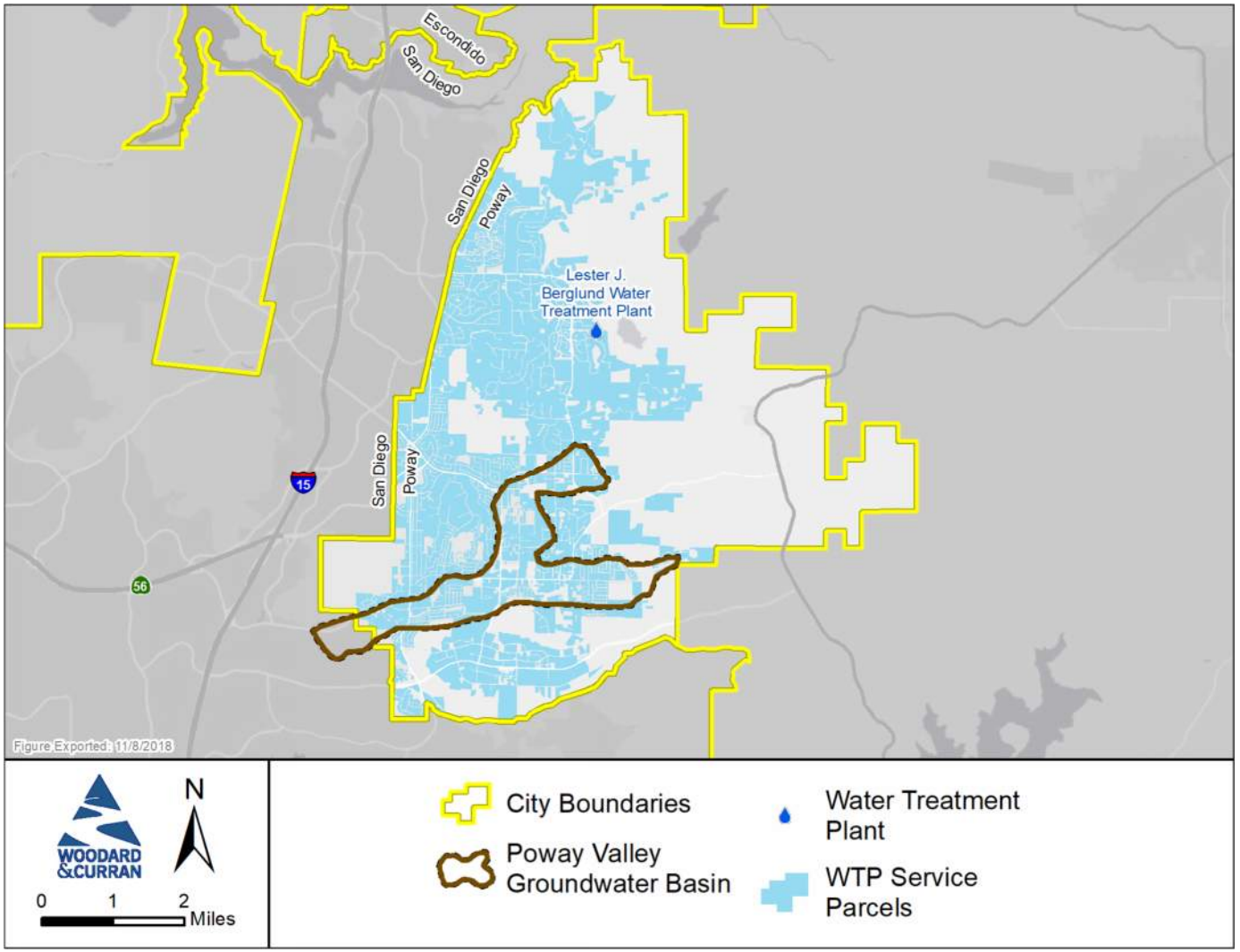
The raw water delivered to the City of Poway from SDCWA has historically been a blend of 60 percent Colorado River Water and 40 percent State Water Project (SWP) water. The blend of raw water purchased from SDCWA has changed significantly since 2010. As reported in the City of Poway's 2015 Lake Poway Watershed Sanitary Survey (City of Poway 2015), raw imported water has recently been comprised of 100 percent Colorado River water. Once treated at the Berglund WTP, the product water substantially surpasses federal and state water quality standards. TDS and nitrate-N concentrations of the City's water are approximately 594 mg/L and 0.4 mg/L, respectively, based on the Annual Drinking Water Quality reports (also known as Consumer Confidence Reports) for the past five-year period. Table 10 presents the City's 2015 and projected imported water deliveries through 2040.

Table 10: City of Poway Current and Projected Imported Water Supplies

Water Supply	Historical (AF)	Projected (AF)				
	2015	2020	2025	2030	2035	2040
Purchased Raw Water from SDCWA	8,712	13,356	14,306	14,482	14,557	15,033

Source: City of Poway 2015 UWMP (2016), Tables 5-7 and 5-8.

Figure 6: City of Poway Delivery Area for Berglund Water Treatment Plant



3.6.2 Groundwater

Groundwater is not a source of municipal water supply for the City. Groundwater is pumped by private domestic wells mainly for residential irrigation purposes. Pumping by private wells are not monitored or reported within the basin. Locations of parcels with private wells and estimated private well pumping are described in Section 4. The basin is not adjudicated and pumping is not currently managed by a Watermaster or other oversight entity.

3.6.3 Recycled Water

The City of Poway purchases a small quantity of recycled water from the City of San Diego for irrigation in the Poway Business Park, located outside the groundwater basin (Figure 7). Distribution of the recycled water within the City of Poway's service area is regulated by RWQCB Order R9-2016-0017. Recycled water is currently used solely in the Poway Business Park, distributed through dedicated pipes and meters. In 2015, the City of Poway purchased 363 AF of recycled water from the City of San Diego (Table 11). Average TDS and nitrate-N concentrations of recycled water are 1,200 mg/L and 12.2 mg/L, respectively, based on the data provided in the NCWRP Nitrate Study conducted by the City of San Diego (2016).

The City of Poway plans to explore opportunities for collaboration with the City of San Diego on recycled water projects in northern areas of Poway as opportunities arise. Approximately 177 AF of future projected recycled water is anticipated to be delivered within the PVGB (City of Poway 2016).

Table 11: Recycled Water Use in the City of Poway

Water Supply	Historical (AF)	Projected (AF)				
	2015	2020	2025	2030	2035	2040
Recycled Water	363	645	645	645	645	645

Source: City of Poway 2015 UWMP (2016), Tables 5-7 and 5-8.

3.7 Water Demand

The basin-wide water demand described in the following sections is based on demands reported in the City of Poway 2015 UWMP for individual sectors, including single-family, multi-family, commercial, landscape, agricultural, and industrial.

3.7.1 Current Water Demand

A summary of water demand by land use within the City of Poway service area is provided in Table 12. Current water use in the City of Poway consists primarily of residential and commercial use, with a small amount of industrial use and agricultural irrigation. Water consumption data for the City is separated into the following sectors: single-family residential; multi-family residential; commercial; industrial; institutional/governmental; landscape; agricultural and water losses.

Figure 7: Recycled Water Service Area

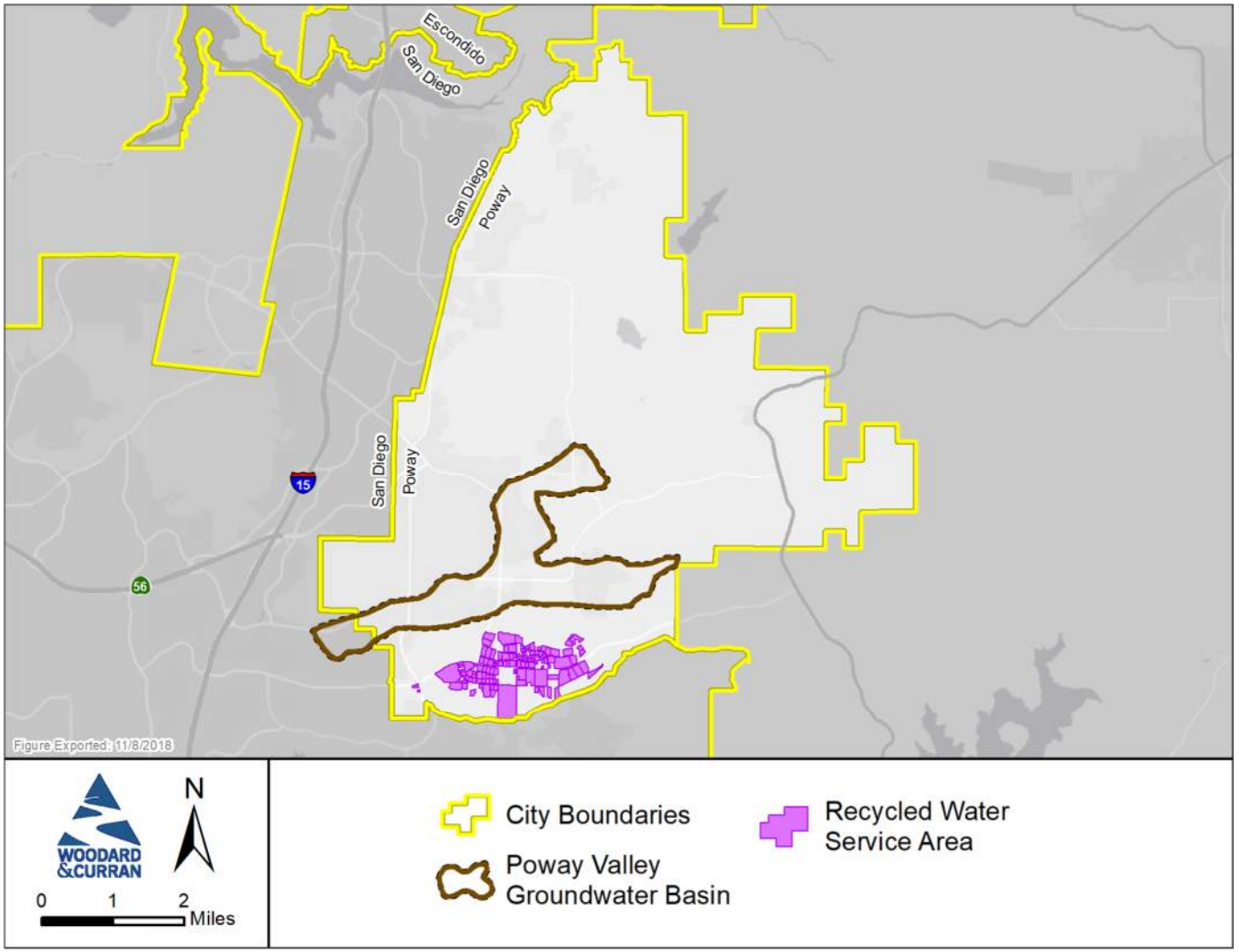


Table 12: Current (2015) Water Demand in the City of Poway

Use Type	Description	Level of Treatment When Delivered	Volume (AFY)
Single Family		Drinking Water	5,356
Multi-Family		Drinking Water	398
Commercial [1]		Drinking Water	1,162
Industrial		Drinking Water	107
Landscape [2]		Drinking Water	474
Landscape	Raw Water for Golf Course	Raw Water	445
Agricultural		Drinking Water	30
Water Losses		Drinking Water	304
Sales/Transfers/Exchanges to other Agencies	Sales to Ramona MWD	Drinking Water	98
		Potable Water Supply	**8,374**
		Recycled Water	**363**
		Total	**8,737**

Notes: 1. Commercial use includes institutional use and special district facilities, such as schools, churches, and the hospital
2. Landscape use includes metered irrigation, minus recycled water irrigation use, plus potable water added to supplement recycled water demands. Source: City of Poway 2015 UWMP (2016), Table ES-2. AFY = acre-feet per year.

3.7.2 Projected Water Demand

Table 13 presents the City of Poway's projected water use through 2040 based on the City's 2015 UWMP. The City's baseline water use from 2020 to 2040 is projected to be in line with the City's 15-year average from 2000 to 2014, 235 gallons per capita per day (gpcd). This baseline water use does not account for active and passive conservation activities that will be implemented within the service area. The UWMP estimated that conservation is estimated to result in approximately a 17 percent reduction in water use through the planning horizon. Approximately 15 AF of projected future demand by 2030 is attributed to the proposed future land use changes along the Poway Road.

Table 13: Projected Water Demand in the City of Poway

Use Type	Description	Projected Water Use (AF)				
		2020	2025	2030	2035	2040
Single Family		7,577	7,826	8,079	8,129	8,115
Multi-Family		402	409	412	409	409
Commercial [1]		1,153	1,162	1,170	1,172	1,173
Industrial		178	198	209	183	13
Landscape [2]		510	504	497	494	496
Landscape	Raw Water for Golf Course	445	445	445	445	445
Agricultural		30	30	30	30	30
Water Losses		304	304	304	304	304
Sales/Transfers/Exchanges to other Agencies		98	98	98	98	98
Potable and Raw Water		**10,697**	**10,975**	**11,244**	**11,264**	**11,264**
Recycled Water		**645**	**645**	**645**	**645**	**645**
Total		**11,342**	**11,620**	**11,889**	**11,909**	**11,909**

Notes: 1. Commercial use includes institutional use and special district facilities, such as schools, churches, and the hospital.
2. Landscape use includes metered irrigation, minus recycled water irrigation use, plus potable water added to supplement recycled water demands. Source: City of Poway 2015 UWMP (2016), Table ES-4.

3.8 Description of Other Plans

In addition to development of this SNMP, the City of Poway participated in other planning efforts and is an active participant in regional water resource management planning activities. These planning efforts inform and support future decisions to ensure that reliable water supplies are available to meet future demand, to promote the sustainable use of water supplies, and to facilitate groundwater resource management in the Plan area.

3.8.1 City of Poway Urban Water Management Plan

Preparation of an UWMP is a requirement of the Urban Water Management Planning Act for urban water suppliers with more than 3,000 connections or supplying more than 3,000 AF of water annually. UWMPs are prepared by urban water suppliers to support long-term resource planning and ensure adequate water supplies are available to meet current and future water demands in their service areas. These plans must be updated and submitted to DWR every five years to comply with the Urban Water Management Planning Act and be eligible for state funding.

The City of Poway prepared its 2015 UWMP as an urban water supplier serving over 3,000 acre-feet per year (AFY) (City of Poway 2016). The City's 2015 UWMP was used to describe water supplies and demands earlier in this section.

3.8.2 City of Poway Stormwater Master Plan

The City of Poway developed a Stormwater Master Plan in 2000 to inventory and analyze the City's stormwater drainage system (City of Poway 2000). The planning period was between 2000 and buildout represented by 2020. The outcome of the analysis was intended to be used as the basis for the design of new storm drain facilities and future system improvement needs for the stormwater system. As described in Section 9, the City implements several Best Management Practices (BMPs) to control water quality of dry weather and stormwater discharges in the Plan area.

3.8.3 San Diego Integrated Regional Water Management Plan

The San Diego Integrated Regional Water Management (IRWM) Plan was last adopted in 2013 as a regional effort to establish water management issues and priorities, facilitate integration and collaboration among stakeholders, and move the region toward in sustainable water resource management (Regional Water Management Group 2018). The City of San Diego is one of the management group members leading the San Diego IRWM Plan. The City of Poway was actively involved in the 2013 IRWM Plan and in the current 2019 IRWM Plan Update, which reflects the City's existing and projected water supplies and demands as part of the regional water resources portfolio.

4. BASIN CHARACTERIZATION

This section presents a brief description of the hydrogeology of the PVGB, geologic setting, and groundwater conditions for levels, flow, storage, and water quality. This section relies on available data collected from public sources, data collected from private wells during the Water Well Sampling Program, and review of information from previous investigations.

4.1 Regional and Geologic Setting

The description of the regional setting that follows is based on the Poway Basin defined previously by the USGS (1989) that covers a much larger area of approximately 22,200 acres, compared to the PVGB defined by DWR Bulletin 118 covering an area of 2,470 acres. The six geologic units exposed in the region, in ascending order, are the Santiago Peak Volcanics, the Lusardi Formation of the Rosario Croup of Late Cretaceous age, granitic rocks of the southern California batholith, the Friars Formation of the La Jolla Croup, the Poway Croup, and Alluvium (USGS 1989).

Santiago Peak Volcanics

The Santiago Peak Volcanics are the oldest rocks that are most commonly found in the western part of the basin, but outside of the PVGB boundary defined by DWR. Isolated outcrops also occur in the eastern part of the Poway Basin. Massive conglomerates, andesitic agglomerates, quartzites, shales, tuffs, and trachytic and andesitic flows make up the Santiago Peak Volcanics.

Lusardi Formation

The occurrence of the Lusardi Formation is limited to several small outcrops in the eastern part of the basin. These rocks are cobble and boulder conglomerates occasionally containing lenses of sandstone (Kennedy and Peterson 1975).

California Batholith

Granitic rocks of the southern California batholith are exposed in or underlie the north and east parts of the basin. These rocks are quartz diorite, gabbro, and tonalites. Review of selected well logs in the PVGB performed as part of the SNMP shows that most wells access fractured water within this unit.

Friars Formation

The Friars Formation of the La Jolla Group, a non-marine lagoonal sandstone and claystone, is exposed along the southern side of Poway Valley and Los Penasquitos Canyon. The formation is also found adjacent to the east and west sides of the alluvium around Beeler Creek and around the outcrop of the Poway Group in the northern part of the basin. This formation also underlies sedimentary deposits throughout the area. The maximum thickness in the basin is about 150 feet.

The Poway Group

The Poway Group forms the south wall of the Poway Valley and extends throughout the southern part of the basin. Isolated occurrences also are located north of Poway Creek and west of Rattlesnake Creek. This group is composed of the Stadium Conglomerate, the Mission Valley Formation, and the Pomerado Conglomerate (Kennedy and Peterson 1975). The Stadium and Pomerado Conglomerates are lithologically similar. Both consist of a cobble conglomerate that has a coarse-grained sandstone matrix, and lenses of sandstone compose as much as 50 percent of the units. The Stadium Conglomerate is the lowermost formation and the Pomerado Conglomerate is the uppermost formation in the Poway Group. The Mission Valley Formation lies between the two. This formation is composed of marine,

lagoonal, and nonmarine sandstone. The sandstone is soft and locally contains carbonate-cemented beds (Kennedy and Peterson, 1975 as cited in USGS 1989).

Alluvium

Alluvium is composed of unconsolidated stream deposits of silt, sand, and cobble-sized particles derived from surrounding formations (Kennedy and Peterson 1975). The largest deposit of alluvium is located in the center of the basin along the Poway Valley. This alluvium-covered area is about 4 miles long and ranges in width from 0.5 to 1 mile. Three other minor occurrences of alluvium are found in the basin, one extending along Beeler Creek south of the main valley, one extending along Pomerado Creek and one along Chicarita Creek to the north of the valley. Thickness of alluvium in the Poway Valley varies. The maximum thickness averages about 40 feet and probably does not exceed 75 feet. The thickness of alluvial fill in the minor valleys probably does not exceed 10 feet. Review of selected well logs in the PVGB performed for this SNMP shows 20 - 50 feet of alluvium.

4.2 Hydrogeologic Information

The geology of Poway does not include large alluvial aquifers with the coarse-grained materials that support efficient groundwater extraction and recharge. Poway's aquifers are small, located along creeks and streams, and contain more fine-grained materials. Groundwater is also available in fractured bedrock, although it typically requires deep wells and can have limited yields.

4.2.1 Water Bearing Formations

The water-producing units within the PVGB as defined by USGS (1989) are granite rocks, the Poway Group, and Alluvium. Within the DWR Bulletin 118 basin boundary, review of selected well boring logs access groundwater from alluvium and from fractured granite. Both of these geologic units were described by the USGS in the 1989 Water Resources Investigations Report. California Batholith rocks are quartz diorite, gabbro, and tonalites. Tonalites can be deeply weathered, and wells drilled in weathered tonalites can produce high yields; wells drilled in the more resistant diorites and gabbros generally have low yields (USGS 1989). Where the alluvium deposits are thick enough, wells obtain water from the alluvium. Groundwater yields are low in the alluvium; some wells yield enough water for domestic uses, but not enough for irrigation (USGS 1989).

It should be noted that given the shallow nature of the alluvial aquifer in the PVGB, there is potential that this should not be classified as a groundwater basin by DWR. Rather, the groundwater resource being accessed here is primarily a fractured rock system.

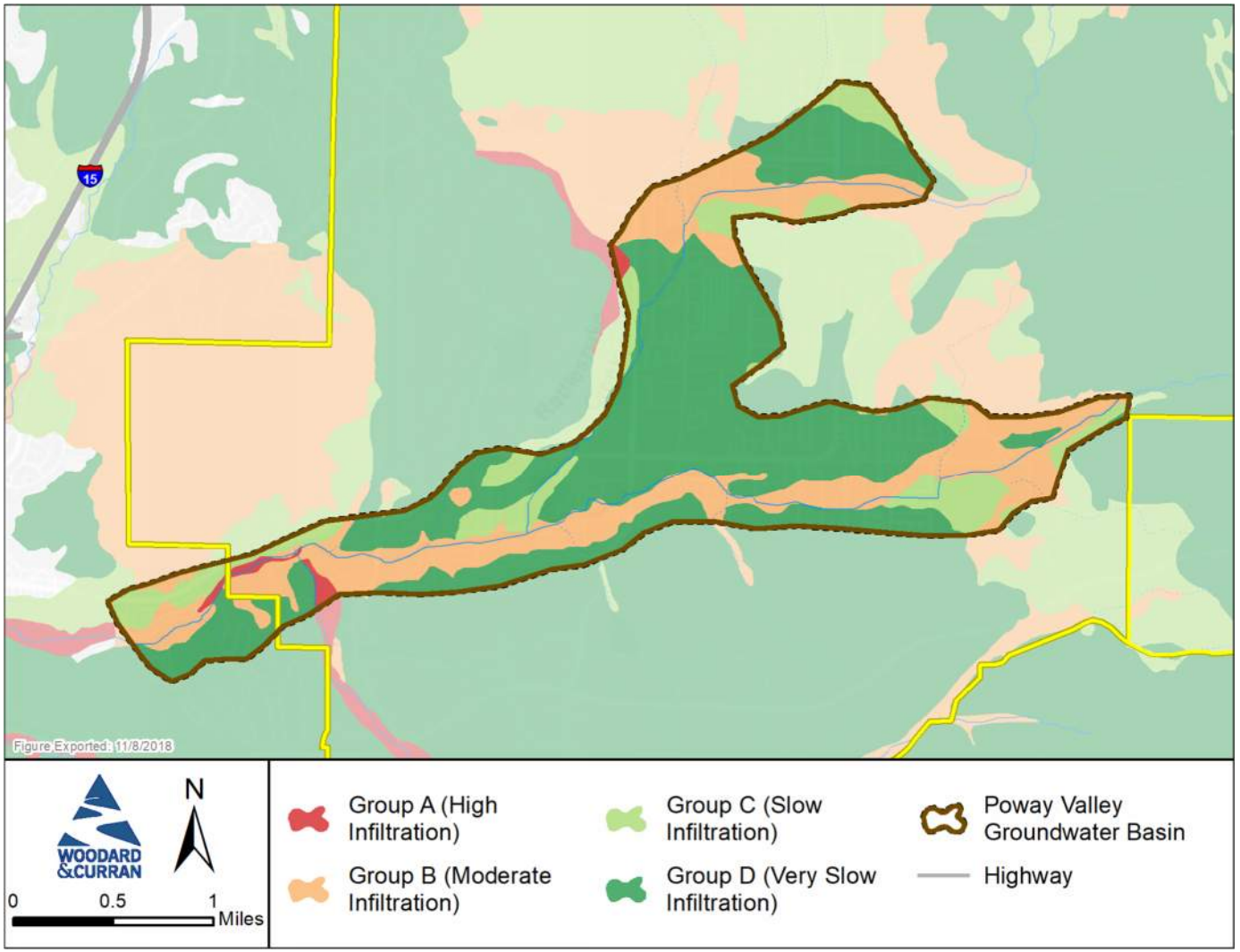
4.2.2 Soils

Soil data for the Plan area were obtained from the City of Poway Stormwater Master Plan (2000) based on the USDA hydrologic soil groups and presented in Figure 8 based on the potential for infiltration. Hydrologic soil groups A, B, C, and D are assigned based on measured rainfall, runoff potential, and infiltration, as described below.

- Group A soils have high infiltration rates even when thoroughly wetted. Water is transmitted freely through the soil. These soils have a high rate of water transmission and would result in a low runoff potential.
- Group B soils have moderate infiltration rates when thoroughly wetted. These soils have a moderate rate of water transmission.
- Group C soils have moderately high runoff potential when thoroughly wet. These soils have a slow rate of water transmission.
- Group D soils have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. These soils have a very slow rate of water transmission.

As shown in Figure 8, according to the soils data, most soils in the Plan area have slow (Group C) to very slow (Group D) infiltration. Activities on the land surface in these areas (e.g., irrigation or recycled water use) are likely to have minimal impact on underlying groundwater quality compared to areas with higher infiltration rates. Small areas of moderate (Group B) and high (Group A) infiltration exist along the creeks. Areas with such high to moderate infiltration are more likely to be potential recharge areas for the underlying groundwater basin, although the presence of pervious surfaces in the urban environment limits this recharge.

Figure 8: Relative Infiltration Rates for Soils, Based on USDA Hydrologic Soils Groups



4.3 Prior and Current Groundwater Monitoring

Groundwater is not used as a source of municipal potable water supply for the City of Poway, and it is not used in the City's water treatment and distribution system. The City of Poway does not currently monitor groundwater, but has previously collected groundwater elevation and quality data from five test wells constructed at public parks. Figure 9 shows the locations of the City's test wells and Table 14 presents data available from the test wells. Data include initial water quality sampling conducted in 1992 for TDS at each test well and TDS and nitrate-N sampling in 2008 and 2016 at a test well, as presented in Table 14. These wells are not used, and no additional water quality data for TDS and nitrate-N were available after these samplings. These test wells are not equipped with pumps and were not cost-effective to use for water quality sampling. They can be used for groundwater level monitoring to improve the basin understanding in support of the SNMP monitoring plan, as discussed in Section 8 of this SNMP.

Table 14: City of Poway Test Wells

Well Location	Depth (feet)	Construction Date	Static Water Levels Depth (feet) [1]	Yield (gallons per minute)	TDS (mg/L)	Nitrate-N (mg/L)	Sampling Dates
Hilleary Park	300	12/12/1992	25	7	1,365	--	01/1992
Starridge Park	400	12/12/1991	80	15	1,650	--	01/1992
Old Poway Park	300	12/12/1992	1	30+	795	--	01/1992
Garden Road Park	300	12/12/1991	15	60+	656	--	01/1992
					655	0.23	05/2016
Community Park	352	12/12/1991	25	400+ estimated 270+ tested	1,420	--	01/1992
					910	ND	10/2008

Note: 1. Static water levels measured in January 1992. ND = Not detected.

Private wells are currently used for residential irrigation purposes. Figure 10 shows the locations of the parcels containing private wells. A subset of these wells was sampled by the City of Poway to obtain TDS and nitrate data as part of the Water Well Sampling Program conducted in May 2018. These data were needed to support the basin characterization and loading analysis for this SNMP. These wells are privately owned and not subject to monitoring by the City. The well owners volunteered to participate in the Water Well Sampling Program.

Currently, the PVGB is categorized as a very low priority basin per SGMA and the PVGB is not covered by a designated CASGEM monitoring entity. There are no wells actively monitored by USGS or DWR in the PVGB. Limited groundwater levels and quality data are maintained by the SWRCB through the GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) program. Within the PVGB, this database typically includes shallow monitoring wells used to assess the quality of groundwater during a cleanup operation.

Figure 9: Locations of City Poway Test Wells

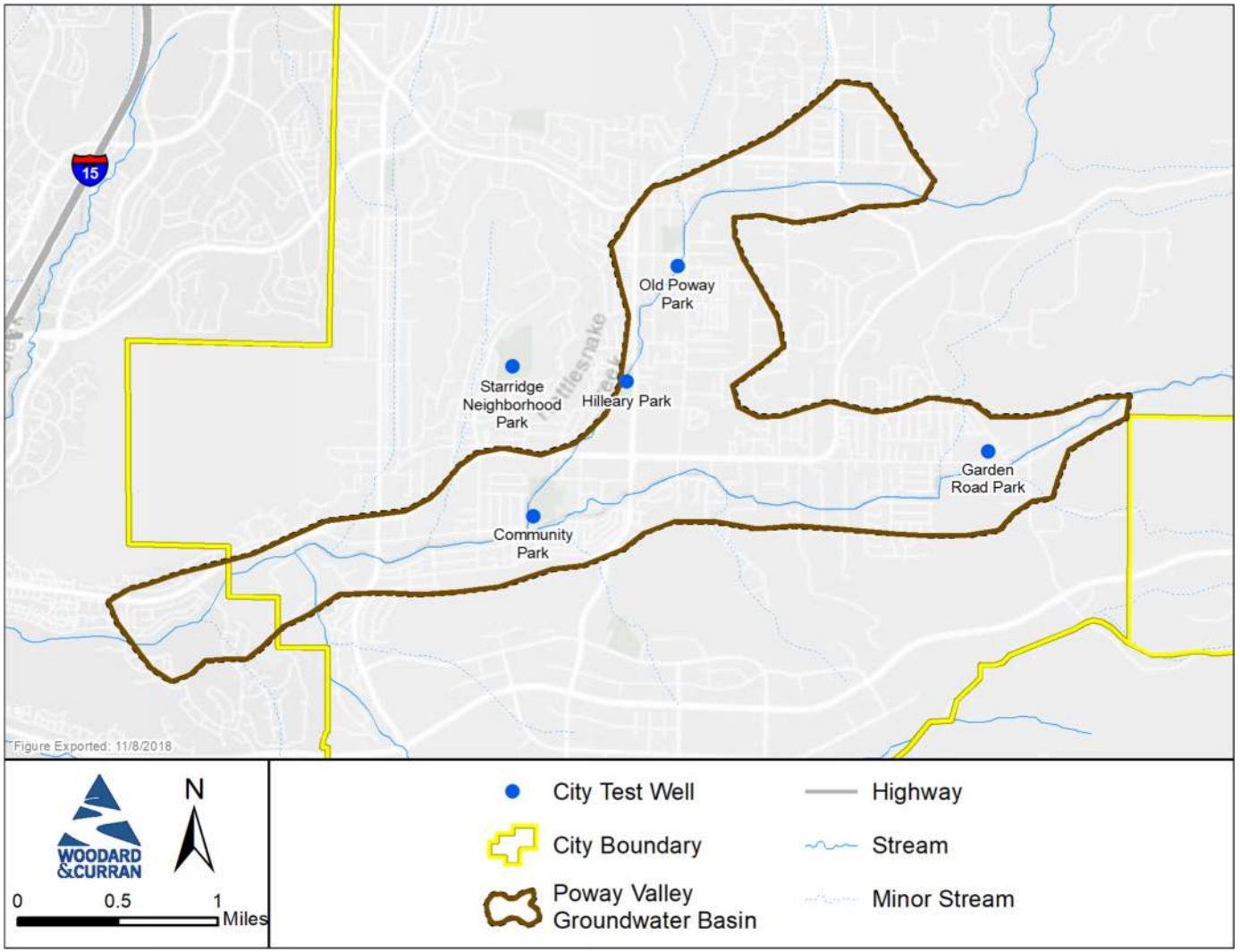
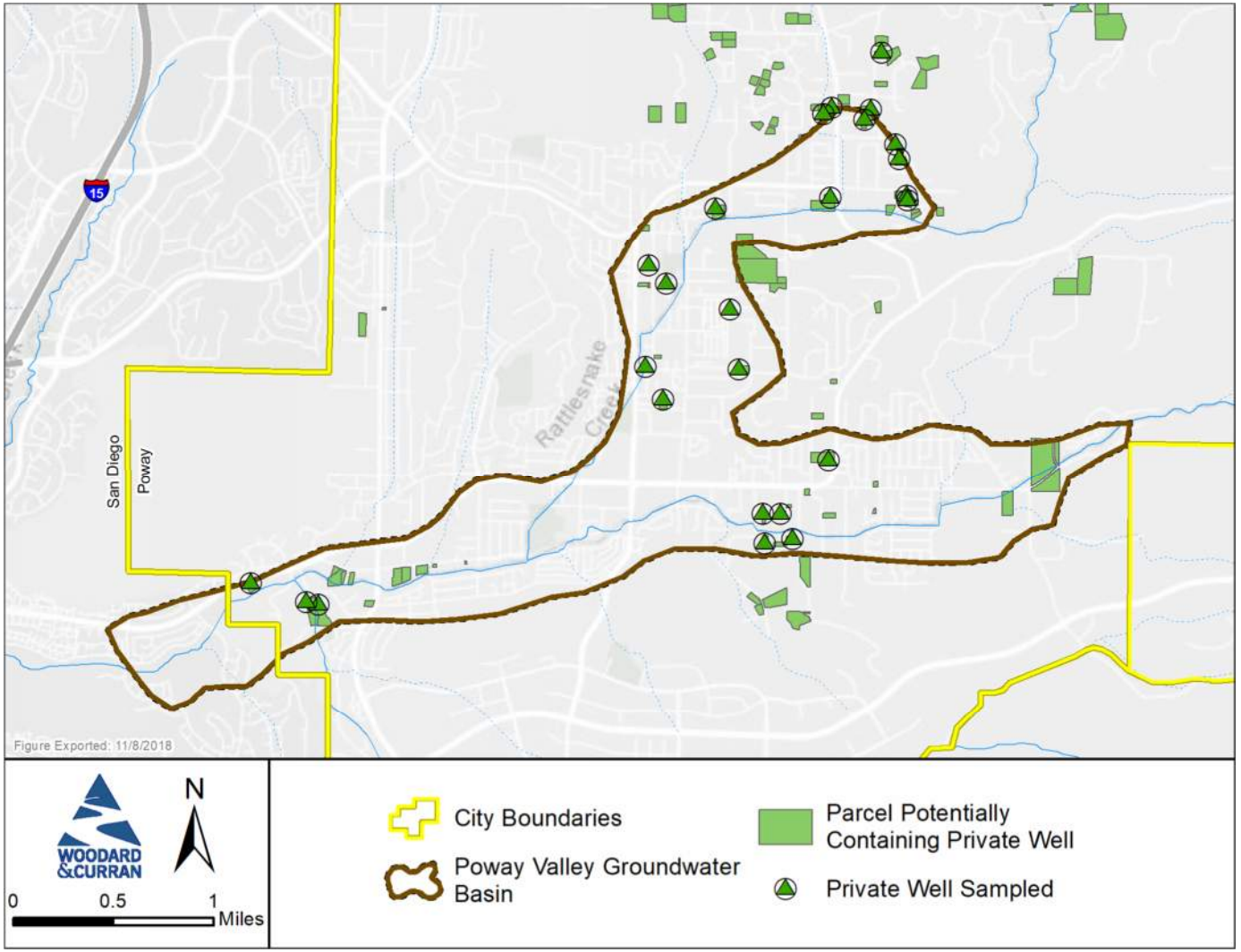


Figure 10: Private Well Locations



4.4 Groundwater Conditions

Current and historical groundwater conditions for general flow directions, groundwater levels, and groundwater storage are described below.

4.4.1 Groundwater Flow

Historically, movement of groundwater has been downgradient from east to west along the Los Penasquitos Creek into the lower Los Penasquitos Canyon. The basin is drained principally by the Poway and Los Peñasquitos Creeks to the Pacific Ocean. Based on the USGS reconnaissance study in 1969 (as referenced in the USGS 1989 study), water levels measured at about 70 sites within the USGS defined Poway Basin showed movement of water downgradient toward the west.

4.4.2 Groundwater Levels

Limited groundwater levels data were compiled from the GeoTracker GAMA. Among the wells identified (a total of 71 wells as shown in Figure 11), the majority of the wells showed limited water levels data for 1969 or 1984-1985. A set of 21 monitoring wells (locations shown in a rectangular box on Figure 11) had records for 2002-2017. Based on hydrographs presented in Figure 12 from these 21 wells, depth to water shows relatively stable conditions, ranging generally from 14 to 16 feet below ground surface (bgs). They are clustered wells used as environmental monitoring wells and have shallow depths of up to approximately 50-60 feet bgs, based on available well depth information.

Measurements made during 1984-1985 by USGS study (1989) indicated water levels experience seasonal fluctuations with water levels higher in spring and lower in summer and showed an overall increase in water levels in the basin compared to 1969 conditions. Groundwater hydrographs based on the 2002-2017 data do not appear to show distinct seasonal fluctuations and appear to show relatively stable groundwater levels (Figure 12).

4.4.3 Groundwater Storage

Limited information is available about storage and withdrawal capacity in the basin. The amount of groundwater storage in the PVGB is unknown. However, available stored groundwater in 1984 was reported to be 2,330 AF by USGS (1989).

For the purpose of the loading analysis, groundwater storage for the PVGB was estimated to be 8,500 AF based on an average alluvium thickness of 50 feet, average depth to water table of 15 feet bgs and specific yield of 10 percent. Depth to water table was estimated based on limited data available for water levels from 2002 to 2017 in the GeoTracker GAMA database (Figure 12). Overall change in storage was assumed to be zero based on water levels data showing stable conditions during the recent period.

Figure 11: Locations of Monitoring Wells with Groundwater Level Data

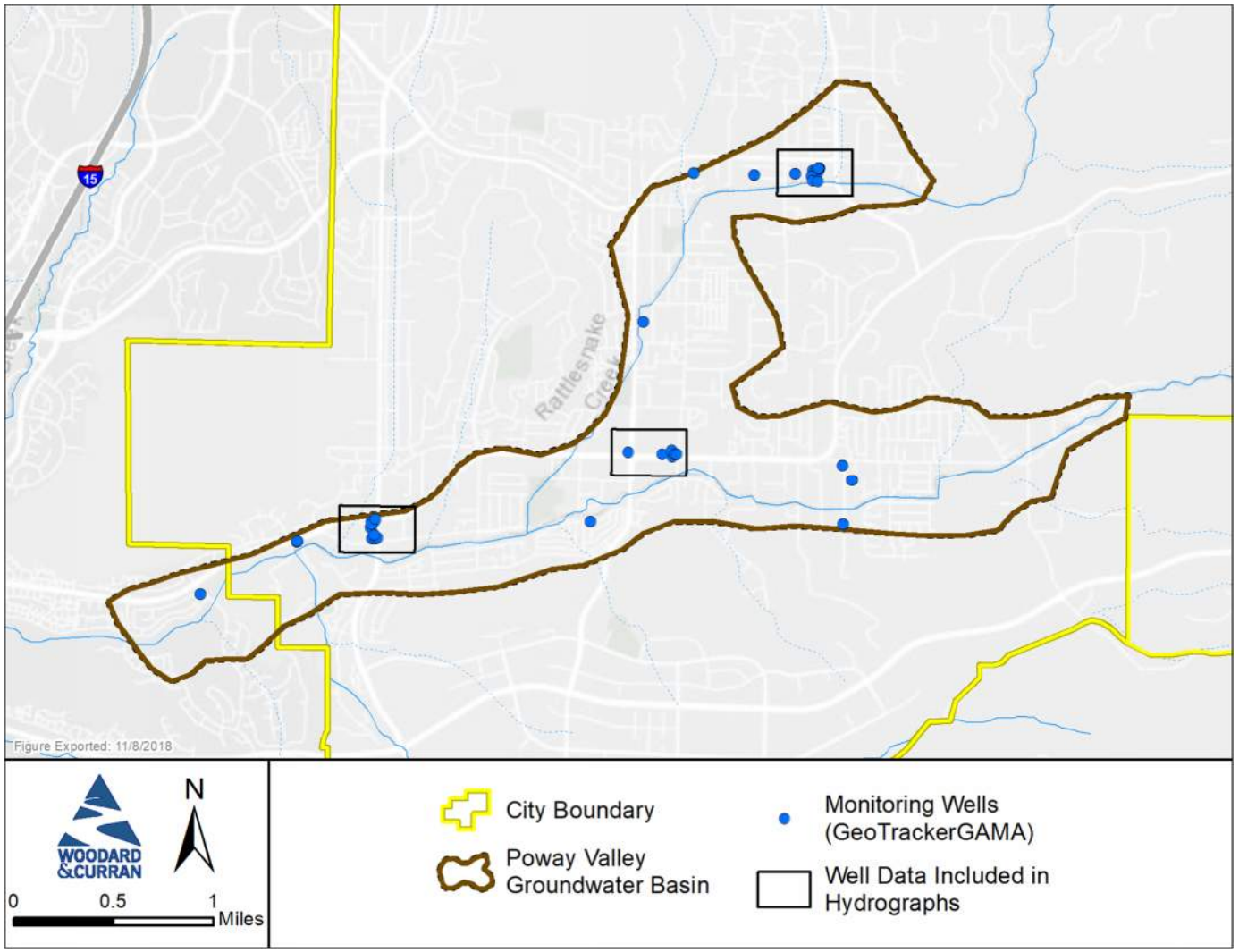
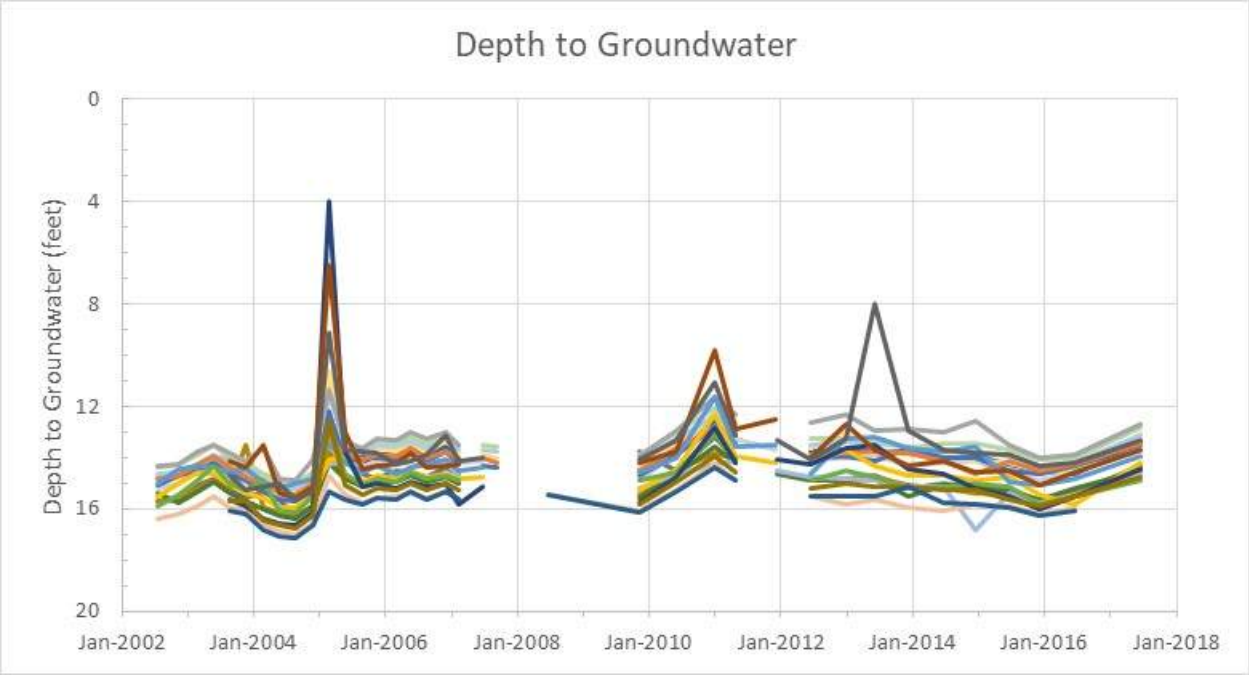
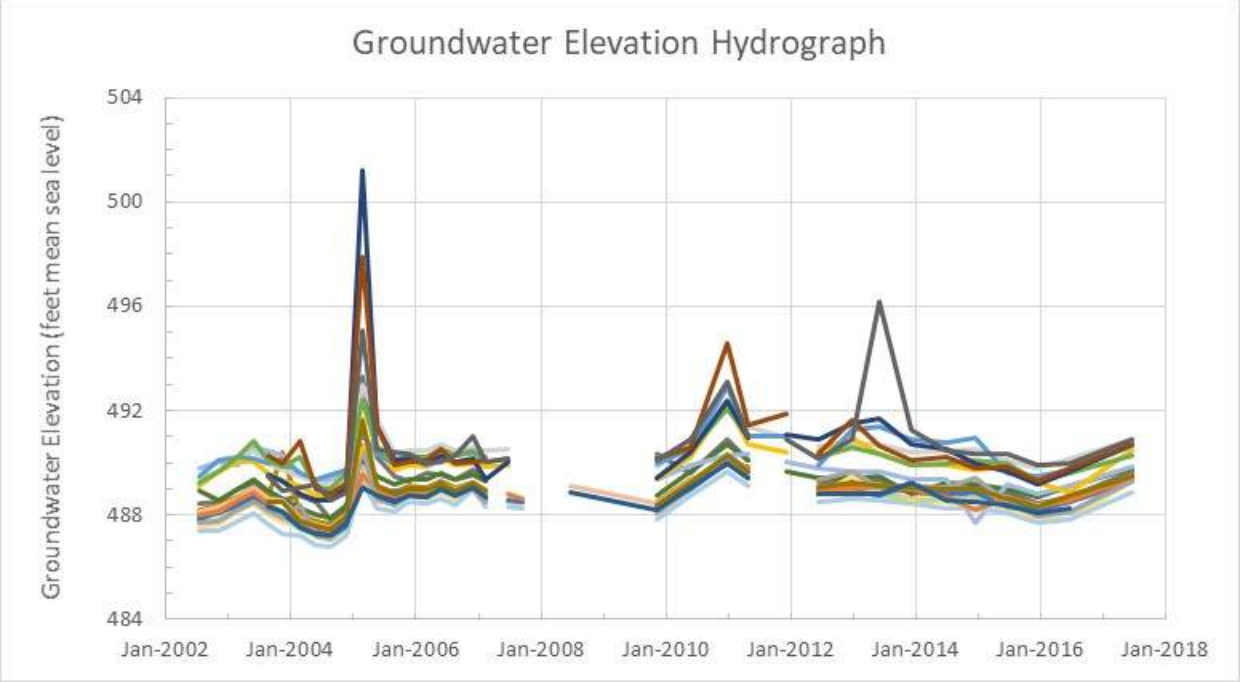


Figure 12: Groundwater Hydrographs in the Poway Valley Groundwater Basin





4.4.4 Water Budget

Groundwater budget information is not available for the PVGB. Limited information available about the basin conditions was used to develop a simplified, conceptual water budget for the PVGB, as presented in Table 15. The primary inflows into the basin come from percolation of rainfall. Recharge from irrigation water and septic effluent was assumed to contribute to the basin recharge and was estimated as part of loading analysis in Section 6. Outflows were assumed to be groundwater pumping from private wells and subsurface outflows combined with discharges to the major creeks. Pumping estimates were developed again from the loading analysis while subsurface outflows were estimated to result in zero change in storage. Zero change in groundwater storage was assumed based on the interpretation of relatively stable groundwater levels data.

Average natural recharge to the basin was estimated to be 270 AFY, based on an average rainfall of approximately 13 inches and recharge coefficient of 0.1. This recharge coefficient means that 10 percent of the volume of precipitation reaches the aquifer, with the remainder used by plants, evaporating, or becoming surface runoff. Based on the high urbanization of the Plan area, which contributes to increasing stormwater discharge, and low to very low soil permeability in the PVGB, runoff was anticipated to be rapid in response to rainfall events. Since the majority of runoff would be generally collected by the City's stormwater drainage system, natural direct recharge from rainfall to the basin was assumed to be relatively small.

Table 15: Annual Average Water Budget for Poway Valley Groundwater Basin

Water Budget Component	Estimated Volume (AF)[1]	Assumptions
Inflows		
Natural recharge from rainfall	270	Estimated based on average long-term rainfall and assumed recharge coefficient
Recharge from irrigation water	450	Estimated, see Section 6 for details
Recharge from septic tank effluent	80	Estimated, see Section 6 for details
Outflows		
Groundwater pumping from private wells	87	Estimated, see Section 6 for details
Subsurface outflows and discharge to creeks	713	Assumed based on relatively stable groundwater levels from 2002 to 2017
Change in groundwater storage	0	Assumed no change in storage based on relatively stable groundwater levels from 2002 to 2017

Note: 1. The listed inflow and outflow estimates are order-of-magnitude approximations.

4.5 Surface Water Conditions

Surface waters in the PVGB include Poway Creek, Rattlesnake Creek, and Beeler Canyon. The PVGB is drained principally by Poway Creek into Los Peñasquitos Canyon, which continues into the Pacific Ocean. Both Rattlesnake Creek and Beeler Canyon drain into Poway Creek. Limited historical surface water flow data reported in the USGS study (1989) are as follows (see Figure 5 for stream gage locations):

- Annual average discharge at the Poway Creek near Poway Station (11023250) from 1979-1983 was 870 AF. The median number of days of no flows was reported to be 222.
- Annual average discharge at the Rattlesnake Creek at Poway Station (11023310) from 1970-1983 was 1,402 AF. The median number of days of no flows was reported to be 162.

- Annual average discharge at the Los Penasquitos Creek below Poway Creek Station (11023330) from 1971-1983 was 2,707 AF. The median number of days of no flows was reported to be 3.5.

4.6 Groundwater Quality for Salt and Nutrients

Determining the groundwater quality conditions with respect to TDS and nitrate is a key step in the SNMP analysis and supports the loading analysis that is discussed in Section 6.

4.6.1 Indicators for Salts and Nutrients

TDS and nitrate (reported as nitrogen [N]) are the salt and nutrient indicator constituents selected for this SNMP. TDS is a measure of all dissolved constituents in water, including organic and suspended solids, primarily from rocks and sediments with which the water comes in contact. While TDS can occur naturally in groundwater, high levels of TDS can be a sign of anthropogenic impacts such as agriculture and waste disposal practices. Because of the wide variety of activities that contribute TDS and could lead to water quality degradation, it is considered a good initial indicator of overall water quality. In SNMP analyses, concentration trends are often used as a long-term indicator of basin health.

Nitrate is a widespread contaminant in California groundwater. Elevated concentrations of nitrate in groundwater are often associated with human activities such as wastewater treatment discharges, fertilizer application, and land application of animal wastes.

4.6.2 Water Quality Objectives

Water quality objectives for TDS and nitrate provide references for assessing groundwater quality in the PVGB. The SMCL for TDS has three levels:

- Recommended SMCL: 500 mg/L
- Upper SMCL: 1,000 mg/L
- Short-term SMCL: 1,500 mg/L

The Basin Plan objective specifies a goal of 1,000 mg/L for areas west of the First Aqueduct and 750 mg/L for areas east of the First Aqueduct. Since the majority of the PVGB is west of the First Aqueduct and only a small portion (approximately 8 percent of the total basin area, or 19.5 acres out of 2,470 acres) is east of the First Aqueduct, the 1,000 mg/L was considered for the assessment of TDS in this SNMP.

As a regulated drinking water contaminant, the Basin Plan has established a water quality objective consistent with the 10 mg/L MCL for nitrate (reported as nitrogen [N]).

4.6.3 Data Sources

Available groundwater quality data for TDS and nitrate-N were collected from the publicly-available GeoTracker GAMA database and historical records collected by the City from the test wells. A summary of data collected is presented in Table 16.

Table 16: Groundwater Quality Data Summary

Reporting Agency	Number of Wells	
	Total Dissolved Solids (TDS)	Nitrate (as N)
City of Poway	5 wells sampled in 1992 [1] 1 well sampled in 2008 [2] 1 well sampled in 2016 [3]	1 well sampled in 2008 [2] 1 well sampled in 2016 [3]
GeoTracker GAMA	18	39
Private Wells Sampled by the City of Poway for this SNMP (Water Well Sampling Program) [4]	24	24

Notes: 1. One-time TDS sampling data in 1992 from the City of Poway five test wells.
2. Sampling for TDS and nitrate in 2008 from Community Park well.
3. Sampling for TDS and nitrate in 2016 from Garden Road Park well.
4. One-time sampling data in May 2018 from voluntary private wells.

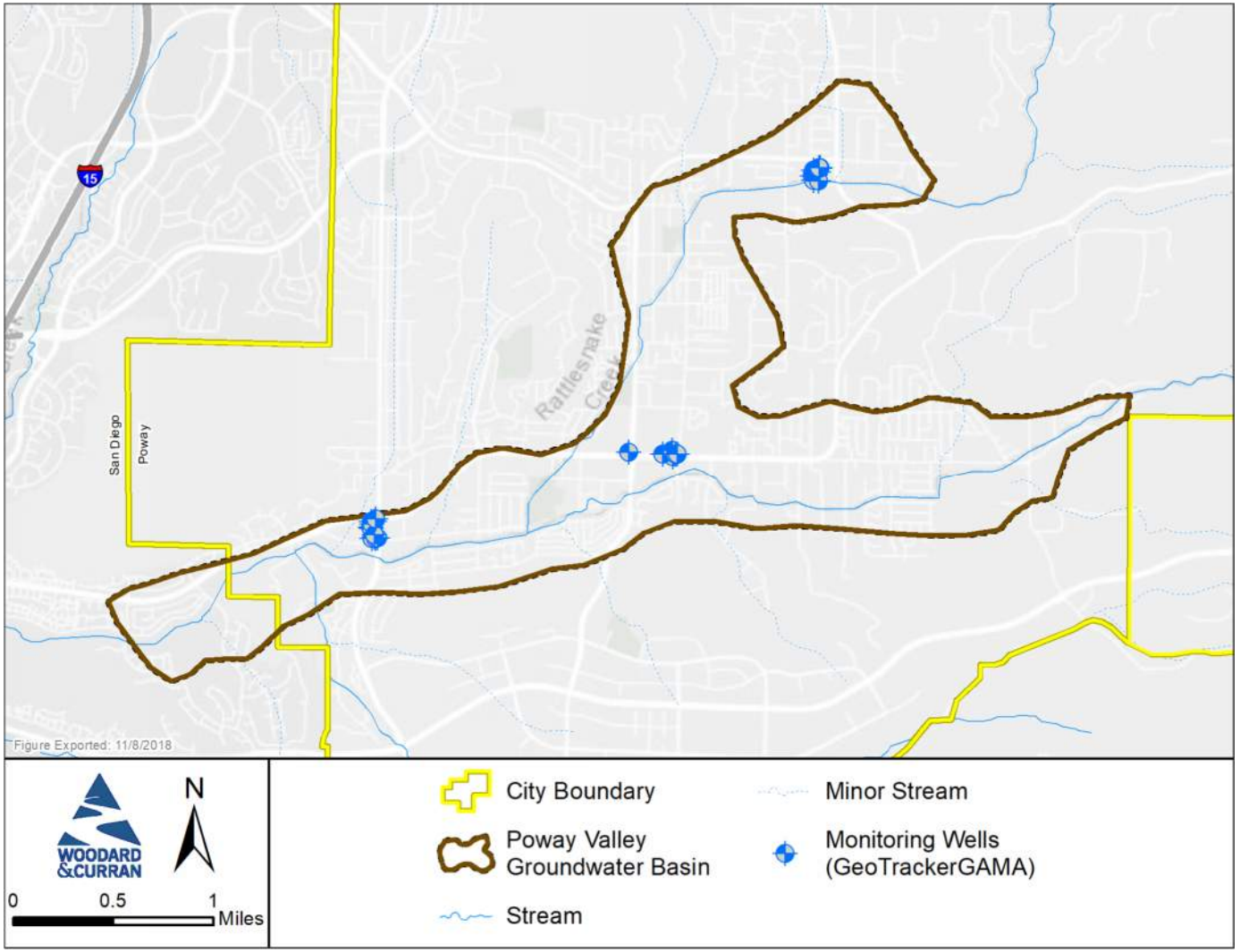
The GeoTracker GAMA database includes shallow monitoring wells with depths of up to 30 feet bgs (Figure 13 shows locations of wells with nitrate data). Nitrate data used in the NCWRP Nitrate Study conducted by the City of San Diego (2016) was also analyzed and compared with the GeoTracker GAMA; all of the environmental monitoring wells (27 wells) considered in the NCWRP Nitrate Study were also included in the GeoTracker GAMA. The GeoTracker GAMA data are not considered to be characteristic of the basin, as this database involves clustered sampling locations and the database is biased toward:

- shallow groundwater (which is unlikely to be characteristic of underlying groundwater quality), and
- problem sites where groundwater cleanup is occurring.

To better characterize the PVGB groundwater, the City of Poway implemented a comprehensive water quality data collection effort in cooperation with private well owners in the City of Poway through the Water Well Sampling Program. Figure 10 shows the locations of the private wells sampled for TDS and nitrate in May 2018.

Due to the biases and limitations of the GeoTracker GAMA data, the private well data source was exclusively used in the SNMP loading analysis. In addition to providing better coverage of the basin both in terms of geography and depth, the private wells are considered more representative of groundwater that is beneficially useable and accessible to well owners.

Figure 13: GeoTracker GAMA Monitoring Well Locations



4.6.4 Total Dissolved Solids Monitoring Results, Water Well Sampling Program

Table 17 and Figure 14 present TDS concentrations based on the private well sampling results. Data are presented in Table 14 in two parts: east of SDCWA First Aqueduct, and west of SDCWA First Aqueduct due to the fact that the Basin Plan water quality objective for TDS is different in each area. Generally, instances of TDS concentrations greater than 1,000 mg/L are observed throughout the Plan area. Of the 20 private wells sampled west of the First Aqueduct, 17 reported TDS concentrations above the Basin Plan water quality objective of 1,000 mg/L. Among the four wells sampled east of the First Aqueduct, three wells exceeded the Basin Plan water quality objective of 750 mg/L.

4.6.5 Nitrate Monitoring Results, Water Well Sampling Program

Table 18 and Figure 15 present nitrate-N concentrations based of the private well sampling result. Generally, there are some instances of nitrate-N concentrations greater than the Basin Plan water quality objective of 10 mg/L throughout the basin. Of the 24 wells analyzed, six wells reported nitrate-N concentrations above the Basin Plan water quality objective of 10 mg/L.

4.6.5.1 Groundwater Quality Averaging, Well Water Sampling Program

Data availability and trends were analyzed for both for TDS and nitrate to develop a dataset representative of the groundwater quality conditions for the PVGB. Data available from the private well sampling were analyzed and used for loading analysis. The data used for characterizing basin TDS and nitrate conditions were shared with the RWQCB in August 2018. For the purposes of the SNMP, median groundwater concentrations for samples collected from the private wells were used for TDS and nitrate-N to reflect variability observed in the datasets. For TDS, the median concentration was approximately 1,572 mg/L for all of the wells sampled, which is above the recommended Basin Plan water quality objective of 1,000 mg/L. Based on the data utilized for this analysis, the majority of the wells exhibited high TDS concentrations.

Similar to the approach used for TDS, the median concentration of 4.5 mg/L calculated for nitrate-N was used for the SNMP assessment. Overall, the majority of the wells exhibited nitrate concentrations below the MCL and the Basin Plan water quality objective. Basin-wide, only six wells utilized for nitrate-N exceeded the 10 mg/L MCL.

In Section 6, the median TDS concentration of 1,572 mg/L and nitrate-N concentration of 4.5 mg/L is used in the loading assessment. In Section 7, these median TDS and nitrate-N concentrations are compared to the Basin Plan water quality objectives to determine the currently-available assimilative capacity in the PVGB.

Figure 14: TDS Concentrations

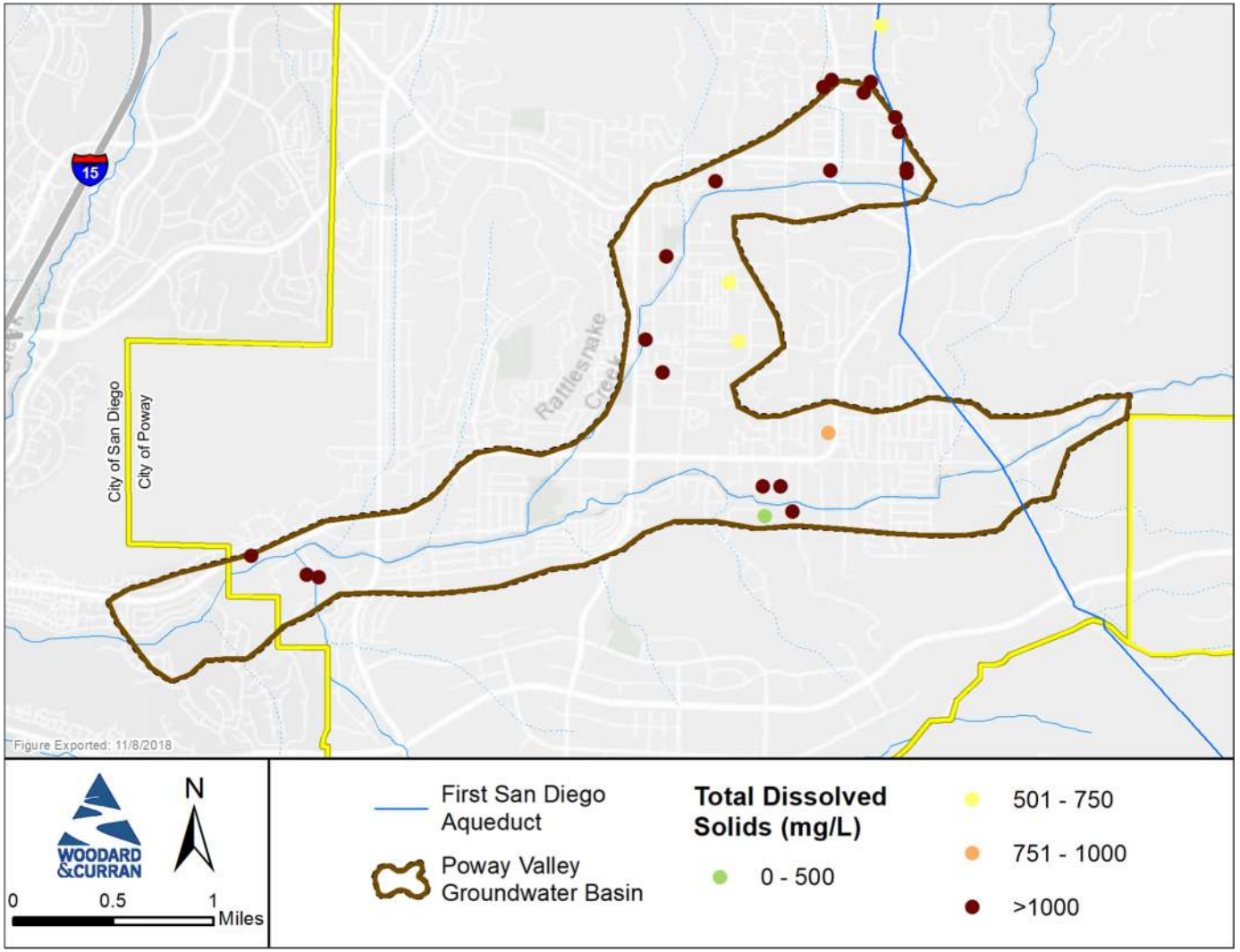


Table 17: Summary of TDS Data

Location	Well (Lab ID)	TDS Measurement (mg/L)	Well Depth (feet)
East of First Aqueduct	17	1,530	--
	26	1,500	300
	48	1,080	900
	54	556	--
	Eastern Maximum	**1,530**	
	Eastern Median	**1,290**	
	Eastern Average	**1,167**	
	Eastern Minimum	**556**	
West of First Aqueduct	1	2,580	30
	2	1,470	--
	3	1,660	40
	5	1,680	40
	10	688	--
	12	1,730	--
	13	1,410	--
	18	3,260	120
	21	798	--
	23	1,584	--
	25	1,940	750
	30	1,660	300
	31	1,560	35
	38	2,180	750
	41	1,280	332
	45	1,760	--
	47	676	336
	50	2,340	750
	51	1,800	800
	53	1,300	620
	Western Maximum	**3,260**	**800**
	Western Median	**1,660**	**332**
	Western Average	**1,668**	**377**
	Western Minimum	**676**	**30**
East + West of First Aqueduct	**Maximum**	**3,260**	**900**
	Median	**1,572**	**332**
	Average	**1,584**	**407**
	Minimum	**556**	**30**

Figure 15: Nitrate-N Concentrations

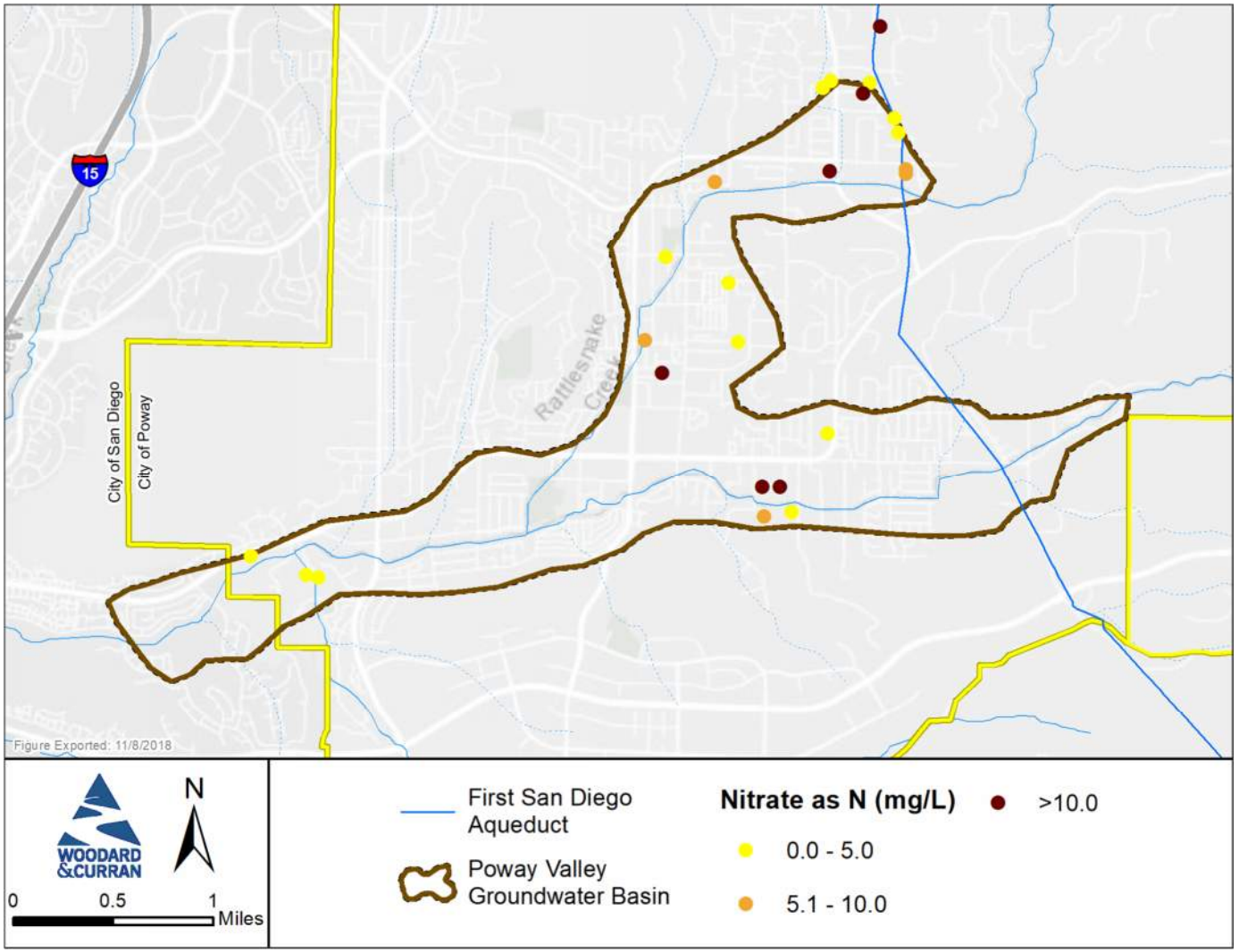


Table 18: Summary of Nitrate-N Data

Well (Lab ID)	Nitrate-N Measurement (mg/L)	Well Depth (feet)
17	5.9	--
26	8.7	300
48	ND	900
54	64.8	--
1	4.5	30
2	16.5	--
3	6.4	40
5	6.3	40
10	2.5	--
12	10.8	--
13	1.5	--
18	ND	120
21	ND	--
23	8.5	--
25	31.2	750
30	ND	300
31	10.9	35
38	15.3	750
41	1.2	332
45	ND	--
47	2.1	336
50	ND	750
51	4.4	800
53	3.3	620
Maximum	**64.8**	**900**
Median	**4.5**	**332**
Average	**8.5**	**407**
Minimum	**ND**	**30**

Note: ND = Not detected

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5. RECYCLED WATER AND STORMWATER GOALS

This chapter presents the goals for the use of recycled water and stormwater in the PVGB. These goals were developed based on information contained in the City's 2015 UWMP and stakeholder input during the development of the SNMP.

5.1 Recycled Water Goals

Recycled water goals are based on information provided in the City's 2015 UWMP and from direct communication with the City of Poway. The goals incorporate recycled water use projections up to the year 2040.

As described in Section 3, the City of Poway purchases recycled water from the City of San Diego for landscape irrigation. Currently, landscape irrigation in the Poway Business Park is the only beneficial use of recycled water. The UWMP describes additional projected beneficial uses outside of the Poway Business Park and within the PVGB. A total of 177 AFY of recycled water use is expected in the Plan area, as described below.

- Recycled water use extension from the Business Park along Community Road, moving toward areas in the PVGB; potable water savings approximately 85 AFY.
- Recycled water use extension from the Business Park along Pomerado Road, moving toward areas in the PVGB; potable water savings approximately 92 AFY.

The future estimates of the recycled water goals for the PVGB are utilized in the groundwater quality analysis described in Sections 6 and 7.

5.2 Stormwater Goals

Historically in the Plan area, stormwater has been viewed as a flood management problem and an issue of protecting public safety and property. However, as drought has put more pressure on water supplies, stormwater is increasingly seen and promoted as a potential option to recharge groundwater basins and augment local water supplies. This is not applicable in the PVGB due to the limited groundwater use in the Plan area and the stable groundwater elevations. Currently, stormwater capture and recharge projects are not being considered in the Plan area as a viable option to augment water supplies or to improve water quality conditions with respect to TDS and nitrate.

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6. SALT AND NUTRIENT LOADING ANALYSIS

Salt and nutrient loading to PVGB is due to various surface activities, including:

- Irrigation water (privately produced groundwater, municipal water supplies, and reclaimed wastewater)
- Urban inputs (septic systems, fertilizer, and applied water)

Nearly all of the land use within the basin is urban uses; salt and nutrient loading due to agricultural uses is very limited. However, some degree of historical loading occurred in the past when agricultural activity was more prevalent. Within urban areas, salt and nutrient loads due to indoor water use are primarily routed to the municipal wastewater system for reclamation or discharge. Percolation of these loadings to groundwater only occurs to the extent that septic systems are used or that recycled water is used for landscape irrigation. Other surface inputs of salts and nutrients, such as atmospheric loading, are not considered a significant net contributing source of salts and nutrients and are not captured in the loading analysis.

This section summarizes the methodology used for estimating loads associated with those activities.

6.1 Loading Analysis Methodology

A GIS-based loading model was developed to estimate the loading factors. The loading model is a spatially-based mass balance tool that represents TDS and nitrogen loading on an annual-average basis. Primary inputs to the model are land use, irrigation water source and quality, and septic system loading.

Salt and nitrogen loadings were determined using the general methodology outlined below:

- **Identify the analysis units to be used in the model**: Parcels and land use data from the SanGIS website, which is a joint powers authority of the City and County of San Diego (http://www.sangis.org), and the City of Poway served as the analysis units.
- **Categorize land use categories into discrete groups**: These land use groups represent land uses that have similar water demand as well as similar salt and nitrogen loading and uptake characteristics. Each land use group is assigned characteristics including: percent irrigated, applied water rates, and applied fertilizer application rates.
- **Identify concentrations of TDS and nitrogen for private groundwater and municipal water supplies**: Concentrations of TDS and nitrogen within a water supplier's service area are assumed to be uniform as they come from the same water supply. Concentrations of TDS and nitrogen in groundwater are based on the findings discussed in Section 4.
- **Apply the irrigation water source to the analysis units**: Each water source is assigned concentrations of TDS and nitrogen.
- **Estimate the water demand for the parcel**: Water demand is based on the irrigated area of the parcel and the type of irrigation and varies with the source water quality according to the crop leaching requirements as described in Section 6.2.2.
- **Estimate the TDS load applied to each parcel**: TDS load is based on the land use practices, irrigation water source and quantity, and septic load. The loading model makes the conservative assumption that no salt is removed from the system once it enters the system.
- **Estimate the nitrogen load applied to each parcel**: Nitrogen load is based on the land use practices, irrigation water source and quantity, and septic load. The loading model assumes that a portion of the applied nitrogen is taken up by plants and (in some cases) removed from the system (through harvest of

plant material). Additional nitrogen is converted to gaseous forms and lost to the atmosphere. A 10 percent volatilization rate is applied, based on the average pH of soils, the relatively coarse texture of soils and a semi-arid climate. Remaining nitrogen is assumed to convert to nitrate and to be subject to leaching.

6.2 Data Sources for Salt and Nitrogen Water Quality

Data sources for the model include land use (spatial distribution and associated loading), irrigation water (sources and associated quality and loading), septic inputs, and wastewater discharge loads. These inputs are discussed below.

6.2.1 Land Use

Section 3.4 describes the general existing land use categories in the Plan area. For the purposes of this loading analysis, a land use database was developed at a parcel-level basis, using San Diego County Assessor data, City of Poway land use and aerial imagery review for the basin. Categories were developed to represent different types of irrigation practices. Parcels identified as agriculture were further refined based on aerial review and a site visit, which determined that these parcels were either not currently in use, or are used as equine properties. As equine properties generally offhaul generated manure, it was assumed that these parcels generate loads associated with landscaping, but not any additional load associated with horse activities.

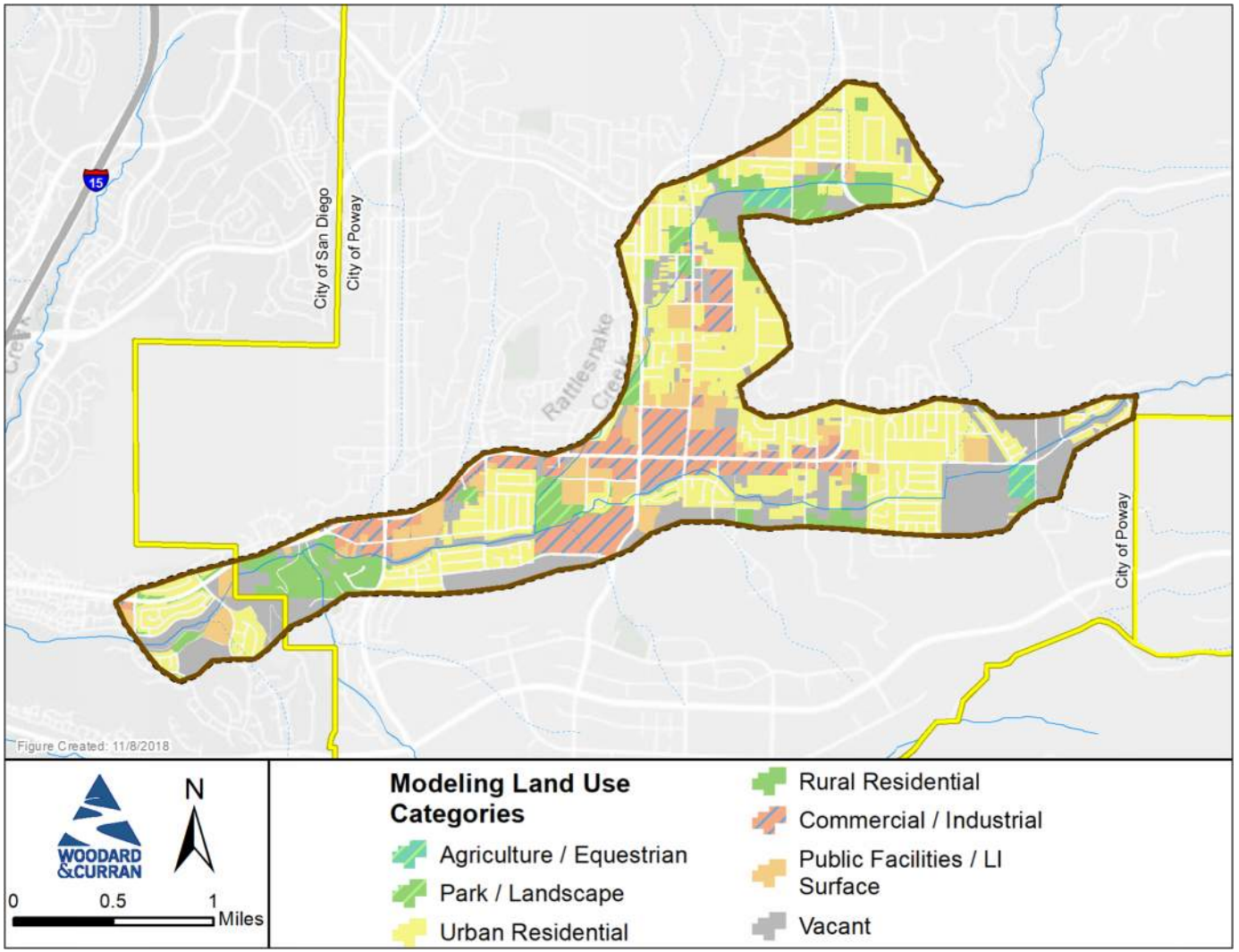
Finally, an aerial review of the land use categories was performed to estimate the typical percentage of the category that is irrigated. For urban categories, the irrigated area is generally turfgrass. The acreages and estimated irrigation percentages are summarized in Table 19; the land uses representing these categories are shown in Figure 16.

Table 19: Land Uses for Loading Analysis

Land Use Category	Total Area (acres)	Percent Irrigated[1]
Agriculture / Equestrian[2]	21	30%
Urban Commercial and Industrial	322	7%
Urban Commercial and Industrial Low Impervious Surface	194	20%
Urban Residential	860	15%
Rural Residential / Developed	179	30%
Park / Landscape	88	60%
Vacant	488	0%

Notes: 1. Percent of the parcel area that is irrigated, based on aerial imagery review.
2. Equine properties (no crops) – treated as Rural Residential for purposes of model loading.

Figure 16: Land Use Categories Used for Loading Analysis



6.2.2 Water Supply Sources

The irrigation water source data input within the PVGB is derived from a combination of several sources, including local municipal water agencies, and private groundwater wells. Imported water purchased and delivered to the City of Poway from SDCWA has historically been a blend of 60 percent Colorado River Water and 40 percent SWP water. As reported in the City of Poway's 2015 Lake Poway Watershed Sanitary Survey, raw imported water has recently been comprised of 100 percent Colorado River water. In addition to supply from the City of Poway, small parts of the basin are supplied water through the City of San Diego's municipal system, and several parcels utilize groundwater wells either for all or part of their usage. The City of Poway provided data indicating parcels with a groundwater well. For loading analysis purposes, it has been assumed that parcels that have wells use them for all irrigation.

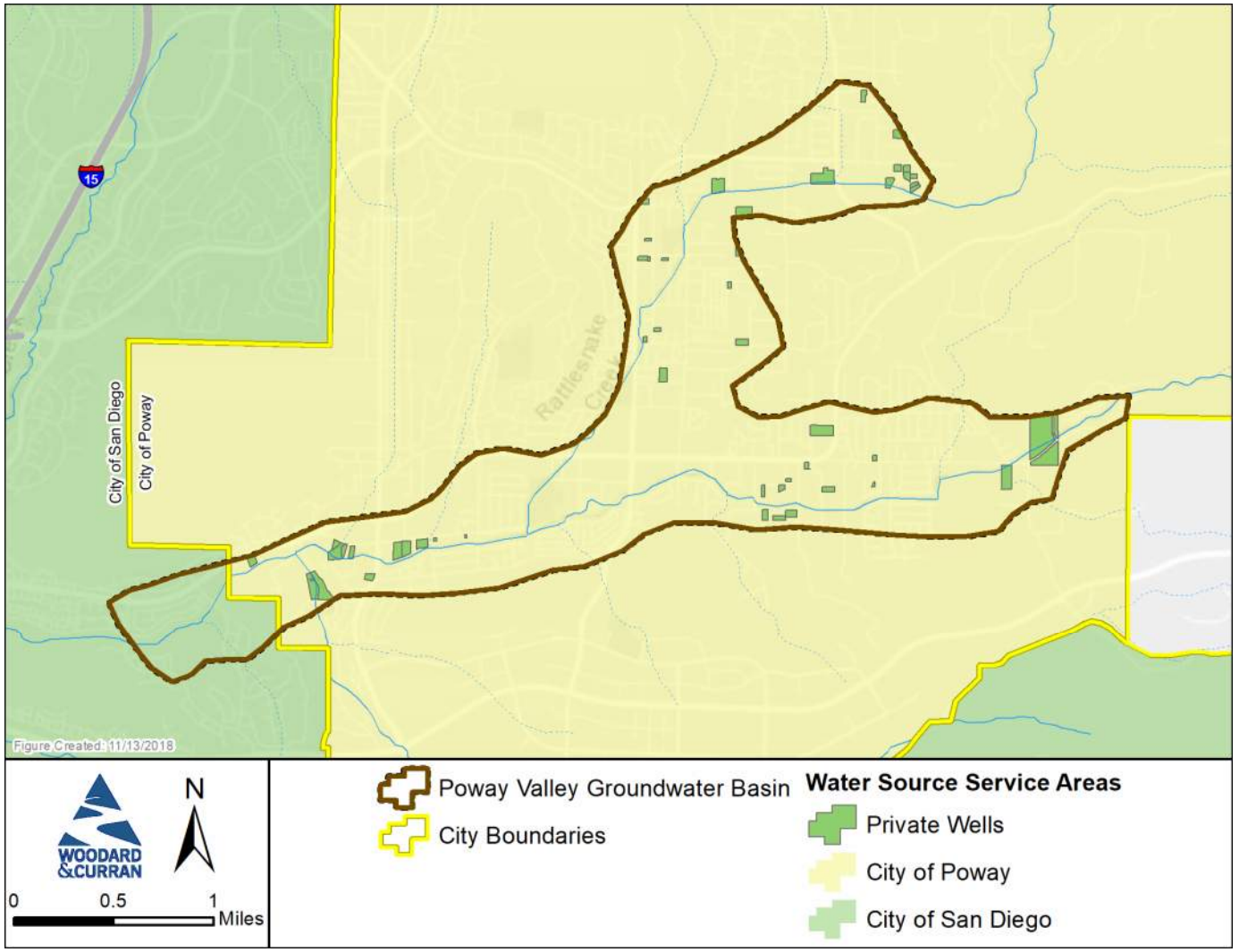
Water quality parameters for the City of Poway and the City of San Diego are based on sampling results from Annual Drinking Water Quality reports (also known as Consumer Confidence Reports) for the past five-year period. For groundwater wells, the median TDS and nitrate-N values from sampling performed in 2018 are used to calculate the loads from applied water. There are no current parcels within the PVGB using recycled water. However, it is anticipated that some future recycled water use would occur; water quality for future recycled water use in the basin is based on the Nitrate Study North City Water Reclamation Plant (City of San Diego 2016).

Sources of water supply for all parcels within the basin are presented in Figure 17. Table 20 summarizes the water quality inputs used for each irrigation water source.

Table 20: Water Quality Parameters for Loading Model Water Sources

Source	TDS (mg/L)	Nitrate- N (mg/L)
City of Poway	594	0.4
City of San Diego	391	0.2
Groundwater – Private Wells	1,572	4.5
Recycled Water	1,200	12.2

Figure 17: Water Sources in the Poway Valley Groundwater Basin



6.2.3 Irrigation Loading

As noted above, there is no significant agricultural land use in the PVGB. The primary irrigation loading will therefore be based on turf-grass irrigation on urban uses. Water use for turfgrass was calculated using monthly average reference evapotranspiration (ETo) for the Plan area, the corresponding crop coefficients, and assumed leaching requirements as summarized below.

Salts can accumulate in the root zone if allowed to remain in the soil due to insufficient leaching. Leaching is the process of applying more water to the field than can be retained by the soil such that the excess water drains below the root system, carrying salts with it. The more water that is applied in excess of the crop water requirement, the less salinity remains in the root zone, despite the fact that more salt loading has actually been added to the field. The objective of leaching is to maintain or reduce soil salinity in the root zone to levels that are equal to or less than the threshold for the particular crops selected. Some crops are very sensitive to salts, while others can tolerate much higher concentrations. Table 21 shows the salt tolerance threshold (EC_{ct}) for turfgrass, above which yield reductions are likely to occur. It has been assumed that water application rates for turf grass are sufficient to maintain salinity less than the salt tolerance threshold.

Table 21: Salt Tolerance of Turfgrass

Crop	Salt Tolerance Threshold EC_{ct}	Source
Turfgrass	6.9 milliMohs/cm	Tanji, K. and N. Keilen, 2002

These crop tolerances, along with irrigation efficiency, are used to estimate the leaching fraction. The leaching fraction is the minimum fraction of the applied water that must pass through the crop root zone to prevent a reduction in yield or plant vigor from excessive accumulation of salts. Irrigation efficiency, considered when calculating the gross irrigation requirement, varies by crop type. For instance, turfgrass is irrigated through conventional irrigation methods while high frequency irrigation is more commonly used for tree crops (e.g., avocados).

This analysis assumes that the proper irrigation methods, tailored to the water, crop, and site conditions, and a high level of management are available to accomplish the efficiencies anticipated in this analysis for golf courses, sports fields, and other larger landscaping projects. Residential irrigation systems, on the other hand, are anticipated to have a lower application efficiency. Conveyance efficiency is assumed to be 95 percent while irrigation efficiency varies with the irrigation system. Conveyance efficiency refers to losses during the delivery of water to the irrigation system. Sprinkler systems are assumed to operate at 80 percent efficiency.

An average regional Nitrogen Update Efficiency (NUE) between the California average and the practical upper limit of 80 percent can be reasonably expected at the individual parcel level. Thus, for the purposes of this Plan, it is assumed that the NUE is 70 percent. Additionally, for the purposes of this Plan, it is assumed that nitrogen loss through NH_3 volatilization is limited to 10 percent for high frequency Urea-Ammonium Nitrate Solution (UAN) applications. For nitrogen fertilizer application rates, it was assumed to be 45 pounds (lbs.) N/acre - year[1].

[1] The value of 45 lbs/acre is based on Viers et al. 2012. Nitrogen Sources and Loading to Groundwater with a Focus on Tulare Lake Basin and Salinas Valley Groundwater, page 166 which notes this value as an overall national average.

6.2.3.1 Irrigation Related Loading Factors

Based on the land use characterization and the irrigation and fertigation assumptions described above, loading factors were associated with each land use type. These loading factors are summarized in Table 22.

Table 22: Crop Loading Factors

Crop Type Category	Water Source	Applied Water (inches/year)[1]	Leachate Volume (inches/year)	Leachable TDS (lbs/acre-year)	Leachable Nitrogen (lbs/acre-year)
Turfgrass	City of Poway	70.7	17.5	9,520	12.3
	City of San Diego	70.3	17.1	6,234	12.2
	Groundwater – Private Wells	73.9	20.7	26,343	14.4
	Recycled Water	72.4	19.2	19,698	18.2

Note: 1. Applied water values are calculated based on crop evapotranspiration (ETc), reference evapotranspiration (ETo), leaching fraction for salinity control, and irrigation efficiency.

6.2.4 Septic Systems

All wastewater generated within the PVGB is either exported outside of the basin to the City of San Diego's NCWRP, or treated by septic systems. The City of Poway provided water and sewer billing data for parcels within the PVGB; it was assumed that all parcels currently receiving water service but not sewer service have individual septic systems. Based on this analysis, it is estimated that there are approximately 320 parcels within the basin using septic systems.

Each parcel with a septic system is assumed to leach 263 gallons per day (gpd), based on 75 gallons per capita per day (gpcd) with an average of 3.5 people per system. The 75 gpcd estimate is based domestic use quantity estimates contained in the CCR, Title 23, Section 697. An estimate of 3.5 persons per household is a conservative estimate which assumes that the average household size for homes with septic systems is larger than that of average homes within the City[1]. TDS concentrations in septic system effluent are assumed to be 640 mg/L across the basin, based on the City's source water quality plus a typical addition of 200 mg/L for urban uses. Nitrate-N concentrations were assumed to be 30 mg/L, based on typical wastewater concentrations for medium strength wastewater of 40 mg/L minus an assumed volatilization rate of 25 percent within the septic system (Metcalf & Eddy, 2003).

6.3 Summary of Loading Analysis Results

Based on the loading parameters and methodology described above, the loading model was used to estimate TDS and nitrate-N loading rates across the basin under existing conditions. Results indicate that most of the TDS loading originates from urban irrigation activities, while most of the nitrogen loading originates from septic systems. Results are summarized in Table 23. Total TDS loading is estimated to be 3,264,000 pounds per year (lbs/year) and total nitrogen loading is estimated to be 8,390 lbs/year.

[1] Persons per household is 3.1 in the City of Poway (2016 American Community Survey for the City of Poway).

Table 23: TDS and Nitrate-N Loading Results

Land Use Category	Total Area (acres)	TDS[1] (lbs/year)	Percent of Total TDS Loading	Nitrogen[1] (lbs/year)	Percent of Total Nitrate-N Loading
Urban Commercial & Industrial	322	217,000	7%	50	1%
Urban Commercial & Industrial Low Impervious Surface	194	399,000	12%	140	2%
Urban Residential	860	1,250,000	38%	240	3%
Rural Residential [2]	200	690,000	21%	780	9%
Urban Landscape (e.g., Park or Golf Course)	88	528,000	16%	380	5%
Vacant/Undeveloped	488	0	0%	0	0%
Septic	N/A	180,000	6%	6,800	81%
TOTAL	2,152	3,264,000		8,390	

Note: 1. TDS and nitrate-N loading estimates were rounded off.
2. Includes 21 acres of parcels used for equine-related land uses.

6.4 Future Land Use and Recycled Water Changes

The City of Poway provided a description of anticipated development within the PVGB, as well as anticipated recycled water use. As the City is largely already urbanized, there is little expected development within the basin, no expected urban or agricultural conversions, and no planned parks. Approximately 14 acres are anticipated to change from a vacant or non-irrigated land use to an urban land use; for loading analysis purpose, it is assumed that approximately 15 percent of the area will have irrigated landscaping.

The City estimated that approximately 177 AFY of current potable water use may be offset with recycled water use. Additional loading has been estimated based on the difference in water quality.

The additional loads based on these activities, which total 325,780 lbs/year of TDS and 206 lbs/year of nitrogen, are summarized in Table 24.

Table 24: TDS and Nitrate Loads from Future Urban Development and Recycled Water Use

Future Scenario Changes	Additional TDS (lbs/year)	Additional Nitrogen (lbs/year)
Urban Development	20,000	26
Recycled Water	305,780	180
TOTAL	325,780	206

7. ANTIDEGREDATION ANALYSIS

SWRCB Resolution No. 68-16 is the State of California's Antidegradation Policy which, in summary, establishes the requirement that discharges to waters of the state be regulated to achieve the "highest water quality constituent to the maximum benefit to the people of the state". This resolution essentially establishes a two-step process for compliance. First, if a discharge will degrade high quality water, the discharge may be allowed if any change in water quality (1) will be consistent with the maximum benefit to the people of the state, (2) will not unreasonably affect present and anticipated beneficial uses of such water (as defined in the Basin Plan), and (3) will not result in water quality less than that prescribed in state policies. These requirements are demonstrated in an antidegradation analysis. The second step requires the use of BPTC of the discharge necessary to avoid a pollution or nuisance and to maintain the highest water quality consistent with the maximum benefit to the people of the State. The Recycled Water Policy states that in cases where more than 10 percent of a basin's assimilative capacity will be used by a project (or more than 20 percent of a basin's assimilative capacity will be used by multiple projects), an antidegradation analysis consistent with Resolution No. 68-16 must be performed to provide sufficient information to the RWQCB to make a determination that the proposed projects will provide the maximum benefit to the people of the state.

The groundwater quality trend analysis presented herein uses data collected and analyzed as part of this SNMP to address the requirements of the Recycled Water Policy and Resolution No. 68-16. These data were used in a mass balance model to perform the groundwater quality trend analysis.

7.1 Mass Balance Model

A mass balance model was developed to evaluate constituent trends in groundwater concentrations over a 25-year planning horizon within the PVGB considering two scenarios – present land and water uses (reflecting baseline or present-day conditions) and future conditions (including the future development and recycled water use identified previously). This model considered the volume of groundwater in storage and water qualities in the PVGB, and it evaluated the impact of the basin inflows and outflows on groundwater quality.

Inflows and outflows in the model include the following components:

- Deep percolation includes deep percolation of precipitation, agricultural irrigation return flows, and septic discharges
- Subsurface inflows or outflows from other basins
- River discharge
- Groundwater pumping

Based on the basin characterization presented in Section 4, there is very limited available information on these flows. An estimate of groundwater pumping, agricultural irrigation return, and septic discharge flowrates were developed as part of the loading analysis. As discussed in Section 4, there are no basins adjacent to PVGB and no significant expected subsurface inflows. River discharge and subsurface outflow rates are unknown, and no data are available to estimate potential flowrates. Based on historical trends indicating stable groundwater levels in the alluvium, it has been assumed that outflow rates through subsurface flow or discharge rates are sufficient to maintain constant volume in the aquifer (i.e., they are set such that total inflow matches total outflow).

As previously discussed, existing water quality of the basin has been evaluated as part of this Plan. Average constituent concentrations and groundwater storage volumes for the Plan area are summarized in Section 4.

Groundwater quality concentrations for TDS and nitrate-N were estimated using a spreadsheet-based mass balance model. To simulate the effect of current and future loading on groundwater quality, the spreadsheet model dynamically

calculated the loading factors of each component based on the conditions at the simulated time step. Under this model, each flow component listed in the groundwater budget was combined with its respective concentration of either TDS or nitrate-N to determine loading from the constituent's mass. These transfers of mass were then assumed to completely mix with groundwater in the aquifer system on an annual time-step to determine the resulting concentrations in the PVGB. As available surface and subsurface water quality data are limited, future revisions of this Plan should confirm or revise constituent concentrations based on any additional available data.

The surface and aquifer loading, used to determine water quality, was calculated utilizing the following equations:

Surface Loading:

$$X_t = X_{t-1} + \sum_{j=1}^{m} Q_{t\,j} C_{t-1\,j}$$

Aquifer Loading:

$$M_t = M_{t-1} + \sum_{i=1}^{n} Q_{t\,i} C_{t-1\,i}$$

$$C_t = M_t / S_t$$

Where: $\mathbf{X_t}$ is the mass of the constituent in the root zone available for deep percolation.

$\mathbf{M_t}$ is the mass of the constituent in the aquifer at timestep t.

m is the total number of budgetary flow components (j) experienced by the root zone (applied water, fertilizers and septic systems).

n is the total number of budgetary flow components (i) experienced by the groundwater system (deep percolation, subsurface boundary flows, and groundwater pumping).

$\mathbf{Q_t}$ is the flow into, out of, or between adjacent basins at timestep t.

$\mathbf{C_t}$ is the concentration of the constituent at timestep t.

$\mathbf{S_t}$ is the end-of-year storage in the groundwater system at timestep t.

7.1.1 Mass Balance Model Inputs

The inputs to the mass balance model are summarized in Table 25 for the PVGB.

Table 25: Estimated Volume and Concentration of Inflows and Outflows for Groundwater Quality Trend Analysis for the Poway Valley Groundwater Basin

Item	Volume in Storage or Flow (AF or AFY)	TDS (mg/L)	Nitrogen (mg/L)	Basis
Initial Conditions	8,600	1,572	4.5	See Section 4.
Inflows				
Deep Percolation of Irrigation (Leachate)	802	2,527	4.0	Leachate volume, and TDS and Nitrogen loads are calculated based on loading analysis discussed in Section 7.
Deep Percolation of Precipitation	270	0	0	Deep percolation of precipitation is based on a recharge coefficient of 0.1 and average precipitation as discussed in Section 4.
Septic Systems	83	794	30	Septic system loading assumptions are discussed in Section 6.
Future Inflows				
Development	3	2,400	3.1	Volume is based on 14 acres of development with 15% irrigated area, and leachate assumptions as discussed in Section 7.
Recycled Water Use	43	4,520	4.2	Volume is the assumed leachate volume based on an application volume of 177 AFY. Concentrations are based on the assumptions discussed in Section 7. Note that this volume would be offset by reductions in potable use.
Offset Potable Water Use	-43	2,398	3.1	Represents the potable water use eliminated through the use of recycled water.
Outflows				
Groundwater Production	87	1,572	4.50	Calculated irrigation usage for urban parcels with groundwater wells.
Other (e.g., river discharge and subsurface outflow)	713	1,572	4.50	Volume estimated to result in a balanced basin storage (inflow = outflow).

7.2 Groundwater Trend Analysis Results

Results from the mass balance model are summarized in Table 26, Table 27, and Figure 18. Analysis of existing basin-wide groundwater quality conditions indicates that the existing groundwater quality generally does not meet the basin plan objectives for TDS, but does meet the basin plan objectives for nitrate-N.

The results of the groundwater quality trend and loading analyses, based on a series of conservative assumptions and over a 25-year planning horizon, indicate that basin-wide average TDS concentrations would decrease slightly over time, but are relatively stable, are not significantly affected by the future land use and recycled water use changes, and would not result in achieving the Basin Plan's water quality objectives. Nitrate-N concentrations are anticipated to be relatively stable basin-wide.

Given the following, the qualitative cost-benefit analysis concludes that increases in the indicator constituents (TDS and nitrate-N) in the groundwater basin with anticipated future uses are consistent with the maximum benefit to the people of the State of California:

- The economic importance of the existing water supplies (including recycled water) that contribute to salt and nutrient loading in the basin;
- Current state mandates to increase recycled water use; and
- The projected continued ability of groundwater to meet present and anticipated beneficial uses.

Table 26: Groundwater Trend Analysis Results - TDS

Initial Conditions (mg/L)		Baseline	Future
1,572	Change in Concentration	-67	-72
	Anticipated Condition (mg/L)	1,505	1,500
--	% AC Used – 1000 mg/L	NAC	NAC

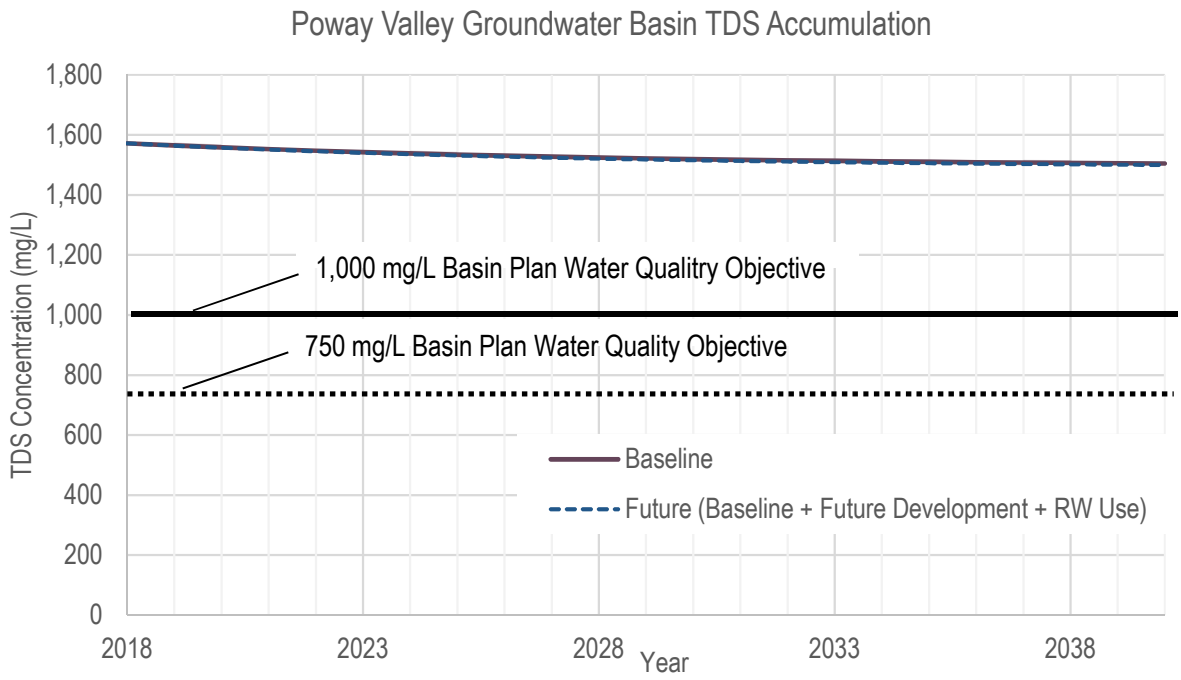
Notes: AC = Assimilative Capacity; NAC = No Assimilative Capacity.

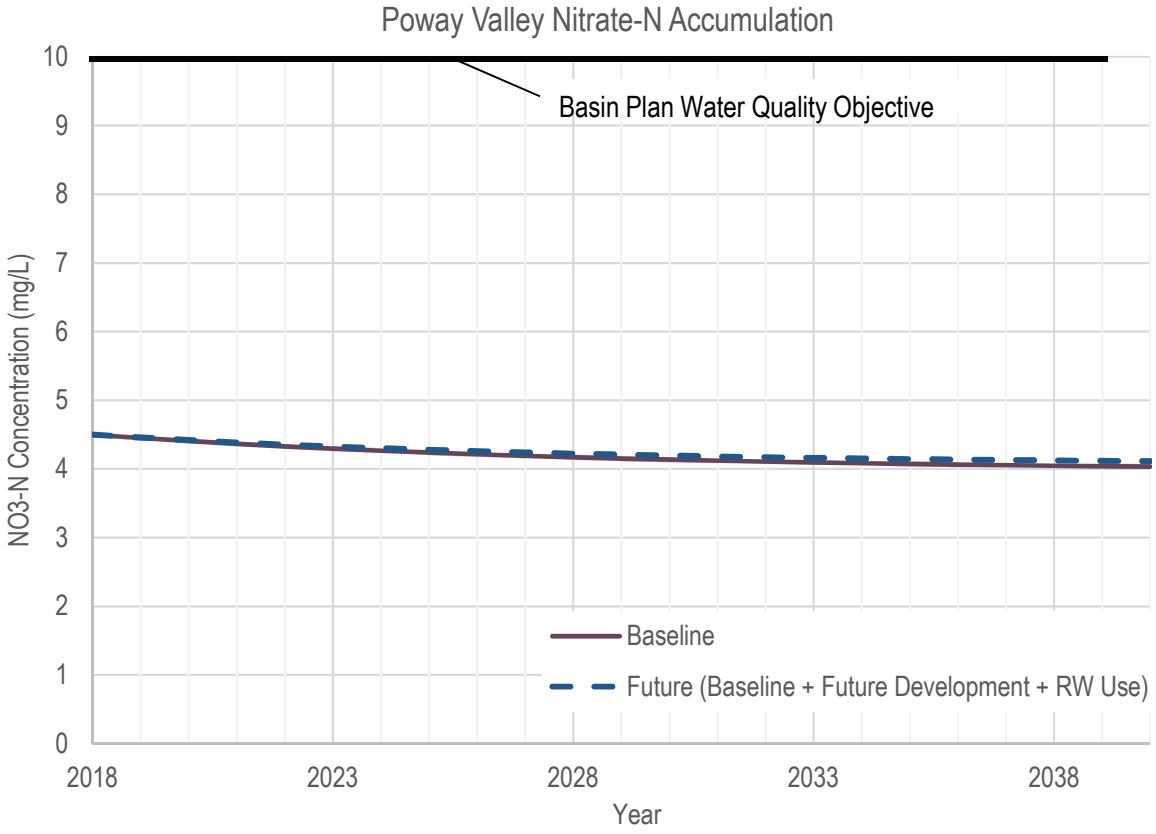
Table 27: Groundwater Trend Analysis Results – Nitrate (as N)

Initial Conditions (mg/L)		Baseline	Future
4.50	Change in Concentration	-0.47	-0.39
	Anticipated Condition (mg/L)	4.03	4.11
--	% AC Used – WQO/MCL	-8%	-7%

Notes: WQO = Water Quality Objective; AC = Assimilative Capacity; NAC = No Assimilative Capacity.

Figure 18: Groundwater Trend Analysis Results





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8. MONITORING PLAN

Groundwater monitoring is a required element of SNMPs under the State's Recycled Water Policy and a key component of groundwater quality management within the PVGB. A framework for the SNMP monitoring plan is described in this section as the next step toward implementation of the SNMP.

Groundwater quality data are currently reported by the GeoTracker GAMA through existing monitoring wells for cleanup sites. Private well owners typically use groundwater for irrigation. Locations of existing private wells were selected and presented as potential monitoring locations, and a preliminary subset of specific wells (wherein the well owner has volunteered for a long-term monitoring program) are recommended to reflect geographic coverage for the PVGB. The responsible agency, frequency of monitoring, parameters to be monitored and documentation of monitoring protocols and monitoring results are presented in this section.

8.1 Monitoring Plan Objectives

Monitoring the groundwater basin is necessary to understanding how constituent concentrations are changing over time in the Plan area in relation the Basin Plan WQOs. The overall objectives of monitoring are to obtain sufficient data to track spatial and temporal changes in TDS and nitrate concentrations in the aquifer. The groundwater level and water quality monitoring plan for this SNMP will be designed to accomplish the following:

- Document groundwater level and groundwater quality trends through time;
- Monitor and evaluate TDS and nitrate constituents of concern;
- Identify potential sources of TDS and nitrate; and
- Identify existing monitoring well locations that will be used to track potential changes in water quality over time.

8.2 Monitoring Network

This section describes the primary parameters to be included in the SNMP monitoring efforts, the selection of appropriate wells, and the sampling frequency. It defines the preliminary monitoring network that will be used for SNMP purposes.

8.2.1 Primary Parameters

The recommended primary parameters to be monitored for the SNMP monitoring plan include electrical conductivity (EC), pH, temperature, TDS and nitrate-N. The primary constituents and monitoring methods are presented in Table 28. Additional parameters may be monitored in the future if they are determined to be appropriate.

In addition to groundwater quality monitoring, groundwater levels will be monitored at the City's test wells.

Table 28: Primary Parameters for Sampling and Sampling Methods

Parameters	Units	Analysis	Analytical Method	Frequency
EC	µmohs/cm	Field	Not applicable	Annually
pH	units	Field	Not applicable	Annually
Temperature	°C	Field	Not applicable	Annually
TDS	mg/L	Laboratory	SM 2540C or EPA Method 160.1	Annually
Nitrate-N	mg/L	Laboratory	EPA Method 300.0 or 300.1	Annually

8.2.1.1 Constituents of Emerging Concern

Constituents of emerging concern (CEC) is a term used to describe a broad range of unregulated chemical components, including pharmaceuticals and personal care products, that are being found at trace levels in many water supplies. A blue-ribbon science advisory panel, convened by the SWRCB, prepared a report titled, "Monitoring Strategies for Chemicals of Emerging Concern in Recycled Water" which presented recommendations for monitoring CECs in municipal recycled water used for groundwater recharge. The Recycled Water Policy Attachment A states that "Monitoring of health-based CECs or performance indicator CECs is not required for recycled water used for landscape irrigation due to the low risk for ingestion of the water."

Currently, recycled water is not used within the PVGB and not directly used to recharge the groundwater basin. This preliminary SNMP monitoring plan does not include monitoring CECs. The City anticipates expanding the use of recycled water within the basin, but no plans are considered for using recycled water for direct groundwater recharge. Future monitoring of CECs can be incorporated into future updates to the SNMP monitoring plan if the Plan area implements recycled water projects for recharging the basin.

8.2.2 Selection of Wells

Private irrigation wells are recommended elements of the SNMP monitoring plan. The City of Poway, as the lead agency for the SNMP, worked closely with private well owners in the Plan area to identify potential wells that could be incorporated into the SNMP monitoring plan.

Figure 19 shows the locations of the existing wells currently owned by private owners in the PVGB. The wells in this figure represent a pool of potential SNMP monitoring wells; and, from this pool, a preliminary subset has been identified and recommended for the SNMP monitoring plan. Four primary criteria are considered in identifying specific wells to recommend for the SNMP monitoring plan:

- Maintain existing well locations.
- Provide adequate geographic coverage for the basin.
- Identify wells that would be representative of groundwater quality accessed by typical wells
- Provide coverage of areas of special interest, including monitoring of areas near surface water courses to better understand surface water/groundwater interactions.
- Select wells owned and operated by well owners who are willing to participate into a long-term SNMP monitoring program.

Of the 21 wells shown in Figure 19, four are recommended as selected wells for the SNMP monitoring plan. These four wells meet all of the criteria described above. Given the small size of the basin, four wells are recommended as

an appropriate representative well density. Table 29 lists the four selected wells and summarizes the well information available, with the rationale for the selection of each well. Figure 20 shows the locations of the selected four wells.

Table 29: Preliminary Subset of Wells Selected for SNMP Monitoring Plan

Well Number	Owner	Well Type	Total Depth (feet bgs)	Constituents Monitored	Date Drilled	Rationale for Selection
1	Private Well Owner	Irrigation Water Supply	300	EC, pH, Temperature, TDS, nitrate-N	N/A	Located near local creek, targets water supply aquifer, covers recharge areas, previously sampled for TDS and nitrate
2	Private Well Owner	Irrigation Water Supply	336	EC, pH, Temperature, TDS, nitrate-N	N/A	Targets water supply aquifer, covers recharge areas, previously sampled for TDS and nitrate
3	Private Well Owner	Irrigation Water Supply	750	EC, pH, Temperature, TDS, nitrate-N	N/A	Located near local creek, targets water supply aquifer, covers recharge areas, previously sampled for TDS and nitrate
4	Private Well Owner	Irrigation Water Supply	300	EC, pH, Temperature, TDS, nitrate-N	N/A	Located near local creek, targets water supply aquifer, previously sampled for TDS and nitrate

Note: N/A: Not available.

Figure 19: Locations of Existing Private Wells Identified as Monitoring Well Candidates

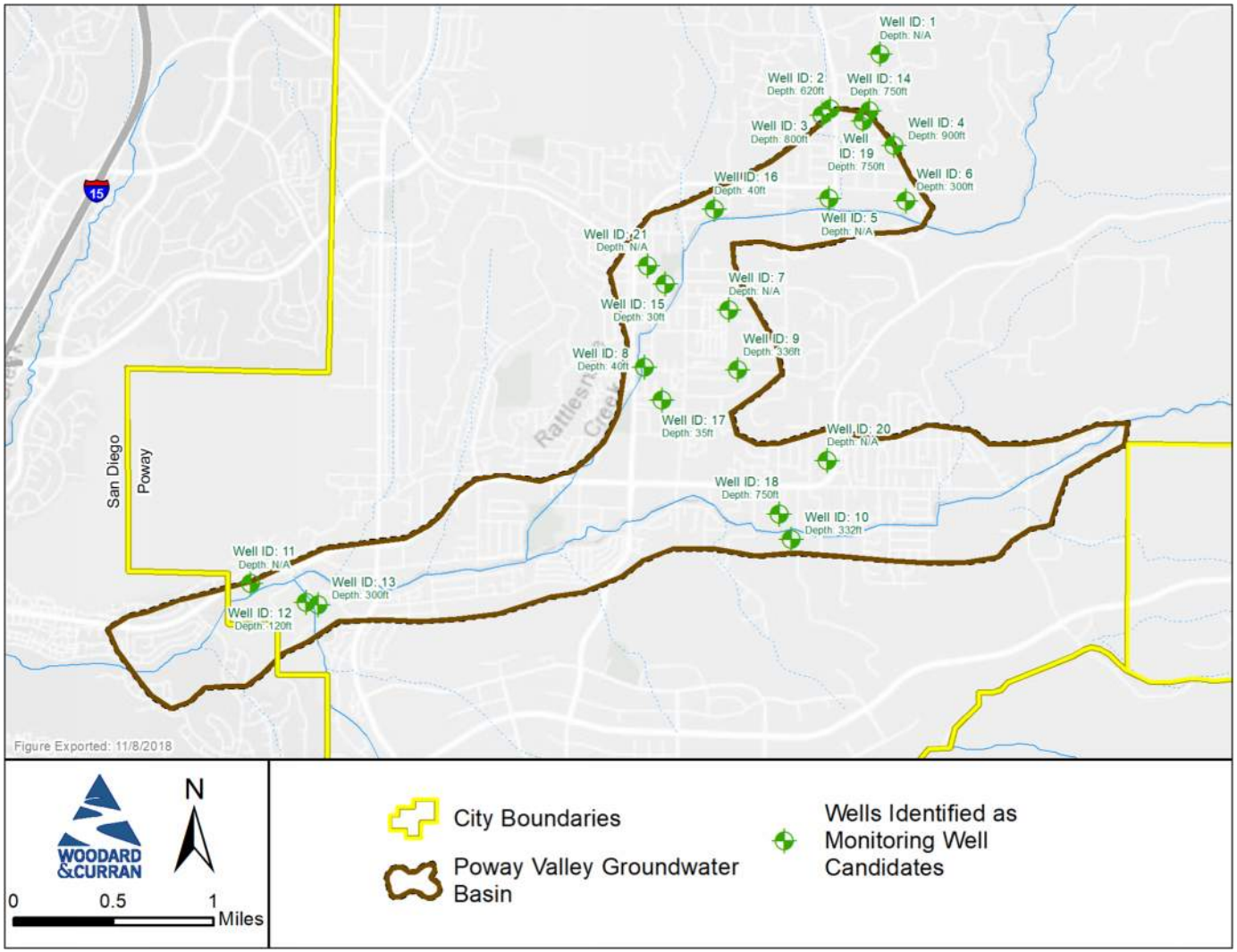
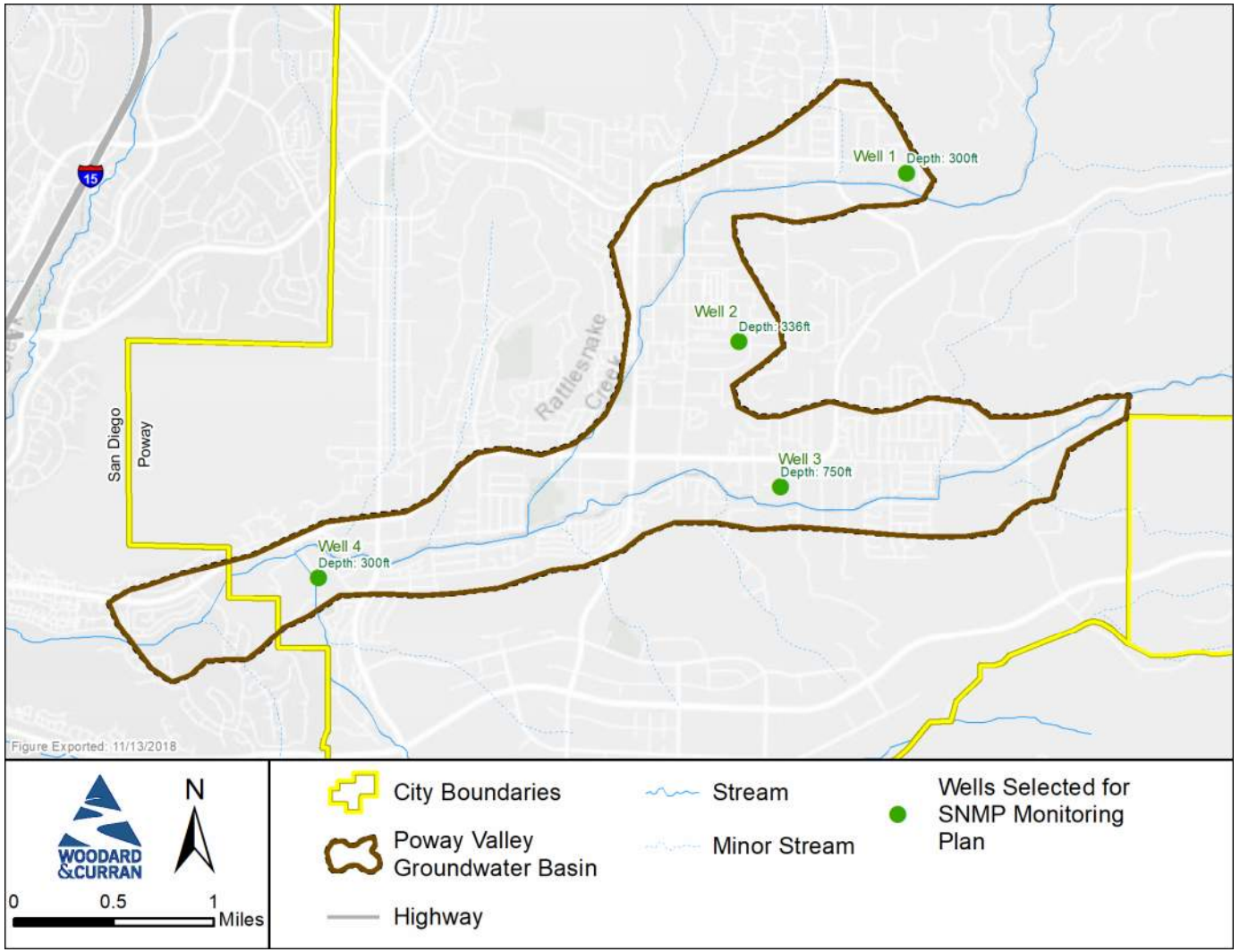


Figure 20: Preliminary Wells Selected for SNMP Monitoring Plan



8.2.3 Sampling Frequency

The SNMP monitoring plan will include annual monitoring of the primary constituents for each well to evaluate long-term changes in groundwater quality. Fall sampling is generally conducted after the irrigation season to observe low water levels following a dry period. Monitoring is proposed during the month of October each year as close to the beginning of the month as possible.

Water levels at the City's test wells will be monitored annually based on the same monitoring schedule. The City will follow the same monitoring schedule for all wells in the SNMP monitoring plan to maintain a consistent sampling frequency and reporting timeline.

8.3 Monitoring Protocols

Groundwater quality samples collected as part of the SNMP monitoring plan will be collected using the following guidelines:

- Wells will be purged using the dedicated pumps. Typically, three to five well casing volumes of water will be purged or until two consecutive measurements of conductivity, temperature, pH, and dissolved oxygen are within 10 percent of the previous two readings. At least five readings will be recorded during purging. Readings will be collected by passing water through a flow-through cell connected to a meter.
- Samples for water quality analysis will be collected in containers provided by the laboratory for the analysis intended.
- Each sample container will be labeled with the well number/location, date/time of sample collection, and sampler's name. The samples shall be delivered to the laboratory under chain-of-custody.
- Field notes will be taken during each monitoring event, including documentation of well purging and sampling.

8.4 Quality Assurance/Quality Control

Consistent procedures for Quality Assurance/Quality Control (QA/QC) are essential for successful implementation of the SNMP and for ensuring the accuracy of water quality data.

8.4.1 Data Reliability

Data obtained from wells will be scrutinized to determine if the data are representative of groundwater levels or water quality trends at each well. Anomalous results may be investigated by collecting confirmation water samples. Laboratory results will be validated with the laboratory's internal QA/QC procedures. To the extent relevant, equipment used to purge and sample wells will be thoroughly cleaned between sampling locations to avoid cross contamination.

8.4.2 Field Equipment Calibration

Equipment used to measure field water quality parameters (EC, pH, and temperature) will be calibrated according to manufacturer specifications prior to each sampling.

8.4.3 Field Duplicate Samples

Field duplicate samples will be collected at a frequency of 10% of the number of samples to be collected during the sampling event. Each duplicate will be analyzed for the same parameters as the real sample. All duplicate samples will be collected, numbered, packaged, and sealed in the same manner as the real samples.

8.4.4 Reporting

A field log book will be kept to document all groundwater field monitoring activities. Field notes will document samples collected, analysis methods, how and when (date and time) the well was purged and sampled, the amount of water removed during the purging, and general field comments (such as site and/or weather conditions). If a well cannot be sampled, the reason will be documented. A Chain of Custody will be completed for each sampling event.

8.5 Agency Responsibilities

The overall implementation of the SNMP monitoring plan will be led by the City of Poway. The City will be responsible for scheduling for sample collection with private well owners that participated into the SNMP monitoring plan. The City will be responsible for laboratory analysis of the sampled collected and reporting the data to the SWRCB via the online Electronic Deliverable Format (EDF) as described below. The City will follow the reporting requirements in compliance with the RWQCB requirements.

8.6 Online Data Submittal

Data collected as part of the SNMP monitoring plan will be submitted online electronically into the SWRCB's GeoTracker GAMA online information system via EDF, as required by the SWRCB. The City will upload all EDFs for each sampling event.

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9. PLAN IMPLEMENTATION

This section describes the management strategies and projects identified to support the goals and objectives of the SNMP. Several programs, BMPs, and identified projects that will help manage groundwater supplies and quality are already underway in the Plan area and will help maintain and improve the water quality of the basin.

9.1 Management Strategies

Best Management Practices (BMPs) are currently in place in the major land use sectors that are likely to be contributing salts and nutrients to the groundwater basin. BMPs for storm water management, recycled water management, waste water management, and water use efficiency measures are briefly described below.

9.1.1 Stormwater Management

The City implements a municipal Stormwater Pollution Prevention Program that includes BMPs to control trash, debris, sediment, bacteria, oil/grease, fertilizers (nitrates), pesticides, and other pollutants in dry weather urban runoff and storm water discharges to local surface waters, groundwater, and ultimately the ocean. The City has five mechanical holding basins for all water runoff from the Poway Business Park. The water runoff goes into a holding basin and is held for 72 hours before it is released into the watershed. The City tests water at the beginning of the 72-hour holding time and before it is released. The City has been collecting data for about 10 years.

The City of Poway implements a robust public education program on stormwater runoff

To encourage pollution prevention, the City of Poway has developed a set of BMPs that must be implemented at all industrial and commercial sites, construction sites, municipal areas and activities, and residential areas as part of the Jurisdictional Urban Runoff Management Program (JURP) adopted by the City in 2002. These BMPs should adequately control sediment discharges from sites, reduce or eliminate discharges of pollutants at their source, and protect local receiving waterbodies.

Some of the BMPs implemented by the City to control water quality of dry weather and storm water discharges include:

- Annual inspections of the drainage system
- Detention basin maintenance
- Emergency spill response 24/7
- Trash abatement
- Vegetation management/removal
- Street sweeping
- Public education and outreach programs
- New development requirements to manage stormwater quality including use of low impact development BMPs such as bioswales that promote infiltration (with certain restrictions to protect groundwater)
- Industrial facility inspections for compliance with stormwater permits
- Construction site inspections for compliance with stormwater permits

The City of Poway implements stormwater BMPs to manage surface water quality

The City of Poway also has a permitted concrete channel maintenance program to inspect, maintain, and document the mechanical removal of incidental sediment, trash, vegetation, and debris within 45 sections totaling 5.9 miles of concrete stormwater conveyance systems throughout the City of Poway. This program is performed annually and intended to ensure hydraulic capacity while preserving and improving water quality for the beneficial uses of waters. An average 573 yards of undesirable deposition annually totaling 4012 yards in the past seven years have been removed from the stormwater system eliminating potential discharges to receiving waters downstream.

9.1.2 Recycled Water Management

The use of recycled water in the City is regulated by the Title 22 of the CCR. Title 22 contains compliance requirements for use of recycled water for irrigation purposes. Recycled water to be used for irrigation of food crops, parks and playgrounds, school yards, residential landscaping, and unrestricted access golf courses, must be disinfected tertiary-treated and meet SWRCB water quality limits for nitrogen compounds, in addition to pathogens and toxic pollutants. This level of treatment is required to protect public health and the public water supply.

The City also implements irrigation and landscaping BMPs as part of their water conservation program and stormwater management program, and in accordance with their *Recycled Water Landscape Irrigation User's Manual* (which is discussed in Section 9.2.1 below) to prevent the over-application of fertilizers and other soil amendments where recycled water is used, and to prevent irrigation overspray that can flow into storm drains and channels.

The following BMPs are implemented as part of recycled water operations:

- **Water quality monitoring** – Monitoring at the treatment plant to ensure regulatory compliance and to meet monitoring requirements for emerging contaminants as required by the Recycled Water Policy.
- **Irrigation at agronomic rates** – Irrigation is applied at a rate that does not exceed the demand of the plants, with some allowance for flushing salts below the root zone, and does not exceed the field capacity of the soil.
- **Site supervision** – A site supervisor, who is responsible for the system and for providing surveillance at all times to ensure compliance with regulations and permit requirements, is designated for each site. The site supervisor is trained to understand reclaimed wastewater and supervision duties. In addition to monitoring the reclaimed wastewater system, the site supervisor must also conduct an annual self-inspection of the system.
- **Minimize runoff from irrigation** – Irrigation is not allowed to occur at any time when uncontrolled runoff may occur, such as during times of rainfall or very low evapotranspiration; and any overspray must be controlled.

9.1.3 Municipal Wastewater Management

The City of San Diego operates the NCWRP that generates the recycled water served by the City of Poway. The City of San Diego operates the NCWRP in compliance with RWQCB Order No. R9-2015-0091 and is currently implementing a host of source control and industrial waste management measures to control salts and nutrients in influent waters.

Recycled water used in Poway is generated at the North City Water Reclamation Plant

The City of Poway also implements a Sewer System Management Plan that contains a spill response plan and standard procedures for immediate response to a Sanitary Sewer Overflow (SSO) in a manner designed to minimize water quality impacts and potential nuisance conditions. SSOs can cause release of nitrates to drainage systems, stream channels and groundwater. Additionally, the City of Poway has an active inflow and infiltration program to identify leaks in the wastewater collection system and implements an active sewer line video inspection program.

The implementation of a Fats, Oils, and Grease (FOG) program is another City of Poway program that helps to prevent potential nitrate releases to surface and groundwater via wastewater conveyance. The intent of the FOG program is to eliminate the discharge of excess grease and oil into the wastewater collection system, minimize the potential formation of blockages to the flow of wastewater as a result of grease accumulations, and eliminate SSOs that may result from blockages and spills. Wastewater sewer blockages or spills can cause harm to the environment and the community, resulting in costly cleanup and repairs. Any wastewater that enters a storm drain flows untreated into surface waters and groundwater affecting water quality. The City's FOG program includes:

- City-issued Food Establishment Wastewater Discharge permits to control discharge of FOG materials.
- Inspection of all food service establishments for FOG management on an annual basis.
- Monthly and quarterly sewer system flushing as required to help prevent sewer overflows.
- Education outreach to restaurant owners and also requires the performance of in-house training.
- Posts the FOG Program on the City website and provide outreach to local citizens to prevent household disposal of FOG materials

9.1.4 Water Use Efficiency and Conservation

The City of Poway promotes water conservation and water use efficiency through the state's mandatory water conservation measures. Conservation of outdoor irrigation water helps diminish the loading of salts into the groundwater basin from irrigation with potable water.

Examples of the City's water use efficiency measures include:

- Implementation of the state's mandatory water use efficiency measures such as:
    - Prohibiting washing of paved surfaces
    - Prohibiting run-off or over irrigation
    - Implementing programs to replacing water intensive lawns and gardens with drought-resistant native plants that require substantially less water
    - Improving efficiency of lawn sprinklers
    - Promoting weather-based irrigation controllers

Poway's public outreach program to promote water conservation indirectly supports basin management

- Conservation water rates (tiered residential rates)
- Meter replacement program with replacement of older meters
- Public outreach to promote conservation consisting of:
    - Rebates and incentives for residents to update their indoor and outdoor water devices such as sprinkler heads, toilets, washers, and weather-based irrigation controllers
    - Landscape makeover classes for its residents to learn how to remove their water intensive lawns and gardens with drought-resistant native plants

- Tools and practices to facilitate contributions by public individuals and groups toward good water management outcomes.

New and continuing initiatives for outdoor water conservation will continue to diminish the quantities of salt loading from outdoor irrigation with potable water.

9.1.5 Onsite Wastewater Treatment System Management

There are permitted septic systems in the Plan area, each managed by individual property owners responsible for employing a variety of BMPs such as monitoring and frequent pumping to properly manage the operation of the system. Septic tank leach fields are a source of nitrate to the groundwater basin. Permits for septic systems can be obtained by application to the SWRCB. In June of 2012, the SWRCB adopted the Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS). This policy was subsequently updated in April 2018. The intent of the policy is "to allow the continued use of OWTS, while protecting water quality and public health". BMPs required in the policy include site evaluations, setbacks, and percolation tests for new systems. With proper permitting and management of the OWTS, nitrate sources can be minimized.

9.2 Projects and Management Actions

Water management planning efforts and projects related to the SNMP are presented in Table 30 and are described in the following sections. These projects will benefit the PVGB by supporting regional water supply reliability, promoting sustainable use of the PVGB, and providing drinking water that meets regulatory requirements.

Table 30: Basin Water Management Projects and Timeline

Target	Purpose	Implementing and Cooperating Agencies	Schedule	Impact to Salt and Nutrients Loadings
Update Recycle Water Landscape Irrigation User's Manual	Operation and control of recycled water system by users	City of Poway	Development stage	Potentially reducing TDS and nitrate loading to the basin through maintaining recycled water system
Seawater Desalination	Reduction in TDS concentrations in potable water supply	SDCWA	Implementation stage	Reduction in TDS in recycled water supplies served to the City of Poway
Pure Water Program	Improve water quality of recycled water	City of San Diego	Development stage, starting in 2021	Reduction in NCWRP recycled water TDS and nitrate and resulting reduced loading to the basin
Potable Water Replacement Program	Replace older meters	City of Poway	Implementation stage, anticipated completion by 2024	Conservation of water use potentially reducing loading to the basin

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9.2.1 Update Recycle Water Landscape Irrigation User's Manual

The City of Poway currently has a "*Recycled Water Landscape Irrigation User's Manual*" that is provided to the users of recycled water system. The intent of the manual is to provide the user of recycled water system a resource for the day-to-day operation and control of the system. The manual provides information for the user to be in compliance with existing regulations for the operation of the recycled water system and serves the following benefits:

- Maintenance of recycled water system on property
- Reduced over-application of fertilizers and soil amendments on grounds where recycled water is applied

The City is planning to update to the manual with the latest available information. Proper use of recycled water system potentially helps reduce TDS and nitrate loading to the basin.

Implementation of BMPs associated with recycled water application (such as reduction of fertilizer use) helps reduce nitrogen loading

9.2.2 Seawater Desalination

The Claude "Bud" Lewis Carlsbad Desalination Plant (Carlsbad Desalination Plant), owned by Poseidon Resources in a public-private partnership with SDCWA, began operation in December 2015. SDCWA constructed a 10-mile-long pipeline that delivers water from the plant to SDCWA's Second Aqueduct and Twin Oaks Valley Water Treatment Plant, where it is blended with existing drinking water supplies for regional distribution. The Carlsbad Desalination Plant delivers 50,000 AFY of desalinated water into the regional aqueduct system, which accounts for approximately one-third of San Diego County's local supply. Operation of the Carlsbad Desalination Project may result in a reduction in TDS concentrations in the potable water supply that is served within the sewer tributary area of the City of San Diego NCWRP. Blending desalinated seawater into SDCWA's treated water supply can result in reduced TDS concentrations in wastewater that is reclaimed within the City's service area. Depending on the mix of treated vs raw water served within the area, as well as the blend of imported water sources, this reduction in potable water TDS may translate to a reduction in TDS in the NCWRP recycled water supplies that are purveyed to the City of Poway.

9.2.3 City of San Diego Pure Water Program

The City of San Diego has been exploring potable reuse for over a decade to supplement local supplies and offload wastewater flows to the Point Loma WWTP, whose location makes it challenging to expand as the region grows. Pure Water Program is the City of San Diego's phased, multi-year program to use proven water purification technology to produce purified water that meets state and federal drinking water standards. Phase 1 of the Pure Water Program will produce 34 million gallons per day (mgd) (38,080 AFY) starting in 2021 and utilize surface water augmentation (City of San Diego, 2018). The project is designed to augment the City of San Diego's Miramar Reservoir with approximately 30 mgd of purified water for potable reuse and 4 mgd (4,480 AFY) will be used to reliably and cost effectively manage the salinity of non-potable reuse water (i.e., recycled water).

Water quality in the Miramar Reservoir will largely reflect the characteristics of the purified water source, exhibiting low concentrations of TDS (City of San Diego 2018). As a result of the use of low-TDS purified water discharged to Miramar Reservoir, reduced potable supply TDS concentrations will, in turn, result in reduced TDS concentrations in both the NCWRP influent and final recycled water.

Non-potable water will have a lower concentration of TDS than the tertiary treated water to satisfy TDS requirements in the RWQCB permit. Salinity management of non-potable reuse water will be provided by blending tertiary disinfected

effluent water with purified water. Projected non-potable reuse water quality will depend on volume of purified water blended with non-potable reuse water for salinity management (City of San Diego 2018).

Once the City of San Diego Pure Water Program is initiated, the project is projected to result in reduction in TDS concentrations in the NCWRP recycled water supply that is purveyed to the City of Poway.

9.2.4 Potable Water Replacement Program

The City of Poway is in the process of its meter replacement program where older meters are replaced with newer meters. It is a ten-year program that started in 2014 and anticipated to completion by 2024. Conservation of water use would have a direct effect on reducing salt loading.

9.3 Plan Update Process

A Draft SNMP was completed by the City of Poway, in collaboration with the City of San Diego, on November 19, 2018 and the Draft SNMP was available for public review through November 30, 2018. The Draft SNMP Report was also posted on the City's website (https://poway.org/936/Salt-and-Nutrient-Management-Plan-Inform). No public comments on the Draft SNMP Report were received. The SNMP was adopted by the City of Poway during the City Council meeting on December 4, 2018 through Resolution No. 18-070 (Appendix C). The Final SNMP was submitted to the RWQCB in December 2018 for their review and incorporation into their Basin Planning process and subsequent environmental documentation process.

The timing of an update for the Plan is not tied to a scheduled reoccurrence interval; however, an update could be triggered by the following:

- Major changes in land use or land management practices
- Changes in basin management
- Implementation of future recycled water projects

Any future updates would be conducted utilizing a similar collaborative process as was utilized for development of this SNMP. The basin monitoring plan will be reviewed to determine the need for updates every five years. More frequent updates may occur if justifiable by basin conditions and data.

9.4 California Environmental Quality Act (CEQA) Compliance

The Recycled Water Policy requires that SNMPs comply with the applicable California Environmental Quality Act (CEQA) requirements. CEQA requires state and local agencies to determine the potential significant environmental impacts of proposed projects and identify measures to avoid or mitigate these impacts where feasible. CEQA Guidelines, which provide the protocol by which state and local agencies comply with CEQA requirements, are detailed in California Code of Regulations, Title 14 § 15000 et seq. The Recycled Water Policy further requires that all CEQA compliance be funded by the local entities developing the SNMP, including CEQA processes required for any RWQCB adoption. The basic purposes of CEQA are to: 1) inform decision makers and public about the potential significant environmental effects of a proposed project, 2) identify ways that environmental damage may be mitigated, 3) prevent significant, avoidable damage to the environment by requiring changes in projects, through the selection of alternative projects or the use of mitigation measures when feasible, and 4) disclose to the public why an agency approved a project if significant effects are involved (Cal. Code Regs., tit. 14, § 15002(a)).

CEQA compliance relevant to the Poway Valley SNMP can be divided into three components:

- Development and adoption of the SNMP by the City of Poway
- Potential adoption of the SNMP by the RWQCB

- Potential development of projects discussed in the SNMP

9.4.1 SNMP Development and Adoption

As the SNMP includes no mandated new implementation activities, the development and adoption of the SNMP by the City of Poway is statutorily exempt from CEQA as a planning study. CEQA Guidelines Section 15262 exempts feasibility and planning studies from CEQA compliance:

> "A project involving only feasibility or planning studies for possible future actions which the agency, board, or commission has not approved, adopted, or funded does not require the preparation of an EIR or Negative Declaration but does require consideration of environmental factors. This section does not apply to the adoption of a plan that will have a legally binding effect on later activities (Cal. Code Regs., tit. 14, § 15262)."

9.4.2 Potential Adoption by RWQCB

The SNMP does not include mandated new implementation activities and does not recommend changes to the water quality objectives as an outcome of this SNMP. As noted above, groundwater quality within the basin does not comply with the existing Basin Plan groundwater TDS water quality objectives. Implementation measures summarized in this SNMP are projected to result in potential reductions in both recycled water and groundwater TDS. Further, groundwater quality is projected to remain stable and the existing beneficial uses of groundwater within the basin will continue to be supported regardless of whether or not recycled water use occurs within the basin. Due to the hydrogeographic nature of the basin, however, no viable strategies exist which could result in sufficient reduction in groundwater TDS to achieve compliance with the existing Basin Plan TDS water quality objectives. Because Basin Plan groundwater TDS objectives will not be achieved (regardless of whether or not recycled water use occurs in the basin), the RWQCB will need to determine:

- whether modification of the existing Basin Plan TDS objectives is warranted to make the objectives consistent with achievable water quality, and
- whether existing and planned recycled water use (consistent with the implementation strategies outlined in this SNMP) is to be allowed, and is so, under what regulatory constraints.

In the event that the RWQCB determines that modification of Basin Plan groundwater TDS objectives is warranted, a Substitute Environmental Documentation (SED), along with other requisite Basin Plan modification support documents, will need to be prepared and certified by the RWQCB.

> "Any water quality control plan, state policy for water quality control, and any other components of California's water quality management plan as defined in Code of Federal Regulations, title 40, sections 130.2(k) and 130.6, proposed for board approval or adoption must include or be accompanied by Substitute Environmental Documentation (SED) and supported by substantial evidence in the administrative record. (Cal. Code Regs., tit. 23, § 3777)"

9.4.3 Projects Discussed in SNMP

The SNMP does not include mandated new implementation activities and therefore this category of CEQA compliance is not applicable. For ongoing projects that the City of Poway or City of San Diego are implementing, such as capital improvements associated with water supply, recycled water, and stormwater systems (e.g., retention basins), separate CEQA compliance has been completed and certified prior to project implementation.

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10. CONCLUSIONS

The PVGB is a small, extremely shallow alluvial aquifer with limited groundwater use by private residential irrigation wells which typically access deeper water from fractured rock. Groundwater quality data are limited in the PVGB, but available data indicate elevated concentrations of TDS compared to the Basin Plan water quality objectives. Median TDS concentrations in the PVGB exceed the Basin Plan water quality objectives of 1,000 mg/L in the western portion of the basin and 750 mg/L in the eastern portion. While analysis of existing basin-wide groundwater quality conditions indicates that the existing groundwater quality generally does not meet the Basin Plan water quality objectives for TDS, groundwater in the PVGB does, with the exception of a few isolated areas, meet the 10 mg/L Basin Plan water quality objective for nitrate-N.

Using assumptions driven by limited data, the antidegradation analysis over a 25-year planning horizon indicates that basin-wide average TDS concentrations would decrease slightly over time, but are relatively stable. Further, the projected TDS concentrations are not significantly affected by the future land use and anticipated recycled water use changes. Nitrate-N concentrations are anticipated to be relative stable basin-wide and achieve compliance with the Basin Plan water quality objective. Finally, given the capacity and hydrogeologic nature of the basin, no practical means exists for improving groundwater TDS concentrations to the point where compliance with the existing Basin Plan TDS water quality objectives are achieved.

On the basis of the information presented within this SNMP, the following are concluded:

1. Existing groundwater quality does not meet the present-day Basin Plan TDS water quality objectives within both the eastern portion (750 mg/L TDS objective) and the western portion (1000 mg/L TDS objective) of the Poway Valley Basin.
2. A number of existing strategies are in place to minimize salt loads, including:
    - stormwater management,
    - recycled water management,
    - conservation and water efficiency management,
    - management of onsite wastewater treatment systems (e.g., septic tank discharges),
    - implementation of strategies which will reduce TDS concentrations in the potable water supply that is served within the NCWRP tributary sewer area, including the Carlsbad Desalination Plant and the City of San Diego Pure Water Program, and
    - proposed City of San Diego blending of purified (reverse osmosis) treated water with recycled water supplies to further reduce TDS concentrations in the recycled water supply provided by the City of San Diego to the City of Poway.
3. In part, because of these strategies, groundwater TDS concentrations in the basin are projected to be stable (even decline slightly) under projected future salt loads.
4. The existing quality of groundwater continues to support existing beneficial uses, and this is not projected to change.
5. Recycled water is projected to be a relatively minor component of the overall basin salt balance, and existing conditions are projected to continue to occur whether or not recycled water use occurs within the basin. Additionally, TDS concentrations in the future recycled water supply (see above) are projected to decrease.

6. Given the hydrogeology of the basin, no feasible or practical strategy exists (e.g., groundwater recharge/recovery) for achieving improvement of groundwater quality to the point where the existing Basin Plan TDS water quality objectives are achieved.
7. The RWQCB has several options for proceeding:
    - modify the Basin Plan to reflect existing and projected groundwater conditions,
    - require the City of Poway to continue to monitor groundwater quality (as proposed as part of this SNMP) to assess how projected improvements in recycled water TDS concentrations may affect groundwater quality,
    - keep existing Basin Plan objectives but allow existing and proposed recycled water use to continue on the basis that such use is consistent with maintaining existing groundwater quality and beneficial uses, or
    - prohibit the use of recycled water within the basin.

Given that recycled water is not projected to adversely impact groundwater quality, the latter of these strategies (prohibiting the use of recycled water in the Poway Basin) appears to be inconsistent with the intent and goals of the State's Recycled Water Policy.

11. REFERENCES

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APPENDIX A: STAKEHOLDER OUTREACH WORKSHOP #1 AND WORKSHOP #2 PRESENTATIONS

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Poway Valley Basin
Salt and Nutrient Management Plan

Stakeholder Workshop #1
May 22, 2018, 6:00 PM
Poway City Hall

Workshop Agenda

- **Presentation** (~30 minutes)
- **Questions & Answers** (~30 minutes)
- **Resource Fair** (~30 minutes)

Presentation Agenda

- Salt and Nutrient Management Plan (SNMP)
- Poway Valley Groundwater Basin
- Data Collected to Date
- Ways to Get Involved
- Next Steps

What is a Salt & Nutrient Management Plan (SNMP)?

- *Purpose*: To evaluate and manage overall groundwater quality and with respect to recycled water use
- *Who's Involved*:

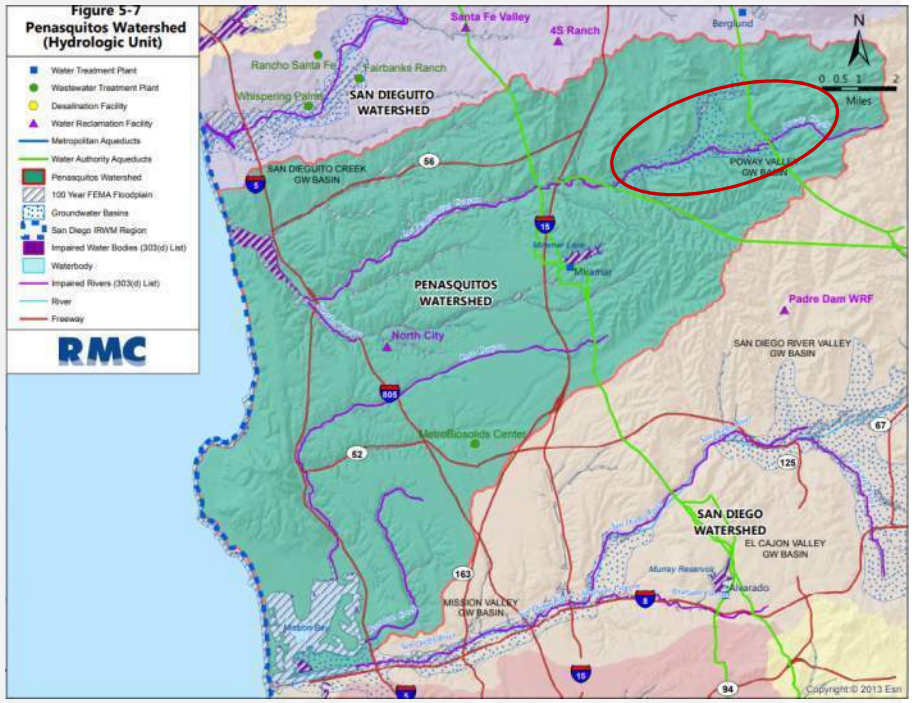
Photo Credit: City of Poway

What is a Salt & Nutrient Management Plan (SNMP)?

- *Driver*: Issuance of a permit to deliver recycled water to customers in the Poway Business Park
  - Recycled water offsets use of potable (precious!) water for landscape irrigation

What is a Salt & Nutrient Management Plan (SNMP)?

- *Regulations*: Mandated by State of California's Recycled Water Policy
  - Recycled water contains salts and nutrients (as does all water)
  - Management goal is to protect groundwater quality
  - Tool to better understand "loading" to groundwater basin and potential contribution from watershed
    - Total dissolved solids (TDS) = salts
    - Nitrate (NO_3) = nutrients



What's the Problem?

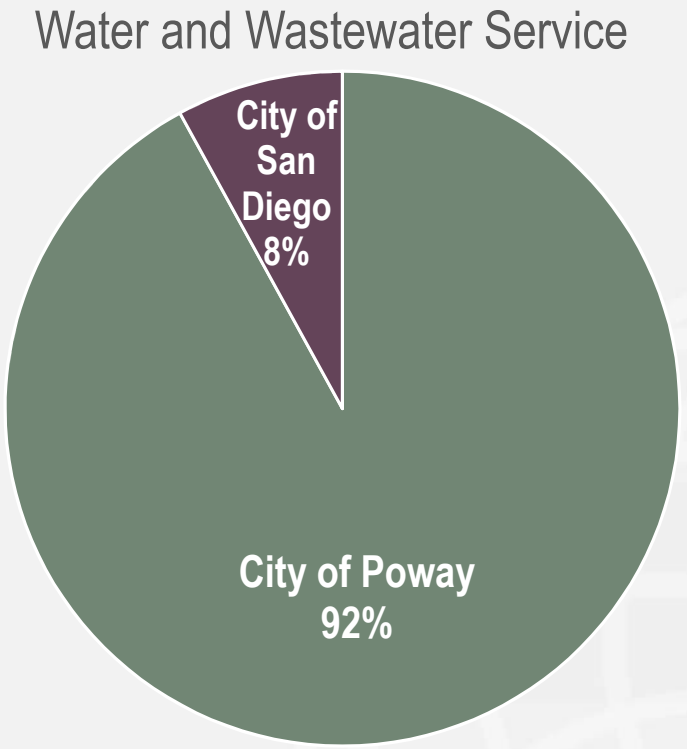
- Increasing salinity and nutrients in groundwater and other water supply sources statewide
- Salt removal is expensive
- Potential for health and environmental effects related to contaminants
- Sources include:
  - Irrigation water
    - Potable and recycled
  - Fertilizer
  - Septic tanks
  - Animal waste

Why Participate?

- Participation ensures the SNMP reflects the local conditions and stakeholder preferences
- Participation offers stakeholder opportunities to:
  - Offer groundwater quality data to help better understand basin
  - Provide feedback on potential water quality protection strategies or basin management methods

Poway Valley Basin

- Poway Valley Basin is estimated by State to have over 2,300 acre feet (AF) of storage (available groundwater)



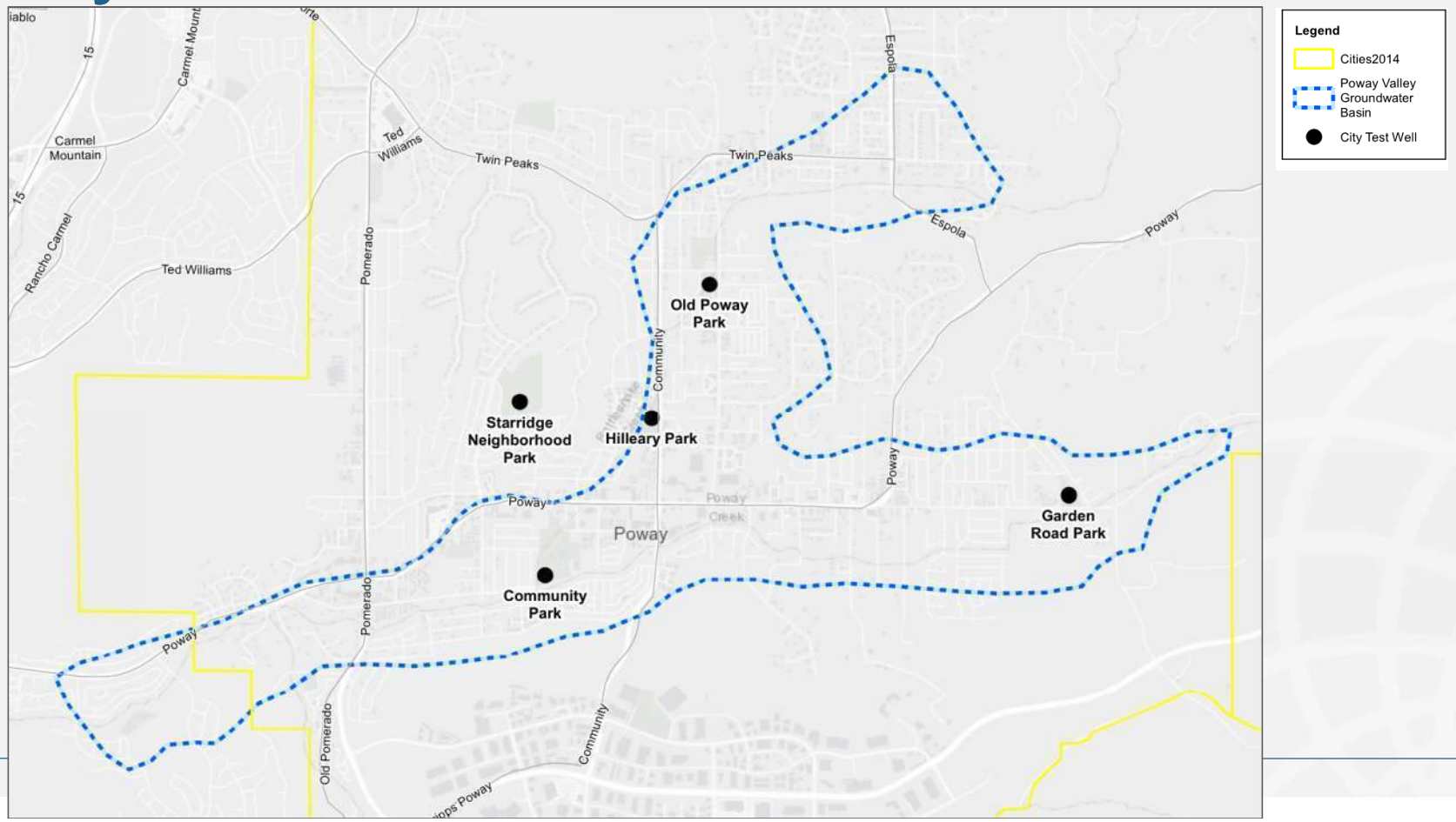
Where Does Poway Get its Water?

- City of Poway imports 99% of its water from San Diego County Water Authority
  - Blend of water from Northern California, Colorado River, and seawater desalination
  - Blend varies seasonally – recent increase in State Water Project water (increased total organic carbon)
- Recycled water is purchased from City of San Diego and delivered to Poway Business Park customers
- Local rainfall is captured by Lake Poway

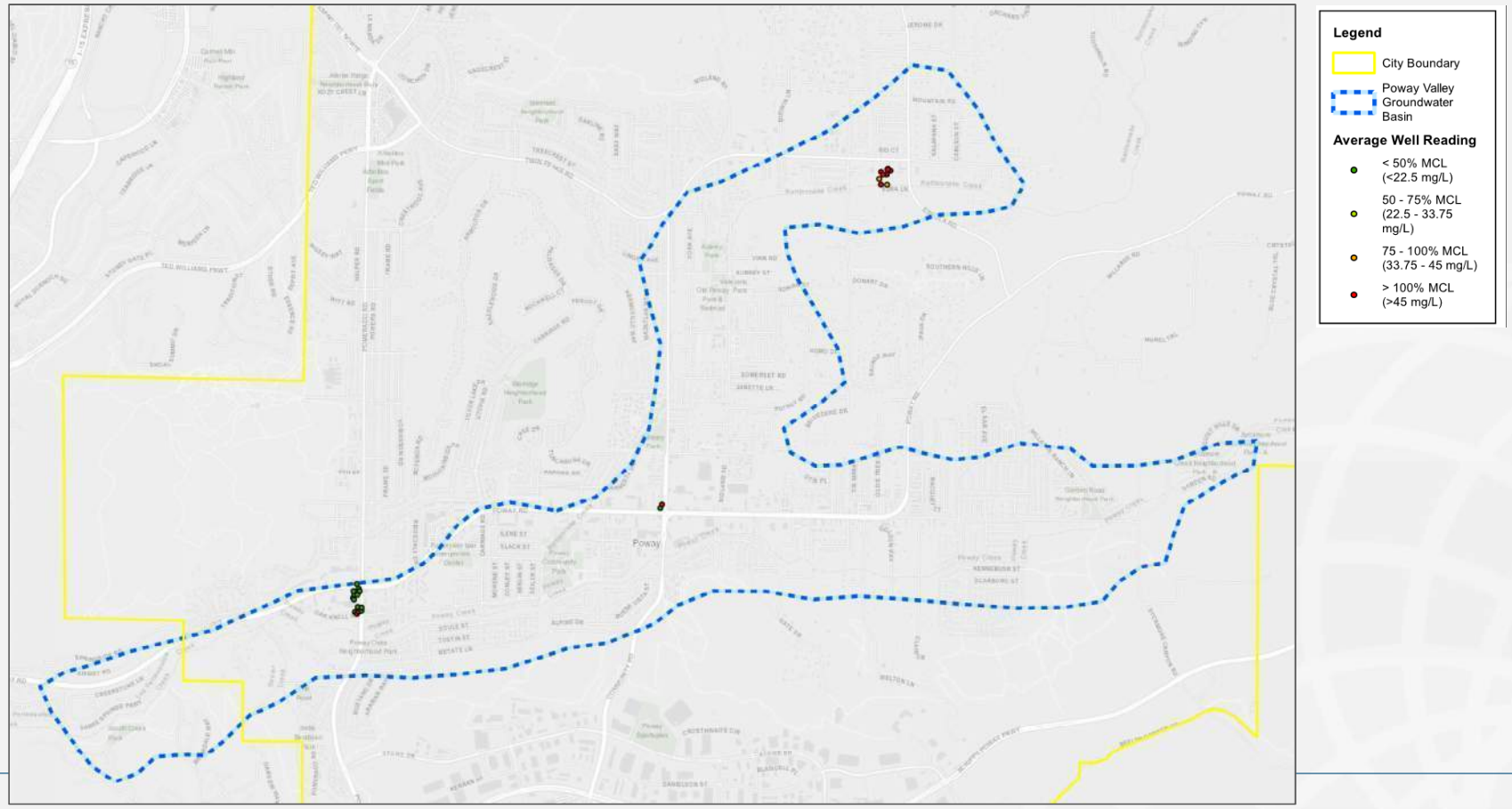
What Data Has Been Collected So Far?

- Well Information – City Wells & Monitoring Wells
- Existing Land Uses
- Water & Sewer Service Areas
- Recycled Water Service Areas
- Water Quality – Groundwater and Recycled Water

City Test Wells - Locations



GeoTracker Wells - Locations

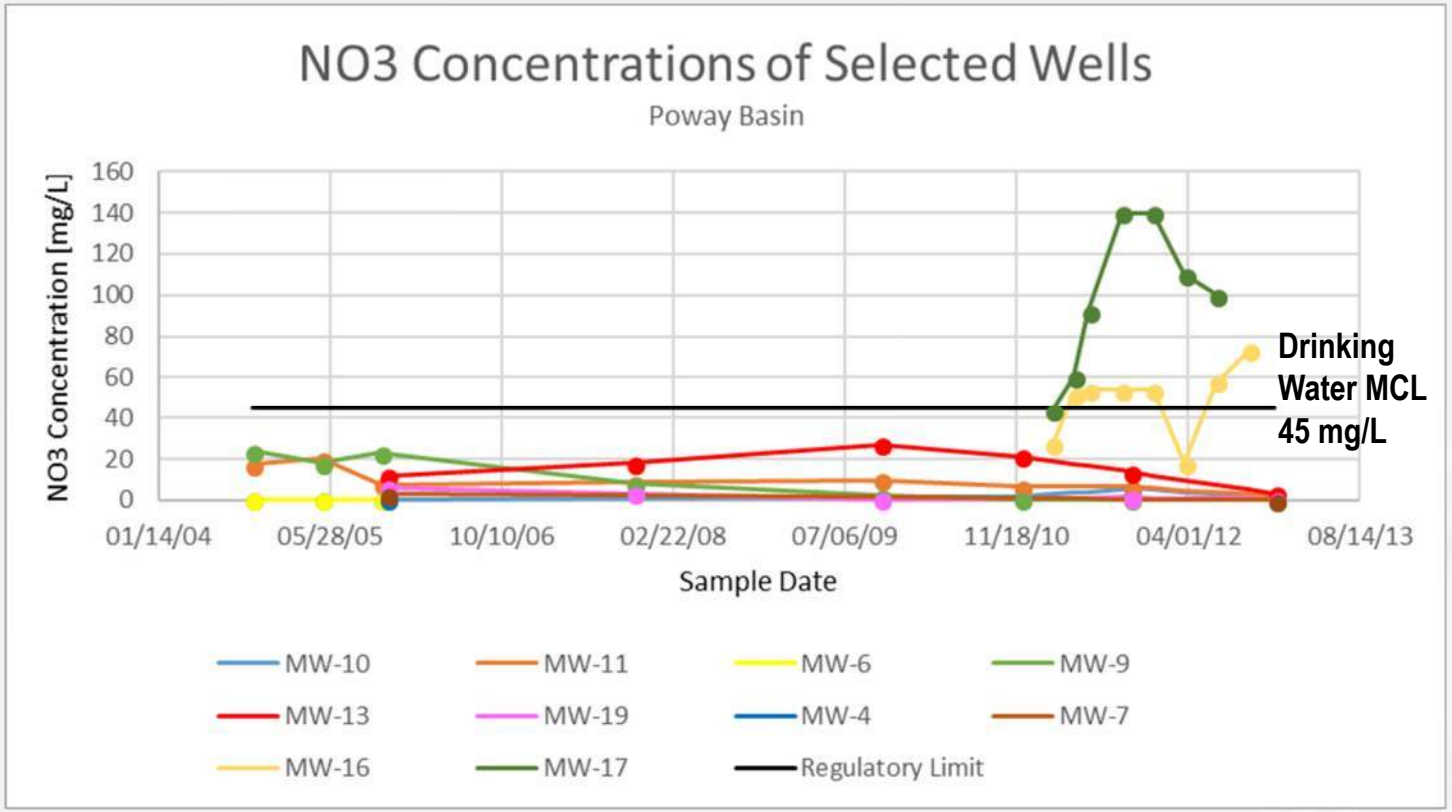


City Test Wells – Water Quality

Location	Water Quality (TDS mg/L)
Regulatory Limit	1,000
Hilleary Park	1,365 (01/1992)
Starridge Park	1,650 (01/1992)
Old Poway Park	795 (01/1992)
Garden Park	656 (01/1992) 795 (01/1992)
Community Park	1,420 (01/1992) 1,440 (05/1992) 1,500 (05/1992)

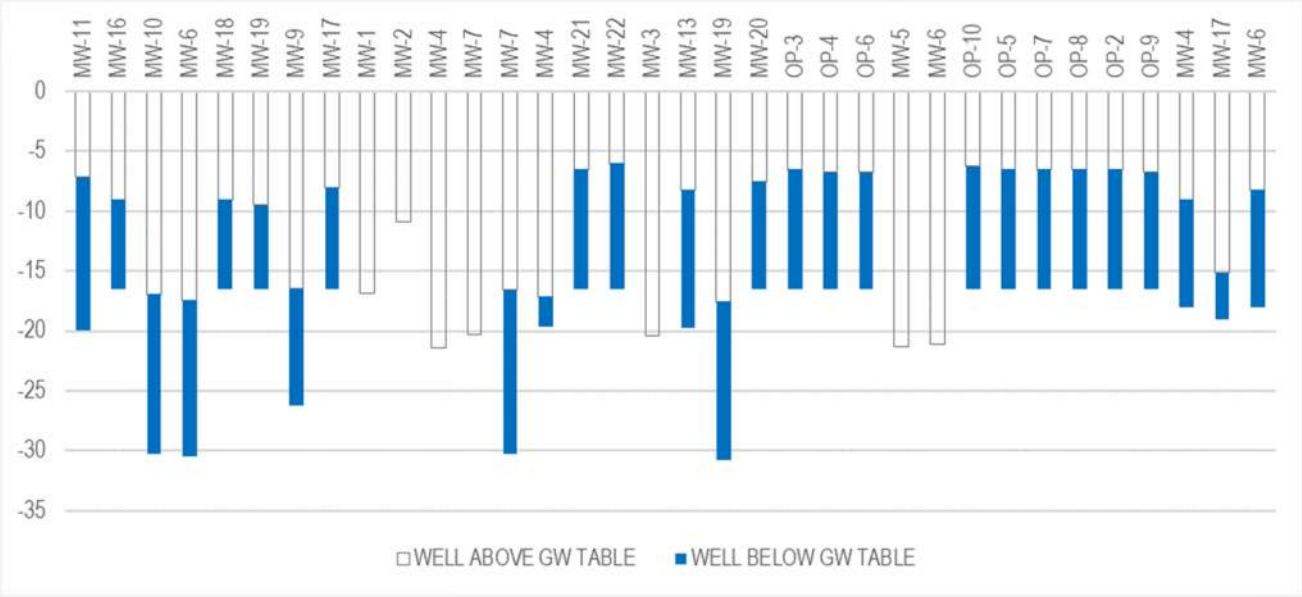
- TDS data from City wells is over 26 years old (from 1992)
- We need current data to understand the basin conditions

GeoTracker Wells – Water Quality



- All nitrate levels were below drinking water maximum contaminant levels (MCL) except for 2 well locations

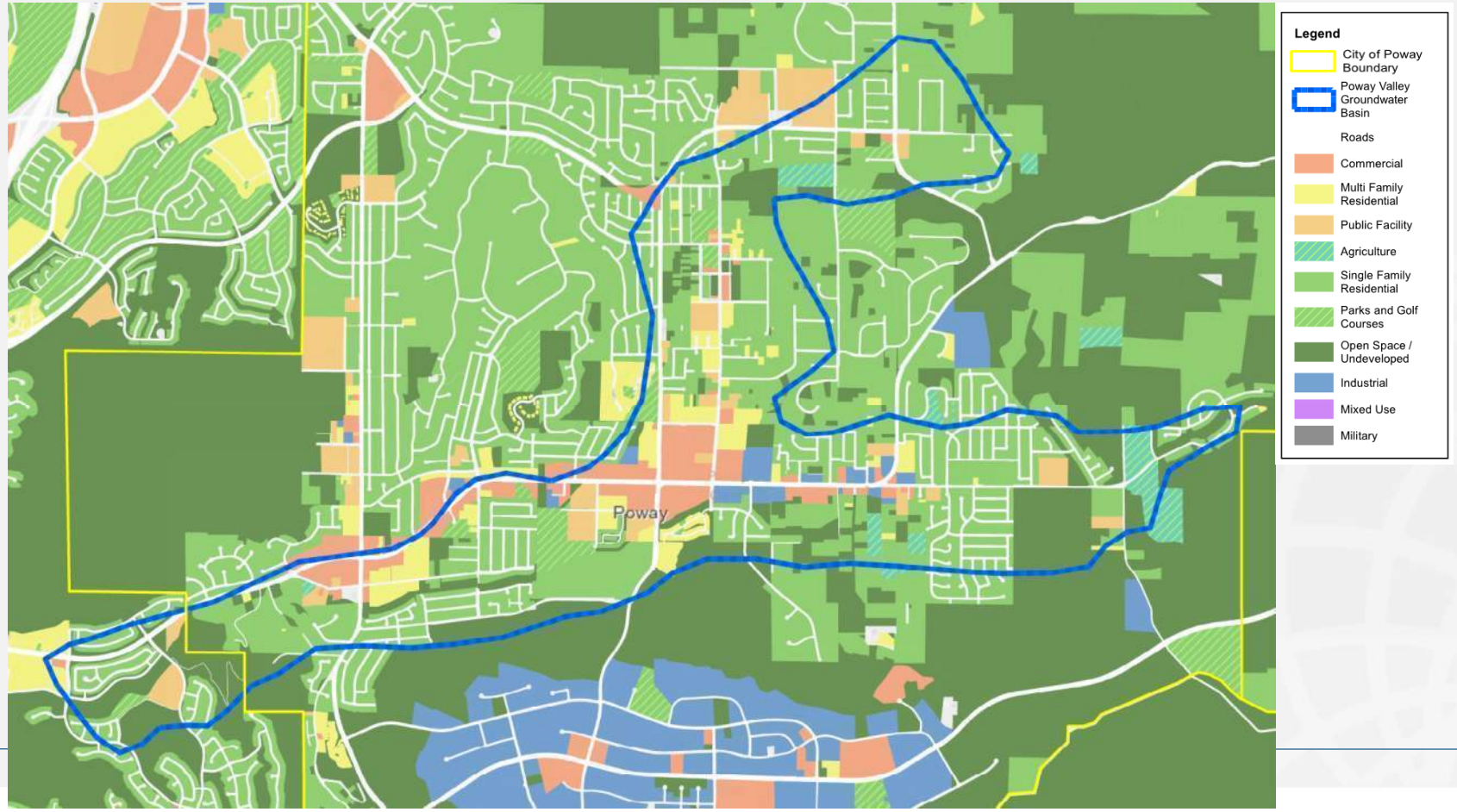
GeoTracker Wells – Summary



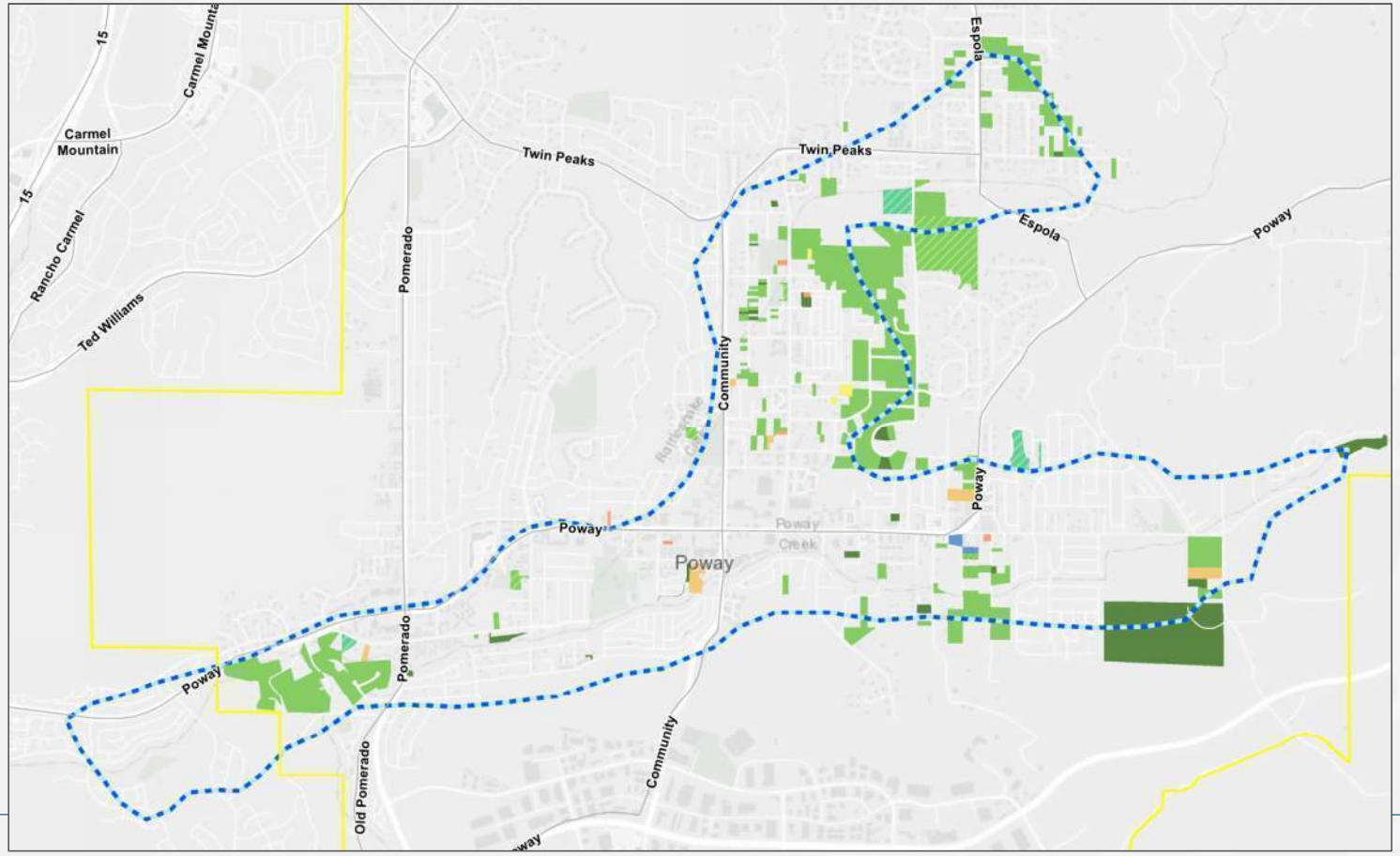
Based on GeoTracker GAMA records

- All wells are shallow, many above groundwater table level
- Results may not be representative of the full aquifer

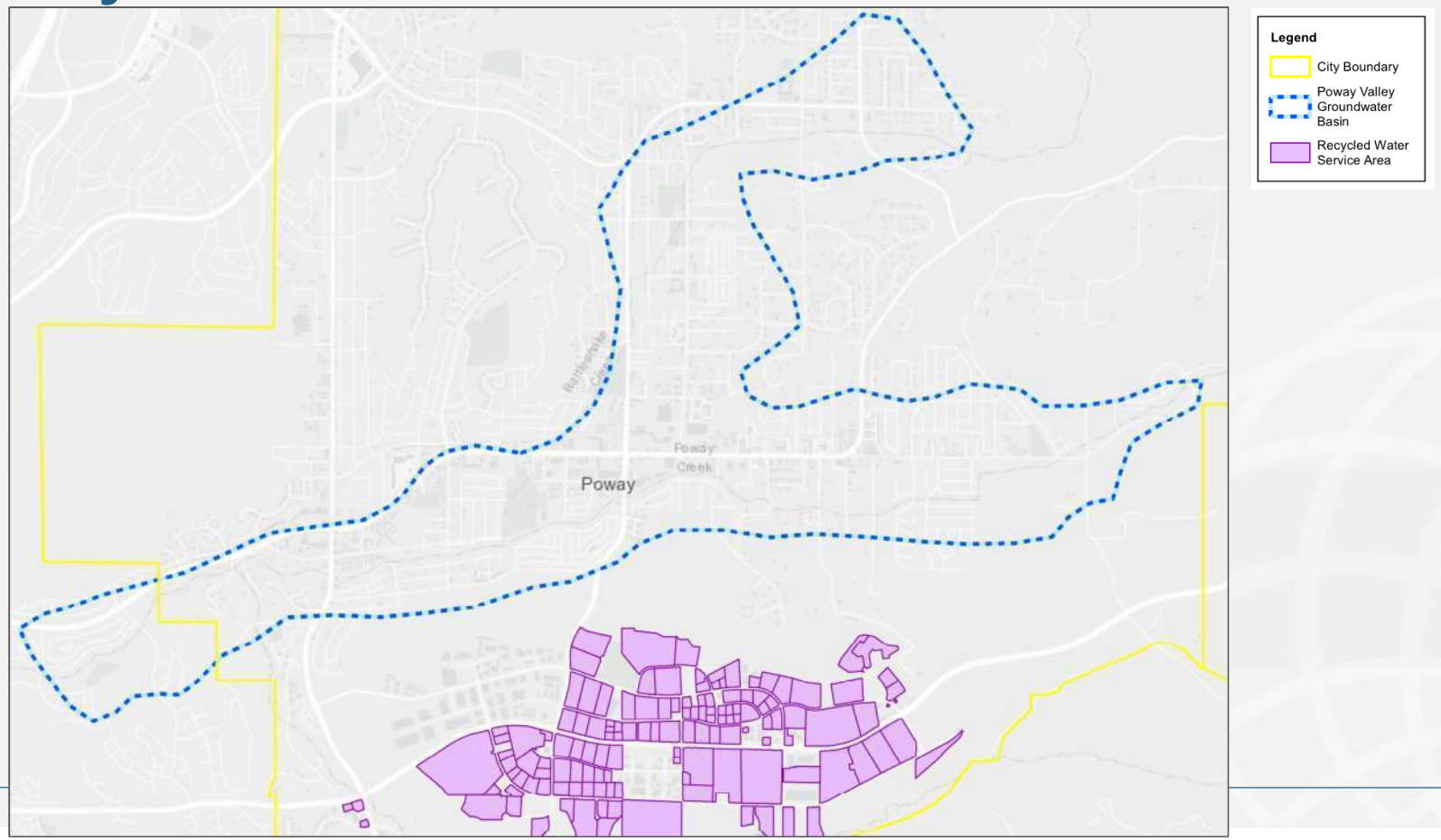
Land Use Data



Water & Sewer Service



Recycled Water Service



Recycled Water – Water Quality

- Recycled water contains higher salt concentrations than potable water
- Recycled water contains higher nutrient concentrations than potable water, which can reduce the amount of fertilizer that needs to be applied to irrigated lands

Ways to Get Involved

- Participate in upcoming workshop
  - Workshop #2 in September
  - Hear overview of study results
  - Provide feedback on basin management strategies
- Participate in our Well Sampling Program
- Sign up for our mailing list!

Well Sampling Program

- Request for access to private wells if:
  - Well has an accessible sampling location
  - Sampling location is not preceded by a treatment system
  - Well has been in regular use for the last month

Well Owner Information	
First Name:	Last Name:
Address:	
Phone Number:	Email:
Preferred Contact Method: □ Mail □ Email □ Phone	
Well Description	
Well Location on Parcel:	
Well Depth: (If Known)	Well Screen Depth(s): (If Known)
Description of Well Access Point(s): *(For Example: sample faucet/spigot near pump. Must not be preceded by a point source treatment system (water softener, carbon filter, etc.))*	
Description of Well Water Use: *(For Example: Drinking Water, Irrigation, etc.)*	

Well Sampling Program Misconceptions

- Private well monitoring DOES NOT…
  - affect your water supply,
  - give permanent access to the City (one-time sample), or
  - put a meter in your well.
- Private well monitoring DOES…
  - give you a free water quality report for your well water, or
  - help the Cities to better manage the Poway Valley Basin.

Resource Fair

- Station 1: SNMP General Resources
  - Alex Heide, City of Poway
  - Larry Abutin, City of San Diego
  - Michael Welch
- Station 2: Private Well Owner Information
  - Rudy Guzman, City of Poway
  - Rosalyn Prickett, Woodard & Curran

Thank You

City of Poway	City of San Diego	Woodard & Curran
Rudy Guzman	Larry Abutin	Rosalyn Prickett
rguzman@poway.org	LAbutin@sandiego.gov	rprickett@woodardcurran.com

Poway Valley Basin
Salt and Nutrient Management Plan

Stakeholder Workshop #2
November 13, 2018, 6:00 PM
Poway City Hall

Workshop Agenda

- **Presentation** (~30 minutes)
- **Questions & Answers** (~30 minutes)
- **Resource Fair** (~30 minutes)

Presentation Agenda

- Salt and Nutrient Management Plan
- Poway Valley Groundwater Basin – Data Collected
- Loading Analysis & Findings
- Management Strategies & Monitoring Program
- Conclusions & Next Steps

What is a Salt & Nutrient Management Plan (SNMP)?

- *Purpose*: To evaluate and manage overall groundwater quality and with respect to recycled water use
- *Who's Involved*:

Photo Credit: City of Poway

What is a Salt & Nutrient Management Plan (SNMP)?

- *Driver*: Issuance of a permit to deliver recycled water to customers in the Poway Business Park
  - Recycled water offsets use of potable (precious!) water for landscape irrigation
- *Regulations*: Mandated by the State of California's Recycled Water Policy (2009)
  - Recycled water contains salts and nutrients (as does all water)
  - Management goal is to protect the water quality of groundwater basins where recycled water is used

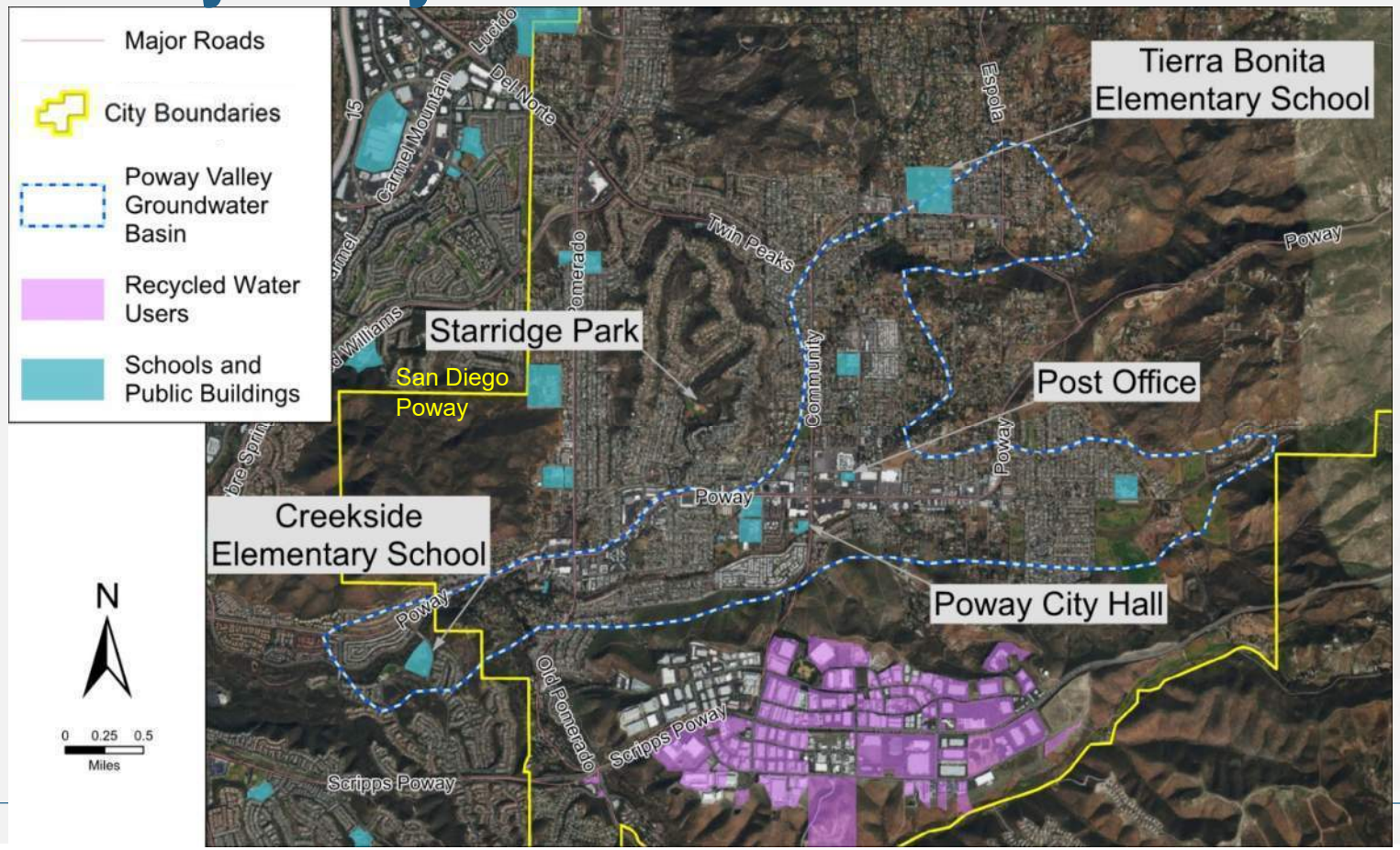
What's the Problem?

- Increasing salinity and nutrients in groundwater and other water supply sources statewide
- Salt removal is expensive
- Potential for health and environmental effects related to contaminants
- Sources include:
  - Recycled water
  - Animal waste
  - Septic tanks
  - Fertilizer
  - All irrigation uses

Why Participate in the SNMP?

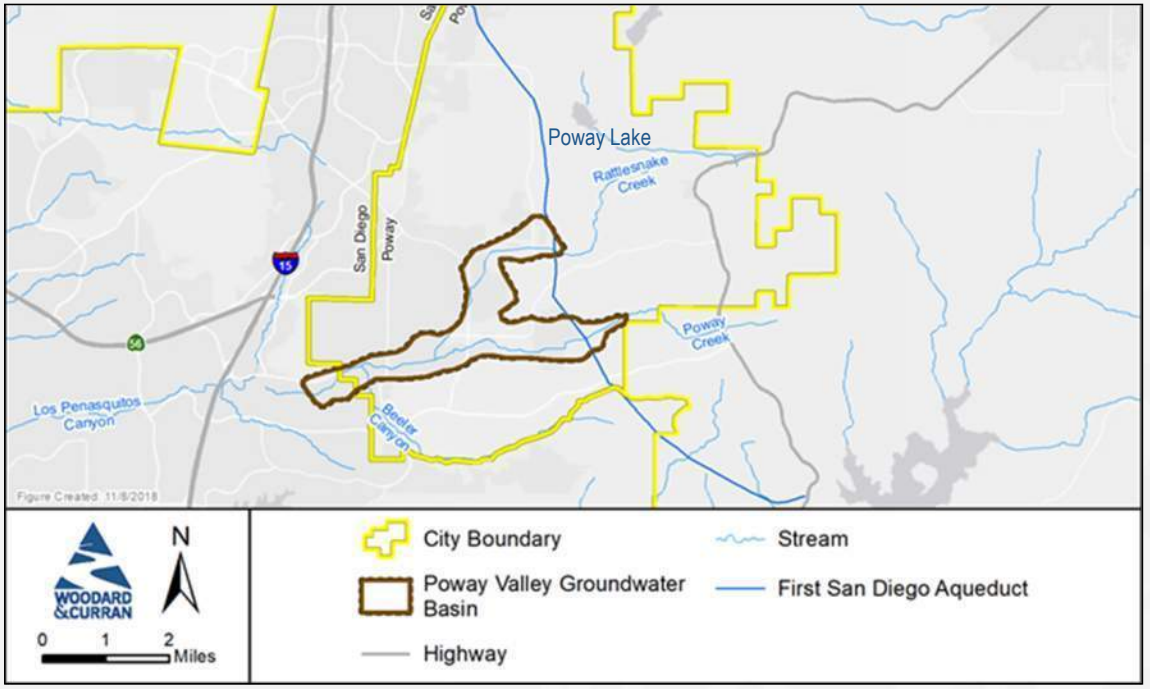
- Regulators are allowing stakeholder-driven SNMPs vs. establishing requirements on individual recycled water projects
- Participation ensures the SNMP reflects the local conditions and preferences
  - Offer groundwater quality data to help better understand basin
  - Offer feedback on basin management methods

Poway Valley Groundwater Basin



Poway Valley Groundwater Basin

- Estimated to have 8,500 acre-feet (AF) of storage capacity
- Water & Wastewater Service
  - City of Poway (92% of the basin)
  - City of San Diego (8% of the basin)



Where Does Poway Get its Water?

- City of Poway imports 99% of its drinking water from San Diego County Water Authority
  - Imports water from Northern California, Colorado River
  - Blend varies seasonally – recent increase in Colorado River water (increased total organic carbon)
- Recycled water is purchased from City of San Diego and delivered to Poway Business Park customers
- Local rainfall is captured by Lake Poway

What Was Analyzed in SNMP?

- Groundwater Basin Conditions
- Basin Plan Beneficial Uses & Water Quality Objectives
- Loading Analysis – Existing & Future Land Uses
- Antidegradation Findings
- Management Strategies
- Monitoring & Plan Implementation

Water Budget for Poway Valley Basin

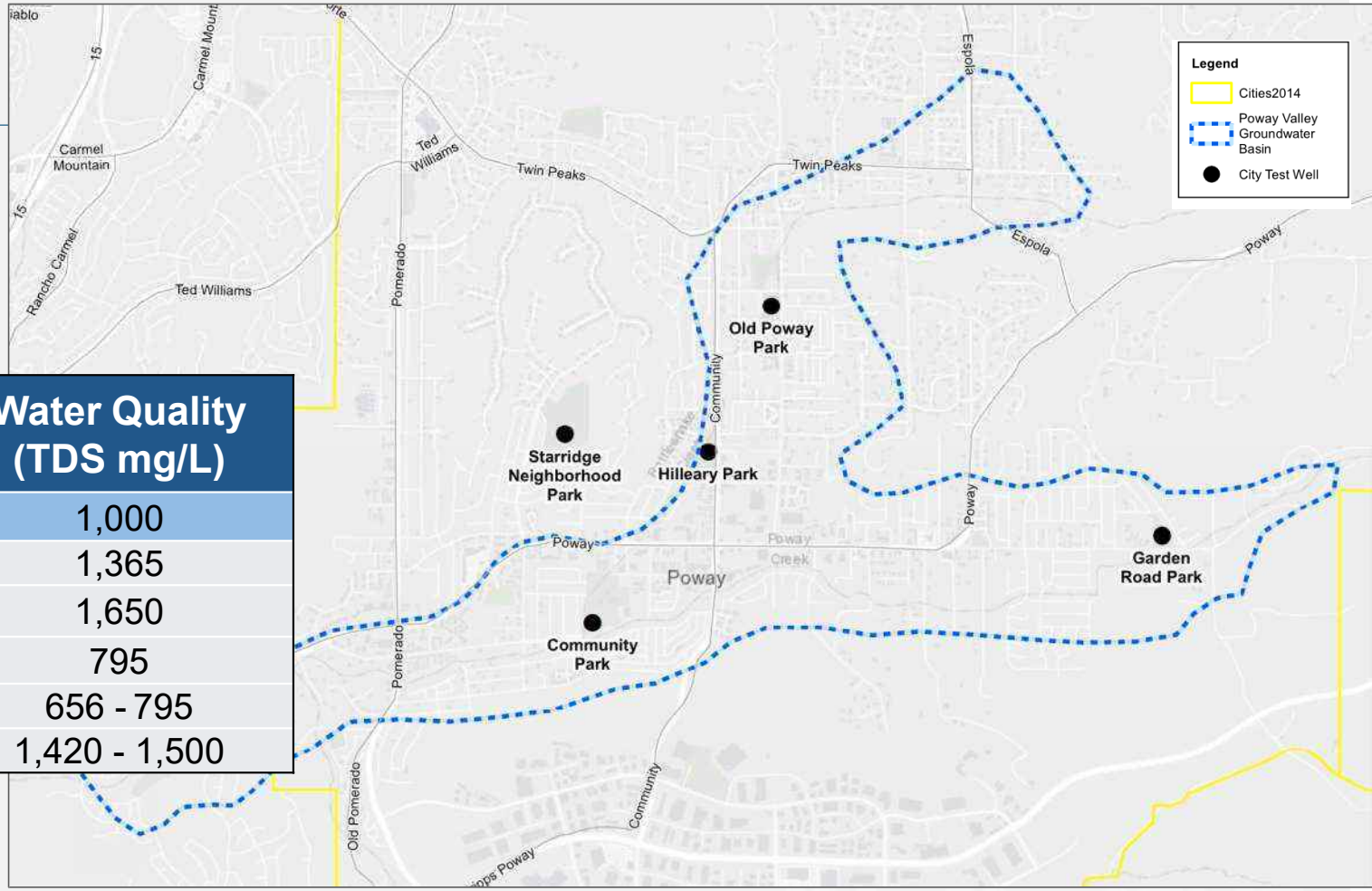
Water Budget Component	Estimated Volume (AF)
INFLOWS	
Natural recharge from rainfall	270
Recharge from irrigation water	450
Recharge from septic tank effluent	80
OUTFLOWS	
Groundwater pumping from private wells	90
Subsurface outflows and discharge to creeks	710
Change in groundwater storage	0

Note: Inflows and Outflows based on average long-term estimates and assumptions

City Test Wells

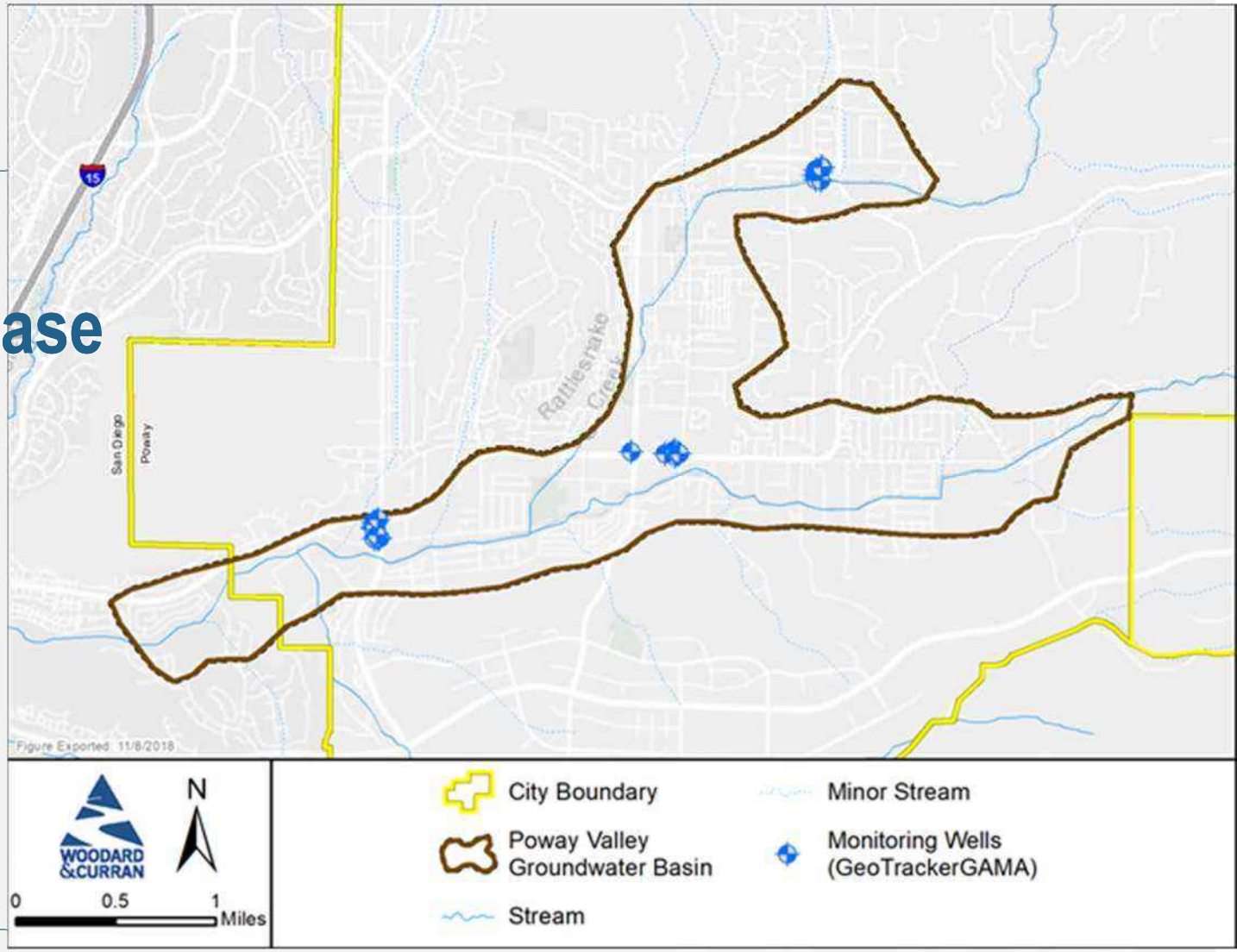
Location	Water Quality (TDS mg/L)
Regulatory Limit	1,000
Hilleary Park	1,365
Starridge Park	1,650
Old Poway Park	795
Garden Park	656 - 795
Community Park	1,420 - 1,500

Data from 1992



GeoTracker GAMA Database

Data from 2004 – 2013
<30 ft wells at cleanup sites



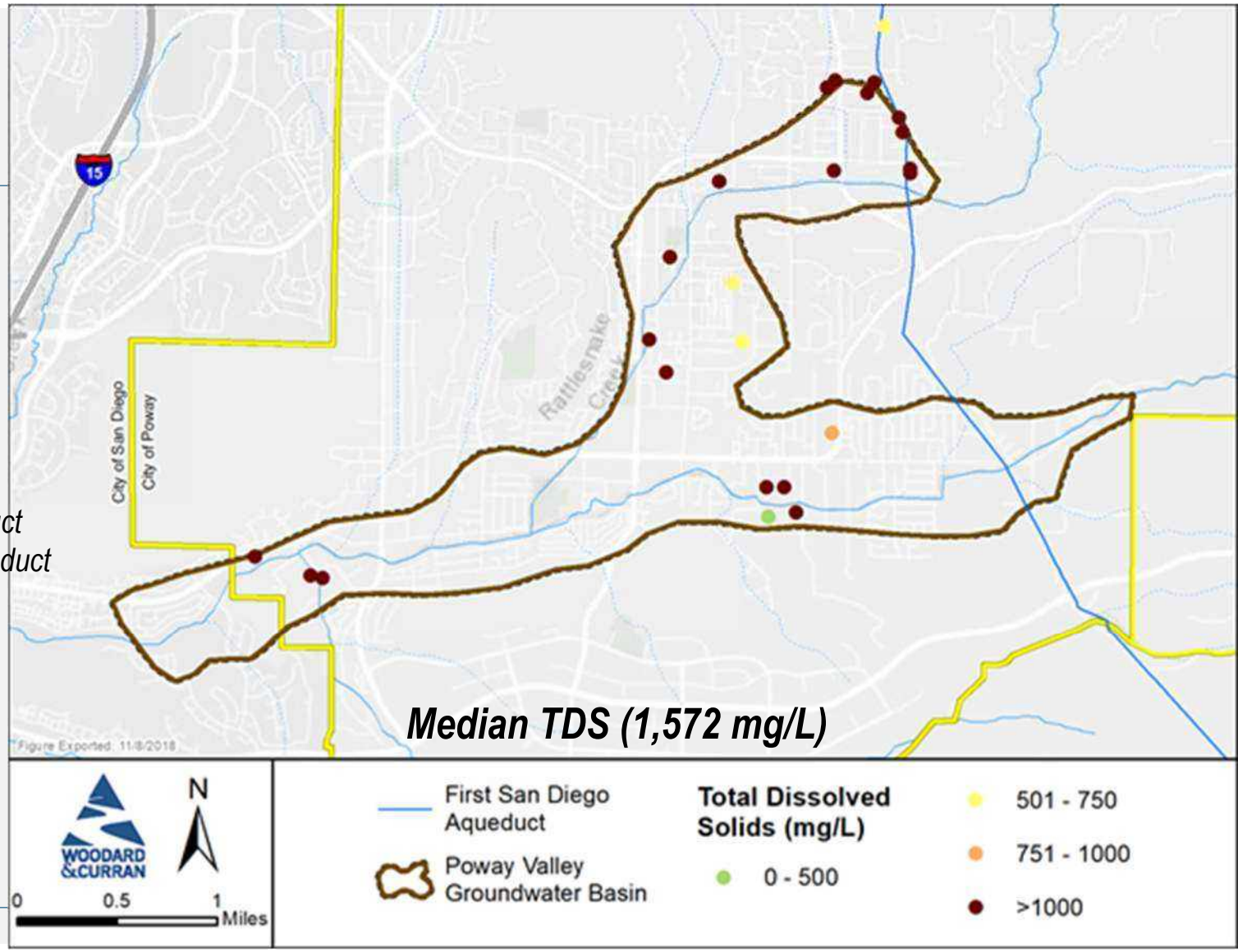
GeoTracker GAMA Database

- GeoTracker well data were excluded from this study for the following reasons:
  - Very shallow wells
  - Not representative of private well depths
  - Old data for former cleanup sites
- *Solution*: Implement the Well Sampling Program
  - Uses local irrigation wells
  - Creates representative, up-to-date data set

Private Wells

Data from 2018

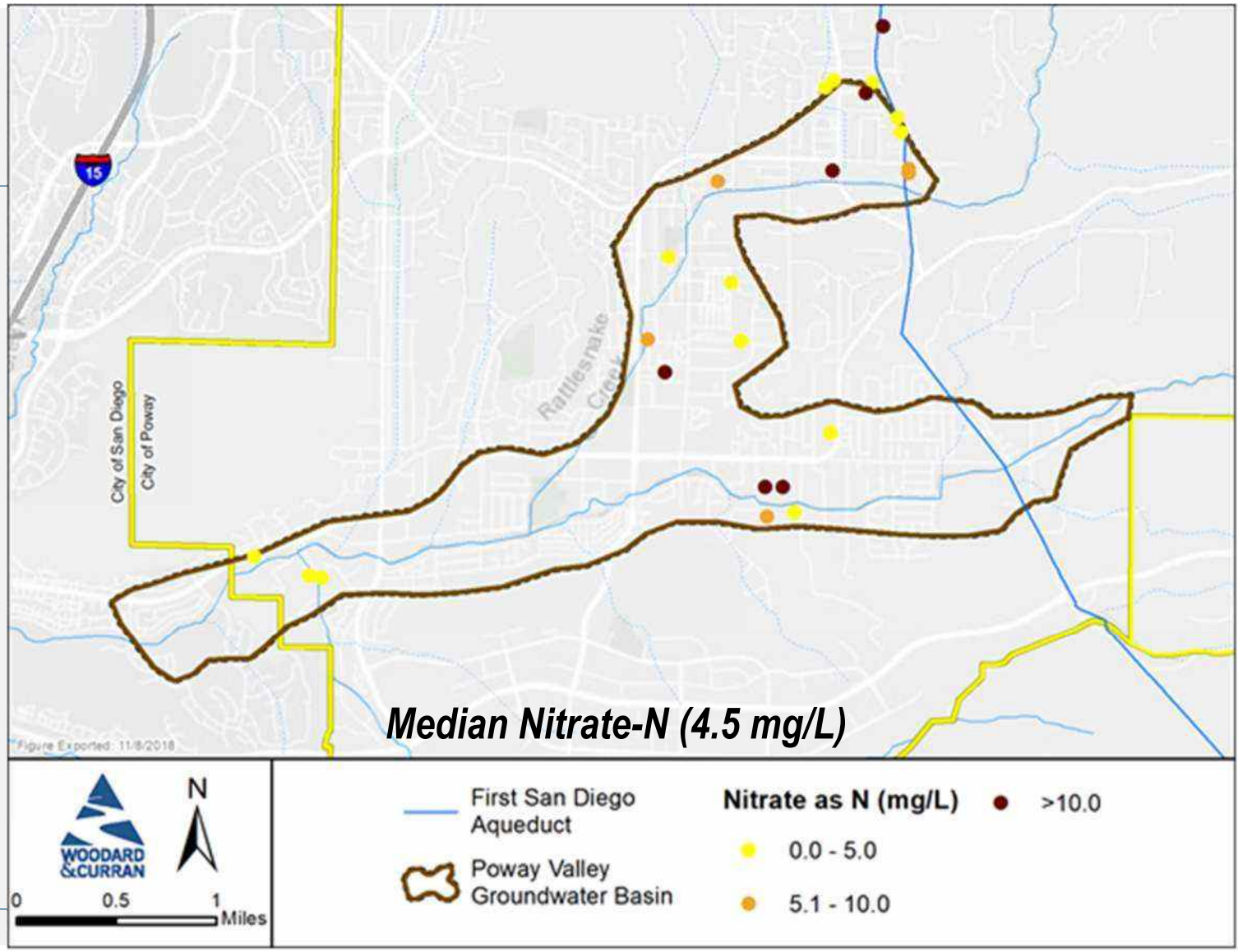
Basin Plan WQO:
750 mg/L East of Aqueduct
1,000 mg/L West of Aqueduct



Private Wells

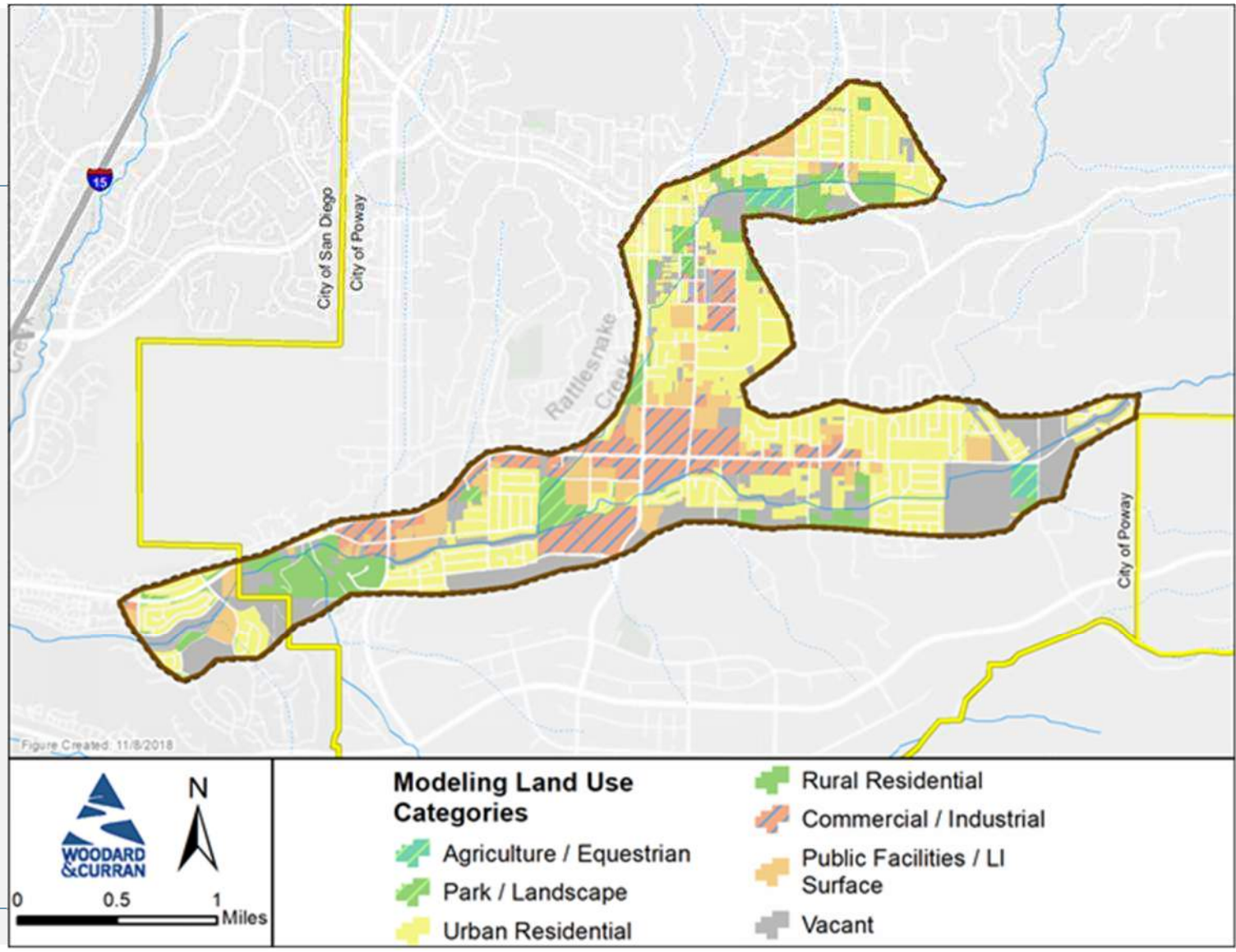
Data from 2018

Basin Plan WQO:
10 mg/L Basinwide



Loading Analysis

Future Conditions: Extension of Recycled Water to Poway Road



Water Quality Parameters for Loading Analysis

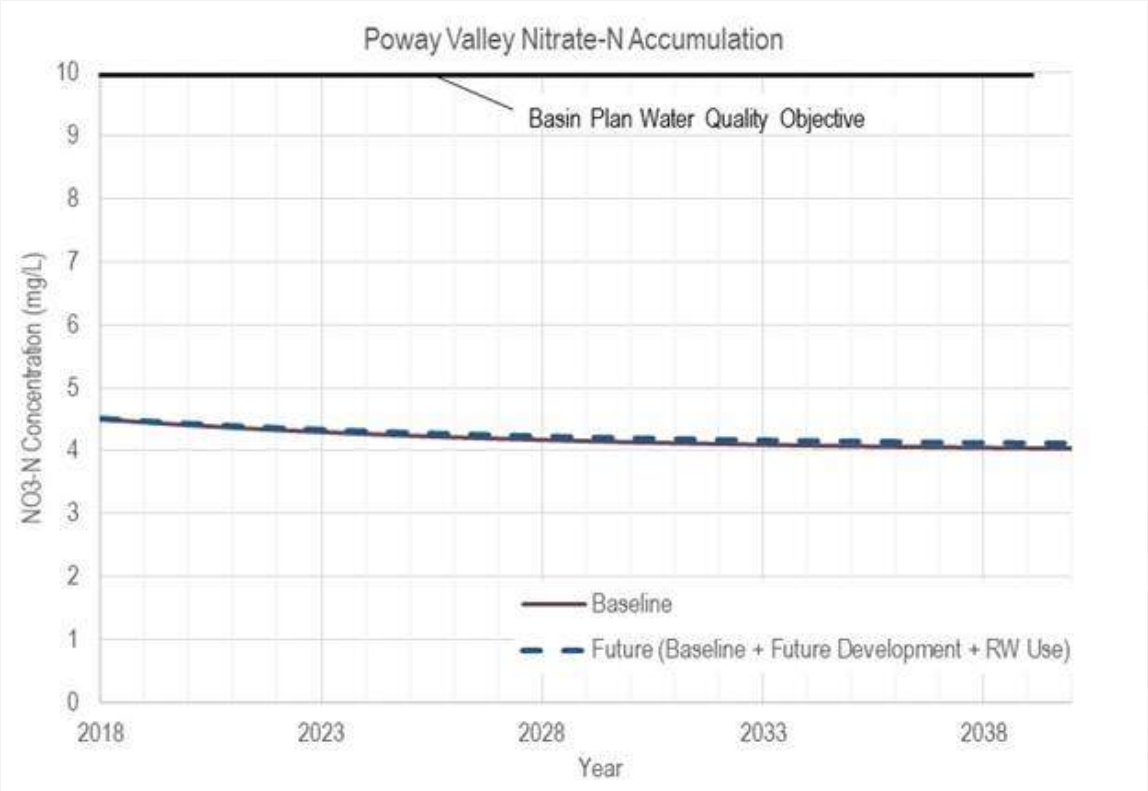
Source	TDS (mg/L)	Nitrate- N (mg/L)
City of Poway	594	0.4
City of San Diego	391	0.2
Groundwater – Private Wells	1,572	4.5
Recycled Water	1,200	12.2

Results of Loading Analysis

Land Use Category	Total Area (acres)	TDS (lbs/year)	% Total TDS Loading	Nitrogen (lbs/year)	% Total Nitrate-N Loading
Commercial & Industrial	322	217,000	7%	50	1%
Commercial & Industrial Low Impervious Surface	194	399,000	12%	140	2%
Urban Residential	860	1,250,000	38%	240	3%
Rural Residential	200	690,000	21%	780	9%
Urban Landscape (e.g. Park or Golf Course)	88	528,000	16%	380	5%
Vacant/Undeveloped	488	0	0%	0	0%
Septic	N/A	180,000	6%	6,800	81%
TOTAL	**2,152**	**3,264,000**		**8,390**	

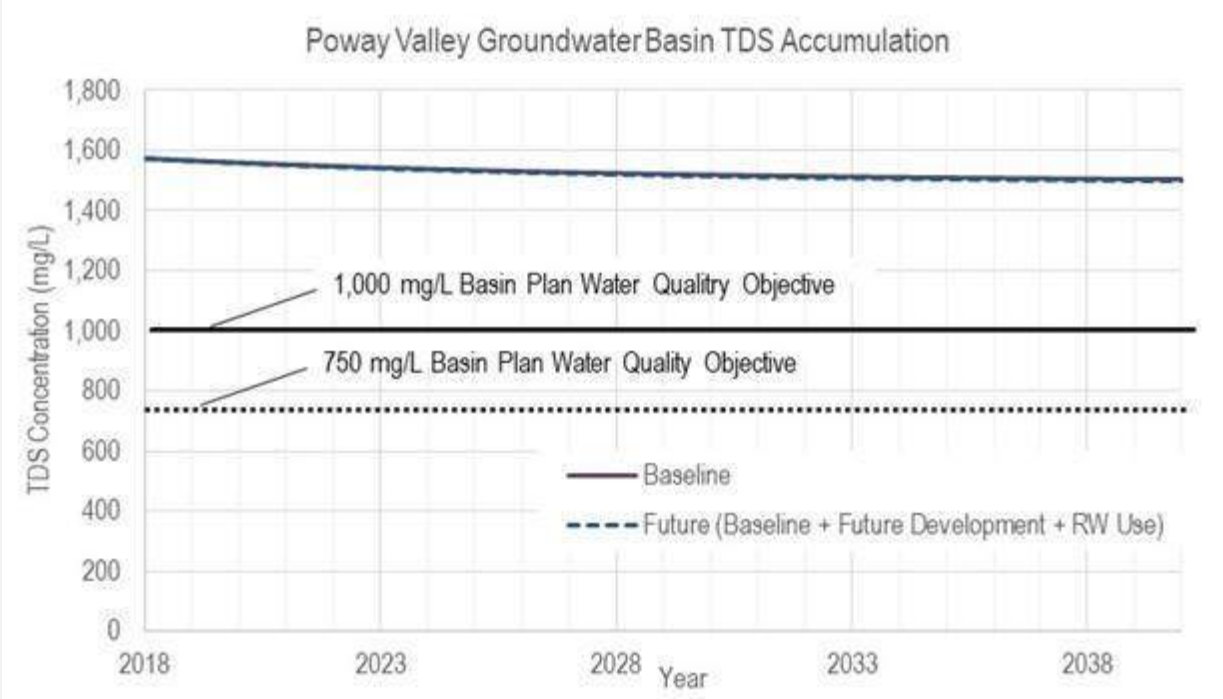
Antidegradation Findings – Nitrate-N

- Basin Ambient Condition = 4.5 mg/L
- Change in Concentration =
  - ⬇ 0.47 mg/L baseline
  - ⬇ 0.39 mg/L w/future development



Antidegradation Findings – TDS

- Basin Ambient Condition = 1,572 mg/L
- Change in Concentration =
  - ⬇ 67 mg/L baseline
  - ⬇ 72 mg/L w/future development



Management Strategies

City of Poway Best Practices

- Stormwater MS4 permit program
- Recycled water landscape Best Management Practices (BMPs)
- Conservation measures (+rebates, classes)
- Wastewater Fat, Oil & Grease (FOG) program
- Sewer overflow prevention

Management Strategies, cont.

Future Management Actions

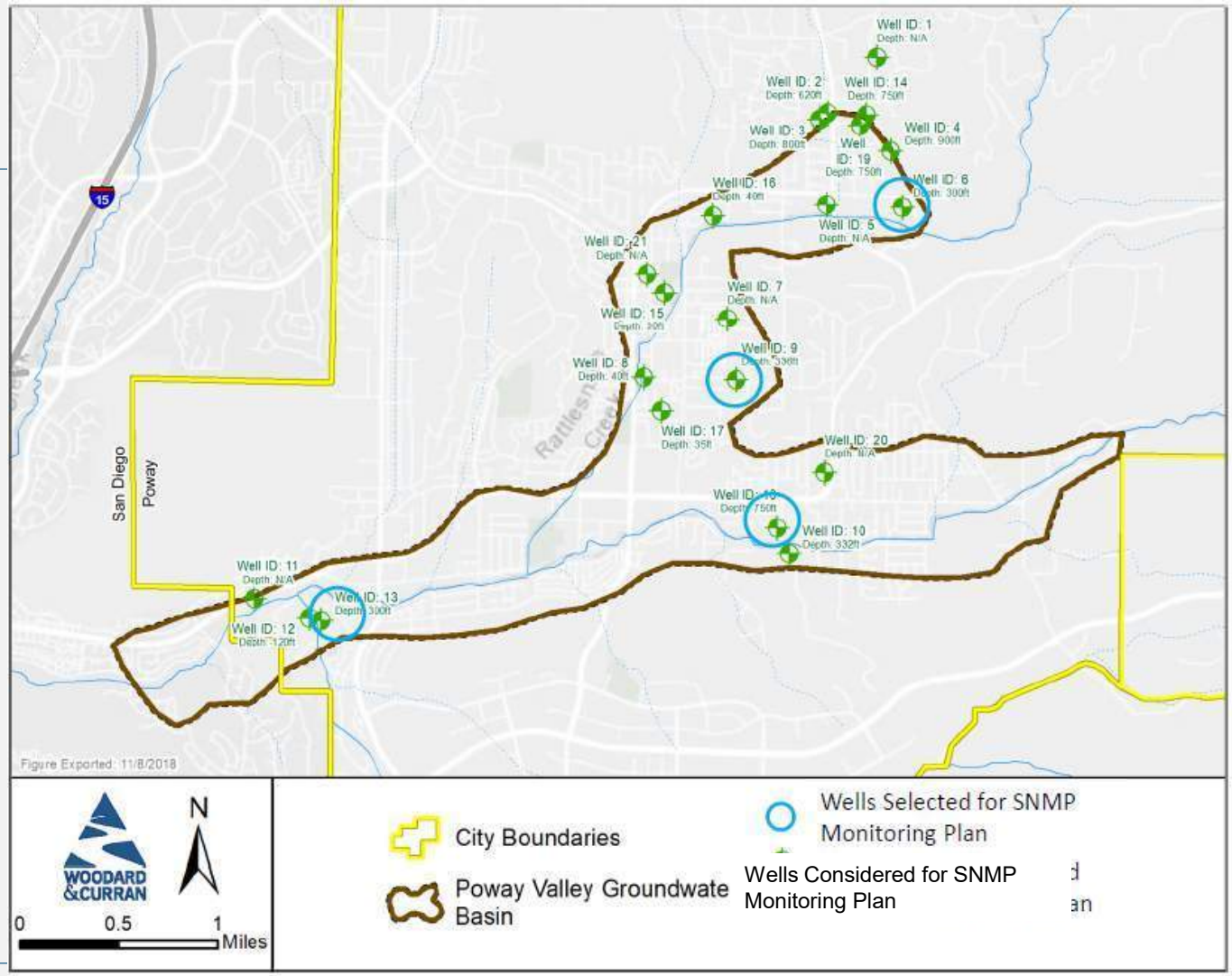
- Improved recycled water quality – from City of San Diego Pure Water and Carlsbad Desalination Project
- Update Recycled Water Users Manual
- Replace older potable water meters

Ways to Get Involved

- Provide feedback on basin management strategies at tonight's workshop
- Participate in our Well Sampling Program
  - 4 wells in our proposed monitoring program; tracking additional well options
- Sign up for our mailing list!

Proposed Monitoring Network

- Electrical conductivity (EC)
- pH
- Temperature
- TDS
- Nitrate-N



SNMP Conclusions

- Existing groundwater quality does not meet the present-day Basin Plan TDS objectives
- Existing strategies (BMPs) are in place to minimize salt loads
- Basin TDS concentrations are projected to be stable (even decline a bit) under projected loading
- Existing quality of water continues to support existing beneficial uses, and this is not projected to change

SNMP Conclusions, cont.

- Recycled water is projected to be a relatively minor component of the overall salt balance
  - Existing conditions are projected to continue with/without it
- No feasible or practical strategy (e.g. groundwater recharge/recovery) exists to meet existing groundwater quality Basin Plan TDS objectives

Next Steps

- Regional Water Quality Control Board (RWQCB) has several options for proceeding:
  1. Modify the Basin Plan to reflect existing and projected groundwater conditions
  2. Keep existing Basin Plan objectives, but allow existing and proposed recycled water use to continue if it maintains existing conditions and beneficial uses
  3. Prohibit the use of recycled water within the basin

Resource Fair

- SNMP General Resources
  - Jessica Parks & Rudy Guzman, City of Poway
  - Sandra Carlson, City of San Diego
  - Rosalyn Prickett, Woodard & Curran

Thank You

City of Poway	City of San Diego	Woodard & Curran
Rudy Guzman	Sandra Carlson	Rosalyn Prickett
rguzman@poway.org	SCarlson@sandiego.gov	rprickett@woodardcurran.com

APPENDIX B: SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD COORDINATION

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San Diego Regional Water Quality Control Board

August 16, 2017

Mr. Rudy Guzman
Assistant Director of Public Works
City of Poway
P.O Box 789
Poway, CA 92074-0789

In reply refer to / attn:
264877:oosibodu

Subject: Salt and Nutrient Management Plan for the Poway Groundwater Basin

Mr. Guzman:

In a letter dated June 8, 2017, the City of Poway (City) requested that the California Regional Water Quality Control Board, San Diego (San Diego Water Board) reassign the Poway Groundwater Basin from Tier B to Tier C per the *Guidelines for Salinity/ Nutrient Management in the San Diego Region 9* (Guidelines).[1] This change will enable the City to develop a salt and nutrient management plan (SNMP) for the basin in accordance with Tier C criteria.

Although Table 3-4 of the Guidelines assigns the Poway Groundwater Basin to Tier B, utilizing the Tier C criteria for preparing the SNMP for the basin is appropriate for the following reasons:

1. Table 3-3 of the Guidelines describe Tier C basins as small, shallow groundwater aquifers of capacities of less than 20,000 acre-feet (AF) in unconsolidated sediments within urbanized or agricultural areas of the Metropolitan Water District of Southern California (MWDSC) service area. The Poway Groundwater Basin is within the MWDSC service area, and the Department of Water Resources estimates the storage capacity of the basin to be less than 2,300 AF.[2]

2. Table 3-3 of the Guidelines specify that the groundwater quality objectives for total dissolved solids (TDS) for Tier C basins range from 500 to 1,100 milligrams per liter (mg/L). The TDS groundwater quality objectives for hydrologic areas in the Poway Groundwater Basin are 750 or 1,000 mg/L.

[1] *Guidelines for Salinity/Nutrient Management Planning (2010)* https://www.sdcwa.org/sites/default/files/files/water-management/recycled/salinity_management_guidelines.pdf

[2] *Groundwater Basins in California*. Department of Water Resources Bulletin 118

3. The Guidelines describe Tier C basins as basins with small groundwater production compared to overall water use. The majority of the water supply wells in the Poway Groundwater Basin are private wells. The main water supply source in the basin is imported water provided by the City.

4. Few studies have been done to characterize the hydrogeology and groundwater quality of the Poway Groundwater Basin as is the case with majority of the Tier C basins, due in part to the smaller yields typically associated with Tier C basins.

The Guidelines, prepared by the Southern California Salinity Coalition and the San Diego County Water Authority, need not be revised in order for the City to utilize the Tier C criteria to prepare the SNMP for the Poway Groundwater Basin. Thank you for the City's ongoing salt and nutrient management planning efforts.

In the subject line of any response, please include the reference code **264877:oosibodu**. Please contact Mr. Fisayo Osibodu at 619-521-8036, or at Olufisayo.Osibodu@waterboards.ca.gov if you have any questions or comments.

Sincerely,

Julie Chan

Julie Chan, P.G.
Chief, Site Restoration and Groundwater Protection Branch

JAC: jro:oo

cc (via email): Mr. Alex Heide, City of Poway, AHeide@poway.org

Subject: RE: City of Poway Salt and Nutrient Management Plan

From: Odermatt, John@Waterboards <John.Odermatt@waterboards.ca.gov>
Sent: Thursday, September 13, 2018 10:39 AM
To: Alexander Heide <AHeide@poway.org>
Cc: Osibodu, Olufisayo@Waterboards <Olufisayo.Osibodu@waterboards.ca.gov>
Subject: City of Poway Salt and Nutrient Management Plan

Mr. Heide,
Thank to you and your staff for meeting with Fisayo to discuss your developing Salt and Nutrient Management Plant (SNMP) on August 20, 2018. We understand the following information from that discussion:

1. The City hired Woodward & Curan to develop its SNMP.

2. The City gathered total dissolved solids (TDS) and nitrate data from existing private wells in the Poway groundwater basin. Most of the wells used are private irrigation wells.

3. Groundwater data shows there is no assimilative capacity in the basin for TDS. Average concentration of TDS in groundwater was 1,584 milligrams per liter (mg/L) which exceeds the TDS water quality objective of 750 mg/L for the Poway Hydrologic Area.

4. Assimilative capacity exists for nitrate. The average concentration of nitrate in groundwater is 8.53 mg/L as N, which is below the nitrate groundwater quality objective of 10 mg/L as N.

5. Total potable water demand within the City is 10,000 acre-feet (ac-ft). The City only uses about 450 ac-ft of recycled water each year, so recycled water makes up a small percentage of the City's water supply portfolio. The City has requested an additional 200 ac-ft of recycled water from the City of San Diego.

6. The City isn't proposing any management strategies to reduce overall salt and nitrogen loadings in the basin since recycled water use makes up a small percentage of salt and nutrient loading within the basin. Best management practices to ensure water conservation and proper application of recycled water may be proposed in the SNMP.

7. Nitrate loads may be predominantly from animal operations.

8. Implementation of the City of San Diego's Pure Water Project may improve quality of recycled water supplied to the City of Poway by the City of San Diego. The Carlsbad Desalination Project may also improve quality of the City's potable water.

9. The City submitted a letter dated September 6, 2017 requesting extension of the deadline for submitting its SNMP from August 14, 2018 to December 14, 2018. The City plans to submit its SNMP to the San Diego Water Board by December 14, 2018.

10. The City requested input from the San Diego Water Board on its approach for completing its SNMP since it isn't proposing to include management measures in its SNMPs that will improve water quality.

San Diego Water Board Staff Response

San Diego Water Board staff provides the following recommendations regarding the City's development of their SNMP for the Poway basin:

1. The City should submit the SNMP to the San Diego Water Board by December 14, 2018, as proposed in its September 6, 2017 letter.

2. The City must ensure its SNMP contains all applicable required components of an SNMP outlined in the State Recycled Water Policy.[1] If any of the required components are not included in the City's SNMP, the SNMP must include a written rationale justifying the omission of any required components from the SNMP. The City's SNMP may be developed to be consistent with the suggested approach for developing SNMPs for Tier C basins outlined in Section 5 of SNMP Guidelines for the San Diego Region (9).[2]

3. The SNMP must identify and quantify all sources of salts and nutrients in the Poway basin. If implementation measures are omitted from the SNMP, the narrative explanation must include sufficient information to demonstrate that measures to improve quality of recycled water (such as additional treatment) will only result in only minimal if any improvements in the groundwater quality of the basin.

4. The SNMP should identify any best management practices, irrigation practices, and water conservation measures that it will implement to ensure recycled water is used in a sustainable manner that adequately protects water quality.

5. The SNMP should quantify improvements in recycled water quality that it anticipates will be realized from implementation of the City of San Diego's Pure Water Project and improvements in recycled water quality and quality from a potable water supply that may be realized from receiving potable water from the Carlsbad Desalination Project.

6. The SNMP must include a proposed groundwater monitoring and reporting program, as required by Section 6.b.3(a) of the Recycled Water Policy. The City's proposed monitoring and reporting program will be reviewed by the San Diego Water Board. At a minimum, the City's groundwater monitoring program shall include a proposed suite of monitoring parameters for salt and nutrient constituents, a proposed method of evaluation of concentration trends, and a specific schedule for annual monitoring and reporting of results to the San Diego Water Board. The initial five years of the monitoring results shall be reported to the San Diego Water Board no less frequently than annually but the San Diego Water Board may consider a proposed alternative to that annual monitoring schedule after the initial five-year period is completed.

Footnotes:

[1]See pages 7 and 8 of the State Recycled Water Policy:
https://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/rwp_revtoc.pdf

[2]The SNMP Guidelines for the San Diego Region are available online at:
https://www.waterboards.ca.gov/sandiego/board_info/agendas/2010/oct/item6/Item6_Doc2.pdf

I will contact you after we are able to hire replacement staff and I can assign this project to another staff person. In the meantime, please let me know if you have any questions concerning the staff recommendations above. Thanks! John

Regards,

John R. Odermatt, M.Sc., PG, Senior Engineering Geologist
California Regional Water Quality Control Board - San Diego Region
2375 Northside Drive, Suite 100,
San Diego, CA 92108-2700
OFFICE TEL: 619-521-5906
GENERAL OFFICE TEL: 619-516-1990

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RWQCB WEB PAGES:
Drought/Water Conservation information: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/emergency_regulation.shtml

San Diego Water Board Home Webpage: www.waterboards.ca.gov/sandiego

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD

[1] See pages 7 and 8 of the Sate Recycled Water Policy: https://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/rwp_revtoc.pdf

[2] The SNMP Guidelines for the San Diego Region are available online at: https://www.waterboards.ca.gov/sandiego/board_info/agendas/2010/oct/item6/Item6_Doc2.pdf

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APPENDIX C: RESOLUTION NO. 18-070 CITY COUNCIL OF THE CITY OF POWAY, CALIFORNIA, ADOPTING THE CITY OF POWAY'S SALT AND NUTRIENT MANAGEMENT PLAN

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RESOLUTION NO. 18-070

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF POWAY, CALIFORNIA, ADOPTING THE CITY OF POWAY'S SALT AND NUTRIENT MANAGEMENT PLAN

WHEREAS, the California State Water Resources Control Board adopted a Recycled Water Policy in May 2009, requiring water and wastewater agencies develop plans to manage salts, nutrients, and other significant chemical compounds in every groundwater basin or sub-basin in the State;

WHEREAS, the City of Poway is both a water and wastewater agency, and a recycled water provider, and the majority of the Poway Valley Groundwater Basin is located within the City of Poway;

WHEREAS, the City of Poway, being desirous of ensuring the protection of groundwater in the Poway Valley Groundwater Basin, elected to take the lead agency role in preparing the SNMP;

WHEREAS, the infiltration of salts and nutrients into the groundwater basin from recycled water and other sources of water must be managed to protect the water quality of the state's groundwater basins;

WHEREAS, the City of Poway has developed a Salt and Nutrient Management Plan to meet the State Water Resources Control Board Recycled Water Policy;

WHEREAS, the City of Poway has prepared and made available for review and comment, a Salt and Nutrient Management Plan, as on file at the City Clerk's Office, and on the City's website;

WHEREAS, the City of Poway has developed an annual groundwater monitoring program to monitor the salts and nutrients within the Poway Groundwater Basin;

WHEREAS, the Salt and Nutrient Management Plan be periodically reviewed at least once every five years; and

WHEREAS, the Salt and Nutrient Management Plan must be filed with the State Water Resources Control Board by December 14, 2018.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Poway as follows:

Section 1: The City of Poway's Salt and Nutrient Management Plan is hereby approved and adopted.

Section 2: The City staff is hereby authorized and directed to file the Salt and Nutrient Management Plan with the State Water Resources Control Board by December 14, 2018.

Section 3: The City Manager is hereby authorized and directed to implement the Poway Groundwater Basin monitoring programs as set forth in the Salt and Nutrient Management Plan, which includes the monitoring of wells within the Poway Groundwater Basin.

PASSED, ADOPTED AND APPROVED by the City Council of the City of Poway, California, at a regular meeting this 4th day of December 2018.

Steve Vaus, Mayor

ATTEST:

Nancy Neufeld, City Clerk

STATE OF CALIFORNIA)
) SS
COUNTY OF SAN DIEGO)

I, Nancy Neufeld, City Clerk of the City of Poway, California, do hereby certify under penalty of perjury that the foregoing Resolution No. 18-070 was duly adopted by the City Council at a meeting of said City Council held on the 4th day of December 2018, and that it was so adopted by the following vote:

AYES:	LEONARD, FRANK, GROSCH, MULLIN, VAUS
NOES:	NONE
ABSENT:	NONE
DISQUALIFIED:	NONE

Nancy Neufeld, City Clerk
City of Poway