Carpinteria Groundwater Sustainability Agency

Carpinteria Groundwater Basin Water Years 2021–2023 Annual Report

April 1, 2024

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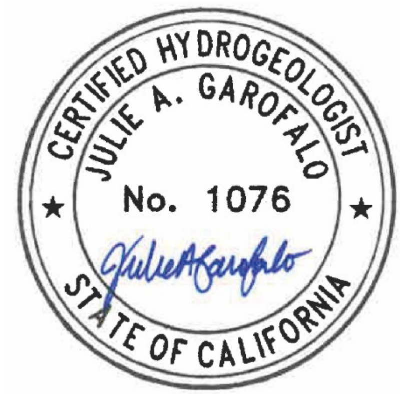
Carpinteria Groundwater Basin
Water Years 2021–2023 Annual Report

This report was prepared by the staff of GSI Water Solutions, Inc., under the supervision of the professionals whose signatures appear below. The findings or professional opinion were prepared in accordance with generally accepted professional engineering and geologic practice.



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Contents

Tables

Figures

Appendices

Abbreviations and Acronyms

AF	acre-feet
AFY	acre-feet per year
amsl	above mean sea level
APN	Assessor Parcel Number
Basin	Carpinteria Groundwater Basin
bmsl	below mean sea level
CAPP	Carpinteria Advanced Purification Project
CGSA	Carpinteria Groundwater Sustainability Agency
CIMIS	California Irrigation Management Information System
COC	constituent of concern
CVWD	Carpinteria Valley Water District
DWR	California Department of Water Resources
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IM	interim milestone
InSAR	Interferometric Synthetic Aperture Radar
mg/L	milligrams per liter
MO	measurable objective
MT	minimum threshold
RMS	representative monitoring site
SBCFCD	Santa Barbara County Flood Control District
SGMA	Sustainable Groundwater Management Act
SMCL	secondary maximum contaminant level
SU-1	Storage Unit No. 1
SU-2	Stroage Unit No. 2
SYID #1	Santa Ynez Improvement District No. 1
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
WY	water year

Annual Report Elements Guide and Checklist

California Code of Regulations – GSP Regulation Sections	Annual Report Elements	Location in Annual Report
Article 7	Annual Reports and Periodic Evaluations by the Agency	
§ 356.2	Annual Reports	
	Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:	
	(a) General information, including an executive summary and a location map depicting the basin covered by the report.	Executive Summary (§356.2[a])
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:	Section 2.4 Monitoring Networks (§356.2[b])
	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:	Section 3 Groundwater Elevations (§356.2[b][1])
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.	Section 3.2 Seasonal High and Low (Spring and Fall) (§356.2[b][1][A])
	(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.	Section 3.3 Hydrographs (§356.2[b][1][B], and Appendix D)
	(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.	Section 4 Groundwater Extractions (§356.2[b][2])
	(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.	Section 5 Surface Water Use (§356.2[b][3])

California Code of Regulations – GSP Regulation Sections	Annual Report Elements	Location in Annual Report
Article 7	Annual Reports and Periodic Evaluations by the Agency	
§ 356.2	Annual Reports	
	(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.	Section 6 Total Water Use (§356.2[b][4])
	(5) Change in groundwater in storage shall include the following:	Section 7 Change in Groundwater in Storage (§356.2[b][5])
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	Section 7.1 Annual Changes in Groundwater Elevation (§356.2[b][5][A])
	(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available.	Section 7.2 Annual and Cumulative Change in Groundwater in Storage Calculations (§356.2[b][5][B])
	(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.	Section 9 Progress towards Basin Sustainability (§356.2[c])

Executive Summary (§ 356.2[a])

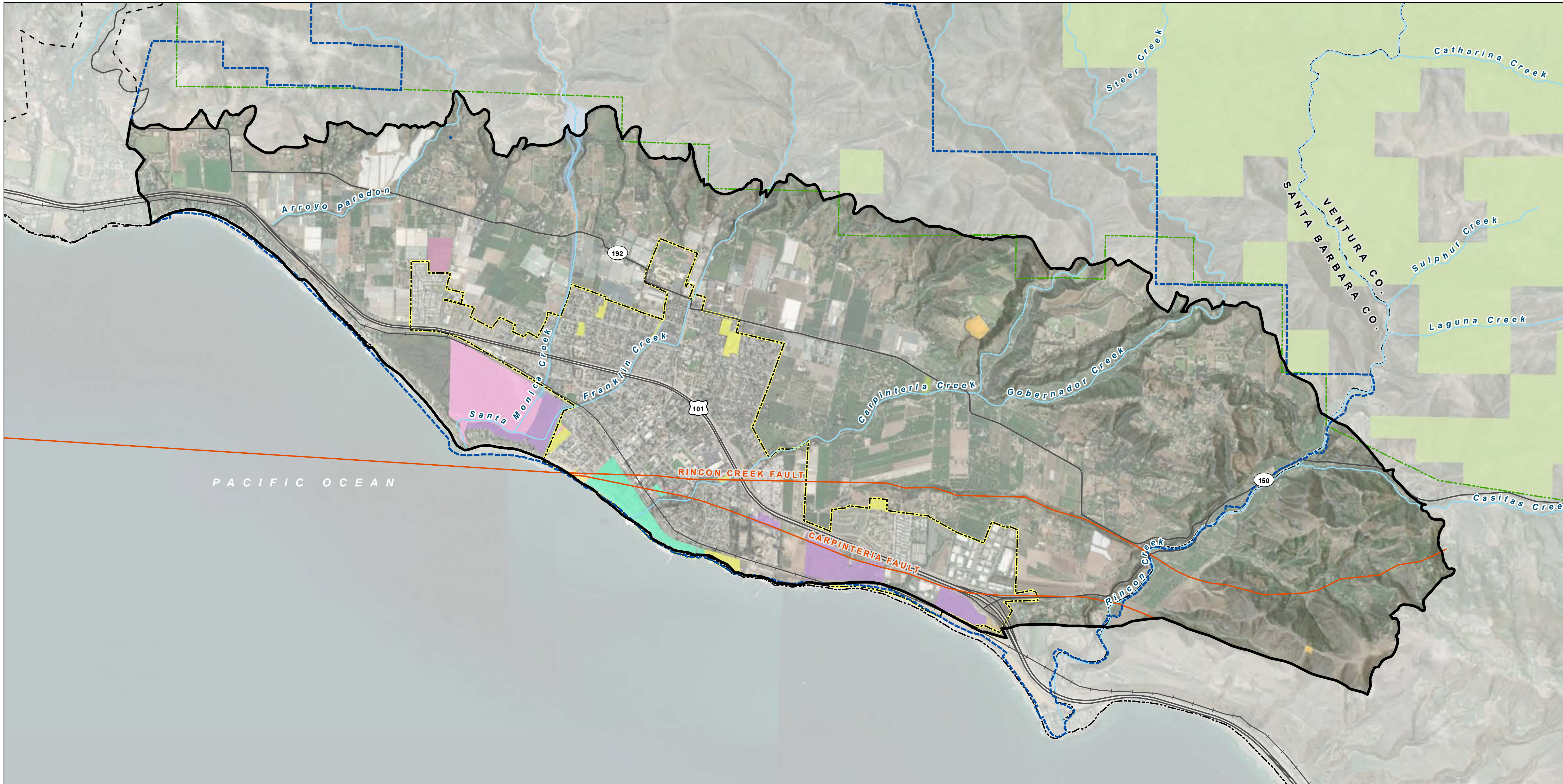
Introduction

This Carpinteria Groundwater Basin (Basin) Water Years (WYs) 2021–2023 Annual Report has been prepared in accordance with the Sustainable Groundwater Management Act (SGMA) regulations for Groundwater Sustainability Plans (GSPs). Pursuant to the SGMA regulations, a GSP Annual Report must be submitted to the California Department of Water Resources (DWR) by April 1 of each year following the adoption of the GSP.

The Basin (see Figure ES-1) was originally designated as a low-priority basin by DWR. In 2019, DWR conducted a basin reprioritization process that reclassified the Basin as a high-priority basin, resulting in the preparation of a GSP pursuant to Section 10720, et. seq., of the State Water Code as required by SGMA. With the adoption and submittal of the Basin GSP (CGSA, 2023) on January 24, 2024, the Carpinteria Groundwater Sustainability Agency (CGSA) is required to submit an annual report for the preceding water year (October 1 through September 30) to DWR by April 1 of each subsequent year. These annual reports will convey monitoring and water use data to the DWR and to Basin stakeholders on an annual basis to gauge performance of the Basin relative to the sustainability goals set forth in the GSP.

Sections of this Carpinteria Groundwater Basin WYs 2021–2023 Annual Report include the following:

- **Section 1. Introduction**: A brief background of the formation and activities of the CGSA and development and submittal of the GSP.
- **Section 2. Basin Setting and Monitoring Networks**: A summary of the Basin setting, Basin monitoring networks, and ways in which data are used for groundwater management.
- **Section 3. Groundwater Elevations (§356.2[b][1])**: A description of recent monitoring data with groundwater elevation contour maps for spring and fall monitoring events and representative hydrographs.
- **Section 4. Groundwater Extractions (§356.2[b][2])**: A compilation of metered and estimated groundwater extractions by land use sector and location of extractions.
- **Section 5. Surface Water Use (§356.2[b][3])**: A summary of reported surface water use.
- **Section 6. Total Water Use (§356.2[b][4])**: A presentation of total water use by source and sector.
- **Section 7. Change in Groundwater in Storage (§356.2[b][5])**: A description of the methodology and presentation of changes in groundwater in storage based on fall to fall groundwater elevation differences.
- **Section 8. Water Quality and Land Subsidence:** A summary of water quality data for the monitoring network wells and assessment of land subsidence Interferometric Synthetic Aperture Radar (InSAR) data reported by DWR.
- **Section 9. Progress towards Basin Sustainability (§356.2[c])**: A summary of management actions taken throughout the CGSA and individual entities towards sustainability of the Basin.



LEGEND

- Carpinteria Groundwater Basin
- Montecito Groundwater Basin
- Carpinteria Valley Water District Service Area
- Los Padres National Forest

Land Ownership

- Bureau of Reclamation
- California Department of Parks and Recreation
- California State Lands Commission
- Carpinteria Cemetery District
- Carpinteria, City of
- Land Trust for Santa Barbara County
- Santa Barbara Flood Control and Water Conserv. District
- Santa Barbara, County of
- USDA Forest Service
- University of California

All Other Features

- City Boundary
- County Boundary
- Fault
- Railroad
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

FIGURE ES-1

Carpinteria Groundwater Basin Plan Area and Jurisdictional Areas

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

CARPINTERIA GSA GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

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Groundwater Elevations

Groundwater elevations observed in the Basin during WY 2023 are generally higher than WYs 2021 and 2022 across a majority of the Basin due to above-average rainfall conditions during the winter of 2023. Positive and negative changes in groundwater elevations from year to year are observed in various parts of the Basin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels are observed annually.

Groundwater Extractions

Total groundwater extractions in the Basin for WY 2023 are estimated to be 4,301 acre-feet (AF), compared to groundwater extractions exceeding 5,800 AF for the two previous water years due to drought conditions. These totals include municipal public water system[1] pumping and private pumping (industrial and irrigated agricultural water demand). Table ES-1 summarizes the groundwater extractions by water use sector for each water year.

Table ES-1. Estimated Groundwater Extractions, Water Years 2020–2023

Water Year	Water Year Type	CVWD	Private Rural and Agricultural	Total (AF)
2020	Below Normal	888	4,437	5,325
2021	Critical	766	5,074	5,840
2022	Critical	2,117	4,811	6,928
2023	Wet	970	3,331	4,301
	Method of Measure:	Metered	Estimated by Land Use	—
	Level of Accuracy:	High	Medium	—

Notes

— = not applicable

AF = acre-feet

CVWD = Carpinteria Valley Water District

[1] A public water system is defined as a system that provides water for human consumption to 15 or more connections or regularly serves 25 or more people daily for at least 60 days out of the year (https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/waterpartnerships/what_is_a_public_water_sys.pdf).

Surface Water Use

The Basin currently benefits from surface water entitlements from the Cachuma Project and the State Water Project (SWP) to supplement municipal groundwater demands as well as irrigated agricultural demands in the Basin. The Carpinteria Valley Water District (CVWD) participates regularly in a SWP exchange program with the Santa Ynez Improvement District No. 1 (SYID #1), located downstream of Lake Cachuma. Under this exchange program, CVWD purchases SWP water and supplies it to SYID #1 for its use. In exchange, SYID #1 supplies an equal amount of Lake Cachuma water to CVWD. The volumes of surface water sources available for delivery to the Basin are heavily dependent on climatic conditions during any given water year. A summary of total actual surface water use by source for WYs 2021 through 2023 is provided in Table ES-2.

Table ES-2. Total Imported Surface Water Use by Source

Water Year	Water Year Type	Cachuma Project (AF)	State Water Project (AF)	SYID #1 Exchange (AF)	Total Surface Water Use (AF)
2020	Below Normal	3,077	0	279	**3,356**
2021	Critical	3,308	512	231	**4,051**
2022	Critical	895	1,397	93	**2,385**
2023	Wet	2,229	0	99	**2,328**

Notes

AF = acre-feet

SYID #1 = Santa Ynez Improvement District No. 1

Total Water Use

For WYs 2021 through 2023, quantification of total water use was completed through reporting of metered groundwater production data from CVWD (see Section 5), from metered surface water use, and from models used to estimate irrigated agricultural crop water supply requirements based on land uses and metered data. Table ES-3 summarizes the total annual water use in the Basin by source and water use sector.

Table ES-3. Total Water Use in the Basin by Source and Water Use Sector

Water Year	CVWD (AF)		Private Rural and Agricultural (AF)	Total (AF)
Source:	**Groundwater**	**Surface Water[1]**	**Groundwater**	**—**
2021	766	4,051	5,074	**9,891**
2022	2,117	2,385	4,811	**9,313**
2023	970	2,328	3,331	**6,629**
Method of Measure:	Metered	Metered	Estimated by Land Use and Water Deliveries	—
Level of Accuracy:	High	High	Medium	—

Notes

— = not applicable

AF = acre-feet

Basin = Carpinteria Groundwater Basin

CVWD = Carpinteria Valley Water District

Change in Groundwater in Storage

The change in groundwater in storage in the Basin was calculated by taking the difference between groundwater elevations in successive fall monitoring events, and multiplying this volume by appropriate specific yield values documented in the Basin groundwater model. For this analysis, the fall 2021 groundwater elevations were subtracted from the fall 2020 groundwater elevations resulting in a map depicting the changes in groundwater elevations in Storage Unit No. 1 (SU-1) that occurred during WY 2021, and the same method was applied for fall to fall for subsequent WYs 2022 and 2023. Due to a lack of data and limited groundwater production in Storage Unit No. 2 (SU-2), the change in groundwater in storage analysis focuses on groundwater elevations and annual changes within SU-1.

The groundwater elevation change maps for WYs 2021 and 2022 show an annual decrease in fall to fall water levels, compared to WY 2023 where water levels generally increased over a majority of the Basin. The annual change of groundwater in storage calculated for WYs 2021 through 2023 is presented in Table ES-4. Increases of groundwater in storage are presented as positive numbers and decreases of groundwater in storage are presented as negative numbers.

Table ES-4. Estimated Annual Change in Groundwater in Storage in SU-1, Water Years 2021–2023

Water Year	Water Year Type	Annual Change in Groundwater in Storage in SU-1 (AF)
2021	Critical	-7,714
2022	Critical	-1,179
2023	Wet	12,071

Notes

AF = acre-feet

SU-1 = Storage Unit No. 1

Water Quality and Subsidence

Laboratory analytical analysis of groundwater samples from the Basin indicate concentrations of monitored constituents within their historical ranges. Nitrates are present in groundwater in the Basin from legacy agricultural practices, but none of the representative monitoring site (RMS) wells (which coincide with the CVWD production wells) had nitrate concentrations exceeding their minimum threshold (MT) for WYs 2021 through 2023. Additionally, concentrations for all other constituents of concern (COCs) for boron, chloride, and total dissolved solids (TDS) were below their respective MTs.

Land subsidence has not been historically documented in the Basin. InSAR data provided by DWR indicated no significant subsidence has occurred in the Basin over the three water years documented in this report.

Adoption and Submittal of the GSP to DWR

The GSP was finalized and unanimously adopted by the CGSA Board on January 24, 2024. The adopted GSP was submitted to DWR for review, and DWR's determination of the GSP is currently pending.

Progress towards Meeting Basin Sustainability

In WYs 2021, 2022, and 2023, there were exceedances of MTs for RMS wells in the monitoring networks for the water level and storage sustainability indicators or the water quality sustainability indicators.

Several projects and management actions are identified in the GSP to attain sustainability. These projects identify two categories of potential projects, Tier 1 and Tier 2 projects. Tier 1 projects are expected to be implemented within the first 5-year SGMA implementation period. Tier 2 projects will be evaluated and ranked during the first 5-year period for potential future implementation. Because there has been little time between the GSP adoption and the preparation of this Annual Report, there is not much significant updated information to report regarding progress toward sustainability in the Basin.

A significant addition to the Basin monitoring network was recently completed with the construction of three clustered monitoring wells monitoring the A, B, and C-zones of the Basin Aquifer. These wells are located in El Carro Park in the City of Carpinteria.

As described in the GSP, the Carpinteria Advanced Purification Project (CAPP) has been in development for the past several years. It is an Indirect Potable Reuse Project intended to inject advanced treated wastewater into the Basin Aquifer for later recovery by the CVWD. Since the submittal of the GSP in January 2024, the CVWD has learned that a $10 Million of the Recycled Water Funding Program grant funding that had been earmarked for this project by the State Water Resources Control Board (SWRCB) has become unavailable as part of the State's management of recent budget shortfalls. This loss of planned funding, in addition to cost escalation indicated by a recently updated project cost estimate, may have the effect of slowing the schedule of planned implementation of this project.

The other Tier 1 projects discussed in the GSP are (1) the Sentinel Monitoring Well Network Expansion Project and the (2) Local Infrastructure Water System Interties Project. There has not been adequate time since the submission of the GSP to make significant progress on these projects.

SECTION 1: Introduction – Carpinteria Groundwater Basin Water Years 2021–2023 Annual Report

This Carpinteria Groundwater Basin (Basin) Water Years (WYs) 2021–2023 Annual Report has been prepared for the Carpinteria Groundwater Sustainability Agency (CGSA) in accordance with the Sustainable Groundwater Management Act (SGMA) regulations for Groundwater Sustainability Plans (GSPs) (§ 356.2. Annual Reports) (see Appendix A). Pursuant to the SGMA regulations, a GSP Annual Report must be submitted to the California Department of Water Resources (DWR) by April 1 of each year following the adoption of the GSP. Submittal of the adopted Basin GSP occurred on January 31, 2020. The Groundwater Sustainability Agencies (GSAs) are required to submit an annual report for the preceding water year (October 1 through September 30) to DWR by April 1 of each subsequent year. Because the GSP (CGSA, 2023) documented groundwater conditions through 2020, this WY 2021–2023 Annual Report for the Basin documents groundwater production, water use data and water level data from October 1, 2021, through October 31, 2023.[2]

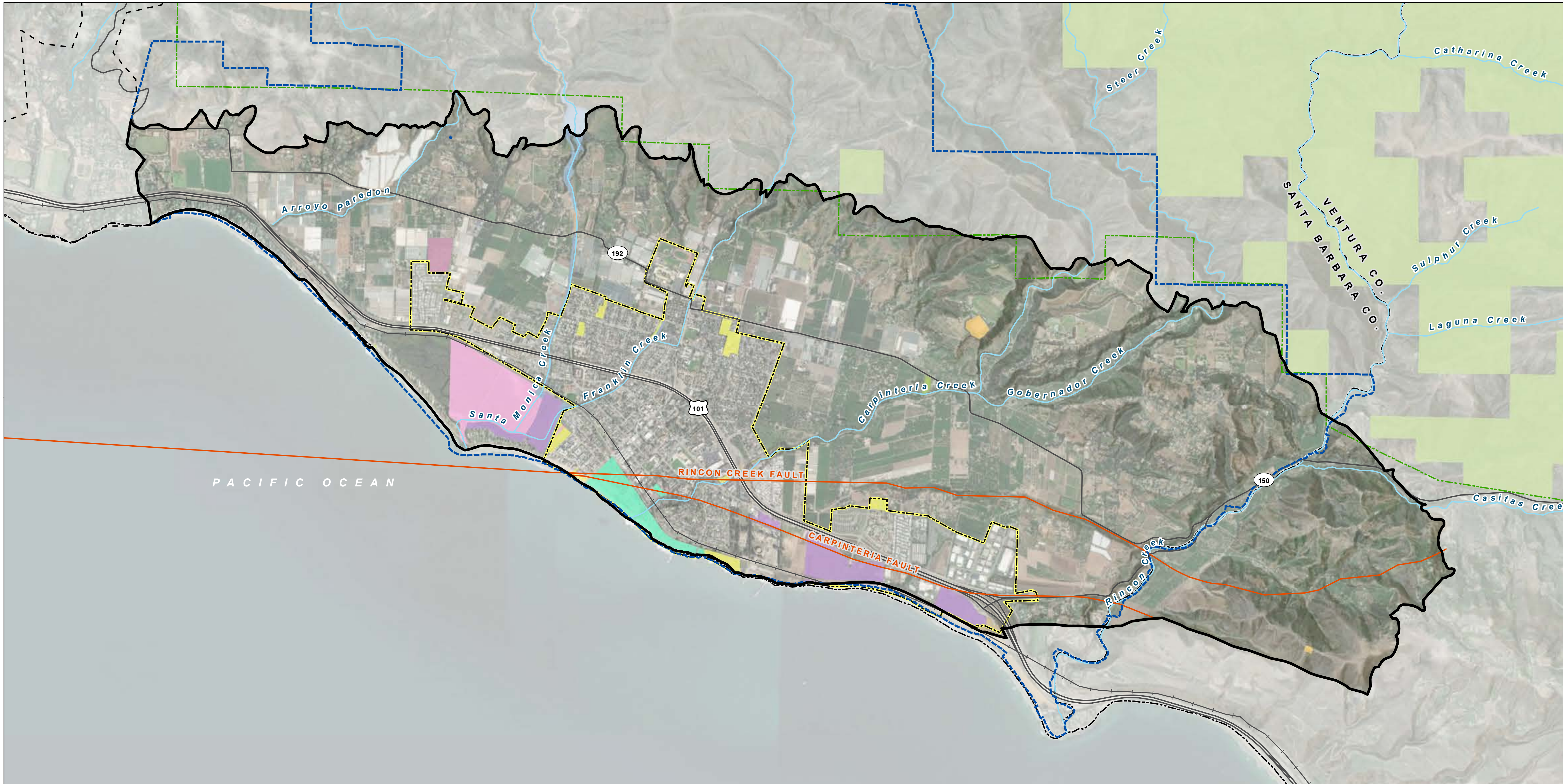
1.1 Setting and Background

The GSP (CGSA, 2023) was prepared on behalf of and in cooperation with the CGSA. The GSP and subsequent required annual reports, including this WY 2021–2023 Annual Report, covers the entire Basin, identified by DWR as Basin No. 3-018 (DWR, 2004, 2023) (see Figure 1). The majority of the Basin consists of a low-lying alluvial plain located in the southeastern portion of Santa Barbara County, with a small portion located in the far southwest corner of Ventura County. In unincorporated areas under county jurisdiction, the County of Santa Barbara and the County of Ventura are responsible for comprehensive long-range planning, permitting, and development review. The Santa Barbara Flood Control and Water Conservation District has jurisdiction over certain flood control facilities. The City of Carpinteria has land management authority within its boundaries. Municipal and agricultural water service within the City of Carpinteria is provided by the CVWD. Private wells supply much of the agricultural pumping in the Basin. The U.S. Bureau of Reclamation has jurisdiction over the Carpinteria Regulating Reservoir. Lands under state jurisdiction include Carpinteria State Beach (California Department of Parks and Recreation), the beds of tidal waters (California State Lands Commission), and the Carpinteria Salt Marsh Reserve (University of California Natural Reserve System).

On January 31, 2020, four member agencies entered into a Joint Exercise of Powers Agreement to form the CGSA for the purpose of managing groundwater in the Basin and developing the GSP and subsequent Annual Reports for the Basin. The four member agencies of the CGSA include:

- Carpinteria Valley Water District (CVWD)
- City of Carpinteria
- Santa Barbara County Water Agency
- County of Ventura

[2] The required timeframe of the annual reports, pursuant to the SGMA regulations, is by water year, which is October 1 through September 30 of any given year. However, because the CVWD measured water levels in October, the October 2023 measurements, for instance, are used to reflect fall conditions at the end of WY 2023.



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Land Ownership

- Bureau of Reclamation
- California Department of Parks and Recreation
- California State Lands Commission
- Carpinteria Cemetery District
- Carpinteria, City of
- Land Trust for Santa Barbara County
- Santa Barbara Flood Control and Water Conserv. District
- Santa Barbara, County of
- USDA Forest Service
- University of California

All Other Features

- City Boundary
- County Boundary
- Fault
- Railroad
- Major Road
- Watercourse

FIGURE 1

Carpinteria Groundwater Basin Plan Area and Jurisdictional Areas

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

N

0 1,500 3,000 4,500
feet

CARPINTERIA GSA GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

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The CVWD's service area covers all the Basin within the County of Santa Barbara, with the exception of a small area on the northeast edge of the district boundary, and the service area also extends beyond the Basin boundaries to the north and includes a small portion to the southeast of the Basin on the west side of Rincon Point. The CVWD has water management and supply authority within its service area. The County of Ventura portion of the Basin is located within the service area of Casitas Municipal Water District, which has water management and supply authority within its service area.

The Basin's eastern boundary is defined by the extent of the Casitas Formation mapped at the surface near Laguna Ridge in Ventura County. The Pacific Ocean forms its southern boundary. An adjustment to the western boundary was approved by DWR in 2018, which follows the limits of the CVWD service area along the western boundary of the Basin and the adjacent Montecito Groundwater Basin, and now includes the Toro basin (which prior to the basin boundary modification was part of Carpinteria Groundwater Basin). The Basin's northern boundary is delineated at the geologic contact with the Coldwater Sandstone and Sespe Formations in the foothills of the Santa Ynez Mountains. DWR approved a second basin boundary modification request in 2018 to refine the delineation of the northern boundary using more recently published geologic maps.

The Basin was originally designated as a low-priority basin by DWR. In 2019, DWR conducted a basin reprioritization process that reclassified the Basin as a high-priority basin, resulting in the preparation of the GSP pursuant to Section 10720, et. seq., of the State Water Code as required by SGMA. The GSP was recently adopted by CGSA on January 24, 2024, and was submitted to DWR for review. DWR's determination of the GSP is currently pending.

1.2 Organization of This Report

The required contents of an annual report are provided in the SGMA Regulations (§ 356.2), included as Appendix A. Organization of the report is meant to follow the regulations where possible to assist in the review of the document. The sections are briefly described as follows:

- **Section 1. Introduction**: A brief background of the formation and activities of the CGSA and development and submittal of the GSP.
- **Section 2. Basin Setting and Monitoring Networks**: A summary of the Basin hydrogeologic setting, monitoring networks, and the ways in which data are used for groundwater management.
- **Section 3. Groundwater Elevations (§356.2[b][1])**: A description of recent monitoring data with groundwater elevation contours for spring and fall monitoring events and representative hydrographs.
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- **Section 8. Groundwater Quality and Subsidence (§356.2[b][5])**: A description of the water quality data collected in the Basin and the Interferometric Synthetic Aperture Radar (InSAR) data measuring subsidence provided by DWR.
- **Section 9. Progress towards Basin Sustainability (§356.2[c])**: A summary of management actions taken throughout the Basin by the CGSA and individual entities towards sustainability of the Basin.

SECTION 2: **Carpinteria Basin Setting and Monitoring Networks**

2.1 Introduction

This section provides a brief description of the basin setting and the groundwater management monitoring programs described in the GSP, as well as any notable events affecting monitoring activities or the quality of monitoring results in the reported WYs 2021–2023. Much of the background information reported in this Annual Report was taken from the recently prepared GSP (CGSA, 2023).

2.2 Basin Setting

The GSP covers the entire Carpinteria Groundwater Basin identified by DWR as Basin No. 3-018 (DWR, 2004, 2023). This 7,801-acre (12.7 square mile) coastal basin includes portions of Santa Barbara and Ventura Counties, the incorporated City of Carpinteria, and small portions of federal and state-owned lands, as shown in Figure 1. Groundwater rights in the Basin have not been adjudicated.

The Basin consists of a low-lying alluvial plain that is physically bordered on the south by the Pacific Ocean and on the north and east by bedrock. The western boundary is an administrative boundary with the Montecito Groundwater Basin. As shown, the Basin is approximately 7 miles long in an east-west direction and extends northward from the coastline a maximum of about 2 miles. The lowest ground surface elevations occur in El Estero, an active intertidal salt marsh west of the City of Carpinteria. From this area, the topography gradually rises northward to elevations of up to approximately 650 feet above mean sea level (amsl) along the northern and eastern boundaries of the Basin. The Santa Ynez Mountains lie north of the Basin boundary.

There are five major creeks in the Basin, each of which extends from the crest of the Santa Ynez Mountains and flows in a generally southerly direction across the Basin to the Pacific Ocean (Figure 2). Rincon Creek crosses the east end of the Basin and dissects the remnant terrace deposits and older alluvial fans in this area. The Gobernador, Carpinteria and Santa Monica Creeks are the main drainages into the central portion of the Basin. The Arroyo Paredon Creek enters the Basin near the western end of the Basin. Existing land uses within the Basin predominantly include urban areas and agricultural areas. Urban areas are focused within the City of Carpinteria in the central portion and along the southern coastline of the Basin. Agricultural land uses consisting of various irrigated crops (citrus, fruits and nuts, grain and hay, row crops, vineyards, and pasture) are largely located outside of the City of Carpinteria limits in the northwestern, north central, and eastern portions of the Basin, as shown in Figure 2.

The Basin is located on the south flank of the Santa Ynez Mountains, one of the east-west trending ridges of the Transverse Range Geomorphic Province. The Basin represents the north limb of a synclinal geologic structure, the deepest parts of which terminate against the traces of the Rincon Creek Fault. This structural depression has subsequently been filled with younger water-bearing deposits. Water-bearing deposits in the Basin include all unconsolidated and semi-consolidated sediments of the Quaternary age, with older consolidated and generally non-water bearing rocks forming the definable boundaries of the Basin. Quaternary Age water-bearing basin deposits primarily consist of the following:

- Alluvial Deposits
- Casitas Formation
- Santa Barbara Formation

Tertiary Age formations that form the primary bedrock boundaries of the Basin include the following:

- Sisquoc Formation
- Monterey Formation

- Rincon Shale
- Vaqueros Formation
- Sespe Formation
- Coldwater Sandstone

The geologic contact between unconsolidated water-bearing deposits and bedrock formations delineates the northern and southeastern lateral boundaries and the definable bottom of the Basin.

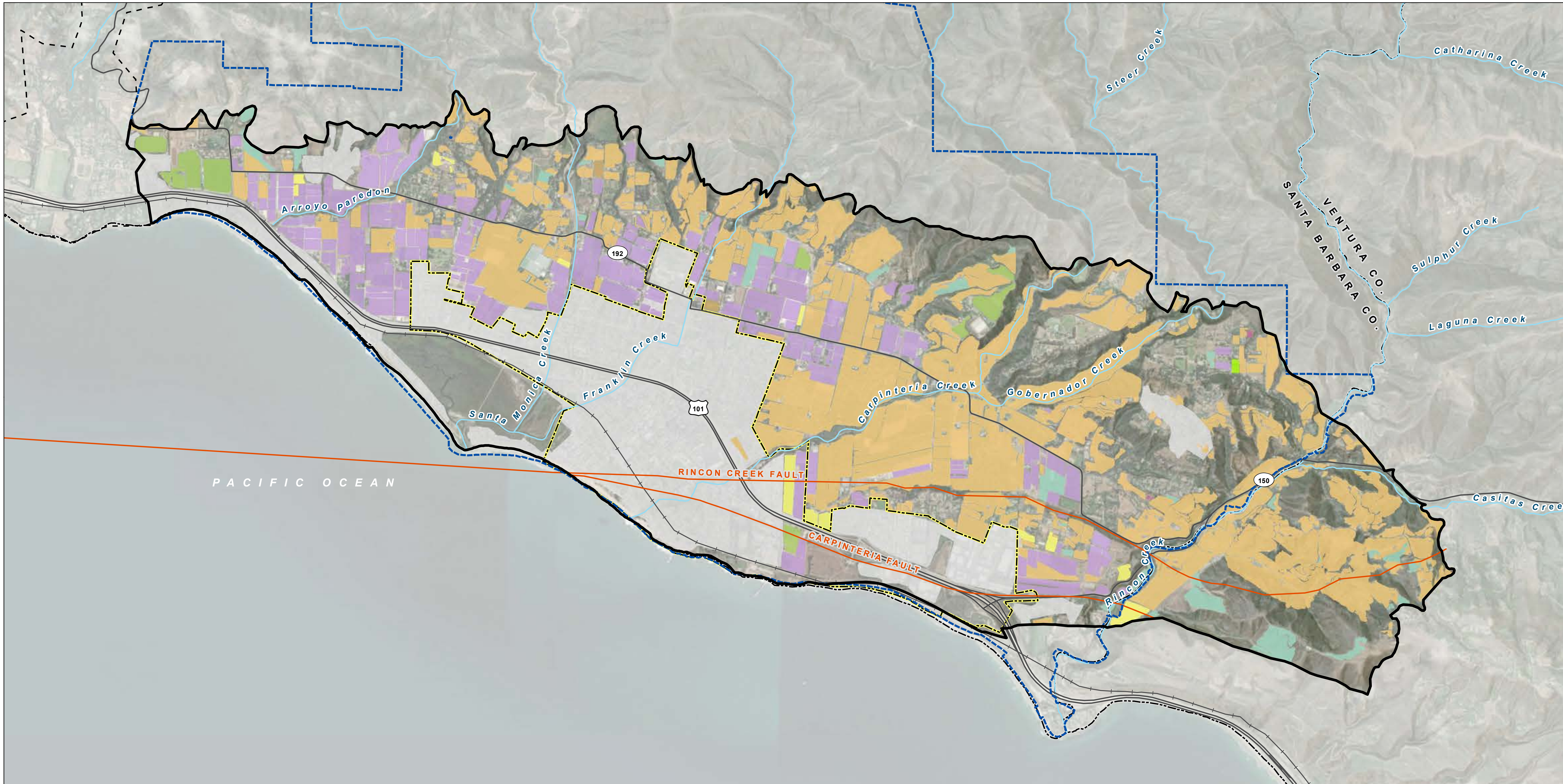
The Rincon Creek Thrust Fault, a prominent east-west trending and south-dipping thrust fault, creates a barrier to subsurface groundwater movement within the Basin. The surface trace of the Rincon Creek fault has been used to segregate the Basin into two Storage Units: Storage Unit No. 1 (SU-1) is on the north side of the fault trace, and Storage Unit No. 2 (SU-2) is to the south, as shown in Figure 3.

SU-1 contains all CVWD's principal municipal supply wells and the vast majority of agricultural wells and has accordingly been the primary focus of previous basin investigations and data collection programs. In the Basin, a single principal aquifer system largely occurs within unconsolidated and semi-consolidated sediments of the Pleistocene- and upper Pliocene-aged Casitas Formation, which is contained in the entire Basin area north of the Rincon Creek Fault and is exposed in outcrops along the northern and eastern boundaries (CGSA, 2023). The Casitas Formation is an assemblage of poorly to moderately consolidated clayey to gravelly sand with variable amounts of silt and cobbles reaching substantial thicknesses of 2,300 feet to 2,500 feet in SU-1. In the deepest portion of the Basin, bedrock is as much as 4,000 feet below mean sea level (bmsl) in SU-1 and rises to approximately 500 feet amsl along the northern boundary of the Basin. Sandy clay is abundant and sandy units are typically thin and lenticular and cannot be correlated over long distances. Notable exceptions to this are the major water-producing zones delineated as the A, B, C and D Zones in the Confined Area of the Basin. Outside of the Confined Area of the Basin and extending to boundaries with the bedrock, the productive A to D Zones become laterally discontinuous and groundwater is generally unconfined.

Underlying the Casitas Formation is the marine Santa Barbara Formation, which unconformably overlies all older consolidated rocks in the Basin. The formation is only exposed south of the Rincon Creek Fault in SU-2 where it unconformably overlies Miocene shales. The Santa Barbara formation consists of poorly to moderately consolidated, soft and massive, sandstone and siltstone with abundant clay shale. Although the formation represents a potential water-bearing deposit in the Basin, no water wells are known to penetrate it and no major aquifers have been discerned within it. In SU-2 (where there are limited geologic data available) the bedrock is estimated to reach depths of approximately 1,000 feet bmsl.

The primary sources of recharge to the Basin aquifers include infiltration of precipitation, percolation of streamflow, and percolation of irrigation return flow. However, in the Confined Area, downward percolation of water is limited due to the presence of fine-grained low-permeability materials overlying most of the area of the principal aquifers. Therefore, recharge of the primary aquifers occurs primarily in the areas between the Confined Area and the boundaries of consolidated bedrock in the north and eastern portions of the Basin.

The primary method of discharge from the aquifer is groundwater pumping. Groundwater within the principal aquifer of SU-1 does not discharge directly to the ocean in the southeastern portion of the Basin due to the presence of overlying confining layers and the barrier created by the Rincon Creek Thrust Fault, thus creating a hydrogeologic separation from the ocean. However, west of El Estero, basin deposits are understood to be in contact with the ocean. Subsurface outflow from SU-1 is believed to occur in the general area from Serena Park to Sand Point (approximate distance of 9,000 feet) where there is no fault barrier between basin sediments and the Pacific Ocean. In SU-2, significant subsurface outflow is not believed to occur due to the onshore contact of unconsolidated water-bearing materials with consolidated bedrock, effectively isolating SU-2 from the Pacific Ocean.



LEGEND

Carpinteria Groundwater Basin
Montecito Groundwater Basin
Carpinteria Valley Water District Service Area

Land Use

Citrus and Subtropical
Deciduous Fruits and Nuts
Grain and Hay Crops
Pasture
Truck, Nursery, and Berry Crops
Urban
Vineyards
Unclassified Fallow
Young Perennial

All Other Features

City Boundary
County Boundary
Fault
Railroad
Major Road
Watercourse

N

0 1,500 3,000 4,500
feet

FIGURE 2

Existing Land Use Designations

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

Date: March 29, 2024
Data Sources: BLM, ESRI, USGS, Maxary Imagery (2020), DWR Bulletin 118, DWR (2018)

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

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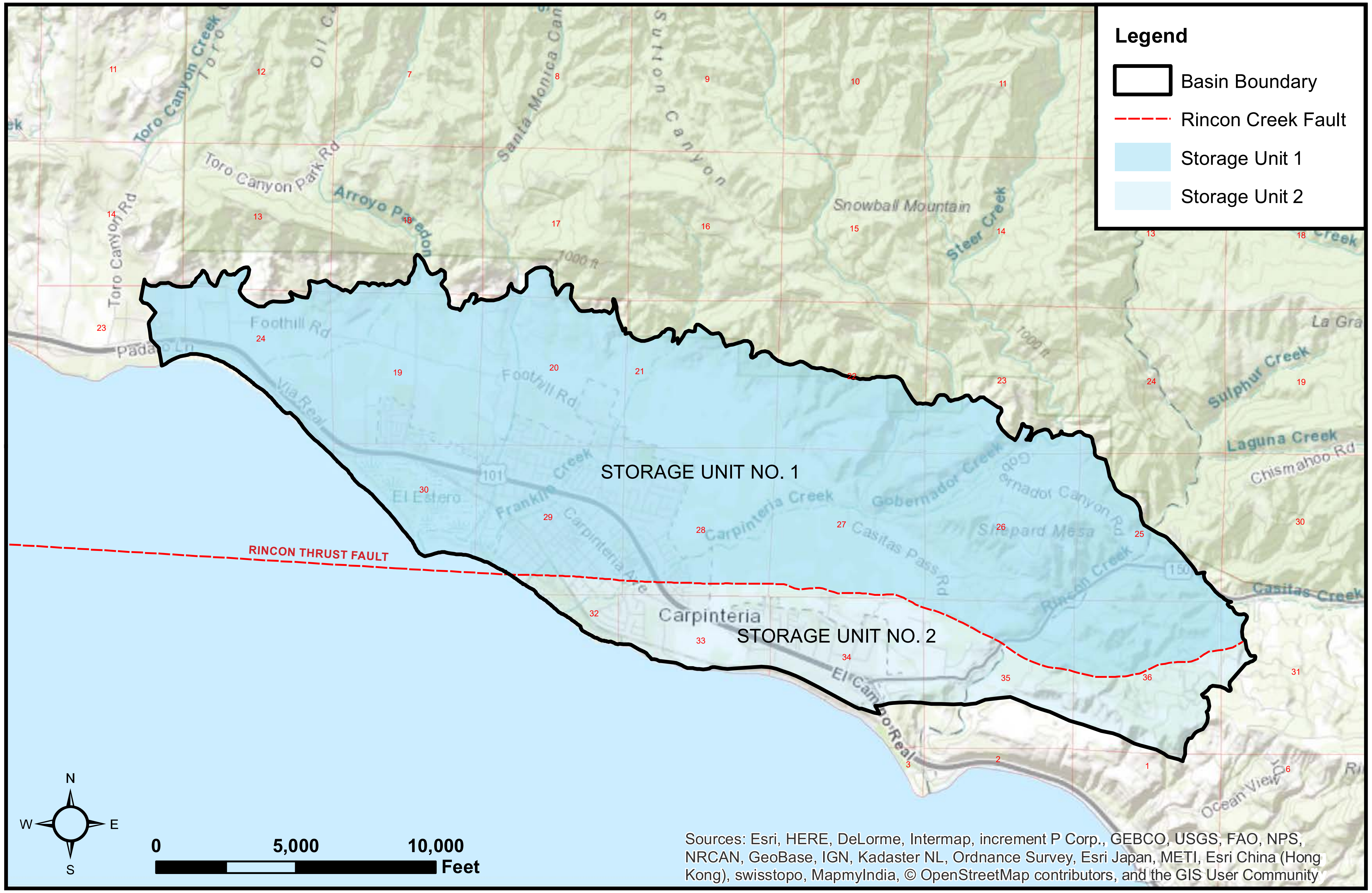


FIGURE 3

Storage Units 1 and 2 Map

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

2.3 Precipitation and Climatic Periods

Climate data are available from two meteorological stations in the Basin monitored by the Santa Barbara County Flood Control District (SBCFCD): Carpinteria Fire Station (Station No. 208), located in downtown Carpinteria, and Carpinteria U.S. Forest Service (Station No. 383), located at Rincon Station in the Los Padres National Forest near the U.S. Geological Survey stream gage on Carpinteria Creek. The closest California Irrigation Management Information System (CIMIS) station is the Santa Barbara station (Station No. 107) located approximately 8 miles west of the Basin at the north end of the Santa Barbara Golf Club. This station measures several climatic factors that allow a calculation of daily reference evapotranspiration for the area since 1993. Average annual precipitation within the Basin ranges from 15 to 19 inches.

Recent precipitation data was obtained from the gauge located at Carpinteria Fire Station No. 1 (SBCFCD, 2024). Figure 4 presents a graph showing the annual water year precipitation for the period of record from WYs 1949 through 2023, and a cumulative departure curve. Upward trending portions of the cumulative departure line represent wet periods of above-average rainfall, and downward trending portions represent drought periods of below-average rainfall. The total annual precipitation recorded at the Carpinteria Fire Station gauge was 4.73 inches for WY 2021 (critical year), 10.32 inches for WY 2022 (critical year), and 29.35 inches for WY 2023 (wet year). The long-term average annual precipitation measures at the Carpinteria Fire Station gauge for the period (1945 through 2023) is 17.20 inches per water year, as shown in Table 1. The lower portion of the chart shown on Figure 3 shows the cumulative departure from the mean annual precipitation over the period of record. Climatic trends (historical wet-dry cycles) are also shown on the graph. Climatic trends were selected in the context of longer-term multi-year climatic periods of wet, normal, and dry/critical drought conditions within the Basin. Historical precipitation records for the Carpinteria Fire Station gauge are provided in Appendix B.

Table 1. Meteorological Monitoring Station in the Basin

Station No.	Station Name	Location	Elevation (feet amsl)	Beginning of Record (year)	Most Recent Record (year)	Period Average Precipitation (inches)
208	Carpinteria Fire Station	Within Basin	30	1949	2023	17.20

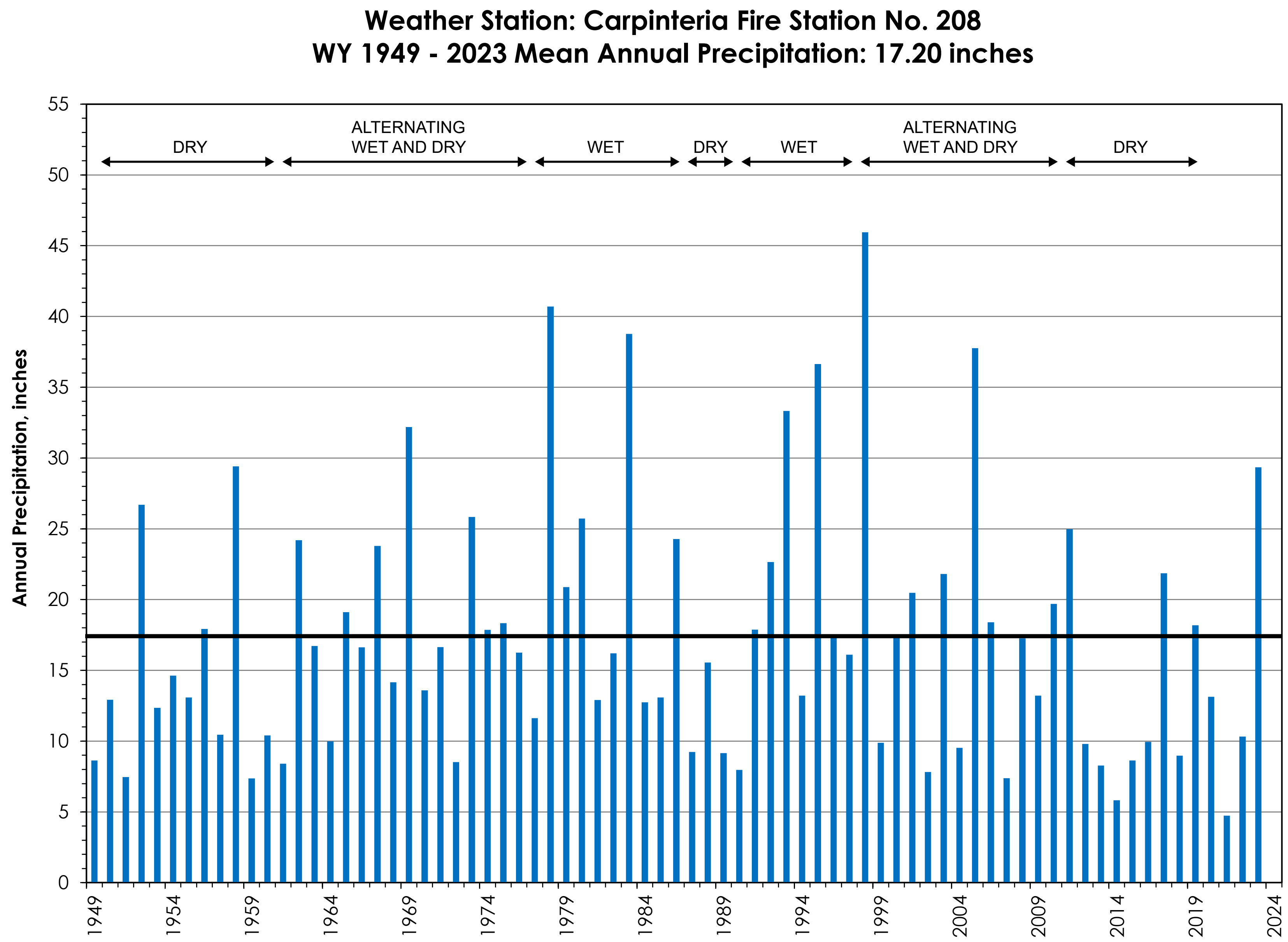
Notes

amsl = above mean sea level

Basin = Carpinteria Groundwater Basin

2.4 Monitoring Networks

The monitoring networks presented in Section 4 of the GSP were developed based on existing sites monitored for decades by the CVWD (formerly the Carpinteria County Water District) prior to the passage of SGMA. Representative monitoring site (RMS) wells are selected from the existing District monitoring network for each applicable sustainability indicator. The monitoring networks will be used to track the GSA's progress toward achieving sustainability by documenting short-term, seasonal, and long-term trends in groundwater conditions.



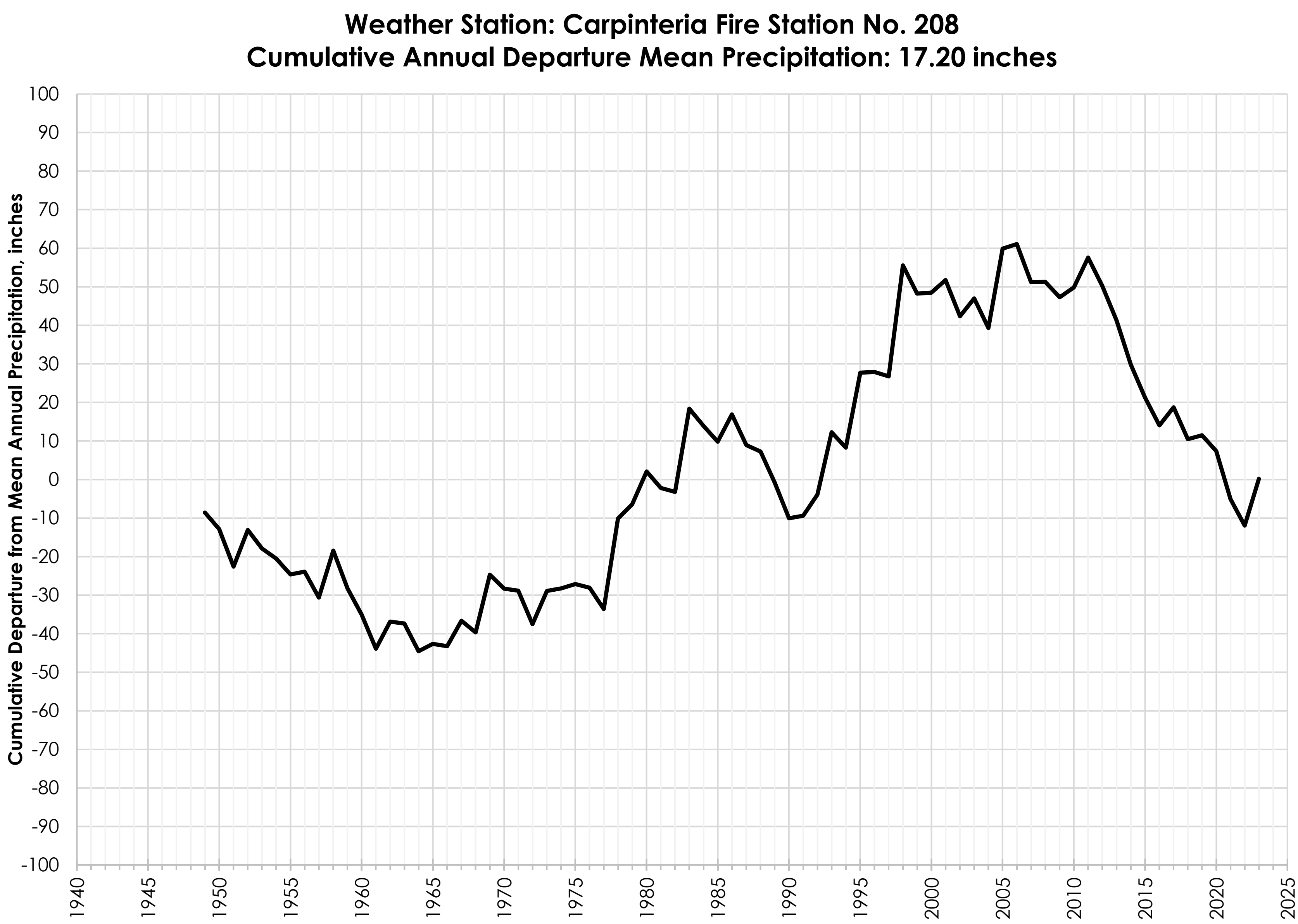


FIGURE 4

Historical Annual Precipitation and Climatic Periods – Carpinteria Station (WY 1949-2023)

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

The proposed monitoring networks include active and inactive CVWD production wells, active and inactive private agricultural wells, and dedicated monitoring wells. The proposed monitoring networks were developed to assess historical and current trends for the following sustainability indicators relevant to the Basin:

- Chronic lowering of groundwater levels
- Reduction of groundwater in storage
- Seawater intrusion
- Degraded water quality
- Land subsidence

Monitoring for the first two sustainability indicators (chronic lowering of water levels and reduction of groundwater in storage) is implemented using the RMSs, discussed in Section 2.4.1. Monitoring for the remaining sustainability indicators (degraded water quality and seawater intrusion) is discussed in Section 2.4.3.

2.4.1 Groundwater Elevation Monitoring Network (§ 356.2[b])

SGMA requires that monitoring networks be developed in the Basin to provide sufficient data quality, frequency, and spatial distribution to evaluate changing aquifer conditions in response to GSP implementation.

The GSP identifies an existing network of 35 wells for the water level monitoring and reduction of storage sustainability indicators, nine of which are designated as RMS wells (CGSA, 2023). Groundwater levels in these RMS wells have been monitored on a bimonthly basis (at the end of every even month) for various periods of record. The RMS groundwater monitoring network developed in the GSP is intended to support efforts to do the following:

- Monitor changes in groundwater conditions and demonstrate progress towards achieving measurable objectives (MOs) and minimum thresholds (MTs) documented in the GSP.
- Quantify annual changes in water use.
- Monitor impacts to the beneficial uses and users of groundwater.

A summary of information for each of the RMS wells and non-RMS wells for the existing groundwater level monitoring network is included in Appendix C.

2.4.2 Groundwater Quality Monitoring Network (§ 356.2[b])

A total of 46 wells are monitored for basic water quality parameters, of which 12 wells are monitored for both water levels and water quality. Water quality data were collected through the sampling of dedicated monitoring wells and at other selected wells throughout the Basin, with the sampling occurring on a biannual basis, typically in April and October. Appendix C summarizes the information for the existing network wells monitored for water quality, including for total dissolved solids (TDS) and general chemistry (cation/anions).

A cluster of three monitoring wells of discrete depths was drilled and installed in 2019 in the southwestern portion of SU-1, where the Rincon Creek Thrust Fault projects offshore and water-bearing units of the Basin are possibly susceptible to seawater intrusion. These monitoring wells are identified as the Basin “Sentinel Wells,” with MW-1, MW-2, and MW-3 completed discretely in the C, B, and A water-bearing zones, respectively.

A second cluster of depth-discrete monitoring wells, again completed in the A, B, and C zones, was recently installed in El Carro Park in the summer and winter of 2023, near the central portion of the confined zone in SU-1.

Evaluation of the water quality sustainability indicator is achieved through monitoring of an existing network of supply wells in the Basin. The constituents of concern (COCs) identified in the GSP that have the potential to impact suitability of water for public supply or agricultural use include salinity (as indicated by electrical conductivity), TDS, arsenic, boron, chloride, and nitrate (as N).

2.4.3 Additional Monitoring Networks

Land subsidence in the Basin is monitored using InSAR data collected using microwave satellite imagery provided by DWR. Available data to date indicate no significant subsidence in the Basin that impacts infrastructure. The GSAs will annually assess subsidence using the InSAR data provided by DWR.

A monitoring network to assess the sustainability indicator seawater intrusion is a current data gap that will be addressed during GSP implementation. A set of proposed RMS seawater intrusion wells to monitor groundwater salinity were proposed in the GSP; negotiations with landowners to get access agreements are ongoing to add to the network near the coastline in the western portion of the Basin. Expansion of the seawater intrusion monitoring network is anticipated before this sustainability indicator can be more robustly characterized.

SECTION 3: **Groundwater Elevations (§ 356.2[b][1])**

3.1 Introduction

This section provides a detailed report on groundwater elevations in the Basin measured during spring and fall seasons of WYs 2021, 2022, and 2023. These maps present seasonal conditions in the Basin between October of 2020 through October of 2023. The monitoring data are reviewed for quality and an appropriate time frame is chosen to provide the highest consistency in the wells used for each reporting period. Data quality is often difficult to ascertain when measurements are taken by other agencies, and well construction information may be incomplete or unavailable. This means that a careful review of the data is required before uploading it to DWR's SGMA Monitoring Network Module[3] to verify whether measurements are trending consistent with trends of previous years and with the current year's hydrology and level of extractions.

3.1.1 Principal Aquifers

As discussed in the GSP, the hydrogeologic conceptual model identifies one principal aquifer in the Basin consisting primarily of unconsolidated and semi-consolidated sediments of the Pleistocene and upper Pliocene-aged Casitas Formation. In some local alluvial valleys of basin creeks, wells penetrate and may possibly screen sediments of the younger alluvium, but available data indicate that these wells usually are also screened in the Casitas Formation, which provides most of the productive yield. The majority of groundwater production occurs from the Casitas Formation, which is contained in SU-1 in the Basin area north of the Rincon Creek Fault and is exposed in outcrops along the northern and eastern boundaries.

3.2 Seasonal High and Low Groundwater Elevations (Spring and Fall) (§ 356.2[b][1][A])

The assessment of groundwater elevation conditions in the Basin as described in the GSP (CGSA, 2023) is largely based on historical data from CVWD's groundwater monitoring program. Groundwater levels are measured by the CVWD through a network of public and private wells in the Basin. Groundwater level data from wells in the water level monitoring network were used to create the spring (April) and fall (October) groundwater elevation contour maps for WYs 2021, 2022, and 2023. As implementation of the GSP progresses, it is anticipated that additional wells will be added to the monitoring network.

In accordance with the SGMA regulations, the following information is presented based on available data:

- Hydrographs for RMS water level wells (Figure 5) and for all RMS and non-RMS wells in the groundwater level monitoring network with publicly available data (Appendix C).

- The well locations and groundwater elevation measurements collected in spring (April) and fall (October) that were used to generate groundwater elevation contour maps are shown in Figures 6 through 12. Groundwater elevation contours in these figures are intended to represent the seasonal high (spring) and seasonal low (fall) groundwater conditions for the previous water year. To capture groundwater conditions for WYs 2021 through 2023, groundwater elevation contour maps are presented for each seasonal high (spring) and seasonal low (fall) between fall 2020 and fall 2023.

[3] Since implementation of the GSP, the GSAs are now responsible for monitoring and reporting of groundwater elevation data to DWR's SGMA Monitoring Network Module.

- A map depicting the change in groundwater elevation for the preceding water year. Maps depicting annual water year changes in groundwater elevations are shown in Figures 13 through 15 (see Section 7.1).

3.3 Hydrographs (§ 356.2[b][1][B])

Groundwater elevation hydrographs are used to evaluate aquifer behavior over time. Changes in groundwater elevation at a given point in the Basin can result from many influencing factors, with all or some occurring at any given time. Factors can include changing climatic trends, seasonal variations in precipitation, varying groundwater extractions, changing inflows and outflows along Basin boundaries, availability of recharge from surface water sources, and influence from localized pumping conditions. Climatic variation can be one of the most significant factors affecting groundwater elevations over time.

3.3.1 Hydrographs

Groundwater elevation hydrographs for the nine RMS wells for water level and storage sustainability indicators are shown in Figure 5. Hydrographs and location inset maps for the nine RMS wells and all other water level monitoring network wells are presented in Appendix D. These hydrographs also include information on groundwater surface elevation, as well as the MO and MT for each RMS well that were developed during the preparation of the GSP. Many of the hydrographs illustrate conditions of declining water levels since the late 1980s, with higher rates of groundwater level decline during drought periods (i.e., 2014 to 2017). However, since approximately 2017, groundwater levels have overall stabilized, or slightly increased in some RMS wells.

As described in the GSP, historical trends in groundwater levels were assessed to set the MO, interim milestone (IM), and MT for each of the nine RMS wells in the water level and storage monitoring network. These established MO, IM, and MT values for each RMS well are shown in the hydrographs in Figure 5. Data collected during WYs 2021 through 2023 indicate that water levels in all nine RMS wells have remained above their MT values.

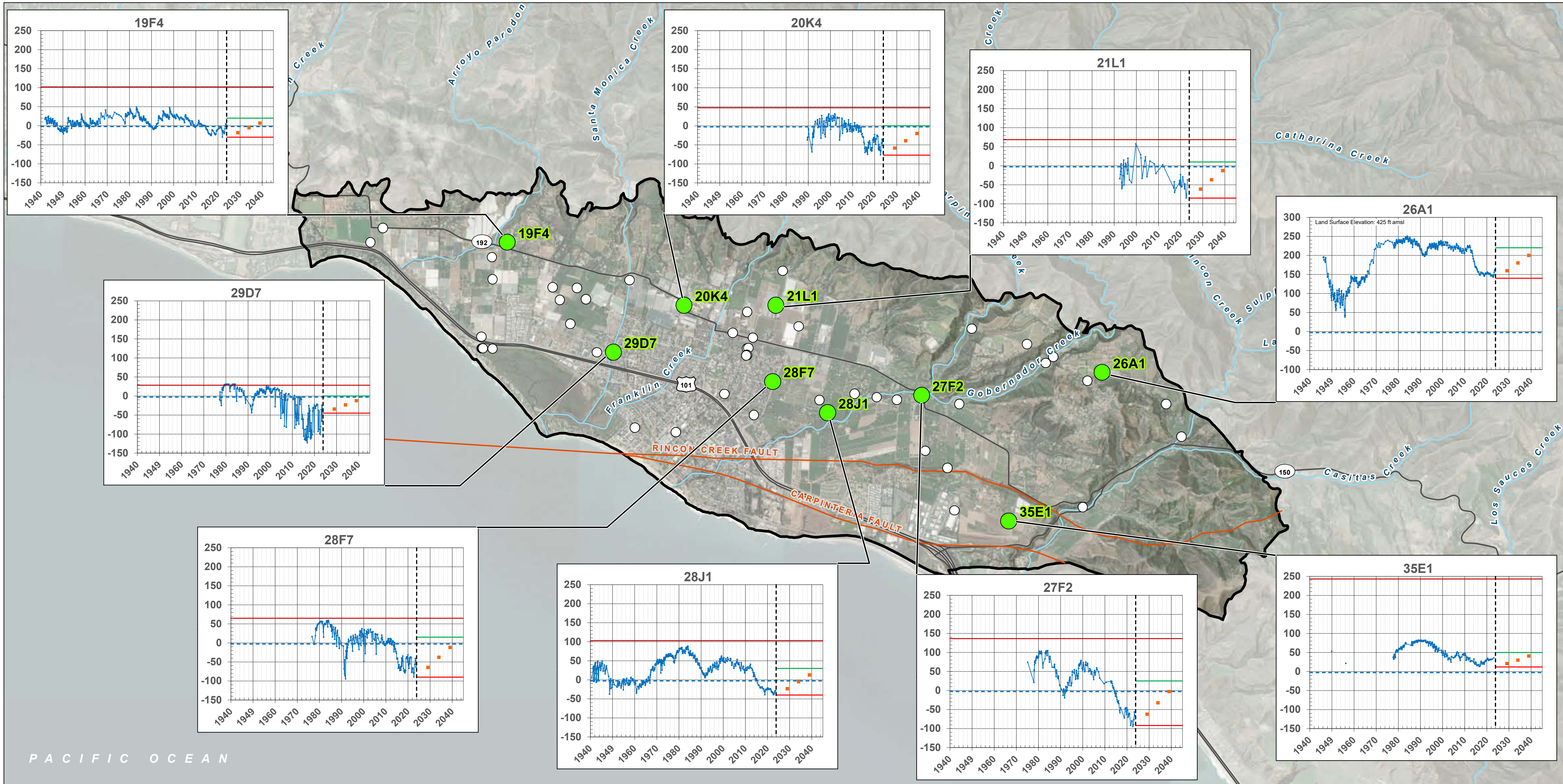
3.4 Principal Aquifer Groundwater Elevation Contours

Spring and fall groundwater elevation data for the aquifers in SU-1 in the Basin were contoured to assess spatial variations, yearly fluctuations, trends in groundwater conditions, groundwater flow directions, and horizontal groundwater gradients. Contour maps were prepared for the seasonal high groundwater levels, which typically occur in the spring, and the seasonal low groundwater levels, which typically occur in the fall. In general, the spring groundwater data are for April and the fall groundwater data are for October. Information identifying the owner or detailed location of private wells is not shown on the maps to preserve confidentiality.

The primary purpose of the water-level contours is to help to identify general patterns in the groundwater flow regime within the Basin, including those attributable to recharge sources and associated with discharge areas. The natural pre-development groundwater flow regime would generally be seaward, from areas of recharge in the north and east towards areas of discharge to the Pacific Ocean along the southern boundary of the Basin. Water level contours shown in Figures 6 through 12 indicate that in SU-1, groundwater generally flows in a northeast to southwesterly direction in the eastern half of the Basin, and north to south in the western half of the Basin. The directions of groundwater flow generally reflect the movement of groundwater from the primary sources of recharge in the Recharge Area to the primary sources of extraction (groundwater pumping) in the Confined Area in the central portion of the Basin, where the majority of production wells are located. It is noted that available water level data for SU-2 are very limited, and therefore, water level contours are not depicted south of the Rincon Creek Fault.

The groundwater elevation contours depicted in Figures 6 through 12 show the development of localized water-level depressions centered in the central portion of the Basin, with water levels as much as 91 feet bmsl (fall 2021). It is noted that this time period coincides with the most recent drought period experienced in the Basin. These water-level conditions result in a reversal of the natural pre-development seaward groundwater gradient, creating the potential for seawater intrusion in the western portion of the Basin where basin deposits are exposed to the Pacific Ocean. It is noted that prior to 2019, seawater intrusion had not historically been detected in existing wells in the Basin; however, prior to 2019, there were no monitoring wells located along the coast that that were designed to detect seawater intrusion. The Sentinel Wells were recently constructed near the coastline west of El Estero, with completions in the upper three water-producing units (A-, B-, and C-zone) of the Primary Aquifer, to monitor for seawater intrusion.

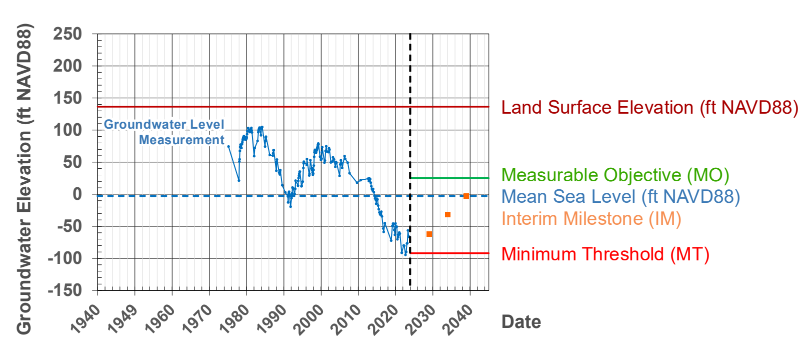
Groundwater elevations observed during WY 2023 (Figures 10 through 12) are generally higher than the previous two water years across a majority of the Basin due to above-average rainfall conditions during the winter of 2022/2023. Positive and negative changes in groundwater elevations from year to year are observed in various parts of the Basin, as has been observed historically. Seasonal trends of slightly higher spring groundwater elevations compared with fall levels are observed annually.



LEGEND

- RMS Water Level Well
- GSA Monitoring Well
- Carpinteria Groundwater Basin
- Fault
- Major Road
- Watercourse

HYDROGRAPH DETAILS



N

0 2,000 4,000 6,000 feet

CARPINTERIA GSA

GSI Water Solutions, Inc.

FIGURE 5

Hydrographs for Groundwater Level and Storage Monitoring Network

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

FIGURE 6

Groundwater Elevation Contours - Fall 2020

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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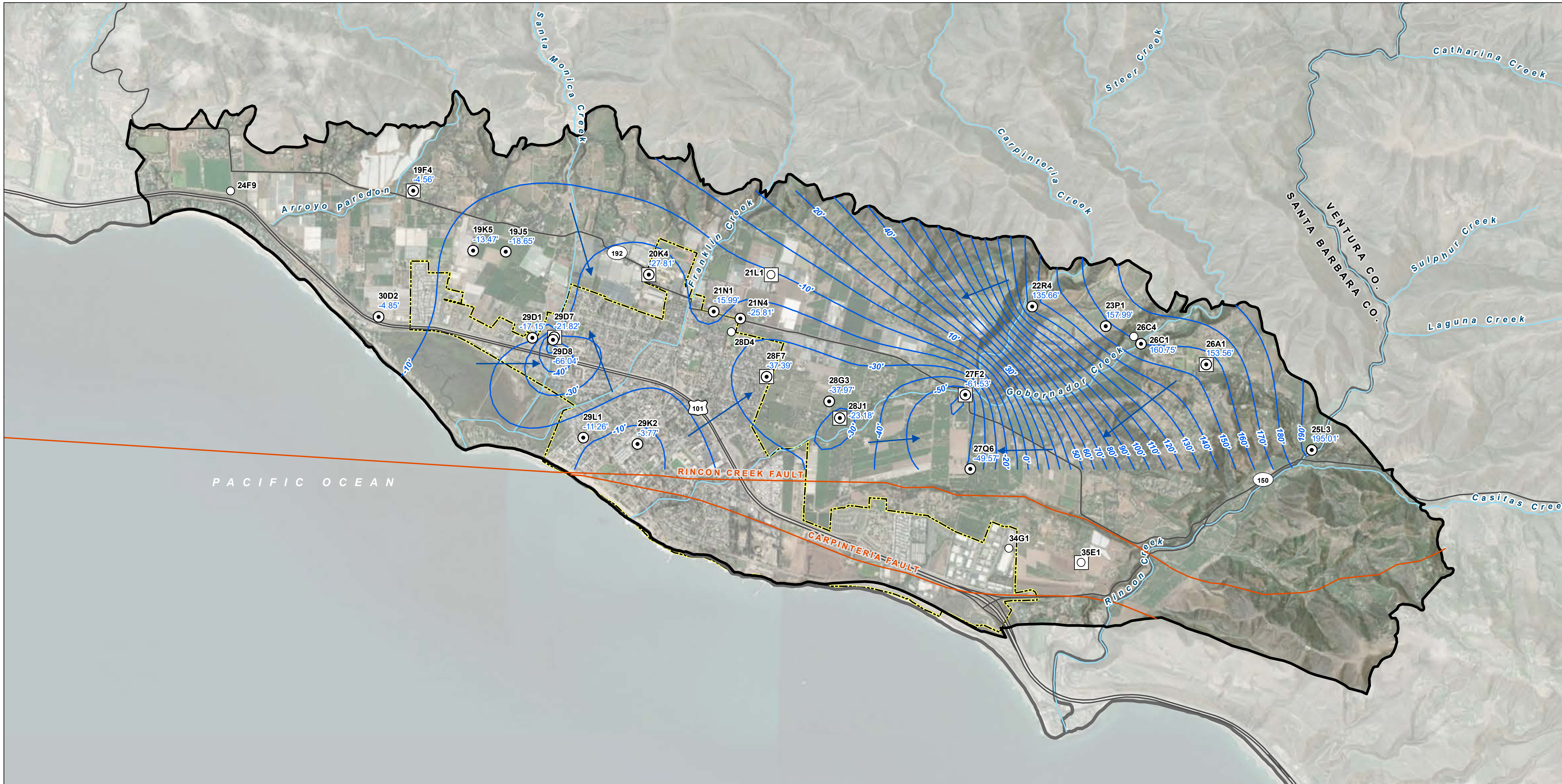


LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

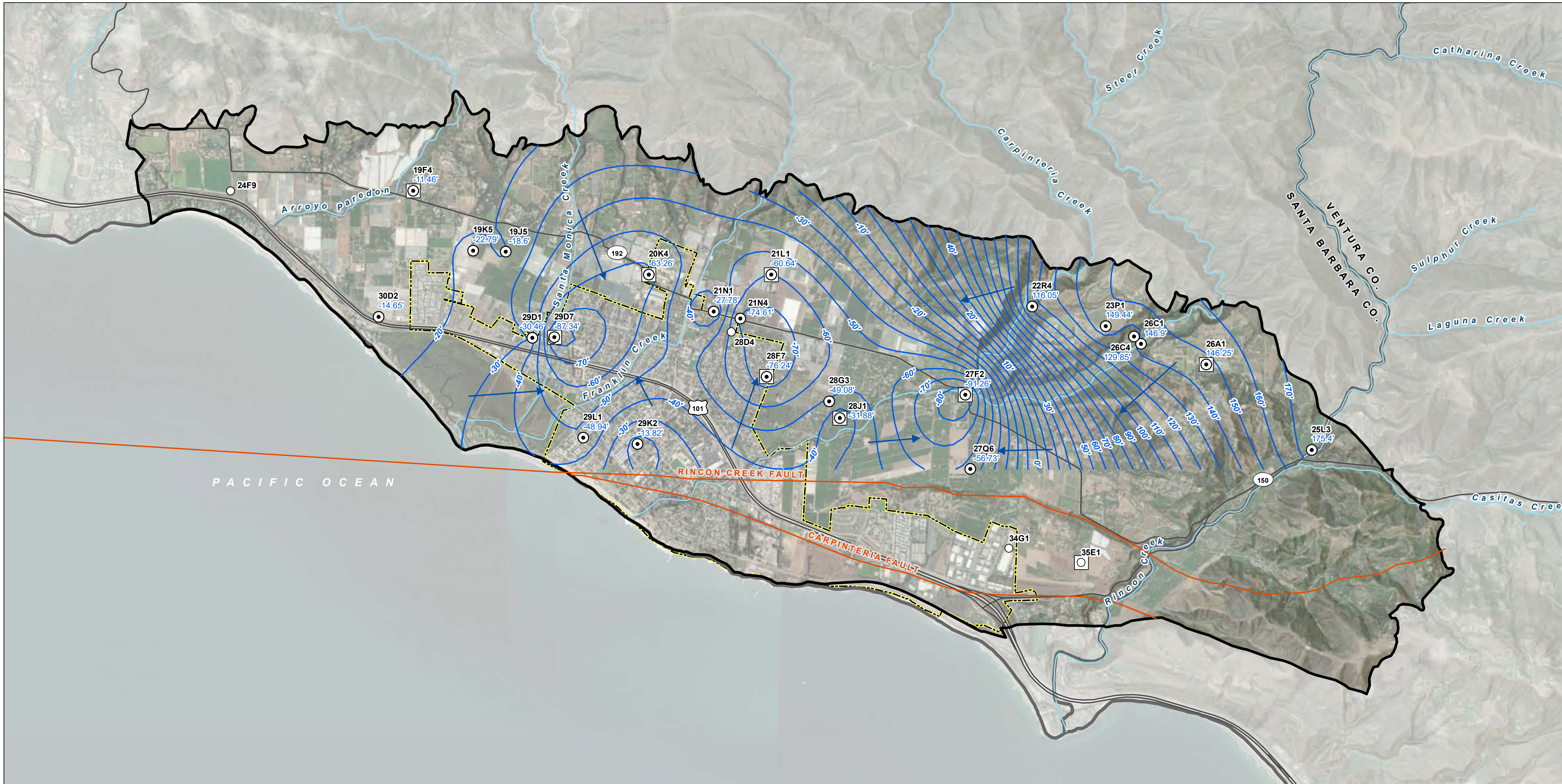
CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

FIGURE 7

Groundwater Elevation Contours - Spring 2021

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report



LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

0 1,500 3,000 4,500 feet

FIGURE 8

Groundwater Elevation Contours - Fall 2021

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

CARPINTERIA GSA GROUNDWATER SUSTAINABILITY AGENCY

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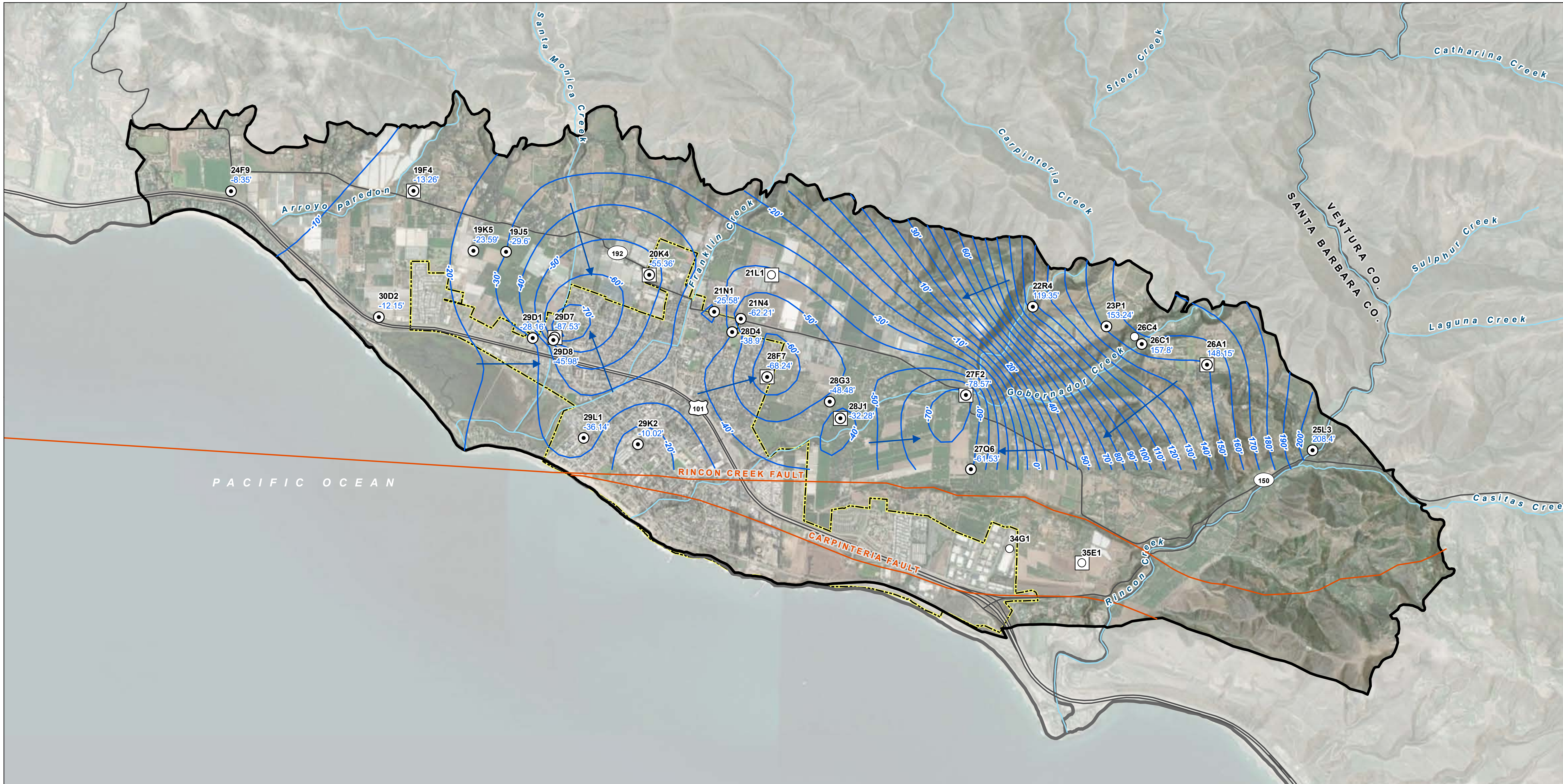

LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

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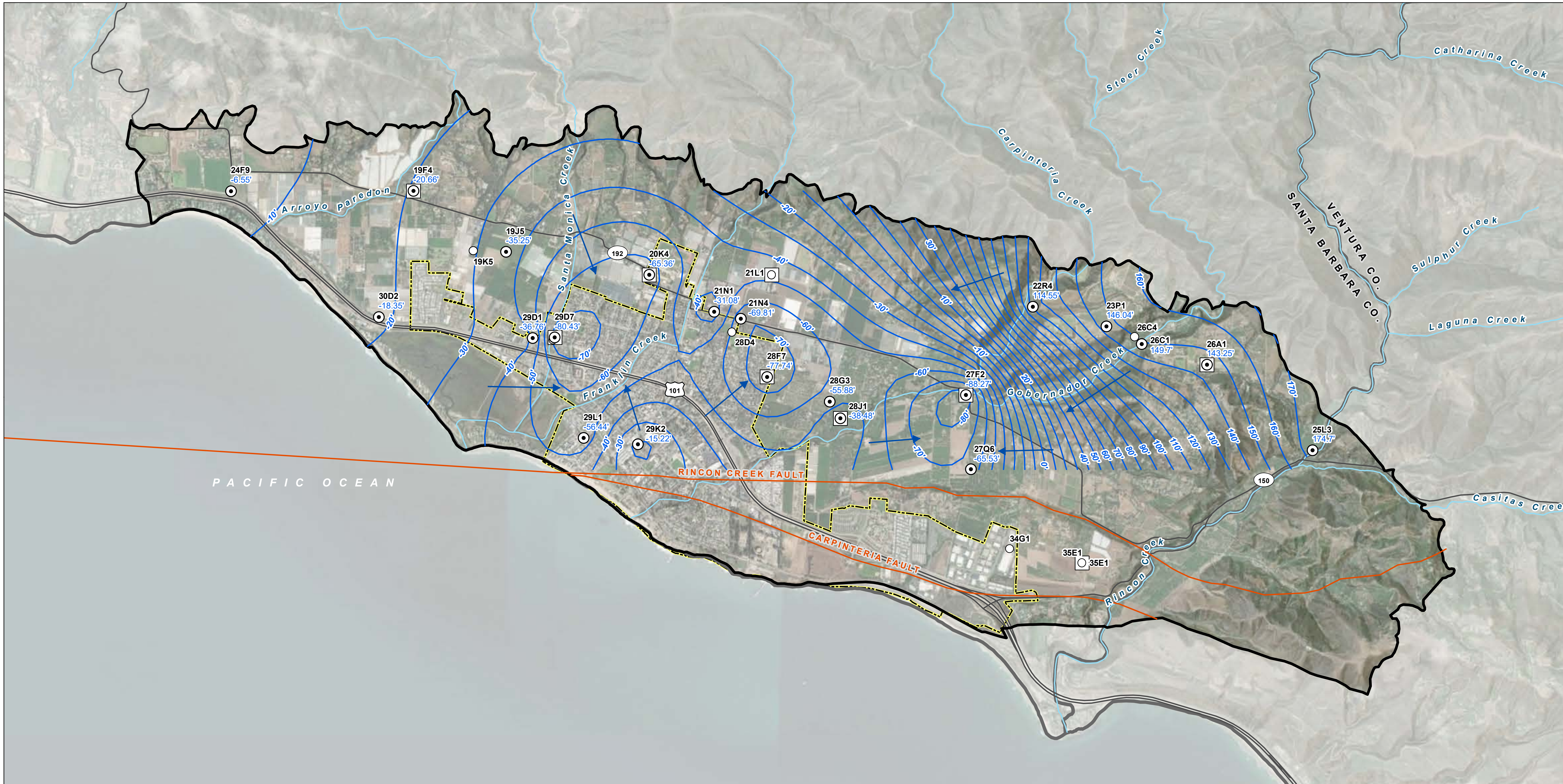
FIGURE 9

Groundwater Elevation Contours - Spring 2022

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report



LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

FIGURE 10

Groundwater Elevation Contours - Fall 2022

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

FIGURE 11

Groundwater Elevation Contours - Spring 2023

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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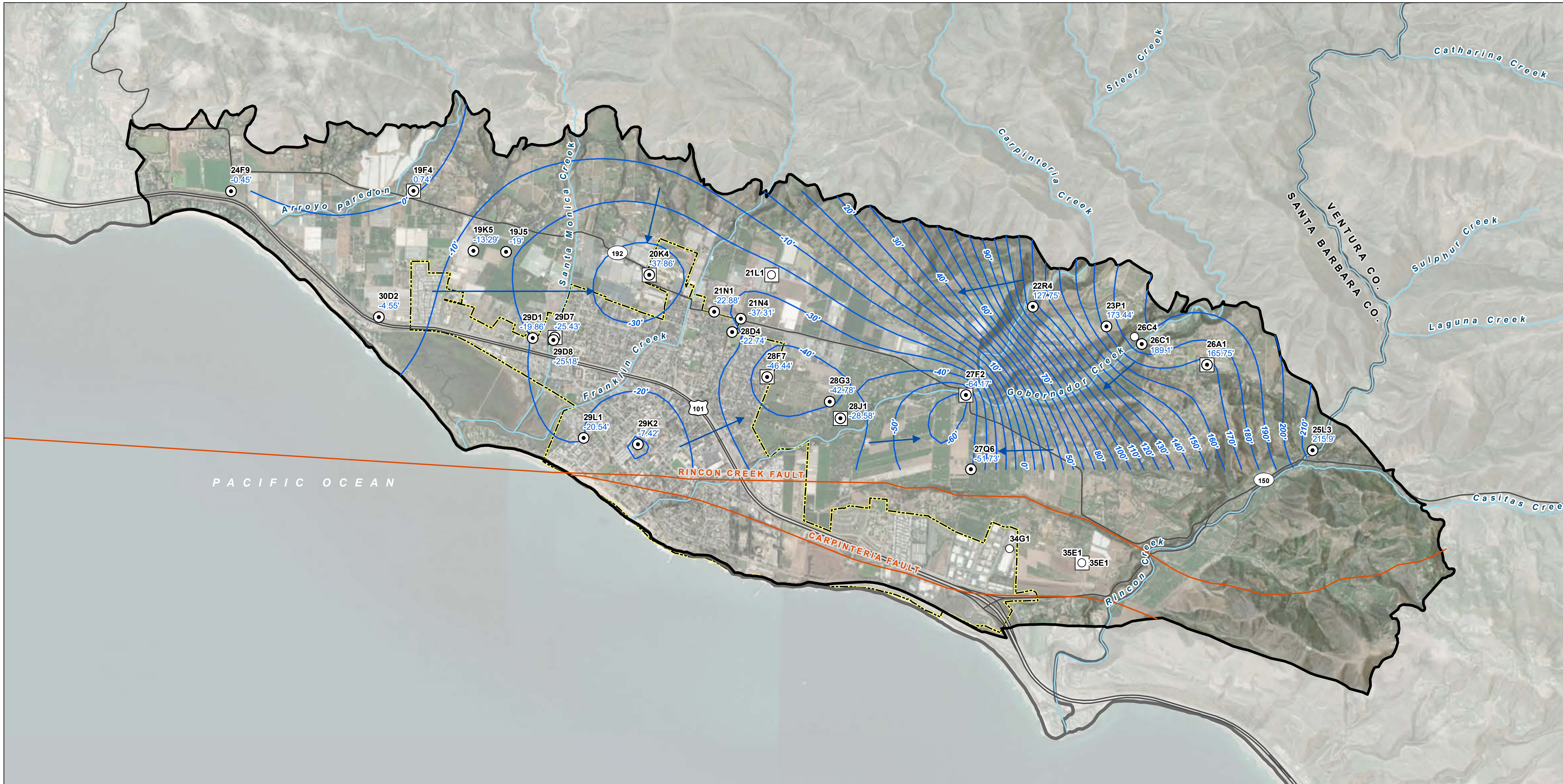

LEGEND

- Monitoring Well with Measurement for Contours
- Monitoring Well
- RMS Water Level Well
- Groundwater Elevation Contour, feet NAVD 88
- Groundwater Flow Direction
- Carpinteria Groundwater Basin

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

FIGURE 12

Groundwater Elevation Contours - Fall 2023

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

Document Path: Y:\2006_Carpinteria_Basin_GSA\Source_Figures\002_AnnualReport_21_23\Figure12_GW_Contours_Fall23.mxd, npalmer

SECTION 4: **Groundwater Extractions (§ 356.2[b][2])**

4.1 Introduction

This section presents the metered and estimated groundwater extractions from the Basin for WYs 2021 through 2023. The types of groundwater extraction in the Basin include CVWD municipal supply wells and approximately 50 to 170 private wells (industrial and agricultural supply). Each following subsection includes a description of the method of measurement and a qualitative level of accuracy for each estimate. The level of accuracy is rated on a qualitative scale of low, medium, and high. The annual groundwater extraction volumes for all water use sectors are shown in Table 2.

4.2 Municipal Well Metered Production Data

The municipal groundwater extractions documented in this report are metered data provided by CVWD. Metered groundwater pumping extraction data from the CVWD wells are reported as monthly total production from each of the CVWD wells. The data shown in Table 2 reflect the CVWD metered data for groundwater production during WYs 2021 through 2023. The accuracy level rating of these metered data is high.

4.3 Private Pumping Extraction Estimates

Private pumping in the Basin is not metered and has been estimated on an annual basis by CVWD since 1984 using land use survey and CVWD's water sales records. CVWD supplies imported water and/or local groundwater to numerous agricultural parcels of known acreage and crop type (e.g., avocados, cherimoyas, and open and covered nurseries). From these metered deliveries, unit use values (known by CVWD as "determining factors") for various crop types have been estimated each year since 1984. These unit use values have been combined by CVWD with land use acreage data to estimate private well production in the Basin. Existing land use designations in the Basin primarily include urban areas in the central portion of the Basin and southern boundary along the coastline, and agricultural areas in the western, northern, and eastern portions of the Basin. For the GSP, the CVWD estimates and assigns monthly pumping to individual private wells in the Basin by intersecting land use "determining factors," acreages of land use per parcel (Assessor Parcel Number [APN]), and well IDs by APN for each month from WYs 1985 to 2020. This same method was applied to estimate groundwater extraction from private wells for WYs 2021 through 2023. The accuracy level rating of the private pumping extraction estimates is medium.

4.4 Total Groundwater Extraction Summary

The data shown in Table 2 below reflect metered data for CVWD wells and estimated groundwater extraction for private wells in the Basin for WYs 2021 through 2023, with WY 2020 included for reference. Total groundwater extraction in the Basin for WYs 2021 through 2023 were estimated to be 5,840 acre-feet (AF), 6,928 AF, and 4,301 AF, respectively. The volume of groundwater extracted in WYs 2021 and 2022 were relatively higher, likely attributed to two consecutive critical dry years, while groundwater extraction during WY 2023 was relatively lower, likely attributed to above-average precipitation in the Basin. The amount of groundwater pumping in the Basin during WYs 2021 through 2023 has exceeded the historically estimated annual sustainable yield of about 3,600 to 4,000 acre-feet per year (AFY), as presented in the GSP (CGSA, 2023).

Table 2. Estimated Groundwater Extractions, Water Years 2020–2023

Water Year	Water Year Type	CVWD (AF)	Private Rural and Agricultural (AF)	Total (AF)
2020	Below Normal	888	4,437	5,325
2021	Critical	766	5,074	5,840
2022	Critical	2,117	4,811	6,928
2023	Wet	970	3,331	4,301
	Method of Measure:	Metered	Estimated by Land Use	—
	Level of Accuracy:	High	Medium	—

Notes

— = not applicable

AF = acre-feet

CVWD = Carpinteria Valley Water District

SECTION 5: **Surface Water Use (§ 356.2[b][3])**

5.1 Introduction

This section addresses the reporting requirement of providing surface water supplies used, or available for use, and describes the annual volume and sources for WYs 2021 through 2023. The CVWD imports surface water supplies from the Cachuma Project and the State Water Project (SWP). Imported water was first made available to the CVWD in 1956 from the Cachuma Project, and water from the SWP was first made available in 1997. Additionally, CVWD participates regularly in a SWP exchange program with the Santa Ynez Improvement District No. 1 (SYID #1), located downstream of Lake Cachuma. Under this exchange program, CVWD purchases SWP water and supplies it to SYID #1 for its use. In exchange, SYID #1 supplies an equal amount of Lake Cachuma water to CVWD.

The CVWD distributes imported water to commercial, industrial, institutional, residential, and agricultural customers within its boundaries. The CVWD's maximum local surface water allocation from the Cachuma Project is currently 2,813 AFY, while the long-term average is estimated to be approximately 1,970 AFY. Maximum allocation from the SWP is 2,200 AFY (including 200 AF of drought buffer), while the long-term average is estimated to be approximately 876 AFY (Woodard & Curran, 2021).

The water use sectors that apply imported surface water to meet beneficial uses in the Basin include the following:

- Urban
- Industrial
- Agricultural

5.2 Total Surface Water Use

CVWD maintains records of imported water supplies and deliveries in the Basin. A summary of CVWD's total surface water use from imported surface water supplies for WYs 2021 through 2023 is provided in Table 3. The accuracy level rating of these metered data is high.

Table 3. Total Imported Surface Water Use by Source

Water Year	Water Year Type	Cachuma Project (AF)	State Water Project (AF)	SYID #1 Exchange (AF)	Total Surface Water Use (AF)
2020	Below Normal	3,077	0	279	**3,356**
2021	Critical	3,308	512	231	**4,051**
2022	Critical	895	1,397	93	**2,385**
2023	Wet	2,229	0	99	**2,328**

Notes

AF = acre-feet

SYID #1 = Santa Ynez Improvement District No. 1

SECTION 6: **Total Water Use (§ 356.2[b][4])**

This section summarizes the total annual groundwater and imported surface water used to meet municipal, agricultural, and rural demands within the Basin. For WYs 2021 through 2023, the quantification of total water use was completed from reported metered municipal water production and metered surface water delivery, and from models used to estimate agricultural and rural water demand based on land use data and metered CVWD water supplies. Table 4 summarizes the total water use in the Basin by source and water use sector for WYs 2021 through 2023. The method of measurement and a qualitative level of accuracy for each estimate is rated on a qualitative scale of low, medium, and high.

Table 4. Total Water Use by Source and Water Use Sector, Water Years 2021–2023

Water Year	CVWD (AF)		Private Rural and Agricultural (AF)	Total (AF)
Source:	**Groundwater**	**Surface Water[1]**	**Groundwater**	**—**
2021	766	4,051	5,074	**9,891**
2022	2,117	2,385	4,811	**9,313**
2023	970	2,328	3,331	**6,629**
Method of Measure:	Metered	Metered	Estimated by Land Use and Water Deliveries	—
Level of Accuracy:	High	High	Medium	—

Notes

— = not applicable

AF = acre-feet

CVWD = Carpinteria Valley Water District

SECTION 7: Change in Groundwater in Storage (§ 356.2[b][5])

7.1 Annual Changes in Groundwater Elevation (§ 356.2[b][5][A])

The amount of groundwater in storage in the Basin generally reflects changes in groundwater elevations over time. Annual changes in groundwater elevation in the Basin for WYs 2021 through 2023 are derived from a comparison of fall groundwater elevation contour maps from one year to the next. For this analysis, fall 2021 groundwater elevation contours were subtracted from the fall 2020 groundwater elevation contours resulting in a map depicting the changes in groundwater elevations in SU-1 that occurred during WY 2021 (see Figure 13), fall 2022 subtracted from fall 2021 groundwater elevation contours for WY 2022 (Figure 14), and fall 2023 subtracted from fall 2022 groundwater elevation contours for WY 2023 (Figure 15).

As stated in Section 3, groundwater in the Basin is predominantly extracted from SU-1, and groundwater level data for SU-2 are insufficient to prepare annual groundwater elevation contour maps. Therefore, the change in groundwater in storage analysis is limited to SU-1 north of the Rincon Creek fault for the WYs 2021–2023 Annual Report. The groundwater elevation change maps presented in Figures 13 through 15 represent the difference in groundwater elevations between two snapshots in time, made approximately one year apart from fall to fall. Considering that groundwater elevations may fluctuate dynamically throughout each year in response to changing climatic conditions and groundwater pumping patterns, the specific patterns of 'higher' versus 'lower' water level areas shown on these figures may not necessarily be representative of Basin conditions occurring throughout the entire water year.

The groundwater elevation change map for WY 2021 (Figure 13) shows that water levels were generally lower over a majority of the basin compared to the previous fall, likely attributed to a critically dry year. The largest declines, upwards of 15 to 35 feet, were noted near the pumping centers in the central portion of the Basin in SU-1.

The groundwater elevation change map for WY 2022 (Figure 14) shows the water levels were generally lower over a majority of the Basin compared to fall of 2021; however, the magnitude of decline was less. This is likely attributed to a decrease in groundwater extraction during WY 2022 compared to WY 2021.

As shown in Figure 15, the groundwater elevation change map for WY 2023 shows the water levels generally increased over a majority of the Basin compared to fall of 2022, with estimated increases of upwards of 35 feet in localized pumping centers in the central portion of the Basin, and near areas of recharge in the eastern portion of the Basin. This is likely attributed to above average precipitation and a significant decrease in the volume of groundwater extraction during WY 2023 compared to the previous two water years.

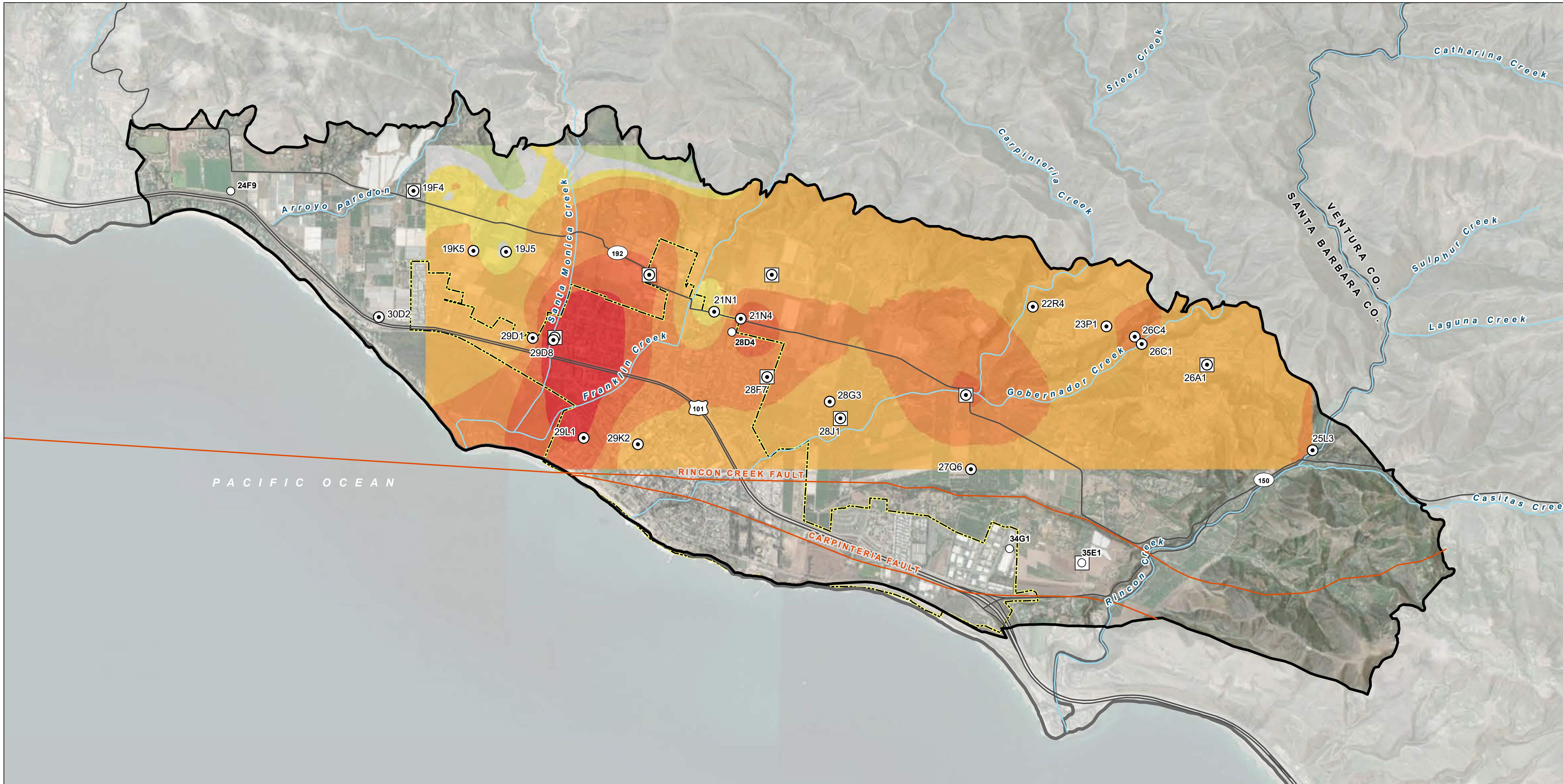

FIGURE 13

Change in Groundwater Elevation from Fall 2020 to 2021

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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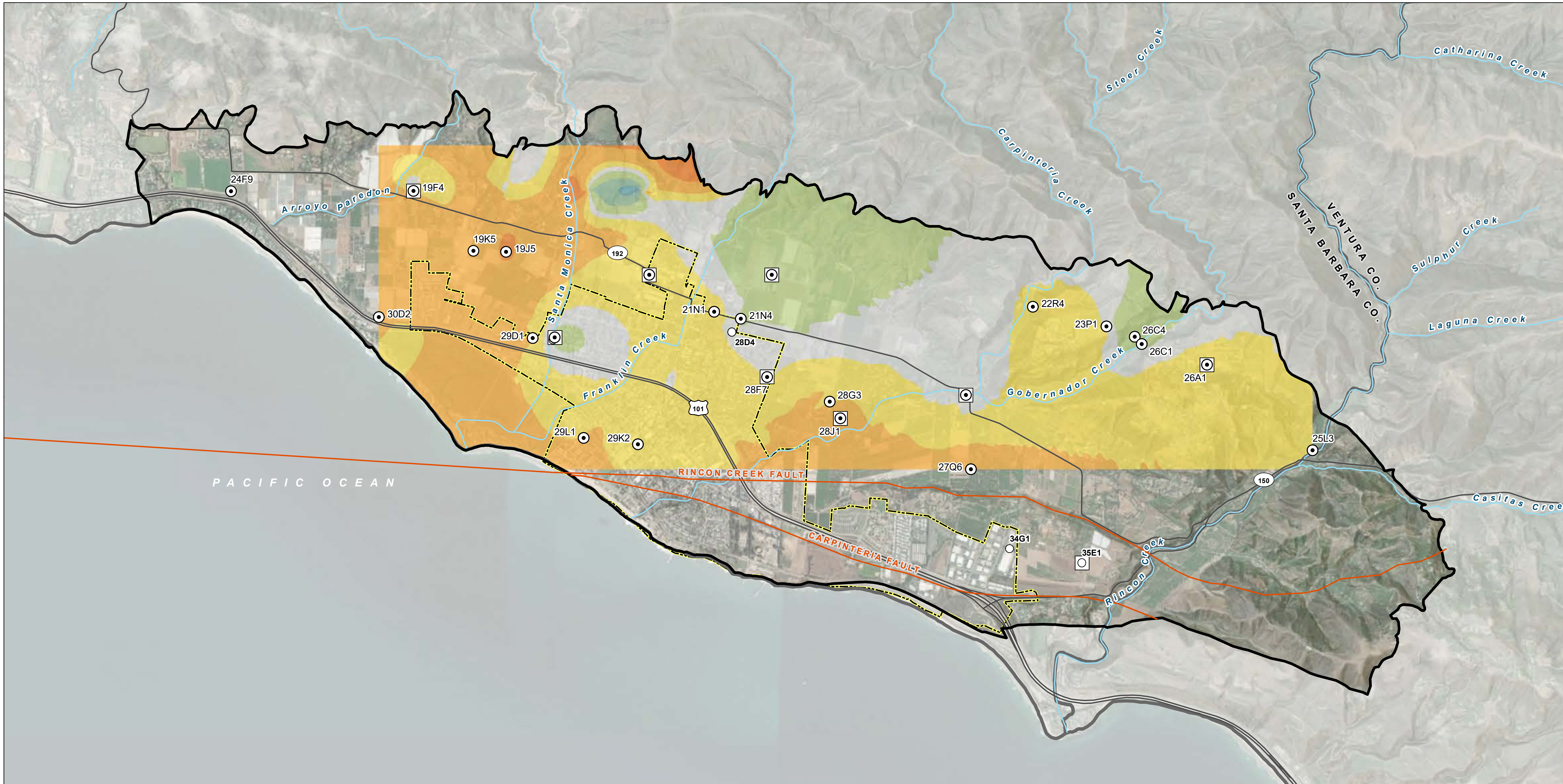


LEGEND

Monitoring Well with Measurement for Change Elevation

Monitoring Well

RMS Water Level Well

Carpinteria Groundwater Basin

Change in Groundwater Elevation (feet NAVD88)

- >35
- 25 to 35
- 15 to 25
- 5 to 15
- 0 to 5
- -5 to 0
- -15 to -5
- -25 to -15
- -35 to -25
- <-35

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500 feet

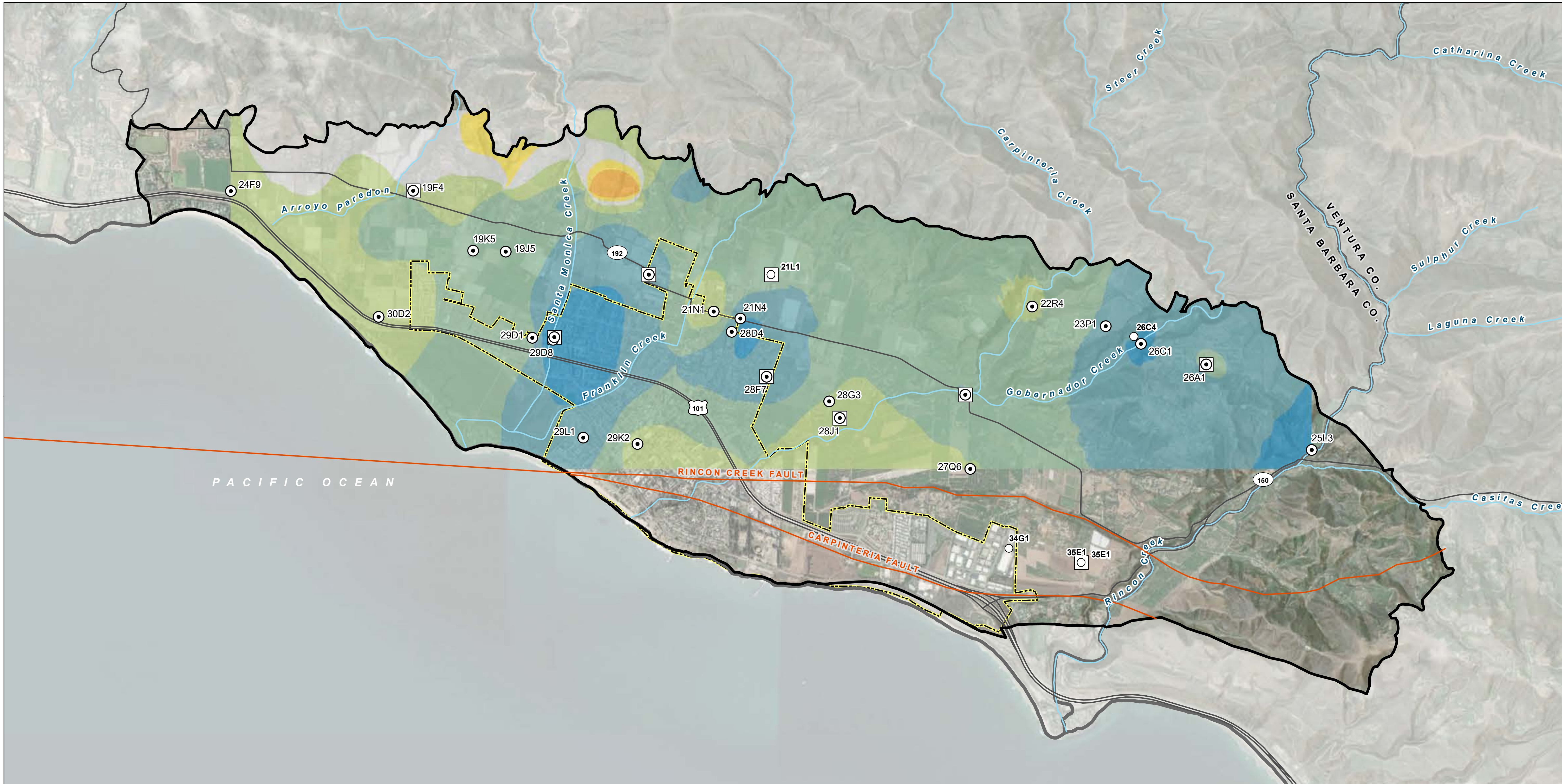
CARPINTERIA GSA GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

FIGURE 14

Change in Groundwater Elevation from Fall 2021 to 2022

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report



LEGEND

- Monitoring Well with Measurement for Change Elevation
- Monitoring Well
- RMS Water Level Well
- Carpinteria Groundwater Basin

Change in Groundwater Elevation (feet NAVD88)

- >35
- 25 to 35
- 15 to 25
- 5 to 15
- 0 to 5
- -5 to 0
- -15 to -5
- -25 to -15
- -35 to -25
- <-35

All Other Features

- City Boundary
- County Boundary
- Fault
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

FIGURE 15

Change in Groundwater Elevation from Fall 2022 to 2023

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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7.2 Annual and Cumulative Change in Groundwater in Storage Calculation (§ 356.2[b][5][B])

The groundwater elevation change maps presented above represent a volume change within SU-1 of the Basin for WYs 2021, 2022, and 2023. The volume changes were inferred from the differences in groundwater elevation contours from fall to fall in any given year and represent a total volume, including the volume displaced by the aquifer material and the volume of groundwater stored within the void space of the aquifer. The portion of void space in the aquifer that can be used for groundwater storage is represented by the aquifer storage (or specific yield) coefficient (Sy), a unitless factor, which is multiplied by the total volume change to derive the change in groundwater in storage.

Based on calibrated modeling work completed in the Basin for the GSP (Montgomery & Associates, 2023), the Sy values for model Layer 2 within SU-1, where the majority of groundwater production occurs, were used to estimate the total annual change in groundwater in storage for WYs 2021 through 2023.[4] The estimated annual changes of groundwater in storage calculated for WYs 2021, 2022, and 2023 are presented in Table 5.

Table 5. Estimated Annual Change in Groundwater in Storage in SU-1, Water Years 2021–2023

Water Year	Water Year Type	Annual Change in Groundwater in Storage in SU-1 (AF)
2021	Critical	-7,714
2022	Critical	-1,179
2023	Wet	12,071

Notes

AF = acre-feet

SU-1 = Storage Unit No. 1

The estimated 7,714 AF and 1,179 AF decreases in groundwater in storage for WYs 2021 and 2022, respectively, coincide with critically dry years during recent drought. The estimated 12,071 AF increase of groundwater in storage in WY 2023 shown in Table 5 is coincident with well above average precipitation in 2023 (29.35 inches). Comparison of annually tabulated precipitation, total groundwater extractions, and surface water delivery data reveals a close correlation to the annual change in groundwater in storage in the Basin. Specifically, years with well above average precipitation are typically associated with years of large increases in groundwater in storage, as documented in the GSP. Conversely, nearly all below average precipitation years are associated with years of decline in groundwater in storage.

While the values of Sy used in the groundwater elevation change method are based on detailed modeling developed for the Basin and using the best readily available information, it is necessary to acknowledge that the Sy values in the Primary Aquifer are spatially variable across the Basin (as indicated in the GSP groundwater model). This, coupled with interpolation of groundwater elevation contouring through data gap areas in the groundwater level monitoring network (see Section 2.4.1) contributes to a moderate amount of method uncertainty.

[4] Appendix F includes derivation of the S values from the calibrated groundwater model developed for the Basin for the GSP.

SECTION 8: **Water Quality and Land Subsidence**

8.1 Water Quality

Groundwater quality in the Basin is generally suitable for both drinking water and agricultural purposes, with some localized water quality impairments for elevated nitrate and TDS. Five COCs were identified and discussed in the GSP (CGSA, 2023) that have the potential to be impacted by groundwater management activities, including arsenic, boron, chloride, nitrate, and salinity (as indicated by TDS). As provided in Table 6, the CGSA developed MTs for each COC to provide a sustainability indicator for water quality degradation. For the water quality sustainability indicator, an undesirable result may occur if:

> *"…for any 5-year period during SGMA implementation, an increase in groundwater quality minimum threshold exceedances is observed at 33-percent or more of the representative monitoring sites in the Basin, in relation to 2015 basin conditions."*

Table 6. Minimum Thresholds for Water Quality Degradation Sustainability Indicator

Constituent	MT	Rationale
Arsenic	10 µg/L	MCL is the federal regulation for drinking water; CVWD is the only potable water supplier in the Basin
Nitrate (as N)	10 mg/L	MCL is the federal regulation for drinking water; CVWD is the only potable water supplier in the Basin
TDS	1,000 mg/L	MT set at SMCL
Chloride	142 mg/L	MT set at the Basin Plan's "no problem" agricultural threshold
Boron	0.75 mg/L	MT set at Basin Plan agricultural threshold for other coastal basins

Notes

µg/L = micrograms per liter

Basin = Carpinteria Groundwater Basin

CVWD = Carpinteria Valley Water District

MCL = maximum contaminant level

mg/L = milligrams per liter

MT = minimum threshold

N = nitrogen

SMCL = secondary maximum contaminant level

TDS = total dissolved solids

For this WYs 2021–2023 Annual Report, trends of concentrations for the COCs were analyzed through WY 2023 using water quality data provided by CVWD. However, water quality data for arsenic in the Basin are not readily available, and therefore, historic or current trends for arsenic could not be assessed at this time. Figure 16 presents chemographs of boron, chloride, nitrate, and TDS concentrations in RMS water quality network wells (three other RMS wells in the network are the El Carro Park monitoring wells [28D5/D6/D7] that were recently constructed in 2023 and data are currently unavailable). Chemographs for all wells within the groundwater quality monitoring network are included in Appendix E. The chemographs illustrate concentrations of these COCs in the wells over time, and also include the defined MT for each COC, where applicable, for the water quality degradation sustainability indicator.

The chemographs show that boron, chloride, nitrate (as N) and TDS concentrations have historically and recently been below their respective MTs in the RMS water quality network wells. It is important to note that elevated nitrate concentrations have been documented in the central portion and eastern portion of the Basin where legacy land use is predominantly agricultural. Additionally, chloride and TDS concentrations show increasing trends since 2015 in RMS Well 29D8, located in the western portion of the Basin near Highway 101. Continual monitoring of chloride and TDS will be important to monitor for seawater intrusion (discussed in Section 8.2 below).

Recent water quality data for three RMS wells (20K4, 29D7, and 28F7) are not available. The CVWD is considering sampling these wells in the future.

Implementation of sustainability projects and/or management actions, as presented in the GSP, in this WYs 2021–2023 Annual Report, or in future reports or GSP updates, are not anticipated to result in degraded groundwater quality in the Basin. Any potential changes in groundwater quality will be documented in future annual reports and GSP updates.

8.1.1 Sentinel Wells

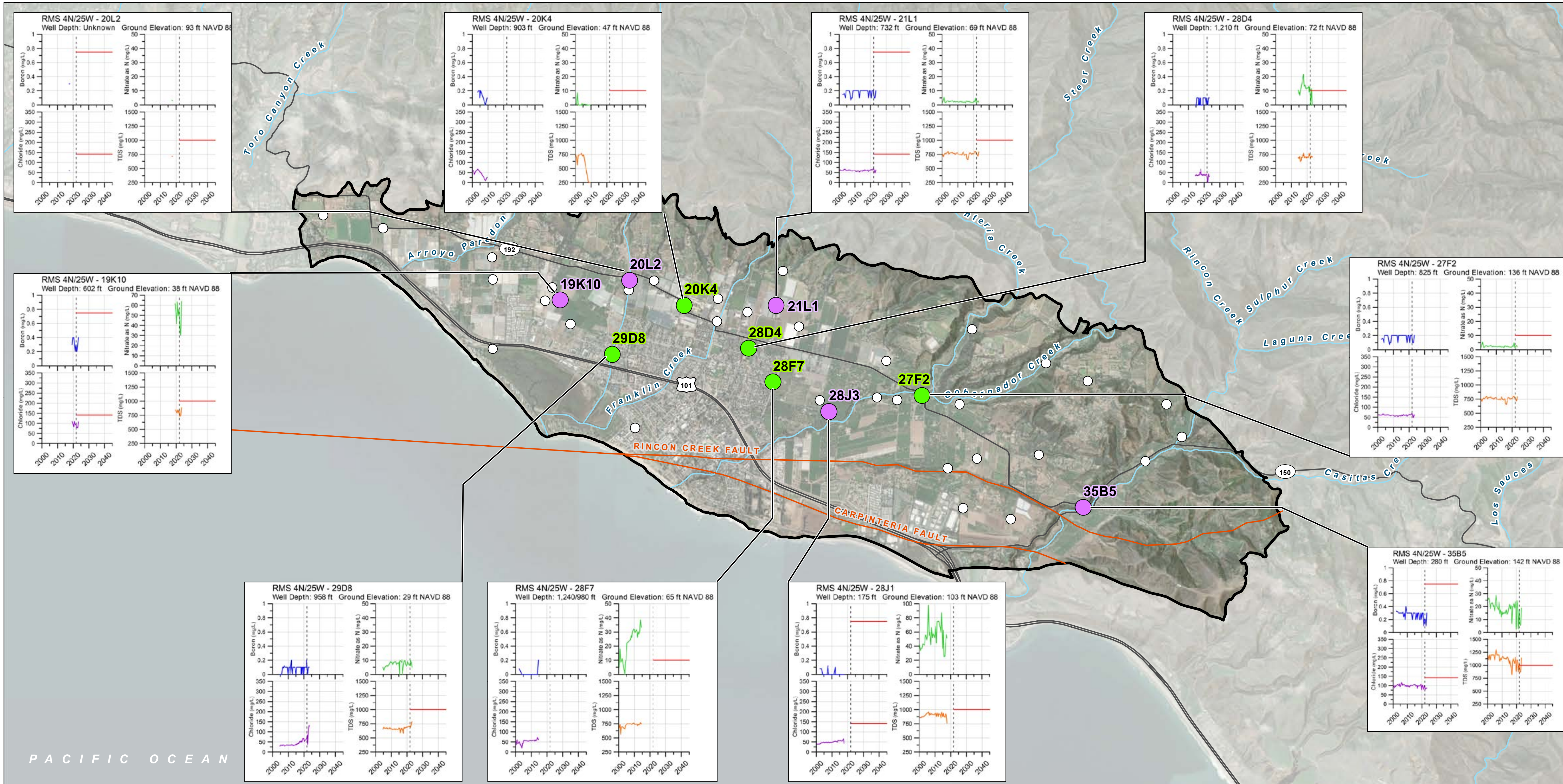
In 2019, the CVWD constructed a set of three nested monitoring wells screening the A, B, and C zones of the Basin Aquifer for the purpose of characterizing groundwater salinity and the potential incidence of seawater intrusion along the coast. These wells are referred to collectively as the Sentinel Wells. Data collected from the Sentinel Wells are presented in Figures 17, 18, and 19.

Figure 17 displays conductivity, chloride, and groundwater elevation data for Sentinel Well MW-1 (C Zone). Initial data collected upon well installation in 2019 indicated chloride concentrations below 250 milligrams per liter (mg/L). Since 2019, conductivity readings and chloride concentrations have trended upward. Recent (2023) chloride concentrations have exceeded 2,500 mg/L.

Figure 18 displays conductivity, chloride, and groundwater elevation data for Sentinel Well MW-2 (B Zone). Chloride concentrations in this well have varied significantly, with no discernible trends evident. During recent periods of pumping at the CVWD Headquarters and El Carro wells in 2021–2022, chloride concentrations were well below 250 mg/L. The sample collected in February 2023 had a chloride concentration of over 1,400 mg/L, but the sample collected in August 2023 had a chloride concentration below 250 mg/L. So, in contrast to Well MW-1 in the C Zone, there is no trend of increasing salinity in Well MW-2.

Figure 19 displays conductivity, chloride, and groundwater elevation data for Sentinel Well MW-3 (A Zone). Chloride concentrations have consistently been stable and below 50 mg/L since the construction of this well in 2019.

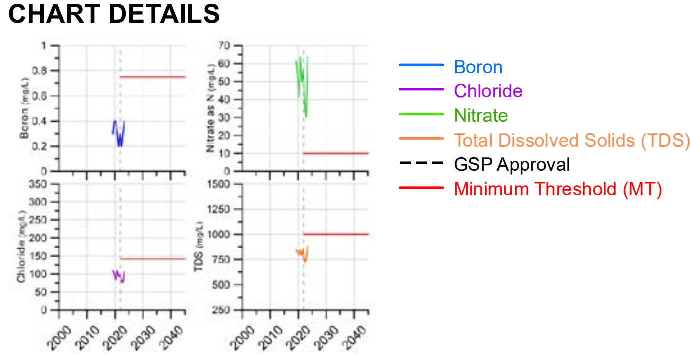
Figure 20 displays the results of geophysical induction logs that have been performed in the Sentinel Wells on a quarterly basis since their installation in 2019. These results confirm the laboratory data just discussed, with A Zone induction results remaining relatively stable, B Zone results displaying variability but with indications of increasing trends over time, and C Zone results displaying increasing salinity over time.



LEGEND

- Chloride, Boron, and TDS RMS Well
- Arsenic and Nitrate RMS Well
- Water Quality Monitoring Well
- Carpinteria Groundwater Basin
- Fault
- Major Road
- Watercourse

CHART DETAILS



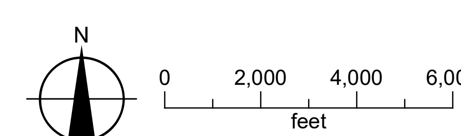


FIGURE 16

Chemographs for Groundwater Quality Monitoring Network

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

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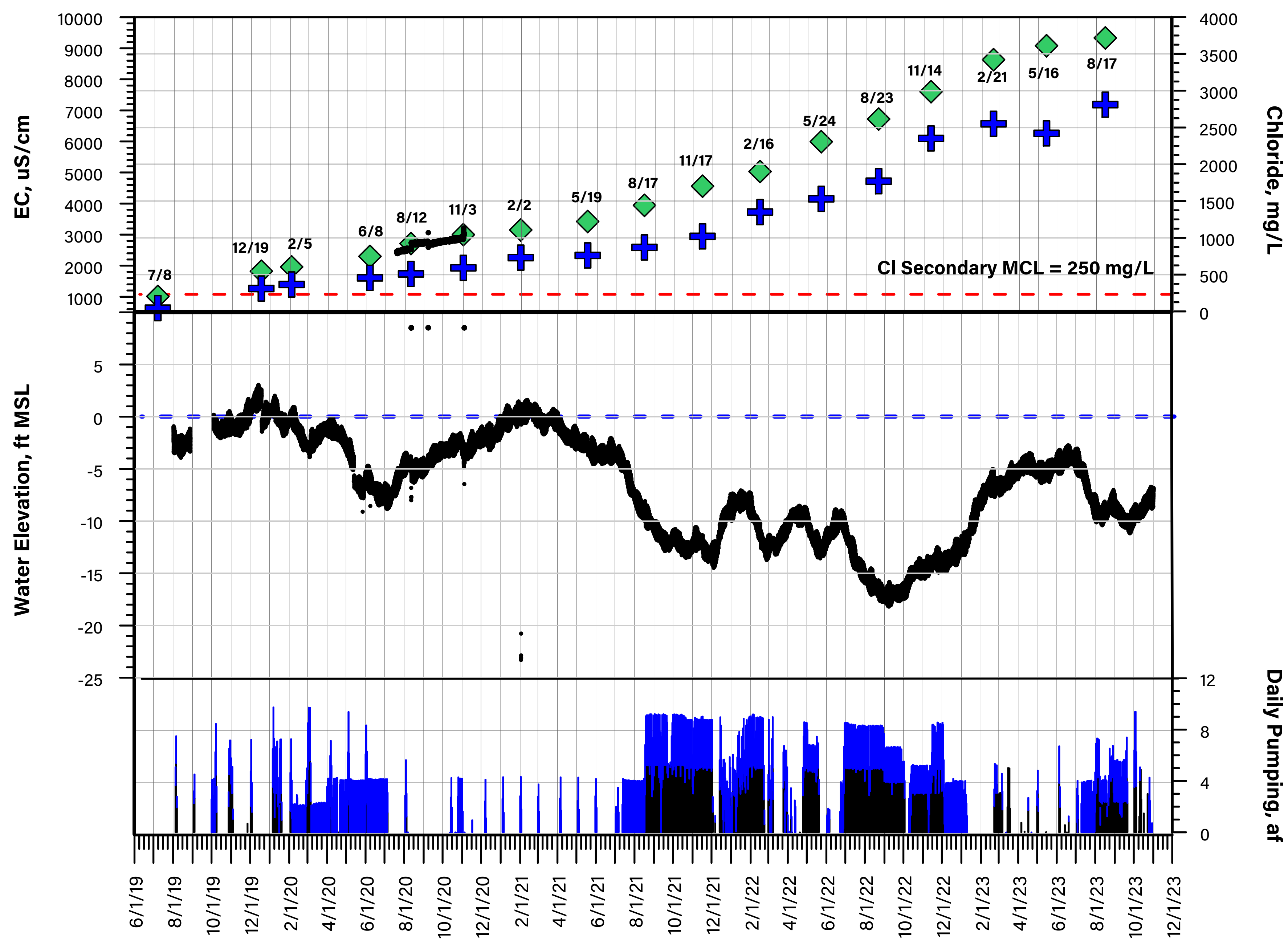


LEGEND

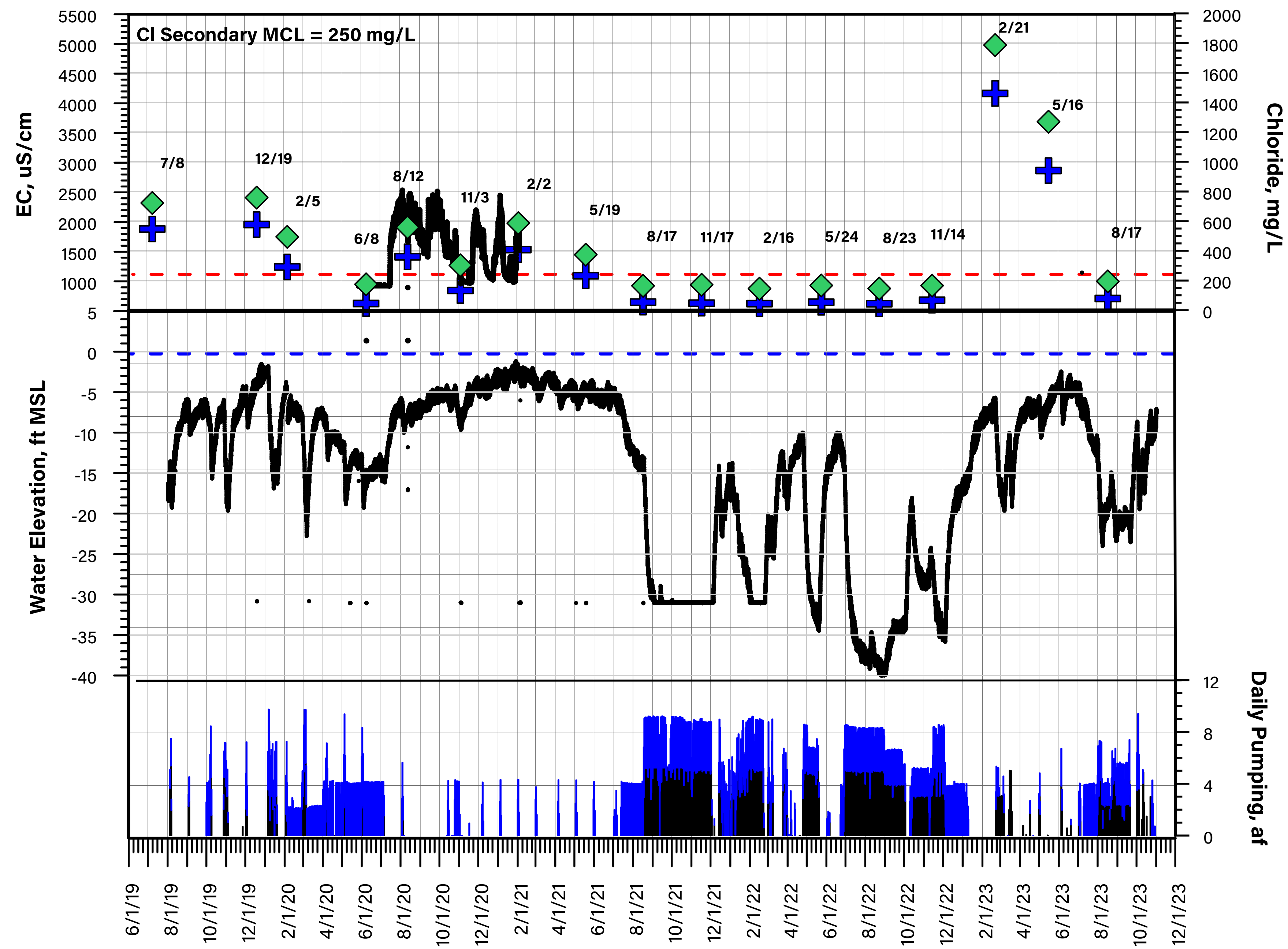
- Cl Lab
- EC Lab
- EC Probe
- Dry
- Critical

FIGURE 17

CVWD Sentinel Well MW-1 (C Zone)

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

GSI Water Solutions, Inc.



LEGEND
- Cl Lab
- EC Lab
- EC Probe
- Dry
- Critical

FIGURE 18

CVWD Sentinel Well MW-2 (B Zone)

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

GSI Water Solutions, Inc.

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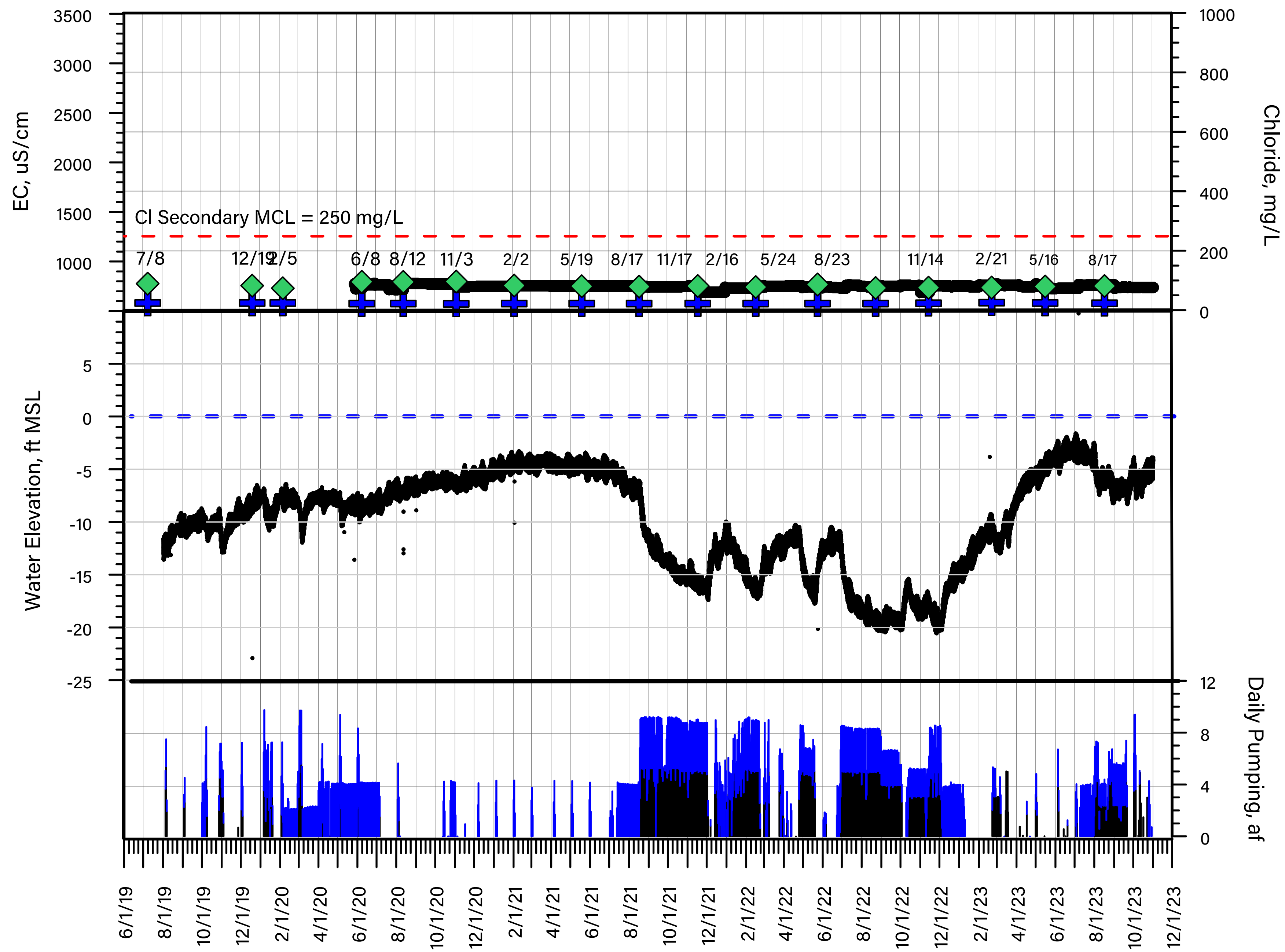

LEGEND

- Cl Lab
- EC Lab
- EC Probe
- Dry
- Critical

FIGURE 19

CVWD Sentinel Well MW-3 (A Zone)

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

GSI Water Solutions, Inc.

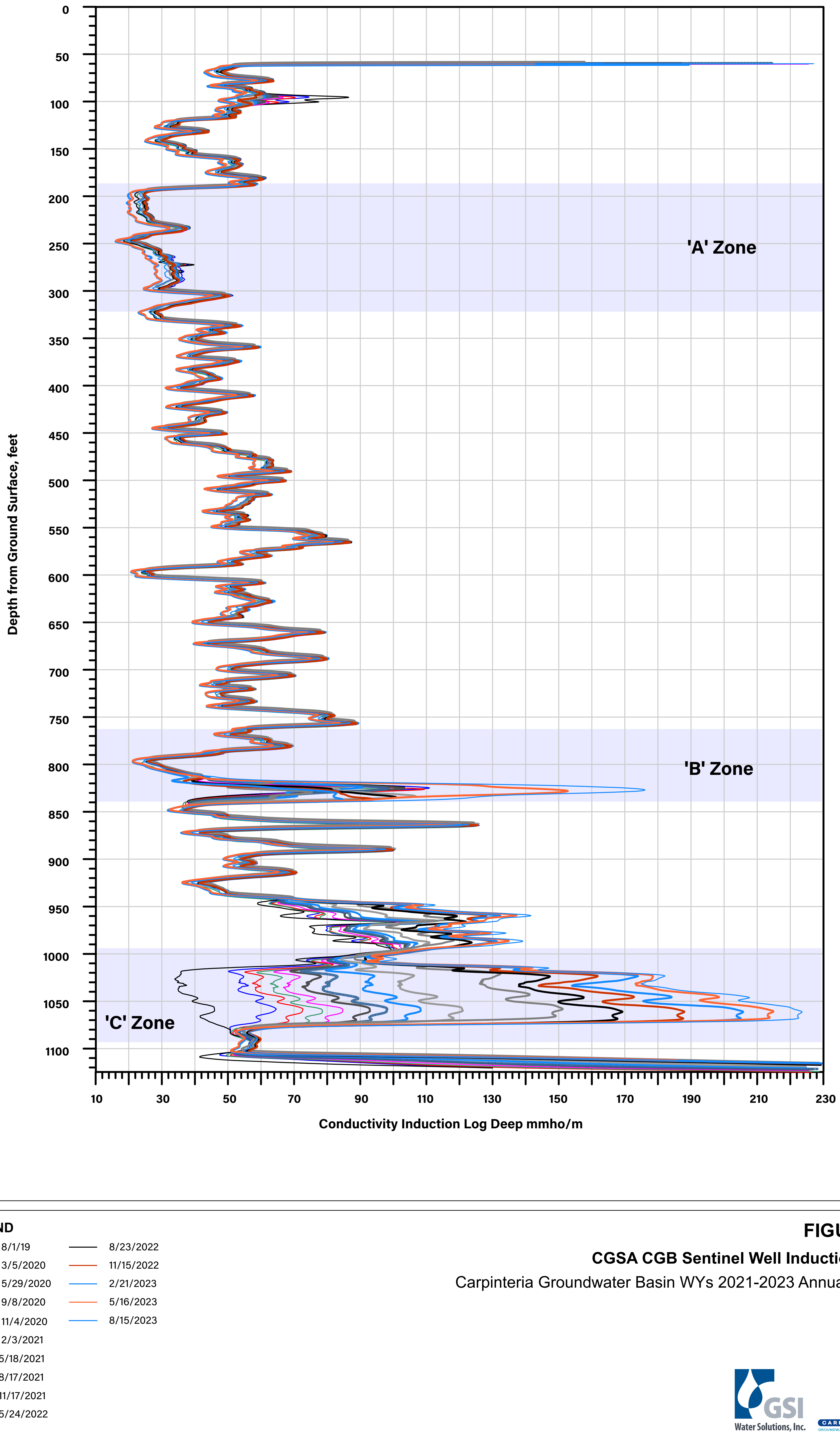

FIGURE 20

CGSA CGB Sentinel Well Induction Logs

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

GSI Water Solutions, Inc.

CARPINTERIA GSA GROUNDWATER SUSTAINABILITY AGENCY

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8.2 Seawater Intrusion

As discussed in Section 8.1.1, the Sentinel Wells data indicate recent evidence of seawater intrusion in the Basin, although the data are confined to that single location near the shoreline in the western portion of SU-1. The CGSA has established that undesirable results may occur in the Basin if:

> *"Seawater moving inland to the point where groundwater produced from currently active wells exhibits increased concentrations of chloride above the established secondary maximum contaminant level (SMCL) for drinking water of 250 parts per million (ppm)."*

Figure 21 illustrates a chloride isocontour (250 ppm) map and proposed RMS wells for seawater intrusion that the CGSA will use to monitor and assess for seawater intrusion. Water quality data for wells in the monitoring network indicate that chloride concentrations across the Basin are predominantly lower than the secondary maximum contaminant level (SMCL) for chloride of 250 mg/L. One of the two notable exceptions includes the area in the western part of the Basin in the vicinity of Arroyo Paredon, which exhibits significantly elevated chloride concentrations in comparison to the rest of the Basin. However, this trend has been observed as part of the basin characterization of ambient groundwater quality likely associated with poor surface water quality in Arroyo Paredon Creek and is not considered to be a result of seawater intrusion.

As of publication of the GSP (December 2023), seawater intrusion is not known to have impacted any active wells in the Basin. The CGSA will continue to conduct groundwater monitoring along the coast in the western portion of the Basin to monitor for and to manage the potential for seawater intrusion in the Basin and will assess chloride concentrations to the sustainability indicator in subsequent annual reports. Additional seawater intrusion monitoring points are planned to be added to the seawater intrusion monitoring network in the future, during implementation of the GSP.

8.3 Land Subsidence

Land subsidence is the gradual (or sudden) lowering of the land surface. Several human-induced and natural causes of subsidence may exist, but the only process applicable to SGMA are those due to permanently lowered ground surface elevations caused by groundwater extraction. Subsidence can be estimated using data derived from InSAR data provided by DWR. InSAR measures ground elevation using microwave satellite imagery data. According to Towill, Inc. (2023) there is a potential error of +/- 18 millimeters, or 0.059 feet associated with the InSAR measurement and reporting methods. Therefore, an InSAR measured land surface change of less than 0.059 feet is within the noise of the data and is equivalent to no evidence of subsidence.

The GSP documents minor total vertical displacement of between -0.129 and 0.0034 feet in the Basin during the period from June 2015 to July 2022, with the highest displacement occurring in the central portion of the Basin, east of the City of Carpinteria (CGSA, 2023). Review of recent InSAR data from the DWR SGMA Data Viewer indicates that no measurable subsidence (within the method of error) has occurred in the Basin on an annual basis between June 2021 and June 2023.

The GSP established MTs for InSAR measured land subsidence as:

> *"…No more than 0.1 foot in any single year and a cumulative 0.5 foot in any five-year period," as measured using InSAR data between June of one year and June of the subsequent year."* (CGSA, 2023)

Although minor land subsidence was documented during the 5-year period of June 2016 to July 2022, neither of these results indicate an undesirable result as specified by the land subsidence MTs. The CGSA will continue to assess and report annual land subsidence in subsequent annual reports.

LEGEND

- CVWD District Well
- Proposed RMS Well (Active)
- Proposed Monitoring Well
- Existing Monitoring Well
- Active Well
- CVWD Database Well
- MT Isocontour at 250 mg/L

Maximum Chloride Concentration in mg/L (2015 - 2021)

- < 100
- 101 - 150
- 151 - 200
- 201 - 250
- 251 - 500
- > 500

All Other Features

- Carpinteria Groundwater Basin
- Montecito Groundwater Basin
- Carpinteria Valley Water District Service Area
- City Boundary
- County Boundary
- Railroad
- Major Road
- Watercourse

N

0 1,500 3,000 4,500
feet

FIGURE 21

Seawater Intrusion Isocontour SMC

Carpinteria Groundwater Basin WYs 2021-2023 Annual Report

CARPINTERIA GSA GROUNDWATER SUSTAINABILITY AGENCY

GSI Water Solutions, Inc.

SECTION 9: Progress towards Basin Sustainability (§ 356.2[c])

9.1 Introduction

This section describes the projects and management actions that the CGSA believes will, when implemented, help the Basin attain sustainability in accordance with § 354.42 and § 354.44 of SGMA regulations. The concepts for the proposed projects and management actions were developed during working sessions with GSA staff, meetings with the Carpinteria GSA Technical Coordination Committee, meetings with the GSA Groundwater Sustainability Public Advisory Committee, and in public workshops between April and August of 2023.

9.2 Basin-Wide Projects and Management Actions

9.2.1 Introduction

The Carpinteria GSA has developed a portfolio of potential projects and management actions that are in process in the Basin to attain sustainability. These projects and actions include capital projects and non-structural policies intended to reduce or optimize local groundwater use. Some of these projects were described in concept in the GSP and are categorized as Tier 1 and Tier 2 projects. Tier 1 projects are priority projects expected to be implemented within the first 5-year SGMA implementation period. Tier 2 projects are non-priority and will be evaluated and ranked during the first 5-year period for potential future implementation.

As outlined in the GSP, the proposed Tier 1 and Tier 2 projects are planned to include:

Tier 1 Projects

- Carpinteria Advanced Purification Project (CAPP)
- Sentinel Monitoring Well Network Expansion Project
- Local Infrastructure Water System Interties

Tier 2 Projects

- Carpinteria Seawater Intrusion Barrier Project
- Aquifer Storage and Recovery Projects
- Recharge Enhancement Projects (Recharge Basins and Creek De-lining)
- Local Inter-Agency Water Delivery and Water Banking Agreements
- Supporting the health of groundwater-dependent ecosystems in the Basin

Based on the results of the analysis performed in conjunction with the development of GSP, the CGSA concludes that the sustainability goals described in the GSP and required under the provisions of SGMA can be achieved through the implementation, as needed, of the Tier 1 projects, and some combination of and management actions. The CGSA does not plan at this time to implement any of the Tier 2 projects.

Management actions will be evaluated on an individual basis after GSP adoption and implemented accordingly under the direction of the CGSA. The six management actions described in the GSP and outlined below will be evaluated for cost and efficacy early in the initial 5-year SGMA implementation period, and implemented as determined appropriate by the CGSA:

- Administrative Approach and Implementation Timing
- Permitting of Wells
- Annual Reporting
- Five-Year Plan Evaluation and Update
- Management Action Implementation
- CGSA Annual Budget Estimates
- Funding Sources

9.3 Summary of Progress towards Meeting Basin Sustainability

Since the recent submittal of the GSP in January 2024, there has not been sufficient time to achieve significant progress on the proposed projects and management actions. Actions are underway to collect data, improve the monitoring and data collection networks, and coordinate with affected agencies and private landowners throughout the Basin to develop solutions that address the shared mutual interest in the Basin's overall sustainability goal. The following actions represent changes since the completion of the GSP.

9.3.1 Adoption and Submittal of the GSP to DWR

The GSP was finalized and unanimously adopted by the CGSA on January 24, 2024. The adopted GSP was submitted to DWR for review, and DWR's determination of the GSP is currently pending.

9.3.2 El Carro Well Monitoring Well Installation

A significant addition to the Basin monitoring network was recently completed with the construction of three clustered monitoring wells monitoring the A, B, and C-zones of the Basin Aquifer. These wells are located in El Carro Park in the City of Carpinteria.

9.3.3 CAPP Funding Developments

As described in the GSP, the CAPP has been in development for the past several years. It is an Indirect Potable Reuse Project intended to inject advanced treated wastewater into the Basin Aquifer for later recovery by the CVWD. Since the submittal of the GSP in January 2024, the CVWD has learned that a portion of the DWR grant funding that had been earmarked for this project by the State Water Resources Control Board (SWRCB) has become unavailable as part of the State's management of recent budget shortfalls. This loss of planned funding, in addition to cost escalation indicated by a recently updated engineer's cost estimate, may have the effect of slowing the schedule of planned implementation of this project.

9.3.4 Other Tier 1 Projects

The other Tier 1 projects discussed in the GSP are (1) the Sentinel Monitoring Well Network Expansion Project and the (2) Local Infrastructure Water System Interties Project. There has not been adequate time since the submission of the GSP to make significant progress on these projects.

9.3.5 Summary of Changes in Basin Conditions

Groundwater elevations and the change in volume of groundwater in storage observed in the Basin during WY 2023 are generally higher than the previous two WYs 2021 and 2021, due to above-average rainfall conditions during the winter of 2022/2023 and reduction in groundwater extraction across the Basin. Groundwater elevations in the RMS wells were generally stable in WYs 2021 through 2023; however, groundwater pumping continues to exceed the estimated sustainable yield of the Basin, and the projects and management actions described in the GSP and in this WYs 2021–2023 Annual Report will be necessary to bring the Basin into sustainability.

9.3.6 Summary of Impacts of Projects and Management Actions

Additional time will be necessary to judge the effectiveness and quantitative impacts of the projects and management actions either now underway or in the planning and implementation stage. However, it is clear that the actions in place and as described in this WYs 2021–2023 Annual Report are a good start towards reaching the sustainability goals laid out in the GSP. It is too soon to judge the observed changes in Basin conditions against the interim goals outlined in the GSP, but the anticipated effects of the projects and management actions now underway are expected to significantly affect the ability of the Basin to reach the necessary sustainability goals.

SECTION 10: **References**

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APPENDICES

APPENDIX A

Sustainable Groundwater Management Act
Groundwater Sustainability Plan Regulations for Annual Reports

§ 356.2. Annual Reports

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.

(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

(5) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

Note: Authority cited: Section 10733.2, Water Code.

Reference: Sections 10727.2, 10728, and 10733.2, Water Code.

APPENDIX B

Historical Annual Precipitation Data – Carpinteria Fire Station

Monthly Precipitation Record (WY 1949-2023)
Carpinteria Basin - Carpinteria Fire Station No. 208

Data Source: **Santa Barbara County Flood Control District (SBCFCD)**
https://files.countyofsb.org/pwd/hydrology/historic%20data/rainfall/208dailys.pdf

Monthly Precipitation Data (inches):

Water Year	WY Type	Oct.	Nov.	Dec.	Jan	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	TOTAL
1949		0.00	0.00	2.63	1.43	1.12	1.89	0.18	1.29	0.09	0.00	0.00	0.00	8.63
1950		0.00	2.42	3.12	2.24	2.73	1.18	0.38	0.00	0.13	0.09	0.00	0.63	12.92
1951		0.61	1.30	0.29	1.89	1.27	0.56	1.46	0.00	0.00	0.00	0.09	0.00	7.47
1952		0.80	1.82	4.87	10.75	0.04	6.40	2.02	0.00	0.00	0.00	0.00	0.00	26.70
1953		0.00	3.56	4.63	1.51	0.00	1.13	1.53	0.00	0.00	0.00	0.00	0.00	12.36
1954		0.00	2.32	0.13	5.57	2.39	3.88	0.34	0.00	0.00	0.00	0.00	0.00	14.63
1955		0.00	1.56	1.56	4.41	2.00	0.31	2.71	0.54	0.00	0.00	0.00	0.00	13.09
1956		0.00	1.47	5.27	6.94	0.73	0.00	2.52	1.00	0.00	0.00	0.00	0.00	17.93
1957		0.07	0.00	0.27	4.10	3.08	0.44	1.57	0.92	0.00	0.00	0.00	0.00	10.45
1958		1.52	0.71	4.45	2.75	7.80	5.79	5.05	0.28	0.00	0.00	0.00	1.06	29.41
1959		0.00	0.00	0.07	1.96	4.15	0.00	1.18	0.00	0.00	0.00	0.00	0.00	7.36
1960		0.00	0.00	0.81	3.21	3.32	1.12	1.94	0.00	0.00	0.00	0.00	0.00	10.40
1961		0.05	6.35	0.00	1.16	0.04	0.62	0.00	0.00	0.00	0.00	0.00	0.18	8.40
1962		0.00	2.61	1.00	2.33	16.99	1.27	0.00	0.00	0.00	0.00	0.00	0.00	24.20
1963		0.49	0.00	0.00	0.89	5.93	3.68	2.57	0.27	1.02	0.00	0.00	1.87	16.72
1964		1.02	3.29	0.00	1.51	0.00	1.78	2.29	0.09	0.00	0.00	0.00	0.00	9.98
1965		0.78	2.14	4.57	1.02	0.59	2.18	7.44	0.14	0.06	0.00	0.00	0.19	19.11
1966		0.00	9.81	3.72	1.76	1.02	0.10	0.00	0.21	0.00	0.00	0.00	0.00	16.62
1967		0.00	3.30	6.69	6.00	0.43	2.74	4.27	0.00	0.00	0.00	0.00	0.36	23.79
1968		0.00	4.80	1.07	1.79	1.51	3.92	0.93	0.00	0.00	0.00	0.13	0.00	14.15
1969		1.21	0.67	2.02	16.30	9.45	0.49	1.81	0.16	0.08	0.00	0.00	0.00	32.19
1970		0.00	2.27	0.22	3.02	2.29	5.79	0.00	0.00	0.00	0.00	0.00	0.00	13.59
1971		0.05	4.72	5.09	1.17	2.10	0.86	0.56	2.09	0.00	0.00	0.00	0.00	16.64
1972		0.13	0.55	6.95	0.63	0.00	0.00	0.16	0.00	0.10	0.00	0.00	0.00	8.52
1973		0.22	4.65	0.88	6.17	10.47	3.04	0.05	0.20	0.04	0.00	0.12	0.00	25.84
1974		0.57	2.79	1.19	8.70	0.14	4.22	0.25	0.00	0.00	0.00	0.00	0.00	17.86
1975		0.89	0.13	7.72	0.00	4.11	4.18	1.15	0.00	0.00	0.00	0.00	0.15	18.33
1976		0.18	0.09	0.28	0.00	6.59	2.31	0.90	0.03	0.23	0.00	0.00	5.65	16.26
1977		0.00	0.46	0.73	3.87	0.23	1.70	0.00	3.92	0.11	0.00	0.61	0.00	11.63
1978		0.00	0.27	6.58	8.83	9.63	11.39	2.44	0.00	0.09	0.00	0.08	1.39	40.70
1979	Wet	0.09	1.80	2.15	3.23	5.06	7.61	0.00	0.08	0.00	0.00	0.16	0.71	20.89
1980	Wet	0.65	0.65	1.23	6.78	11.71	3.68	0.76	0.19	0.00	0.04	0.00	0.03	25.72
1981	Above Normal	0.00	0.00	1.08	2.84	1.99	5.69	0.81	0.00	0.00	0.00	0.00	0.50	12.91
1982	Dry	0.00	1.85	0.89	3.10	0.55	5.54	2.70	0.15	0.11	0.00	0.00	1.32	16.21
1983	Wet	0.58	5.54	3.11	8.89	6.28	7.52	3.73	0.31	0.18	0.00	1.65	0.97	38.76
1984	Wet	3.93	3.51	3.29	0.04	0.00	0.35	0.24	0.25	0.00	0.00	0.58	0.55	12.74
1985	Critical	0.45	2.54	5.05	1.49	1.86	1.50	0.12	0.00	0.00	0.00	0.00	0.07	13.08
1986	Above Normal	0.65	4.47	0.88	2.07	7.66	5.52	1.60	0.00	0.00	0.00	0.00	1.43	24.28
1987	Dry	0.00	1.25	0.36	2.08	2.25	3.16	0.13	0.00	0.00	0.00	0.00	0.00	9.23
1988	Dry	1.36	1.71	3.50	2.58	2.42	0.54	3.35	0.00	0.00	0.00	0.00	0.09	15.55
1989	Critical	0.00	1.05	2.93	0.44	3.19	0.54	0.71	0.22	0.00	0.00	0.00	0.07	9.15
1990	Critical	0.96	0.42	0.00	2.79	2.71	0.15	0.09	0.78	0.00	0.00	0.00	0.06	7.96
1991	Dry	0.00	0.29	0.05	1.60	2.27	13.30	0.04	0.00	0.27	0.02	0.04	0.00	17.88
1992	Above Normal	0.55	0.19	5.02	2.76	9.33	3.99	0.00	0.31	0.09	0.42	0.00	0.00	22.66
1993	Wet	1.74	0.00	5.50	12.35	7.39	5.42	0.00	0.09	0.77	0.07	0.00	0.00	33.33
1994	Wet	0.09	1.38	1.47	0.98	5.79	2.07	0.65	0.37	0.00	0.00	0.00	0.42	13.22
1995	Wet	0.40	1.59	1.14	19.08	1.72	10.87	0.35	0.88	0.61	0.00	0.00	0.00	36.64
1996	Wet	0.00	0.21	3.11	2.03	8.48	2.05	1.14	0.37	0.00	0.00	0.00	0.00	17.39
1997	Below Normal	2.70	0.00	6.25	6.97	0.09	0.00	0.00	0.00	0.09	0.00	0.00	0.00	16.10
1998	Wet	0.08	2.86	7.69	4.42	20.97	3.71	2.13	3.83	0.14	0.00	0.00	0.12	45.95
1999	Wet	0.00	0.75	0.95	2.26	0.86	3.16	1.87	0.00	0.02	0.00	0.00	0.02	9.89
2000	Dry	0.00	0.72	0.00	1.43	8.66	2.74	3.90	0.00	0.00	0.00	0.00	0.00	17.45
2001	Above Normal	2.18	0.00	0.08	6.30	5.24	4.73	1.67	0.18	0.02	0.03	0.00	0.04	20.47
2002	Critical	0.49	3.75	1.78	0.59	0.31	0.37	0.11	0.14	0.01	0.05	0.02	0.20	7.82
2003	Below Normal	0.01	5.88	4.59	0.09	2.91	4.46	1.90	1.72	0.19	0.02	0.00	0.04	21.81
2004	Dry	0.09	1.31	1.89	0.42	5.18	0.57	0.01	0.02	0.01	0.03	0.00	0.00	9.53
2005	Wet	4.46	0.10	8.62	11.20	7.41	3.96	0.74	1.01	0.02	0.00	0.04	0.20	37.76
2006	Wet	1.08	0.82	0.72	2.82	2.88	3.26	5.88	0.90	0.00	0.00	0.02	0.01	18.39
2007	Critical	0.09	0.26	0.72	3.24	1.86	0.18	0.70	0.00	0.02	0.01	0.02	0.28	7.38
2008	Dry	0.28	0.02	3.06	12.00	1.75	0.00	0.08	0.04	0.00	0.00	0.00	0.03	17.26
2009	Below Normal	0.06	2.71	2.55	0.63	6.18	0.78	0.15	0.03	0.07	0.00	0.00	0.06	13.22
2010	Above Normal	3.61	0.01	2.86	6.14	3.86	0.56	2.45	0.15	0.03	0.02	0.00	0.01	19.70

Monthly Precipitation Record (WY 1949-2023)
Carpinteria Basin - Carpinteria Fire Station No. 208

Monthly Precipitation Data (inches):

Water Year	WY Type	Oct.	Nov.	Dec.	Jan	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	TOTAL
2011	Above Normal	2.45	1.00	9.66	0.59	4.06	6.20	0.05	0.48	0.36	0.00	0.03	0.09	24.97
2012	Below Normal	1.06	1.35	0.32	1.59	0.06	2.32	2.93	0.06	0.02	0.02	0.01	0.06	9.80
2013	Critical	0.04	2.27	3.05	1.32	0.18	0.75	0.26	0.29	0.09	0.02	0.00	0.01	8.28
2014	Critical	0.02	0.62	0.30	0.00	2.54	1.68	0.48	0.09	0.04	0.00	0.05	0.00	5.82
2015	Critical	0.00	0.78	3.62	1.69	0.47	0.45	0.24	0.16	0.75	0.32	0.00	0.16	8.64
2016	Critical	0.48	0.10	0.30	4.60	1.14	3.02	0.26	0.02	0.03	0.00	0.00	0.00	9.95
2017	Above Normal	0.87	0.87	3.05	7.21	8.60	0.62	0.31	0.17	0.05	0.00	0.00	0.10	21.85
2018	Below Normal	0.00	0.06	0.00	2.47	0.11	6.13	0.05	0.11	0.01	0.00	0.00	0.03	8.97
2019	Below Normal	0.23	2.02	0.35	5.06	5.88	2.77	0.18	1.43	0.19	0.01	0.04	0.02	18.18
2020	Below Normal	0.01	1.45	4.55	0.42	0.04	3.94	2.30	0.26	0.13	0.01	0.01	0.01	13.13
2021	Critical	0.00	0.24	1.59	1.65	0.01	1.02	0.02	0.07	0.01	0.03	0.06	0.03	4.73
2022	Critical	0.99	0.03	7.31	0.02	0.00	1.30	0.24	0.10	0.00	0.01	0.01	0.31	10.32
2023	Wet	0.09	0.83	3.72	9.72	3.80	8.81	0.03	1.07	0.38	0.00	0.87	0.03	29.35

Mean Annual Precipitation, inches (WYs 1949-2023):	**17.20**

APPENDIX C

Groundwater Level/Storage and
Groundwater Quality Monitoring Network

Table C-1. Existing Groundwater Monitoring Network Well Information Summary

Well Number[1]	Short Name	Owner	Use[2]	GSE Elev.[3] (feet AMSL)	RP Elev.[4] (feet AMSL)	Water Level Monitor	Water Quality Monitor	Year Drilled	Casing Depth (feet)	Screen Interval (feet)	Water Level Data Start
4N/25W-19K5	19K5	Private	A	40.5	42.7	✓	✓	1921	98	—	1946
4N/25W-21L1	21L1	Private	A	68.5	69.7	✓	✓	1991	732	365 - 732	1992
4N/25W-21N4	21N4	Private	A	52.9	54.2	✓	✓	1947	406	60 - 406	1949
4N/25W-22R4	22R4	Private	A	218.8	219.4	✓	✓	1946	504	—	1949
4N/25W-25L3	25L3	Private	C	224.2	226.4	✓	✓	—	190	—	1996
4N/25W-27F2	27F2	CVWD	A	136.2	138.0	✓	✓	1975	825	455 - 801	1975
4N/25W-28D4	28D4	CVWD	A	72.3	74.1	✓	✓	2010	1210	285 - 915	2010
4N/25W-28G3	28G3	Private	A	87.8	88.6	✓	✓	1994	300	200 - 300	1995
4N/25W-28J1	28J1	Private	I	103.3	103.8	✓	✓	1919	175	59 - 175	1940
4N/25W-29D8	29D8	CVWD	A	29.0	30.6	✓	✓	2002	958	317 - 938	2005
4N/25W-29K2	29K2	CVWD	M	22.0	20.8	✓	✓	1989	320	210 - 240	1992
4N/25W-29L1	29L1	Private	M	14.1	18.7	✓	✓	—	110	—	1946
4N/26W-13R1	13R1	Private	A	378.8	DU		✓	1990	294	—	—
4N/25W-19E1	19E1	Private	A	78.0	78.0		✓	1992	400	120 - 400	—
4N/25W-19H2	19H2	Private	A	125.7	—		✓	2007	560	—	—
4N/25W-19J4	19J4	Private	A	58.0	—		✓	—	—	—	—
4N/25W-19K10	19K10	Private	A	38.1	—		✓	2017	602	242 - 602	—
4N/25W-19K9	19K9	Private	A	31.3	—		✓	—	—	—	—
4N/25W-19M1	19M1	Private	A	58.0	—		✓	—	204	—	—
4N/25W-19R1	19R1	Private	A	30.4	—		✓	—	146	—	—
4N/25W-20C1	20C1	Private	A	411.6	—		✓	2006	710	—	—
4N/25W-20J2	20J2	Private	A	55.0	—		✓	1984	377	—	—
4N/25W-20L2	20L2	Private	A	92.7	—		✓	—	—	—	—
4N/25W-20L3	20L3	Private	A	72.1	—		✓	1940	403	—	—
4N/25W-20L5	20L5	Private	A	80.3	—		✓	2008	860	380 - 840	—
4N/25W-20R4	20R4	Private	A	42.7	—		✓	1984	403	—	—
4N/25W-21F1	21F1	Private	I	118.1	—		✓	1991	450	—	—
4N/25W-21N7	21N7	Private	A	58.0	58.0		✓	2008	875	335 - 855	—
4N/25W-21Q1	21Q1	Private	A	78.0	78.0		✓	1991	740	240 - 740	—
4N/26W-24F1	24F1	Private	A	54.0	—		✓	1922	146	—	—
4N/25W-26B1	26B1	Private	A	457.4	457.4		✓	1944	552	240 - 552	—
4N/25W-26C4	26C4	Private	A	280.4	280.7		✓	1947	586	—	—
4N/25W-26C8	26C8	Private	A	268.9	268.9		✓	1947	360	144 - 360	—
4N/25W-26P2	26P2	Private	A	256.2	—		✓	1990	350	—	—
4N/25W-27D1	27D1	Private	A	128.0	—		✓	1990	870	—	—
4N/25W-27E1	27E1	Private	A	108.0	—		✓	1930	280	—	—
4N/25W-27E3	27E3	Private	A	119.5	—		✓	2016	805	245 - 805	—
4N/25W-27H2	27H2	Private	A	175.0	—		✓	2016	515	265 - 505	—
4N/25W-27Q9	27Q9	Private	A	138.6	—		✓	2003	800	340 - 800	—
4N/25W-27R2	27R2	Private	A	134.1	—		✓	—	421	—	—
4N/25W-28A1	28A1	Private	A	100.0	—		✓	1990	580	—	—
4N/25W-28A2	28A2	Private	A	91.0	—		✓	2017	800	220 - 780	—
4N/25W-28H1	28H1	Private	A	109.1	—		✓	1992	500	200 - 500	—
4N/25W-28J3	28J3	Private	A	92.2	92.2		✓	2016	860	140 - 840	—
4N/25W-34A1	34A1	Private	A	240.6	—		✓	—	250	—	—
4N/25W-35B5	35B5	Private	A	142.0	—		✓	1990	280	90 - 280	—
4N/25W-35E4	35E4	Private	A	249.2	—		✓	2002	460	290 - 450	—
4N/25W-19F4	19F4	Private	M	102.1	102.1	✓		1929	250	—	1941
4N/25W-19J5	19J5	Private	M	56.7	58.0	✓		1939	100	—	1941
4N/25W-20K4	20K4	CVWD	I	47.4	49.1	✓	✓	1989	903	355 - 885	1989
4N/25W-21N1	21N1	Private	I	43.5	44.1	✓		1936	405	—	1938
4N/25W-23P1	23P1	Private	I	452.5	453.3	✓		1945	465	—	1948
4N/26W-24F9	24F9	Private	A	41.3	38.1	✓		1990	440	190 - 430	2022
4N/25W-26A1	26A1	Private	M	425.6	426.3	✓		1941	480	228 - 480	1946
4N/25W-26C1	26C1	Private	M	287.3	287.9	✓		—	250	—	1949
4N/25W-27Q6	27Q6	Private	M	136.7	137.0	✓		—	580	100 - 580	1989
4N/25W-28F7	28F7	CVWD	I	64.8	66.6	✓	✓	1976	1100	—	1976
4N/25W-28M1	28M1	Private	M	53.6	54.5	✓		—	152	—	1941
4N/25W-29D1	29D1	Private	M	19.5	18.8	✓		—	147	—	1938
4N/25W-29D7	29D7	CVWD	DM	28.4	31.0	✓	✓	1972	982	215 - 950	1977
4N/25W-29H2	29H2	Private	M	42.8	44.0	✓		1912	98	—	1941
4N/25W-30D2	30D2	Private	M	16.8	16.8	✓		1947	232	—	2015
4N/25W-34G1	34G1	Private	M	192.3	191.1	✓		1990	278	25 - 278	1991
4N/25W-35E1	35E1	Private	M	242.9	243.6	✓		1939	385	—	1949
4N/25W-28D5	28D5	CGSA	DM	45.9	—	✓	✓	2023	1040	—	2023
4N/25W-28D6	28D6	CGSA	DM	42.9	—	✓	✓	2023	925	—	2023
4N/25W-28D7	28D7	CGSA	DM	41.7	—	✓	✓	2023	360	—	2023
4N/25W-30D6	30D6	CGSA	DM	9.5	9.3	✓		2019	1130	1020 - 1120	2019
4N/25W-30D7	30D7	CGSA	DM	10.0	9.8	✓		2019	870	780 - 860	2019
4N/25W-30D8	30D8	CGSA	DM	10.0	9.8	✓		2019	340	190 - 330	2019

Notes

[1] Representative Monitoring Site (RMS) wells are in **bold**.

[2] Use categories: A - Active production well; I - Inactive production well; M - Monitoring well; DM - Dedicated monitoring well

[3] Ground surface elevation as interpolated from a Digital Elevation Model (DEM)

[4] Reference point elevations from various sources with variable accuracy

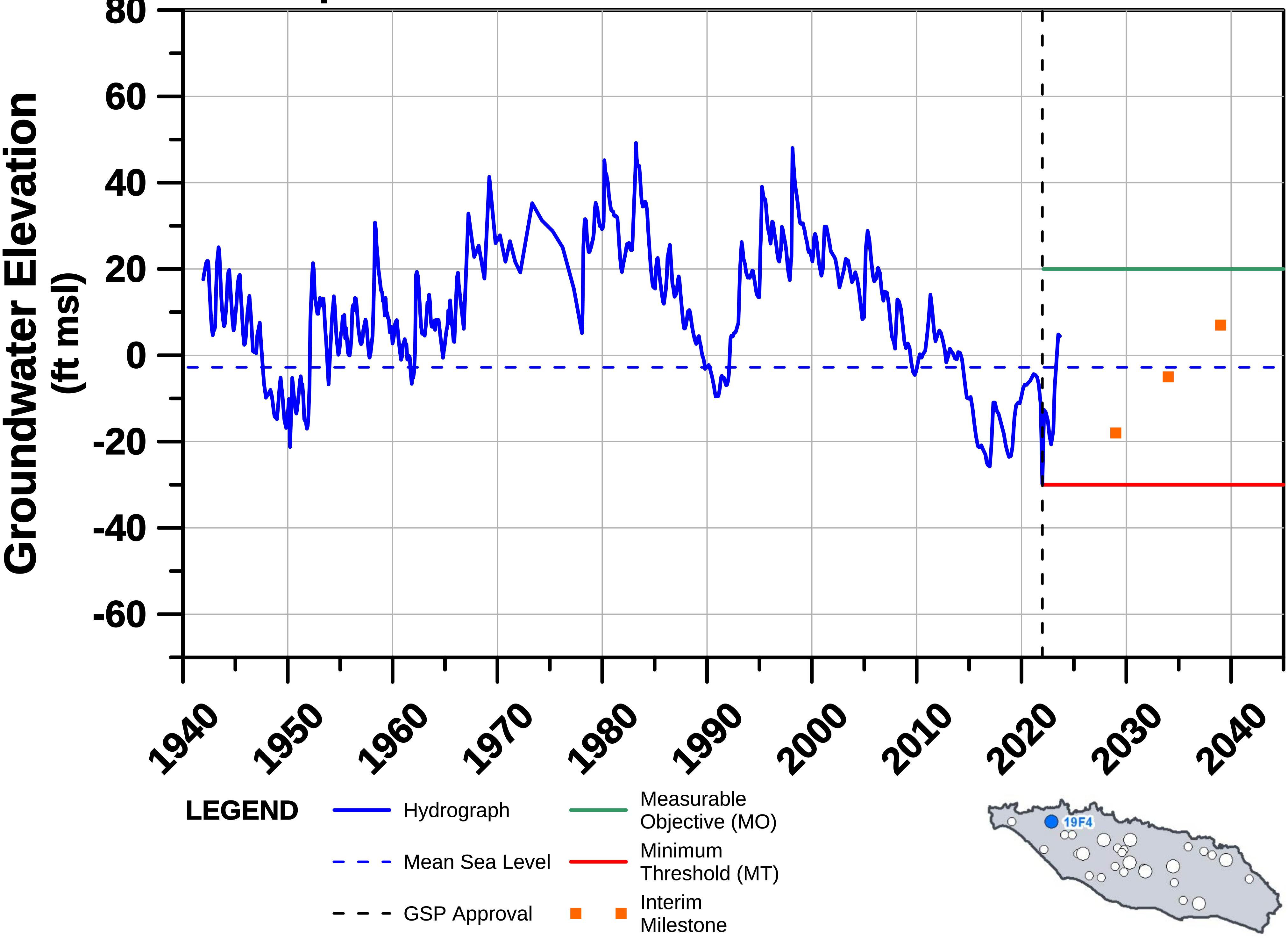
— = unknown; not applicable

APPENDIX D

Hydrographs for Groundwater Level Monitoring Network

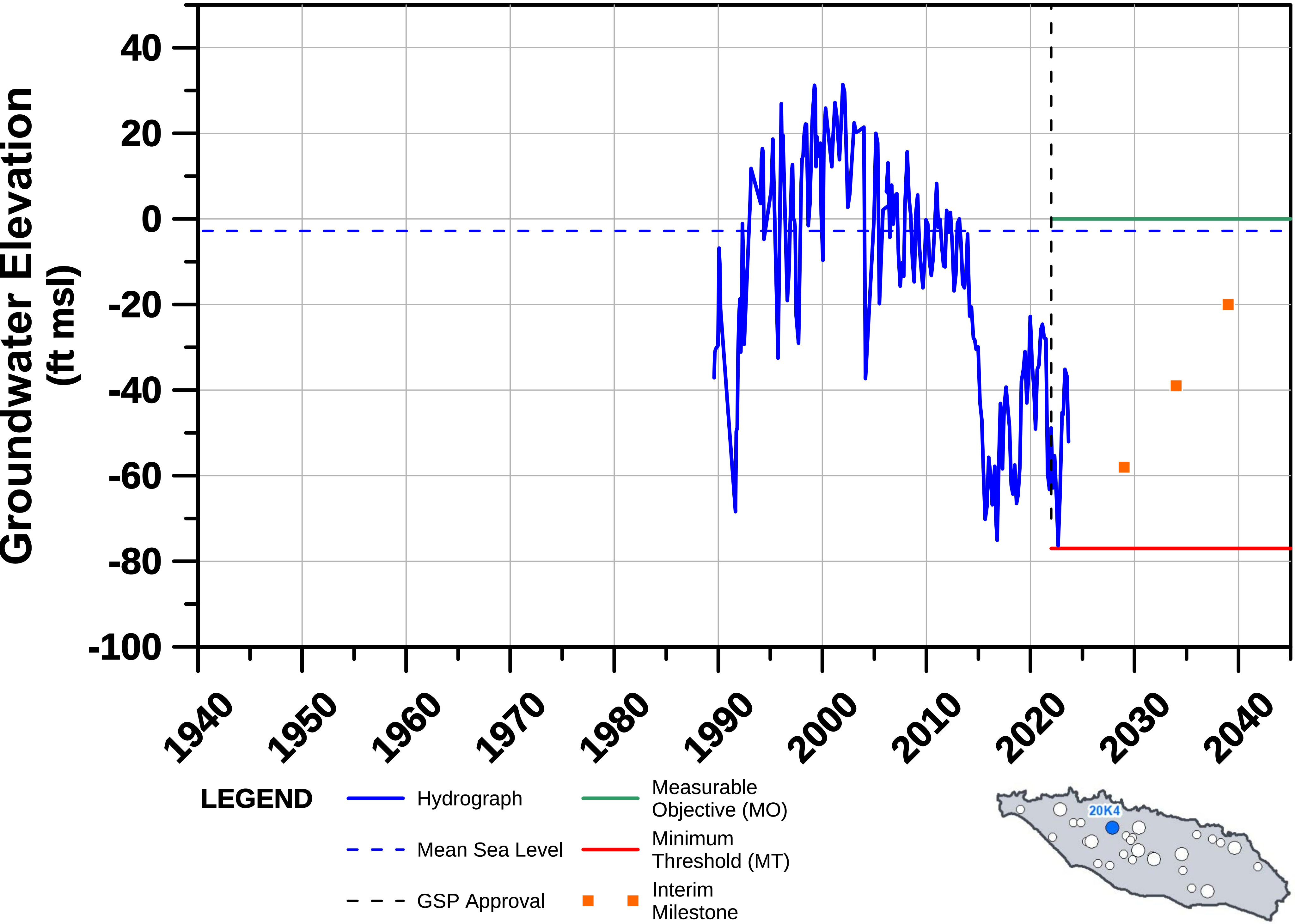
RMS 4N/25W - 19F4

Well Depth: Unkown Ground Elevation: 102 ft msl



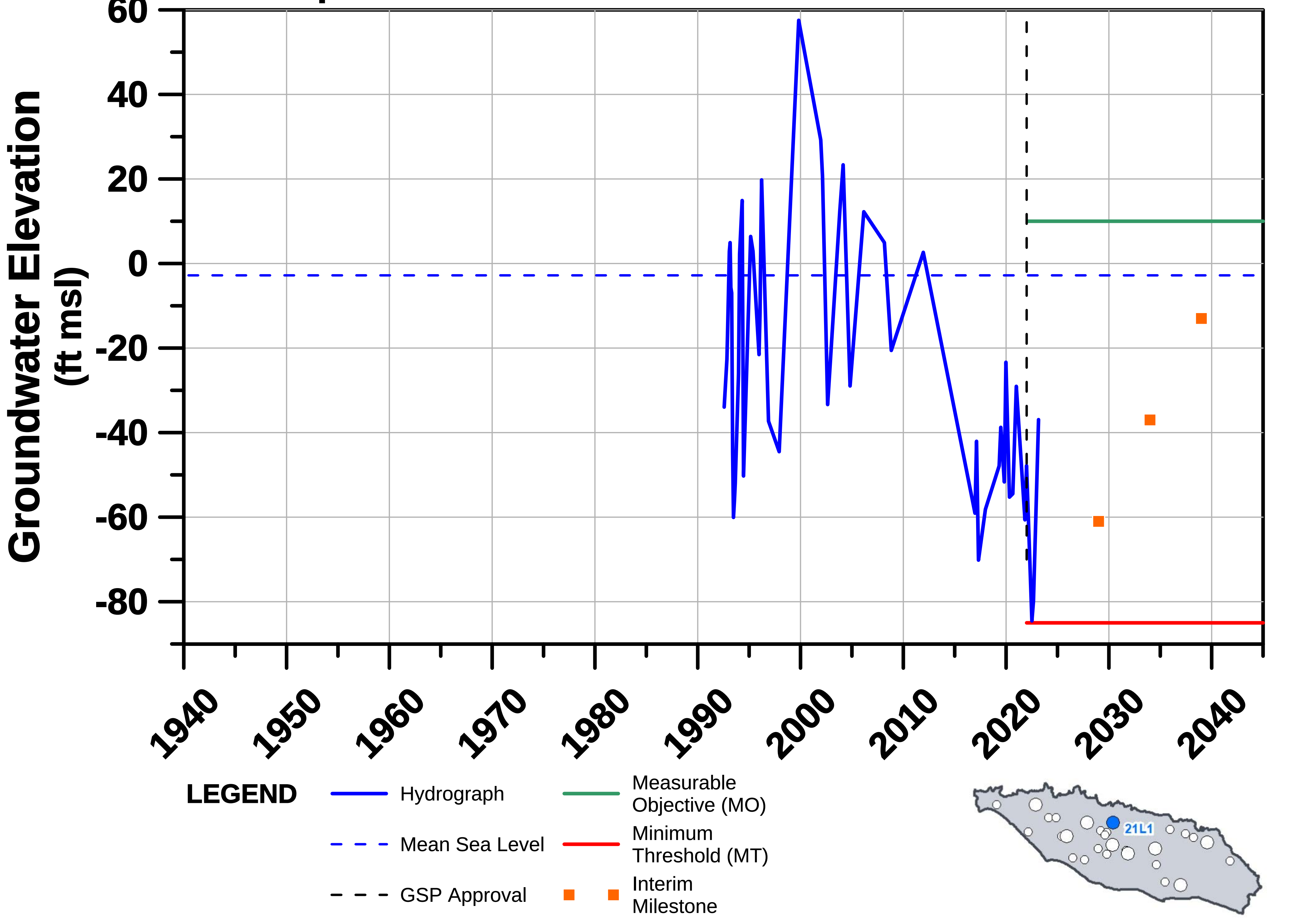
RMS 4N/25W - 20K4

Well Depth: 903 ft   Ground Elevation: 47 ft msl



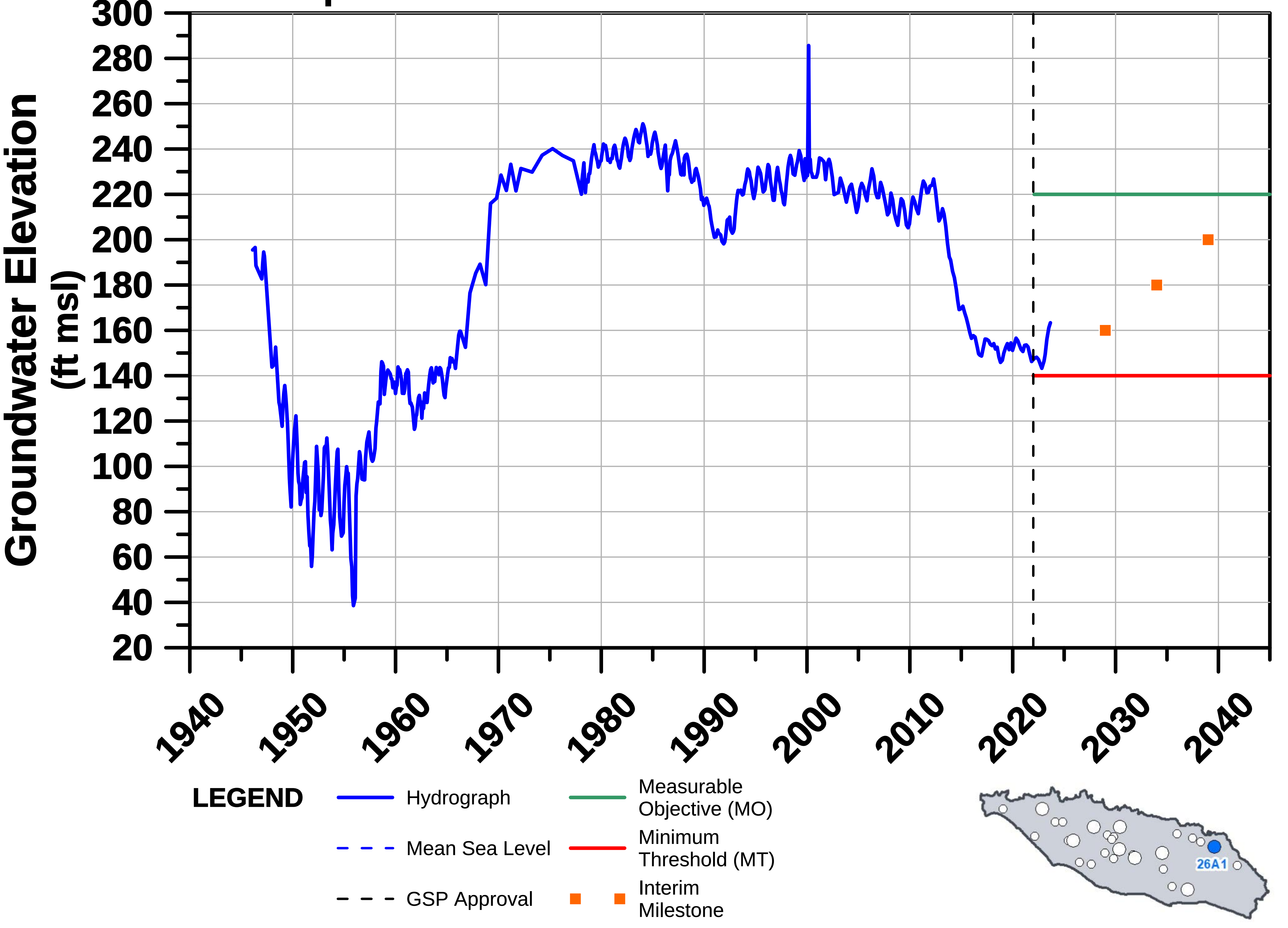
RMS 4N/25W - 21L1

Well Depth: 732 ft   Ground Elevation: 69 ft msl



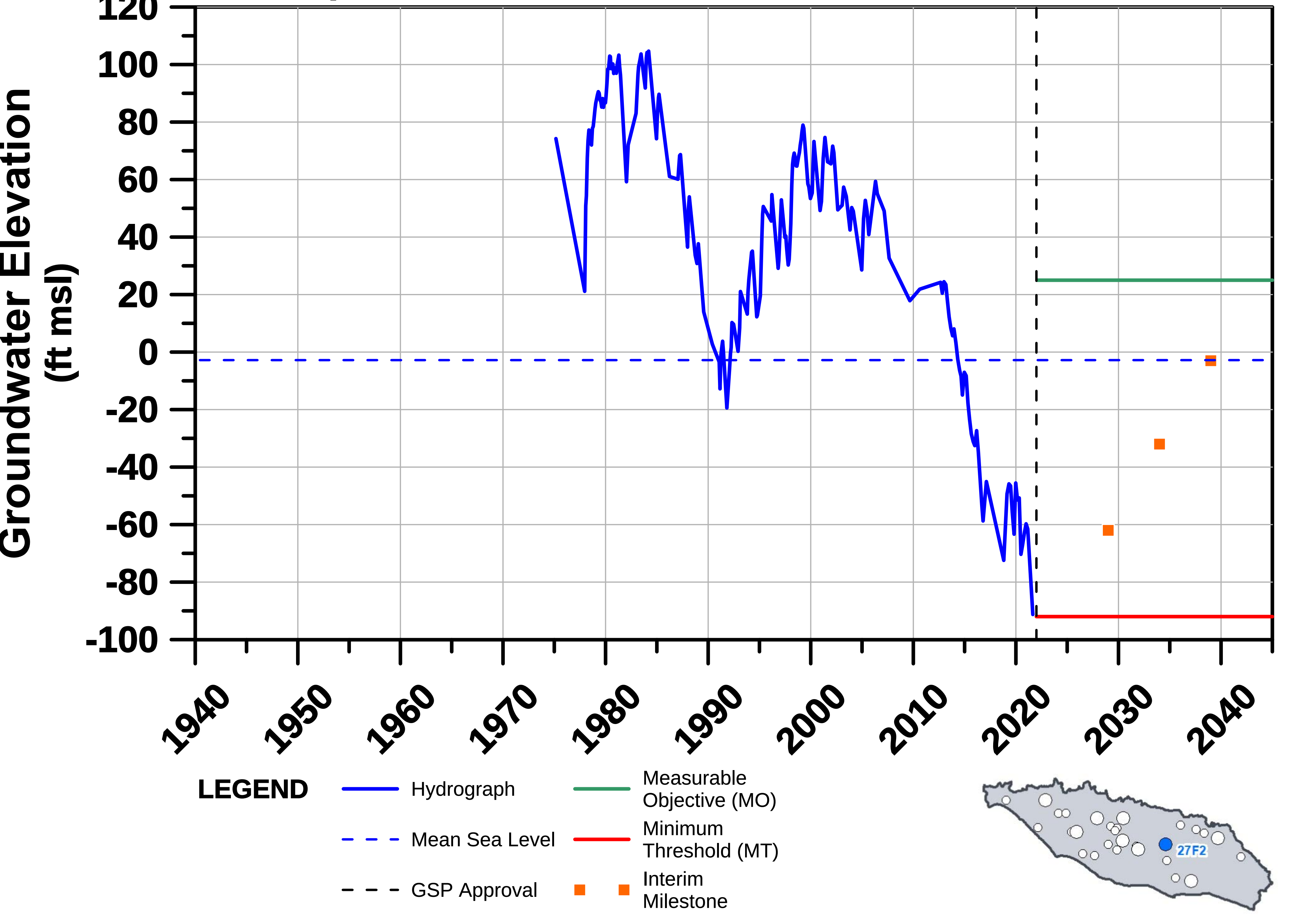
RMS 4N/25W - 26A1

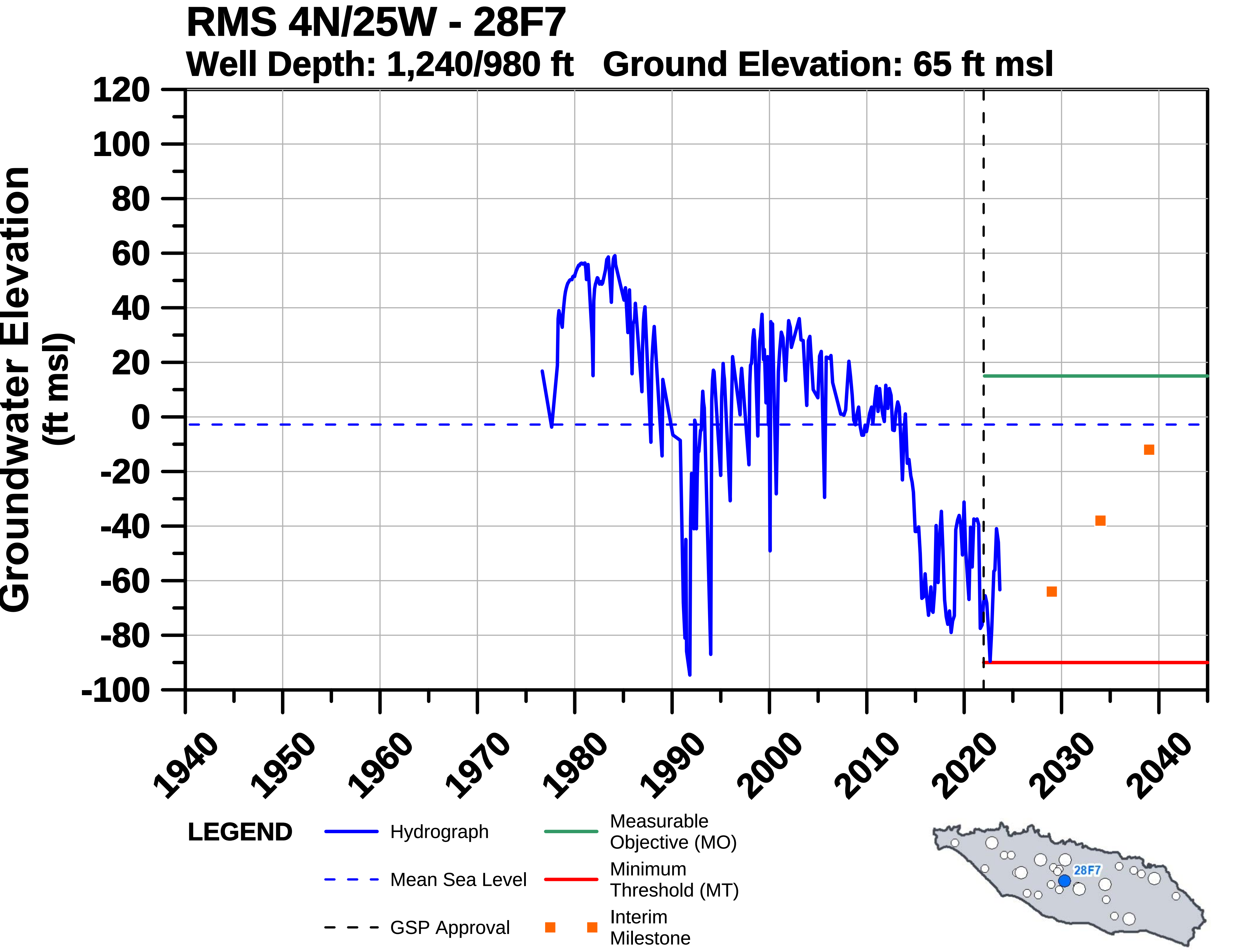
Well Depth: 480 ft   Ground Elevation: 426 ft msl



RMS 4N/25W - 27F2

Well Depth: 825 ft   Ground Elevation: 136 ft msl

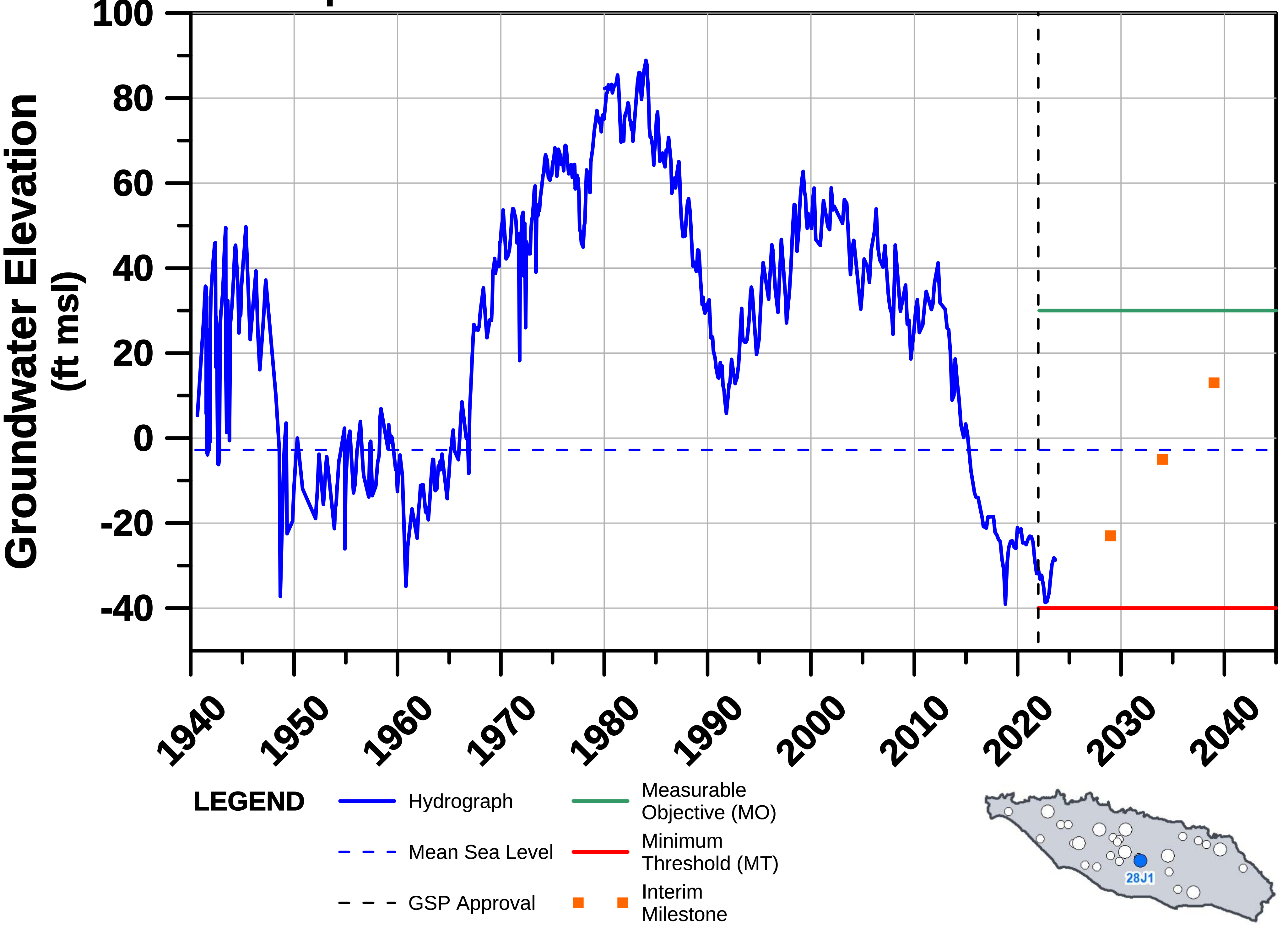


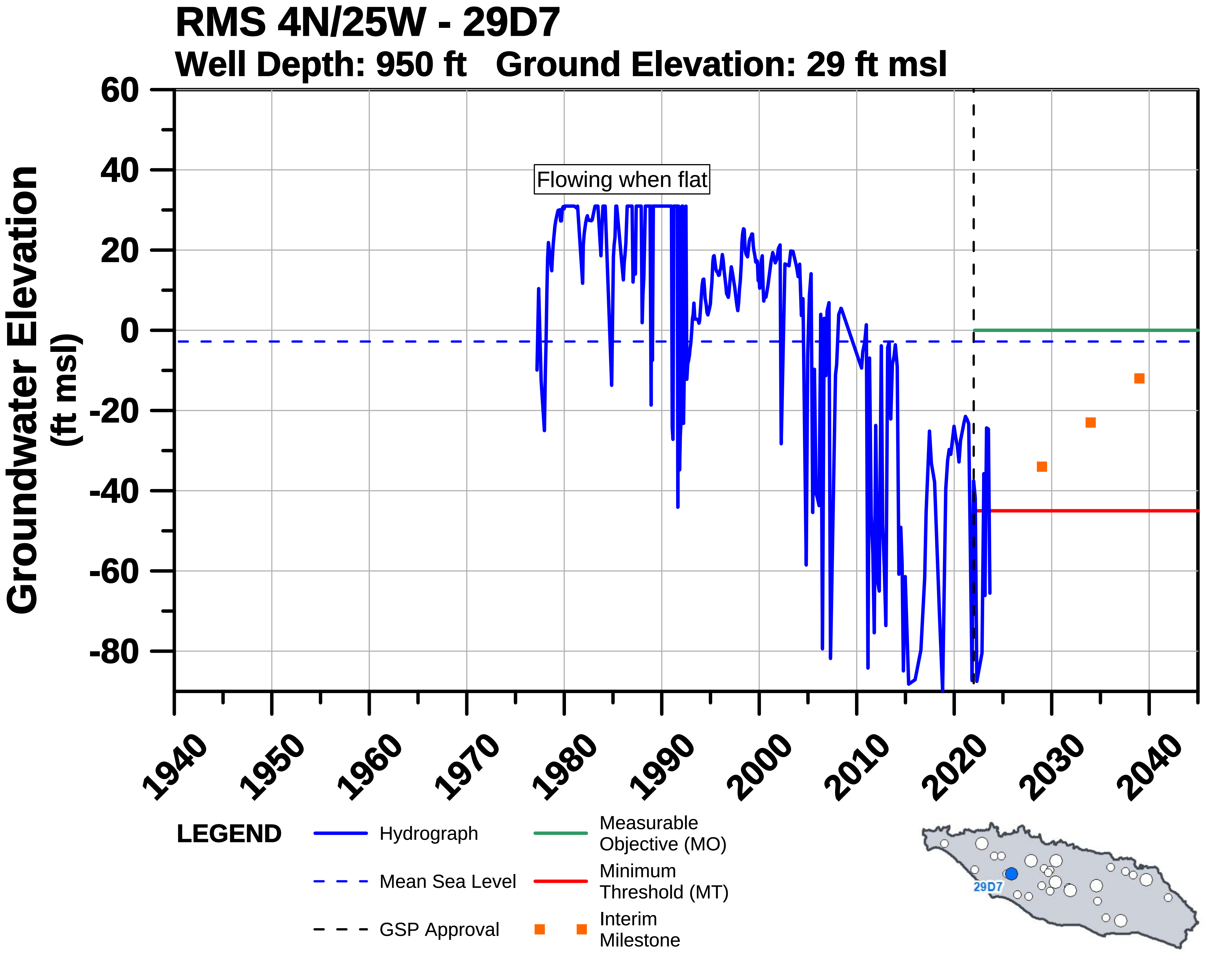


RMS 4N/25W - 28F7
Well Depth: 1,240/980 ft   Ground Elevation: 65 ft msl
Groundwater Elevation (ft msl)
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
LEGEND
Hydrograph
Mean Sea Level
GSP Approval
Measurable Objective (MO)
Minimum Threshold (MT)
Interim Milestone
28F7

RMS 4N/25W - 28J1

Well Depth: 175 ft   Ground Elevation: 103 ft msl

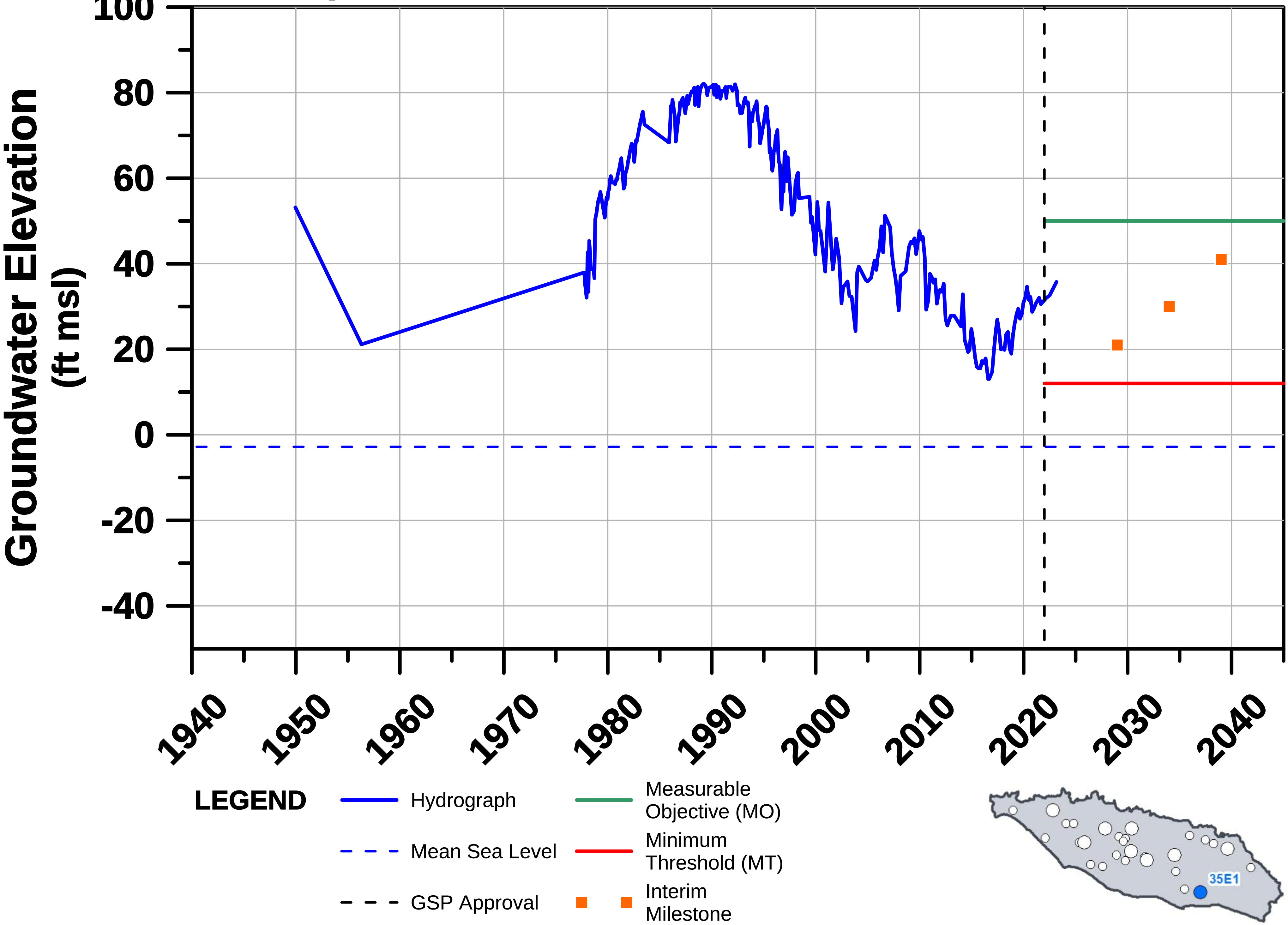




RMS 4N/25W - 29D7
Well Depth: 950 ft Ground Elevation: 29 ft msl
Groundwater Elevation (ft msl)
60
40
20
0
-20
-40
-60
-80
Flowing when flat
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
LEGEND
Hydrograph
Mean Sea Level
GSP Approval
Measurable Objective (MO)
Minimum Threshold (MT)
Interim Milestone
29D7

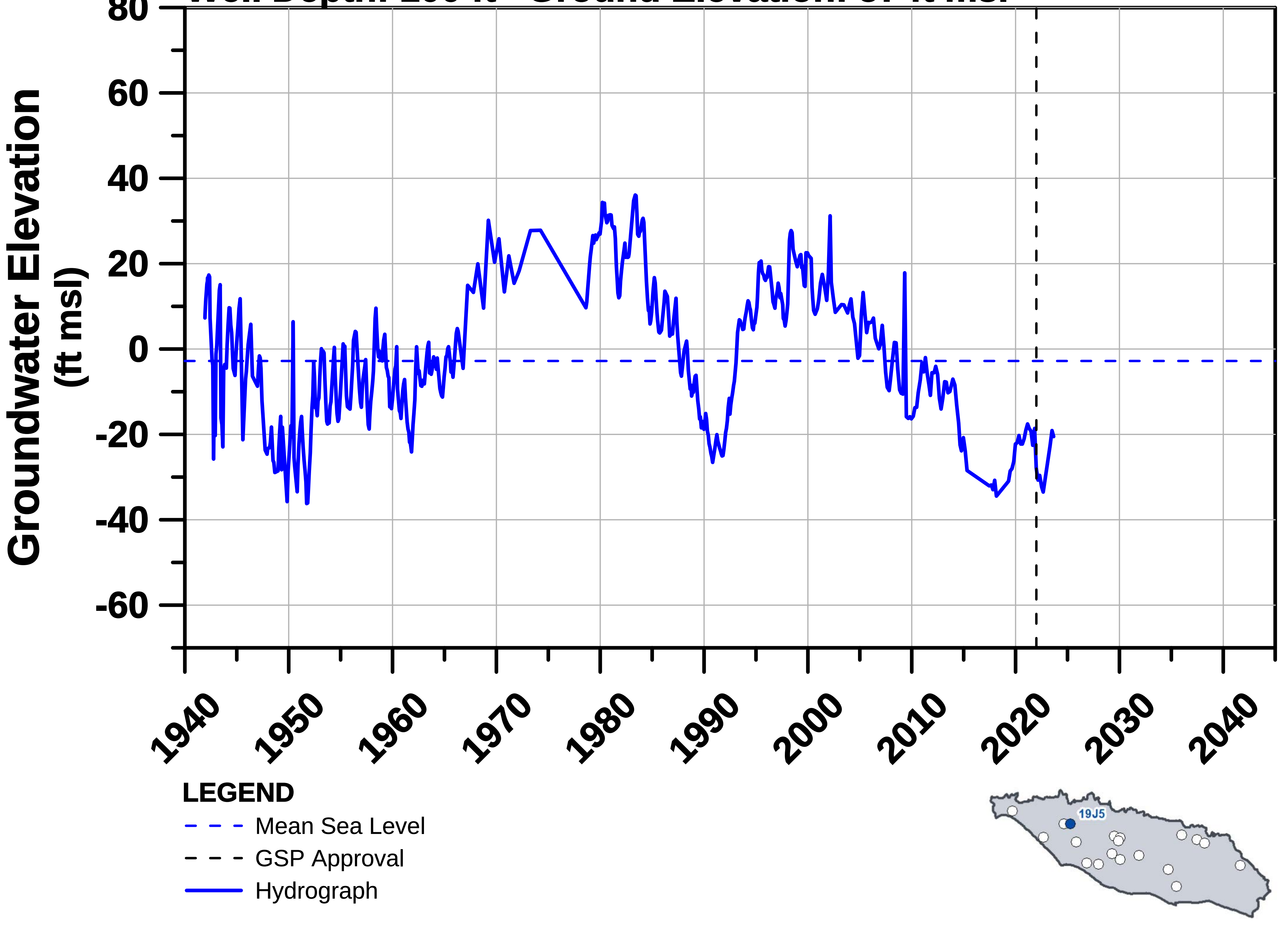
RMS 4N/25W - 35E1

Well Depth: 385 ft   Ground Elevation: 243 ft msl



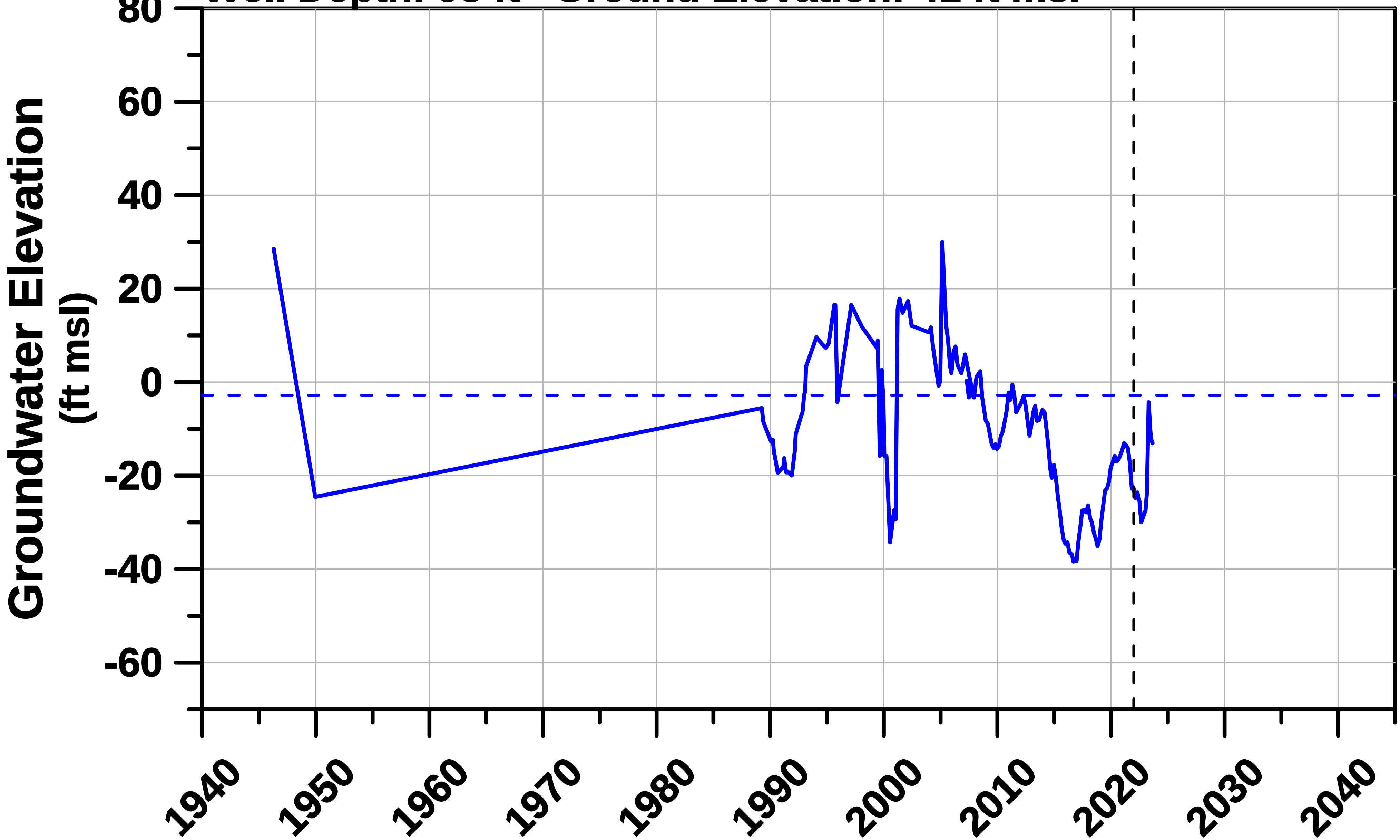
4N/25W - 19J5

Well Depth: 100 ft   Ground Elevation: 57 ft msl



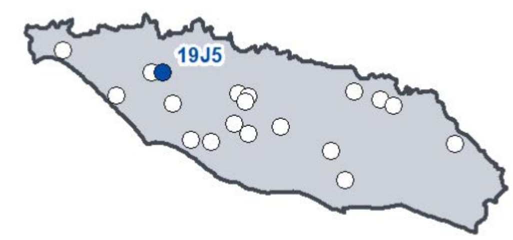
4N/25W - 19K5

Well Depth: 98 ft   Ground Elevation: 41 ft msl



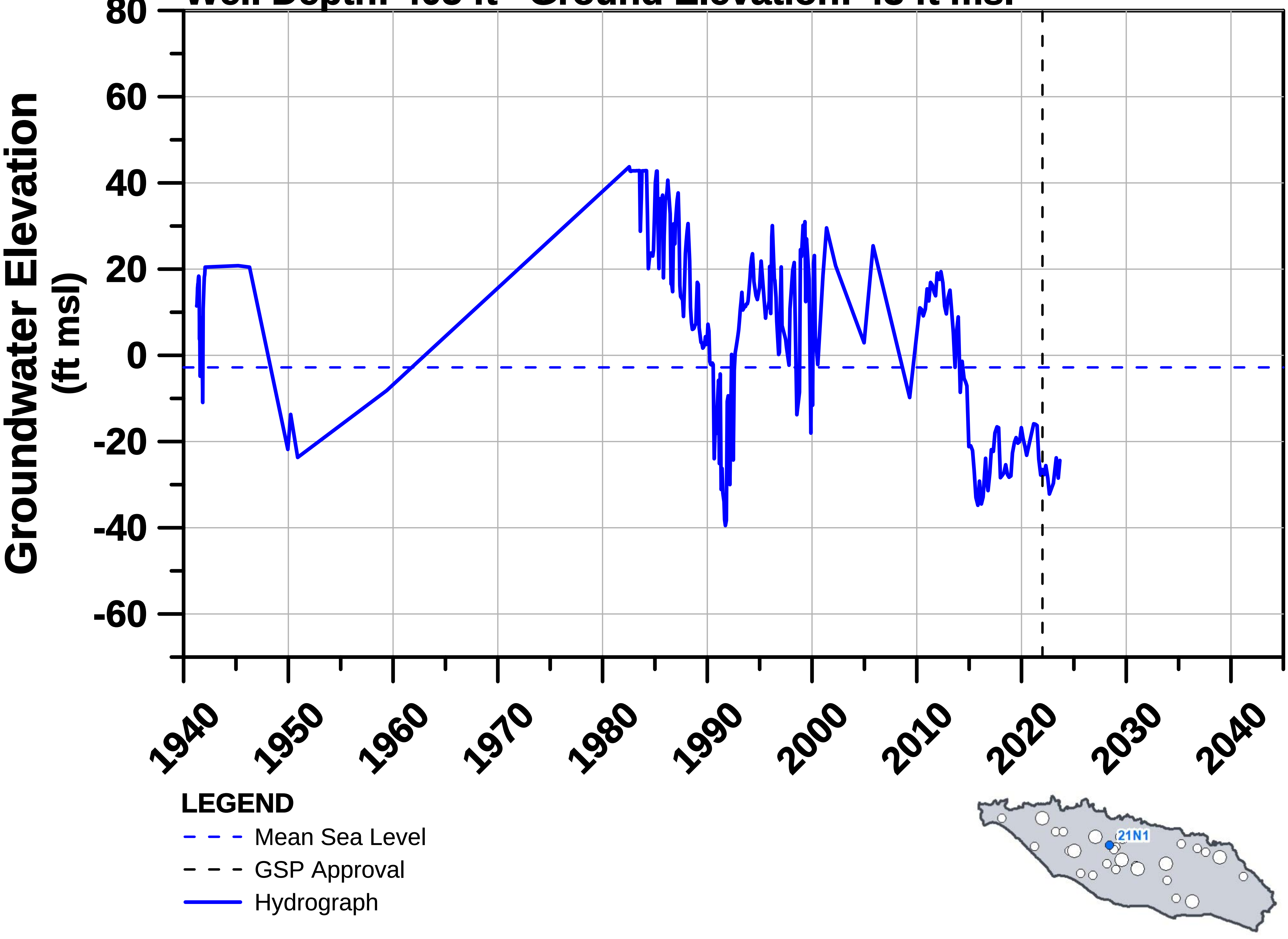
LEGEND

- - - Mean Sea Level
- - - GSP Approval
—— Hydrograph



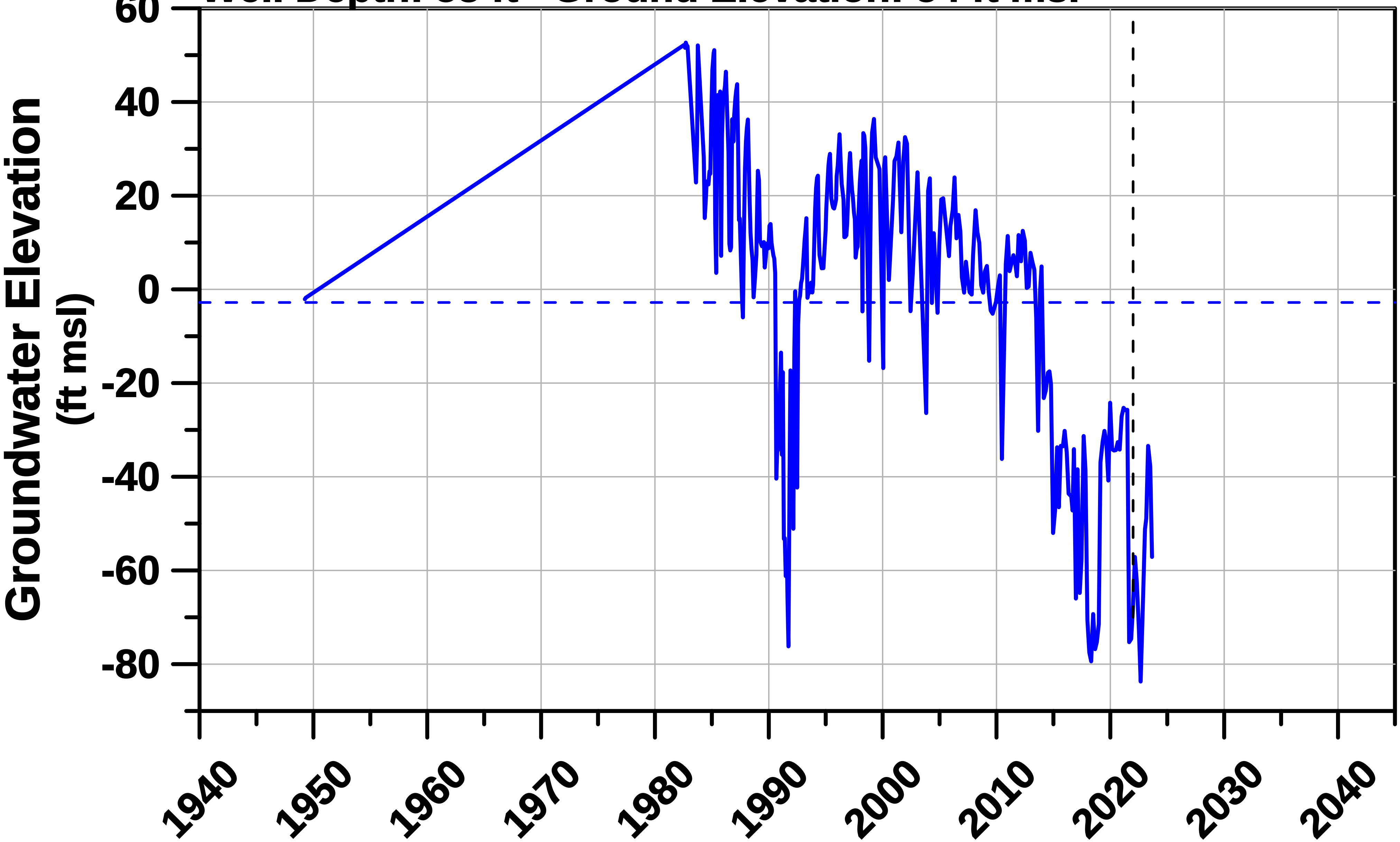
4N/25W - 21N1

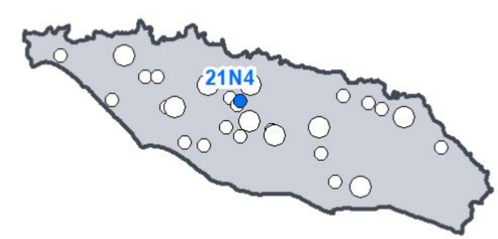
Well Depth: 405 ft   Ground Elevation: 43 ft msl



4N/25W - 21N4

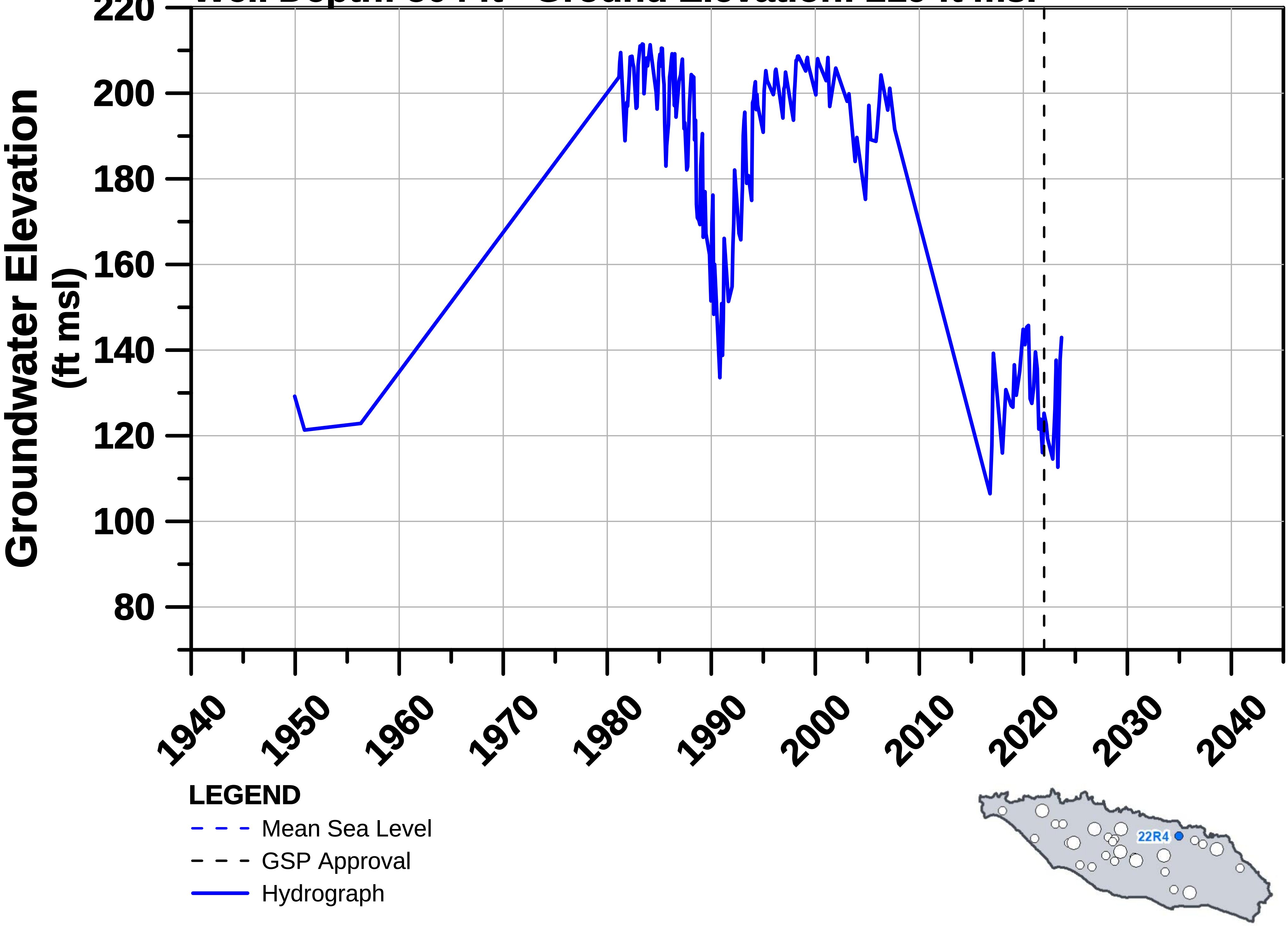
Well Depth: 53 ft   Ground Elevation: 54 ft msl





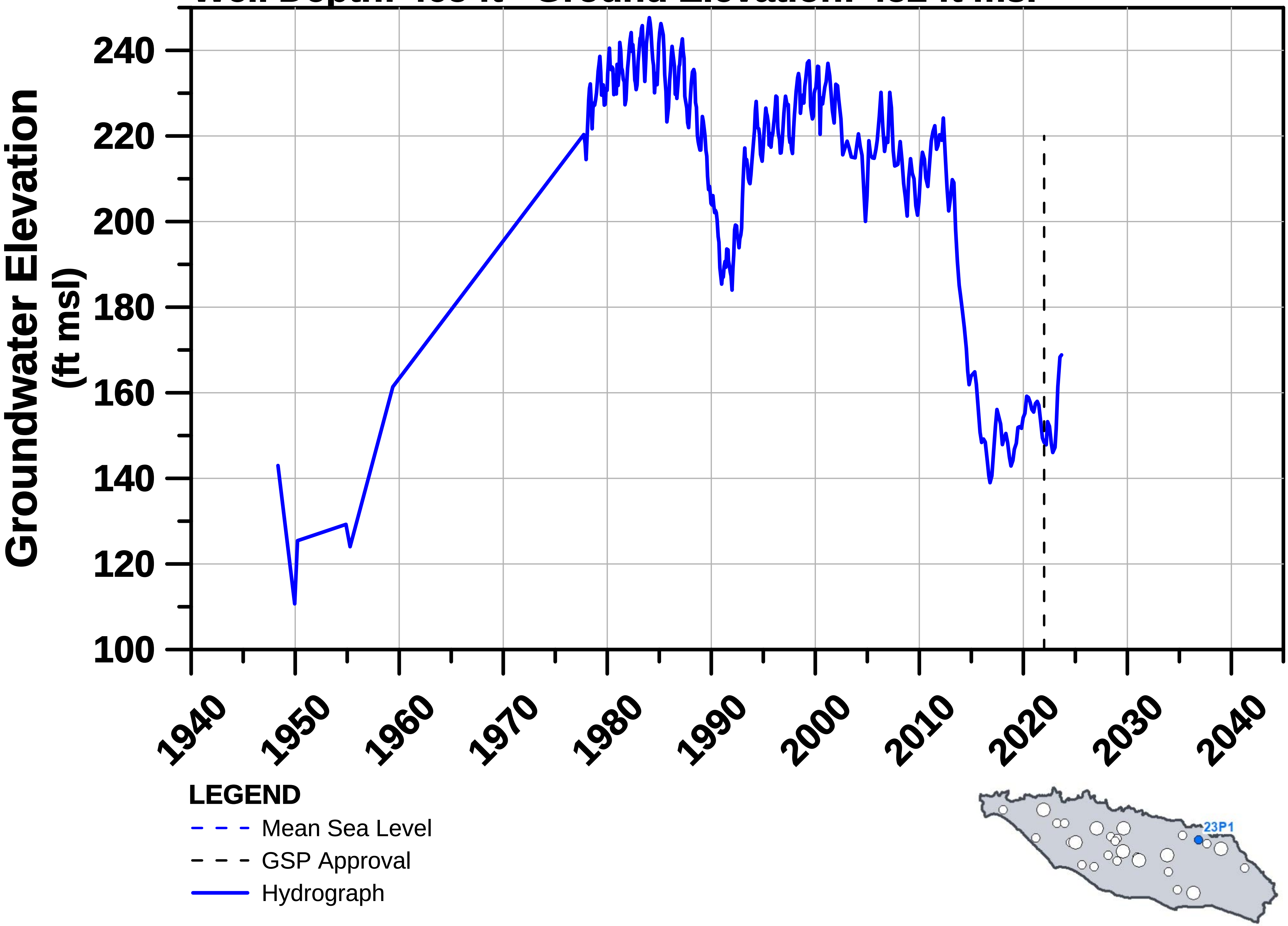
4N/25W - 22R4

Well Depth: 504 ft   Ground Elevation: 219 ft msl



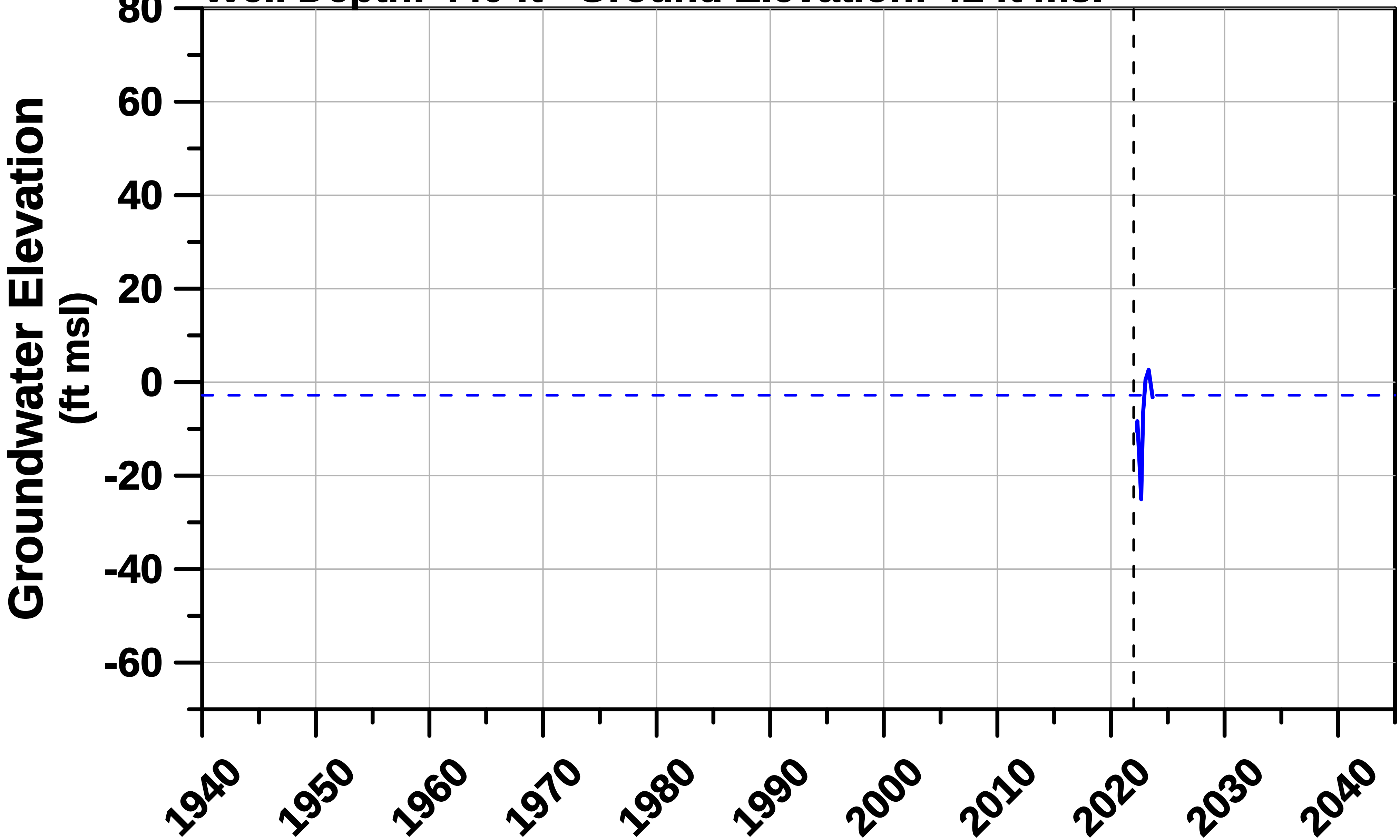
4N/25W - 23P1

Well Depth: 465 ft   Ground Elevation: 452 ft msl



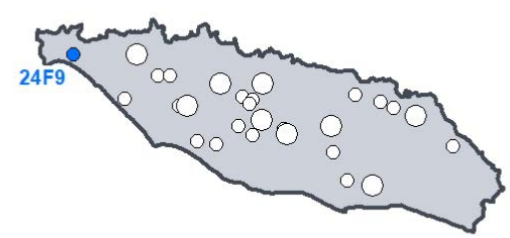
4N/25W - 24F9

Well Depth: 440 ft   Ground Elevation: 41 ft msl



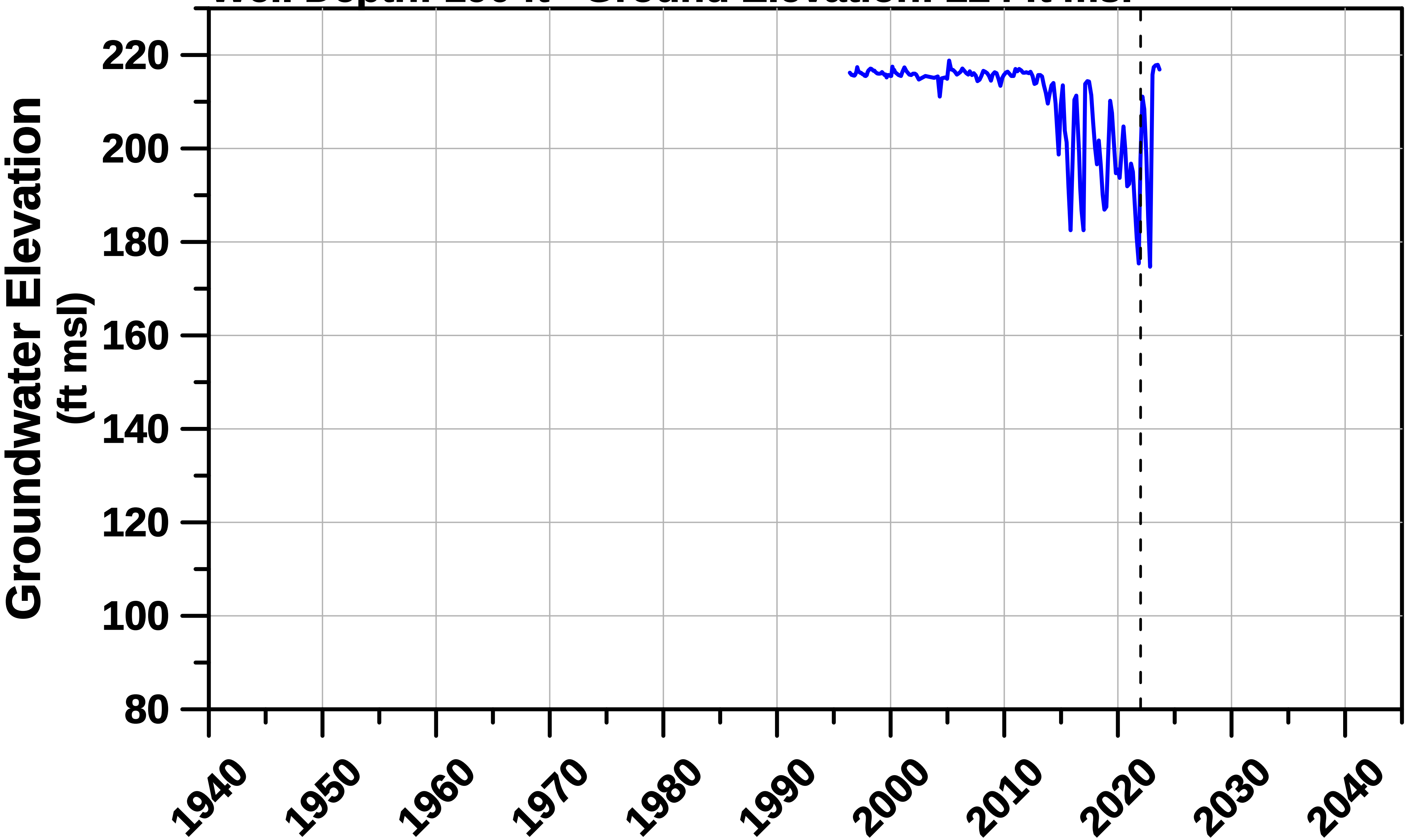
LEGEND

- - - Mean Sea Level
- - - GSP Approval
— Hydrograph



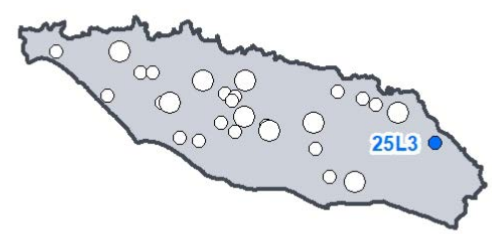
4N/25W - 25L3

Well Depth: 190 ft   Ground Elevation: 224 ft msl



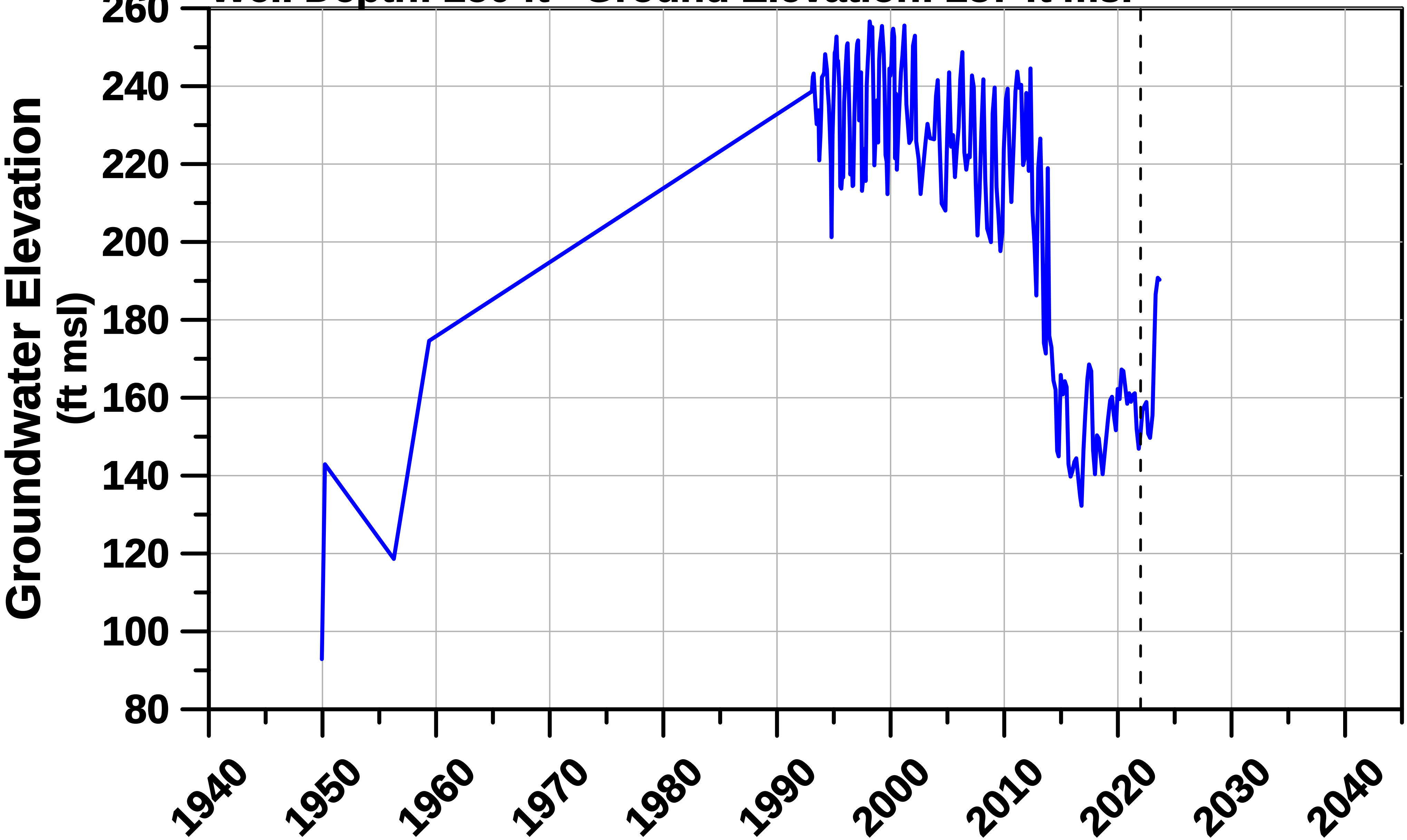
LEGEND

- Mean Sea Level
- GSP Approval
- Hydrograph



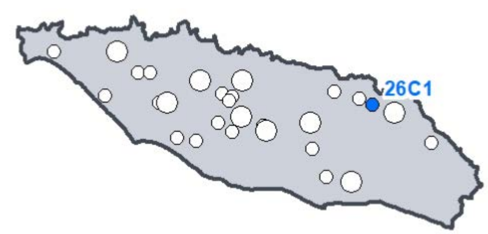
4N/25W - 26C1

Well Depth: 250 ft   Ground Elevation: 287 ft msl



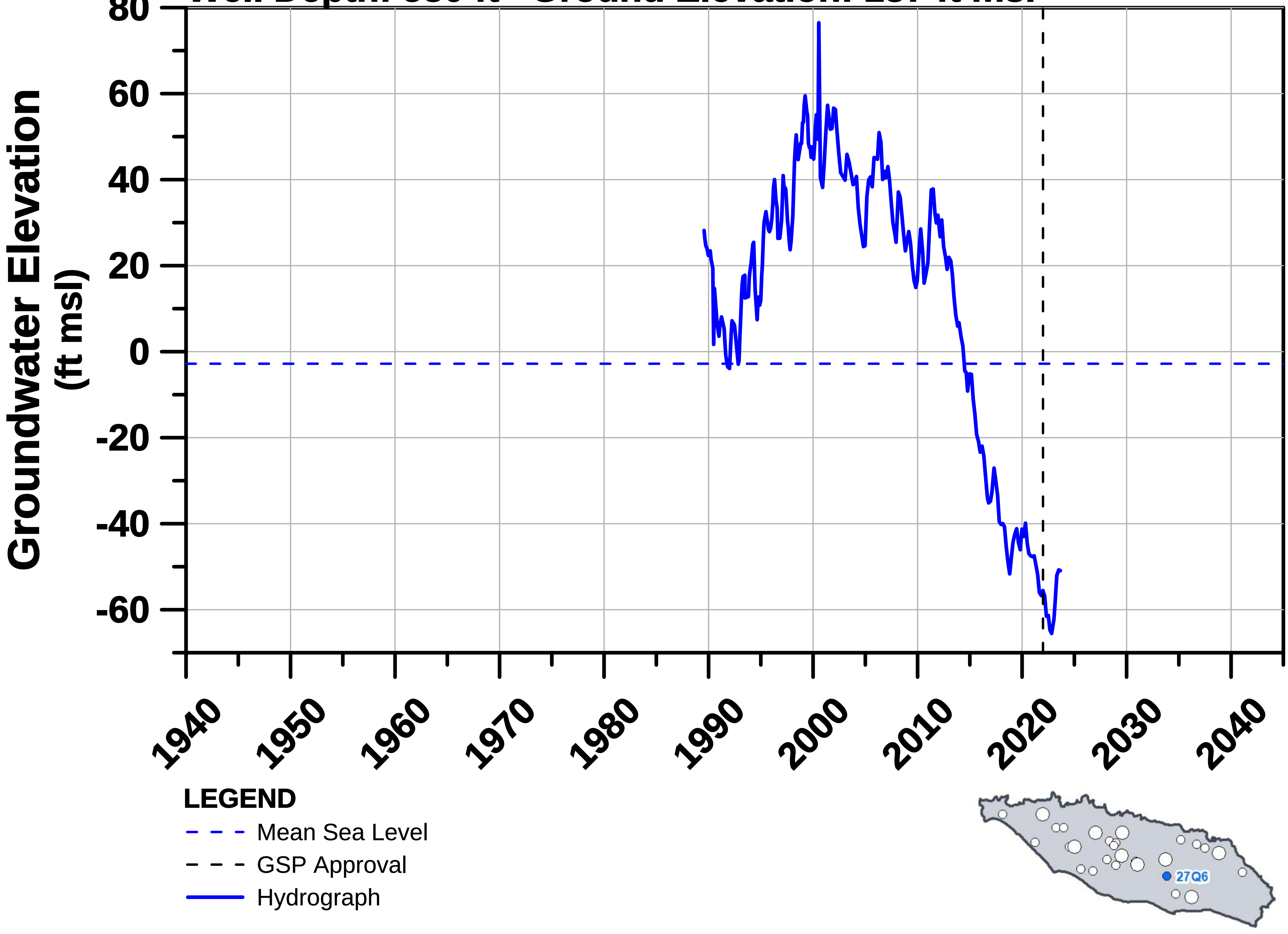
LEGEND

- - - Mean Sea Level
- - - GSP Approval
— Hydrograph



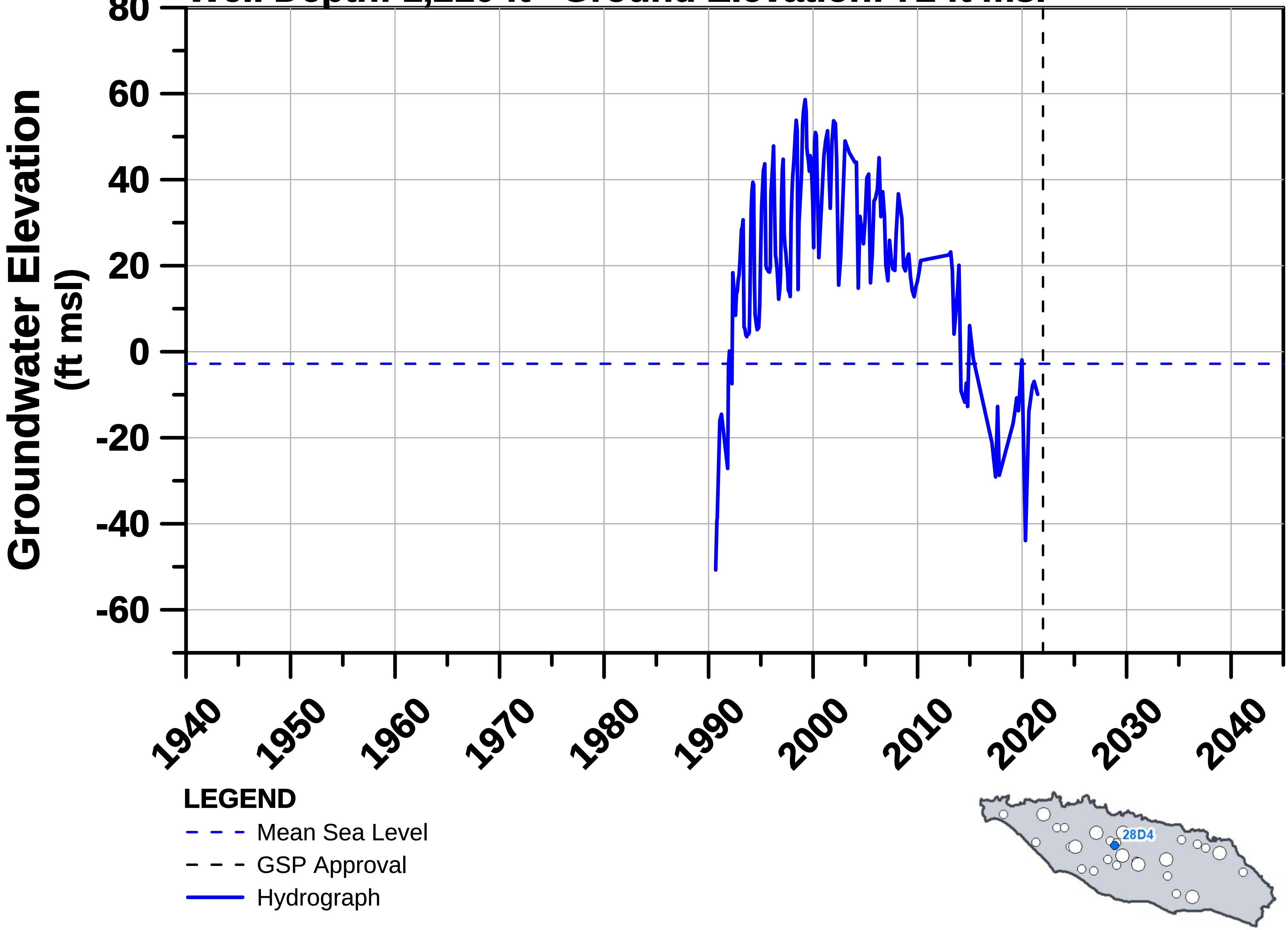
4N/25W - 27Q6

Well Depth: 580 ft   Ground Elevation: 137 ft msl



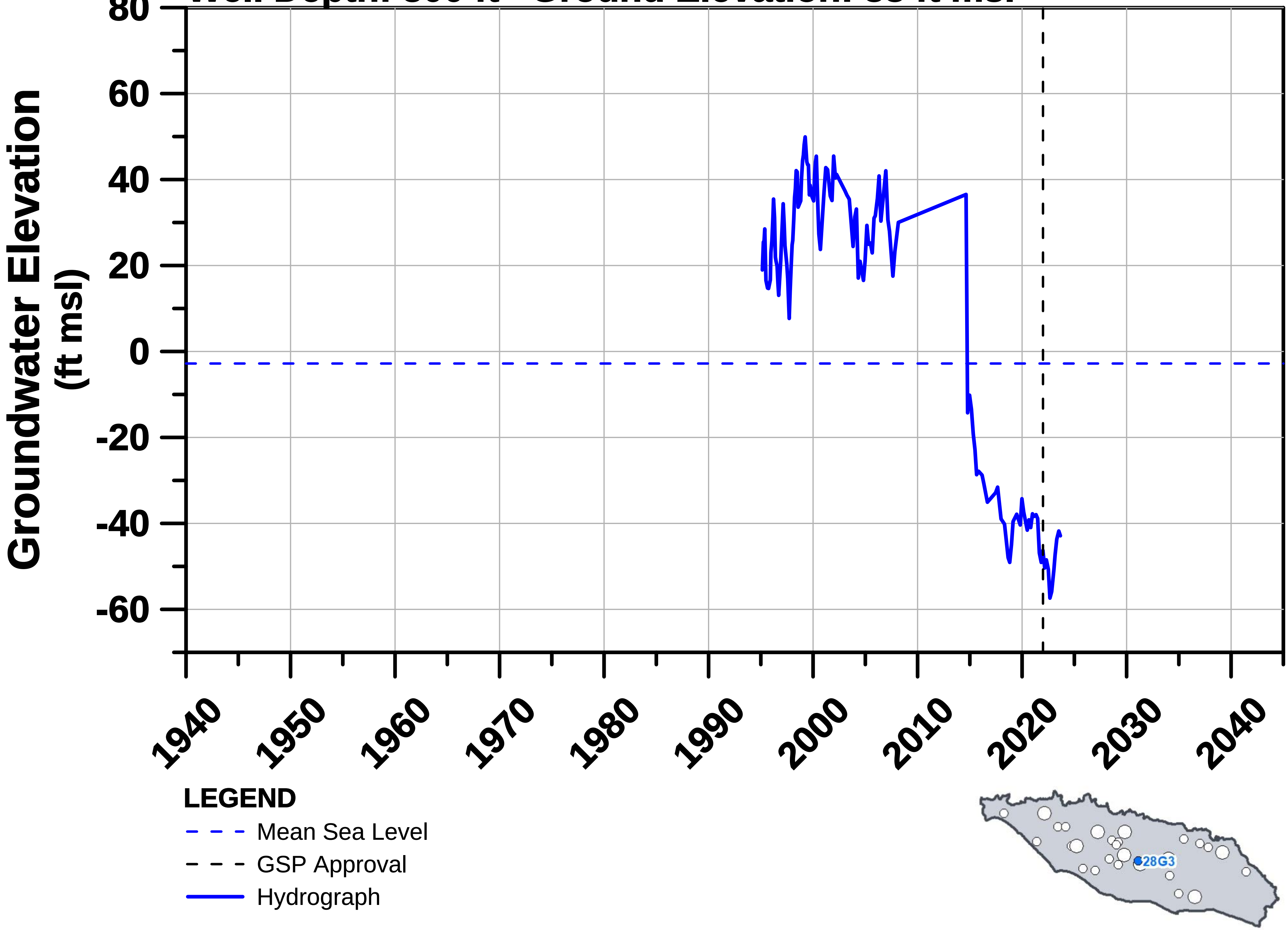
4N/25W - 28D4

Well Depth: 1,210 ft   Ground Elevation: 72 ft msl



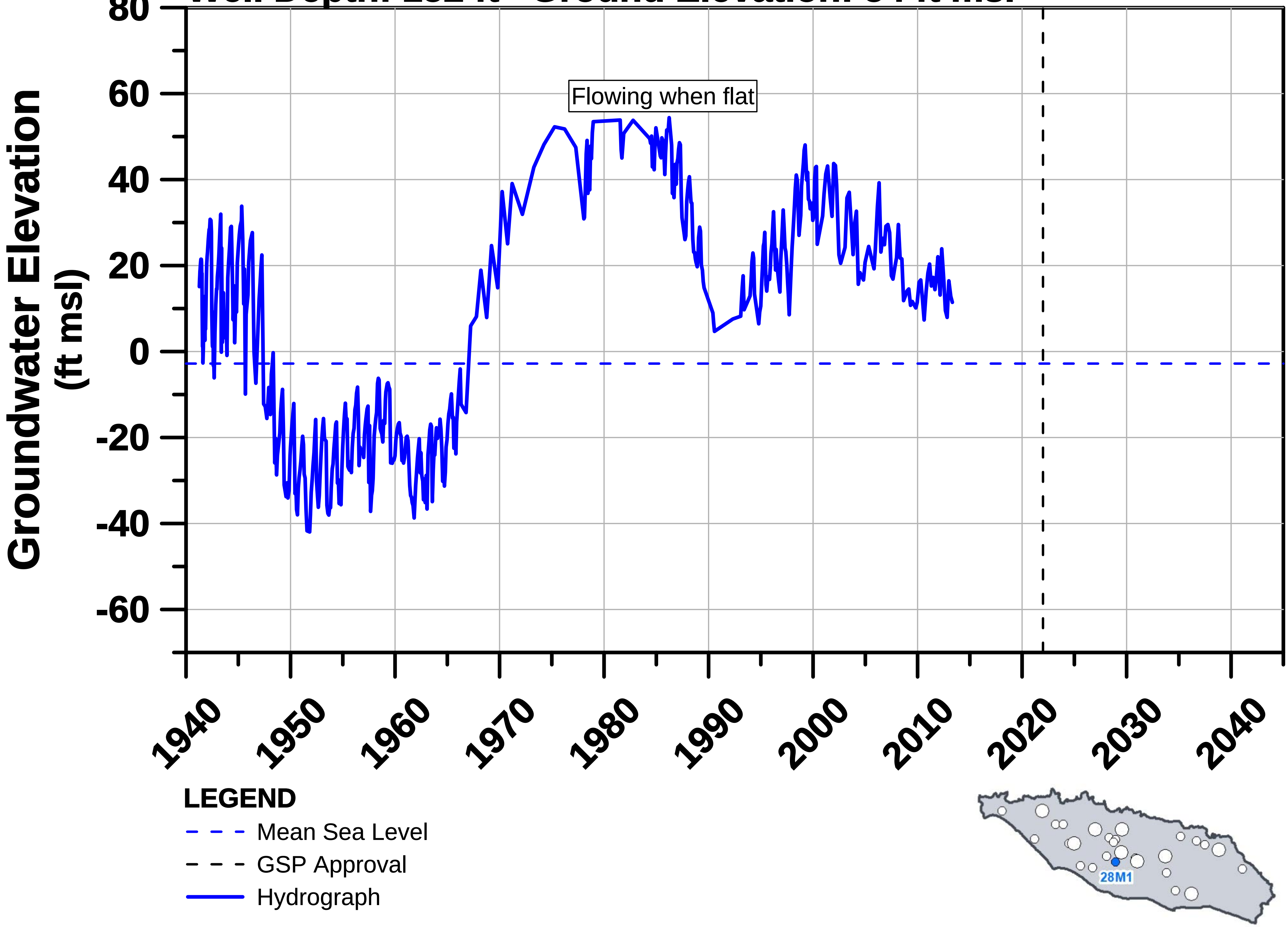
4N/25W - 28G3

Well Depth: 300 ft   Ground Elevation: 88 ft msl



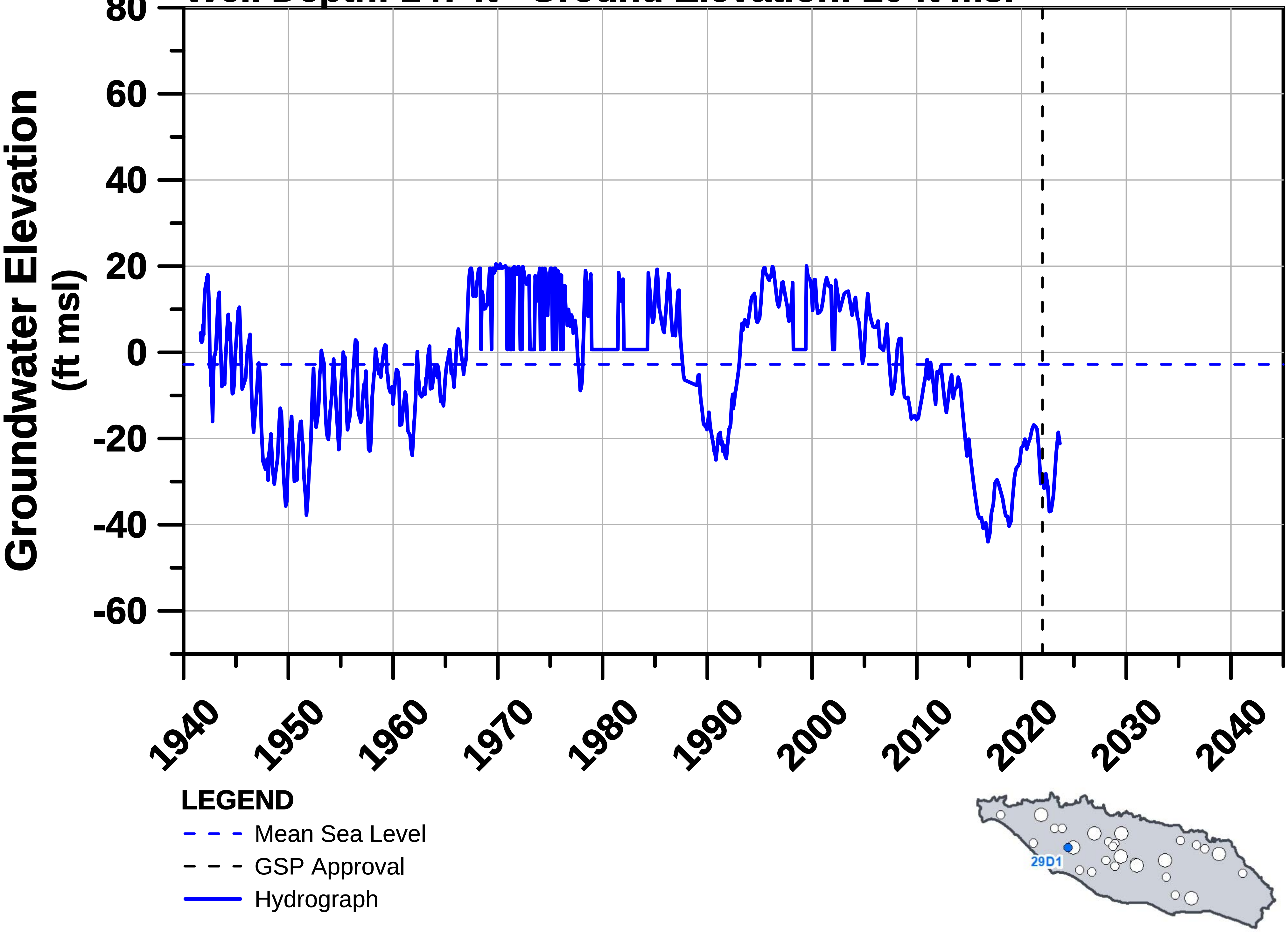
4N/25W - 28M1

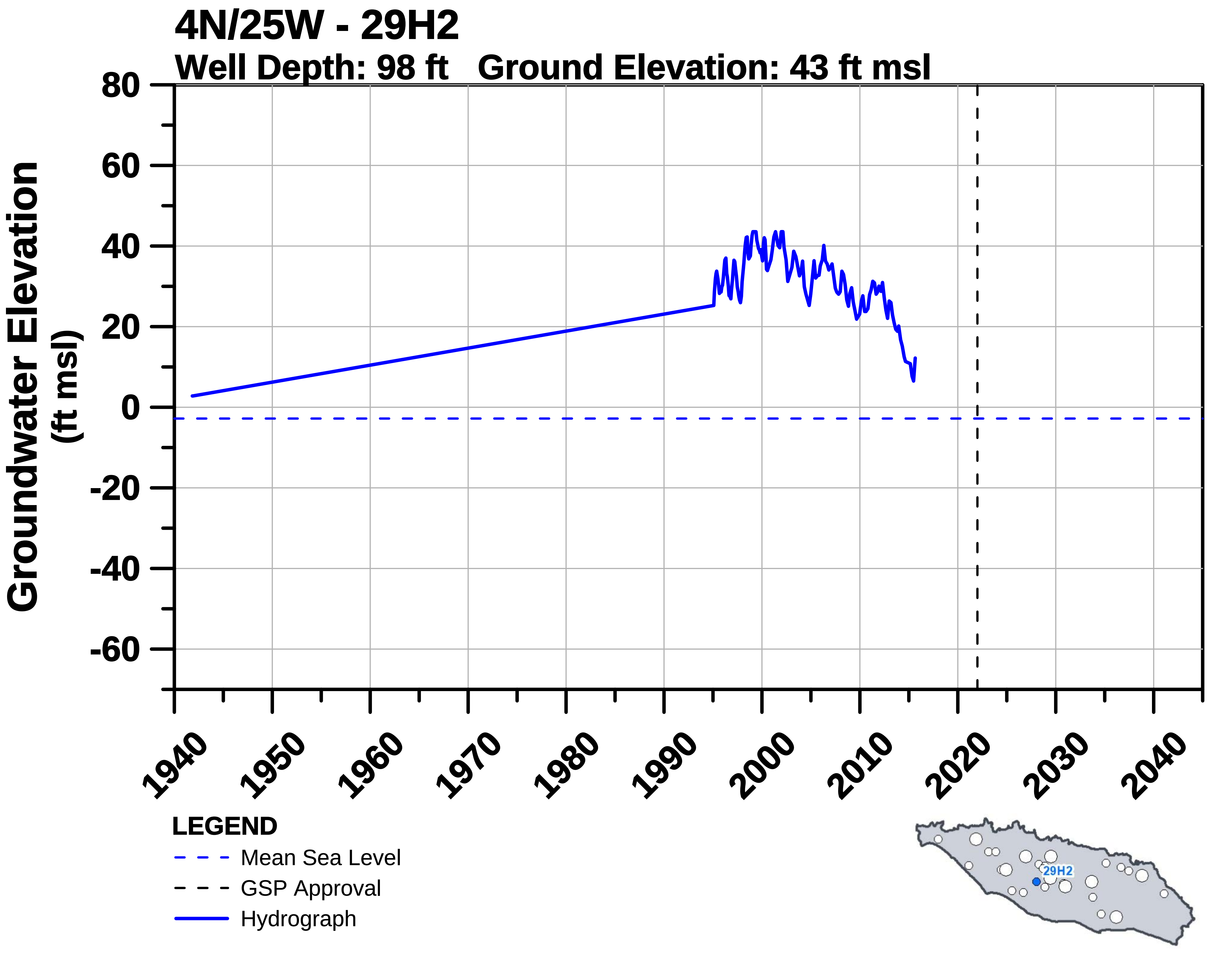
Well Depth: 152 ft   Ground Elevation: 54 ft msl



4N/25W - 29D1

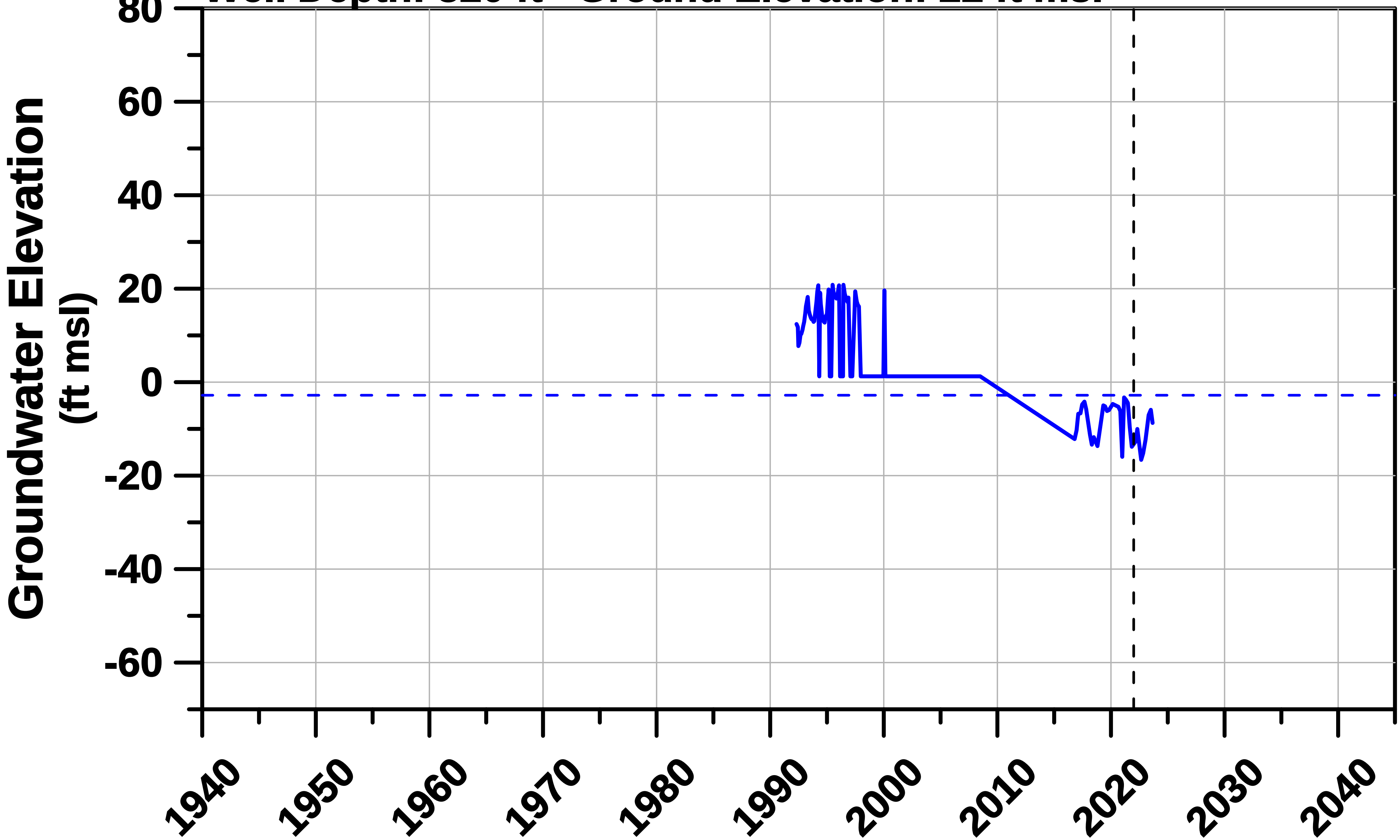
Well Depth: 147 ft   Ground Elevation: 20 ft msl




4N/25W - 29H2
Well Depth: 98 ft   Ground Elevation: 43 ft msl
Groundwater Elevation
(ft msl)
80
60
40
20
0
-20
-40
-60
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
LEGEND
Mean Sea Level
GSP Approval
Hydrograph
29H2

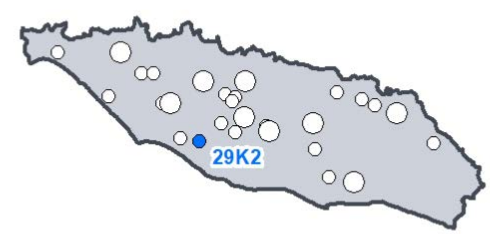
4N/25W - 29K2

Well Depth: 320 ft   Ground Elevation: 22 ft msl



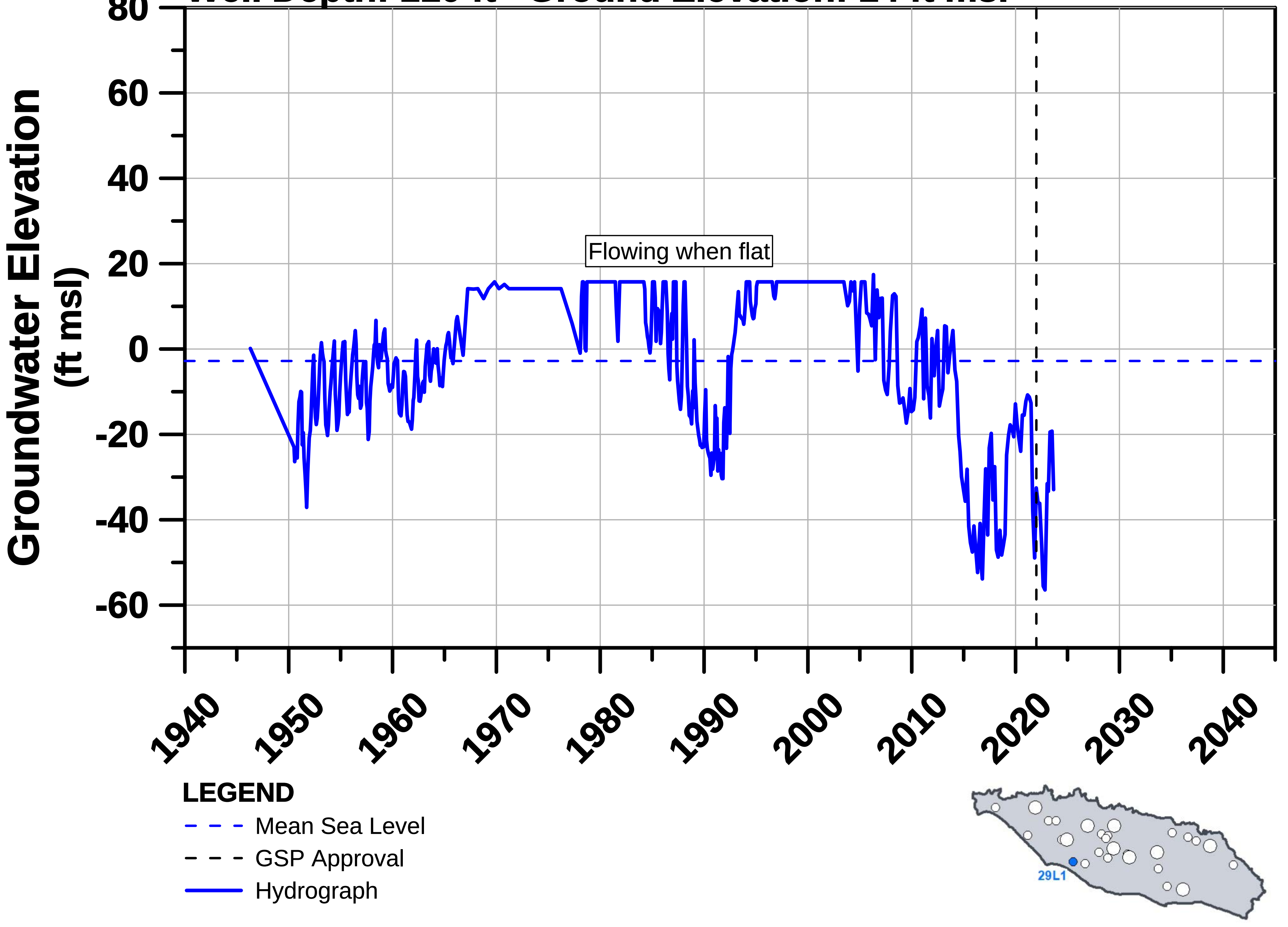
LEGEND

- Mean Sea Level
- GSP Approval
- Hydrograph



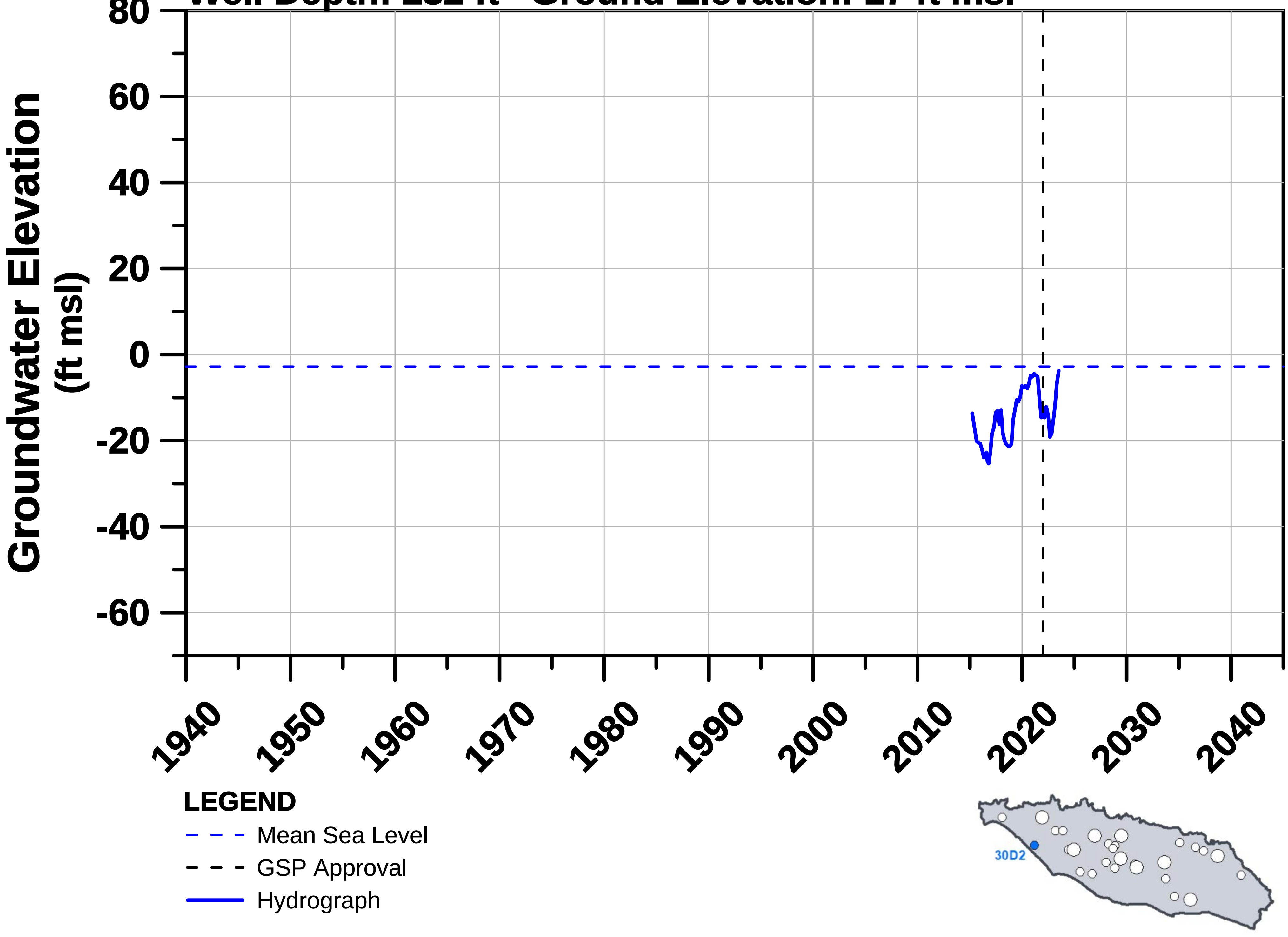
4N/25W - 29L1

Well Depth: 110 ft   Ground Elevation: 14 ft msl



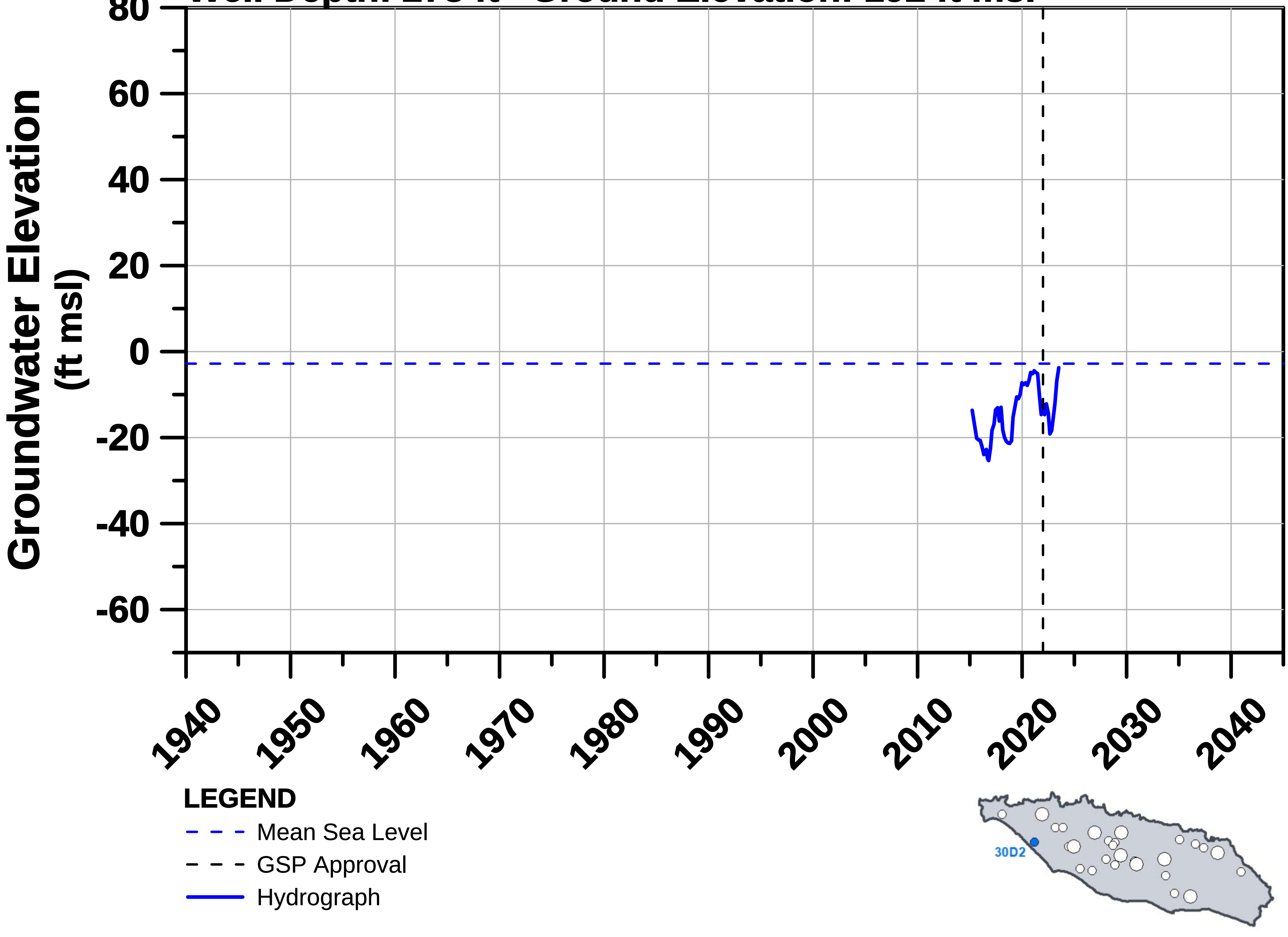
4N/25W - 30D2

Well Depth: 232 ft   Ground Elevation: 17 ft msl



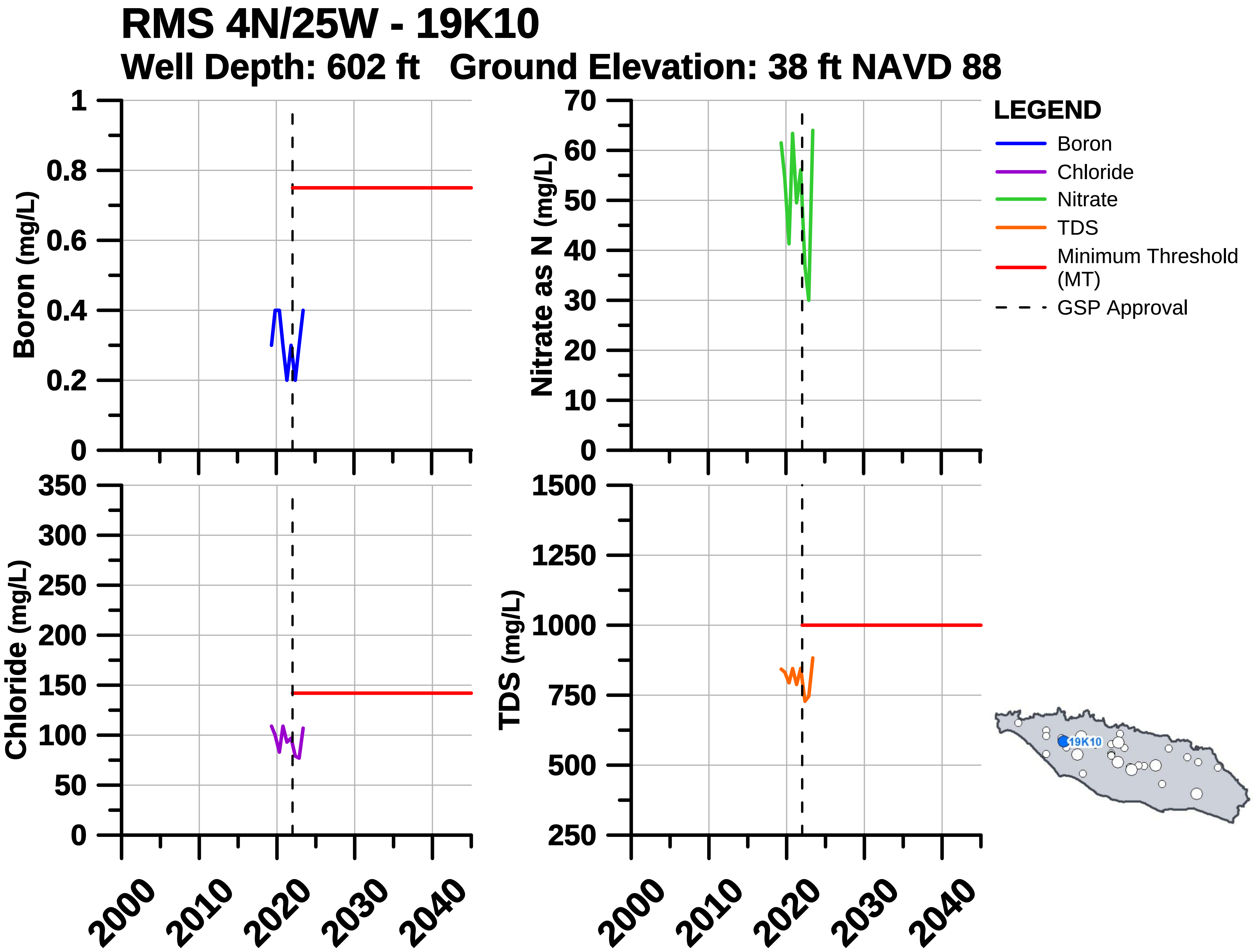
4N/25W - 34G1

Well Depth: 278 ft   Ground Elevation: 192 ft msl



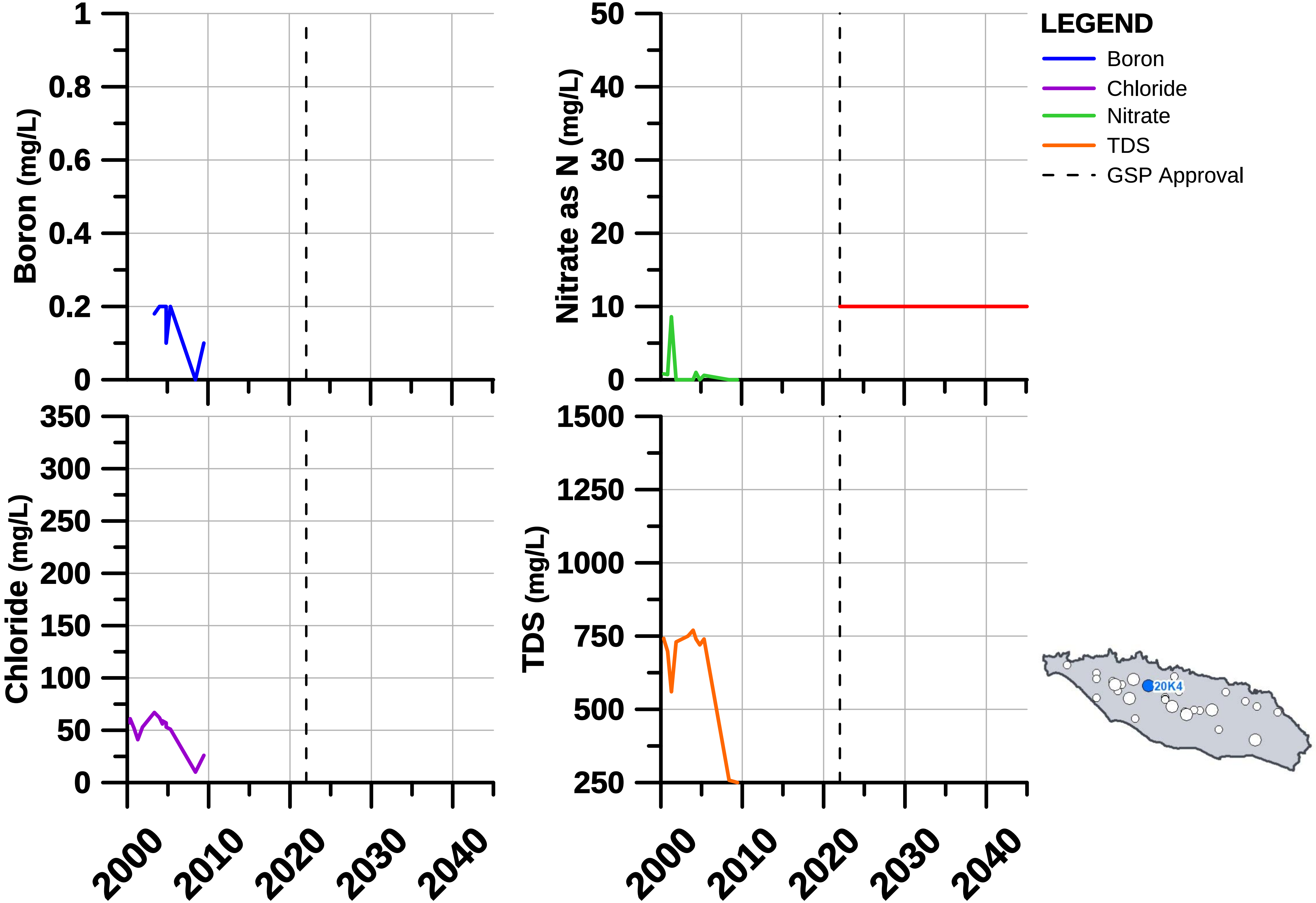
APPENDIX E

Chemographs for Groundwater Quality Monitoring Network


RMS 4N/25W - 19K10
Well Depth: 602 ft Ground Elevation: 38 ft NAVD 88
Boron (mg/L)
Nitrate as N (mg/L)
Chloride (mg/L)
TDS (mg/L)
0
0.2
0.4
0.6
0.8
1
0
10
20
30
40
50
60
70
0
50
100
150
200
250
300
350
250
500
750
1000
1250
1500
2000
2010
2020
2030
2040
LEGEND
Boron
Chloride
Nitrate
TDS
Minimum Threshold (MT)
GSP Approval
19K10

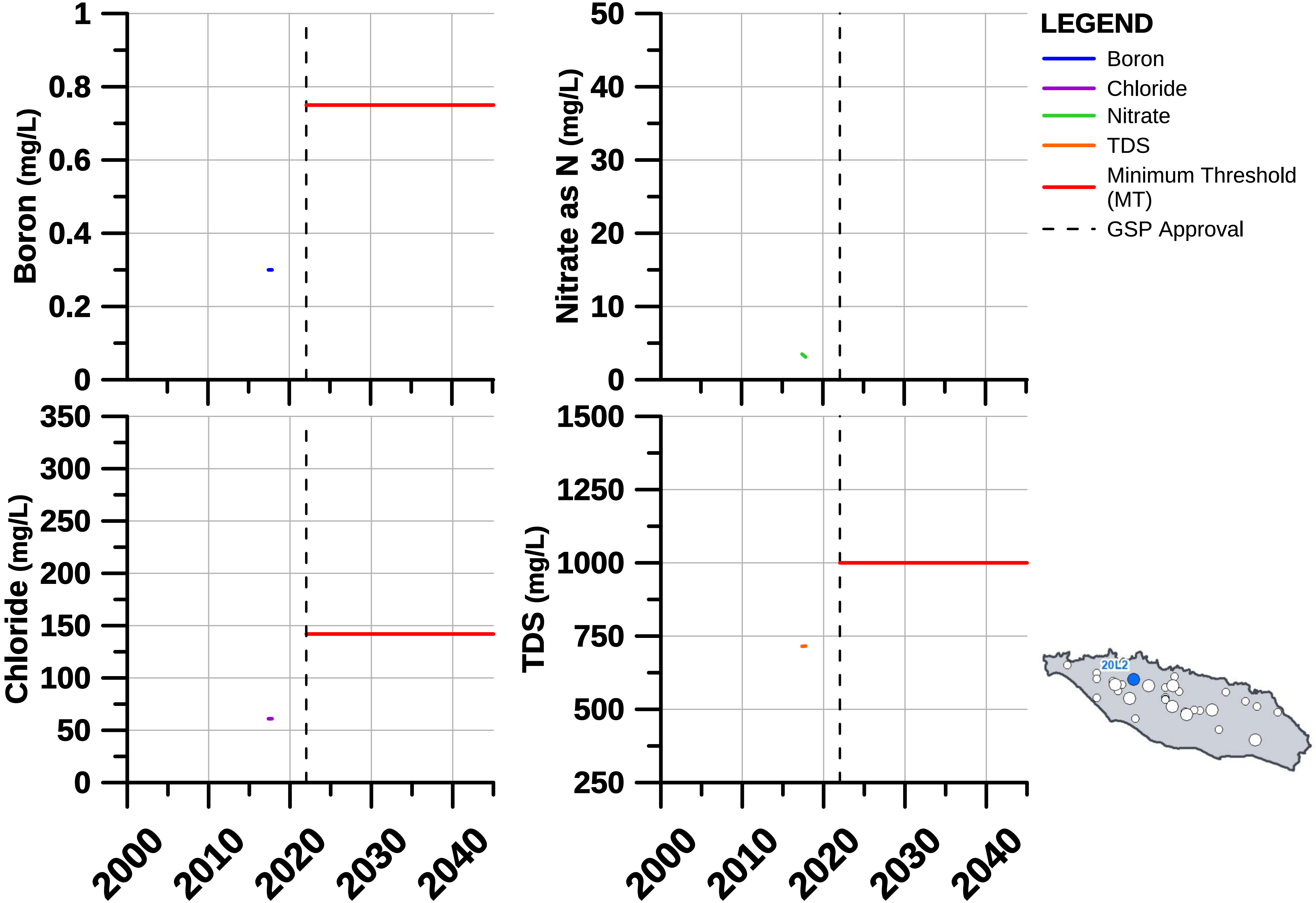
RMS 4N/25W - 20K4

Well Depth: 903 ft   Ground Elevation: 47 ft NAVD 88



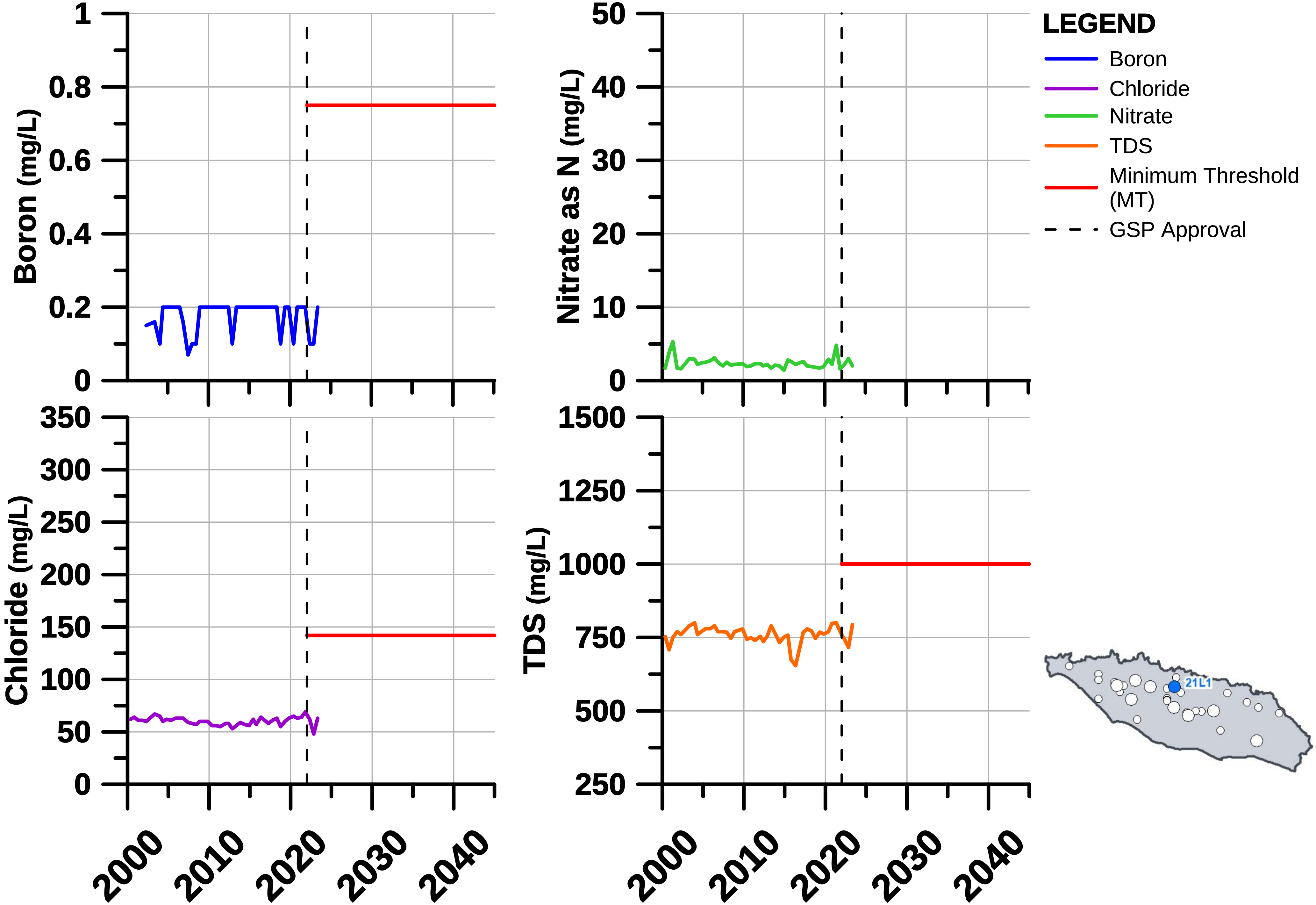
RMS 4N/25W - 20L2

Well Depth: Unknown   Ground Elevation: 93 ft NAVD 88



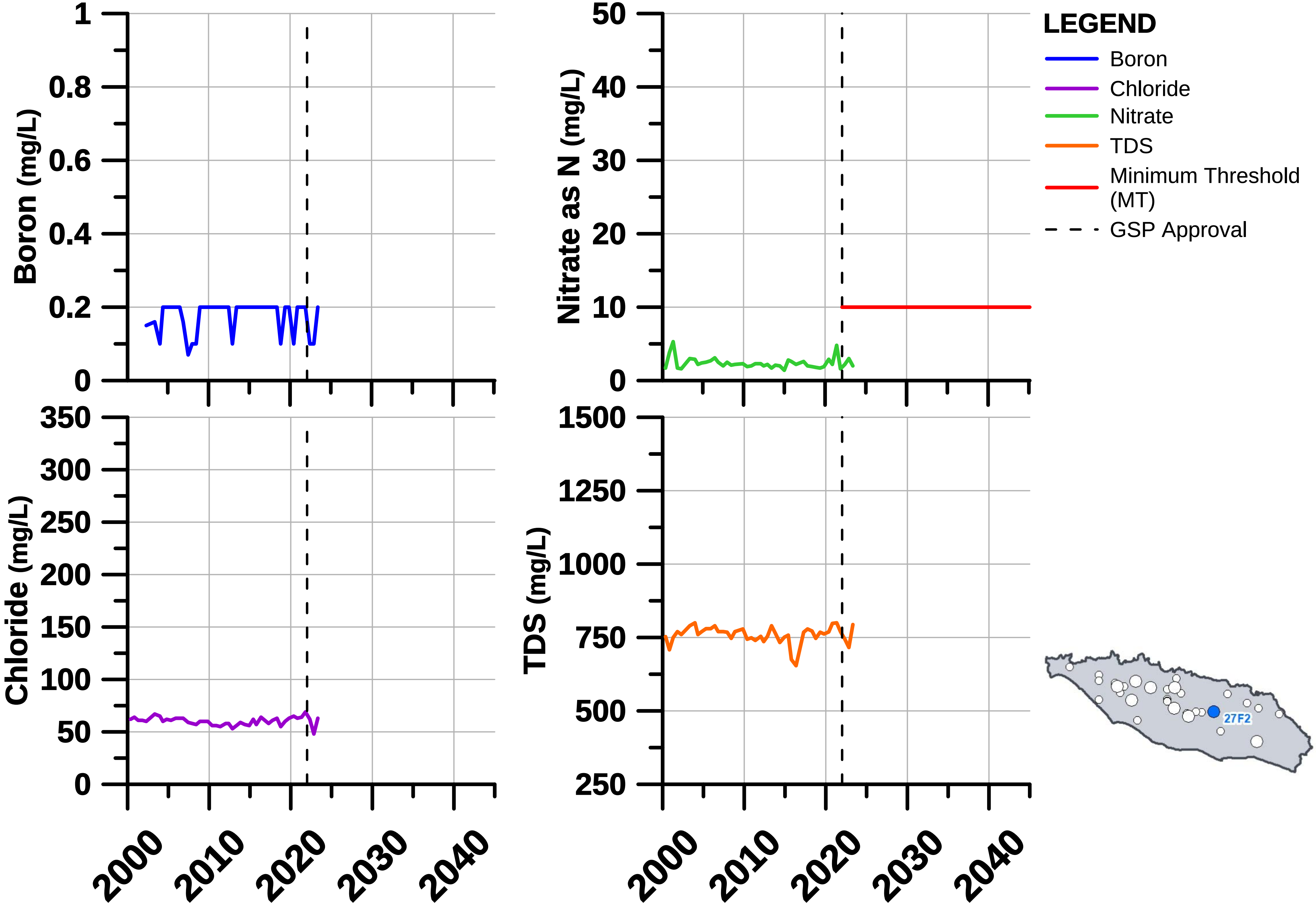
RMS 4N/25W - 21L1

Well Depth: 732 ft   Ground Elevation: 69 ft NAVD 88



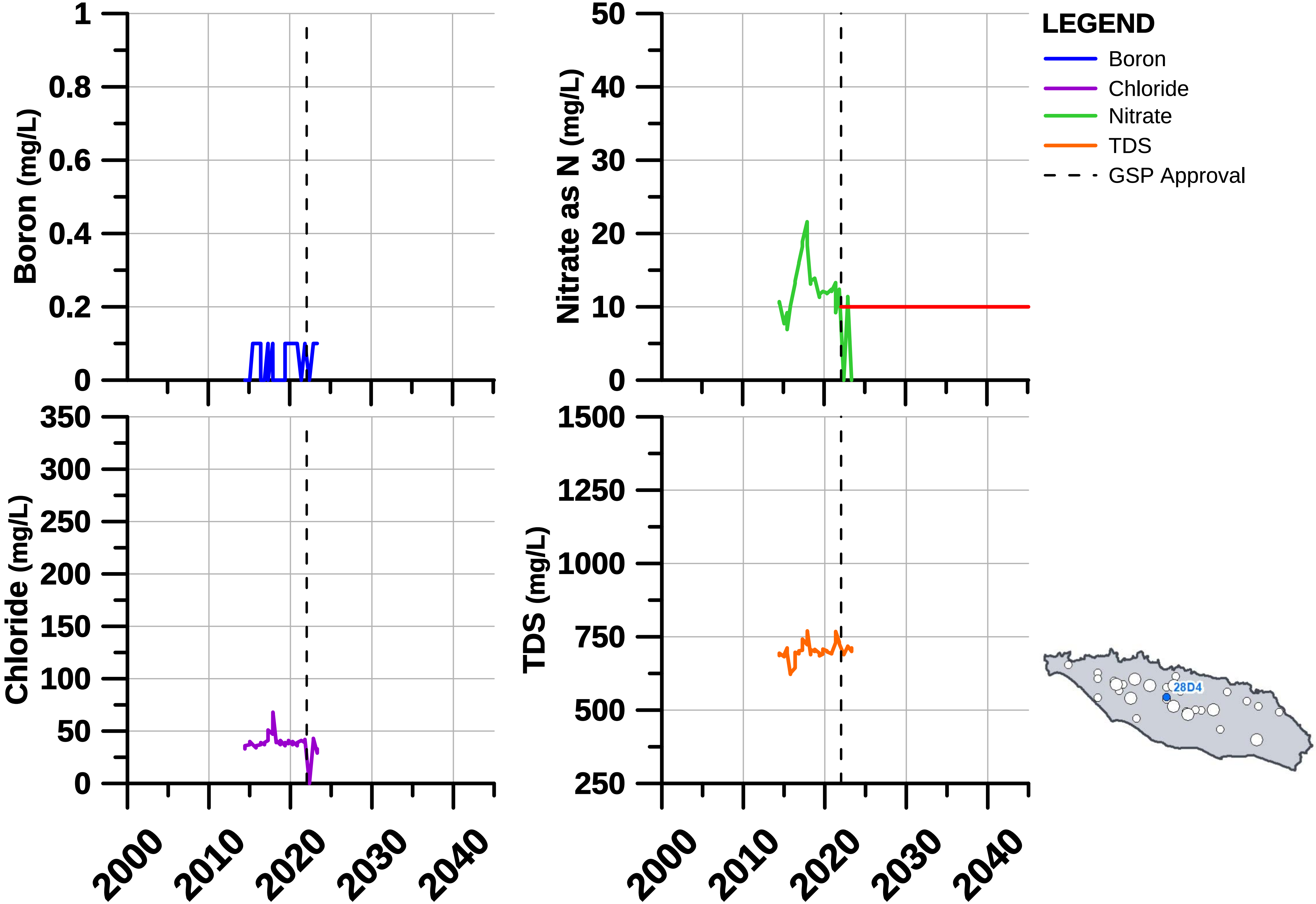
RMS 4N/25W - 27F2

Well Depth: 825 ft   Ground Elevation: 136 ft NAVD 88



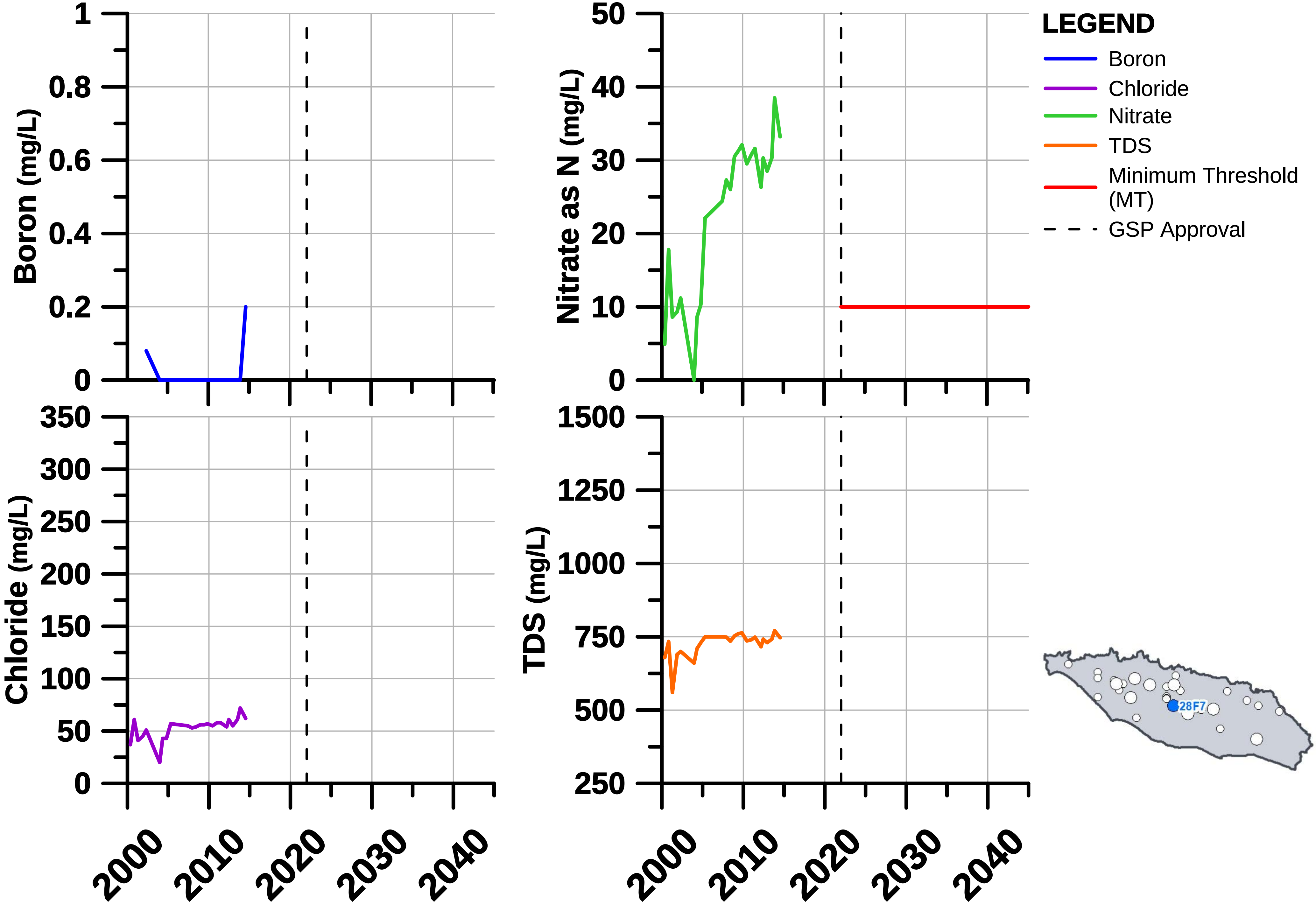
RMS 4N/25W - 28D4

Well Depth: 1,210 ft   Ground Elevation: 72 ft NAVD 88



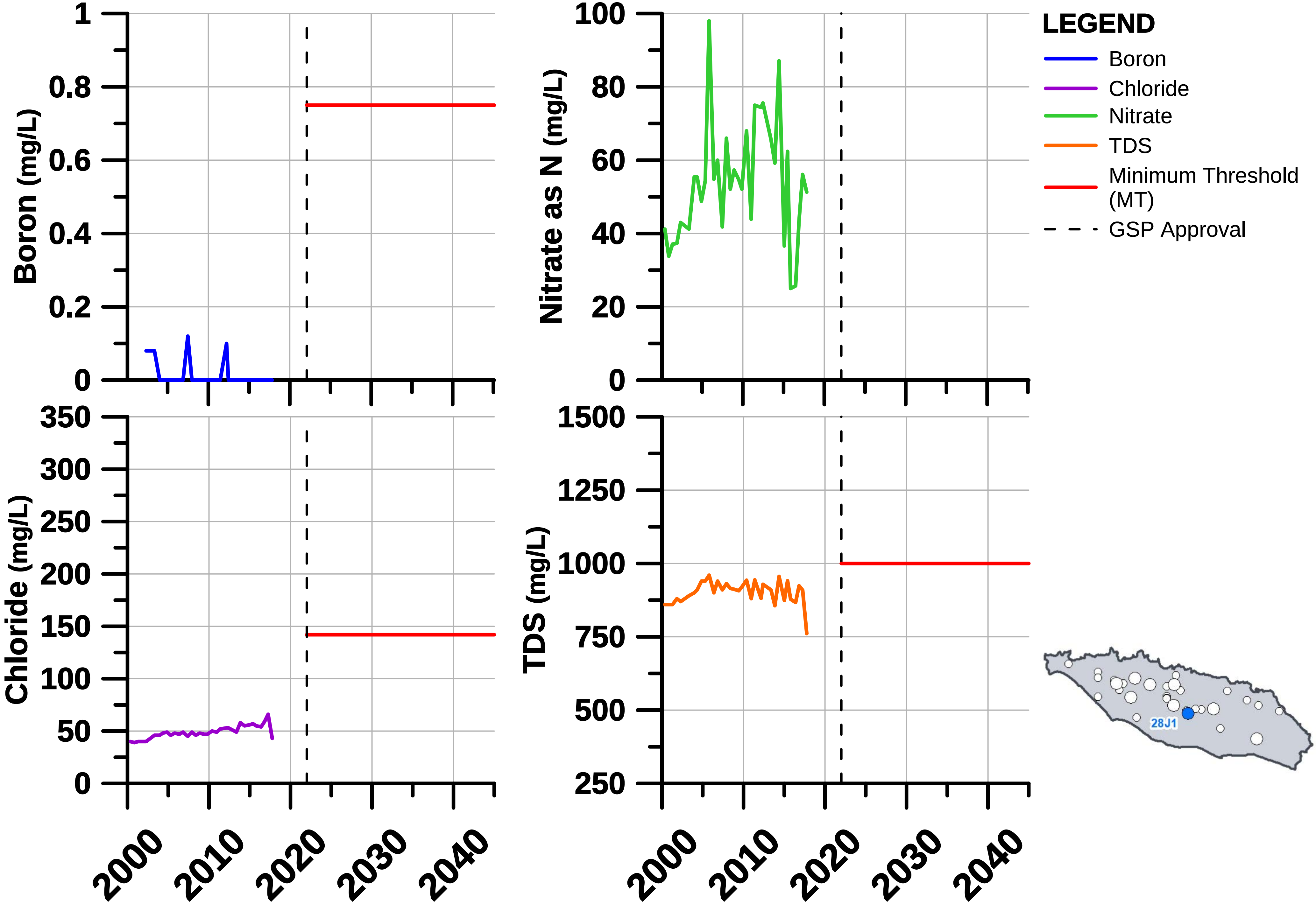
RMS 4N/25W - 28F7

Well Depth: 1,240/980 ft   Ground Elevation: 65 ft NAVD 88



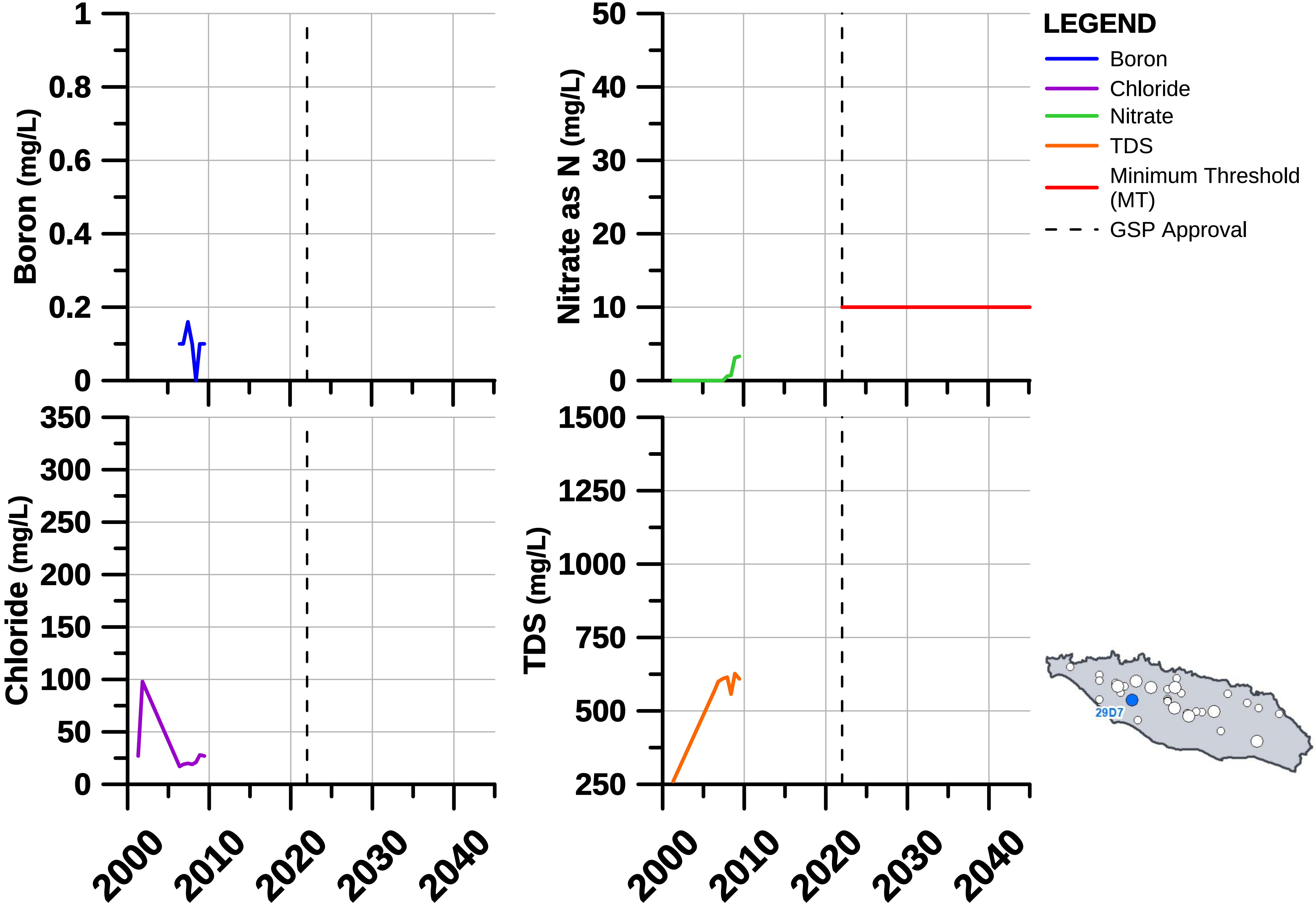
RMS 4N/25W - 28J1

Well Depth: 175 ft   Ground Elevation: 103 ft NAVD 88



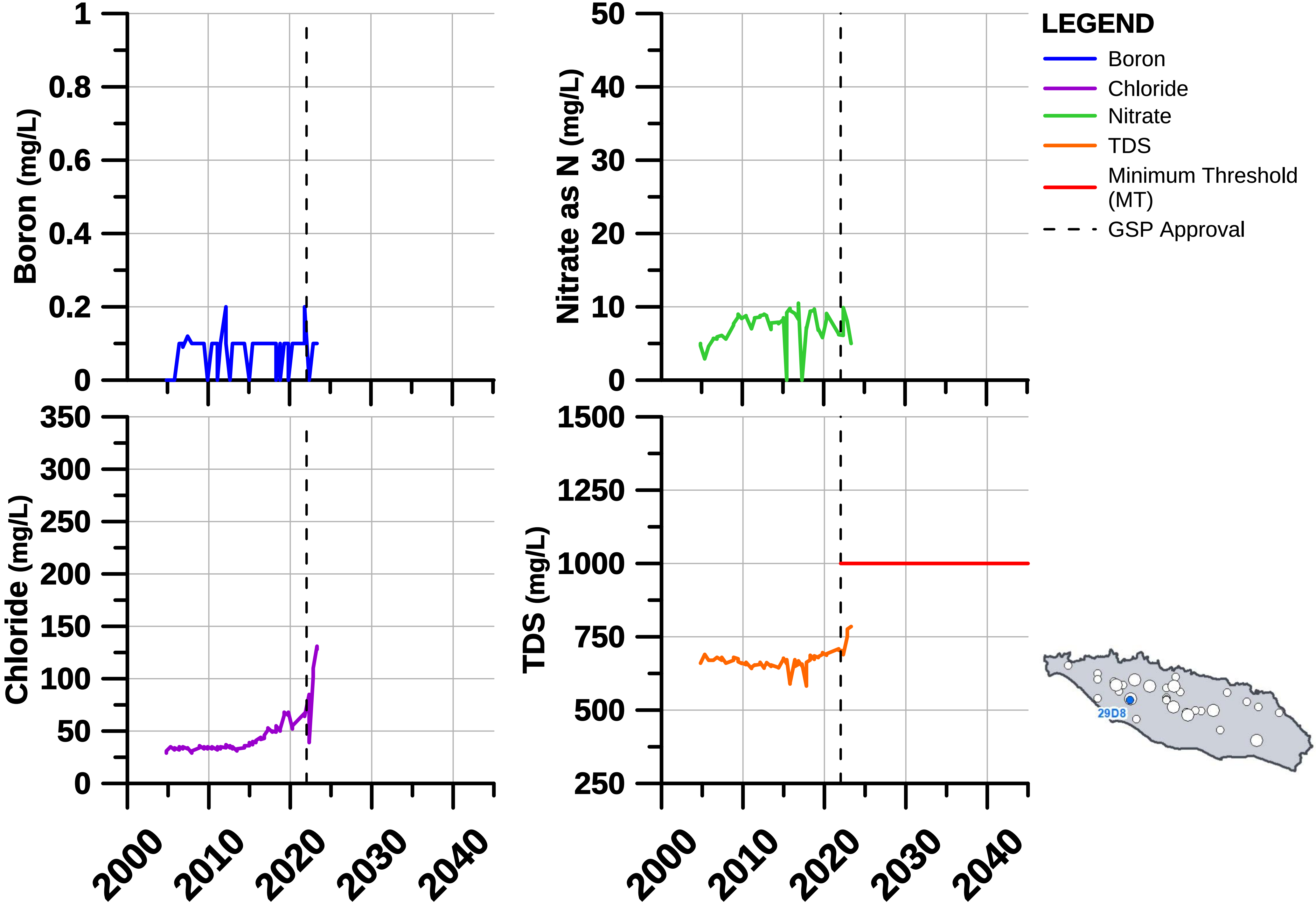
RMS 4N/25W - 29D7

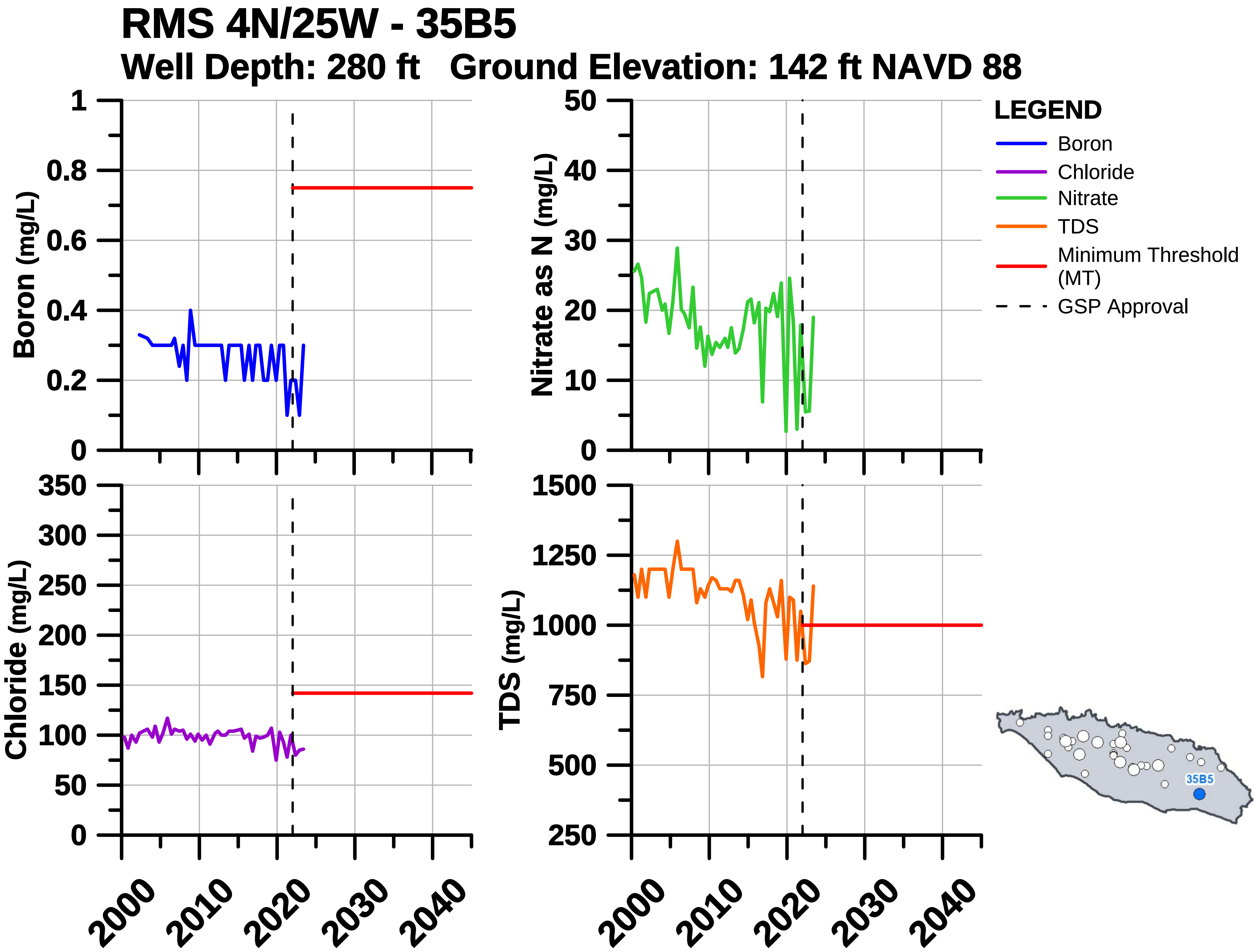
Well Depth: 950 ft   Ground Elevation: 28 ft NAVD 88



RMS 4N/25W - 29D8

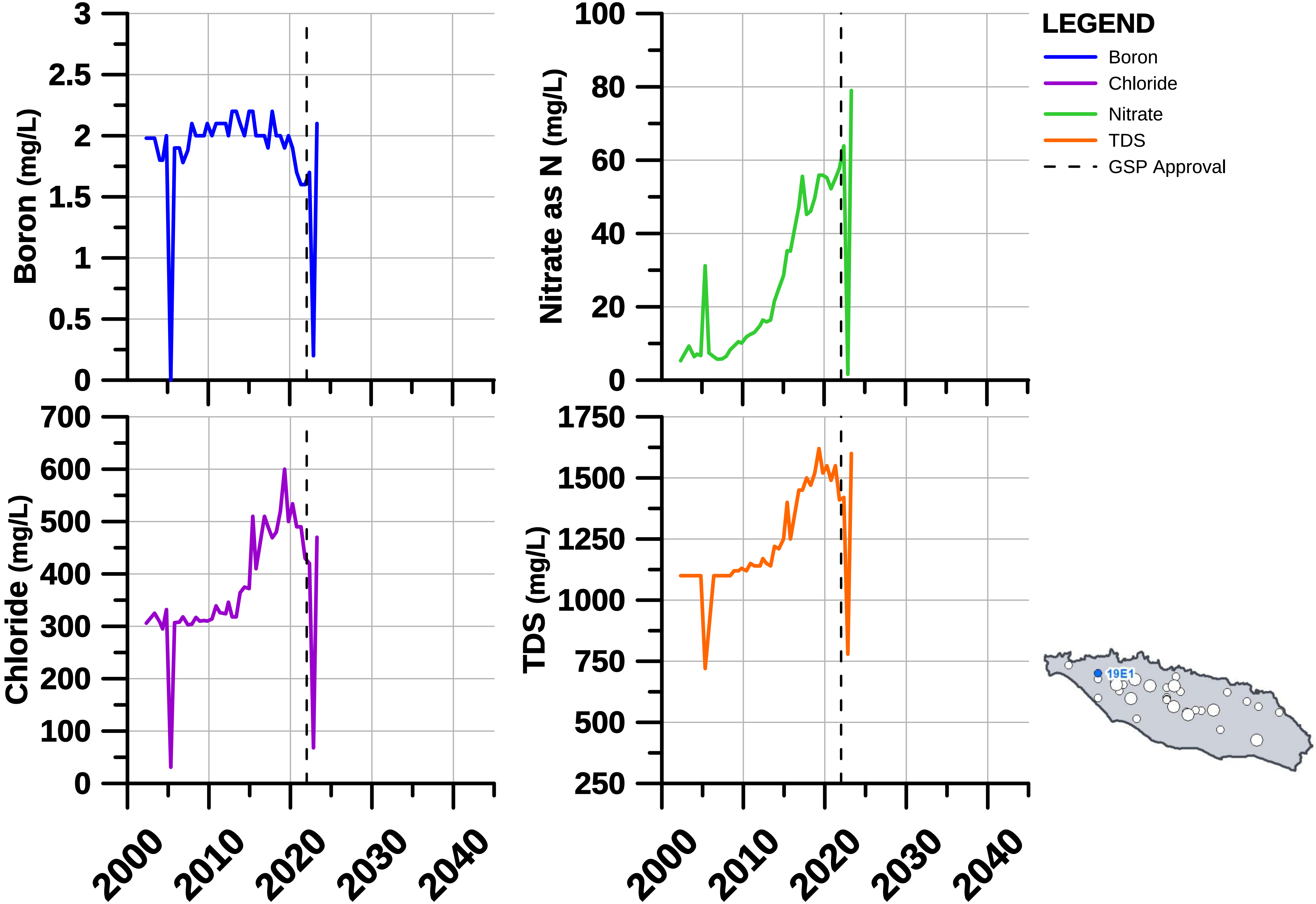
Well Depth: 958 ft   Ground Elevation: 29 ft NAVD 88




RMS 4N/25W - 35B5
Well Depth: 280 ft   Ground Elevation: 142 ft NAVD 88
Boron (mg/L)
Nitrate as N (mg/L)
Chloride (mg/L)
TDS (mg/L)
LEGEND
Boron
Chloride
Nitrate
TDS
Minimum Threshold (MT)
GSP Approval
35B5
2000
2010
2020
2030
2040

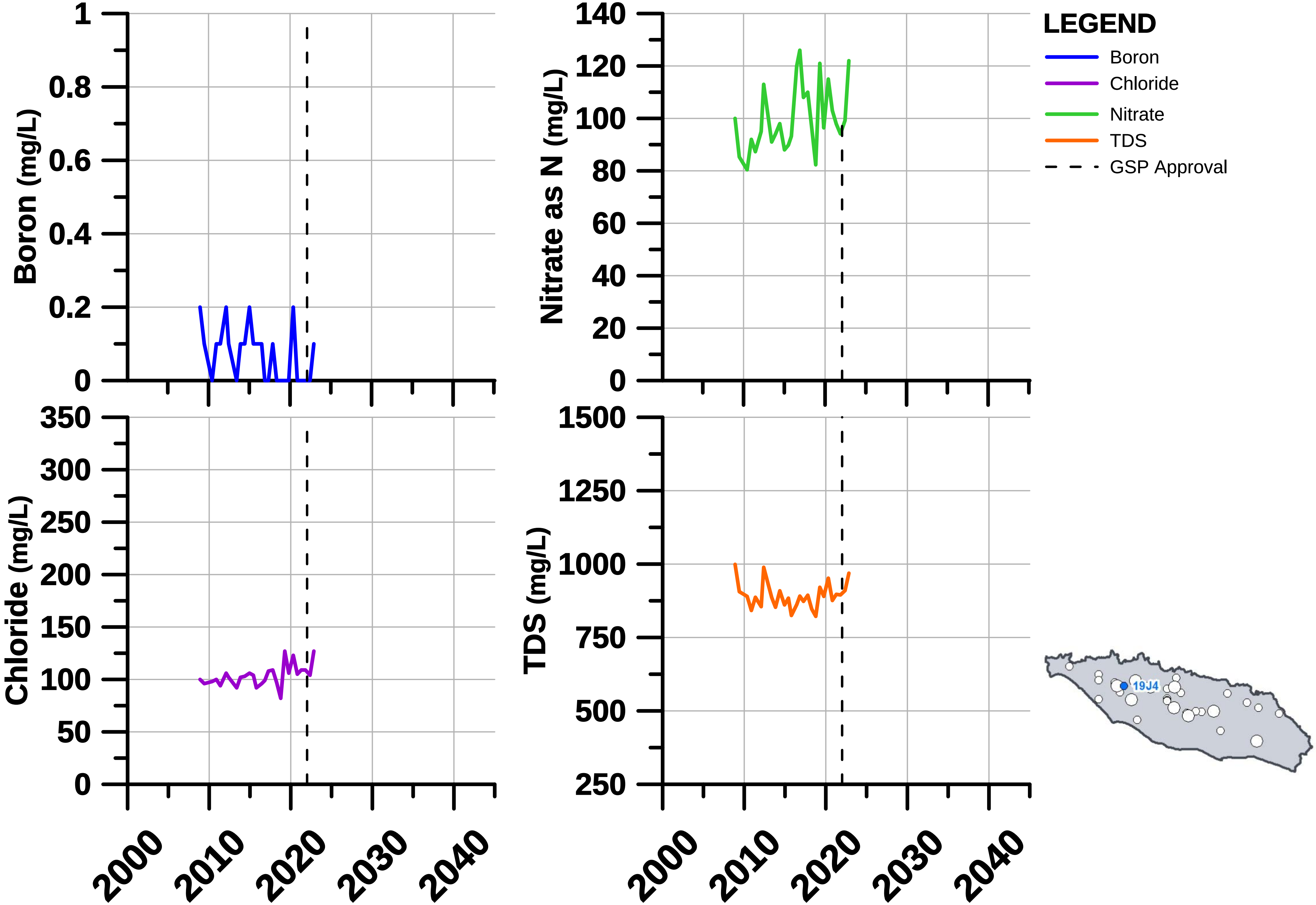
4N/25W - 19E1

Well Depth: 600 ft   Ground Elevation: 78 ft NAVD 88



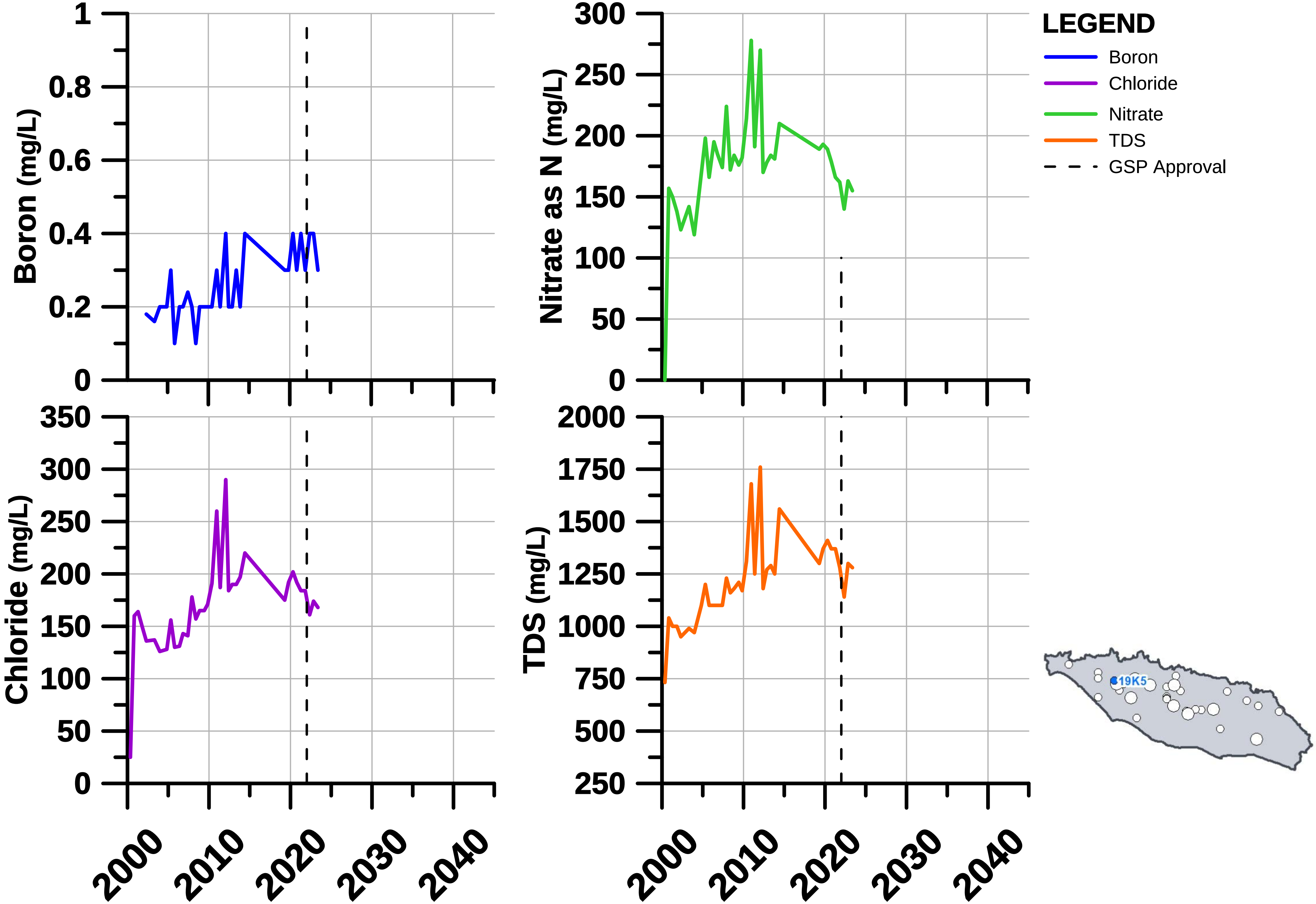
4N/25W - 19J4

Well Depth: 150 ft   Ground Elevation: 58 ft NAVD 88

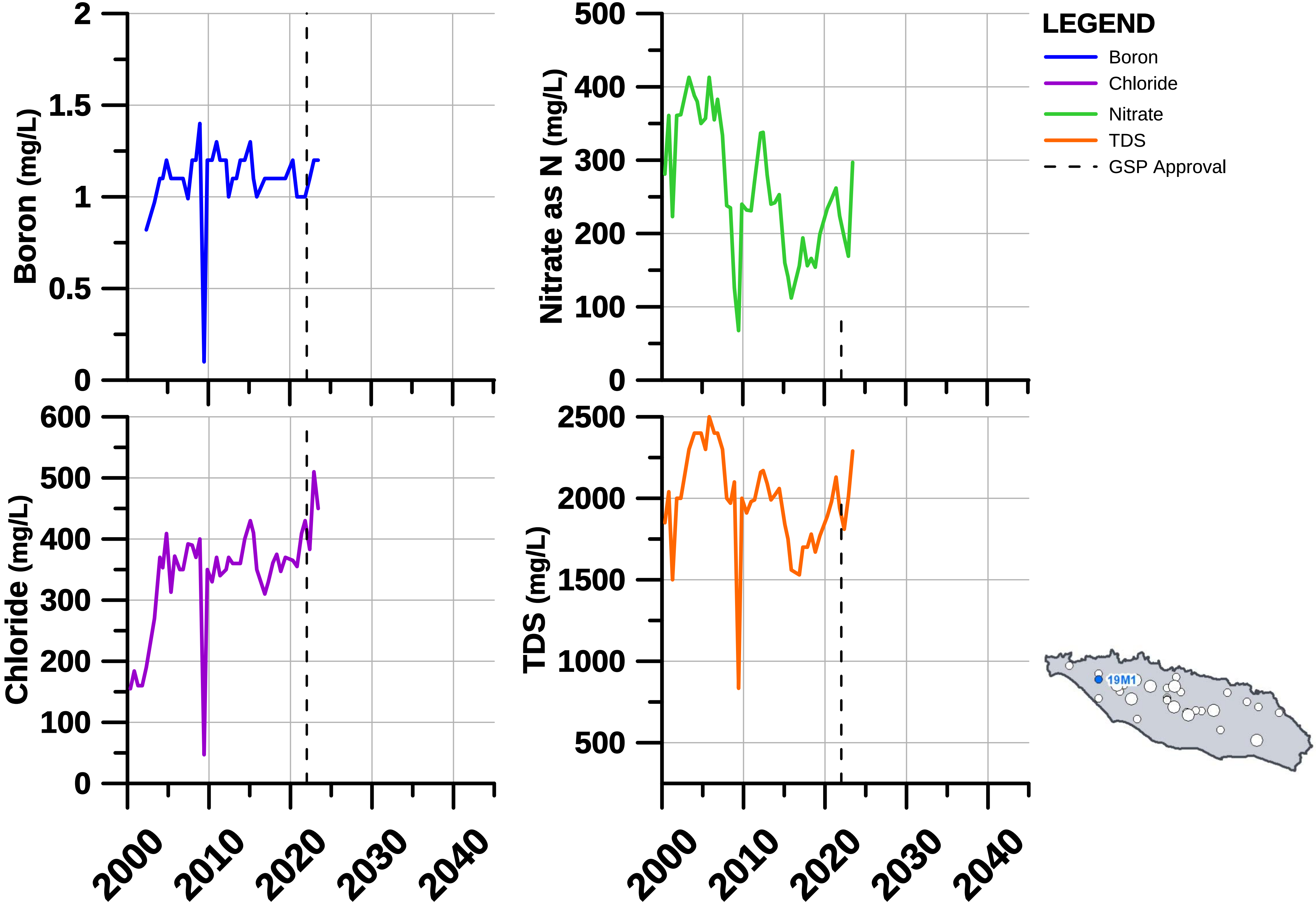


4N/25W - 19K5

Well Depth: 98 ft   Ground Elevation: 41 ft NAVD 88

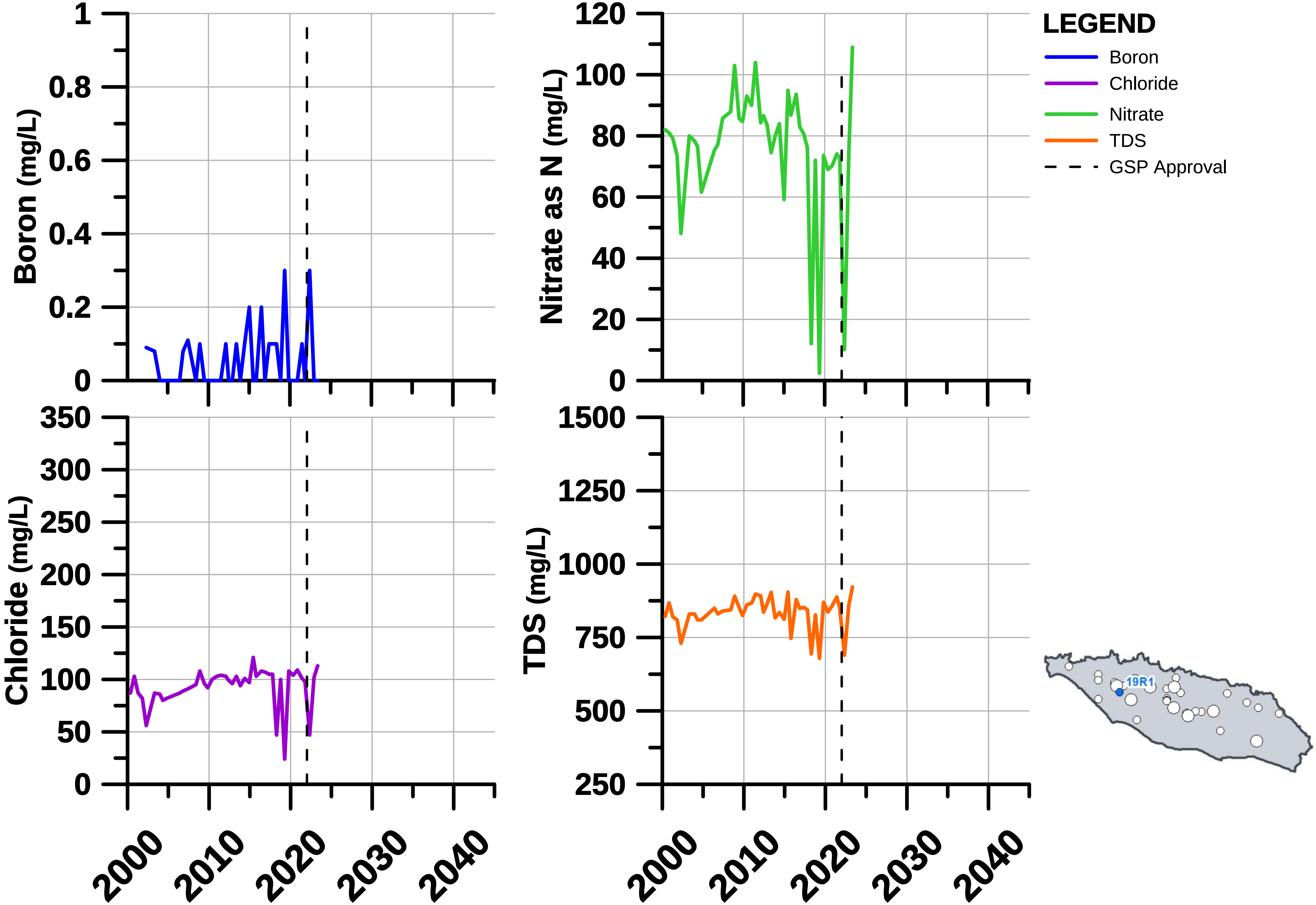


4N/25W - 19M1
Well Depth: 204 ft   Ground Elevation: 58 ft NAVD 88



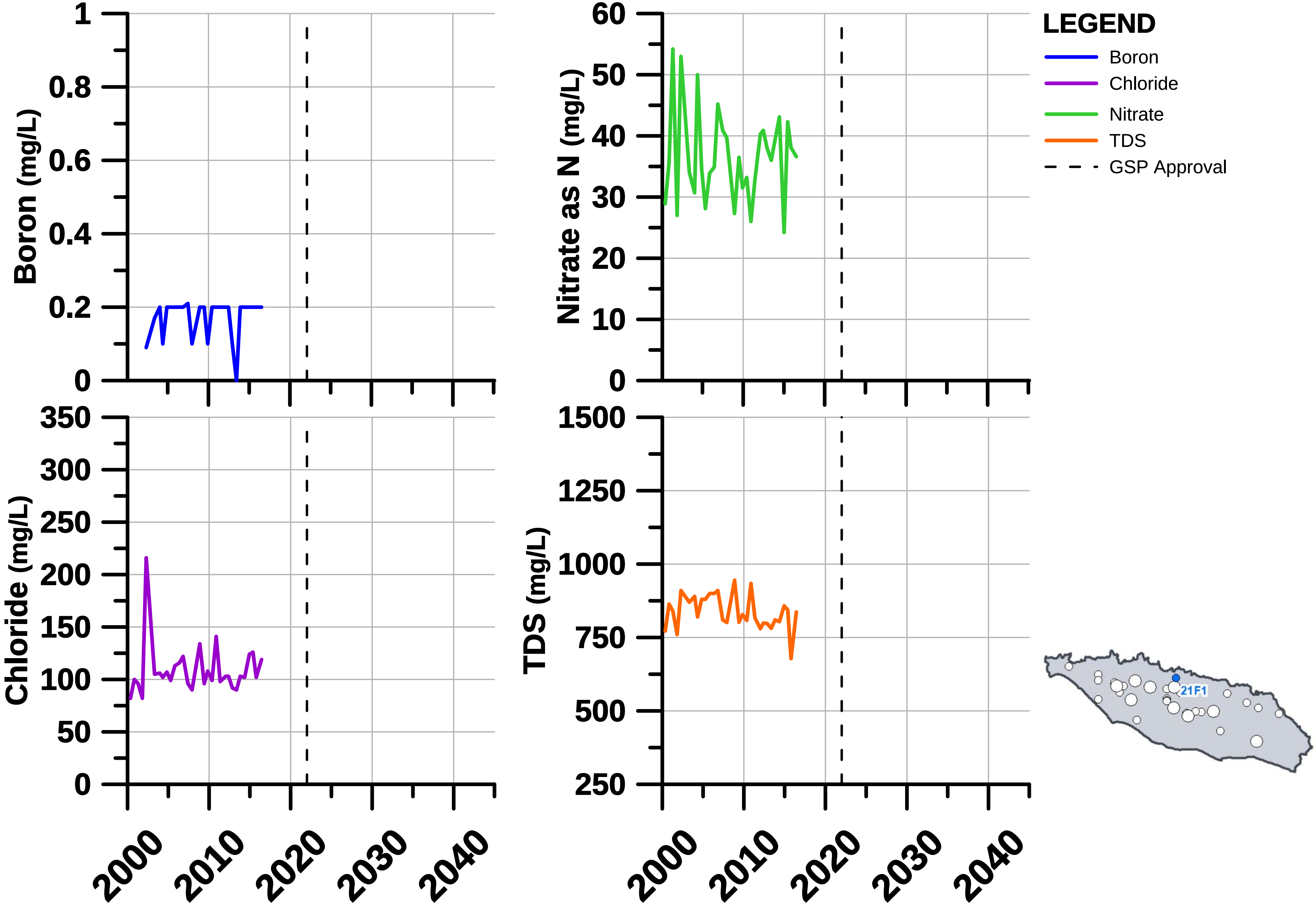
4N/25W - 19R1

Well Depth: 146 ft   Ground Elevation: 30 ft NAVD 88



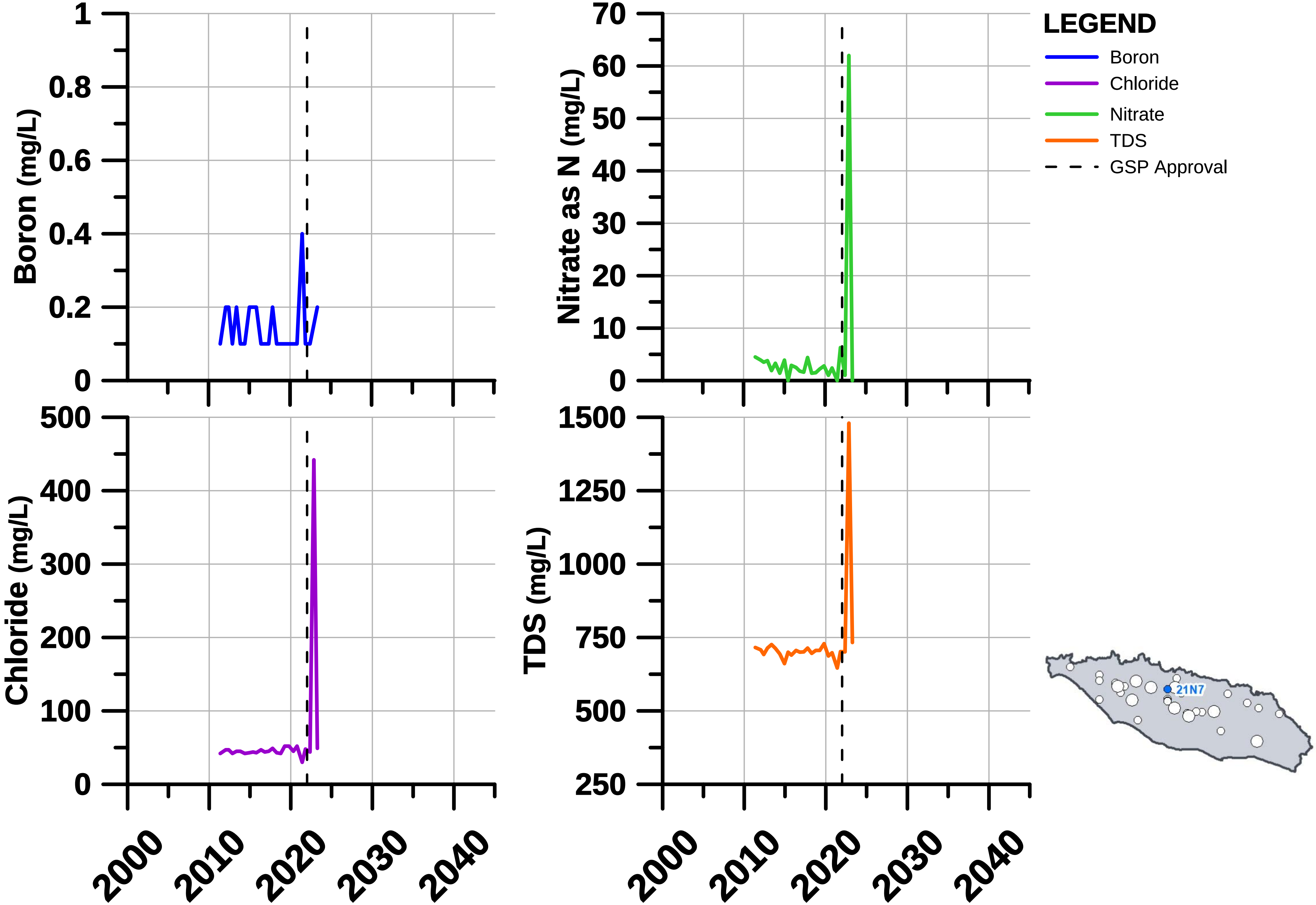
4N/25W - 21F1

Well Depth: 450 ft   Ground Elevation: 118 ft NAVD 88



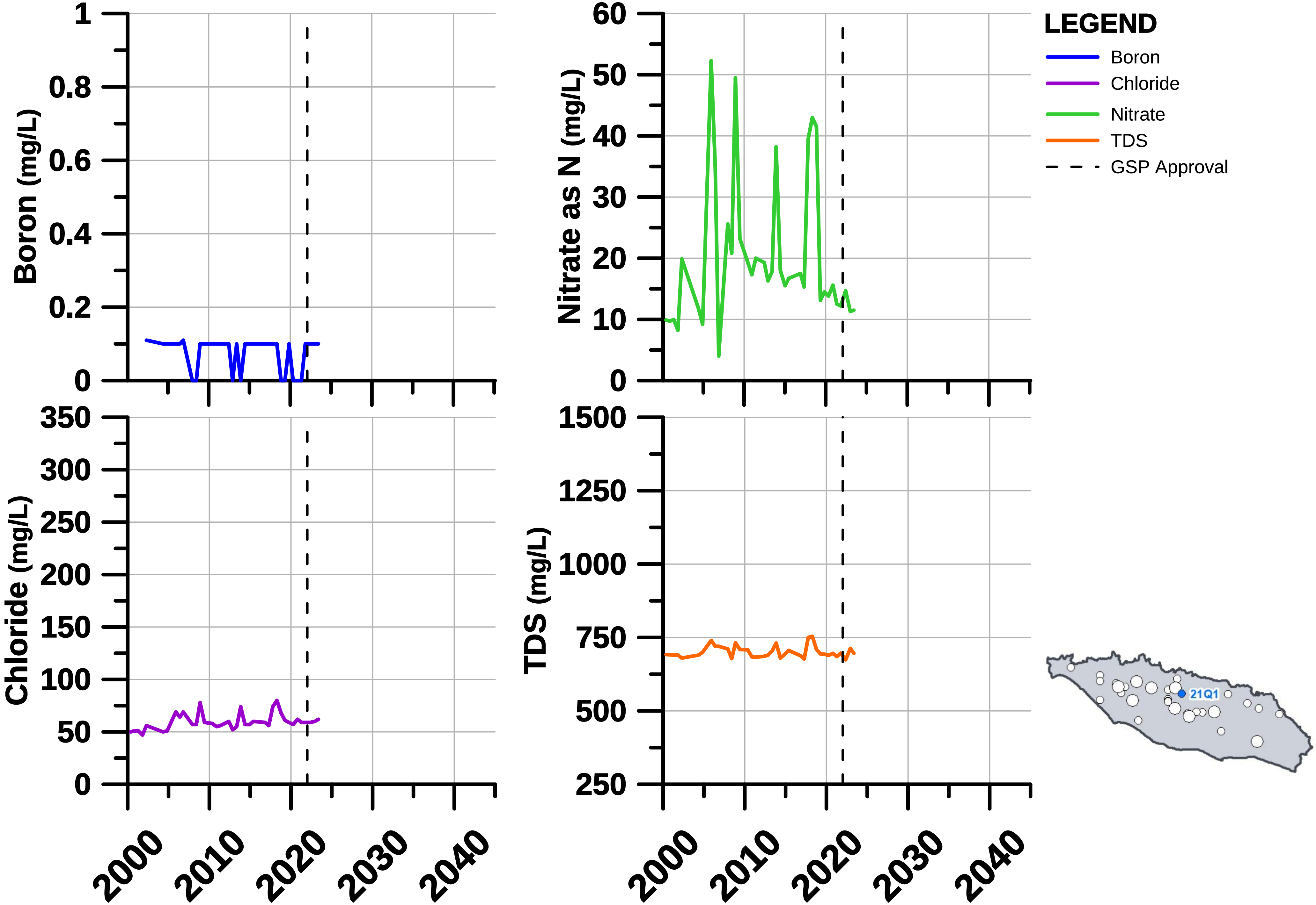
4N/25W - 21N7

Well Depth: 875 ft   Ground Elevation: 58 ft NAVD 88



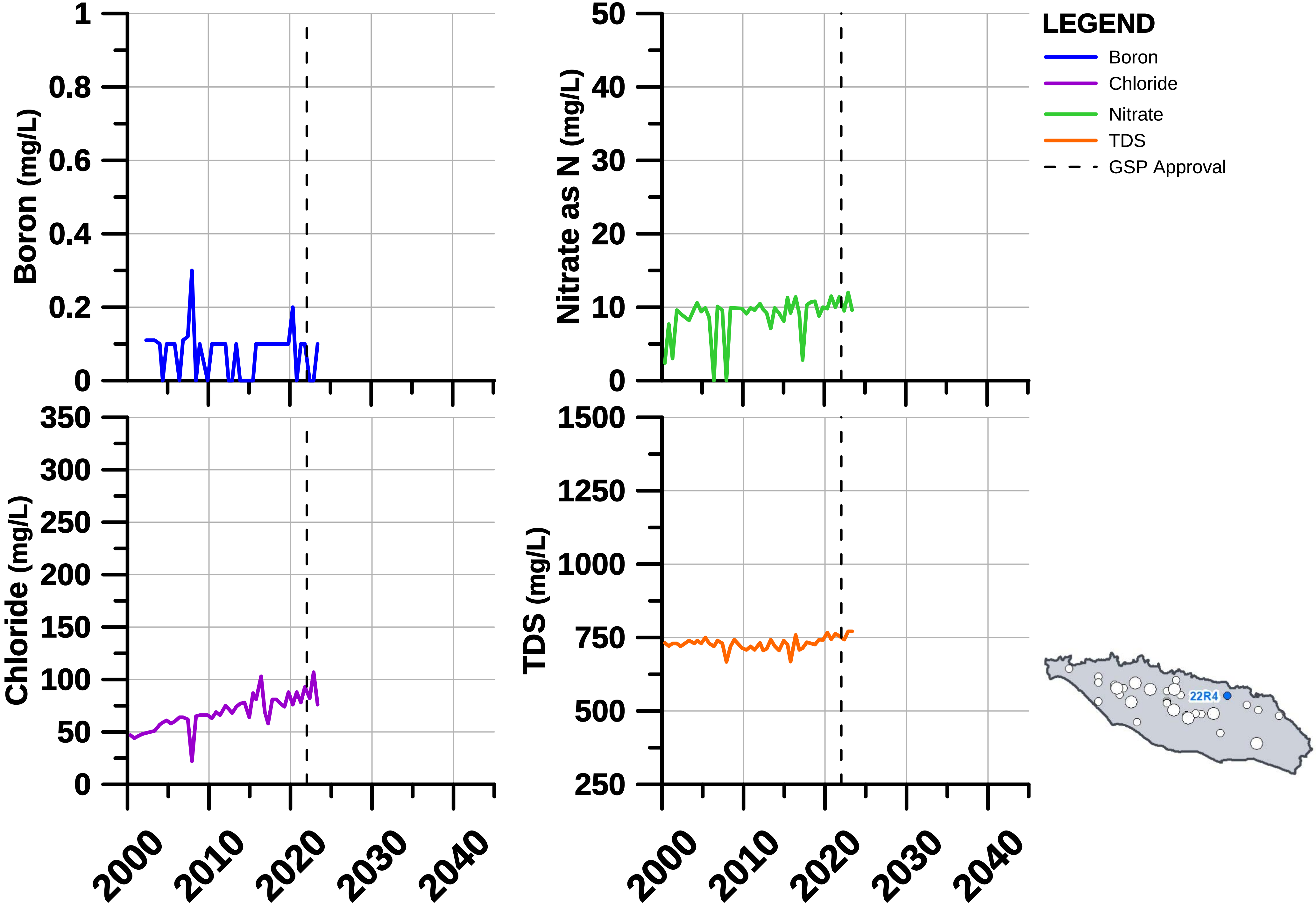
4N/25W - 21Q1

Well Depth: 740 ft   Ground Elevation: 78 ft NAVD 88



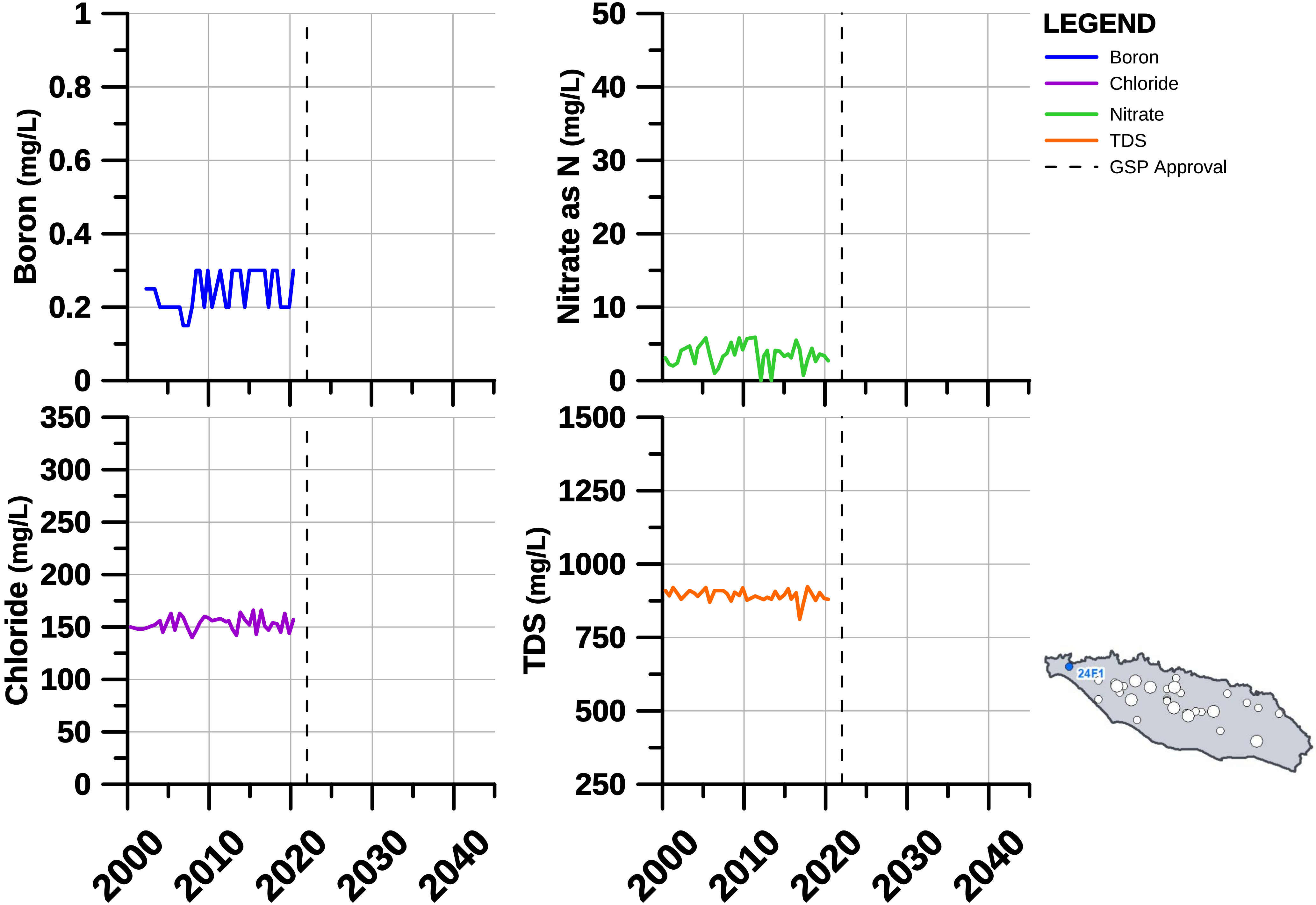
4N/25W - 22R4

Well Depth: 504 ft   Ground Elevation: 219 ft NAVD 88



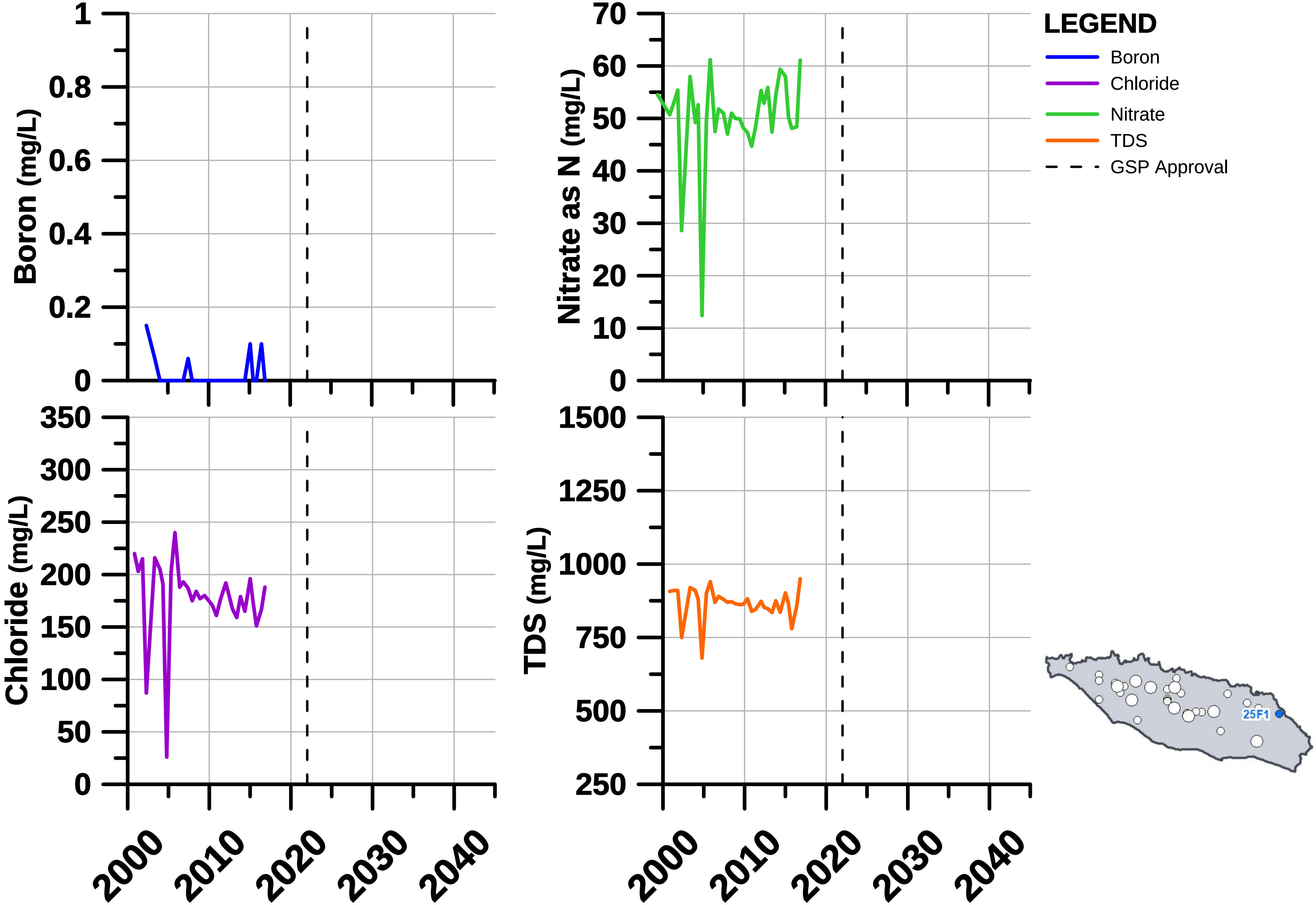
4N/25W - 24F1

Well Depth: 146 ft   Ground Elevation: 54 ft NAVD 88



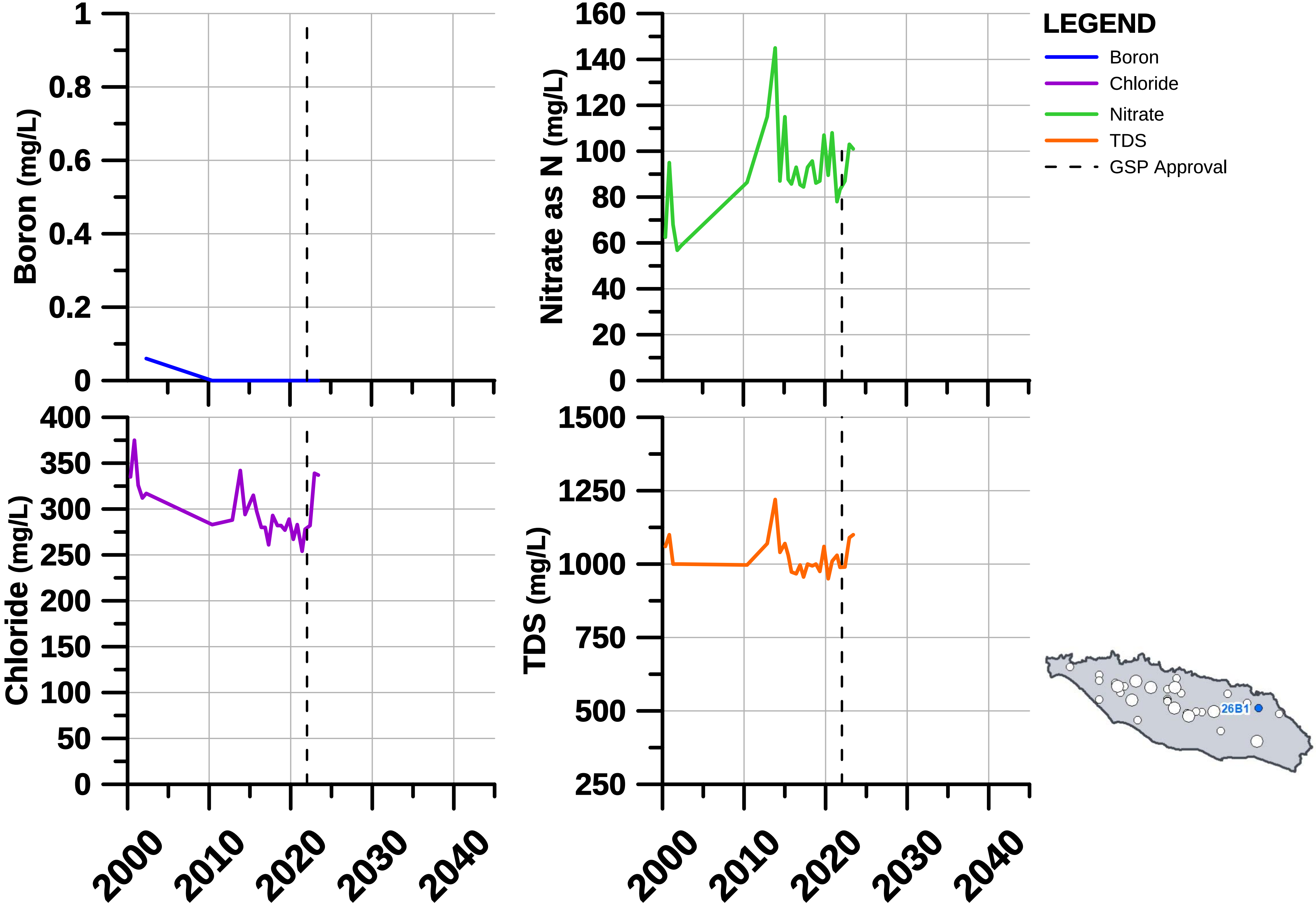
4N/25W - 25F1

Well Depth: 800 ft   Ground Elevation: 300 ft NAVD 88



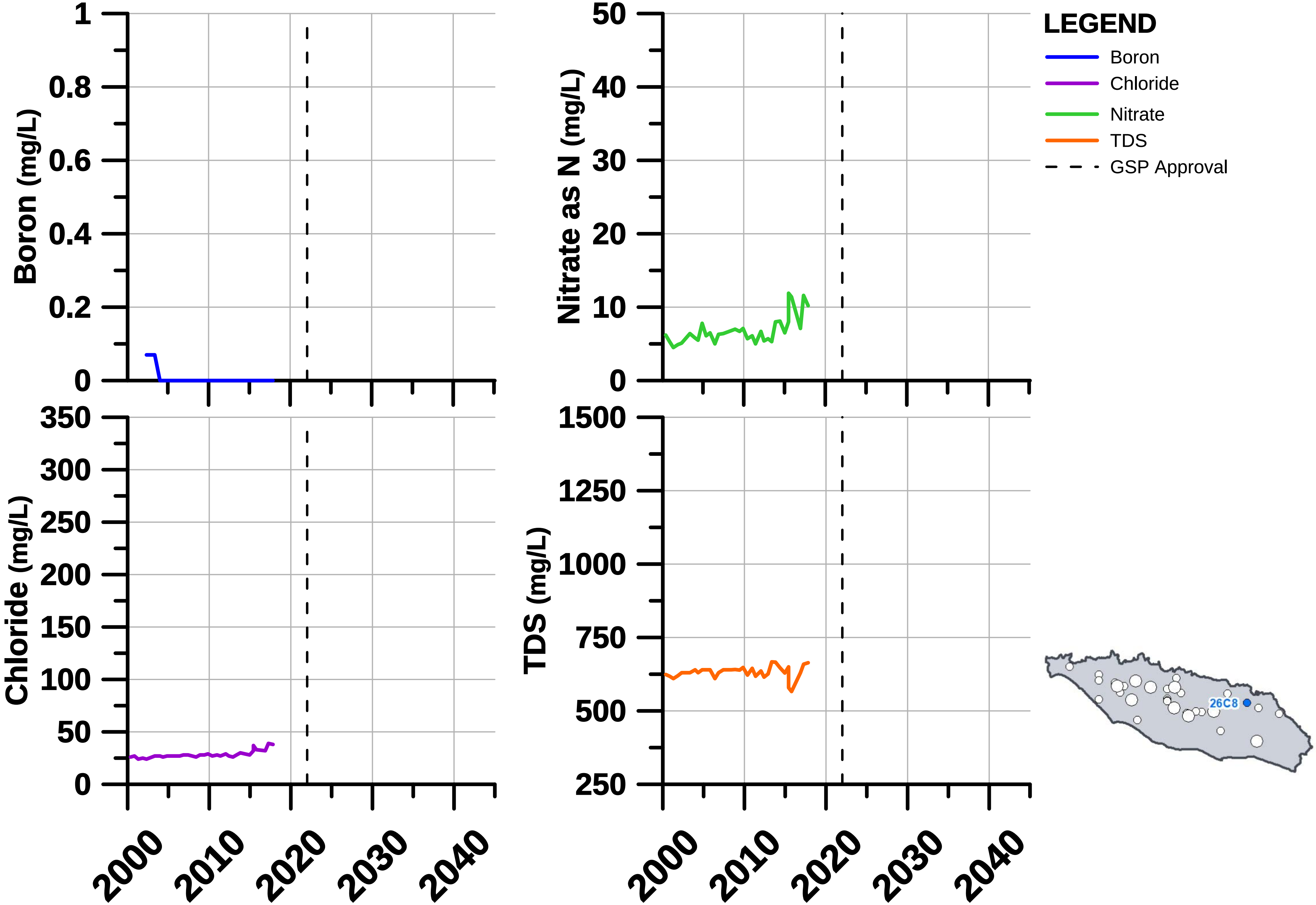
4N/25W - 26B1

Well Depth: 552 ft   Ground Elevation: 457 ft NAVD 88



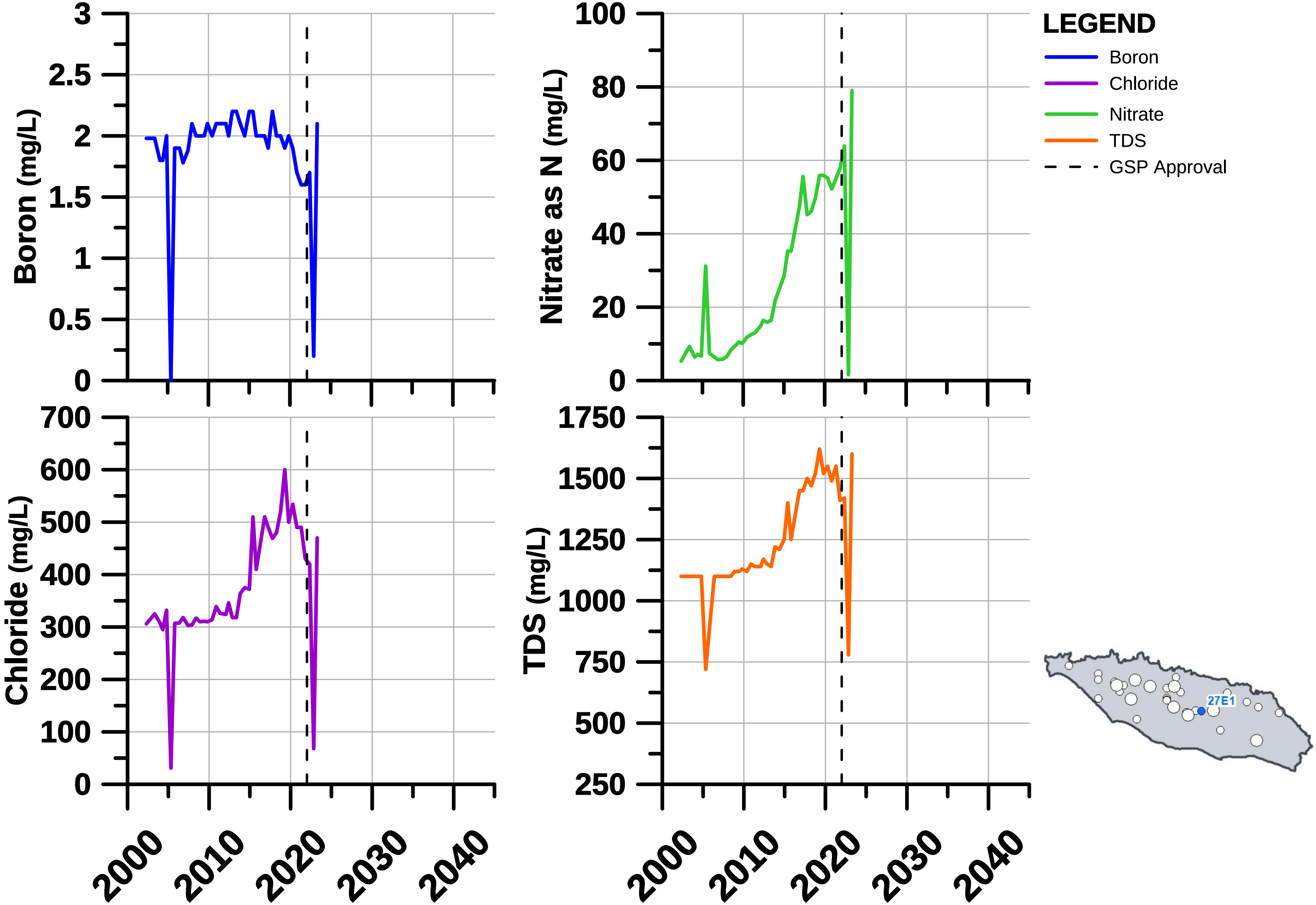
4N/25W - 26C8

Well Depth: 360 ft   Ground Elevation: 269 ft NAVD 88



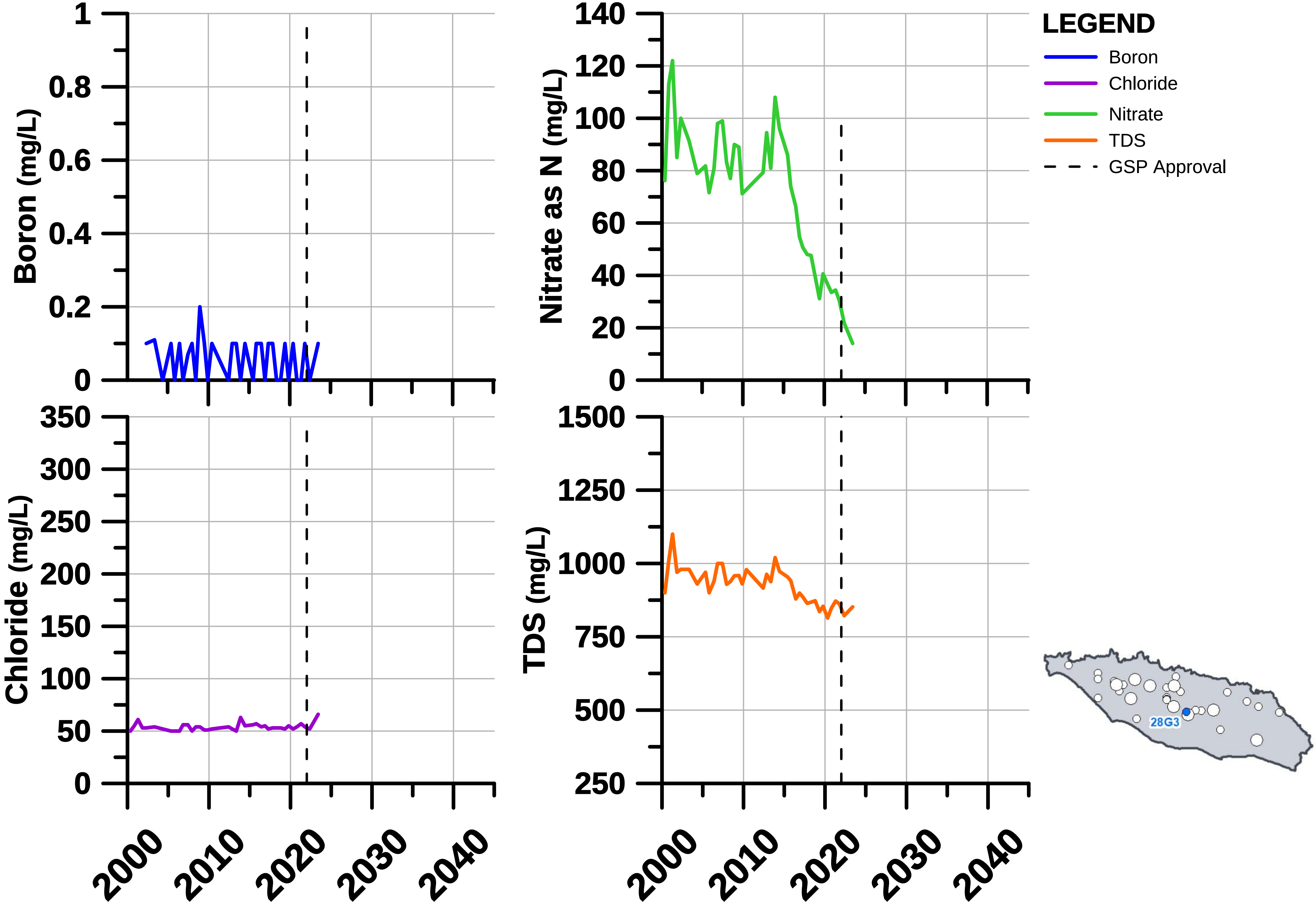
4N/25W - 27E1

Well Depth: ft   Ground Elevation: ft NAVD 88



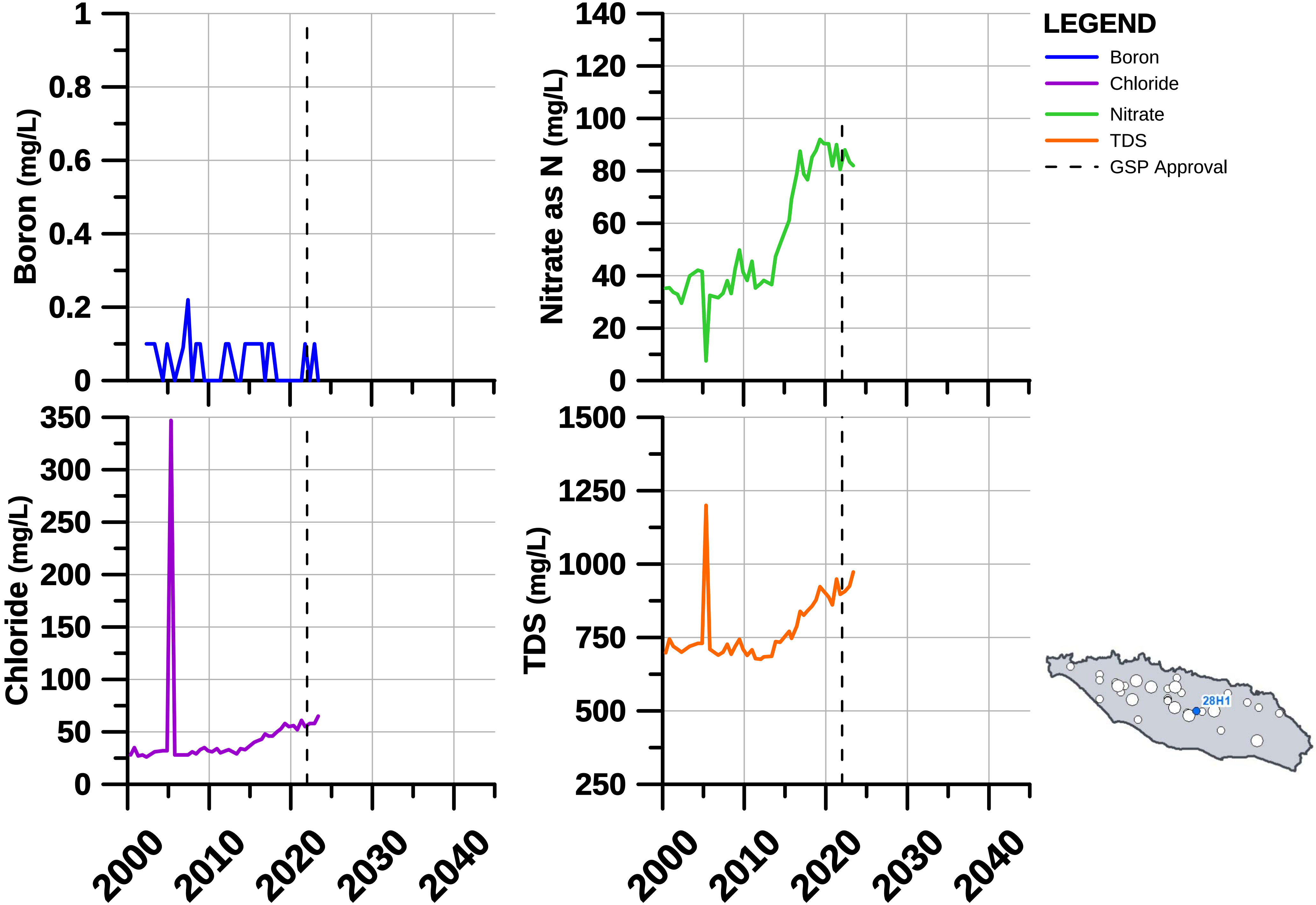
4N/25W - 28G3

Well Depth: 300 ft   Ground Elevation: 88 ft NAVD 88



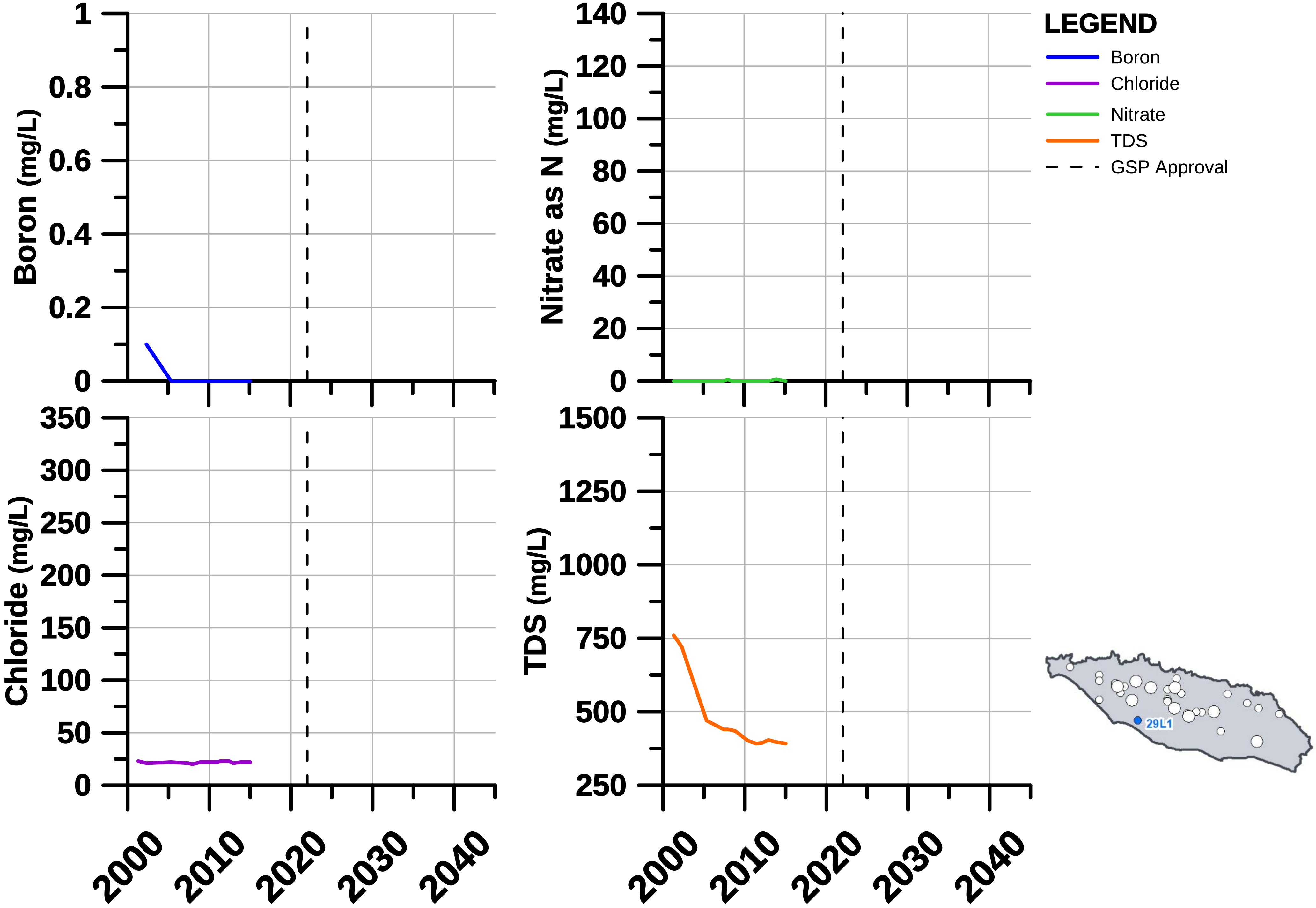
4N/25W - 28H1

Well Depth: 500 ft   Ground Elevation: 109 ft NAVD 88



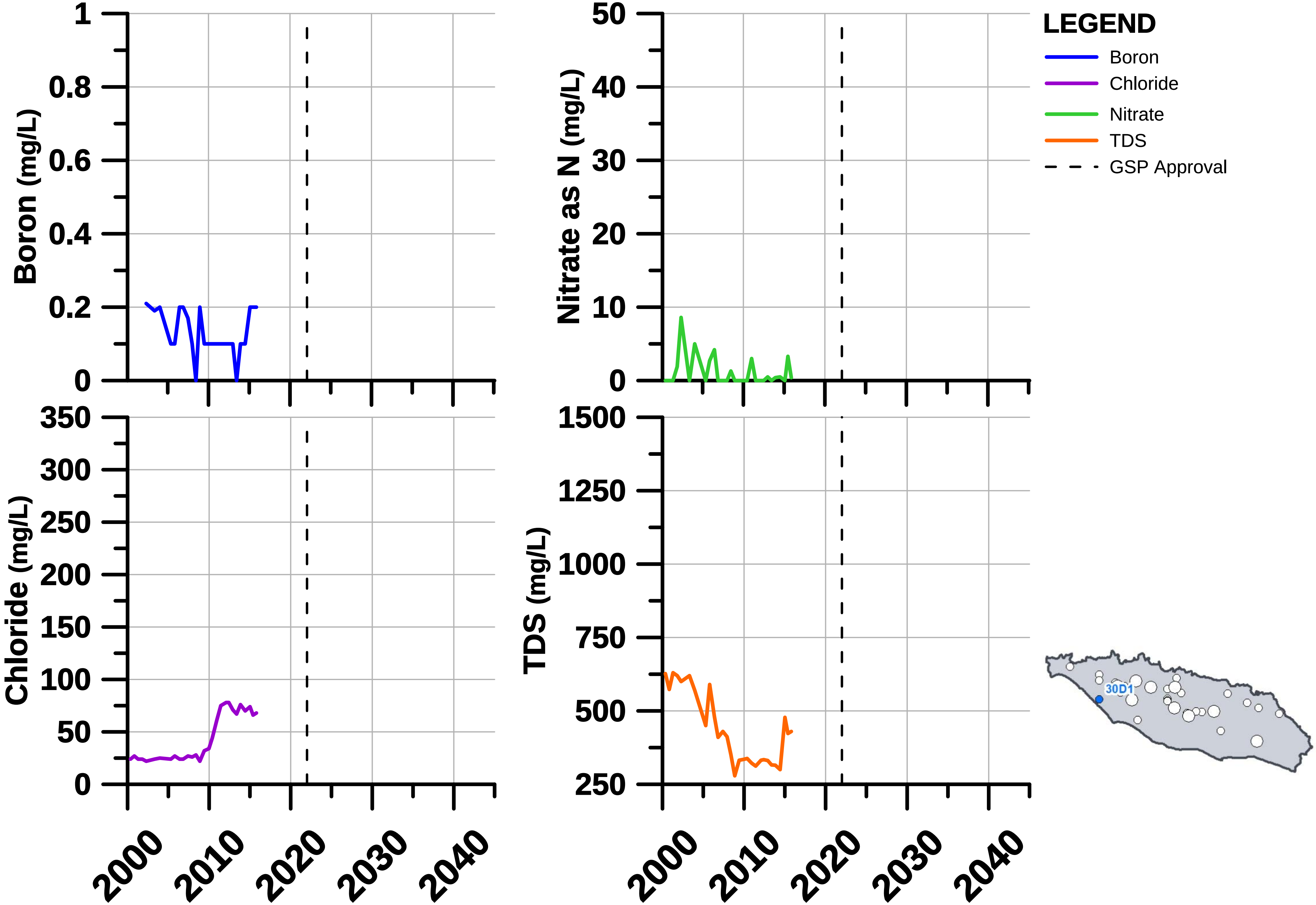
4N/25W - 29L1

Well Depth: 110 ft   Ground Elevation: 14 ft NAVD 88



4N/25W - 30D1

Well Depth: 210 ft   Ground Elevation: 8 ft NAVD 88



4N/25W - 34B4

Well Depth: 408 ft   Ground Elevation: 139 ft NAVD 88