APRIL 2024

SISKIYOU COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

Shasta Valley Groundwater Sustainability Plan – WY 2023 Annual Report

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Abbreviation	Explanation
AF	Acre-feet
AFY	Acre-feet per year
amsl	above mean sea level
AT	Action Trigger
bgs	Below ground surface
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CCR	California Code of Regulations
CDEC	California Data Exchange Center
DTW	Depth to Water
DWR	California Department of Water Resources
ET	Evapotranspiration
ft	Foot/feet
GAMA	Groundwater Ambient Monitoring and Assessment Program
gpm	Gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic conceptual model
in	Inch/inches
IND	Industrial Service Supply (acronym used to describe beneficial use)
InSAR	Interferometric Synthetic Aperture Radar
km	Kilometer/kilometers
LLNL	Lawrence Livermore National Laboratory
m	Meter/meters
MCL	Maximum contaminant level
mg/L	Milligrams per liter
mi	Mile/miles
mm	Millimeter
MO	Measurable Objective
MT	Minimum Threshold
MW	Monitoring well
NOAA	United States National Oceanic and Atmospheric Administration
OSWCR	Online Systems for Well Completion Reports
PMA	Projects and Management Actions
ppb	Parts per billion

(continued)

Abbreviation	Explanation
ppm	Parts per million
RMP	Representative Monitoring Point
SGMA	Sustainable Groundwater Management Act
SI	Sustainability Indicator
sq	Square
SSWD	Scott Valley and Shasta Valley Watermaster District
SWGM	Shasta Watershed Groundwater Model
SWRCB	California State Water Resources Control Board
TAF	Thousand acre-feet
TMDL	Total Maximum Daily Load
U.S.	United States
UCD	University of California, Davis
ug/L	Micrograms per liter
UL	Upper level
umhos/cm	Micromhos per centimeter
USGS	United States Geological Survey
WQO	Water quality objective

Executive Summary

California Water Code (CWC) §356.2 requires the submission of an annual report to DWR by April 1 of each year following the adoption of the GSP. The annual report includes information for the proceeding water year. This report is the third annual report submitted to DWR and provides an update on Basin conditions and plan implementation progress within the Shasta Valley Basin for Water Year 2023 (October 1, 2022 – September 30, 2023). It also includes changes in conditions that have occurred between the baseline year assessed in the GSP (2018) and the conditions in Water Year 2023. CWC §356.2 requires annual reports to include general information about the Basin and GSP, groundwater elevation data (contour maps and hydrographs), groundwater extraction, surface water supply, changes in groundwater storage, and a description of progress towards implementation of the GSP since the adoption of the previous annual report. The summary table defines undesirable results and the compliance with sustainable management criteria included in Chapter 3 of the adopted GSP (Table 1). Table 1 lists the sustainable management criteria defined in the adopted GSP and provides an evaluation of compliance with the criteria for Water Year 2023.

Water Year 2023 experienced above average precipitation and increased precipitation compared to Water Year 2022. Preliminary water year type calculations define Water Years 2020-2022 as the *Critical* water year type, while Water Year 2023 improved to the *Below Normal* water year type. These results indicate persisting, though improving, drought conditions. In May 2021, Governor Gavin Newsom declared a drought emergency for 41 counties in California, including Siskiyou County. In August 2021, the State Water Resources Control Board (SWRCB) adopted drought Emergency Regulations, regarding the Scott and Shasta Rivers which were readopted, with amendments, in July 2022[1]. These Emergency Regulations authorized curtailments of surface water diversions when flows did not meet SWRCB approved drought emergency minimum monthly flow targets. It is unknown at this time the impacts curtailment of surface water diversions had on the underlying aquifer; however, impacts to rural residential and groundwater dependent ecosystem (GDE) water use are still being evaluated. This Emergency Regulation was in effect until July 31, 2023. In December 2023, a new Emergency Regulation was adopted for the Scott and Shasta River Watersheds.

[1] https://www.waterboards.ca.gov/drought/scott_shasta_rivers/

Table 1: Summary of Sustainable Management Criteria.

Sustainability Indicator	Minimum/Maximum Threshold (MT)	Measurable Objective (MO)	Occurrence of Undesirable Results	WY 2023 Annual Report Status
Groundwater Levels	Set to the historic low minus a buffer, which is either 10% of the historic maximum depth to water measured, or 10 feet, whichever is less.	75th percentile of the fall measurement range (i.e., water levels > 25% of historic record).	The fall low water level observation in any of the representative monitoring sites in the Basin falls below the respective minimum threshold for 2 consecutive years.	Occurrence of undesirable results at RMP well 415444N1225387W001 (well name SV03).
Groundwater Storage	Groundwater levels used as a proxy for this sustainability indicator.		Groundwater levels used as a proxy for this sustainability indicator.	Occurrence of undesirable results at RMP well 415444N1225387W001 (well name SV03).
Seawater Intrusion	This sustainability indicator is not applicable in the Subbasin.			
Degraded Water Quality	Nitrate = 10 mg/L, Specific Conductivity = 900 umhos/cm	More than 90% of wells monitored for water quality maintain their range of water quality measurements measured during 1990 to 2020.	More than 25% of groundwater quality wells exceed the maximum threshold for concentration and/or concentrations in over 25% of groundwater quality wells increase by more than 15% per year, on average over ten years.	No occurrence of undesirable results.

Table 1: Summary of Sustainable Management Criteria. *(continued)*

Sustainability Indicator	Minimum/Maximum Threshold (MT)	Measurable Objective (MO)	Occurrence of Undesirable Results	WY 2023 Annual Report Status
Land Subsidence	<0.1 ft of subsidence in any one year.	Maintain current ground surface elevations.	Groundwater pumping induced subsidence is greater than the minimum threshold of 0.1 ft (0.03 m) in any single year.	No occurrence of undesirable results.
Depletions of Interconnected Surface Waters	Baseflow = 100 cfs to maintain recent conditions	Baseflow = 145 cfs	Greater than the depletion under which a minimum threshold of 100 CFS +/- 20% average monthly groundwater contributions occurs, for two consecutive years.	Not completed for 2023, awaiting model update

Groundwater Levels

This section describes general observations of groundwater level declines or increases in the reporting water year. This summary includes quantified changes observed during the water year and refers to hydrographs and contour maps of groundwater elevation. Hydrographs are included in Appendix A.

Groundwater Storage

This section provides quantified changes observed in groundwater storage based on groundwater levels and aquifer properties (i.e., specific yield) in the reporting water year. This summary includes a map of change in groundwater level between the current and previous WY and a time series plot of change in groundwater storage by water year.

Land Subsidence

This section describes the status of land subsidence as a concern and frequency of monitoring for the reporting year. This summary includes available subsidence values from InSAR data for the entire Basin during the water year 2023.

Groundwater Quality

This section describes compliance with sustainable management criteria (SMC), which include Maximum Threshold (MT) and Measurable Objective (MO) values. It also includes a summary of any water quality coordination and communication activities performed by GSAs.

Plan Implementation Progress

This section describes progress made in the implementation of the GSP, including implementation of projects and management actions, and any additional implementation support actions. This section also includes an overview of plan implementation activities anticipated for the coming year.

Chapter 1

Introduction

1.1 Purpose

This section describes the purpose of the annual report.

Brief description of annual report production schedule:

- October 1: day after end of water year for preceding reporting period.
- November 1: all data for preceding water year is input into the DMS.
- November to January (3 months): produce draft report.
- February 1: produce annual report draft.
- February to March (2 months): review report and gain GSA approval.
- April 1: submit finalized report to DWR.

1.2 Shasta Valley GSA

The Siskiyou County Flood Control and Water Conservation District is the sole GSA for the Shasta Valley Basin (Basin). The Siskiyou County Flood Control and Water Conservation District Act (Cal Uncod. Water Deer, Act 1240 §§ 1-38) was adopted by the State Legislature in 1959. This Act established a special district of the same name, and of limited powers that could provide flood protection, water conservation, recreation and aesthetic enhancement within its boundaries. At the time of its creation, the jurisdictional boundaries of the Flood District were smaller than those of the County. In 1983, following the County of Siskiyou Local Agency Formation Commission (LAFCO) action, the balance of the County was annexed into the District, making its jurisdictional boundaries coincide with the County. The District is governed by a Board of Directors that is composed of the Board of Supervisors; however, the District is a separate legal entity from the County, with independent rights and limited powers set forth in its originating act. The District's purpose is the conservation and control of storm, flood, and other waters and ensuring beneficial use thereof.

The Siskiyou County Flood Control and Water Conservation District approved the GSP for the Shasta Valley Groundwater Basin in December 2021 and submitted the GSP to the DWR in January 2022. The District will submit an annual report to the DWR documenting the progress in achieving groundwater sustainability, by April 1st, for each preceding water year. The monitoring data for the preceding water year will be compiled to present the most current groundwater conditions to identify whether the SMCs were met. Additionally, progress in project management action implementation will be presented.

1.3 Basin Description

The Watershed is located in central Siskiyou County in north-central California and is bounded by Mount Shasta to the south, the Klamath Mountains to the west, and the Cascade Range to the east. The Basin covers approximately 800 square miles (sq mi; about 2,000 square kilometers [sq km]) and consists of a north dipping and topographically rough valley floor surrounded by mountain terrain (Figure 1). The topography of the Basin ranges in elevation from just over 2,000 feet (ft; ~610 meters [m]) above mean sea level (amsl) near the confluence of the Shasta River with the Klamath River (the hydrologic terminus for the Watershed) to over 14,100 ft (~4,300 m) amsl near the volcanic peak of Mount Shasta. The valley floor transitions sharply to the mountains bordering the valley, all of which are either part of the Klamath or Cascade Mountain Ranges.

The Basin contains one principle aquifer with various water-bearing geologic formations consisting of a mixture of alluvial and volcanic formations, with the latter consisting of water-laden lava tubes to water-sediment-filled pockets within the cracks and crevices in the volcanic deposits. The connection of structurally differing water-bearing formations result in a multitude of springs or diffuse wetlands where groundwater more easily discharges to the surface than into less-conductive water-bearing units or where head levels are close to or exceed the ground level. The discharge levels of the springs can vary over many orders of magnitude from one spring to the next and can also significantly vary seasonally at the same spring as well as year-to-year averages.

Vegetation on the mountains to the east, south, and west of the Basin mainly consists of evergreen tree species, with lower flank elevations containing shrub and scrub vegetation (MRLC 2019). The remaining lower-lying areas in the Basin core are vegetated by shrub and scrub, grasslands, wetland, pasture, small forested pockets, and cultivated crops (mainly alfalfa).

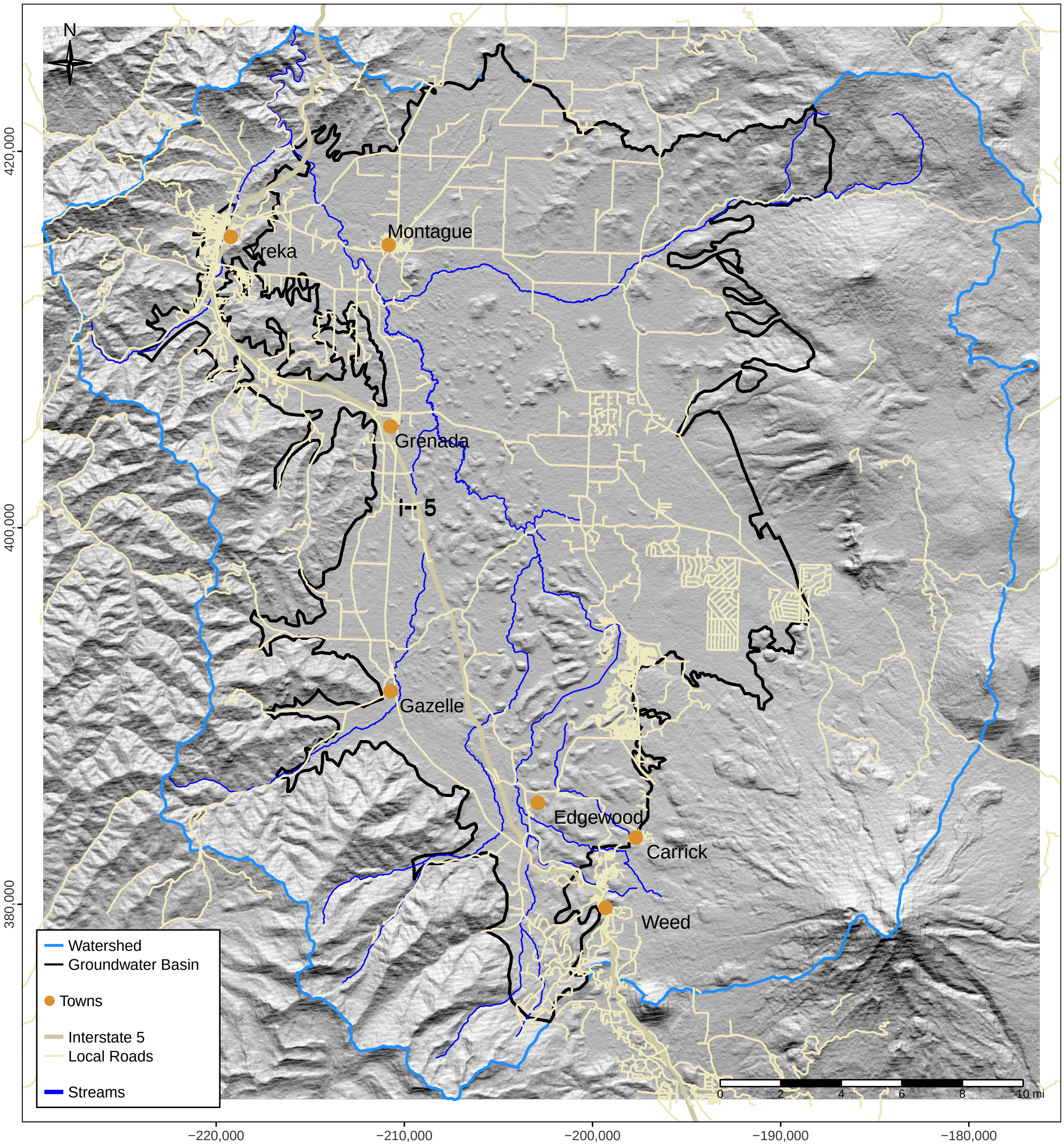


Figure 1: Topography of the Basin and surrounding Watershed.

1.3.1 Climate

Annual precipitation for the City of Yreka is presented in Figure 2, where annual precipitation values range from 9 to 31 inches (23–79 cm). Water Year 2023 had more total rainfall compared to Water Year 2022. The rainy season, which generally begins in October and lasts through April, accounts for about 80 percent of total annual rainfall.

To illustrate the variation in precipitation throughout the basin, annual precipitation is shown for four stations in Figure 3. **YRK** and **SBG** are CDEC stations located near the City of Yreka and Grenada, respectively; **USW00024259** and **US1CASK0003** are NOAA stations located in the northern part of the basin near Montague Siskiyou County Airport and in the southern part of the basin near City of Weed, respectively. The mean annual precipitation over the total period of available data shown in Figure 3 is 18.2 (YRK), 14.7 (US1CASK0003), 11.2 (USW00024259), and 8.71 (SBG) inches. All stations show increased precipitation in WY 2023 compared to WY 2022.

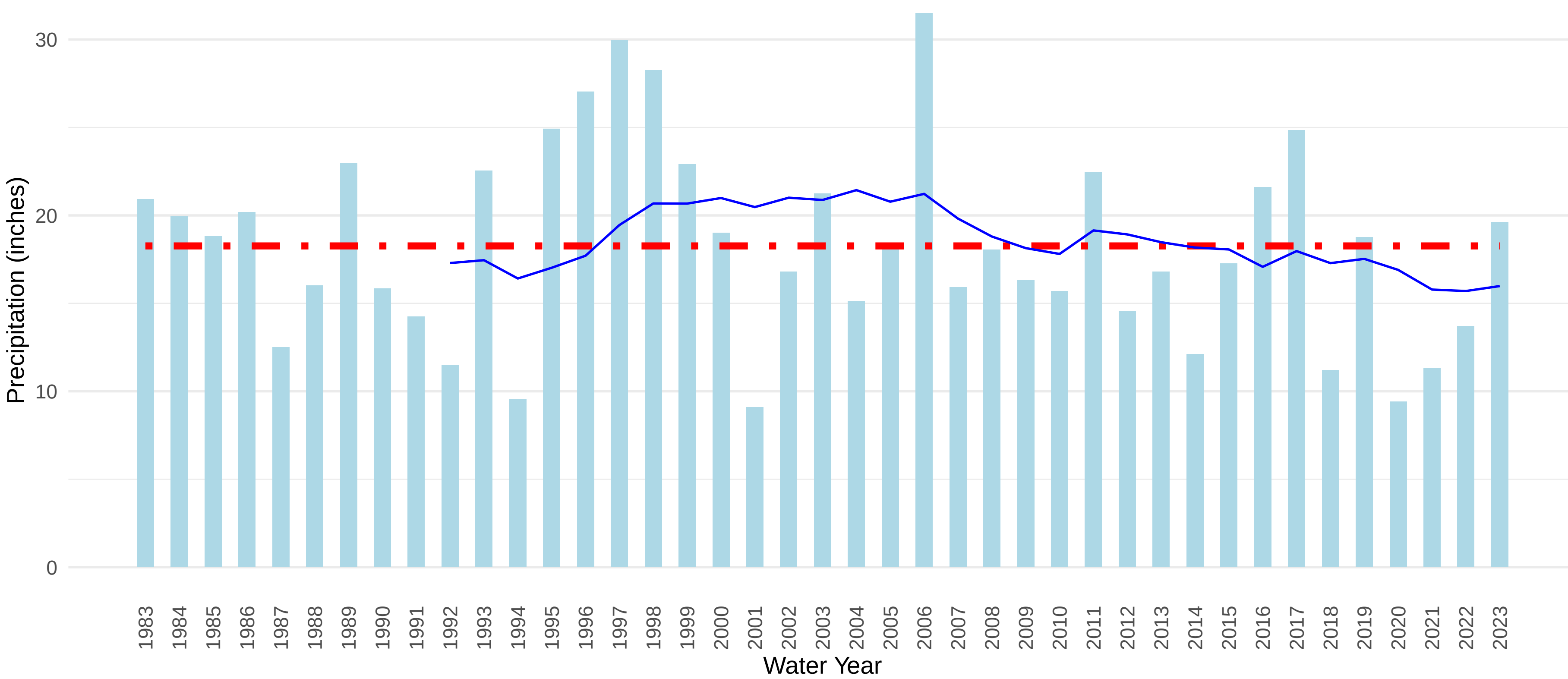


Figure 2: Yreka annual precipitation from 1983 to 2023, according to CDEC data. The long term mean (18 in) is shown as the red dashed line, and the ten-year rolling mean is shown as the blue trendline.

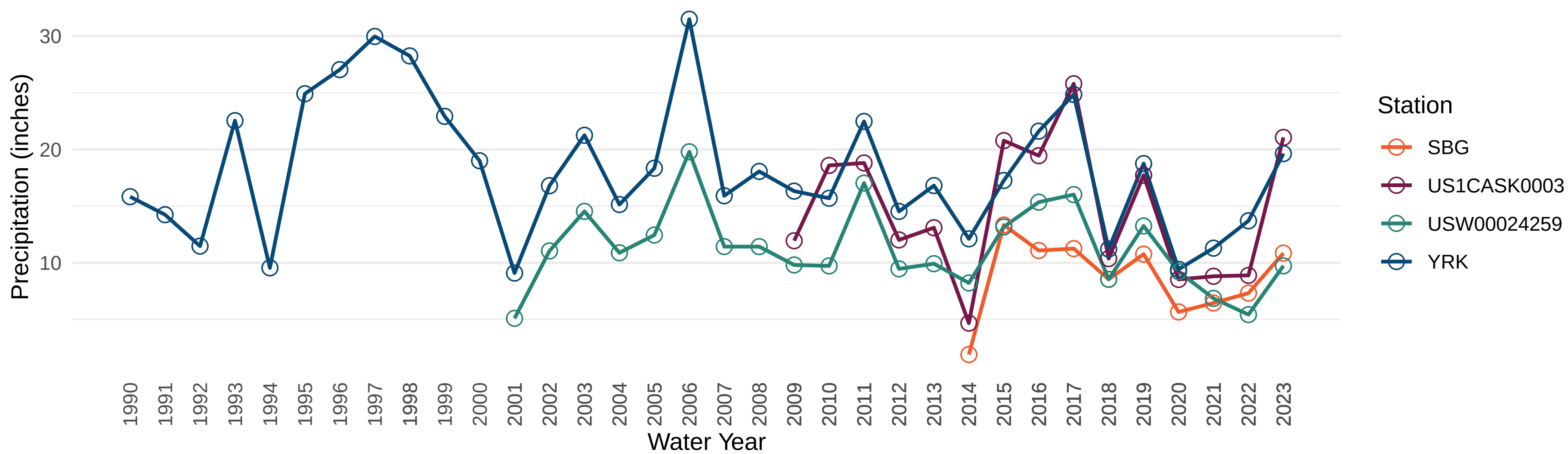


Figure 3: Annual precipitation time series from WY 1990 to WY 2023 from CDEC (YRK and SBG) and NOAA (US1CASK0003 and USW00024259) stations.

Chapter 2

Groundwater Basin Conditions

2.1 Groundwater Elevations

This section visualizes the groundwater elevations in the subject water year from representative monitoring points (RMPs) as well as from the broader GSP monitoring network. The groundwater level *RMP network* consists of the wells that were used to define the SMC criteria, and are thus used to determine the basin status, compare to SMCs, and determine the occurrence of undesirable results. The broader *GSP monitoring network* includes additional wells to help provide further insight into the basin conditions. The RMP network is a subset of the GSP monitoring network. This groundwater level monitoring network is discussed in Chapter 3, including any changes to the network and additions or removal of monitoring wells.

Groundwater elevation contours for the seasonal high and low groundwater conditions (i.e., spring and fall) are shown in Figure 4 and 5. Data gaps prevent the contour map from covering the entire Basin. Both Figure 4 and 5 show characteristically lower groundwater elevations in the northwest portion of the basin (near the City of Montague) that increase towards the southern edge near the City of Edgewood as well as the north and northeastern portion of the Basin.

Appendix A provides hydrographs of groundwater elevations for both the RMP network (Appendix A.1) and the larger GSP monitoring network (Appendix A.2). These hydrographs include the water year type for each year to the greatest extent available, including from January 1, 2015 to the current reporting year. Water year types from WY 2019-2023 are preliminary results calculated based on the SGMA Water Year Type Dataset Development Report [1]. Results will be finalized once DWR updates the water year type dataset for these years.

Figure 6 shows groundwater elevation timeseries for select wells in each hydrogeologic zone to illustrate the historical record of these wells.

[1] https://data.cnra.ca.gov/dataset/sgma-water-year-type-dataset/resource/79c7b9c1-1203-4203-b956-844554fcec79

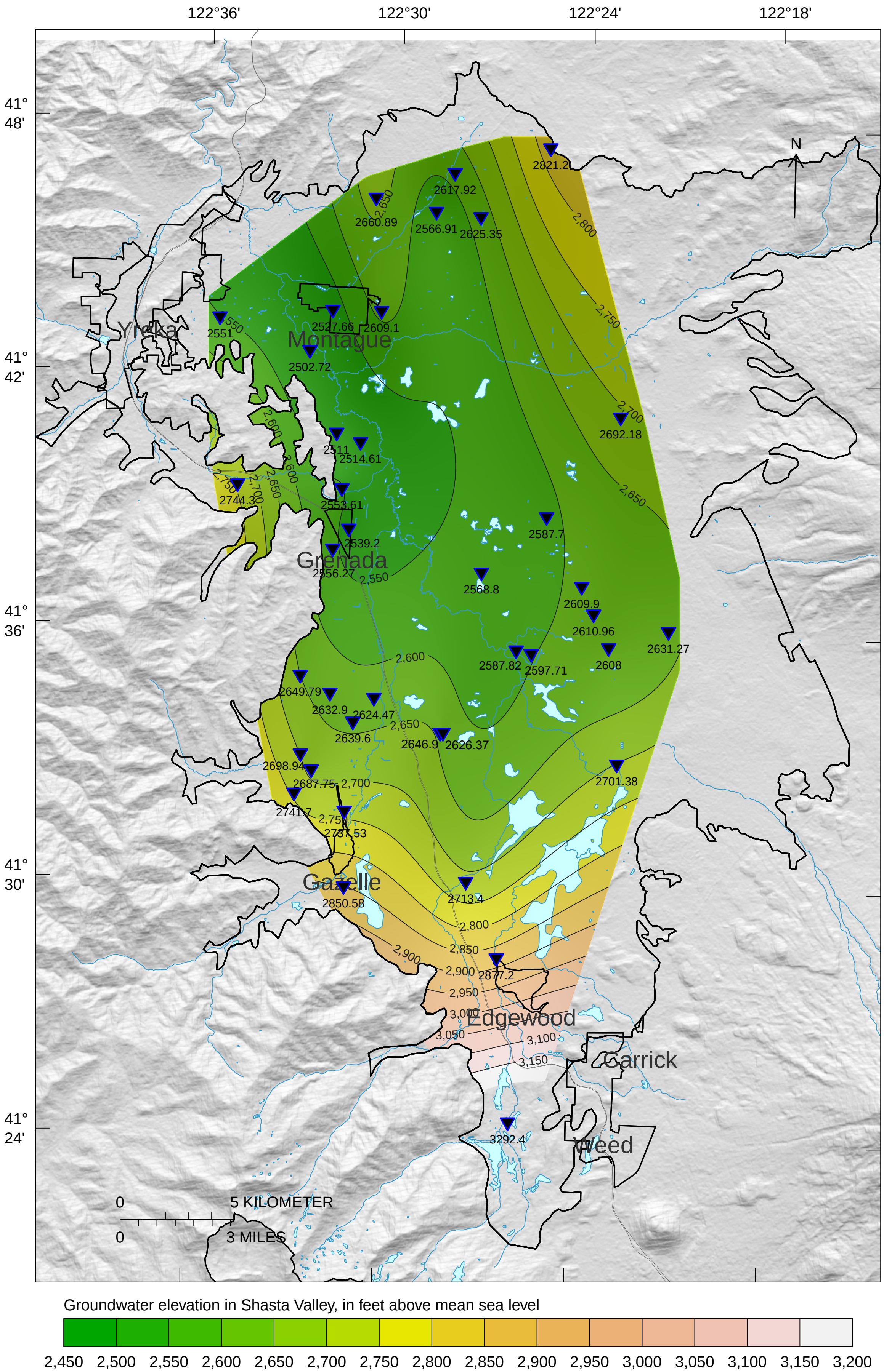


Figure 4: Interpolated representation of Spring 2023 Shasta Valley Groundwater Elevations

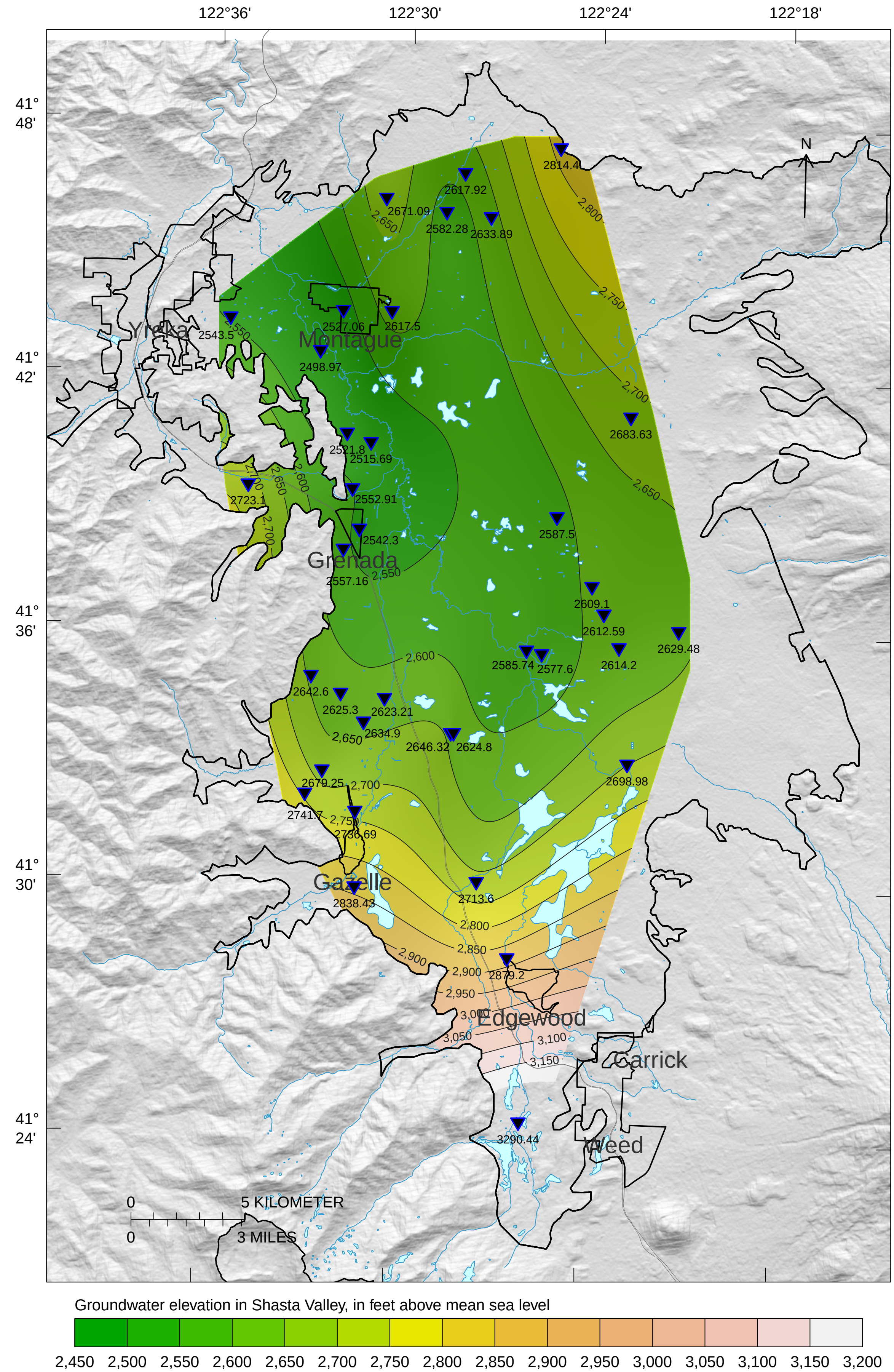


Figure 5: Interpolated representation of Fall 2023 Shasta Valley Groundwater Elevations

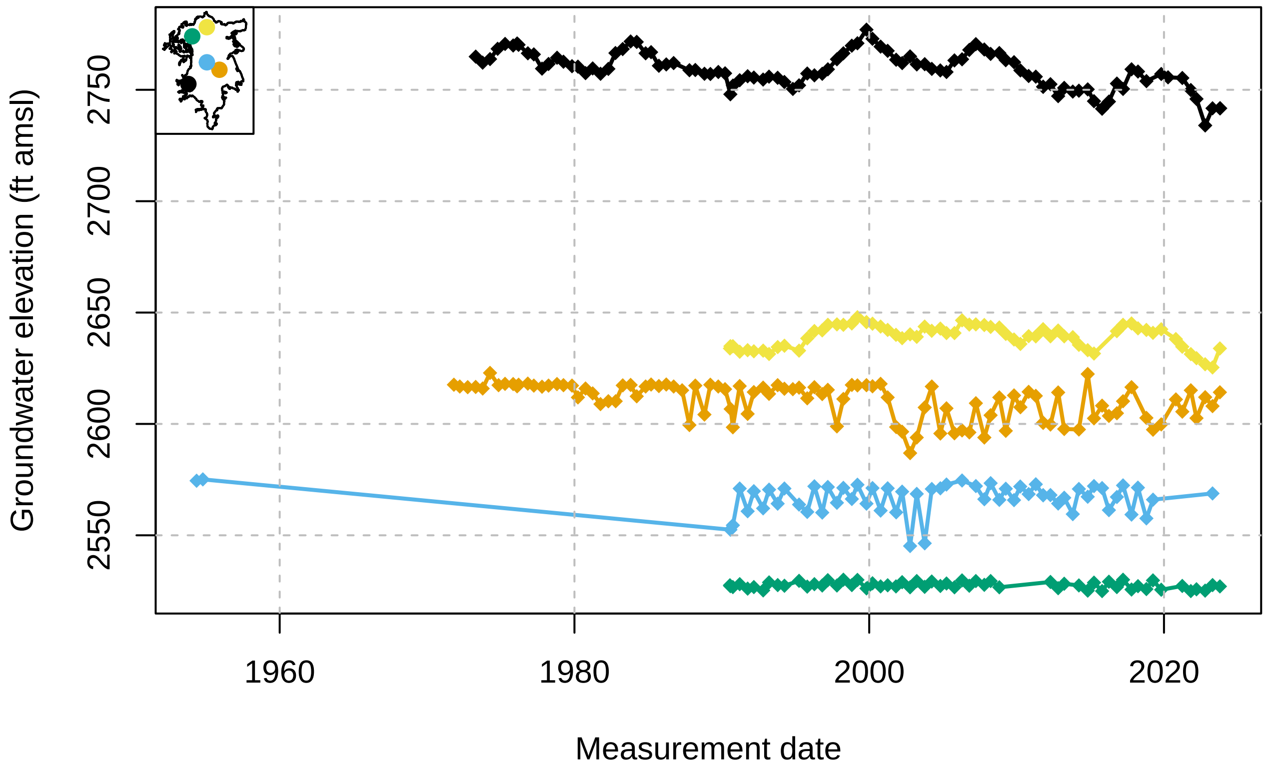


Figure 6: Groundwater elevation measurements over time in five wells, one located in each hydrogeologic zone.

2.2 Groundwater Extractions

This section summarizes monthly groundwater extractions for the preceding water year with the data available and defines the method of measurement by water use sector (Table 2). The best method available to estimate groundwater extraction in Shasta Valley is land-use, which is applied in the Shasta Watershed Groundwater Model (SWGM), provided in Figure 7. The previous SWGM spanned WY1990-WY2018 and is currently being updated. Thus it cannot directly calculate WY2023 groundwater extraction, but the groundwater extraction from WY2000 is an appropriate estimate for WY2023 given similar precipitation and water year types. Additionally, this amount will be adjusted to account for the 30% curtailment regulation by the State Water Resources Control Board. The mean annual groundwater extraction (1990-2018) due to agricultural use is 39 TAF in the Basin, the WY2000 groundwater extraction was 38.9 TAF which is 31[2] TAF after accounting for an expected 20% extraction reduction. There is an additional 3.5[3] TAF of urban groundwater

[2]Rounded to 31 TAF for spreadsheet rules
[3]Rounded to 4 TAF for spreadsheet rules

extraction based on population[4]. The amount of groundwater sold by Big Springs Irrigation District (BSID) was 1.478 TAF in WY 2022, a substantial drop compared to historical groundwater extraction due to curtailments. The same value is used to estimate the groundwater sold by BSID in WY 2023. This gives a total groundwater extraction of 36 TAF for WY2023.

Lake Shastina Community Services District also reported extracting 637.48 AF in WY 2023.

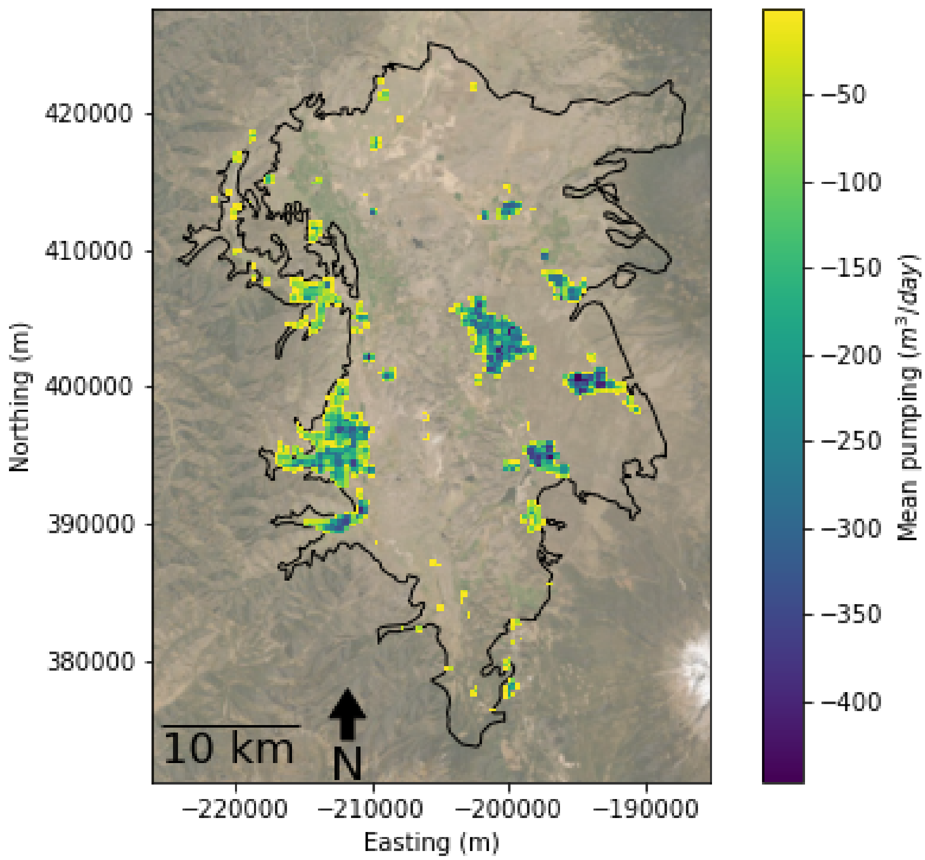


Figure 7: Approximate spatial distribution of average groundwater extraction estimate for WY2023 based on WY2018 pumping data.

Table 2: Groundwater Extraction in WY 2023 by water use sector.

Water Use Sector	Applied Groundwater (AF)	Method	Accuracy
Urban / Domestic	3500	Estimate	70-80%
Industrial	0	Estimate	80-90%
Agricultural	32500	Estimate	60-70%

[4]Population data from (https://gis.water.ca.gov/app/bp-dashboard/final/), groundwater extraction assumes 1 AF per 3.5 persons/year.

Table 2: Groundwater Extraction in WY 2023 by water use sector. *(continued)*

Water Use Sector	Applied Groundwater (AF)	Method	Accuracy
Managed Wetlands	0	Estimate	90-100%
Managed Recharge	0	Estimate	80-90%
Native Vegetation	Data Gap		

2.3 Surface Water Supply Used for Groundwater Recharge or In-Lieu Use

SGMA requires that the GSP annual report tabulate "Surface water supply used or available for use" (CCR §356.2 [b] [3]). For WY 2023 the surface water supply data was provided by the Scott Valley and Shasta Valley Watermaster District (SSWD) and is 71.413 TAF.

2.4 Total Water Use

This section summarizes groundwater use and surface water available for use for the reporting period (Table 3). For WY 2023 the total water use combines the surface water supply data provided by the Scott Valley and Shasta Valley Watermaster District and estimated groundwater extraction. This totals to 107.4 TAF.

Table 3: Total Water Use in WY 2023 by water use sector.

Category	Water Use Type/Sector	Applied Water (AF)	Method	Accuracy
WY 2023 Total	Total Water Use	107400	Estimate	60-70%
Water Source Type	Groundwater	36000	Estimate	60-70%
	Surface Water	71400	Direct	90-100%
	Recycled Water	0	Estimate	90-100%
	Reused Water	0	Estimate	90-100%
	Other	0	Estimate	90-100%
Water Use Sector	Urban / Domestic	3500	Estimate	80-90%
	Industrial	0	Estimate	90-100%
	Agricultural	103900	Estimate	60-70%
	Managed Wetlands	0	Estimate	90-100%
	Managed Recharge	0	Estimate	90-100%
	Native Vegetation	Data Gap		
	Other	0	Estimate	60-70%

2.5 Change in Groundwater Storage

The change in groundwater storage for the Basin is calculated based on the change in groundwater levels between Fall of the report water year and previous water year (Figure 8). The groundwater contours are cropped to the extent of the groundwater level monitoring points to avoid low accuracy contours, thus the groundwater storage change is only calculated for the portion of the Basin where there is sufficient groundwater level data. Additionally, groundwater level stations are only used if they exist in both the current and previous year to avoid discrepancies in groundwater contour due to a lack of historic data. As more groundwater level monitoring stations are installed during plan implementation, the groundwater contours will cover more of the Basin producing more accurate change in groundwater storage estimates. Additionally, when the Shasta Watershed Groundwater Model is extended to present day it may be used to estimate groundwater storage change for the Basin and watershed.

For the current water year there are still data gaps in the groundwater level network that may significantly impact the accuracy of the groundwater contours and thus there is still uncertainty in the calculated change in storage. This is important to note because an erroneous depth to water measurement at one of the monitoring points can estimate a much larger change in groundwater level than in reality, and this error is multiplied because that change in groundwater level is used over a large spatial distance due to data gaps in the basin.

Figure 9 depicts water year type, the annual change in groundwater storage, and the cumulative change in groundwater storage for the Basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year. Groundwater storage gained 69,300 AF in WY 2023.

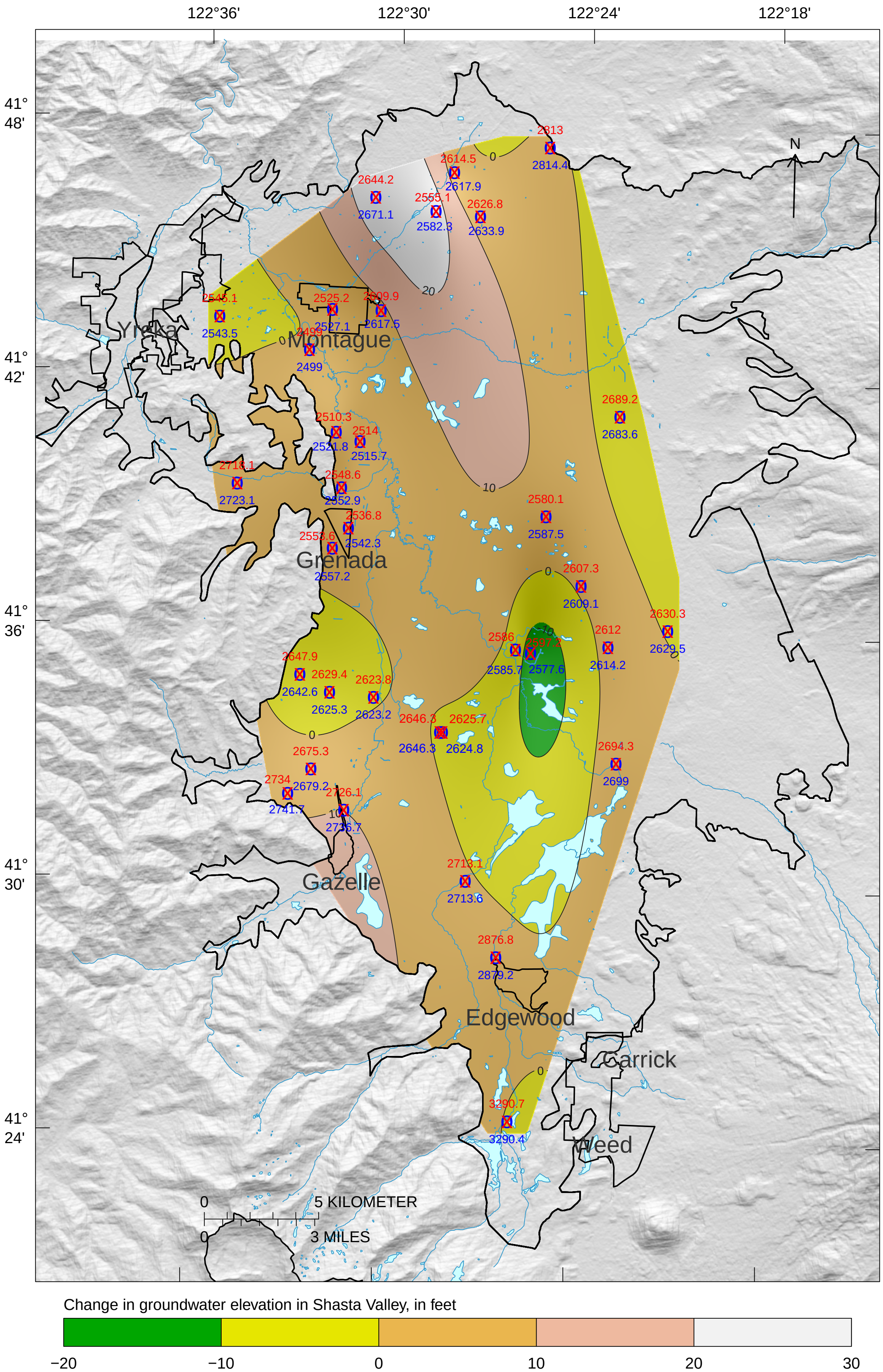


Figure 8: Groundwater elevation change between water years. WY 2023 is represented with blue text and WY 2022 is red.

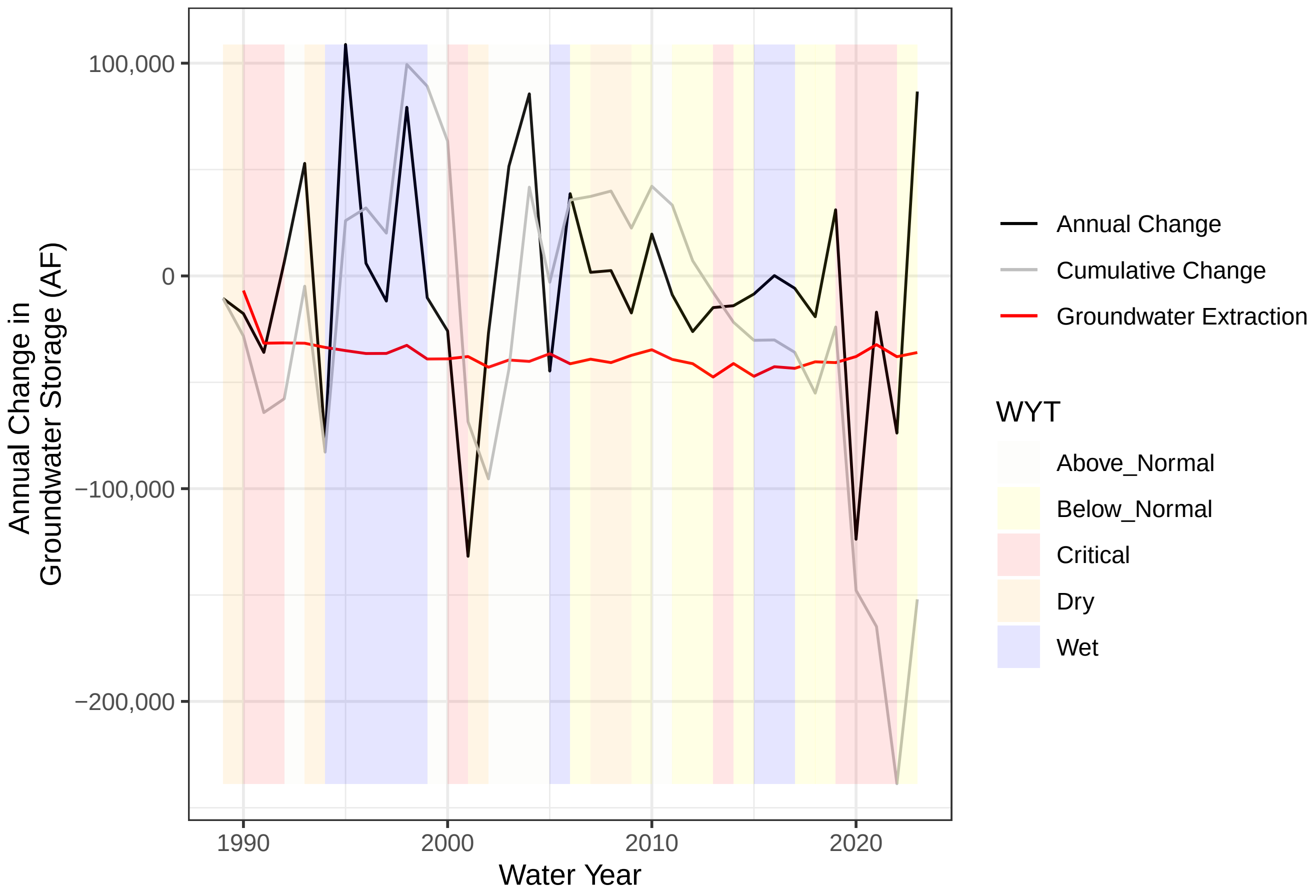


Figure 9: Groundwater storage change based on difference in fall groundwater contours between years.

Chapter 3

Monitoring Network

As described in Chapter 2, the groundwater level RMP network is a subset of the full GSP monitoring network. The groundwater level RMP network is used to evaluate SMCs for individual sustainability indices for the Basin and will be used to demonstrate the sustainability of the Basin through 2042. The full GSP monitoring network provides further insight into Basin conditions.

Continuous monitoring offers the best data coverage while periodic monitoring is generally completed twice a year (spring and fall). A subset of the monitoring wells are instrumented with continuous dataloggers (temperature and water level measured collected every 15 minutes) with telemetry, while for the rest of the California Statewide Groundwater Elevation Monitoring (CASGEM) Program wells, bi-annual measurements are collected. The continuous monitoring network developed during the first four years of GSP development and two years of implementation is undergoing continued maturation and data collection. During 2023, 19 continuous groundwater monitoring stations were active in the Shasta Valley basin. None of these wells have sufficient history for use as RMPs, however they may be added to the RMP network during a future GSP update.

The water quality RMP network is similarly a subset of the GSP monitoring network and is used to evaluate water quality SMCs. With the exceptions of streamflow, land subsidence, and stream depletion due to groundwater pumping, monitoring is performed using wells. Some wells are monitored for water level, some for water quality, some for both.

3.1 Groundwater Level Monitoring Network

The groundwater level RMP network consist of thirteen CASGEM wells in the Basin. Three wells are located within the fractured basalt formation, seven in the alluvial formation, and three in various other geologic material. The distribution of monitoring wells is shown in Figure 10. The currently designed network satisfies DWR requirements with respect to spatial distribution and can be expanded using recently installed new instruments that will be evaluated over the first five years of implementation.

Water level monitoring network status update

RMP well *416595N1223971W001* (well name *44N05W14M002M*) has been temporarily inaccessible since October 2019, due to challenges surrounding COVID-19, gate access, and well owner contact. Efforts are being conducted to contact the well owner or property manager. The well will remain in the network until it is conclusively determined through communication with the well owner or property manager that the well will remain inaccessible and should be removed from the RMP network. Similarly, RMP well *416237N1224524W001* (well name *44N05W32C002M*) is a CASGEM well that was not been consistently measured since 2019 and was not measured in Fall 2023. The GSA will investigate why monitoring was not conducted at these wells, and will consider installing a sensor for continuous measurements at these wells.

A response from CASGEM regarding the status of these wells was not received at the time of the submission of this annual report.

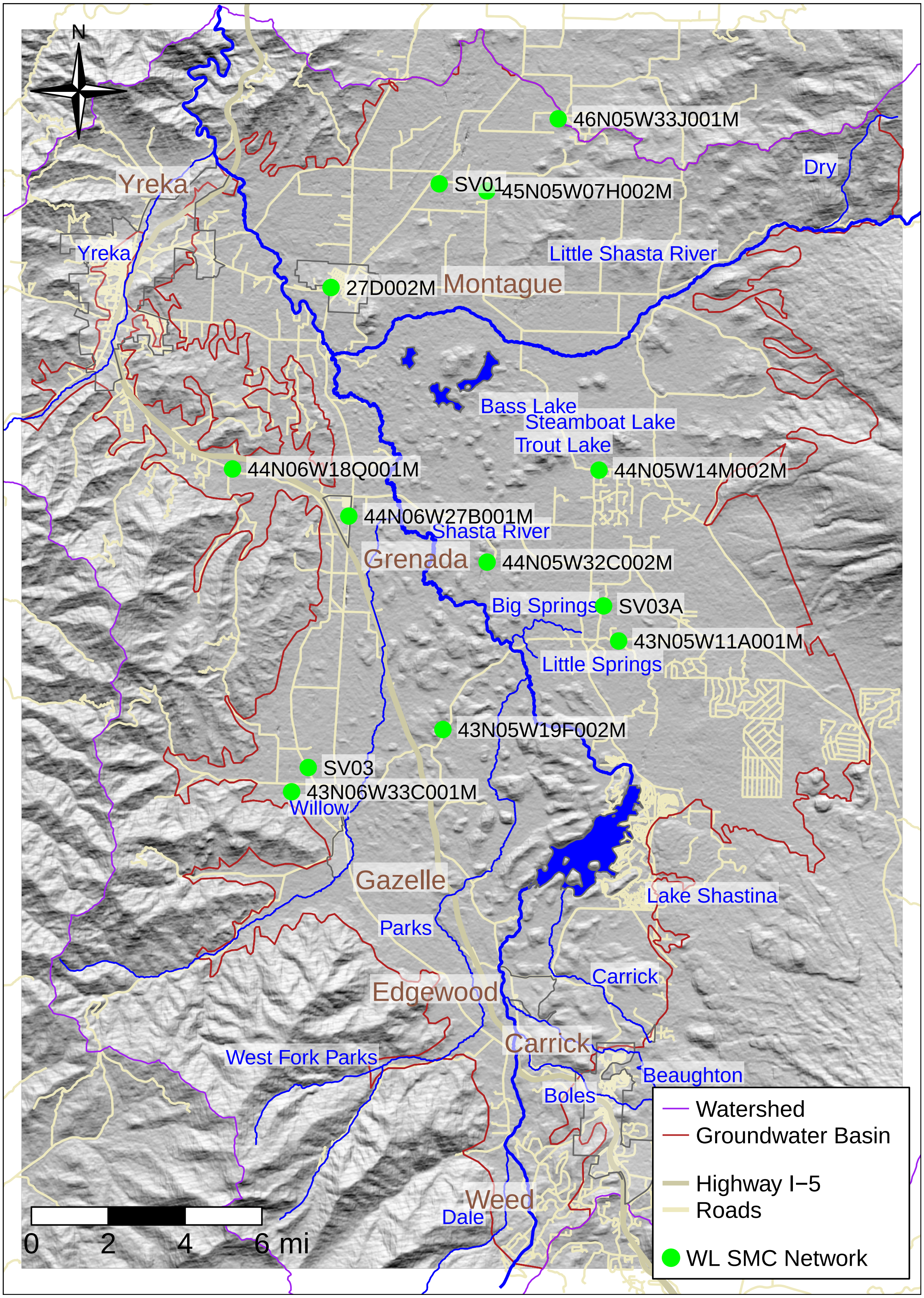


Figure 10: RMP Wells in the Water Level Monitoring Network.

3.2 Groundwater Quality Monitoring Network

Existing wells used for monitoring groundwater quality in the Basin include public water supply wells and monitoring wells, which are shown in Figure 11. Initially, the groundwater quality monitoring network is based on wells that are regularly sampled as part of existing monitoring programs for the constituents for which SMCs are set: nitrate and specific conductivity. Efforts are currently underway to identify additional wells for inclusion in the water quality network.

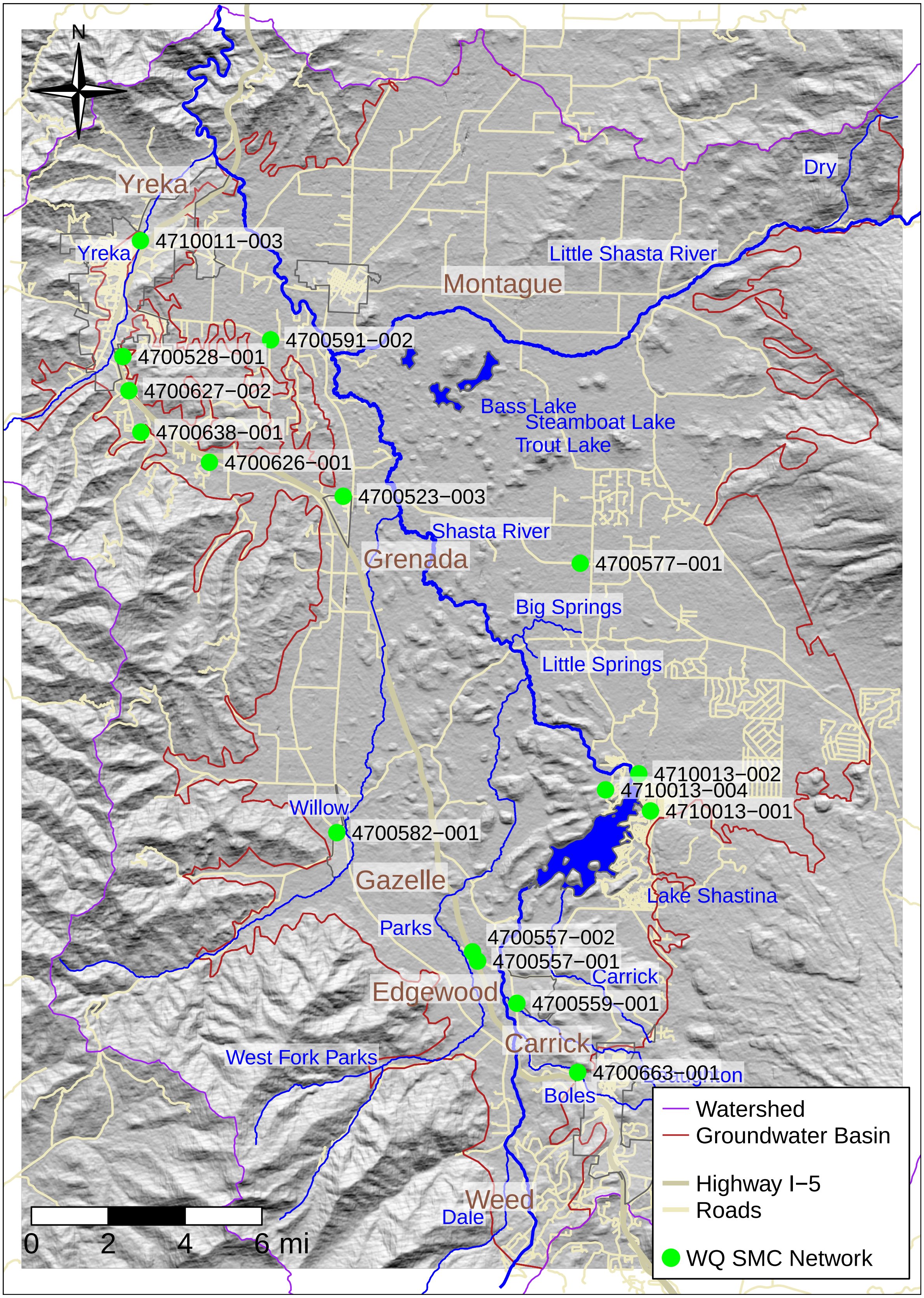


Figure 11: RMP wells in the Water Quality Monitoring Network.

Chapter 4

Sustainable Management Criteria

The GSP defines Sustainable Management Criteria with respect to quantifiable impacts to beneficial users of groundwater that if exceeded, would lead to the identification of undesirable results. Here, we report on impacts to shallow wells, interconnected surface water (ISW), and groundwater dependent ecosystems (GDEs). Groundwater conditions in Water Year 2023 have improved from Water Year 2022, but significant and unreasonable impacts are occurring at one well in the western part of the Basin, due to low fall measurements for two consecutive years.

4.1 Interim Milestones

This section provides a brief overview of the Interim Milestones (IM) identified in Chapter 3 (Sustainable Management Criteria) of the GSP for all Sustainability Indicators. These IM are anticipated to be achieved over the course of GSP implementation in increments of five years, pursuant to the CCR definition "Target values representing measurable groundwater conditions, in increments of five years, set by Agency as part of a Plan" [CCR Title 23, Division 2 §351(q)].Currently, IM are set to the MO of each RMP well. Progress toward stabilizing groundwater levels away from minimum thresholds and towards the MO is also progress towards achieving IMs. In WY 2023, all RMP wells except one are above the MT, which is positive progress compared to conditions in WY 2022.

4.2 Chronic Lowering of Groundwater Levels

Table 4 compares the groundwater fall low measurement to the SMCs for Fall 2023. The values shown in Table 4 represent depth to groundwater. The fall low is the maximum depth to groundwater during the period of September 15 - October 31, 2023. The column "Status" notes whether the maximum depth to groundwater for this period exceeded the minimum threshold ("Below MT"), exceeded the measurable objective and not the minimum threshold ("Above MT"), did *not* exceed both the measurable objective and the minimum threshold ("Above MO"), or whether a measurement was not recorded. The IM is the same as the MO for each RMP well. Detailed hydrographs for each RMP with their SMC's can be found in Appendix A.1

The Fall 2023 status of the RMP wells in relation to their SMCs is also shown in Figure 12. Measurements are sorted into the following categories: Near or Above Measurable Objective, Within

Central Operational Range, Near Minimum Threshold, or At or Below Minimum Threshold. These ranges are defined below and are based on the MO, MT, and a provisional metric NMT (near measurable objective). The NMT is defined as the Action Trigger (AT).

Near or Above Measurable Objective: measurement > MO

Within Central Operational Range: MO > measurement > NMT

Near Minimum Threshold: NMT > measurement > MT

At or Below Minimum Threshold: MT > measurement

RMP wells *416595N1223971W001* and *416237N1224524W001* did not have measurements during this fall period. The GSA will investigate why monitoring was not conducted at these RMPs, and will consider options to continue monitoring such as installing a sensor for continuous measurements at these wells.

For Fall 2023, one RMP exceeded the MT. These results are an improvement from the previously reported Fall 2022 status where five RMPs exceeded the MT. Exceedances of the MT occurred at the following wells outside of the Fall 2023 sampling period: *415351N1225474W001*, *417638N1224574W001*, *416397N1225224W001*, *417660N1224811W001*, and *415444N1225387W001*. Most of these exceedances occurred in October 2022 (start of WY 2023), and deviations from the MT range from percent differences of 0.5-20%. These data are not used for SMC comparison purposes for the WY 2023 report for the reason that they reflect seasonal low water levels associated with the 2022 WY.

RMP well *415444N1225387W001* exceeded the minimum threshold in Fall 2023, however the measured depth to groundwater was above the fall low measured in Fall 2022, indicating an improvement in groundwater levels compared to the previous fall period. This RMP well is an irrigation well in the Gazelle area, hence the impacts of pumping may explain the excursion below the MT in Fall 2022 and Fall 2023. Both Spring 2022 and Spring 2023 levels were above the MT, indicating groundwater level recovery during the spring months. Since the fall low measurement at this well fell below the MT for two consecutive years, the occurrence of undesirable results is reported (Table 1). Section 5.1 and 5.2 discuss PMA activities conducted and anticipated to improve water levels and storage in the Basin. Particularly, the implementation of irrigation efficiency improvements and the installation of additional monitoring wells in the area of Gazelle could help address the MT exceedances at this well. The GSA will continue to closely monitor conditions moving forward.

Groundwater levels had been dropping during the 2020-2022 drought; however, WY 2023 had above average precipitation (Figure 2). Notably, all wells except *415444N1225387W001* that were below the MT sometime during WY 2023 jumped above the MT by Fall 2023. Based on the hydrographs, these wells started recovering by the Spring 2023 measurement and fully recovered above the MT by Fall 2023.

Table 4: Comparison of Fall 2023 groundwater measurements to SMC values. Measurements represent depth to groundwater and fall low is defined as the maximum depth to groundwater during the period September 15 - October 31, 2023.

Well Code	Well Name	Station ID	MT (ft bgs)	AT (ft bgs)	MO (ft bgs)	IM (ft bgs)	2023 Fall Low (ft bgs)	Status
415952N1223848W001	43N05W11A001M	22370	166.5	156.5	144.1	144.1	129.20	Above MO
415351N1225474W001	43N06W33C001M	22373	79.1	71.9	61.0	61.0	71.70	Above MT
416595N1223971W001	44N05W14M002M	22375	65.8	59.8	56.5	56.5	NA	No measurement
417638N1224574W001	45N05W07H002M	24045	30.7	27.9	22.3	22.3	26.91	Above MT
417258N1225337W001	27D002M	24067	8.7	7.9	6.8	6.8	5.80	Above MO
416237N1224524W001	44N05W32C002M	36753	73.0	66.4	51.3	51.3	NA	No measurement
417916N1224217W001	46N05W33J001M	36892	45.2	41.1	34.4	34.4	43.40	Above MT
416397N1225224W001	44N06W27B001M	36999	22.2	20.2	17.4	17.4	21.00	Above MT
417660N1224811W001	SV01	37001	53.4	48.5	24.2	24.2	33.00	Above MT
415444N1225387W001	SV03	49002	88.1	80.1	76.0	76.0	91.67	Below MT
415601N1224718W001	43N05W19F002M	49294	13.3	12.1	10.0	10.0	10.70	Above MT
416563N1225813W001	44N06W18Q001M	49295	33.3	30.3	27.1	27.1	27.90	Above MT
416083N1223932W001	SV03A	50631	69.0	62.7	47.3	47.3	64.90	Above MT

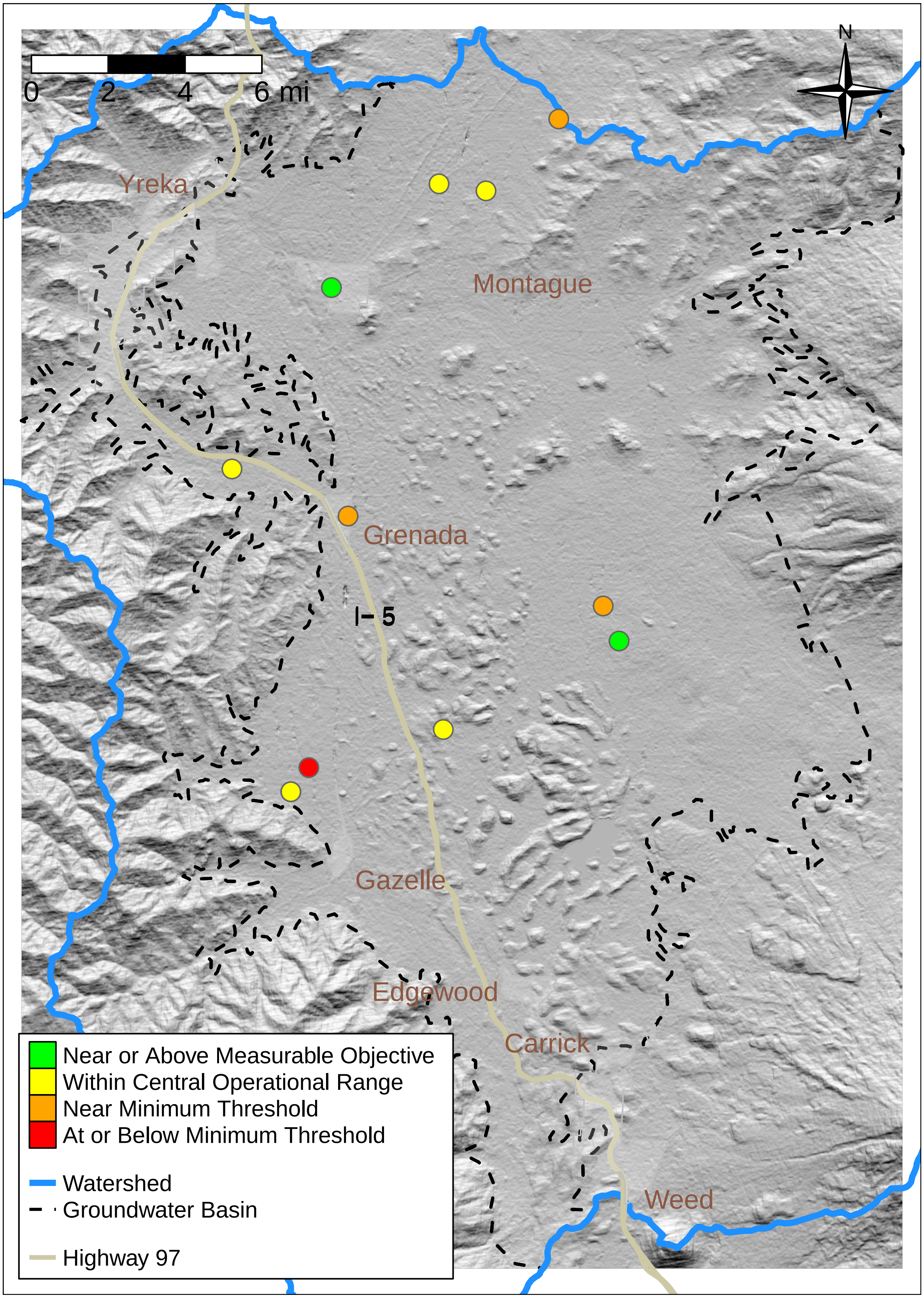


Figure 12: Status of the groundwater level RMP networks for Fall 2023.

4.3 Reduction of Groundwater Storage

Groundwater levels are the proxy for groundwater storage and the sustainability management criteria are identical. According to the United States Geologic Survey, estimates of groundwater storage rely on groundwater level data and sufficiently accurate knowledge of hydrogeologic properties of the aquifer. Direct measurements of groundwater levels can be used to estimate changes in groundwater storage. As groundwater levels fall or rise, the volume of groundwater storage changes accordingly, where unacceptable groundwater decline indicates unacceptable storage loss. The hydrogeologic model outlined in Chapter 2 of the GSP provides the needed hydrogeologic properties of the aquifer. As with the groundwater level sustainability indicator, there was occurrence of undesirable results for the groundwater storage sustainability indicator for WY 2023 due to the fall low measurement at RMP well *415444N1225387W001* falling below the MT for two consecutive years.

4.4 Seawater Intrusion

This sustainability indicator is not applicable in this Basin.

4.5 Groundwater Quality

This section compares groundwater quality monitoring results to the GSP's sustainable management criteria and provides a summary of ongoing water quality coordination activities conducted by the GSAs. Groundwater quality data for the evaluation is obtained from the Groundwater Ambient Monitoring and Assessment (GAMA) Groundwater Information System. The maximum concentration of nitrate as N and specific conductivity sampled from the groundwater quality RMP network in WY 2023 is shown in Table 5. The results are compared to the MT and MO for each of the 16 groundwater quality RMPs in the network. The MT for nitrate as N is 10 mg/L (the Title 22 Primary Maximum Contaminant Level, or MCL), and the MT for specific conductivity is 900 micromhos/cm (Title 22 Recommended Secondary Maximum Contaminant Level, or SMCL). The MO is achieved when more than 90% of wells monitored for water quality maintain their range of water quality measurements measured during 1990 to 2020.

For nitrate, eight RMPs had measurements below the MO, one RMP had a measured concentration greater than the MO, no RMPs had a measured concentration greater than the MT, and seven RMPs were not monitored during WY 2023. For specific conductivity, one RMP had a measurement below the MO, and fifteen RMPs were not monitored during WY 2023. Based on this evaluation, the MO for nitrate was not met as eight of the nine wells with measurements were below the MO (i.e., 88% of RMPs measured maintained their historic concentration, while the MO is set to 90%), and the MO for specific conductivity was met (100% of RMPs measured maintained their historic quality).

To ensure that current water quality data is available for future annual reports, efforts will be made to contact the monitoring entities of the wells with missing measurements to facilitate continued data collection. If this communication is not successful, a process to plan for the continued collection of representative water quality data will be developed. Options may include planning alternate monitoring entities for the wells, or inclusion of different wells in the network.

As per the GSP, there are currently no SMCs defined for benzene, arsenic, manganese, and iron. Data for these constituents is presented in Table 6 and is provided to track potential mobilization, or exceedances of the primary MCLs or secondary MCLs. As presented, no measured concentrations during WY 2023 result in an exceedance of the MCL or SMCL.

Table 5: Water quality data from WY2023 in the RMP network (Nitrate MT is 10 mg/L; Specific Conductivity MT is 900 micromhos/cm).

Well ID	GSP ID	Nitrate MO (mg/L)	Nitrate WY 2023 Max Measurement (mg/L)	Nitrate Status	SC MO (micromhos/cm)	SC WY 2023 Max Measurement (micromhos/cm)	SC Status
CA4700523_003_003	4700523-003	6.80	7.58	Above MO	540	NA	No measurement
CA4700528_001_001	4700528-001	2.04	NA	No measurement	513	NA	No measurement
CA4700557_001_001	4700557-001	2.42	1.45	Below MO	NA	NA	No measurement
CA4700557_002_002	4700557-002	2.75	2.69	Below MO	NA	NA	No measurement
CA4700559_001_001	4700559-001	9.57	9.49	Below MO	297	NA	No measurement
CA4700577_001_001	4700577-001	6.79	4.12	Below MO	NA	NA	No measurement
CA4700582_001_001	4700582-001	9.77	4.8	Below MO	672	NA	No measurement
CA4700591_002_002	4700591-002	2.90	<0.4	Below MO	1.92	NA	No measurement
CA4700626_001_001	4700626-001	5.05	2.37	Below MO	453	NA	No measurement
CA4700627_002_002	4700627-002	3.39	3.12	Below MO	464	425	Below MO
CA4700638_001_001	4700638-001	1.66	1.38	Below MO	533	NA	No measurement
CA4700663_001_001	4700663-001	0.68	NA	No measurement	NA	NA	No measurement
CA4710011_003_003	4710011-003	5.34	NA	No measurement	627	NA	No measurement
CA4710013_001_001	4710013-001	0.45	NA	No measurement	360	NA	No measurement

Table 5: Water quality data from WY2023 in the RMP network (Nitrate MT is 10 mg/L; Specific Conductivity MT is 900 micromhos/cm). *(continued)*

Well ID	GSP ID	Nitrate MO (mg/L)	Nitrate WY 2023 Max Measurement (mg/L)	Nitrate Status	SC MO (micromhos/cm)	SC WY 2023 Max Measurement (micromhos/cm)	SC Status
CA4710013_002_002	4710013-002	0.40	NA	No measurement	310	NA	No measurement
CA4710013_004_004	4710013-004	1.12	NA	No measurement	310	NA	No measurement

Table 6: Water quality data from WY2023 for benzene, arsenic, manganese, and iron.

Well ID	Result	Analyte	Date	Units	MCL or SMCL	Source
CA4700591_002_002	<0.5	Benzene	2023-06-07	ug/L	1	Title 22 Table 64444-A
CA4700626_001_001	<0.5	Benzene	2023-06-27	ug/L	1	Title 22 Table 64444-A
CA4700627_002_002	<0.5	Benzene	2023-04-06	ug/L	1	Title 22 Table 64444-A
CA4700627_002_002	<2	Arsenic	2023-05-04	ug/L	10	Title 22 Table 64431-A
CA4700627_002_002	<0.5	Manganese	2023-05-04	ug/L	50	Title 22 Table 64449-A
CA4700627_002_002	93	Iron	2023-06-01	ug/L	300	Title 22 Table 64449-A

4.6 Subsidence

To monitor subsidence, the Basin relies on data provided by DWR based on Interferometric Synthetic Aperture Radar (InSAR), a satellite-based remote sensing technique that measures vertical ground surface displacement changes at high degrees of measurement resolution and spatial detail. This data is made available through the DWR SGMA Data Viewer [1] and shows overall subsidence less than 0.1 feet for the entire Basin during the water year 2023 (Figure 13).

[1] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#currentconditions

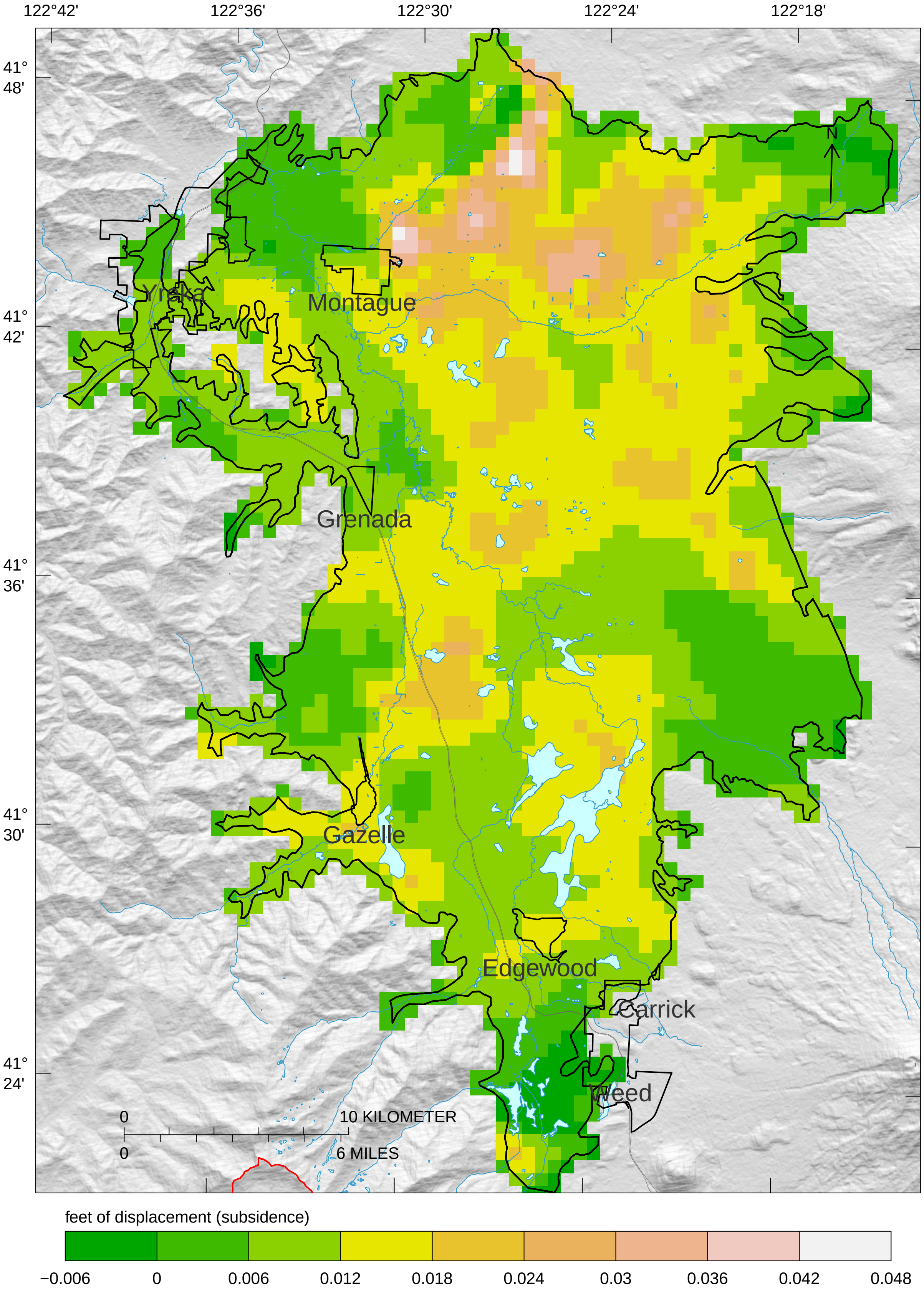


Figure 13: InSAR satellite measured total vertical subsidence (feet) in WY 2023. Note that the processed InSAR instrument and GIS conversion error is roughly +/-0.1 feet (https://gis.water.ca.gov/arcgisimg/rest/services/SAR).

4.7 Interconnected Surface Water

Interconnected surface waters in the Basin are not determined for WY2023 because the updated method using the Shasta Watershed Groundwater Model (SWGM) will be ready following additional model calibration in 2024. A component of the grant proposal submitted to DWR's SGM Implementation Grant Program for Shasta Valley is conducting a groundwater-surface water study to better characterize groundwater-surface water interaction in the Basin. From WY2024 and on the annual report will use the SWGM to determine the location, timing and rate of interconnected surface waters in the Basin.

Chapter 5

Project Implementation and Management Actions

This section provides updates and progress towards implementing the GSP, including implementation of projects and management actions since adoption of the GSP and the most recent annual report. The project and management actions that are described in the GSP are summarized in Table 7, which provides the status of the project, the project's management category (i.e., demand management), and targeted sustainability indicator. Section 5.1 describes the progress on implementing projects and management actions focusing on water year 2023, Section 5.2 describes the activities planned for water year 2024, and Section 5.3 describes additional coordinated activities or management actions that the GSA is conducting with other agencies.

5.1 Implementation of Projects and Management Actions

The GSA continued activities (e.g. RMP data collection) necessary to implement the GSP and put the Basin on a path toward sustainable management. In late summer 2023, the GSA was awarded a grant from DWR's *Sustainable Groundwater Management (SGM) SGMA Implementation Program (SGM Implementation Grant Program)*, which includes components to conduct a well inventory, additional surface water-groundwater characterization, and upland management coordination and monitoring. Planning and submittal of the grant application was a significant effort and members of the Advisory Committee met throughout the fall of 2022 to develop the specific scopes for projects included in the grant application. The progress of specific PMAs identified in Table 7 are described below:

Irrigation Efficiency Improvements – The GSA and Technical Team continued to work with the agricultural community to evaluate results of irrigation efficiency studies that were conducted on farms and agricultural operations in the Basin. Based on the results of the studies, recommendations on management practices to increase irrigation efficiency were made as well as suggestions for infrastructure or equipment improvements.

Well Drilling Permits - The GSA is continuing to work with the Siskiyou County Environmental Health Department's well permitting staff to develop a new "Well Permitting Guidance Document" that will update the County well permitting policies and comply with the Governors Executive Order (N-7-22, which language specific to well permitting is now under EO N-3-23). The County presented information related to the well permitting process at the Advisory Committee meetings, and input was received and incorporated into the draft process. Information included updated definitions of replacement wells and well deepening projects, clarification on well types, and how impacts to nearby wells will be evaluated.

Data Gaps and Data Collection – Steps were taken to reduce data gaps in the Basin including the installation of continuous groundwater level and surface water monitoring sites to monitor and support the implementation of planned projects and management actions. These sites will also used to improve representation of the Basin's different hydrogeologic units. During the August 2023 Advisory Committee meeting an ad hoc group was formed with members of the public to address data gaps in the Basin. In fall 2023 the group met to identify and prioritize the Basin's existing data gaps and provided input on how to fill the gaps. Data gaps discussed by the ad hoc group include the groundwater quality and level monitoring network, lack of spring and flow monitoring as related to interconnected surface water, and the need to identify groundwater dependent ecosystems. Lack of groundwater extraction data and the need for additional precipitation data were also discussed. Geophysical data collected during airborne electromagnetic (AEM) surveys was collected and analysis was conducted by the technical team. The AEM data partially covered the Basin, but will increase confidence in the model. Additionally, the surface water-groundwater transect monitoring was continued by the Shasta Valley Resource Conservation District.

Shasta Watershed Groundwater Model (SWGM) Model Update – Evaluation and further calibration of the current groundwater surface water model was conducted. Geophysical data collected during the AEM surveys was used to develop and inform the new geological model. The streamflow and recharge components of the Shasta Valley Precipitation Runoff Modeling System (PRMS) model were updated. The PRMS model was updated with data from local monitoring stations (precipitation, temperature, and snowpack) and was extended to water year 2023.

Upland Management – To address the impact of upland management projects in the Basin, during the August 2023 Advisory Committee meeting an ad hoc group was formed. The group includes members of the public who will meet with the GSA and the technical team to discuss opportunities to monitor and study the effects of existing upland management projects on surface and groundwater resources.

Public Outreach - The GSA has continued public outreach by visiting local well owners who report concerns about groundwater levels in their wells and also worked to develop opportunities to improve monitoring and data collection to aid the GSA in characterizing and improving groundwater reliability. Quarterly Advisory Committee meetings, open to the public, were also conducted.

5.2 Activities Anticipated for the Coming Year

Data Gaps and Data Collection - The GSA plans to continue the installation of continuous groundwater level and surface water monitoring sites to support the implementation of planned projects and management actions. These new monitoring sites will improve the representation of groundwater levels throughout the Basin and improve the representation of the different hydrogeologic units. Current areas identified for installation of additional monitoring wells include the Big Springs area, Gazelle, and the central portion of the Basin. Expansion of the water quality monitoring network is planned to occur, with the addition of representative monitoring points. One time sampling of additional constituents will also occur to evaluate the impact of pesticides associated with cannabis cultivation on groundwater and surface water. Groundwater-surface water connectivity will continue to be evaluated in the Basin. The installation of temporary and permanent stream gages to measure surface flows will occur at multiple sites including the inflow to Lake Shastina as well as the outflow to various canal systems. Additionally, sites will be identified and prioritized for pumping tests to be conducted to evaluate the impact of pumping on the water table and nearby surface waters. These studies will eventually be paired with geophysical surveys as well as geochemical sampling to estimate and refine water mass balances.

Irrigation Efficiency Improvements – In early 2024 an Efficient Agricultural Water Management Workshop will be held in coordination with the University of California Cooperative Extension and the Tehama Resource Conservation District. The Workshop will provide information on a Mobile Irrigation Lab that can provide on-site evaluations of irrigation systems and provide comprehensive reports to producers that detail how their irrigation system is performing, including tips, suggestions, and recommendations based on data collected during the inspection.

Well Inventory Program – During the upcoming water year the GSA is initiating the Well Inventory Program. The Program will utilize datasets from the County and Department of Water Resources to identify wells in the Basin and create a database to store relevant data related to the inventory. Information from the Well Inventory will be incorporated into the model and also be used to inform an upcoming Fee Study that will be conducted to identify options to fund groundwater management in the Basin.

Shasta Watershed Groundwater Model (SWGM) Model Update – The location of wells and quantity of pumping will continue to be refined and information from the Well Inventory Program will be used. Additional information on streamflow and groundwater-surface water interaction will be incorporated into the model, this includes updates on streamflow diversions, timing and use of specific canals in the model domain, and incorporation of more accurate measurements of surface runoff. The geologic model will continue to be refined and calibrated, and will be incorporated to the groundwater model. The method to estimate groundwater extraction and deep percolation of irrigated lands will continue to be refined, and on-farm water use will be ground-truthed to support the use of satellite imagery.

Upland Management – Existing upland management projects will be identified to monitor and study the benefits to groundwater or surface water supplies from existing upland management projects. The objective of this effort is to use existing watershed projects to evaluate potential benefits, particularly from removal of Western juniper. In fall 2023 an ad hoc group was formed with members of the public. During the upcoming water year the group will meet to discuss upland management opportunities and help inform the GSA and technical team of these opportunities.

Public Outreach – The GSA will continue public outreach by working with the public to develop opportunities to improve monitoring and data collection. Quarterly Advisory Committee Meetings, open to the public, will also be conducted.

5.3 Coordination

State Water Resources Control Board – GSA staff meets biweekly with SWRCB staff to discuss updates and activities related to SWRCB's Emergency Regulation Curtailments. The two parties discuss updates to curtailment actions in place, including Local Cooperative Extensions (LCS) and activities that may have impacts on groundwater management.

Karuk Tribe – During water year 2023 the GSA worked to finalize the Memorandum of Understanding (MOU) with the Karuk Tribe regarding coordinating on aspects of the GSP implementation in the Scott and Shasta basins, and the Final MOU was signed on May 3, 2023. A staff-to-staff meeting between the GSA and the Karuk Tribe was held on July 26, 2023 with the purpose of debriefing the SGM implementation grant proposal development process and brainstorming ways to improve transparency in the Advisory Committee process and in providing draft proposals further in advance to allow time for review. In the coming water year, a call is tentatively planned for February 2024 between the GSA and the Karuk Tribe to share plans related to implementing the SGM Grants and identify opportunities for coordination at a staff-to-staff level.

Table 7: Project and Management Actions Summary.

Project Title	**Status**	**Project Category - Targeted Sustainability Indicator(s)/Benefits**	**Project Description**
Well Drilling Permits and County of Siskiyou Groundwater Use Restrictions	Existing/ Ongoing	Demand Management - Groundwater levels	Siskiyou County Well Drilling Permits (Standards for Wells, Title 5, Chapter 8 of Siskiyou County Code of Ordinances).
Scott and Shasta Valley Watermaster District	Existing/ Ongoing	Demand Management - Interconnected Surface Water	Implements Shasta River Decree. Among other things, a watermaster assists in managing water leases under the authority of Shasta River Water Trust and 1707 dedications and transfers.
Shasta Watershed Groundwater Model (SWGM) Model Update and Isotope Results	Active	GSP Implementation	Update the Shasta Watershed Groundwater Model and conduct a groundwater isotope study.
Novy Rice Zenkus Fish Passage Improvement Project	Active	Habitat Improvement	Improve fish habitat on the Shasta River.
Montague- Grenada Weir Modification Project	Active	Habitat Improvement - Interconnected surface water	Improve fish passage on the Shasta River.
Piezometer Transect Study Project	Active	Demand Management – Groundwater levels	Conduct piezometer transects at key reaches of primary surface water bodies in the Basin.
City of Yreka Water Demand	Active	Demand Management – Groundwater levels	City water shortage contingency ordinance.
Shasta River Safe Harbor Agreement	Active	Habitat Improvement	Improve fish habitat on the Shasta River.

Table 7: Project and Management Actions Summary. *(continued)*

Project Title	Status	Project Category - Targeted Sustainability Indicator(s)/Benefits	Project Description
Enhancement of Survival Permits Authorizing Shasta River Template Safe Harbor Agreement and Associated Site Plans/ Recovery of Southern Oregon/Northern California Coast (SONCC) Coho Salmon	Active	Habitat Improvement - Interconnected Surface Water	Habitat enhancement on private land.
Shasta River Tailwater Reduction Plan	Active	Conjunctive Use -Groundwater quality	Reduce tailwater's negative impacts to water quality.
Upland Management	Active	Supply Enhancement – (1) Improved groundwater recharge, (2) groundwater levels, (3) habitat	Upland management includes removal of excess vegetation. This can occur on US Forest Service, Bureau of Land Management, or private land.
Data Gaps and Data Collection	Active	GSP Implementation	Prioritization and actions to address data gaps during GSP implementation.
Aquifer Characterization Analysis	Active	Demand Management – (1) Groundwater levels, (2) Interconnected Surface Water	Conduct aquifer characterization studies with large capacity wells.
Avoiding Significant Increase of Total Net Groundwater Use from the Basin	Active	Demand Management – (1) Groundwater levels, (2) Interconnected Surface Water	Avoid significant future increase of total net groundwater use above the most recent 20 year period (2000-2020) within the Basin through planning and coordination with land use zoning and well permitting agencies.
Conservation Easements	Planning Phase	Supply Augmentation – Interconnected Surface Water	Conservation easements in Shasta Valley that enhance stream flow during the critical low flow period.

Table 7: Project and Management Actions Summary. *(continued)*

Project Title	**Status**	**Project Category - Targeted Sustainability Indicator(s)/Benefits**	**Project Description**
Upslope Water Yield Projects	Planning Phase	Supply Augmentation – Interconnected Surface Water	Building green infrastructure in the upper watershed to increase water yield. Green infrastructure includes fuel reduction, road improvements, canopy opening to manage snow shade and accumulation, and other large landscape projects that increase water storage within the upper watershed during wet periods and baseflow from the upper watershed during dry periods.
Habitat Improvement in Shasta Watershed	Planning Phase	Habitat Improvement - Interconnected Surface Water	Improve wildlife habitat conditions in the Shasta watershed
Instream Flow Leases	Planning Phase	Supply Augmentation – Interconnected Surface Water	Temporary transfer of a water rights to protect instream flows.
Irrigation Efficiency Improvements	Active	Demand Management – (1) Groundwater levels, (2) Interconnected Surface Water	Increase irrigation efficiency (and in some cases, yields) through assessing infrastructure or equipment improvements. Consider funding incentives through the NRCS EQIP program.
Juniper Removal	Conceptual Phase	Habitat Improvement - (1) Groundwater levels, (2) Interconnected Surface Water	Juniper removal
Public Outreach	Active	GSP Implementation	Public outreach and education for GSA stakeholders.
Reporting of Pump Volumes	Conceptual Phase	Demand Management – Groundwater levels	Reporting of pump volumes for pumps above 500 gpm and commercial purposes.

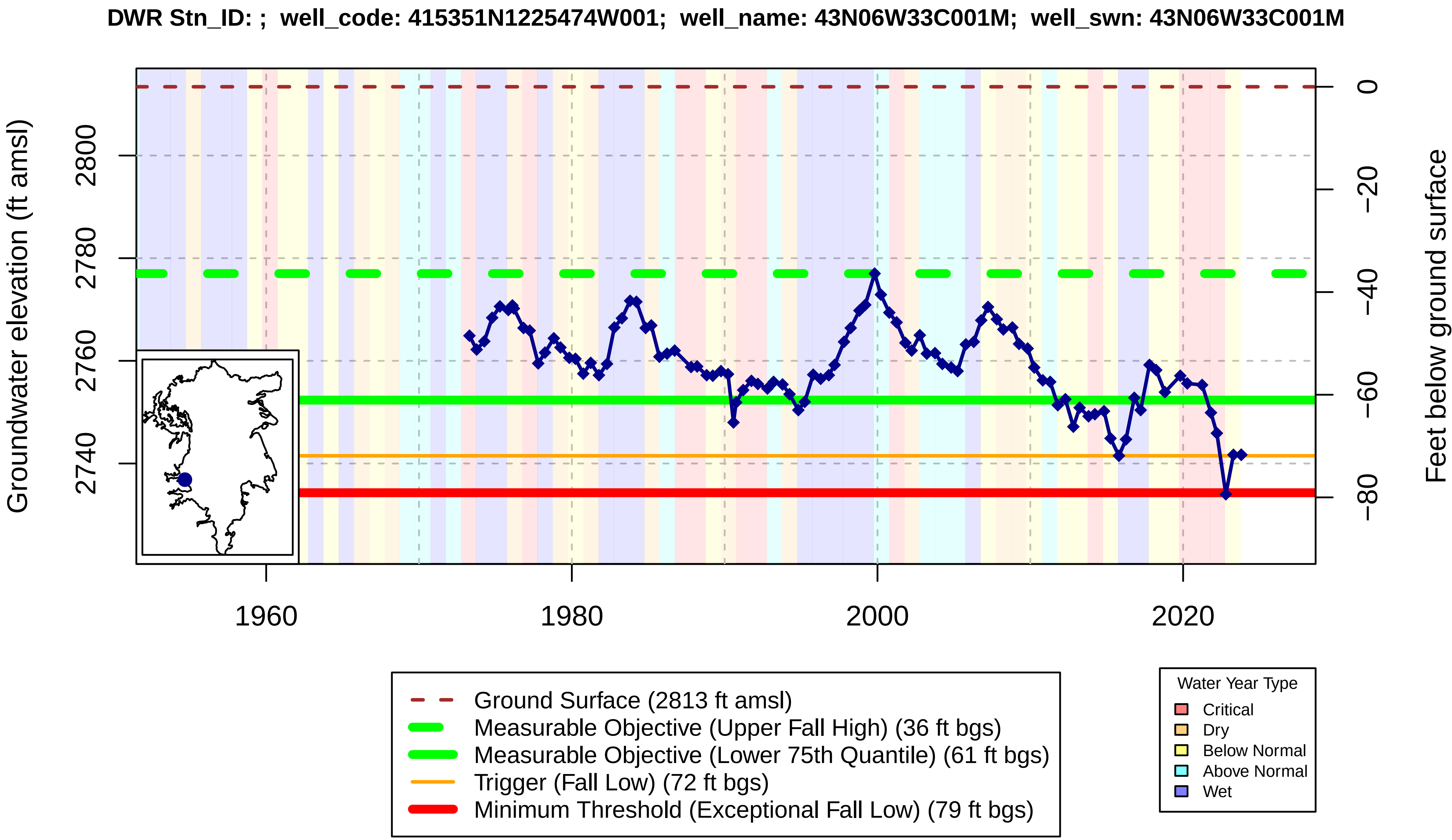
Table 7: Project and Management Actions Summary. *(continued)*

Project Title	**Status**	**Project Category - Targeted Sustainability Indicator(s)/Benefits**	**Project Description**
Voluntary Managed Land Repurposing	Conceptual Phase	Demand Management – Groundwater levels	Reduce water use through voluntary managed land repurposing activities including term contracts, crop rotation, irrigated margin reduction, conservation easements, and other uses
Well Inventory Program	Planning Phase	GSP Implementation	Improve the GSA database of wells within the Basin

Appendix A - Water Level Hydrographs

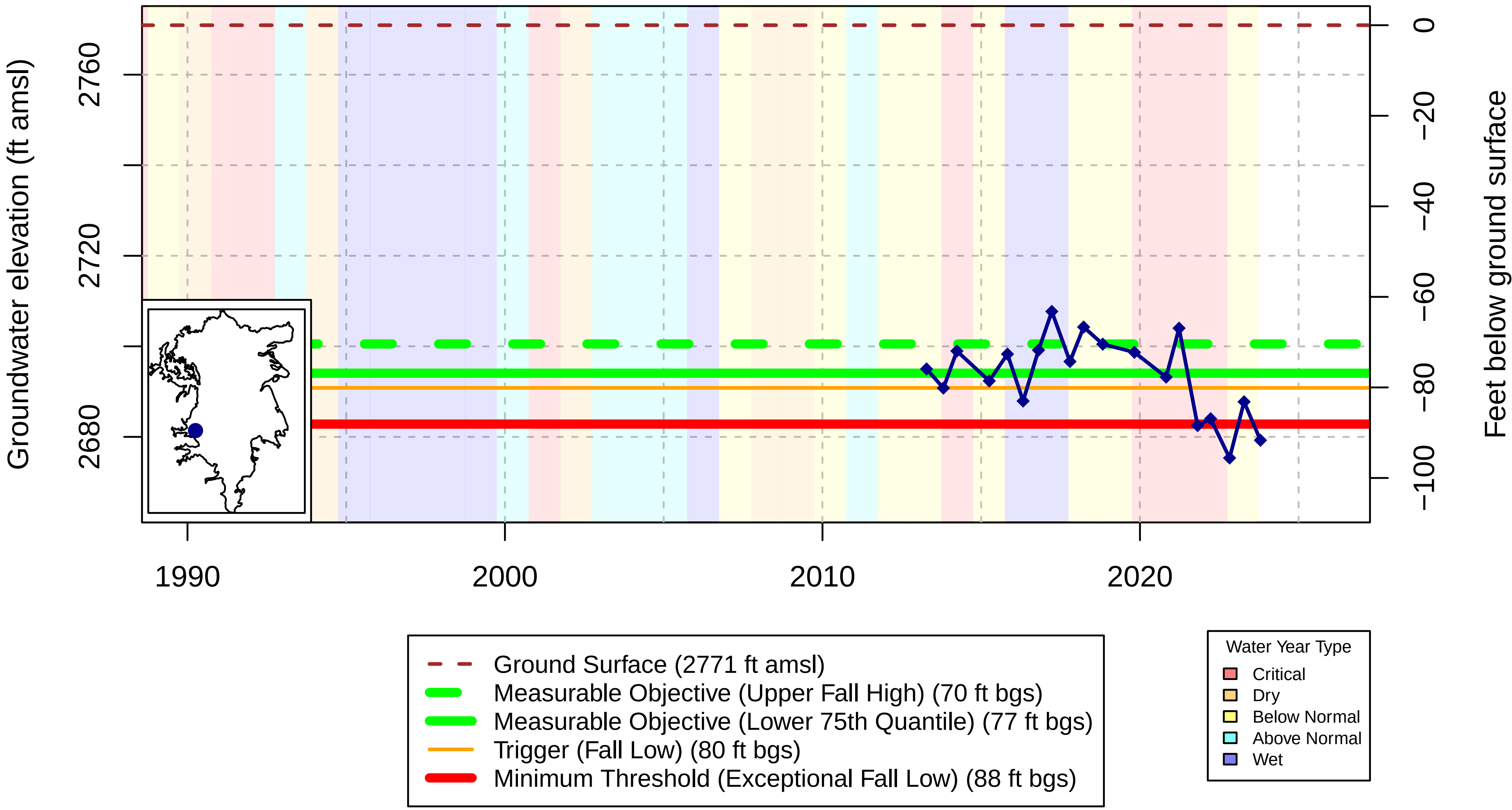
This appendix contains groundwater level hydrographs to document the Groundwater Elevation and Storage Sustainability Management Criteria. Appendix A.1 shows hydrographs for each RMP. The historical hydrographs for these RMPs were used to set the minimum thresholds and measurable objectives in the GSP. The designated SMCs are shown on each hydrograph in Appendix A.1. Appendix A.2 shows general hydrographs for the larger GSP monitoring network, including wells for which SMCs were not defined.

Appendix A.1 - Water Level Representative Monitoring Network (RMP) Hydrographs



Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

DWR Stn_ID: ; well_code: 415444N1225387W001; well_name: SV03; well_swn: NA



Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

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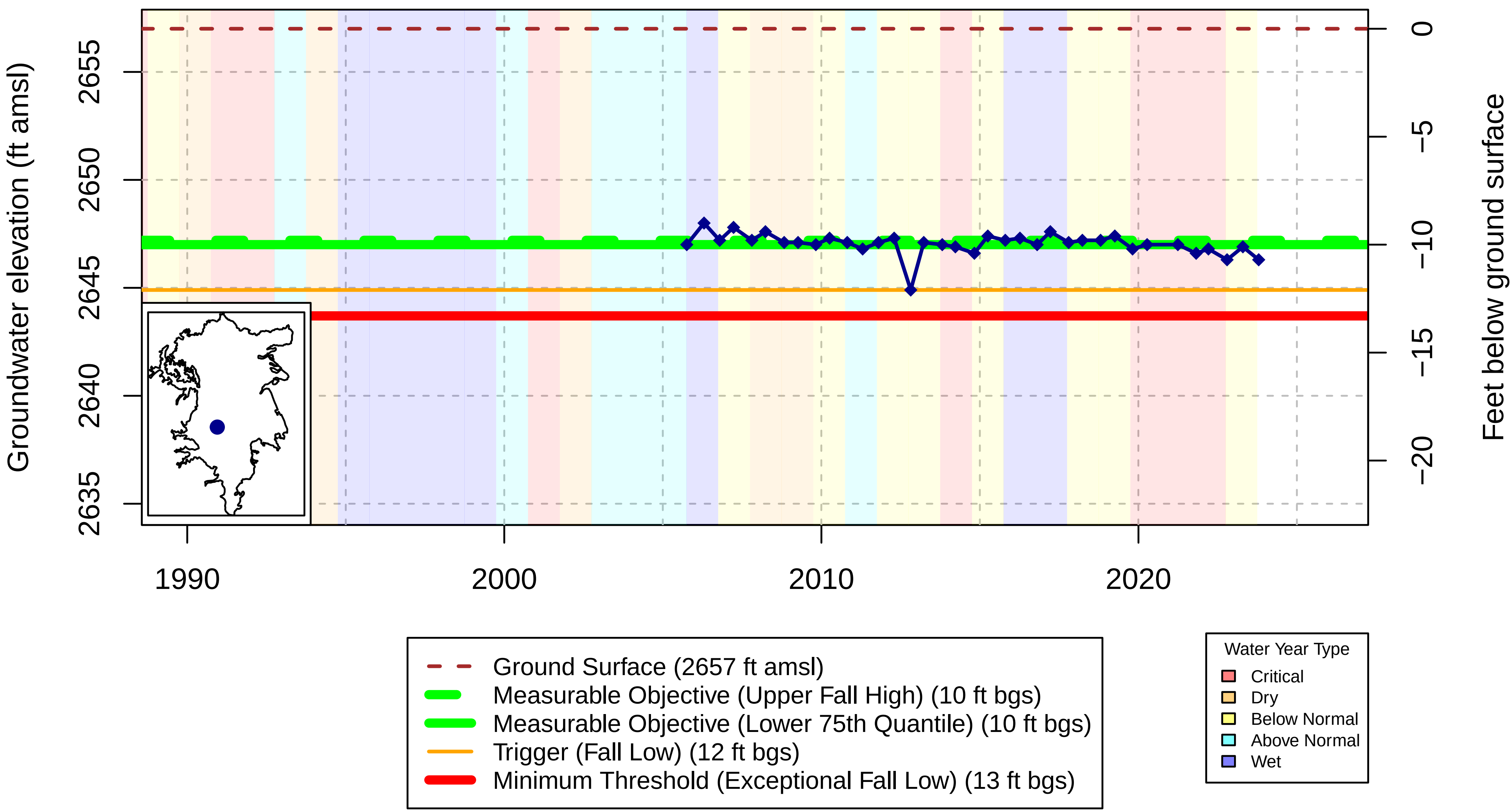
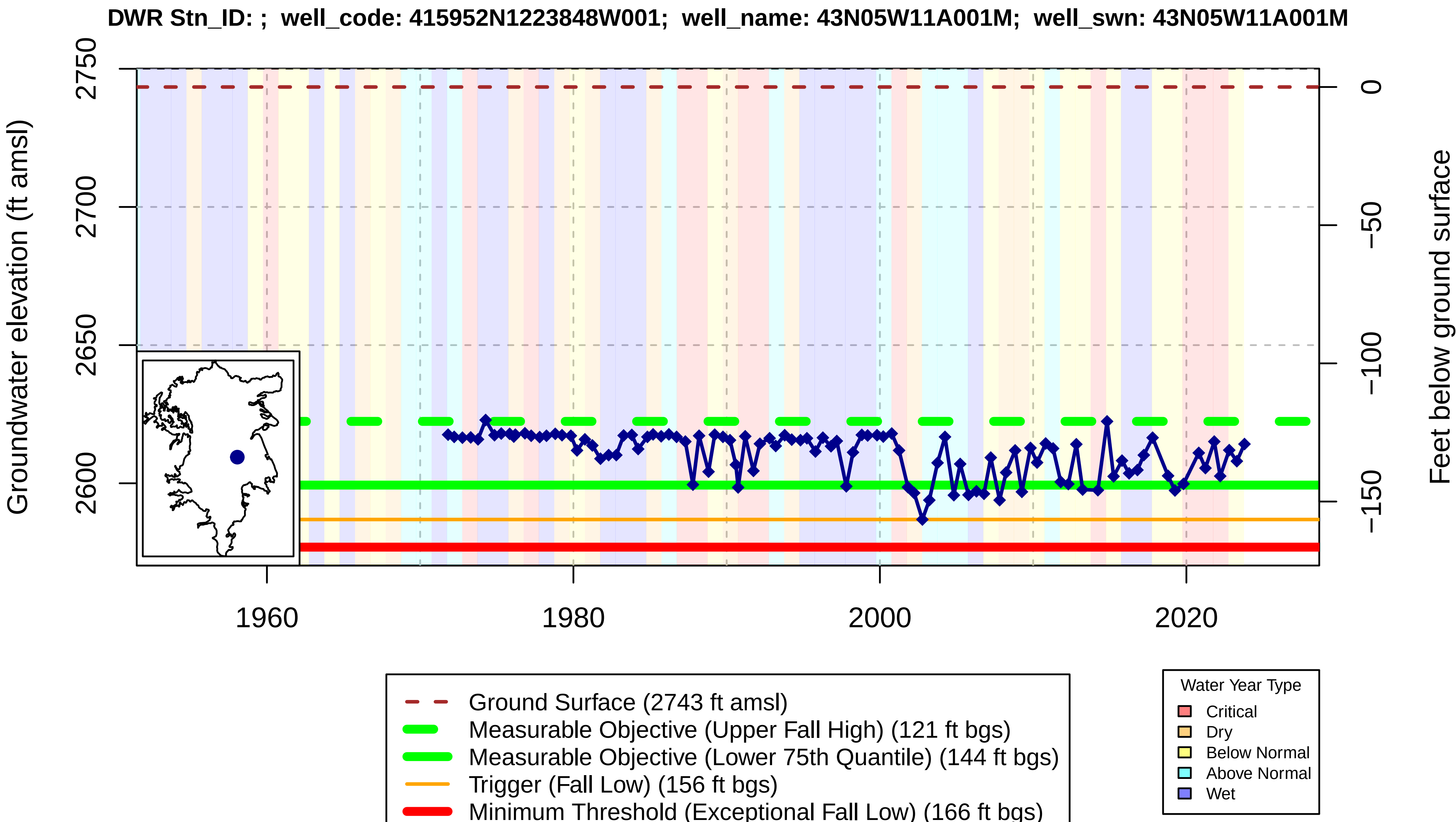
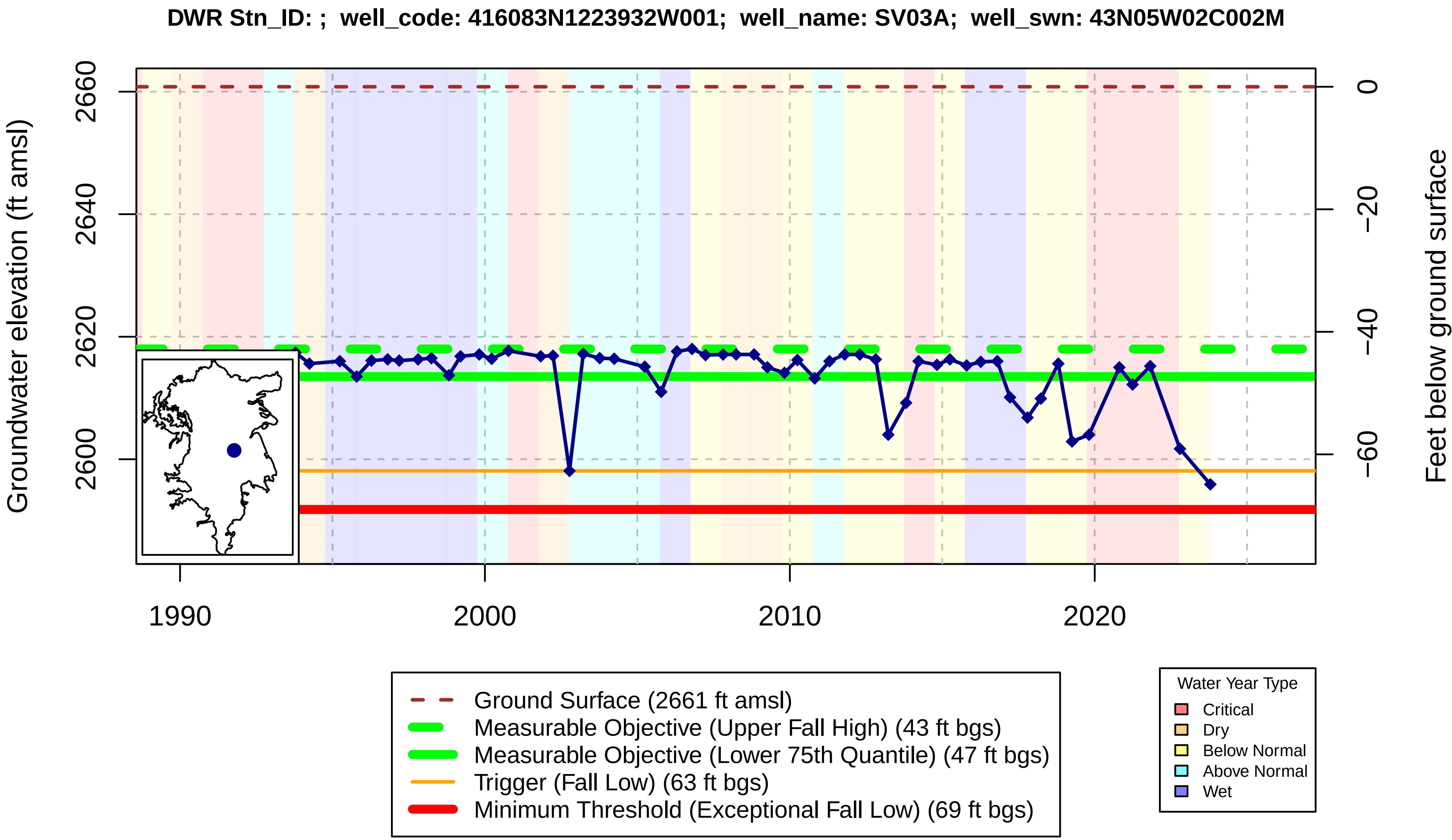


Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

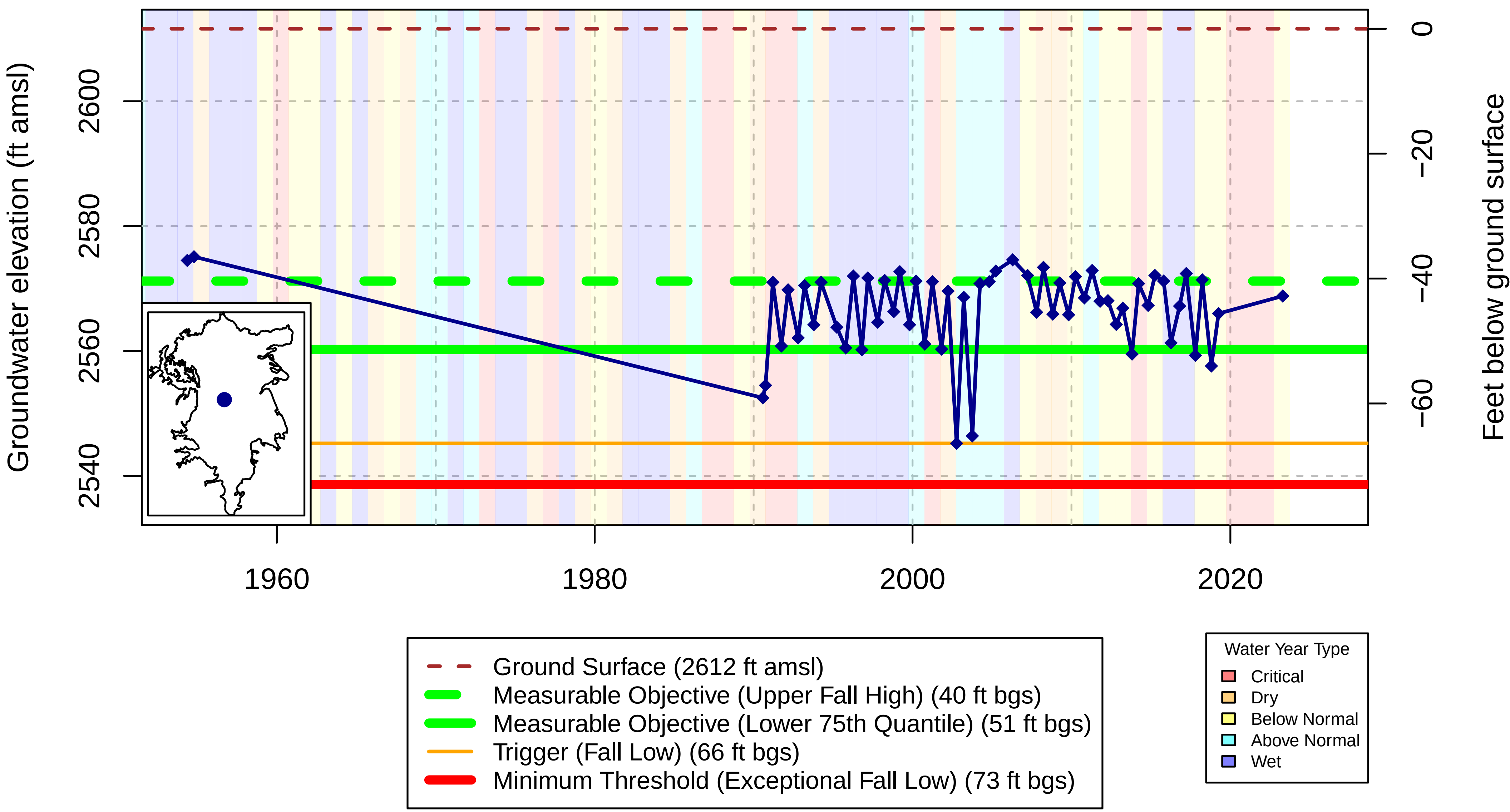


Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

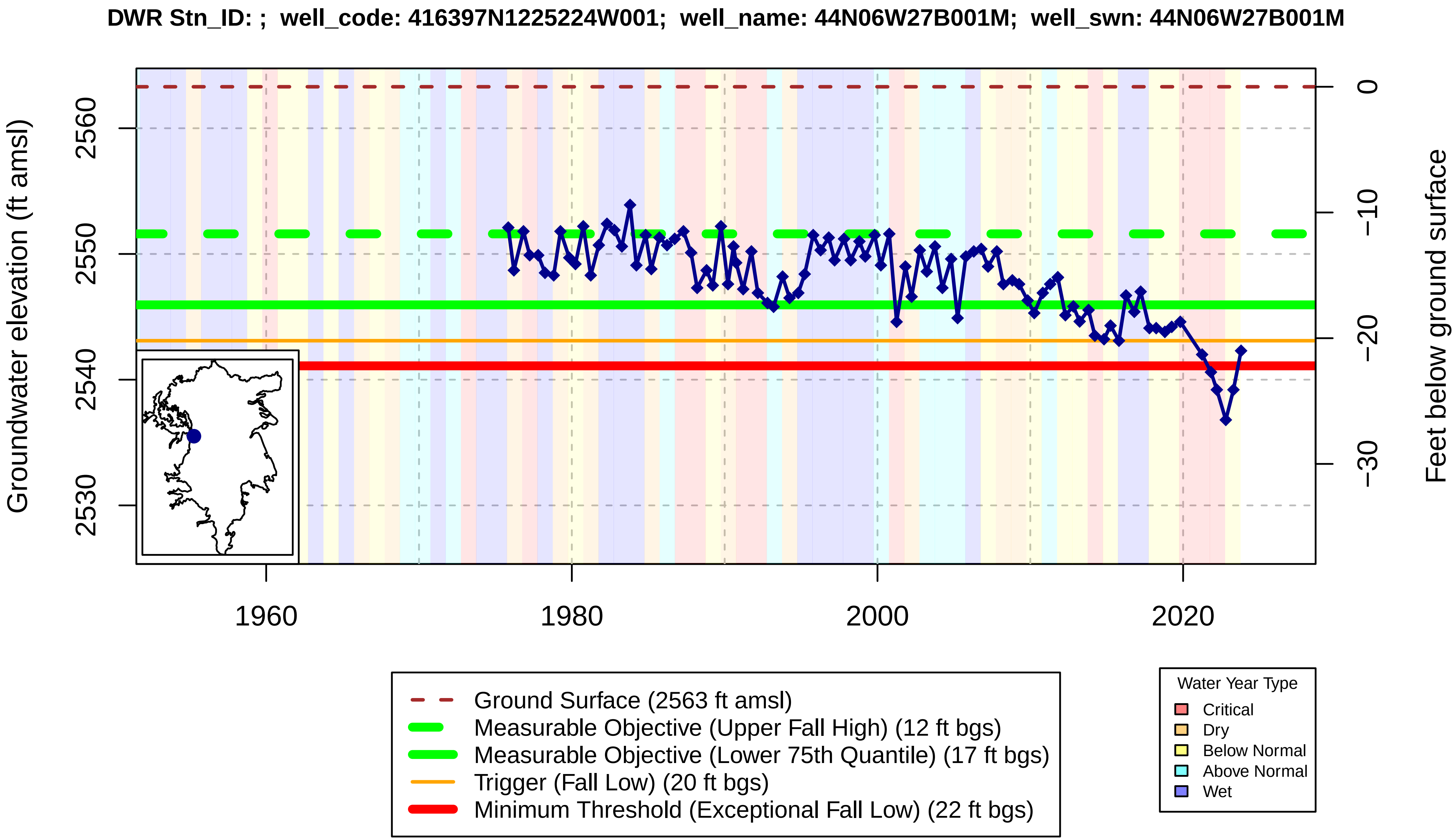


Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

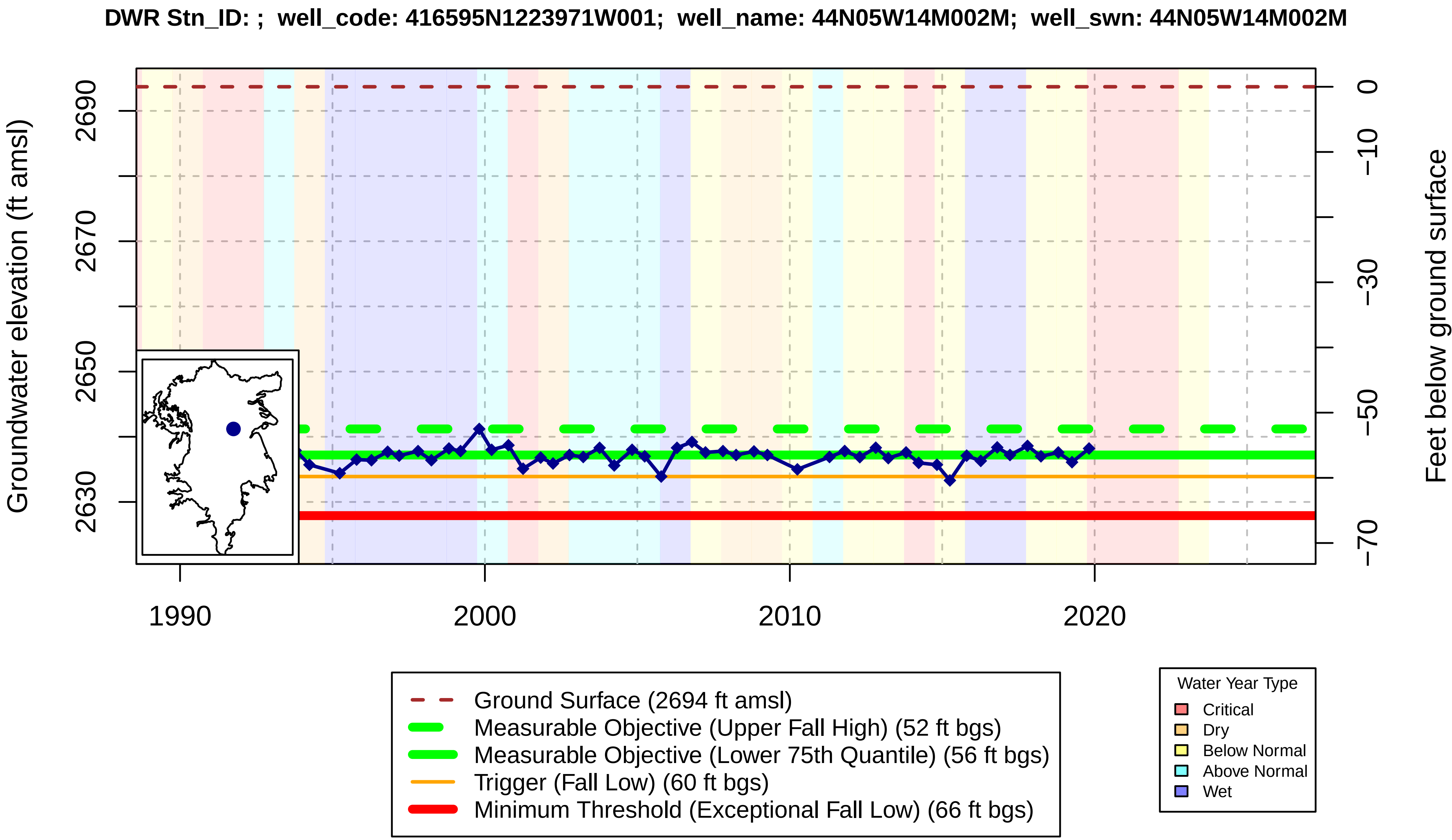
DWR Stn_ID: ; well_code: 416237N1224524W001; well_name: 44N05W32C002M; well_swn: 44N05W32C002M



Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

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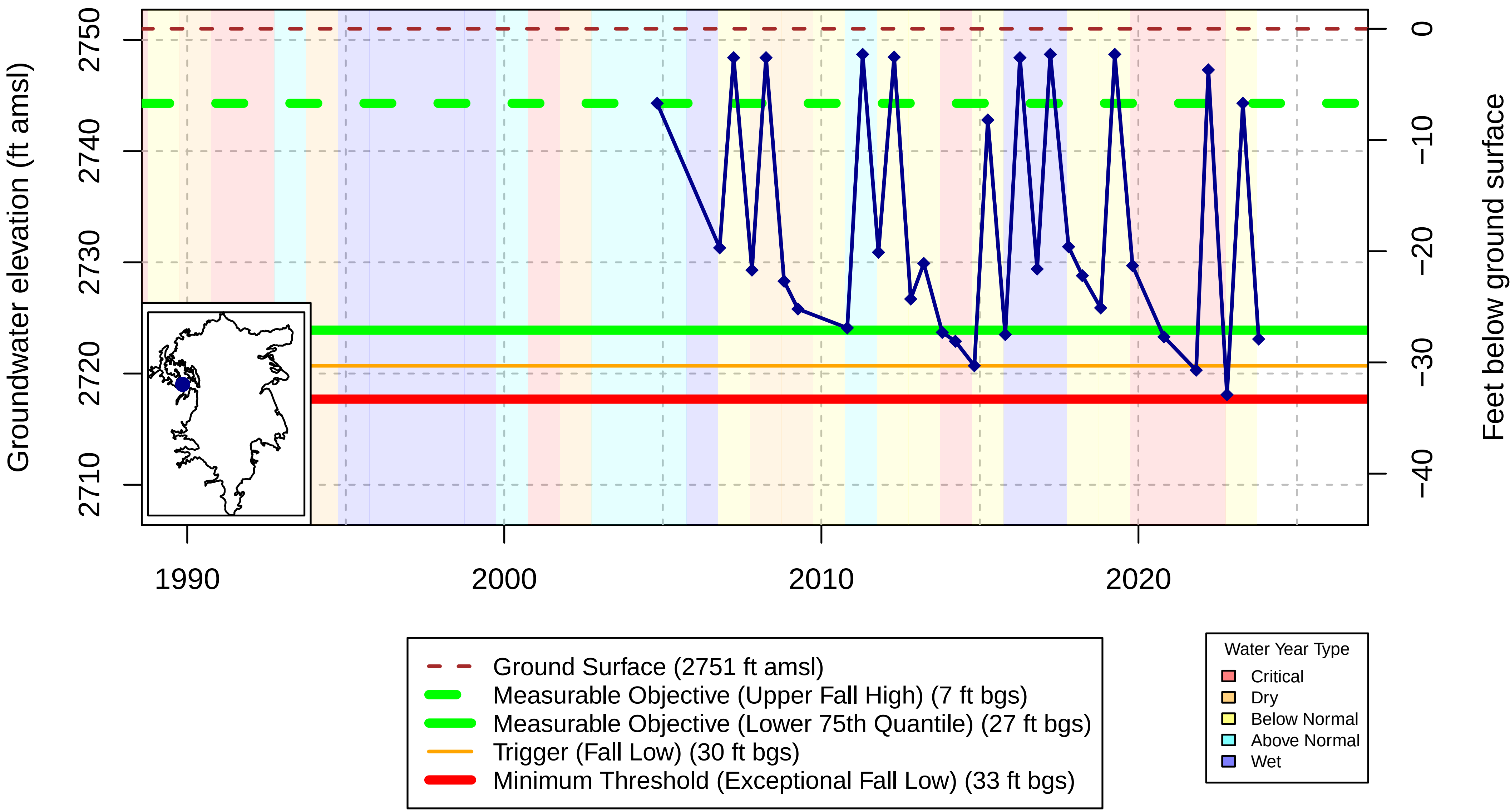
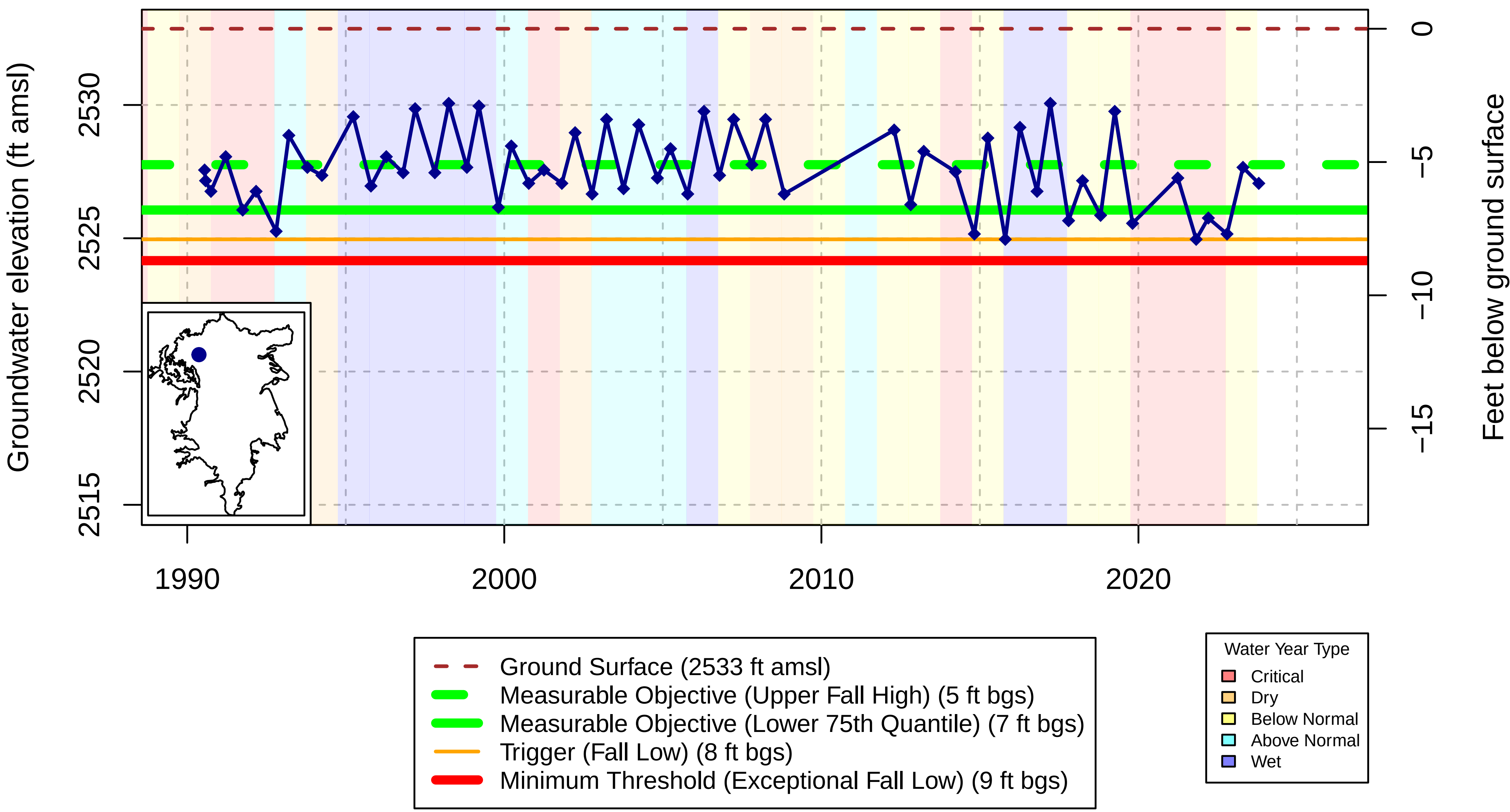
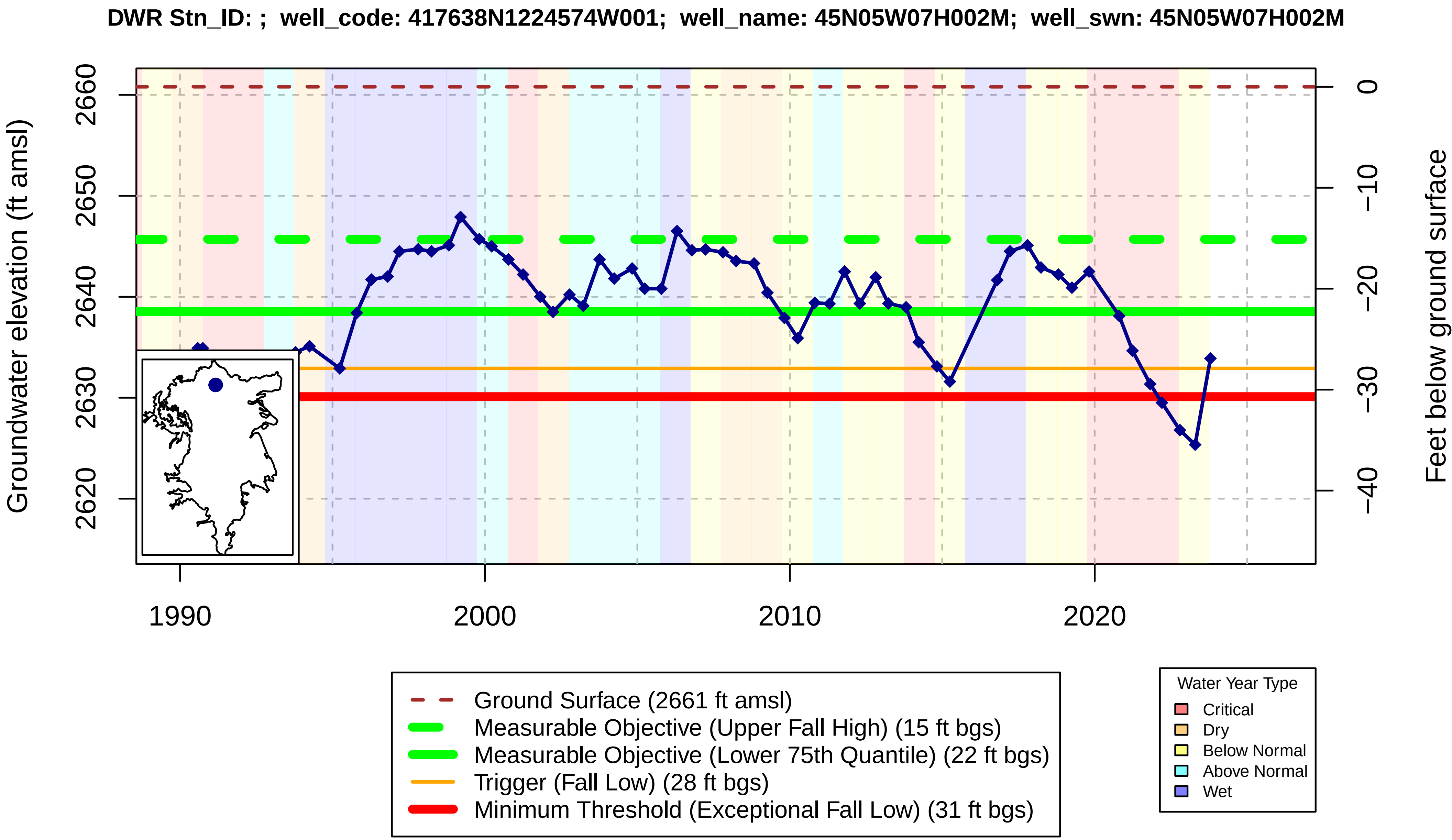


Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

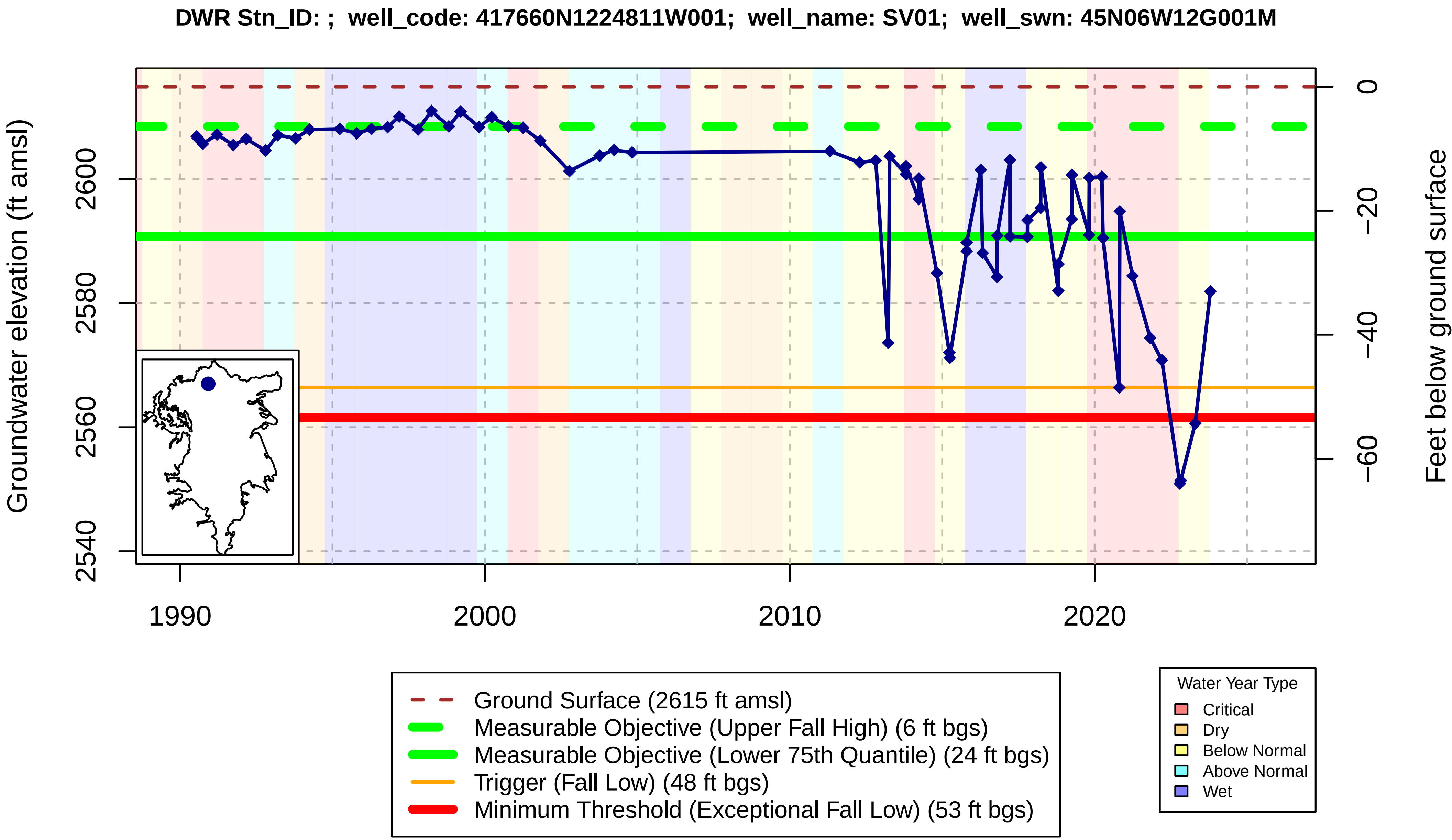
DWR Stn_ID: ; well_code: 417258N1225337W001; well_name: 27D002M; well_swn: 45N06W27D002M



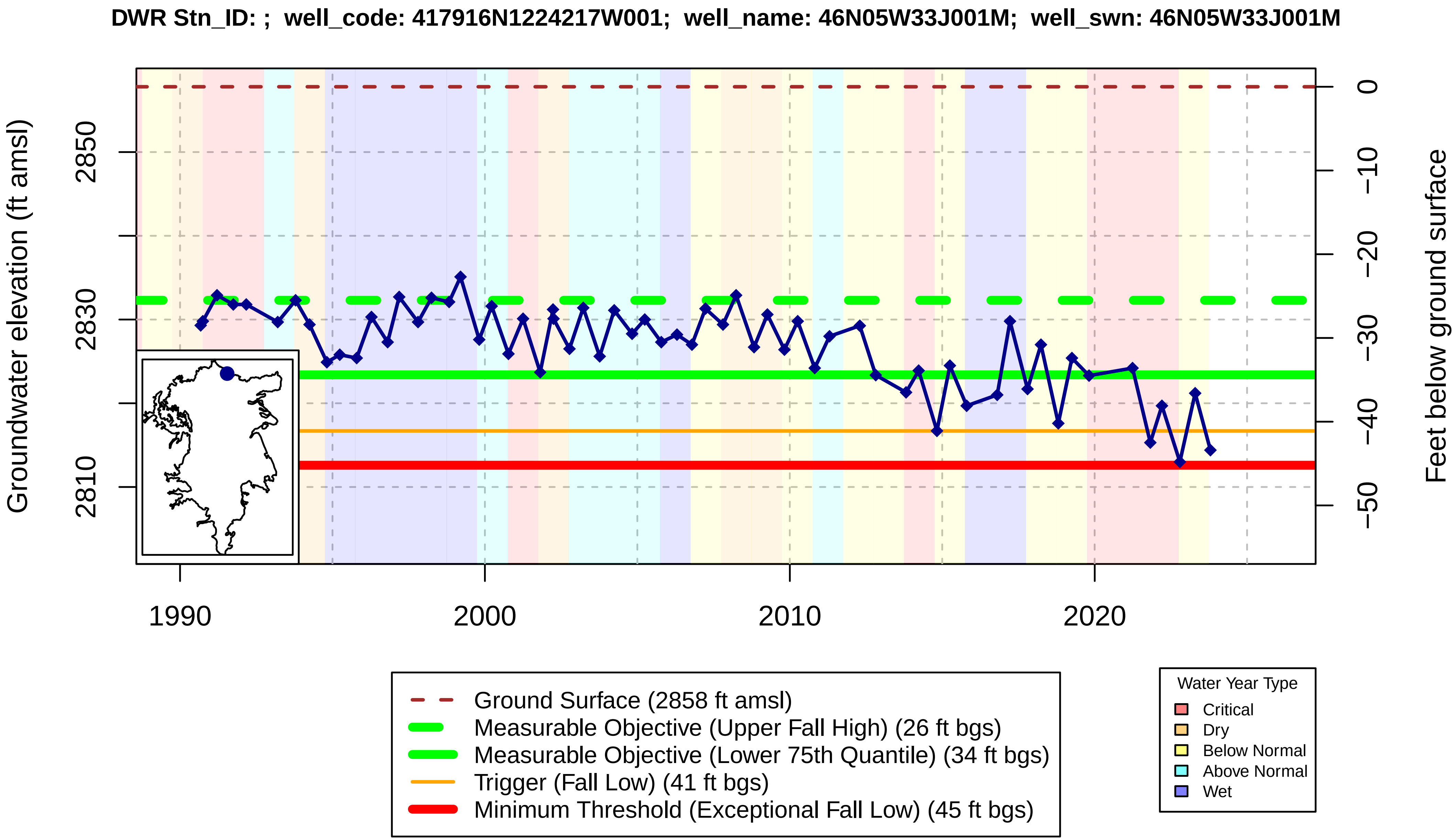
Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.



Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

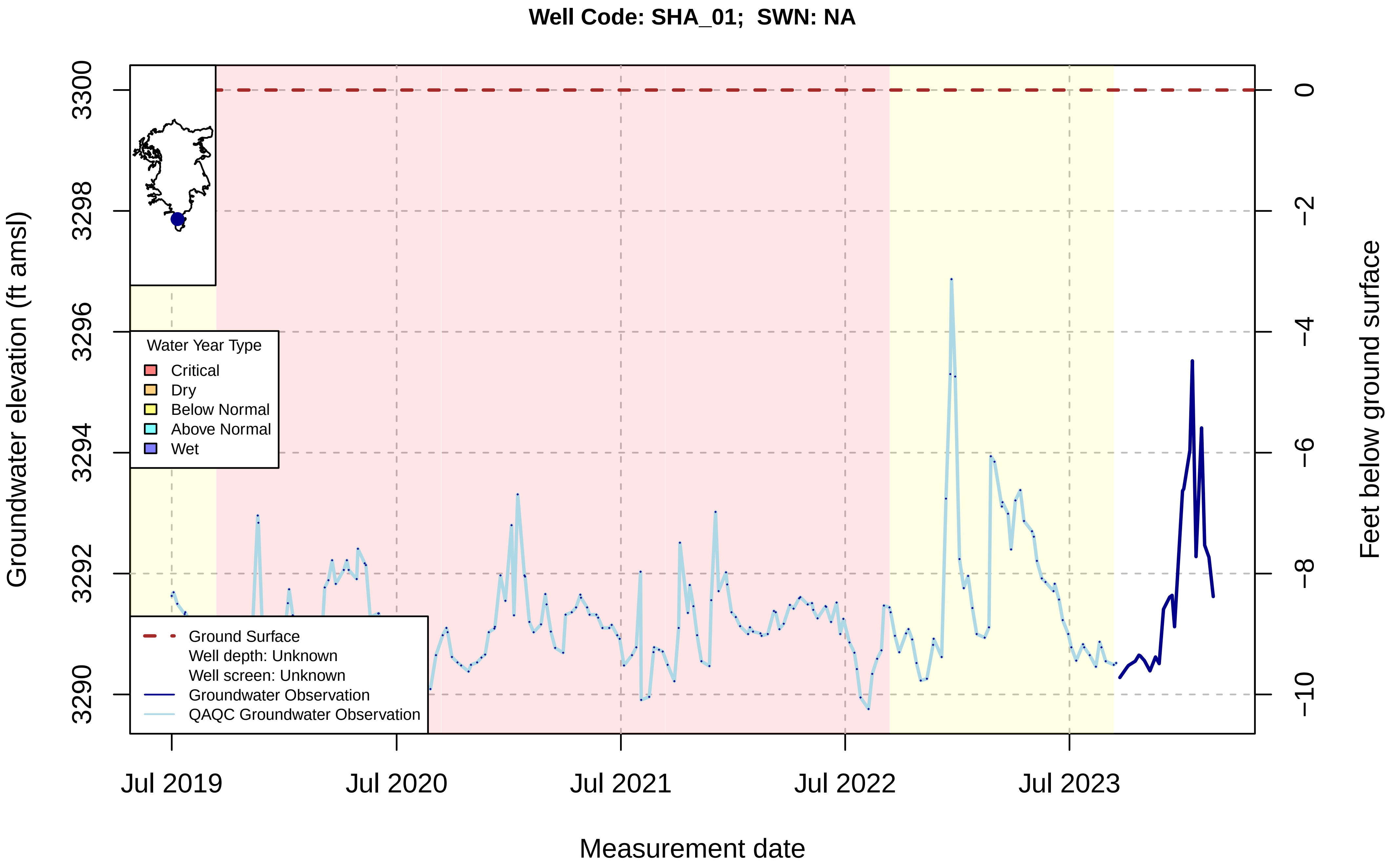


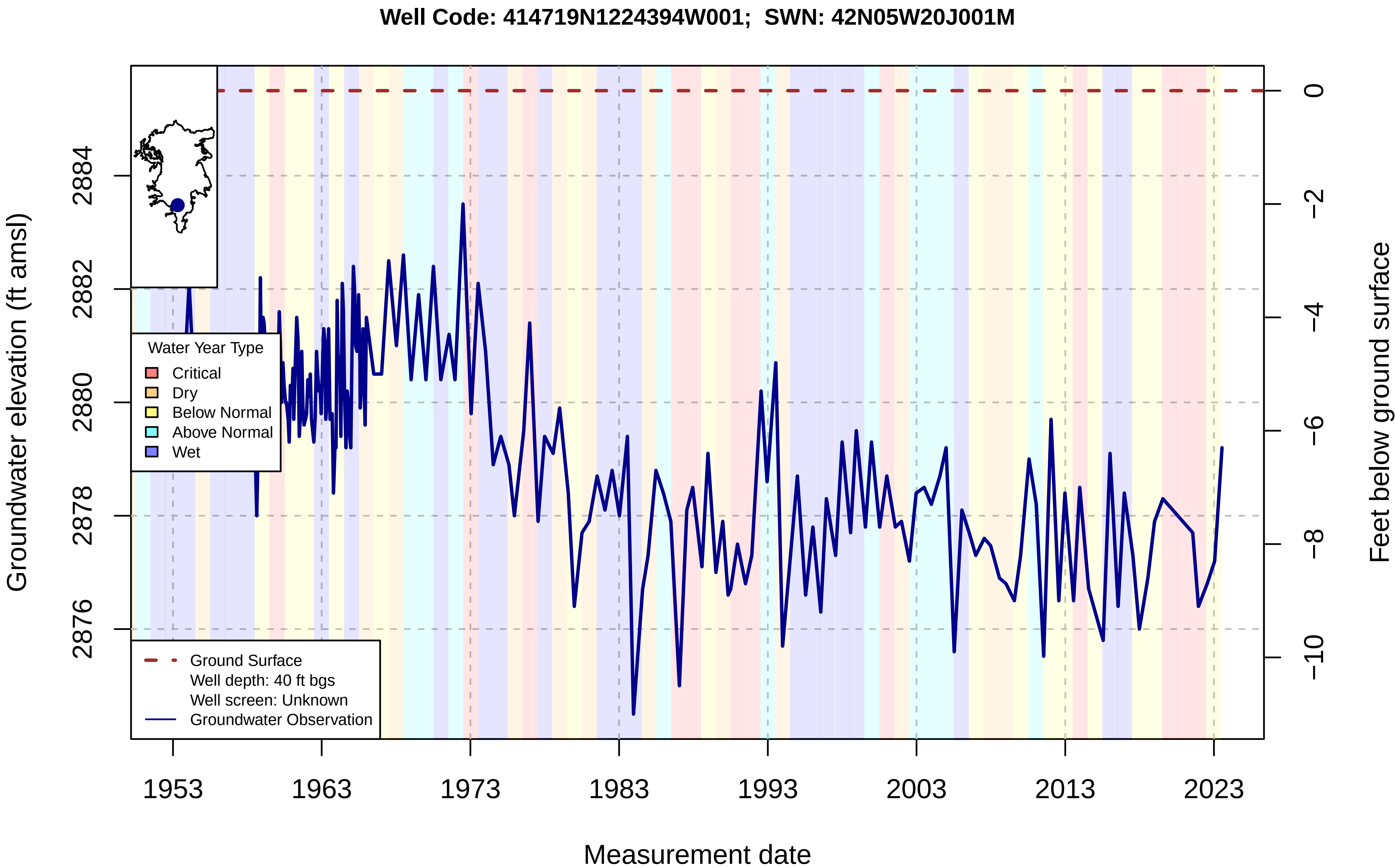
Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



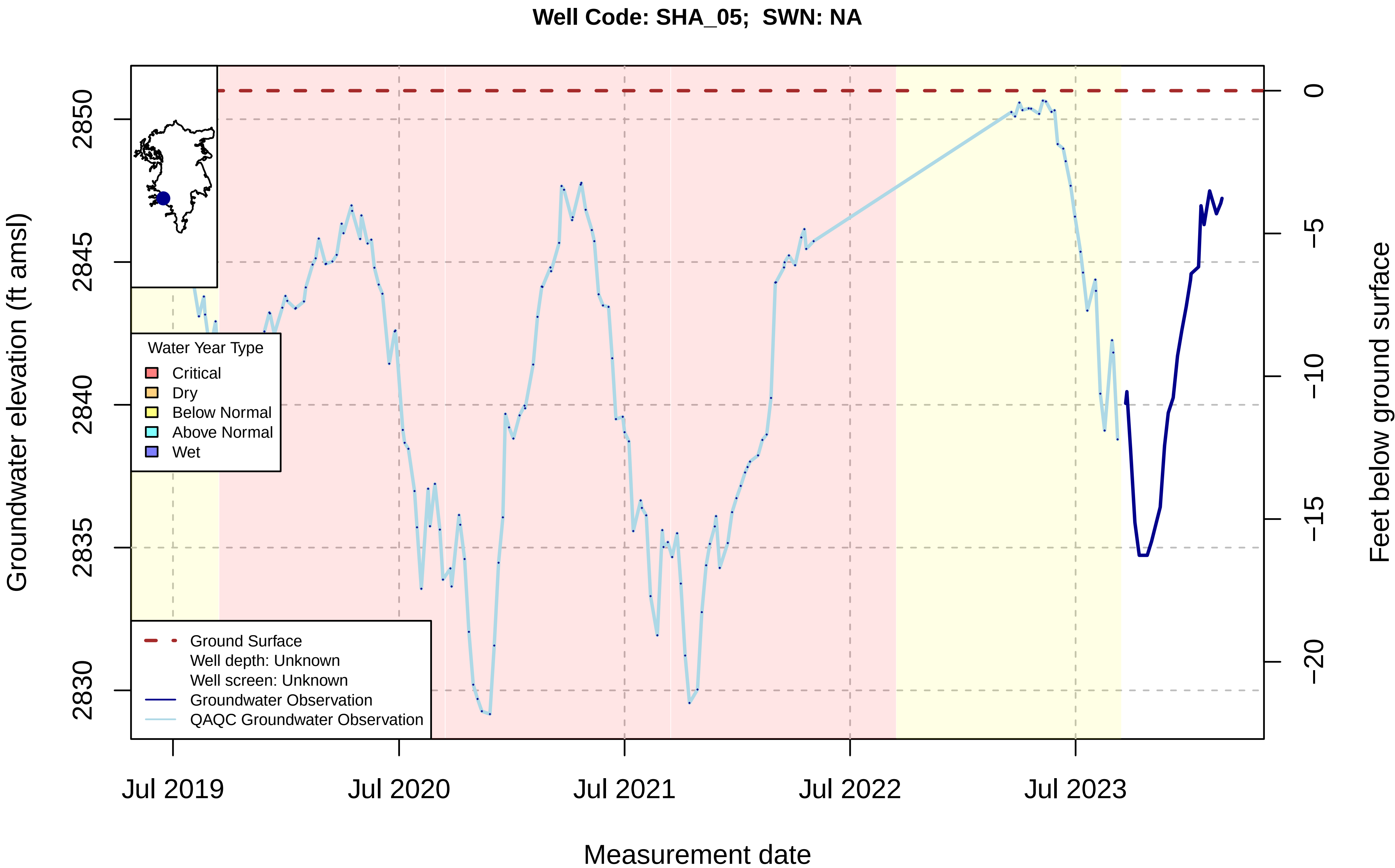
Water Year Types from WY 2019−2023 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

Appendix A.2 - Water Level GSP Monitoring Network Hydrographs

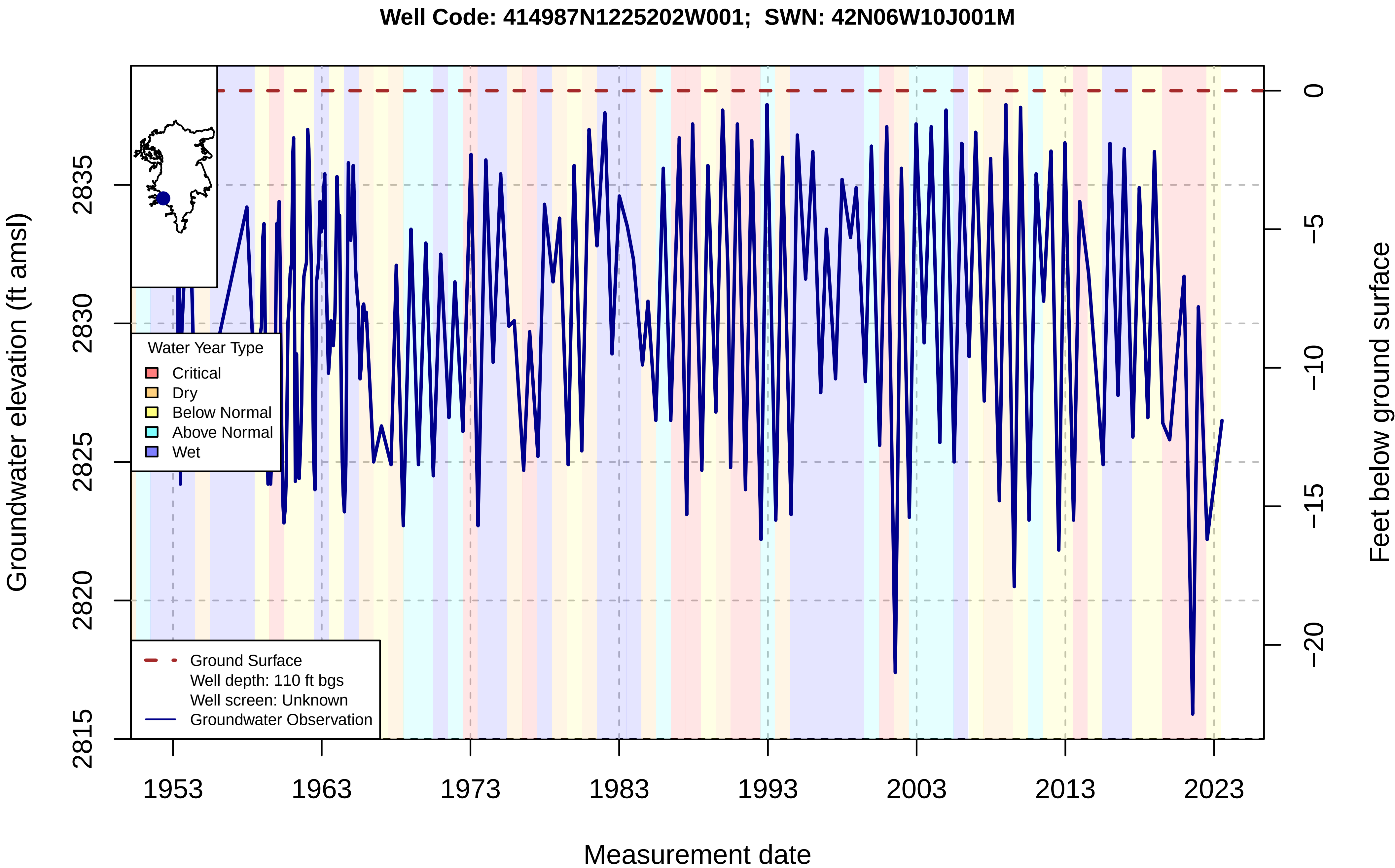

Well Code: SHA_01; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
3290
3292
3294
3296
3298
3300
0
−2
−4
−6
−8
−10
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



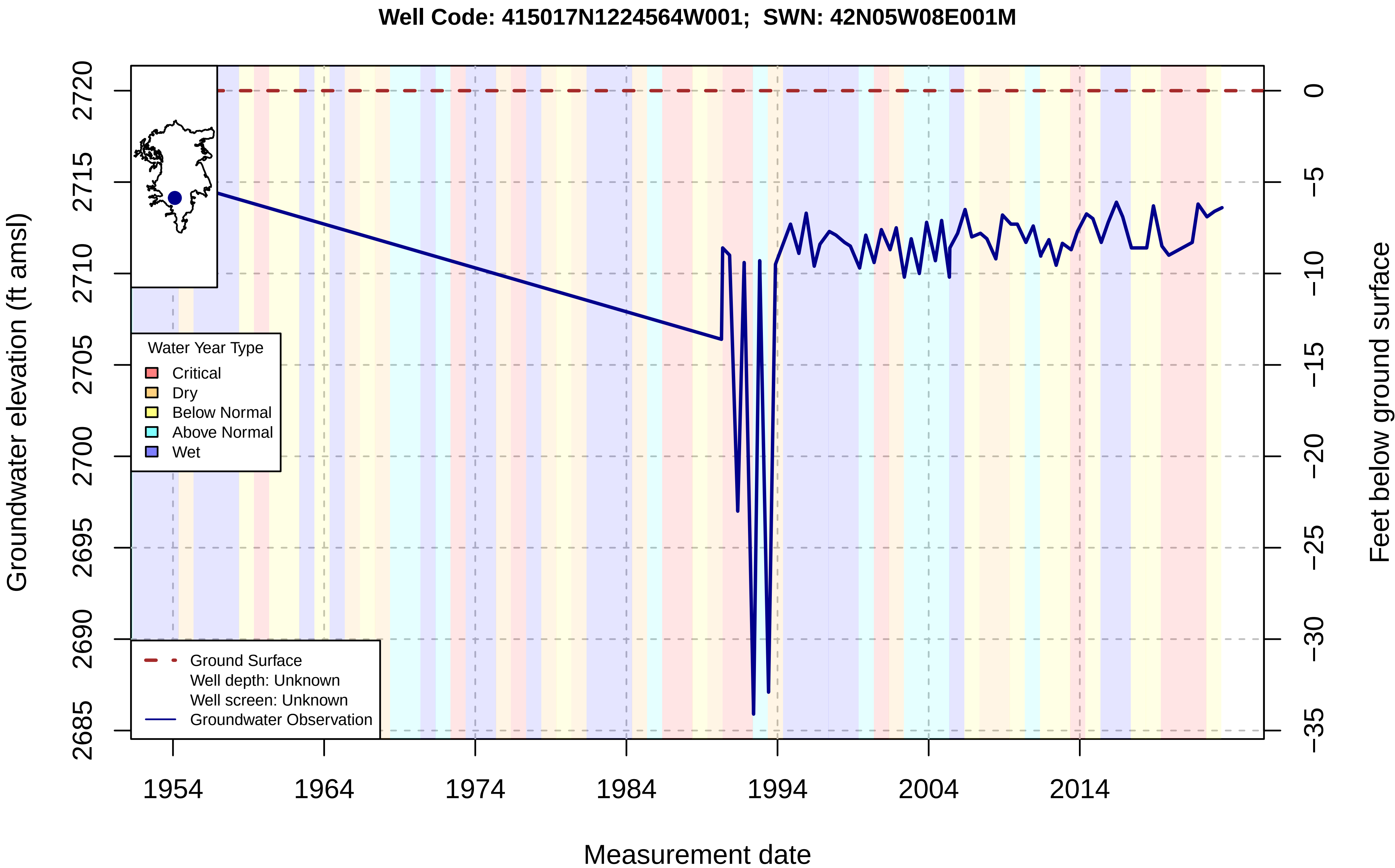
Well Code: 414719N1224394W001; SWN: 42N05W20J001M
Groundwater elevation (ft amsl)
2876
2878
2880
2882
2884
Feet below ground surface
0
−2
−4
−6
−8
−10
Measurement date
1953
1963
1973
1983
1993
2003
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 40 ft bgs
Well screen: Unknown
Groundwater Observation



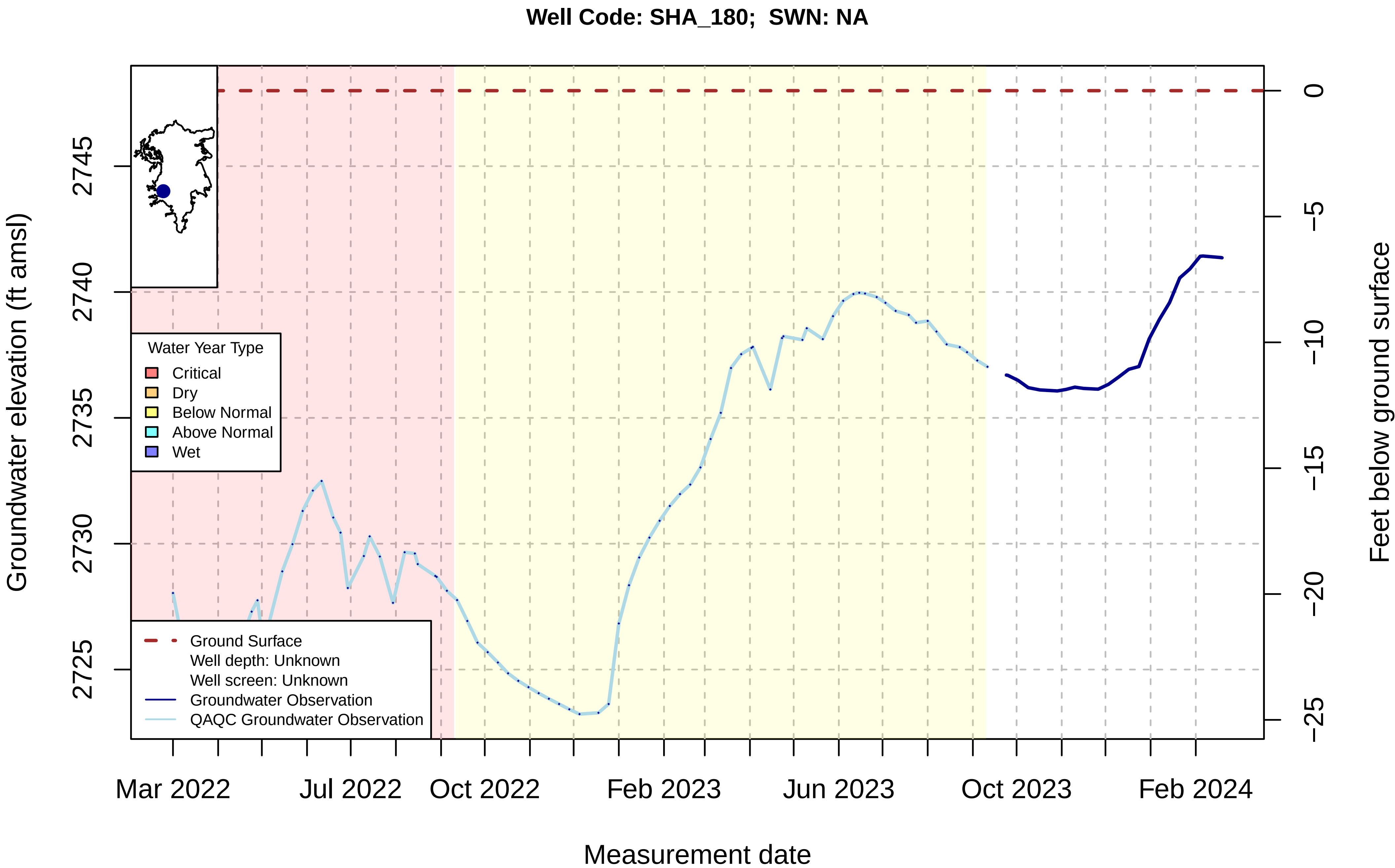
Well Code: SHA_05; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2850
2845
2840
2835
2830
0
−5
−10
−15
−20
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



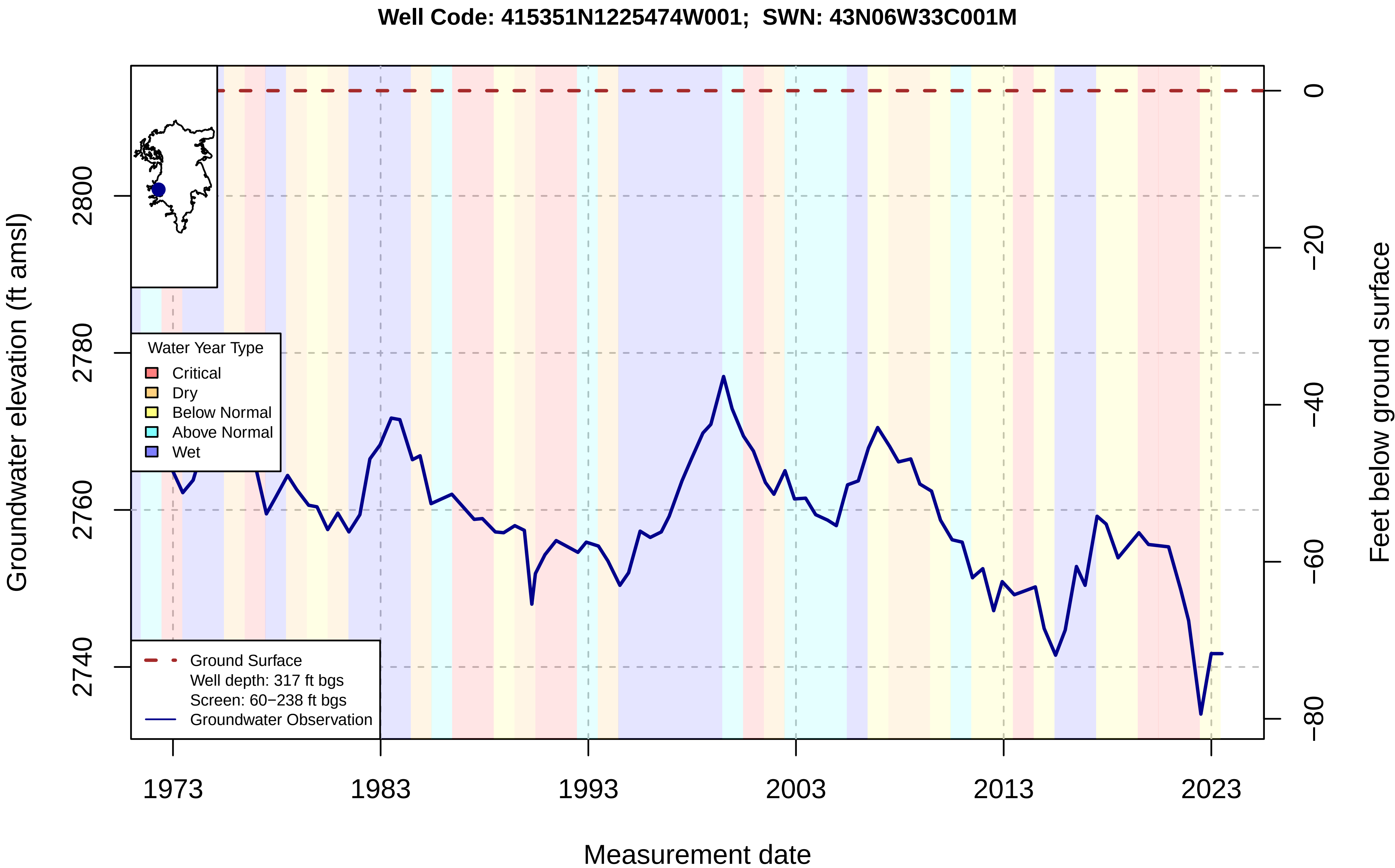
Well Code: 414987N1225202W001; SWN: 42N06W10J001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2815
2820
2825
2830
2835
0
−5
−10
−15
−20
1953
1963
1973
1983
1993
2003
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 110 ft bgs
Well screen: Unknown
Groundwater Observation



Well Code: 415017N1224564W001; SWN: 42N05W08E001M
Groundwater elevation (ft amsl)
2685
2690
2695
2700
2705
2710
2715
2720
Feet below ground surface
0
−5
−10
−15
−20
−25
−30
−35
1954
1964
1974
1984
1994
2004
2014
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation

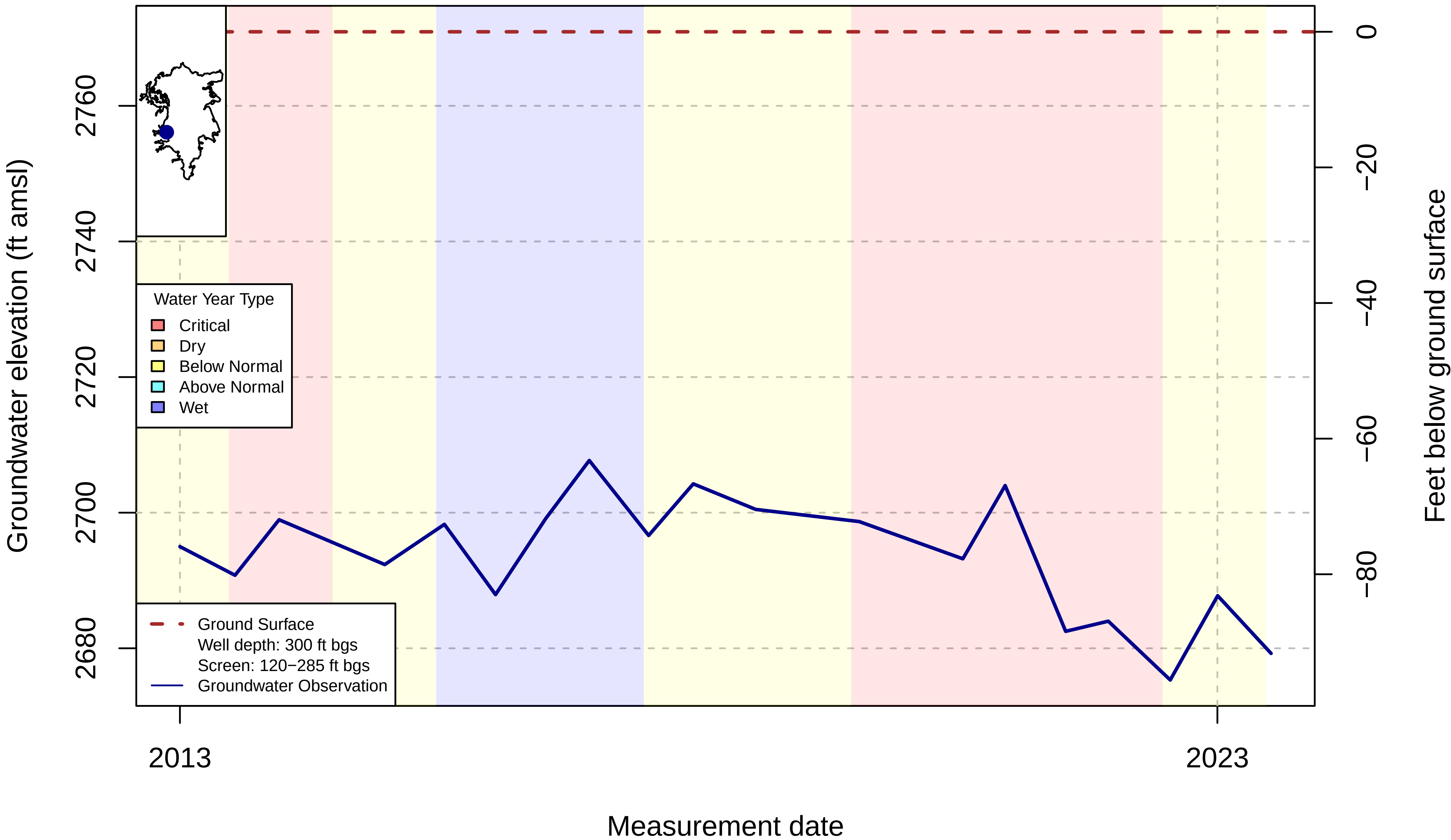


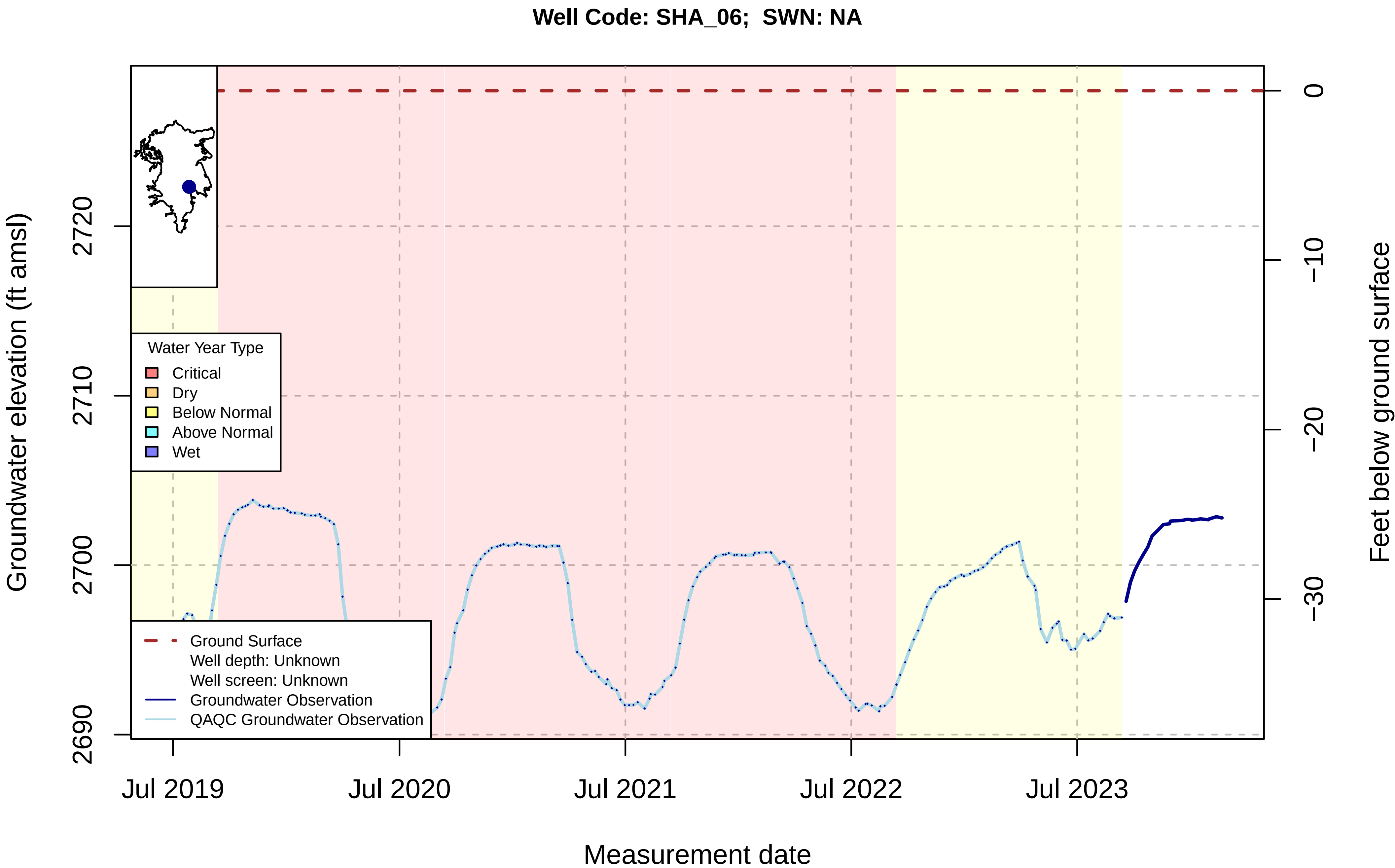
Well Code: SHA_180; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2725
2730
2735
2740
2745
0
−5
−10
−15
−20
−25
Mar 2022
Jul 2022
Oct 2022
Feb 2023
Jun 2023
Oct 2023
Feb 2024
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation

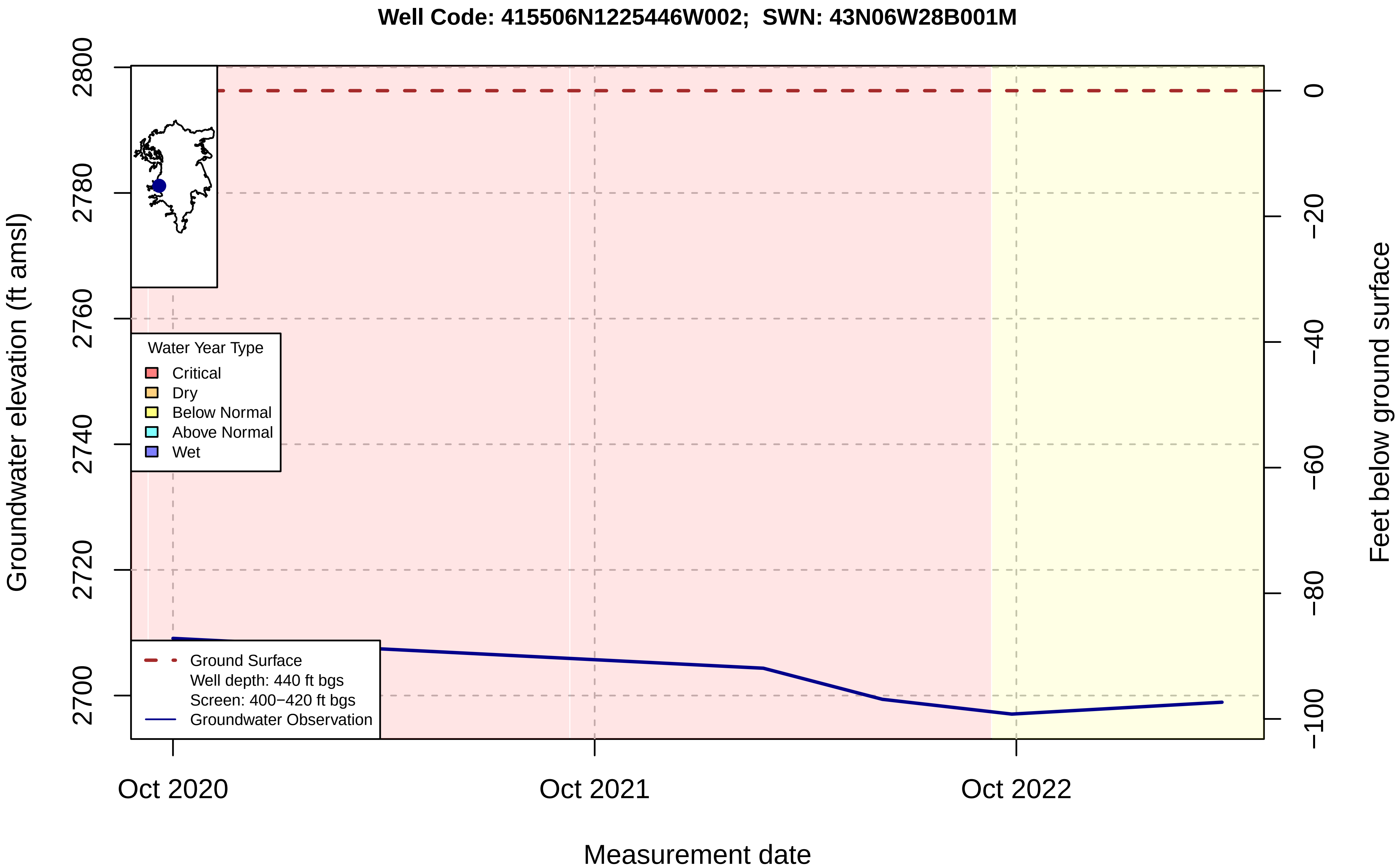


Well Code: 415351N1225474W001; SWN: 43N06W33C001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2740
2760
2780
2800
0
−20
−40
−60
−80
1973
1983
1993
2003
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 317 ft bgs
Screen: 60−238 ft bgs
Groundwater Observation

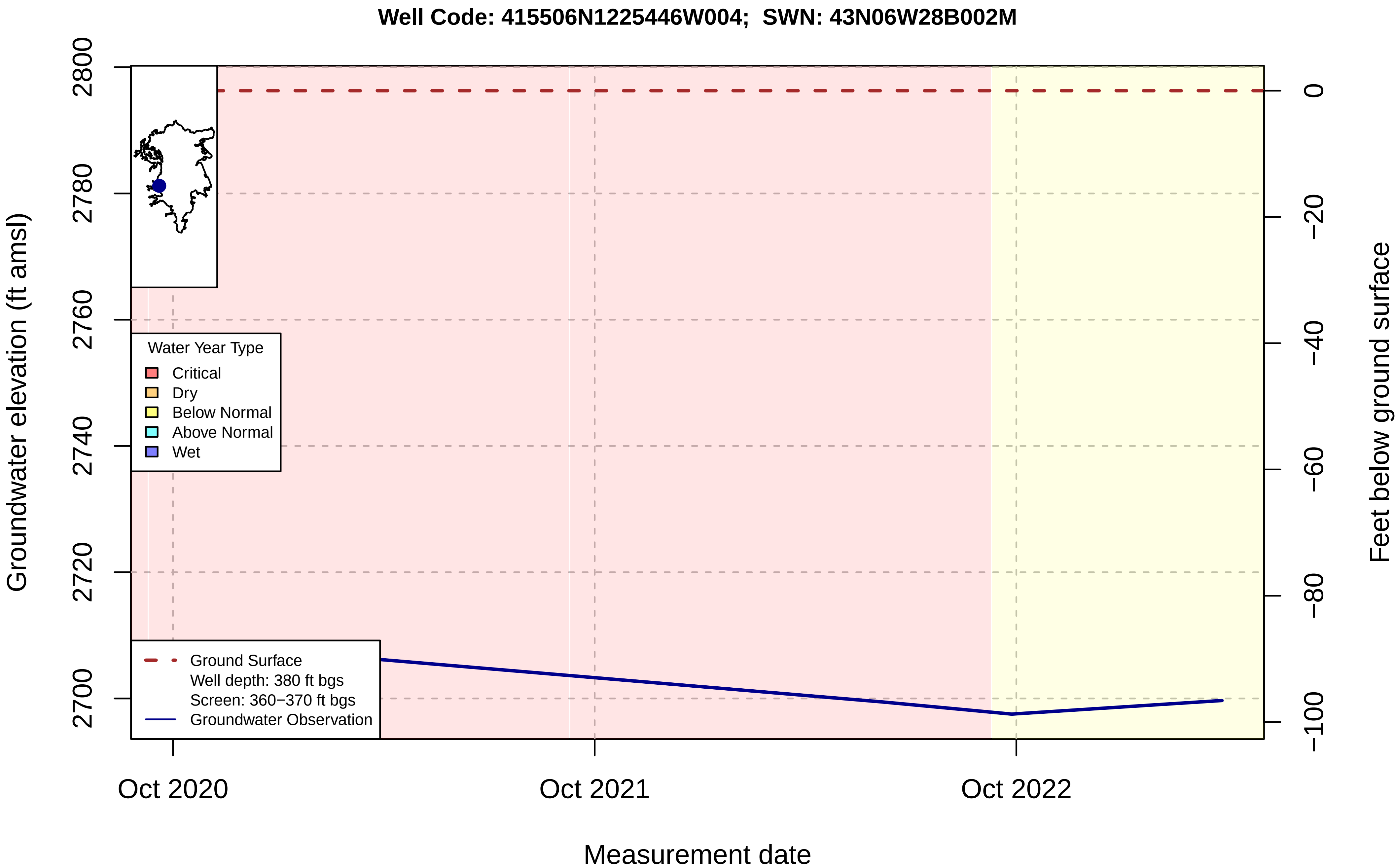
Well Code: 415444N1225387W001; SWN: NA



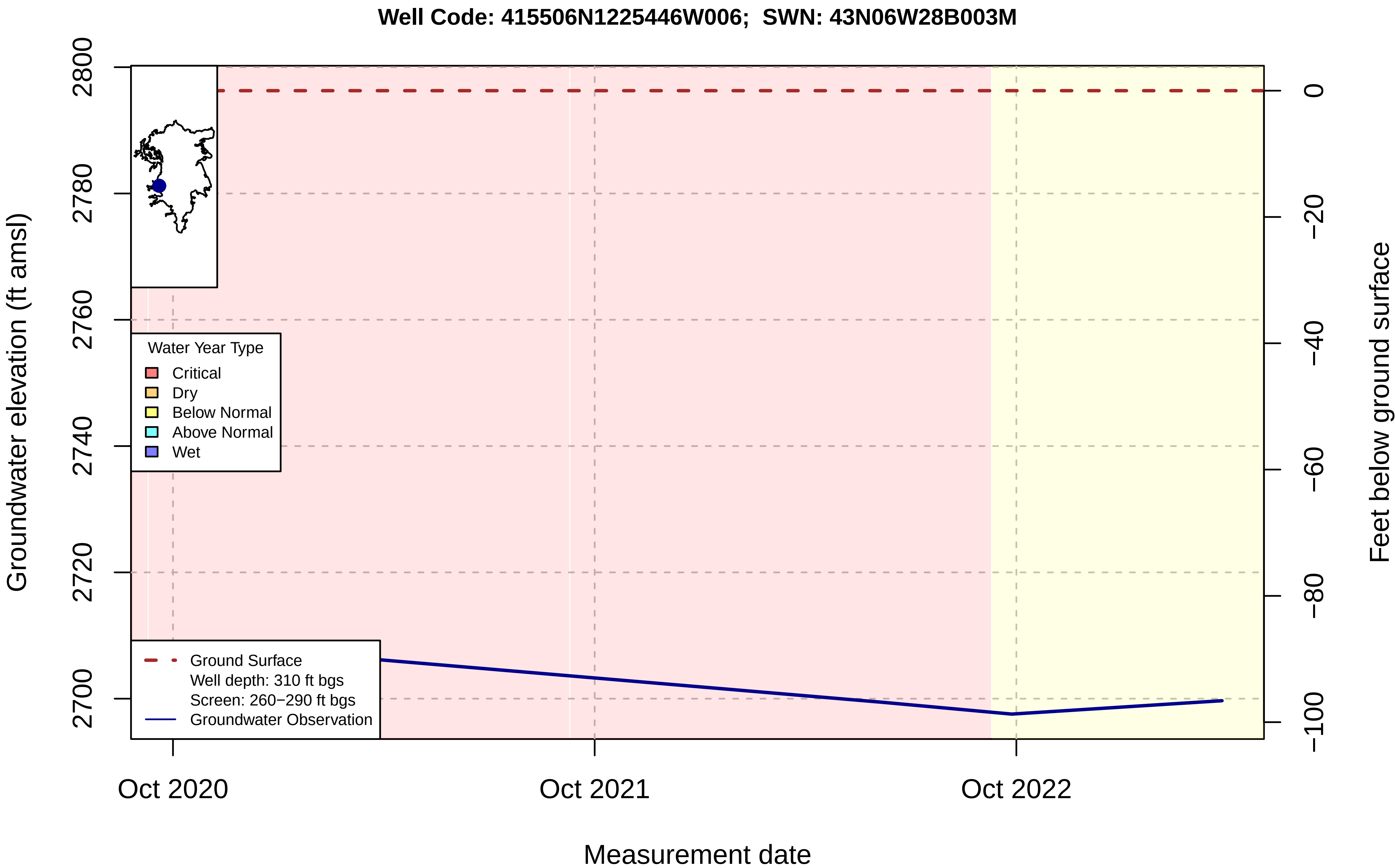

Well Code: SHA_06; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2690
2700
2710
2720
0
−10
−20
−30
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



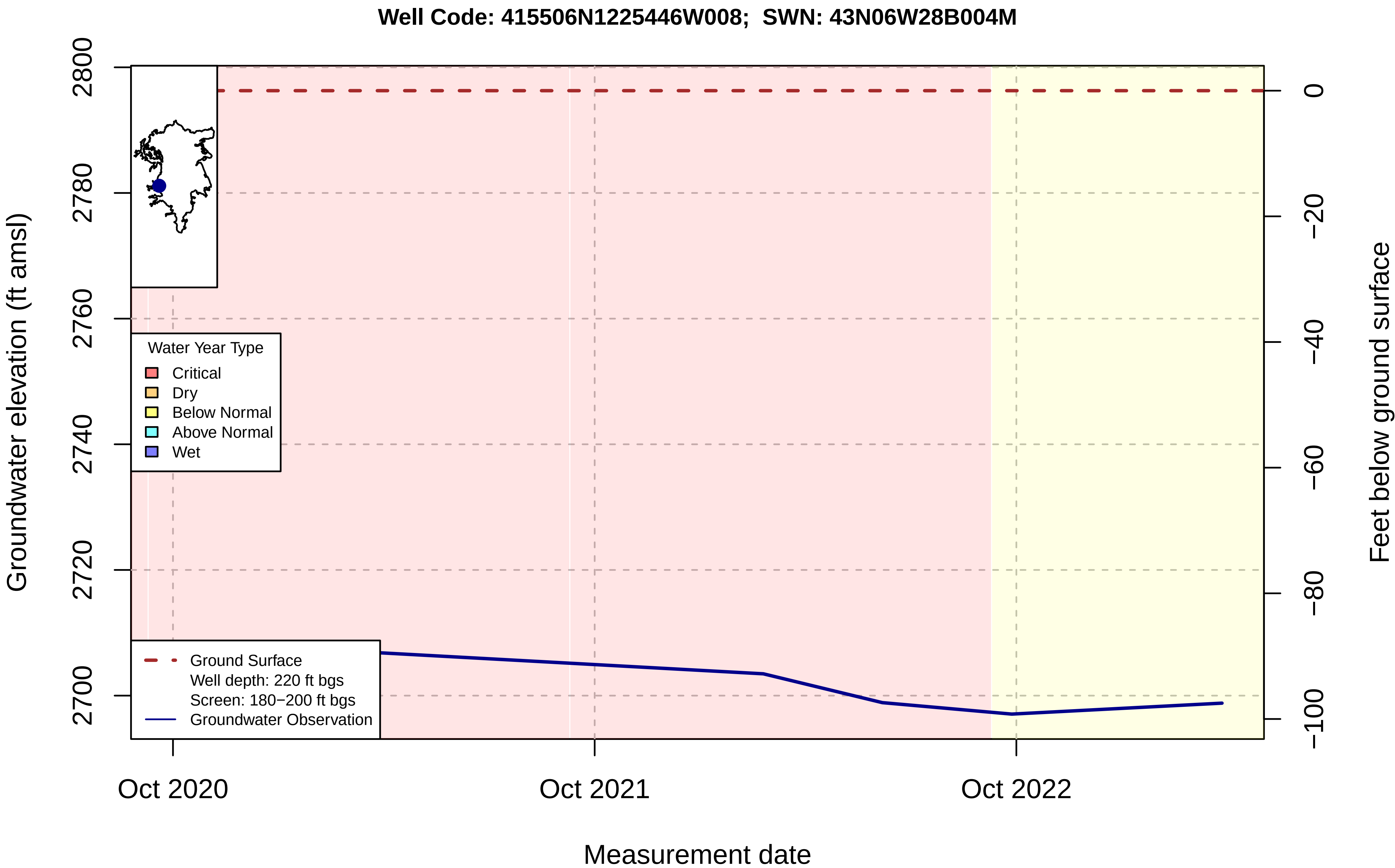
Well Code: 415506N1225446W002; SWN: 43N06W28B001M
Groundwater elevation (ft amsl)
2800
2780
2760
2740
2720
2700
Feet below ground surface
0
−20
−40
−60
−80
−100
Oct 2020
Oct 2021
Oct 2022
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 440 ft bgs
Screen: 400−420 ft bgs
Groundwater Observation



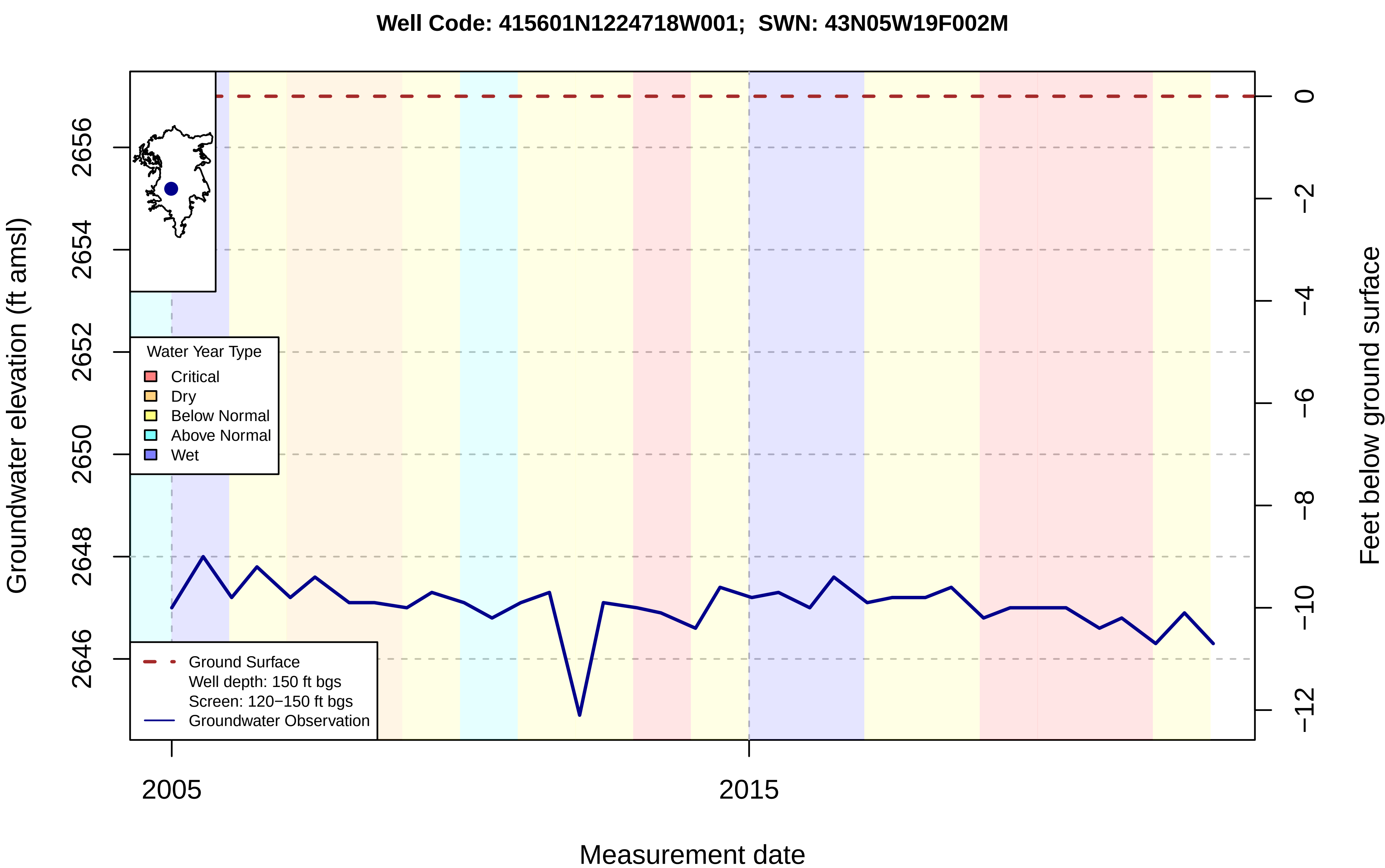
Well Code: 415506N1225446W004; SWN: 43N06W28B002M
Groundwater elevation (ft amsl)
2800
2780
2760
2740
2720
2700
Feet below ground surface
0
−20
−40
−60
−80
−100
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 380 ft bgs
Screen: 360−370 ft bgs
Groundwater Observation
Oct 2020
Oct 2021
Oct 2022
Measurement date



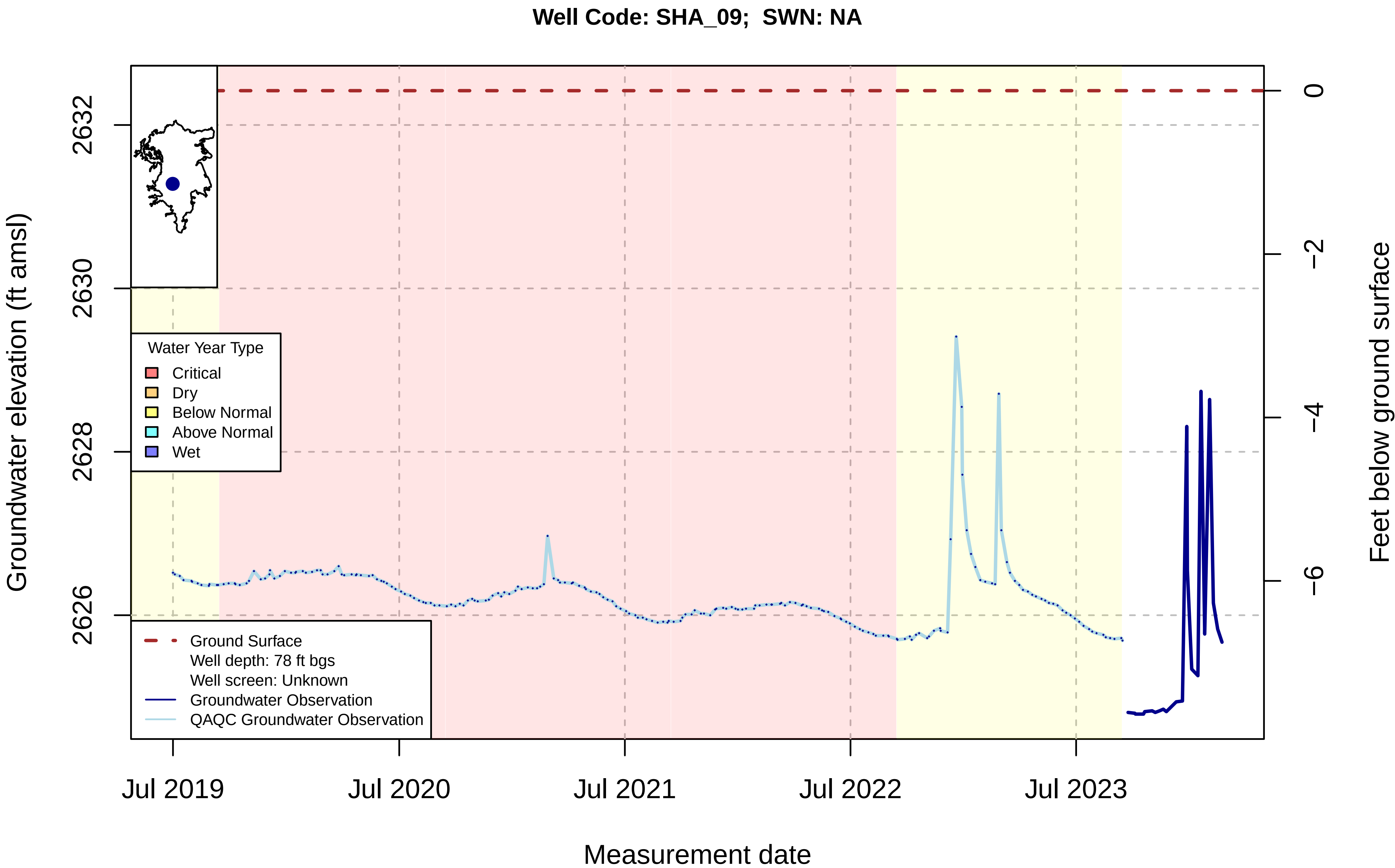
Well Code: 415506N1225446W006; SWN: 43N06W28B003M
Groundwater elevation (ft amsl)
2800
2780
2760
2740
2720
2700
Feet below ground surface
0
−20
−40
−60
−80
−100
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 310 ft bgs
Screen: 260−290 ft bgs
Groundwater Observation
Oct 2020
Oct 2021
Oct 2022
Measurement date

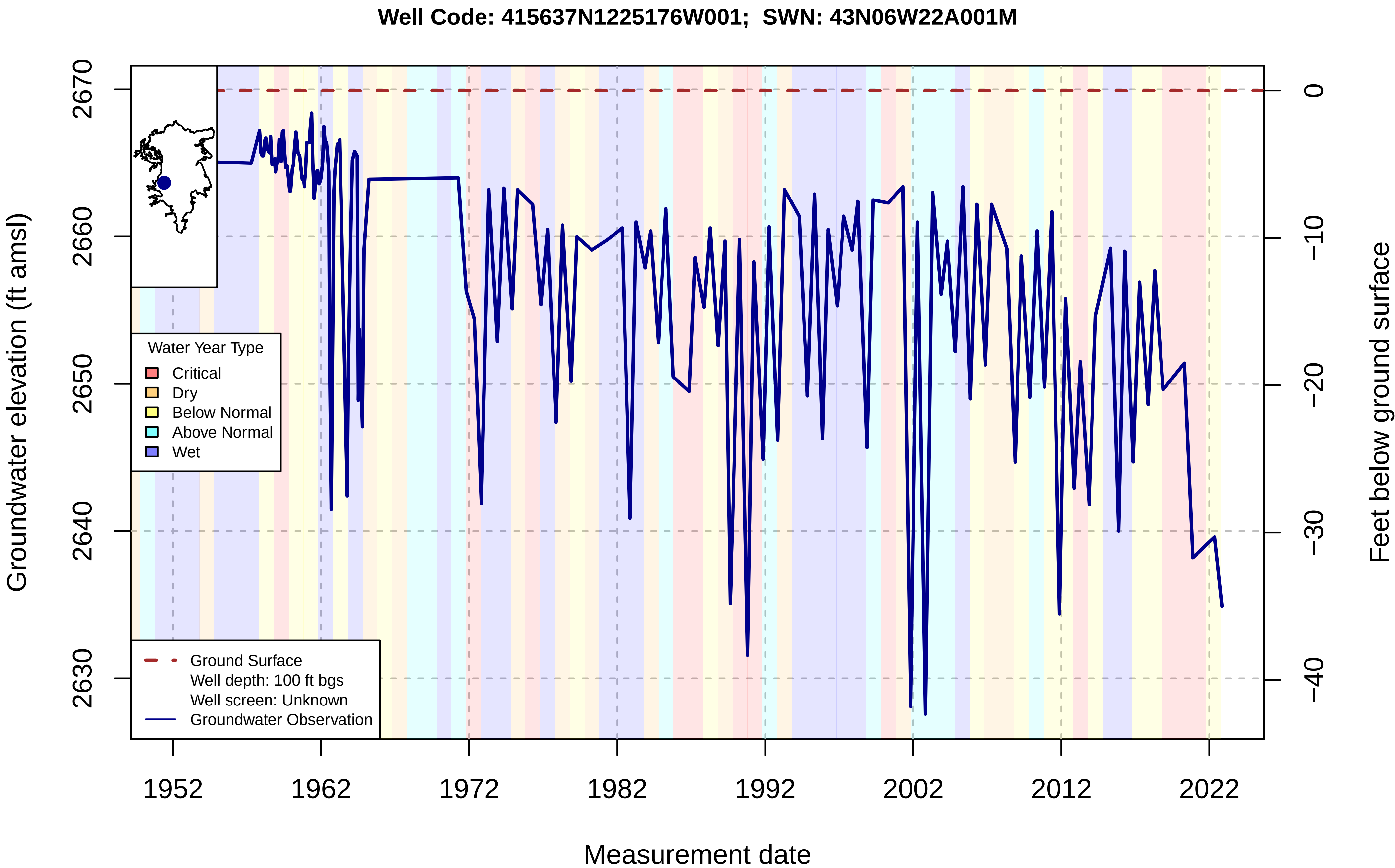


Well Code: 415506N1225446W008; SWN: 43N06W28B004M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2700
2720
2740
2760
2780
2800
0
−20
−40
−60
−80
−100
Oct 2020
Oct 2021
Oct 2022
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 220 ft bgs
Screen: 180−200 ft bgs
Groundwater Observation

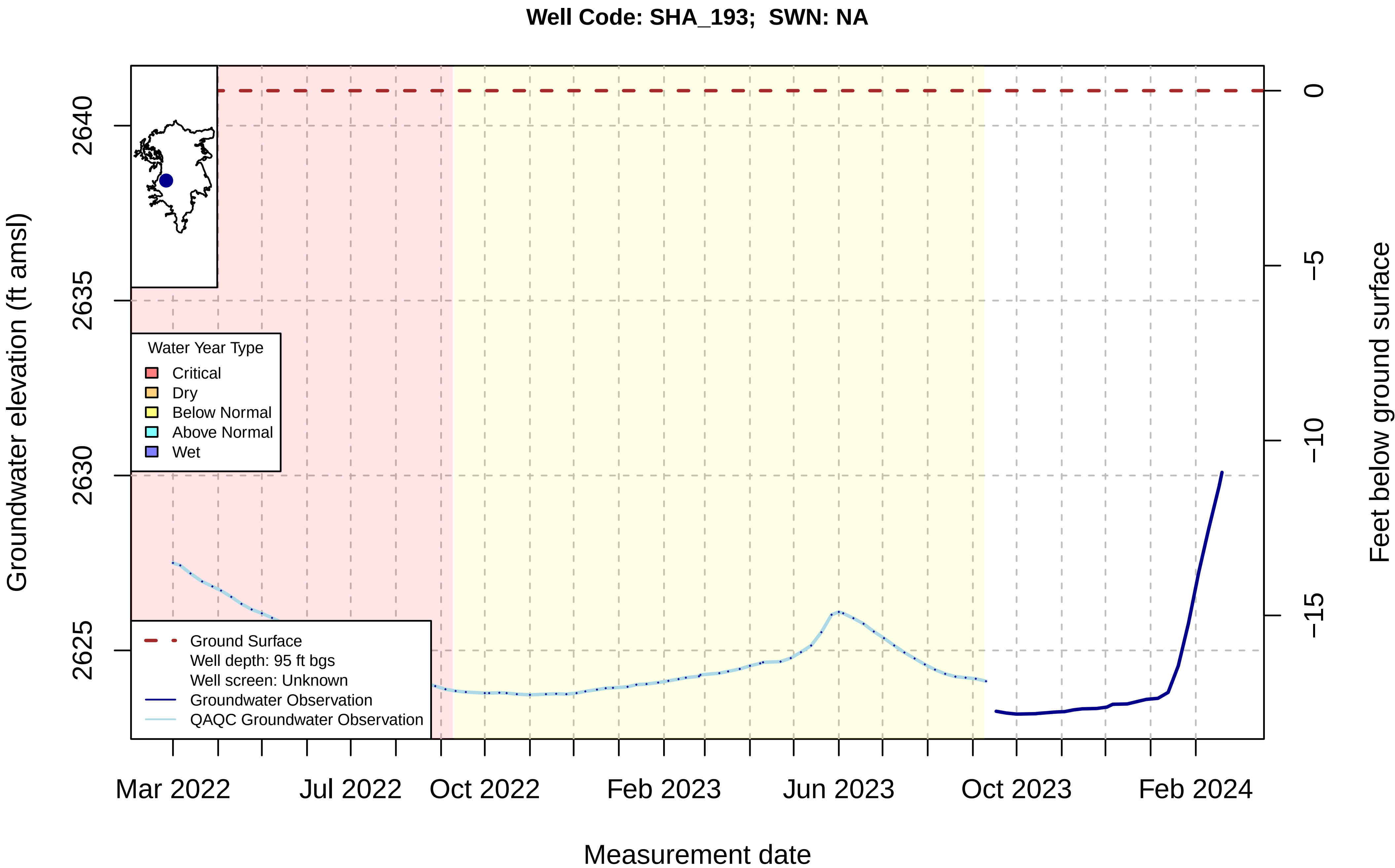


Well Code: 415601N1224718W001; SWN: 43N05W19F002M
Groundwater elevation (ft amsl)
2646
2648
2650
2652
2654
2656
Feet below ground surface
0
−2
−4
−6
−8
−10
−12
2005
2015
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 150 ft bgs
Screen: 120−150 ft bgs
Groundwater Observation

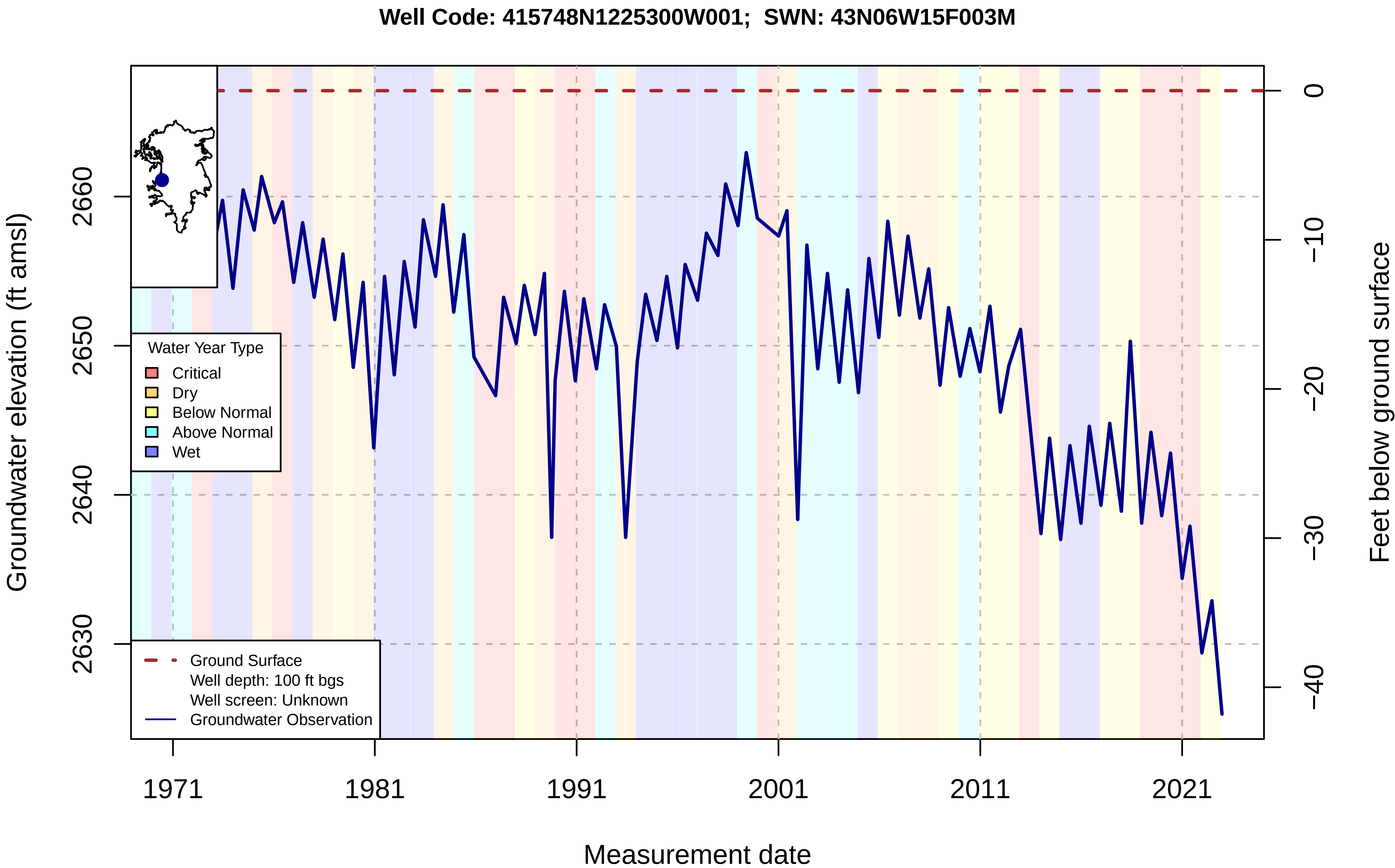

Well Code: SHA_09; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2626
2628
2630
2632
0
−2
−4
−6
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 78 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



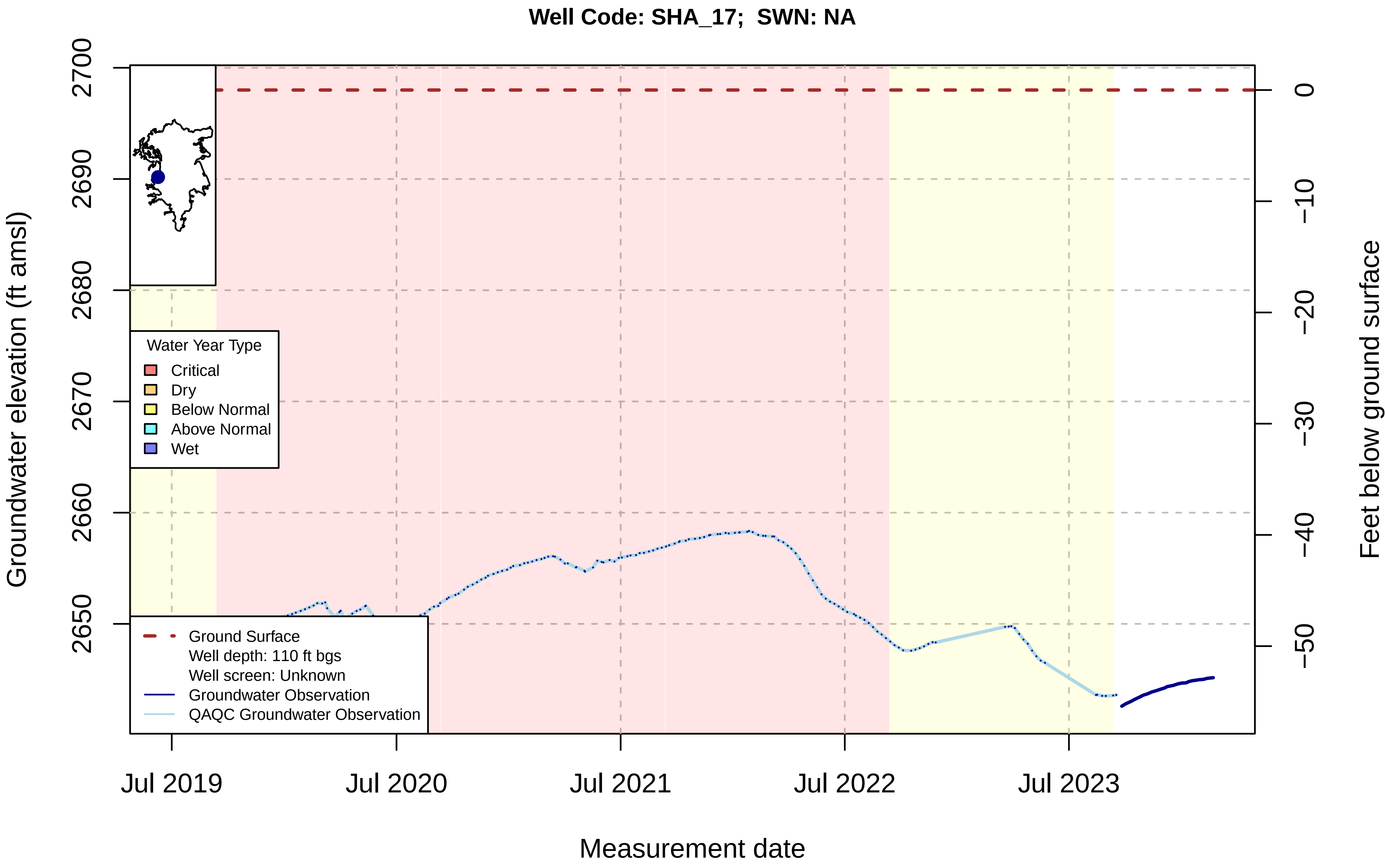
Well Code: 415637N1225176W001; SWN: 43N06W22A001M
Groundwater elevation (ft amsl)
2630
2640
2650
2660
2670
Feet below ground surface
0
−10
−20
−30
−40
1952
1962
1972
1982
1992
2002
2012
2022
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 100 ft bgs
Well screen: Unknown
Groundwater Observation



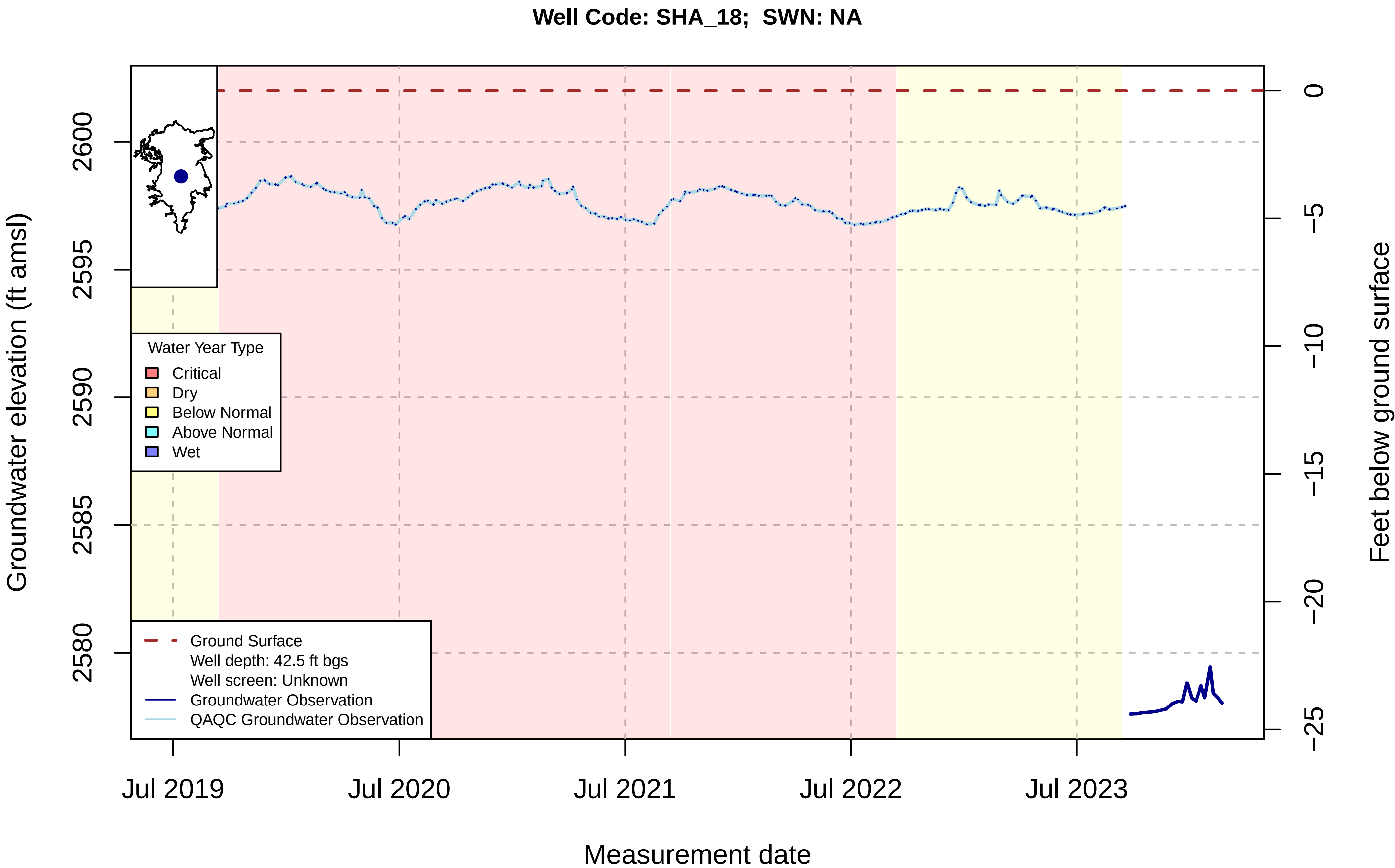
Well Code: SHA_193; SWN: NA
Groundwater elevation (ft amsl)
2640
2635
2630
2625
Feet below ground surface
0
−5
−10
−15
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 95 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation
Mar 2022
Jul 2022
Oct 2022
Feb 2023
Jun 2023
Oct 2023
Feb 2024
Measurement date



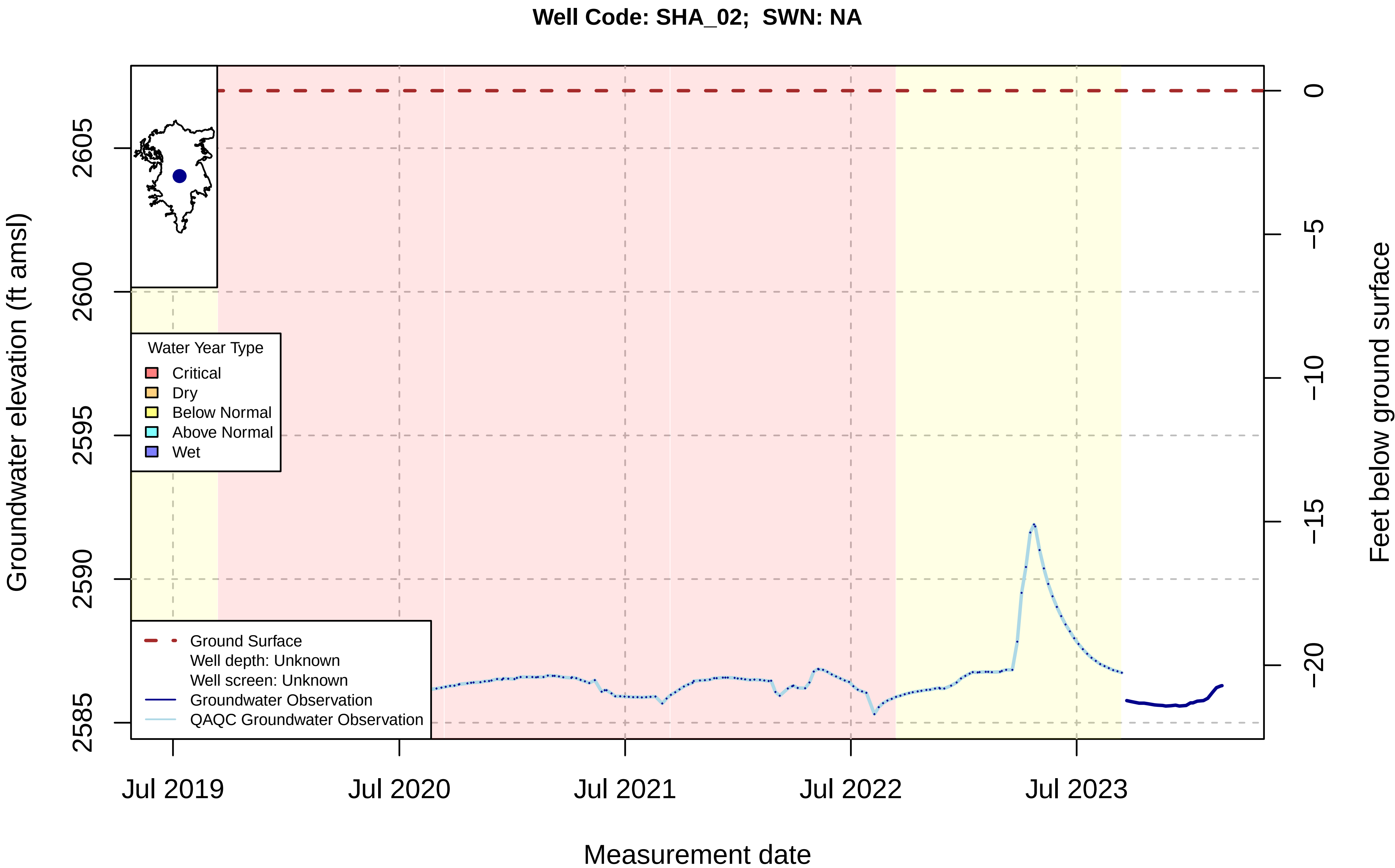
Well Code: 415748N1225300W001; SWN: 43N06W15F003M
Groundwater elevation (ft amsl)
2630
2640
2650
2660
Feet below ground surface
0
−10
−20
−30
−40
1971
1981
1991
2001
2011
2021
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 100 ft bgs
Well screen: Unknown
Groundwater Observation



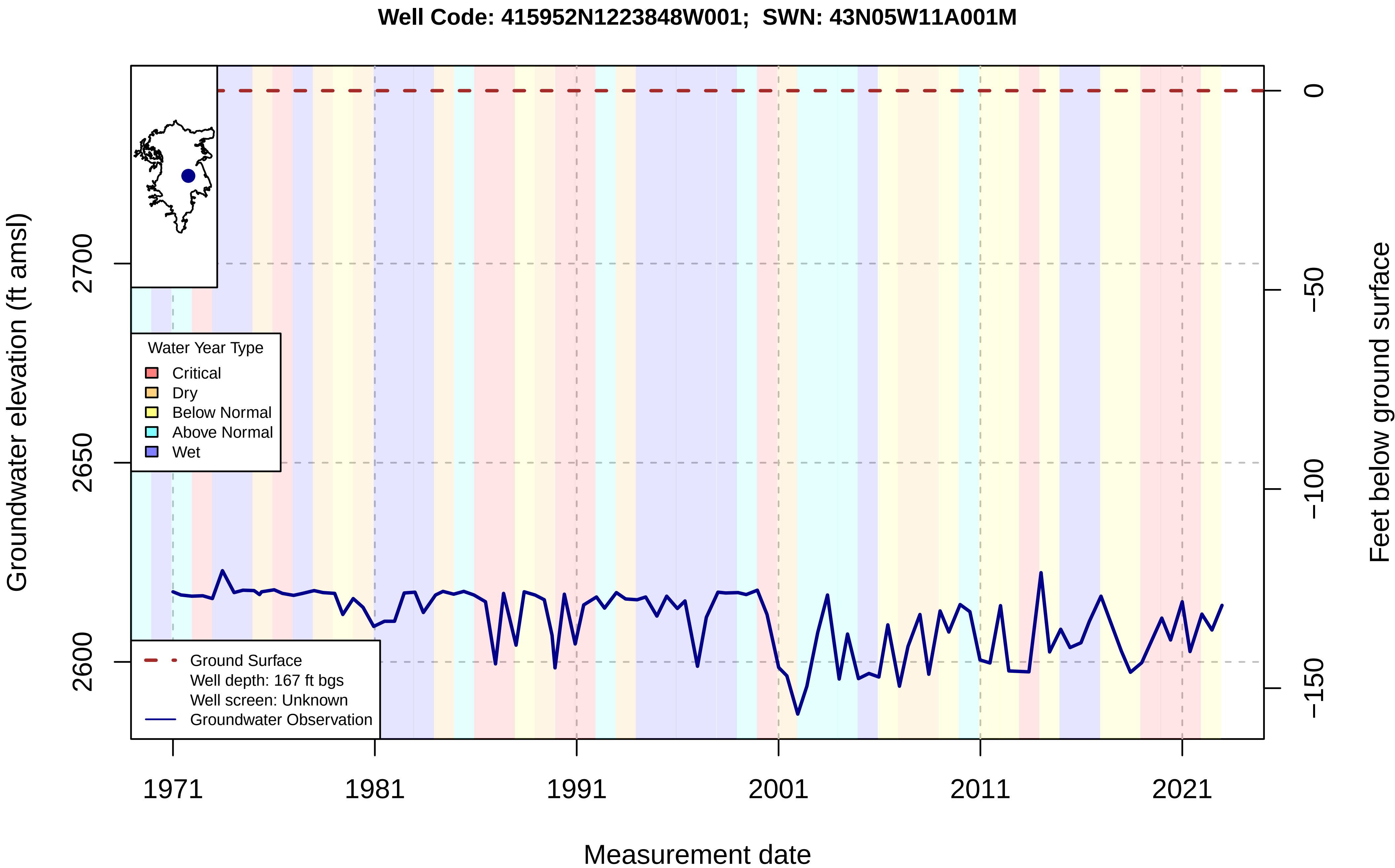
Well Code: SHA_17; SWN: NA
Groundwater elevation (ft amsl)
2700
2690
2680
2670
2660
2650
Feet below ground surface
0
−10
−20
−30
−40
−50
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 110 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Measurement date



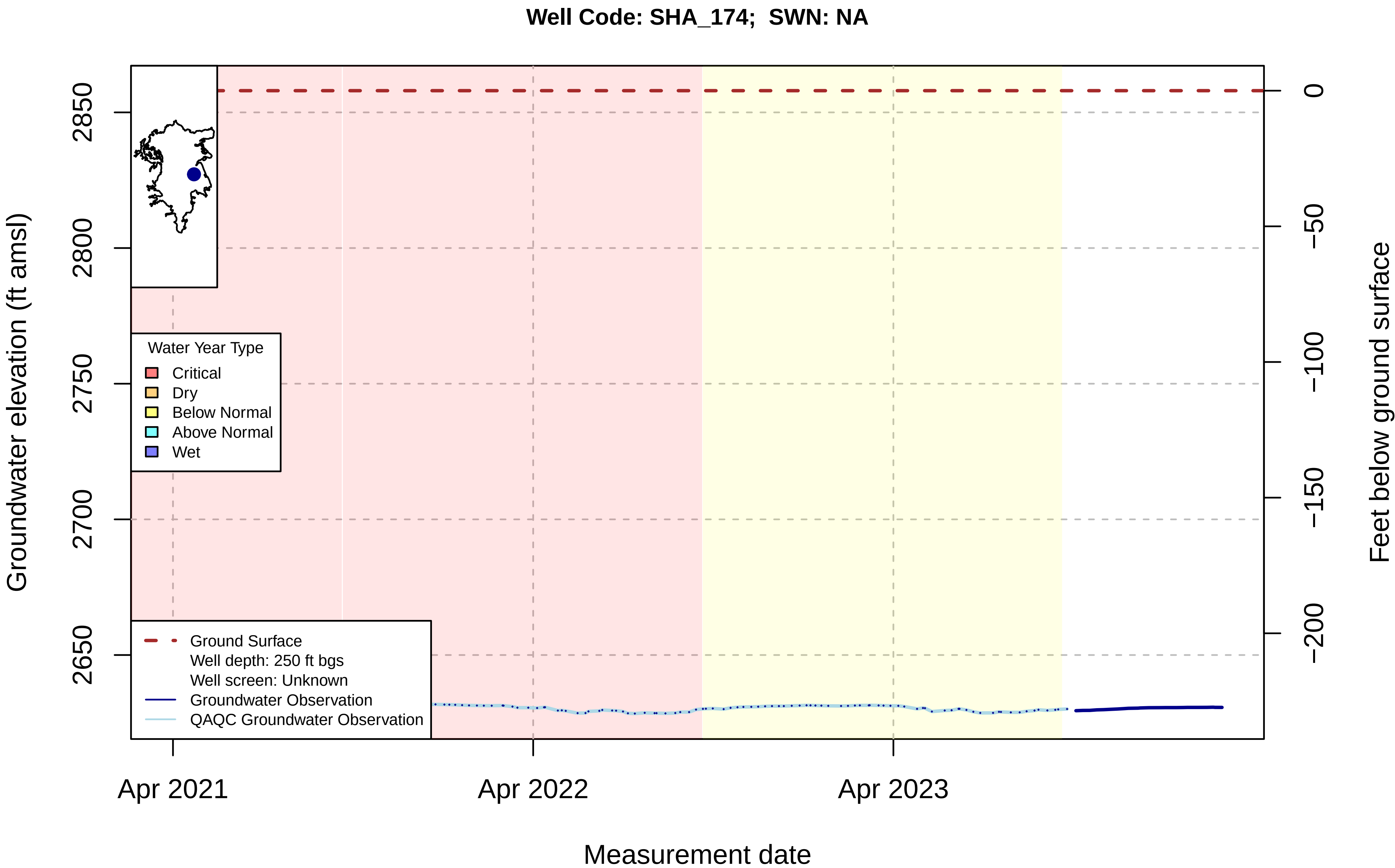
Well Code: SHA_18; SWN: NA
Groundwater elevation (ft amsl)
2600
2595
2590
2585
2580
Feet below ground surface
0
−5
−10
−15
−20
−25
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 42.5 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



Well Code: SHA_02; SWN: NA
Groundwater elevation (ft amsl)
2585
2590
2595
2600
2605
Feet below ground surface
0
−5
−10
−15
−20
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Measurement date

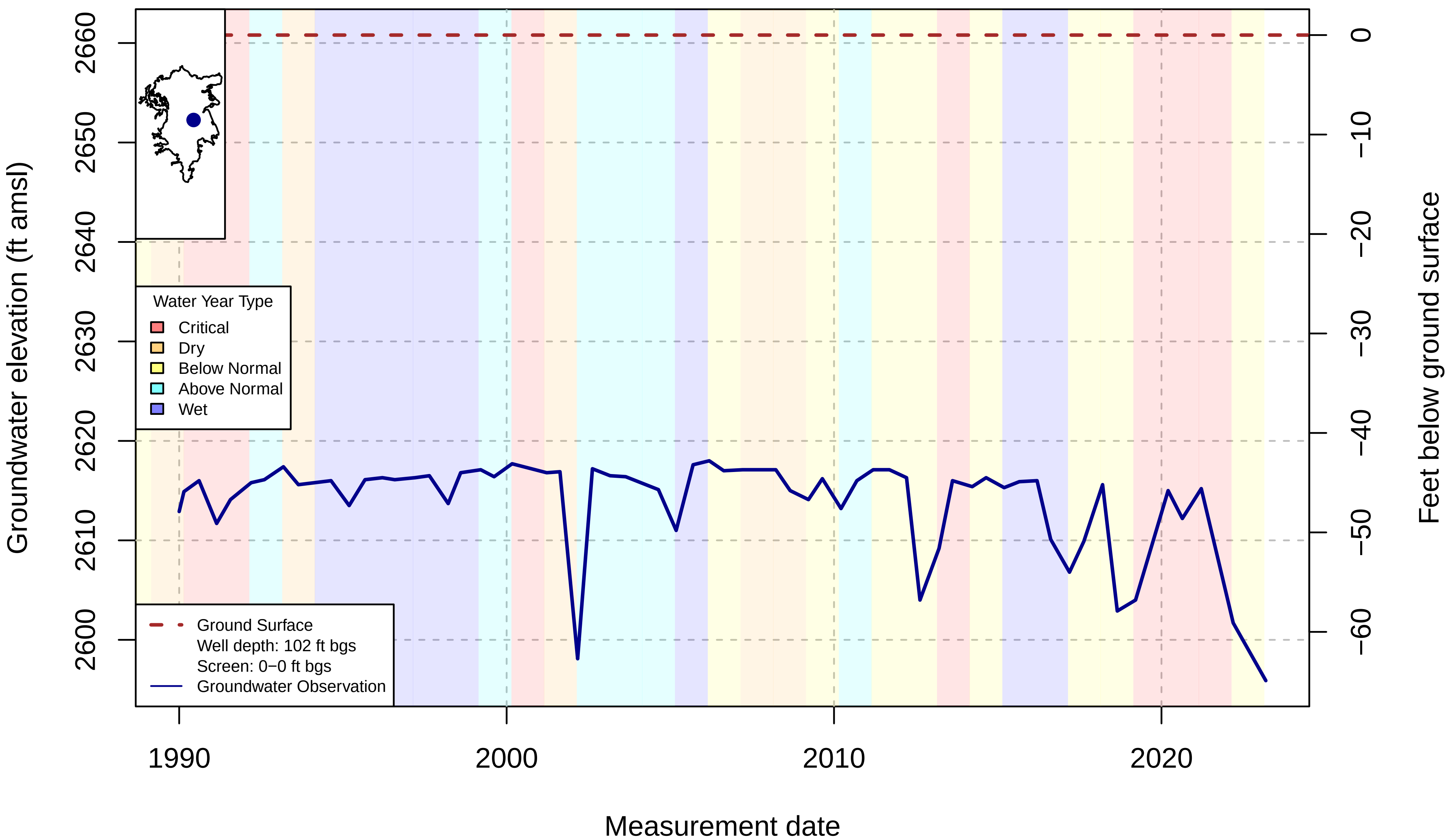


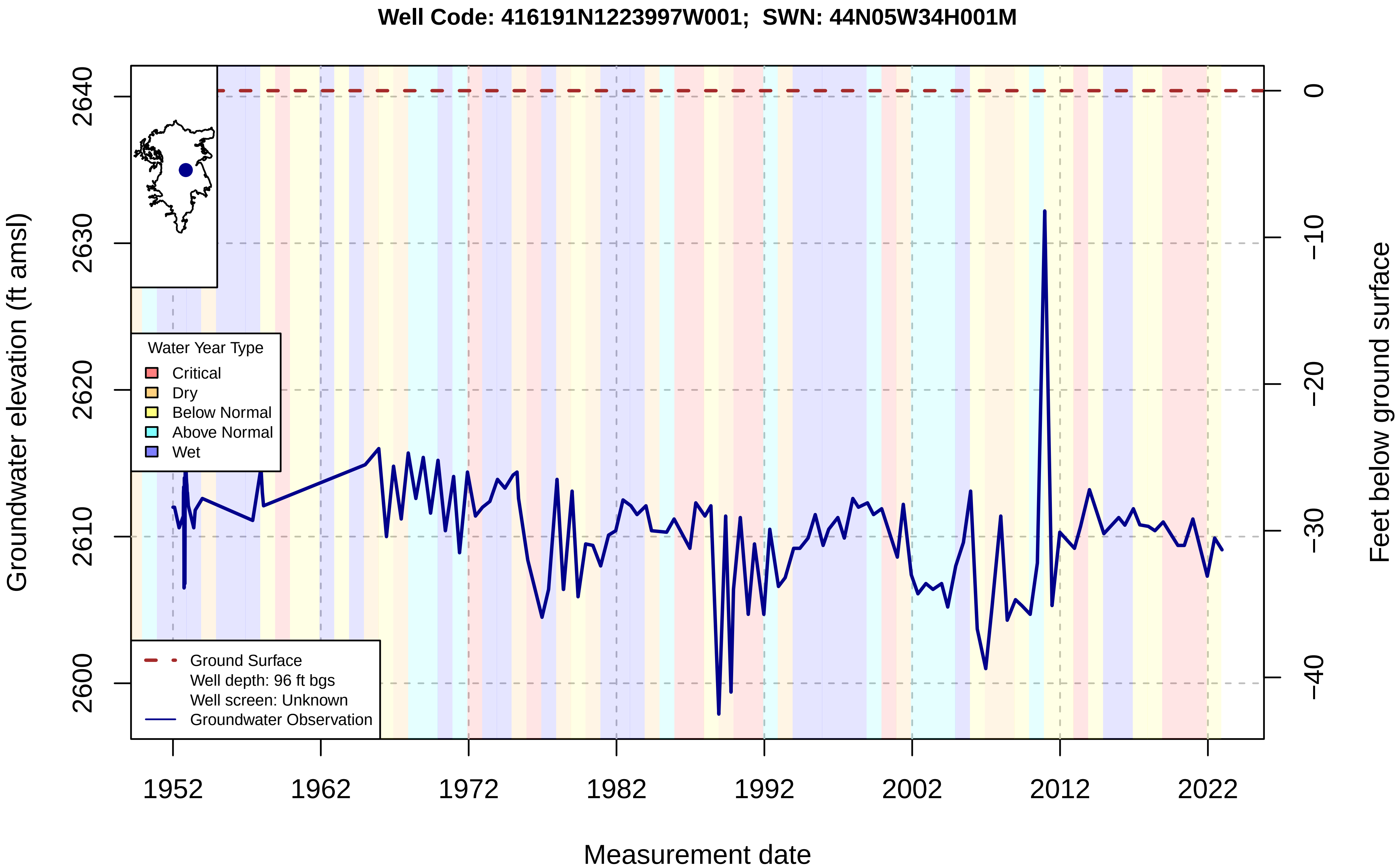
Well Code: 415952N1223848W001; SWN: 43N05W11A001M
Groundwater elevation (ft amsl)
2600
2650
2700
Feet below ground surface
0
−50
−100
−150
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 167 ft bgs
Well screen: Unknown
Groundwater Observation
1971
1981
1991
2001
2011
2021
Measurement date

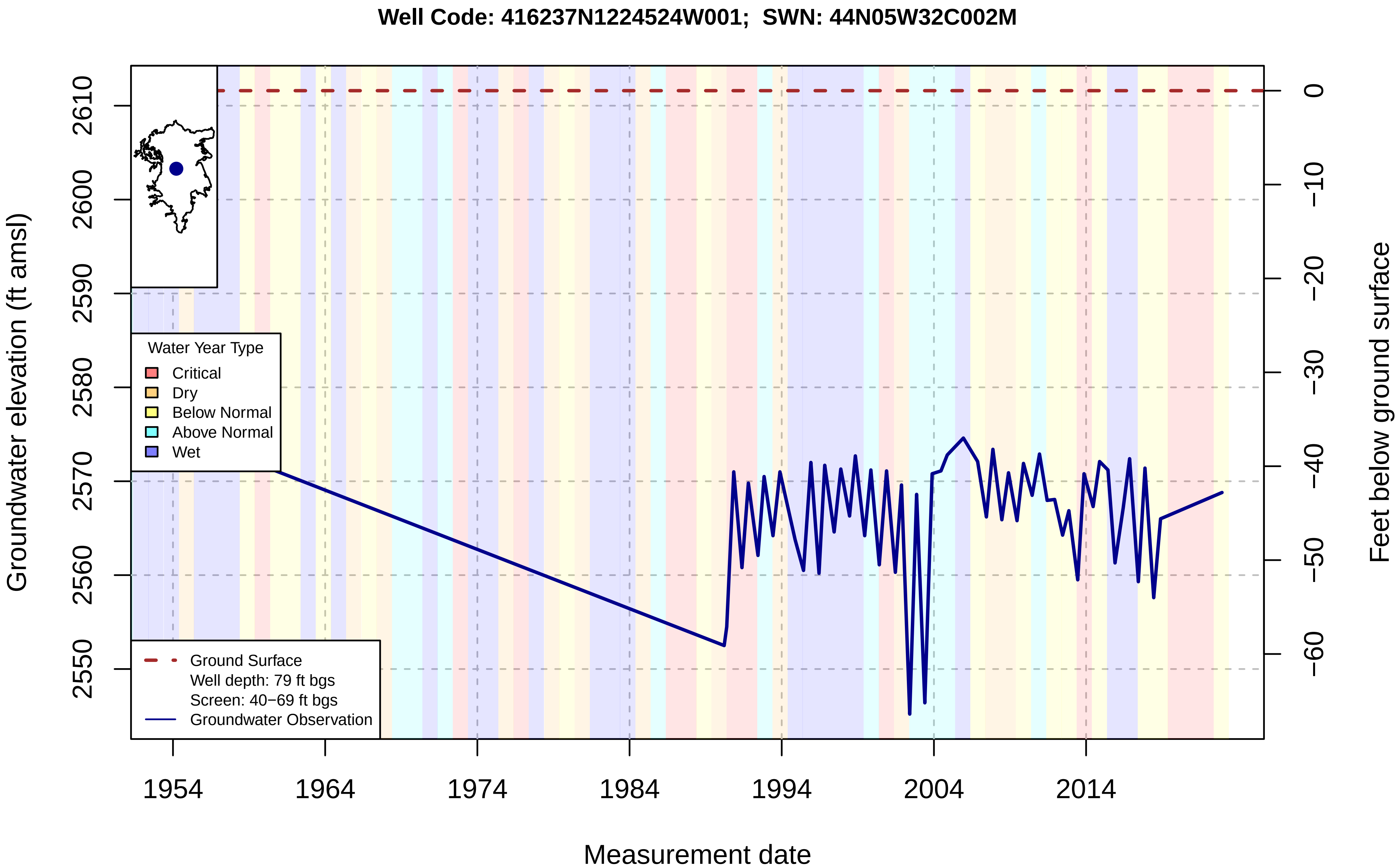


Well Code: SHA_174; SWN: NA
Groundwater elevation (ft amsl)
2850
2800
2750
2700
2650
Feet below ground surface
0
−50
−100
−150
−200
Apr 2021
Apr 2022
Apr 2023
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 250 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation

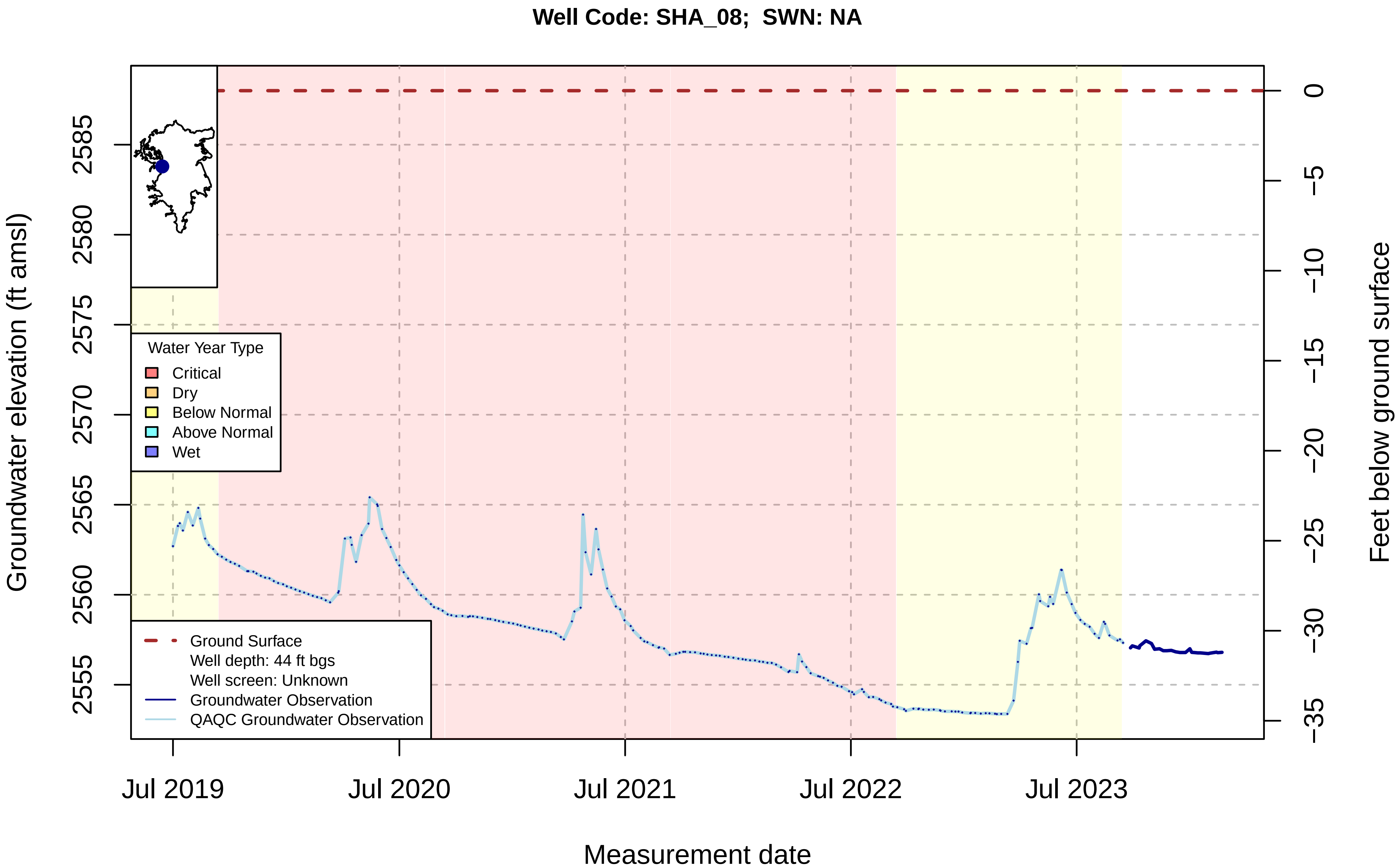
Well Code: 416083N1223932W001; SWN: 43N05W02C002M



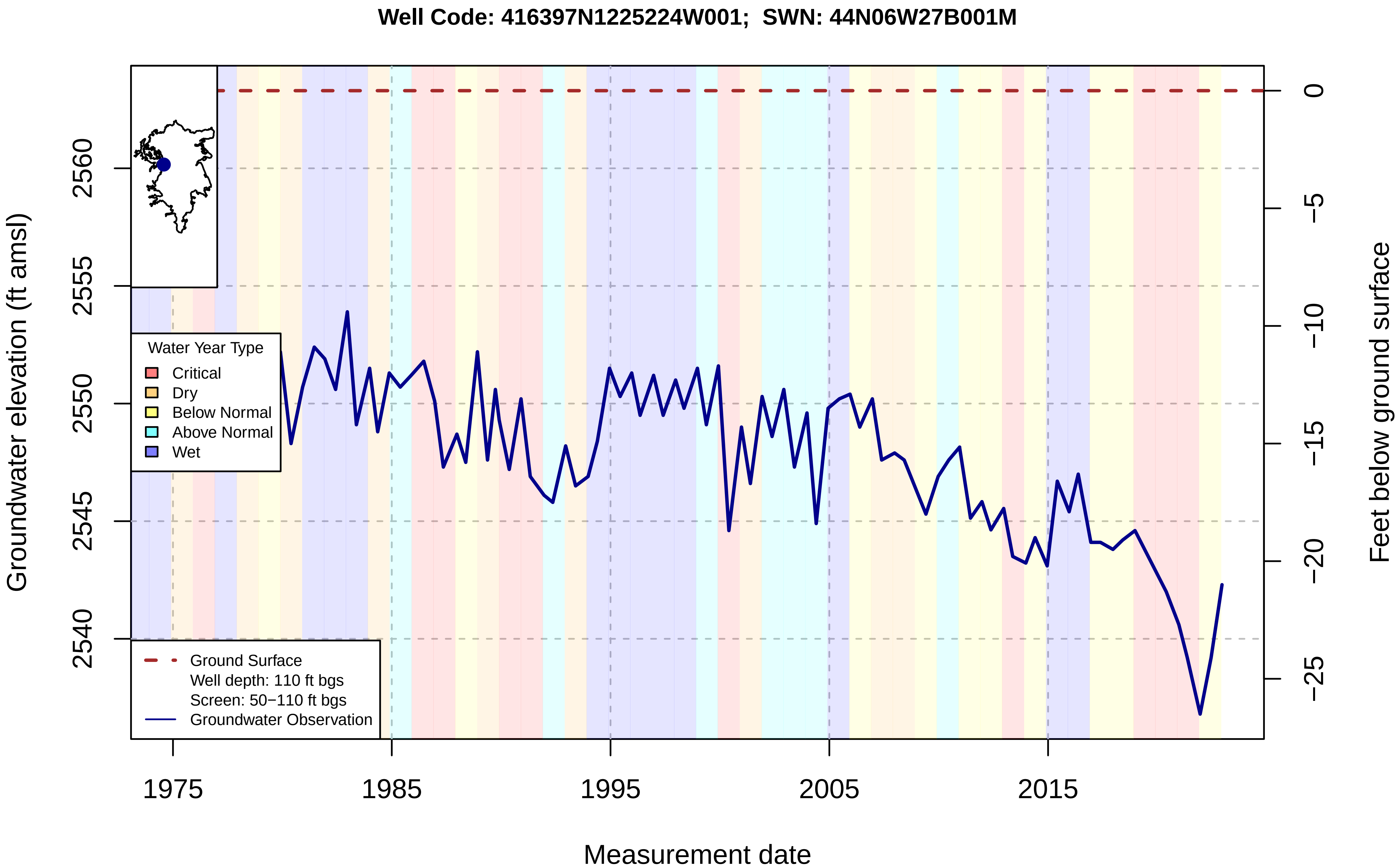

Well Code: 416191N1223997W001; SWN: 44N05W34H001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2600
2610
2620
2630
2640
0
−10
−20
−30
−40
1952
1962
1972
1982
1992
2002
2012
2022
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 96 ft bgs
Well screen: Unknown
Groundwater Observation



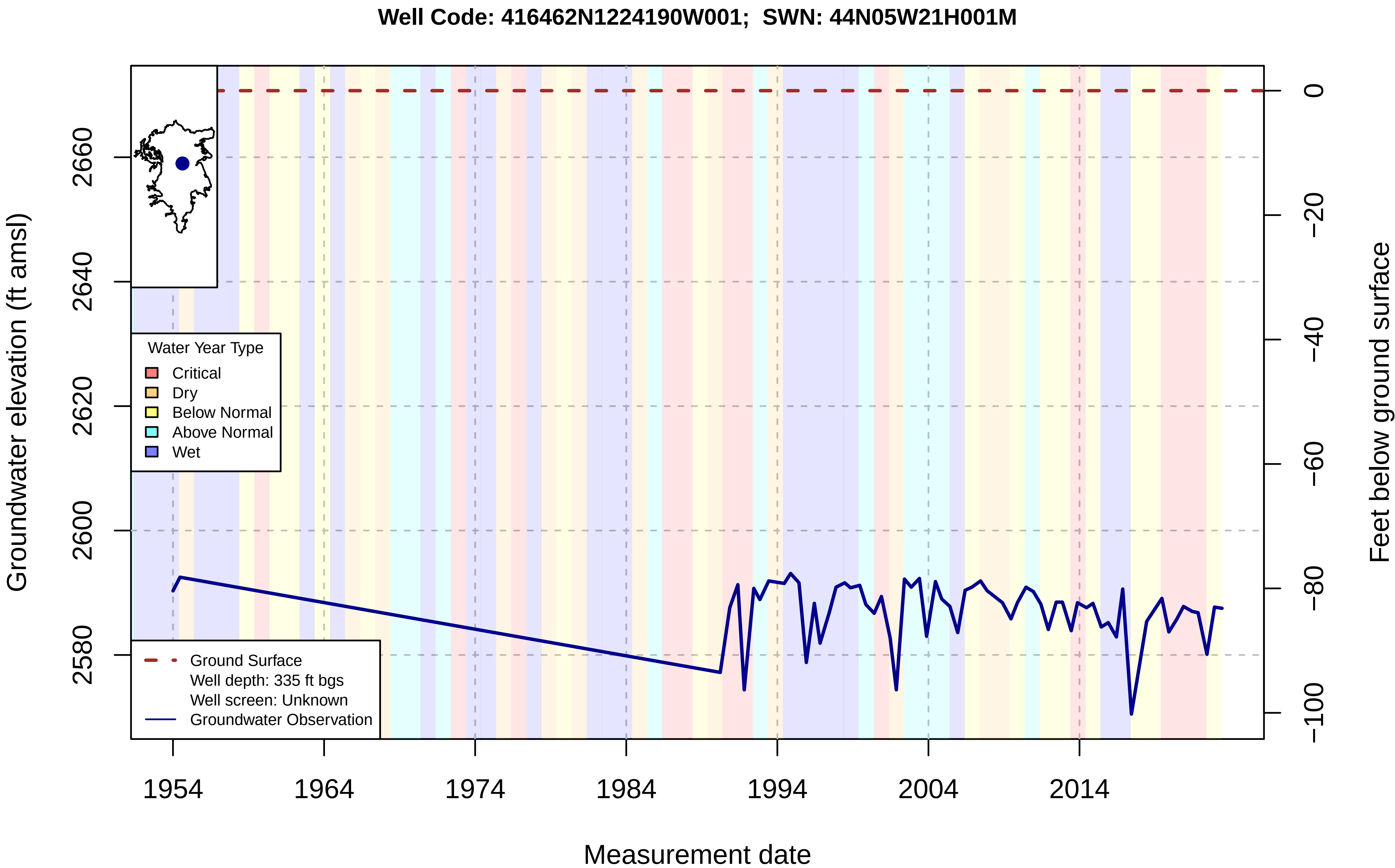
Well Code: 416237N1224524W001; SWN: 44N05W32C002M
Groundwater elevation (ft amsl)
2550
2560
2570
2580
2590
2600
2610
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 79 ft bgs
Screen: 40−69 ft bgs
Groundwater Observation
1954
1964
1974
1984
1994
2004
2014
Measurement date



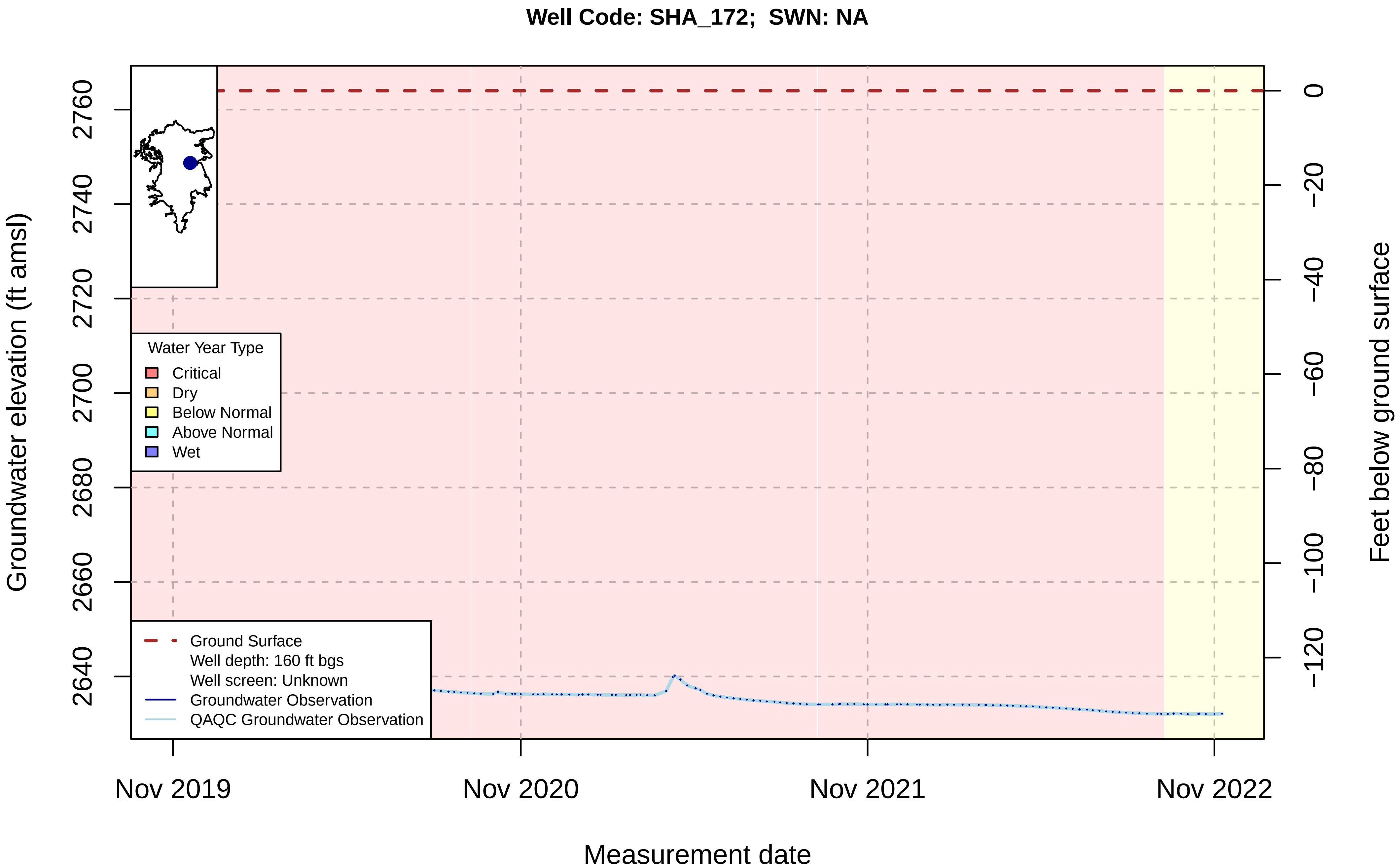
Well Code: SHA_08; SWN: NA
Groundwater elevation (ft amsl)
2555
2560
2565
2570
2575
2580
2585
Feet below ground surface
0
−5
−10
−15
−20
−25
−30
−35
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 44 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Measurement date



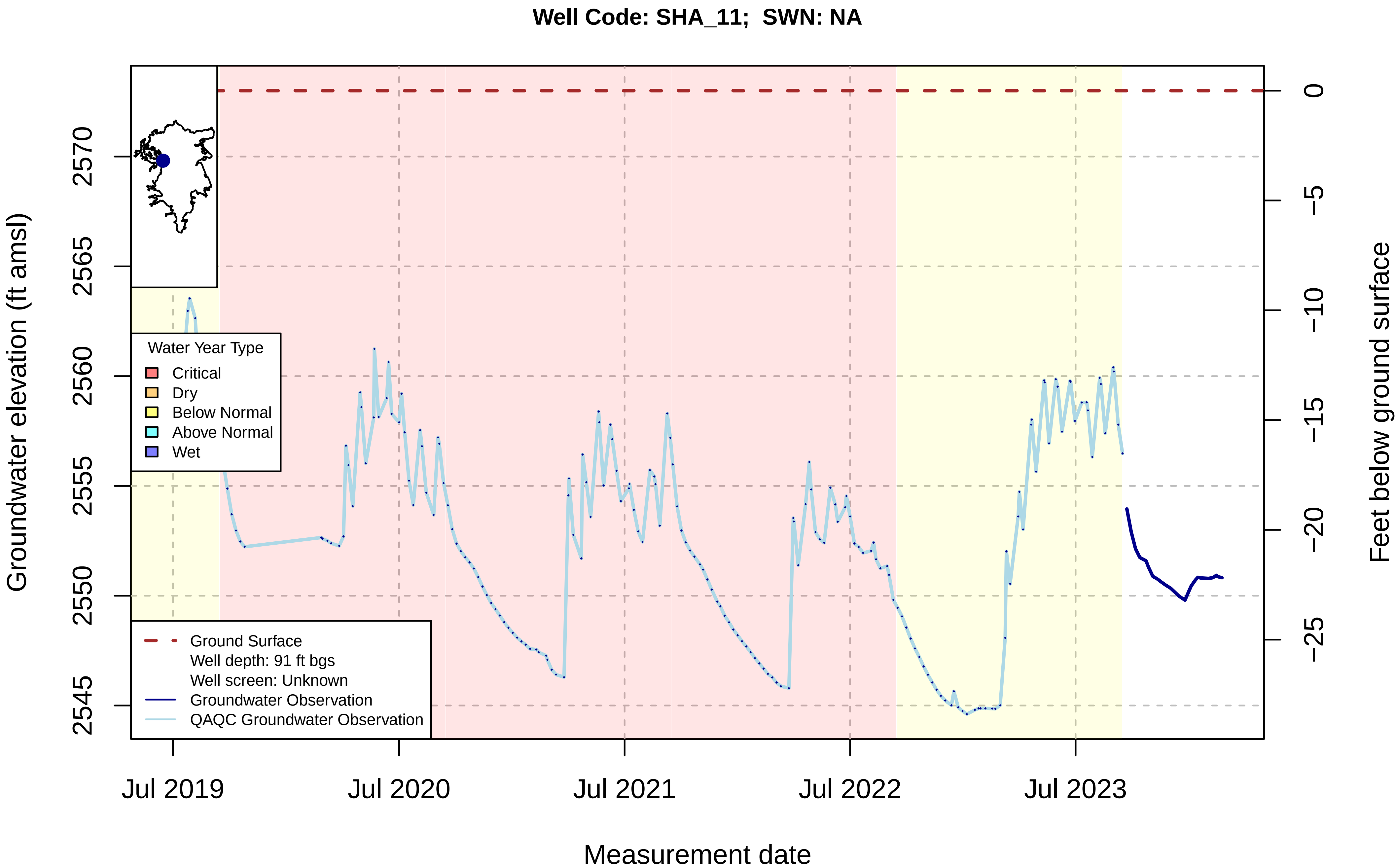
Well Code: 416397N1225224W001; SWN: 44N06W27B001M
Groundwater elevation (ft amsl)
2540
2545
2550
2555
2560
Feet below ground surface
0
−5
−10
−15
−20
−25
Measurement date
1975
1985
1995
2005
2015
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 110 ft bgs
Screen: 50−110 ft bgs
Groundwater Observation



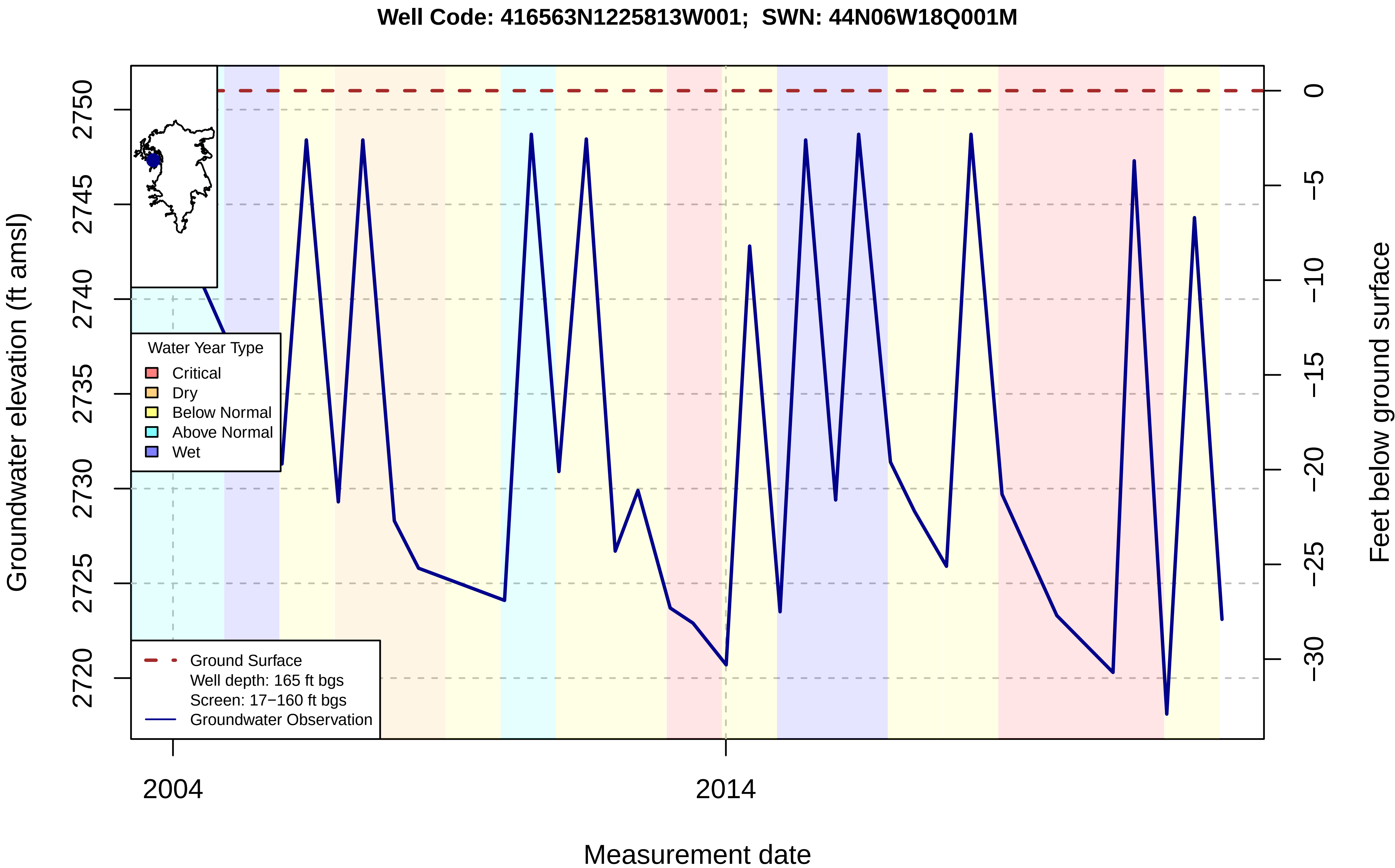
Well Code: 416462N1224190W001; SWN: 44N05W21H001M
Groundwater elevation (ft amsl)
2580
2600
2620
2640
2660
Feet below ground surface
0
−20
−40
−60
−80
−100
Measurement date
1954
1964
1974
1984
1994
2004
2014
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 335 ft bgs
Well screen: Unknown
Groundwater Observation



Well Code: SHA_172; SWN: NA
Groundwater elevation (ft amsl)
2640
2660
2680
2700
2720
2740
2760
Feet below ground surface
0
−20
−40
−60
−80
−100
−120
Measurement date
Nov 2019
Nov 2020
Nov 2021
Nov 2022
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 160 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation

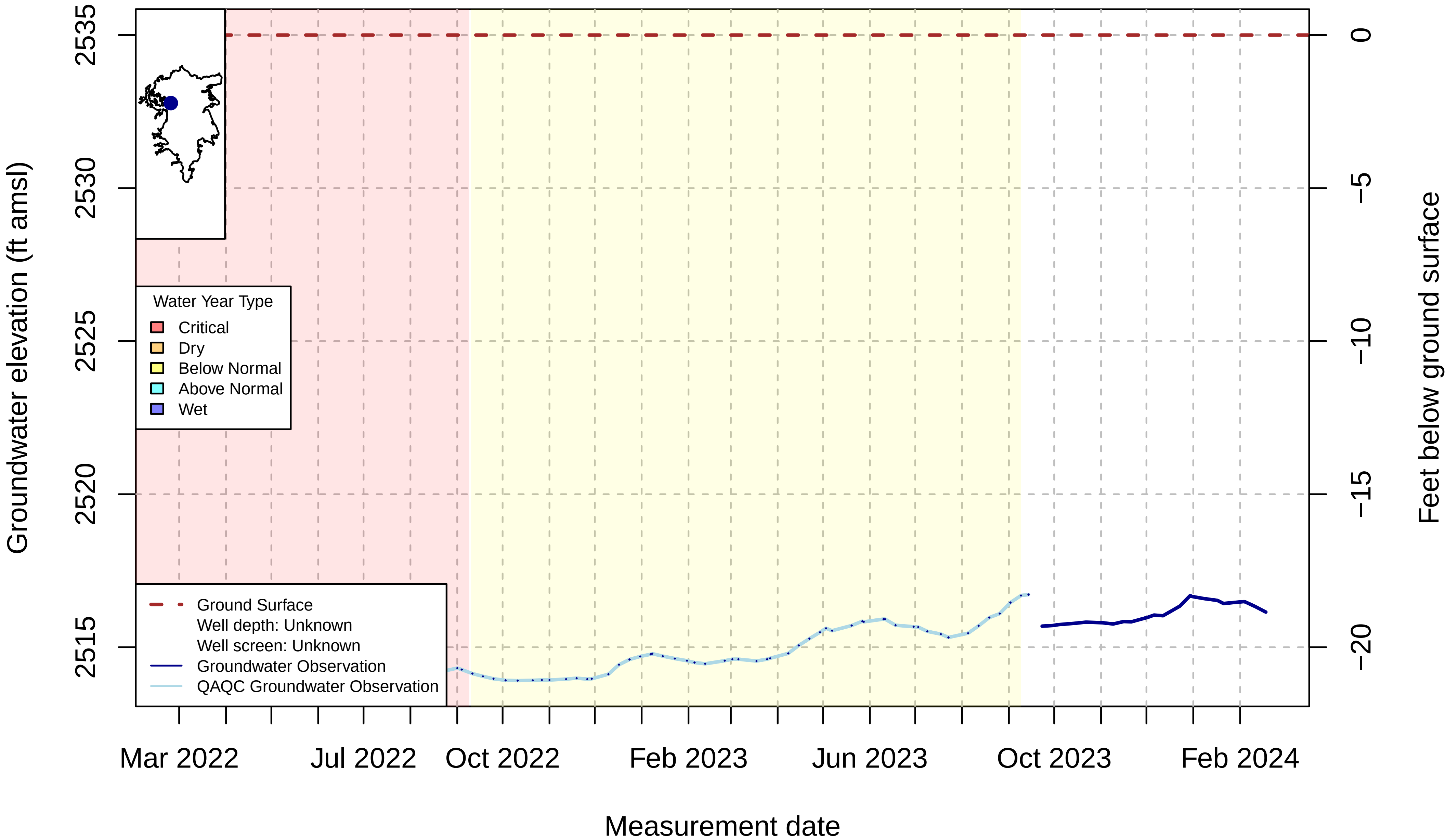


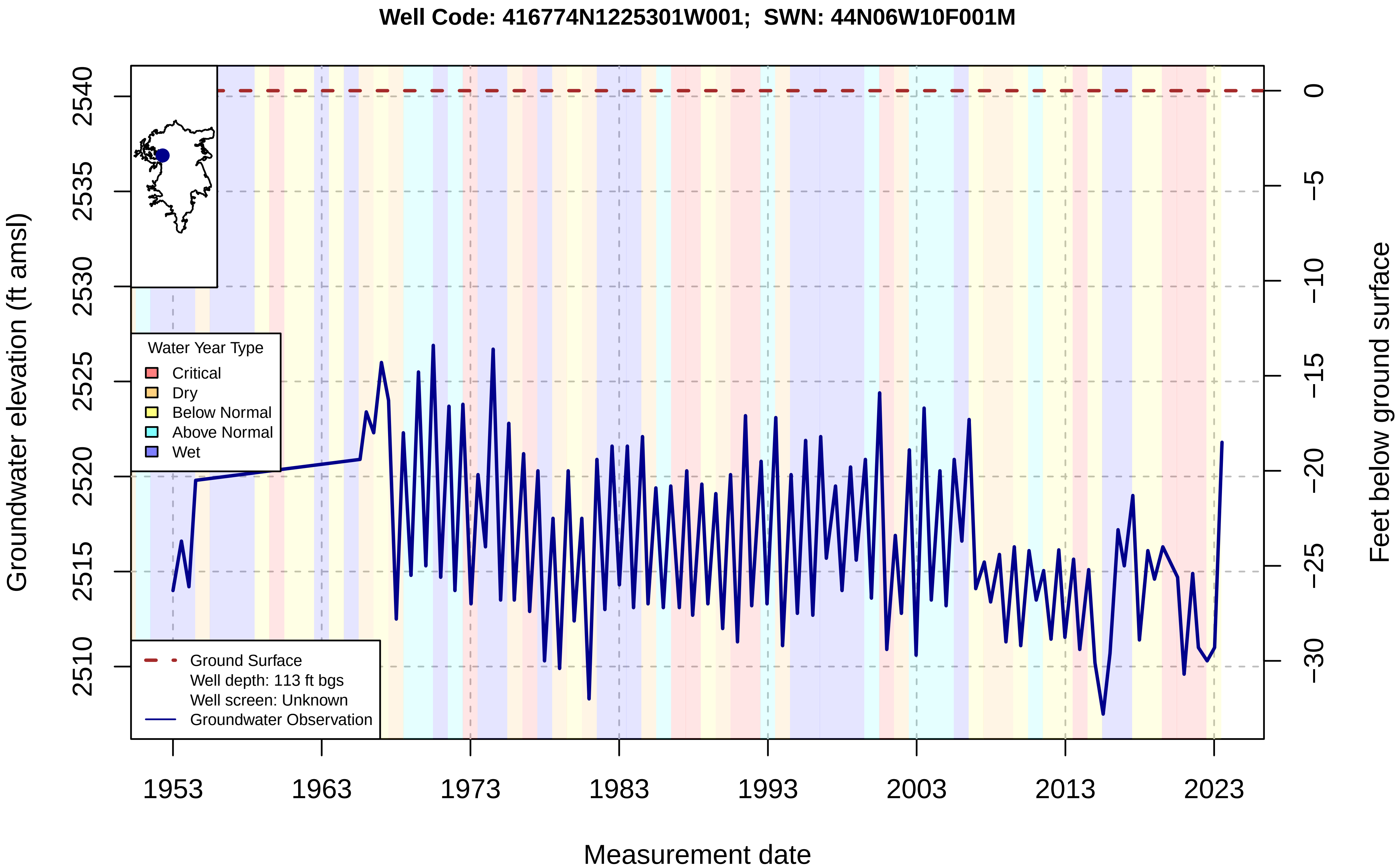
Well Code: SHA_11; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2545
2550
2555
2560
2565
2570
0
−5
−10
−15
−20
−25
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 91 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



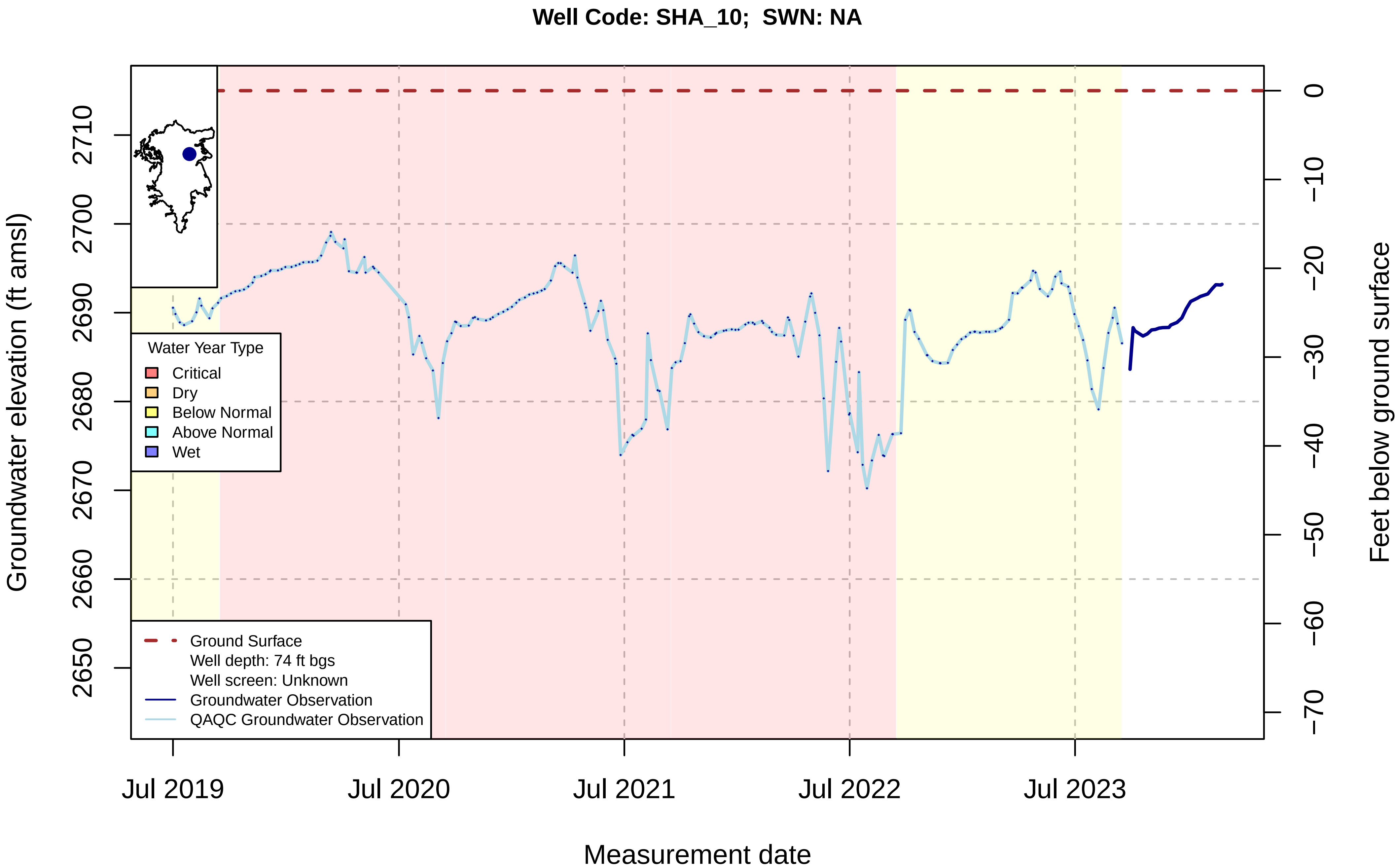
Well Code: 416563N1225813W001; SWN: 44N06W18Q001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2750
2745
2740
2735
2730
2725
2720
0
−5
−10
−15
−20
−25
−30
2004
2014
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 165 ft bgs
Screen: 17−160 ft bgs
Groundwater Observation

Well Code: SHA_187; SWN: NA

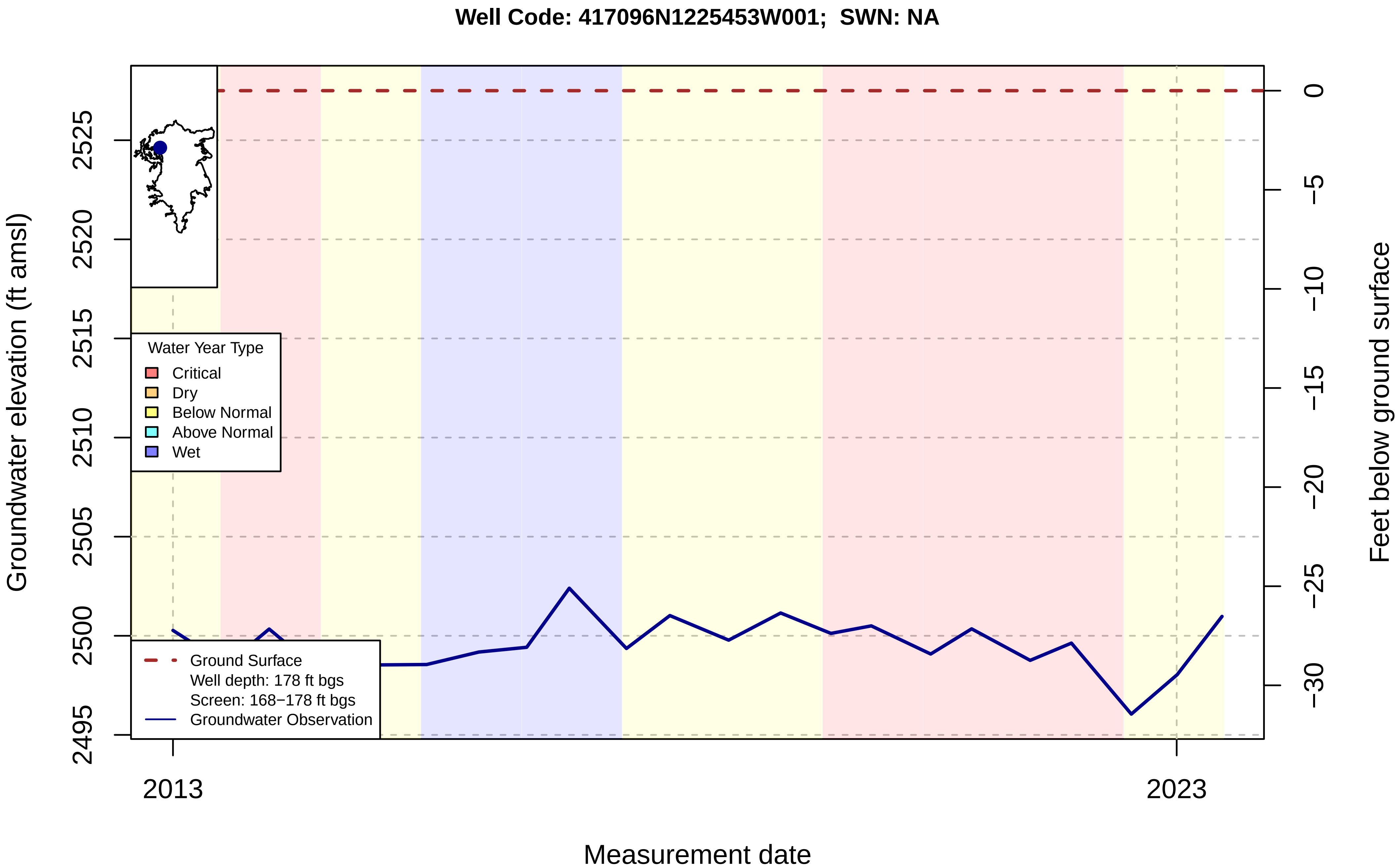




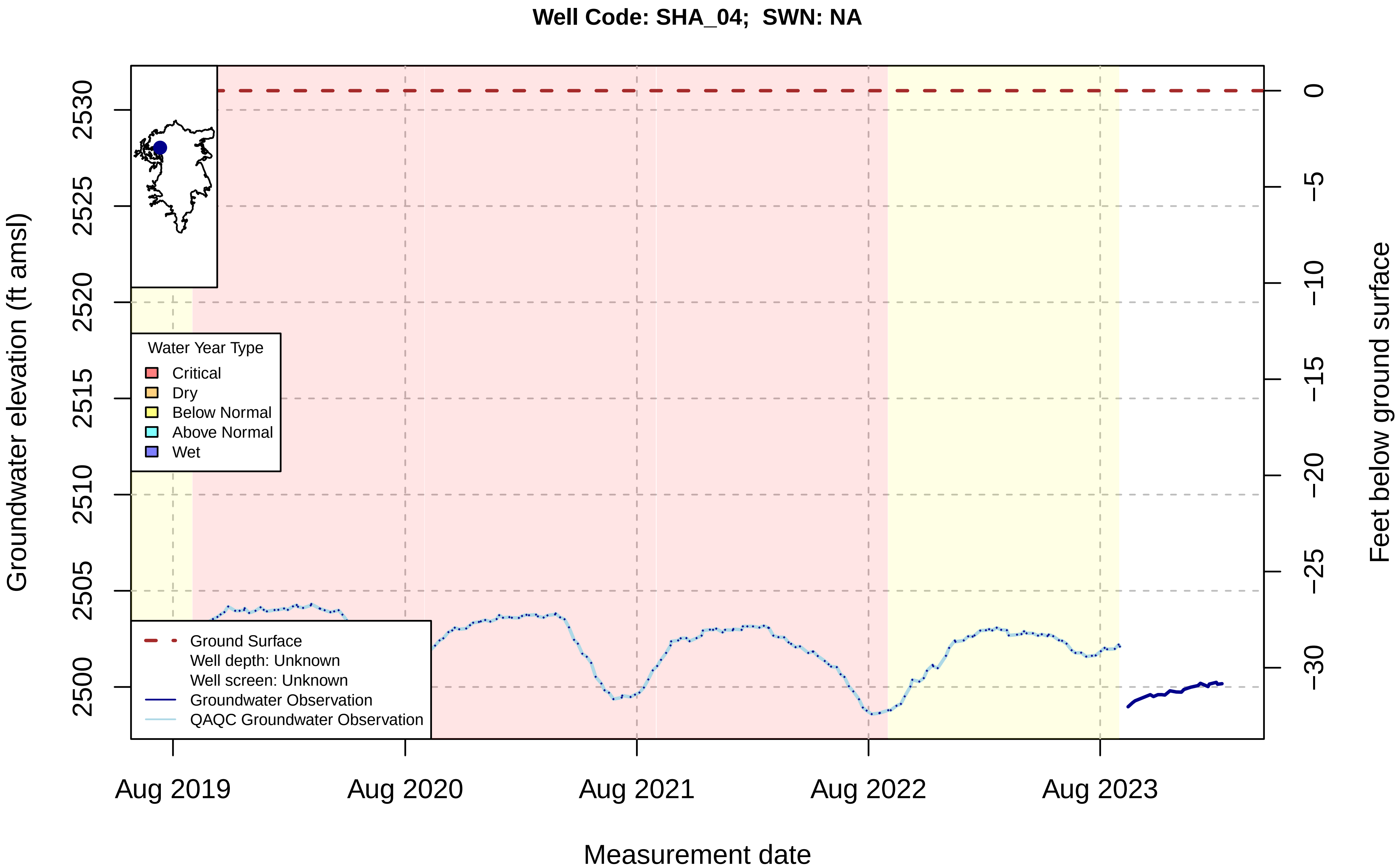
Well Code: 416774N1225301W001; SWN: 44N06W10F001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2510
2515
2520
2525
2530
2535
2540
0
−5
−10
−15
−20
−25
−30
1953
1963
1973
1983
1993
2003
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 113 ft bgs
Well screen: Unknown
Groundwater Observation



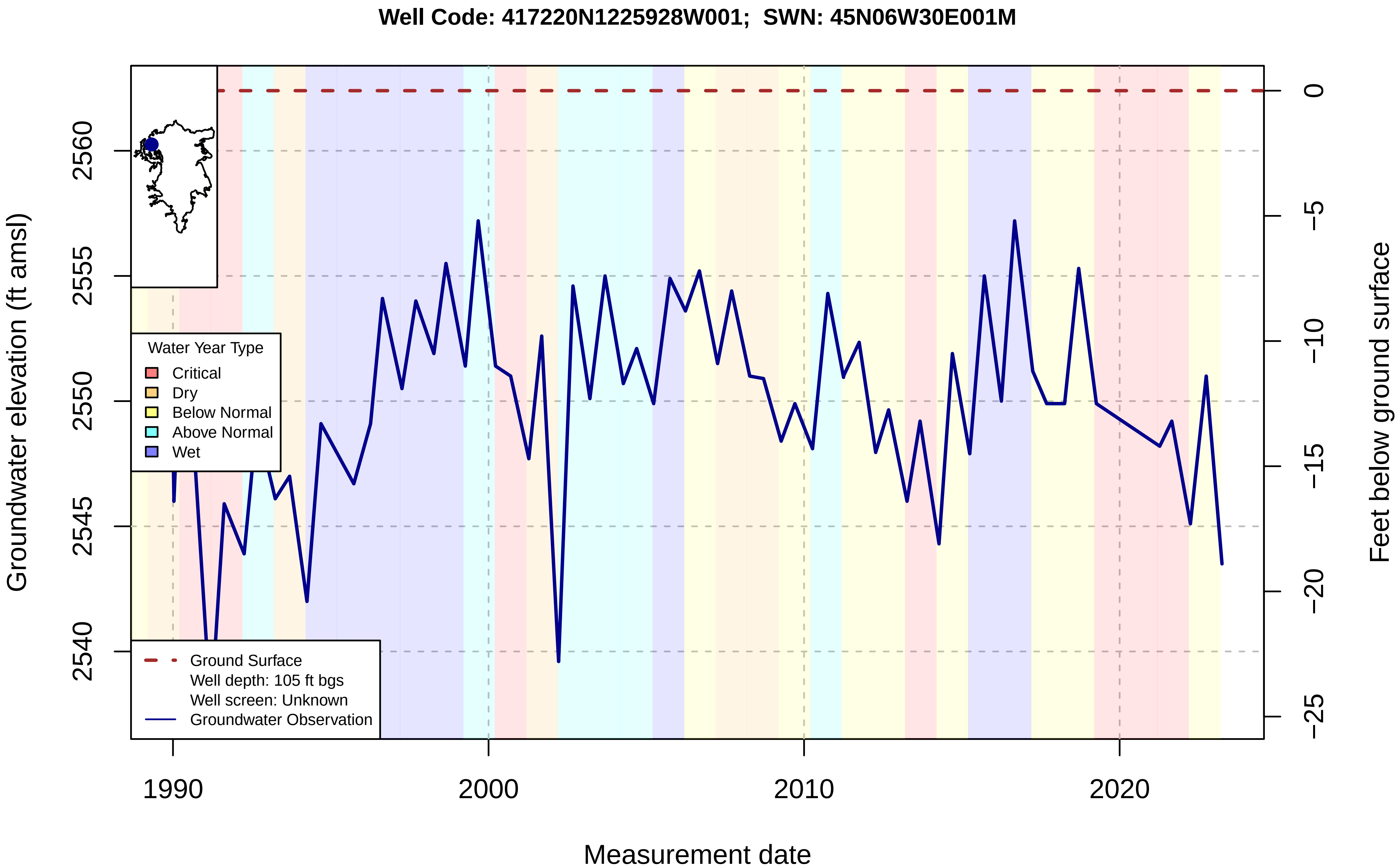
Well Code: SHA_10; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2650
2660
2670
2680
2690
2700
2710
0
−10
−20
−30
−40
−50
−60
−70
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 74 ft bgs
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



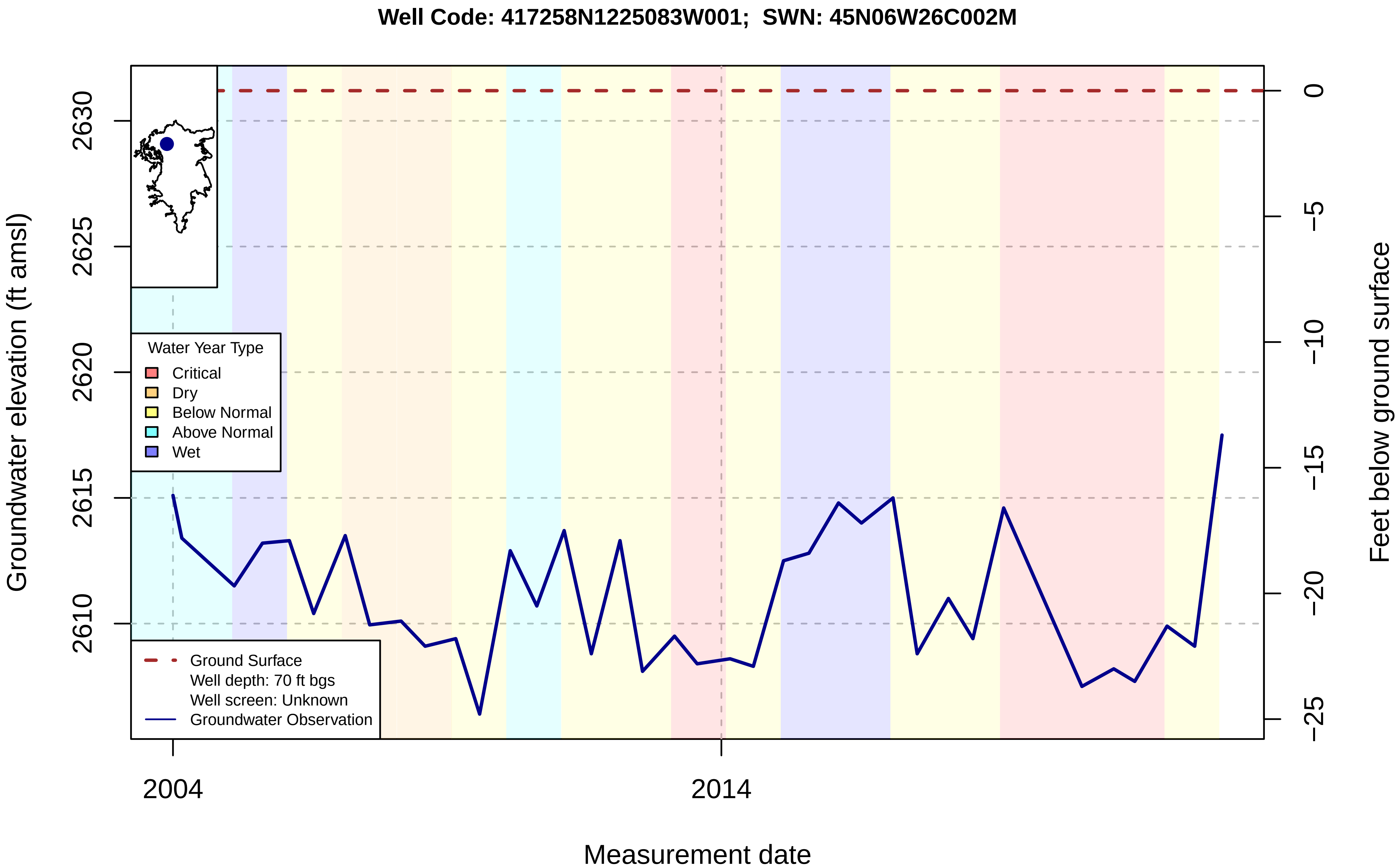
Well Code: 417096N1225453W001; SWN: NA
Groundwater elevation (ft amsl)
2495
2500
2505
2510
2515
2520
2525
Feet below ground surface
0
−5
−10
−15
−20
−25
−30
Measurement date
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 178 ft bgs
Screen: 168−178 ft bgs
Groundwater Observation



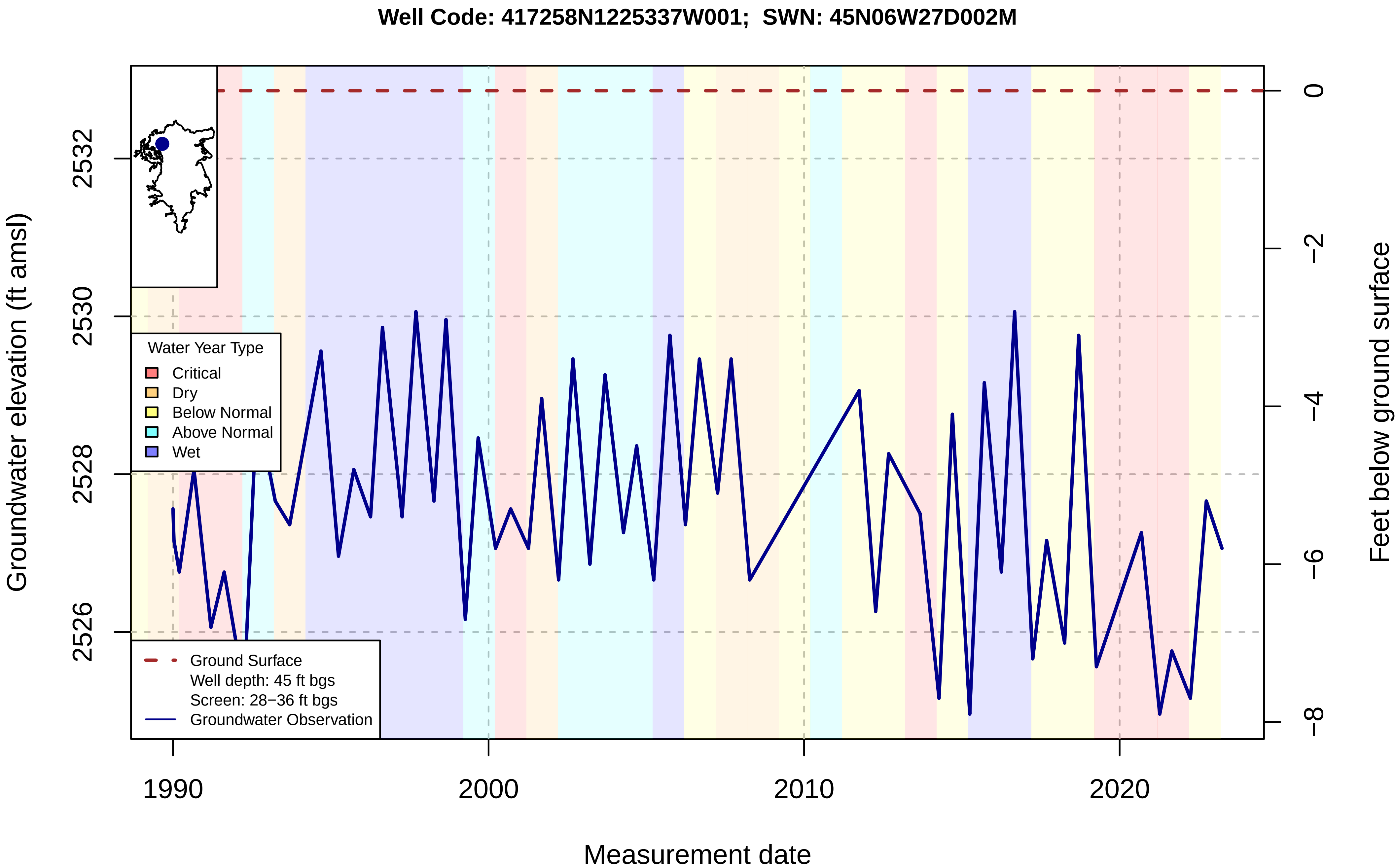
Well Code: SHA_04; SWN: NA
Groundwater elevation (ft amsl)
2500
2505
2510
2515
2520
2525
2530
Feet below ground surface
0
−5
−10
−15
−20
−25
−30
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation
Aug 2019
Aug 2020
Aug 2021
Aug 2022
Aug 2023
Measurement date



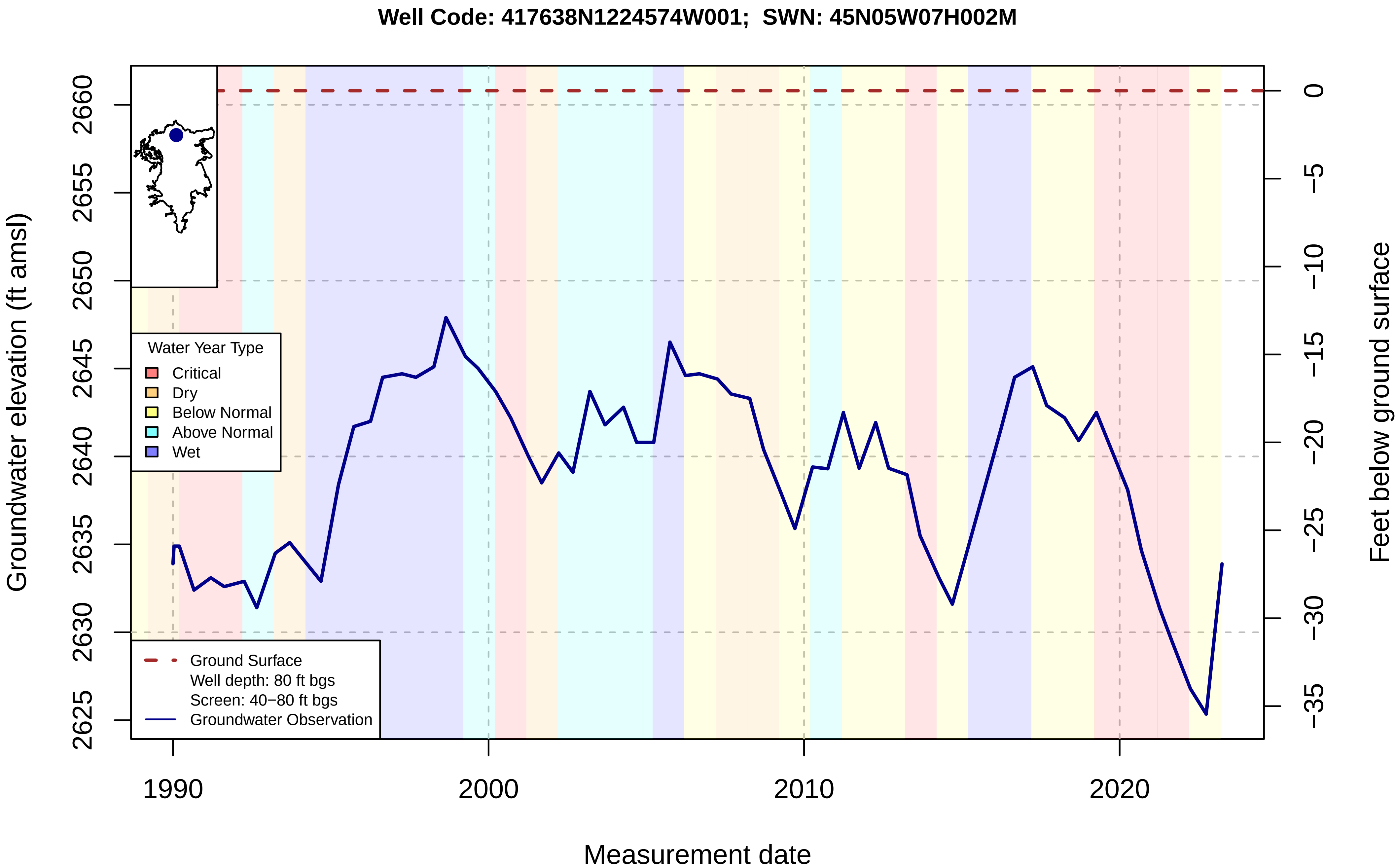
Well Code: 417220N1225928W001; SWN: 45N06W30E001M
Groundwater elevation (ft amsl)
2540
2545
2550
2555
2560
Feet below ground surface
0
−5
−10
−15
−20
−25
1990
2000
2010
2020
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 105 ft bgs
Well screen: Unknown
Groundwater Observation



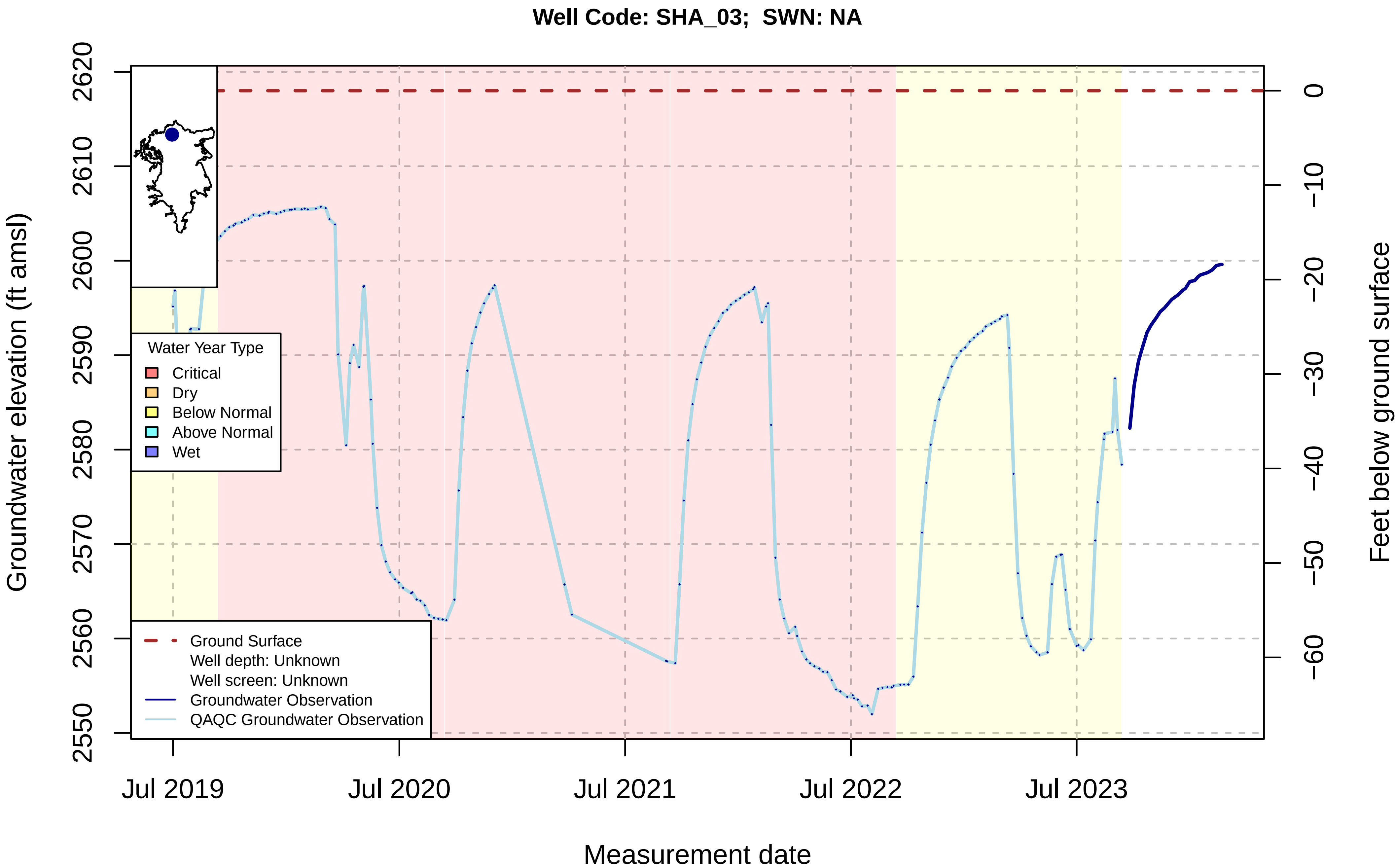
Well Code: 417258N1225083W001; SWN: 45N06W26C002M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2004
2014
2610
2615
2620
2625
2630
0
−5
−10
−15
−20
−25
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 70 ft bgs
Well screen: Unknown
Groundwater Observation

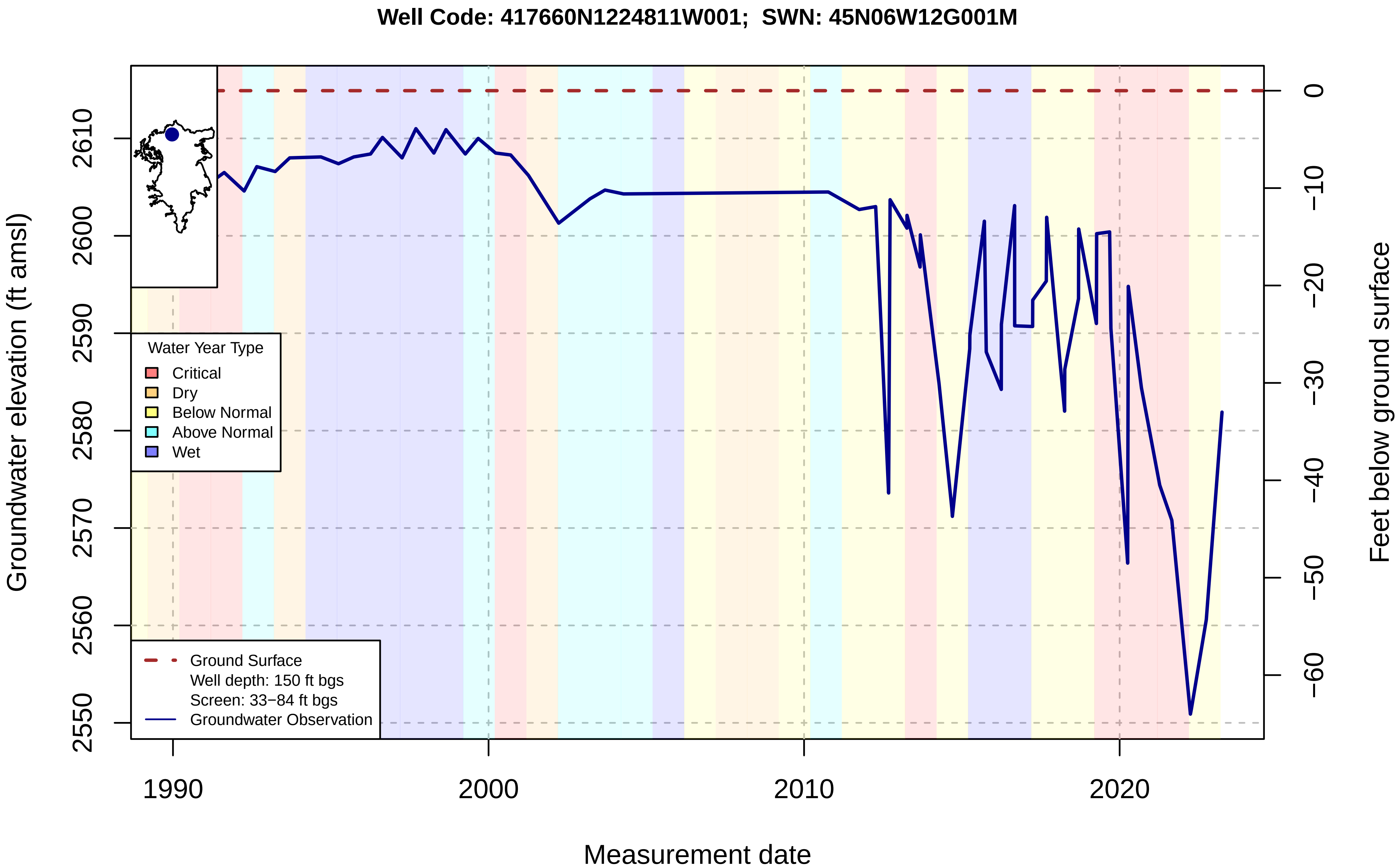


Well Code: 417258N1225337W001; SWN: 45N06W27D002M
Groundwater elevation (ft amsl)
2526
2528
2530
2532
Feet below ground surface
0
−2
−4
−6
−8
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 45 ft bgs
Screen: 28−36 ft bgs
Groundwater Observation
1990
2000
2010
2020
Measurement date

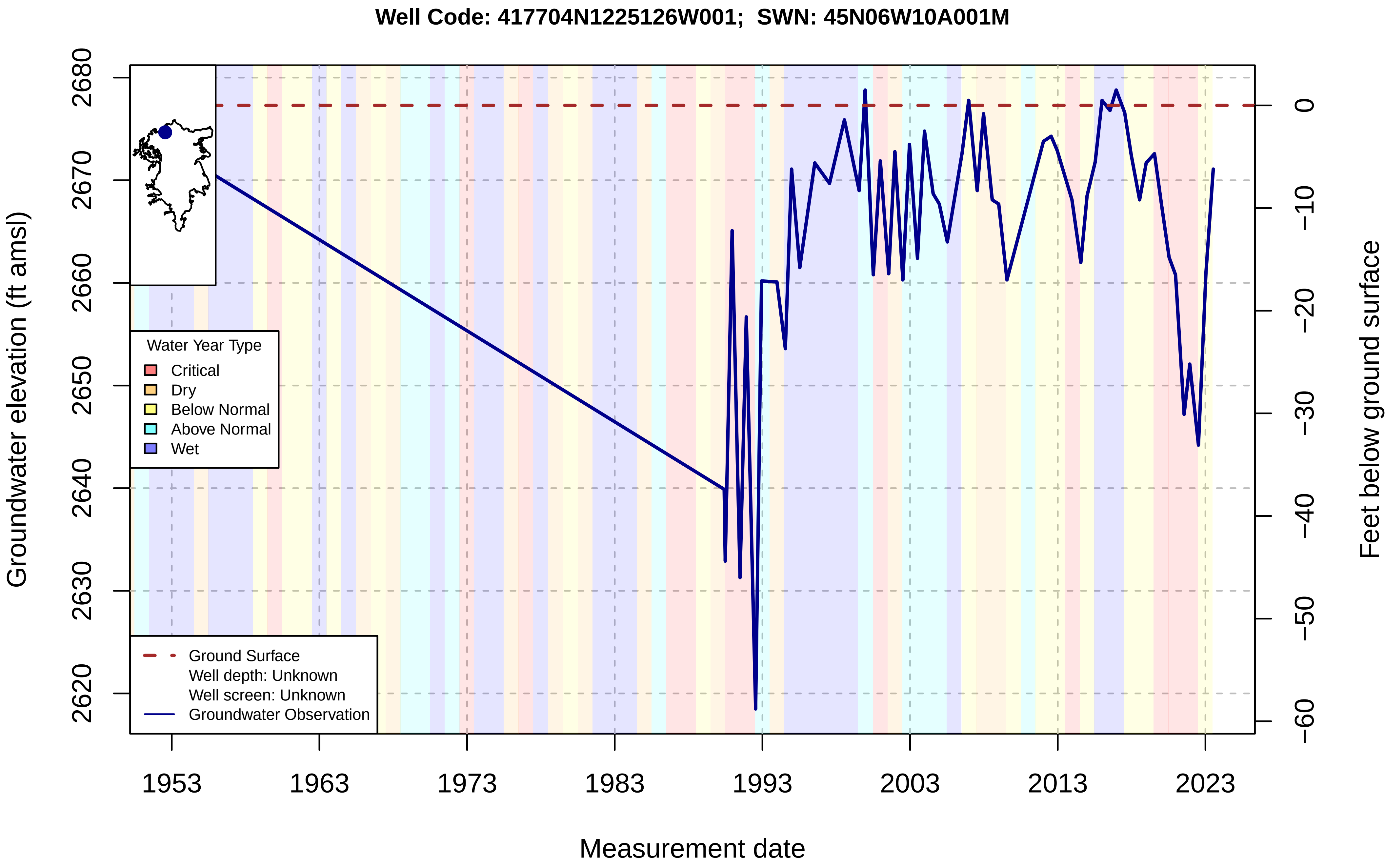


Well Code: 417638N1224574W001; SWN: 45N05W07H002M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
1990
2000
2010
2020
2625
2630
2635
2640
2645
2650
2655
2660
0
−5
−10
−15
−20
−25
−30
−35
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 80 ft bgs
Screen: 40−80 ft bgs
Groundwater Observation

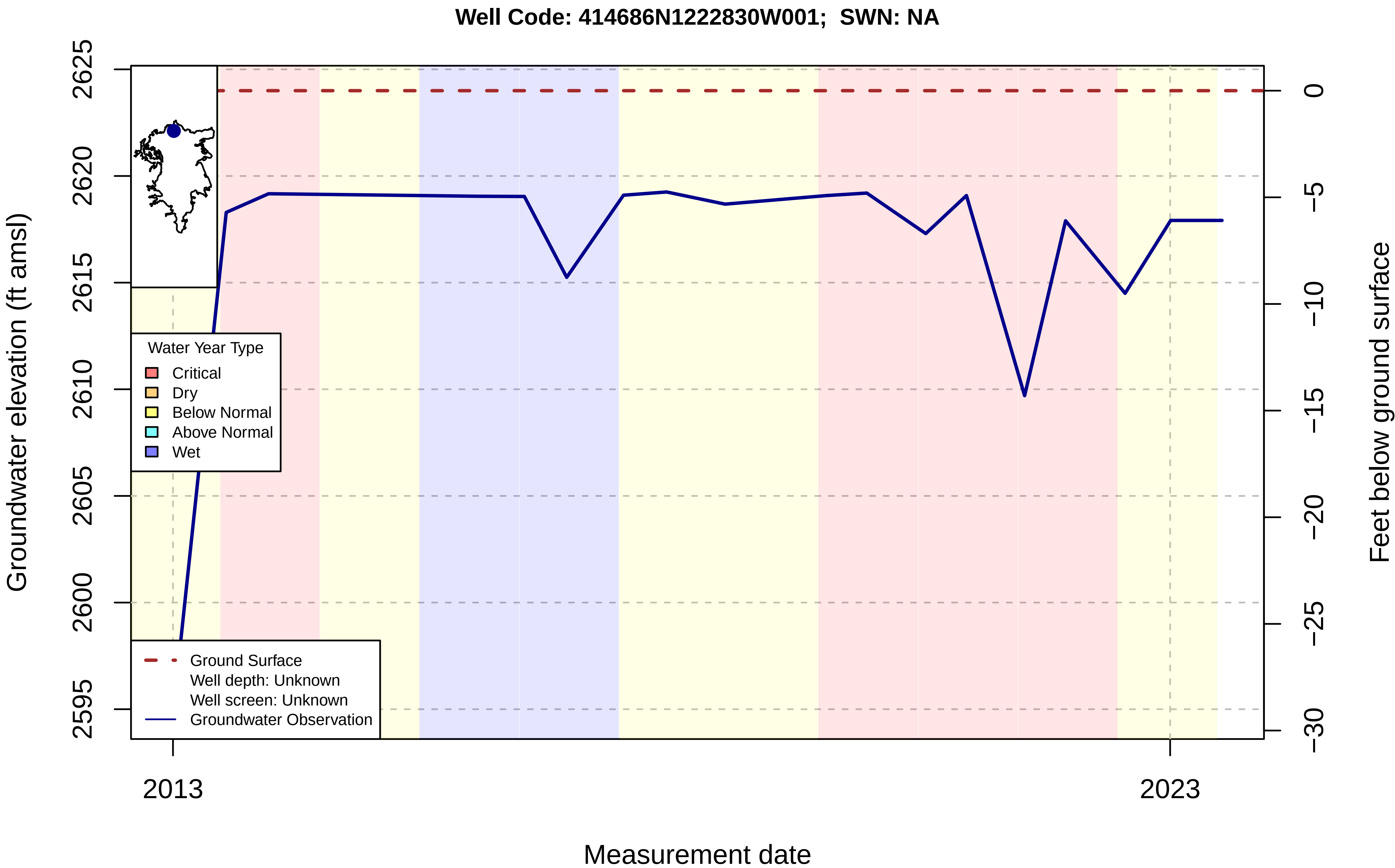

Well Code: SHA_03; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
2620
2610
2600
2590
2580
2570
2560
2550
0
−10
−20
−30
−40
−50
−60
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
QAQC Groundwater Observation



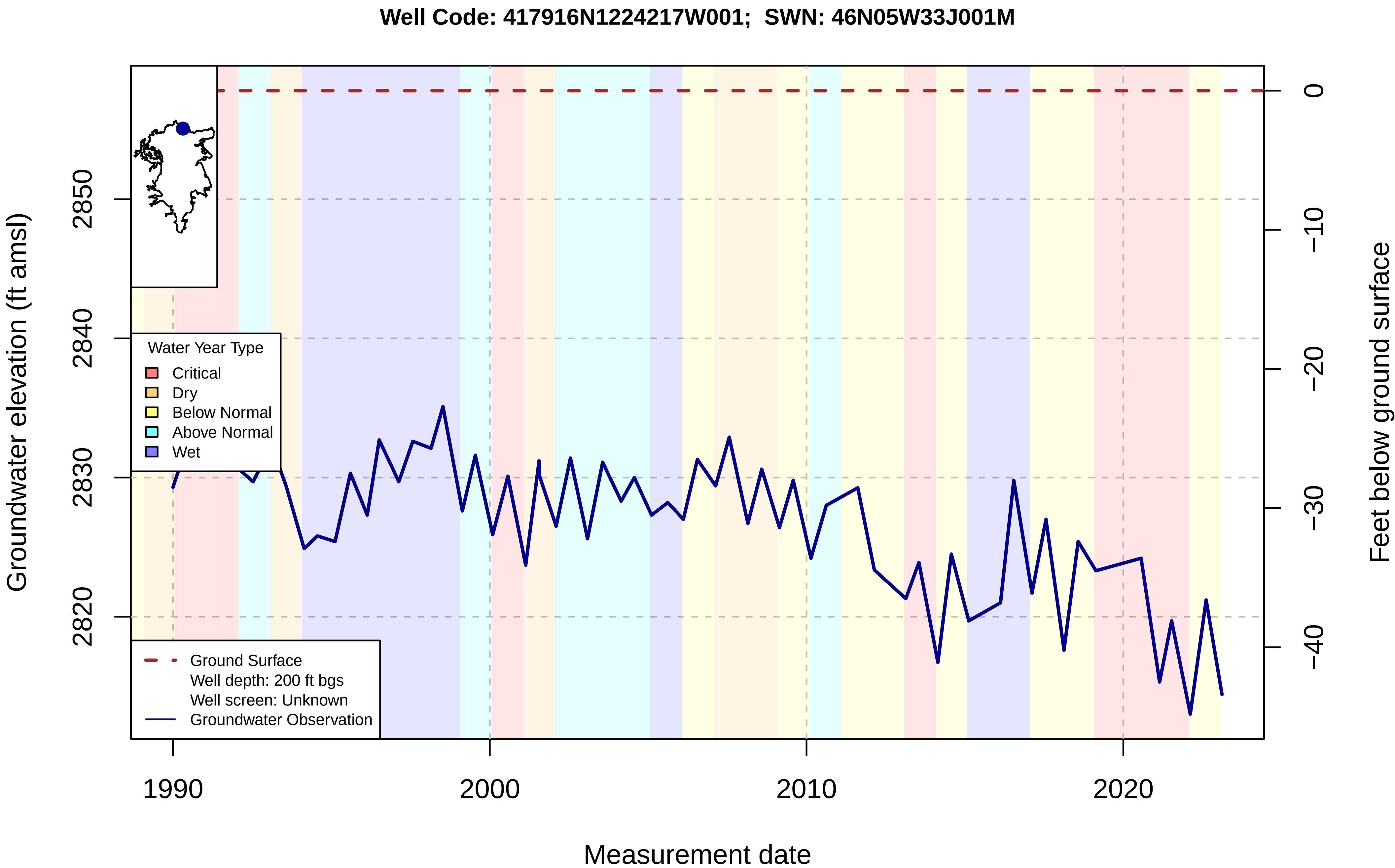
Well Code: 417660N1224811W001; SWN: 45N06W12G001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 150 ft bgs
Screen: 33−84 ft bgs
Groundwater Observation
2550
2560
2570
2580
2590
2600
2610
0
−10
−20
−30
−40
−50
−60
1990
2000
2010
2020



Well Code: 417704N1225126W001; SWN: 45N06W10A001M
Groundwater elevation (ft amsl)
2620
2630
2640
2650
2660
2670
2680
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
Measurement date
1953
1963
1973
1983
1993
2003
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



Well Code: 414686N1222830W001; SWN: NA
Groundwater elevation (ft amsl)
2625
2620
2615
2610
2605
2600
2595
Feet below ground surface
0
−5
−10
−15
−20
−25
−30
2013
2023
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



Well Code: 417916N1224217W001; SWN: 46N05W33J001M
Groundwater elevation (ft amsl)
2820
2830
2840
2850
Feet below ground surface
0
−10
−20
−30
−40
1990
2000
2010
2020
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 200 ft bgs
Well screen: Unknown
Groundwater Observation

References

MRLC. 2019. “2019 National Land Cover Database.” Multi-Resolution Land Characteristics (MRLC) Consortium. https://www.mrlc.gov/viewer/.