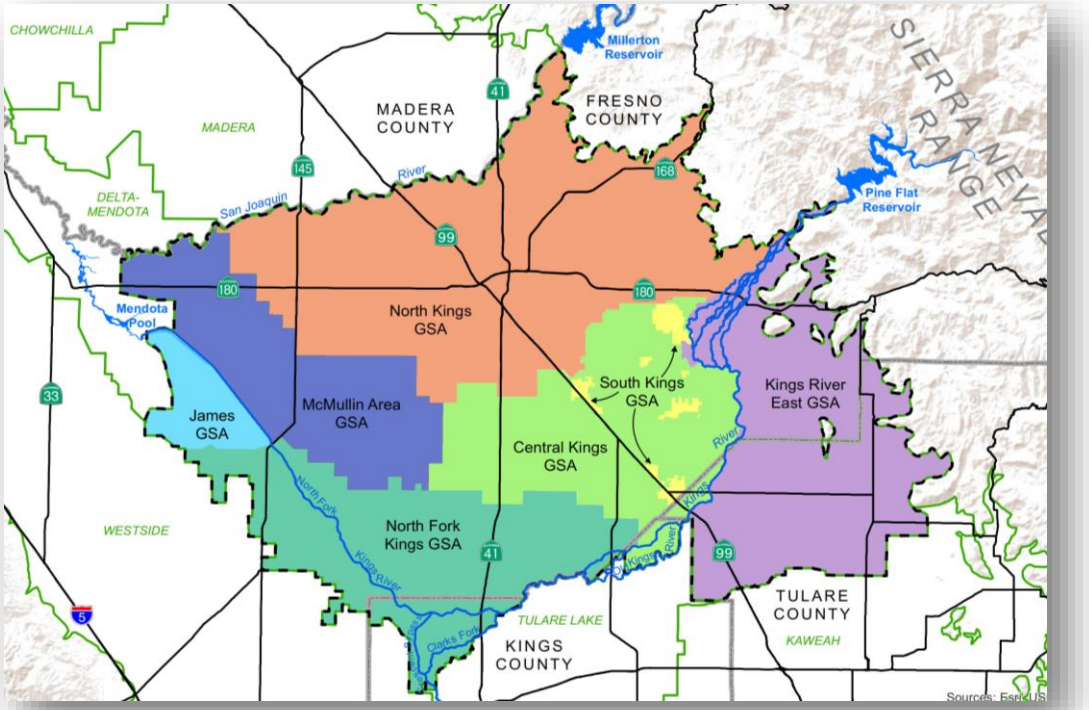
Kings Subbasin
Groundwater Sustainability Agencies



Groundwater Sustainability Annual Report

April 2020

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Abbreviations

AF ..... Acre-Foot
AF/YR ..... Acre-Foot Per Year
Coalition ..... Kings River Water Quality Coalition
CVDRMP ..... Central Valley Dairy Representative Monitoring Program
CVP ..... Central Valley Project
DWR ..... Department of Water Resources
EDT ..... Electronic Data Transfer
ET ..... Evapotranspiration
FID ..... Fresno Irrigation District
GAMA ..... Groundwater Ambient Monitoring and Assessment
GSA ..... Groundwater Sustainability Agency
GSP ..... Groundwater Sustainability Plan
ILRP ..... Irrigated Lands Regulatory Program
JID ..... James Irrigation District
KRCD ..... Kings River Conservation District
KRWQC ..... Kings River Water Quality Coalition
NGS ..... National Geodetic Survey
SGMA ..... Sustainable Groundwater Management Act

Executive Summary

This is the annual report prepared for the Kings Subbasin. The Kings Subbasin has seven Groundwater Sustainability Agencies (GSAs) (see **Figure 1-1**), all of whom prepared and submitted individual Groundwater Sustainability Plans (GSPs). The seven GSAs have worked cooperatively since 2016 to coordinate the development of their GSPs and have jointly prepared this single annual report for the entire Kings Subbasin.

This report has been prepared in accordance with the requirements for annual reports as identified in the GSP Emergency Regulations (i.e., California Code of Regulations section on Groundwater Sustainability Plans). Included in the body of the report are the regulation requirements. The outline of this report is similar to the structure headings used in the common outline used for each of the GSPs within the basin. The following is a short listing of what is included in each of the sections:

- Section 1 Introduction – A brief introduction of the intent and purpose of this report.
- Section 2 Land Use – A description of recent available land use data used in the report for the estimation of groundwater pumping.
- Section 3 Groundwater Pumping – An estimation of the GW pumping within the basin and a description of how the estimation was calculated.
- Section 4 Sustainable Management Criteria – A update as to the status of each of the Sustainability Indicators applicable to the basin, including groundwater levels (hydrographs and contours), estimation of groundwater storage change, groundwater quality data, land subsidence and surface to groundwater interconnection.
- Section 5 Monitoring Network – A description of any changes or problems with the monitoring network.
- Section 6 – An update of project and management actions undertaken during the reporting period.

This annual report includes data from Water Year 2019 (Oct 2018 to Sept 2019) and groundwater storage changes from Spring 2018 to Spring 2019, however in several places additional data from 2015 to 2019 is included.

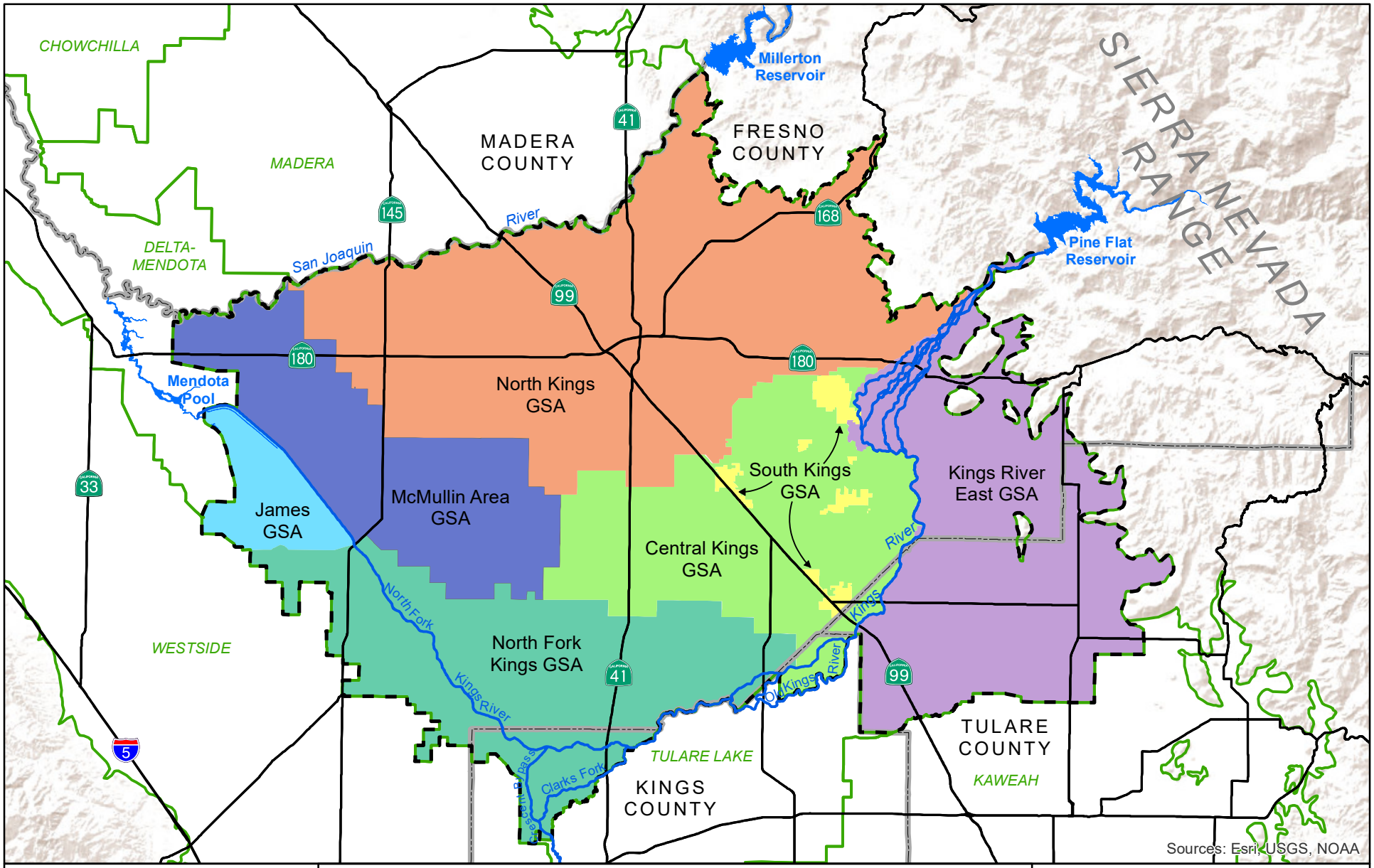
1 Introduction

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

The Sustainable Groundwater Management Act (SGMA) requires groundwater sustainability agencies (GSAs) to submit annual reports to DWR each April 1 following adoption of a groundwater sustainability plan (GSP). This is the annual report prepared for the Kings Subbasin. The Kings Subbasin has seven Groundwater Sustainability Agencies (GSAs) (see **Figure 1-1**), all of whom prepared and submitted individual Groundwater Sustainability Plans (GSPs). The seven GSAs have worked cooperatively since 2016 to coordinate the development of their GSPs and have jointly prepared this single annual report for the entire Kings Subbasin.

This report has been prepared in accordance with the requirements for annual reports as identified in the GSP Emergency Regulations (i.e., California Code of Regulations section on Groundwater Sustainability Plans). GSP annual reports provide information on groundwater conditions and implementation of the plan for the prior water year. The period covered by this report is October 1, 2018 through September 30, 2019, however there are portions of the report that cover from 2015 to 2019.

The structure of this annual report is similar to the common heading structure used for all of the GSPs in the basin. For additional clarification or information on the basin plan area or conditions, please refer to the GSPs. As acknowledged by the Department of Water Resources, it is important to note that there are some data gaps and missing information as the GSAs have just finalized their GSPs in late 2019 and are just starting to implement their GSPs.



Kings Subbasin

Kings Groundwater Subbasin
Groundwater Sustainability Agencies

Figure 1-1

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2 Land Use and Surface Water Supplies

356.2(b) (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.

2.1 Overview of Surface Water Supplies in Kings Basin

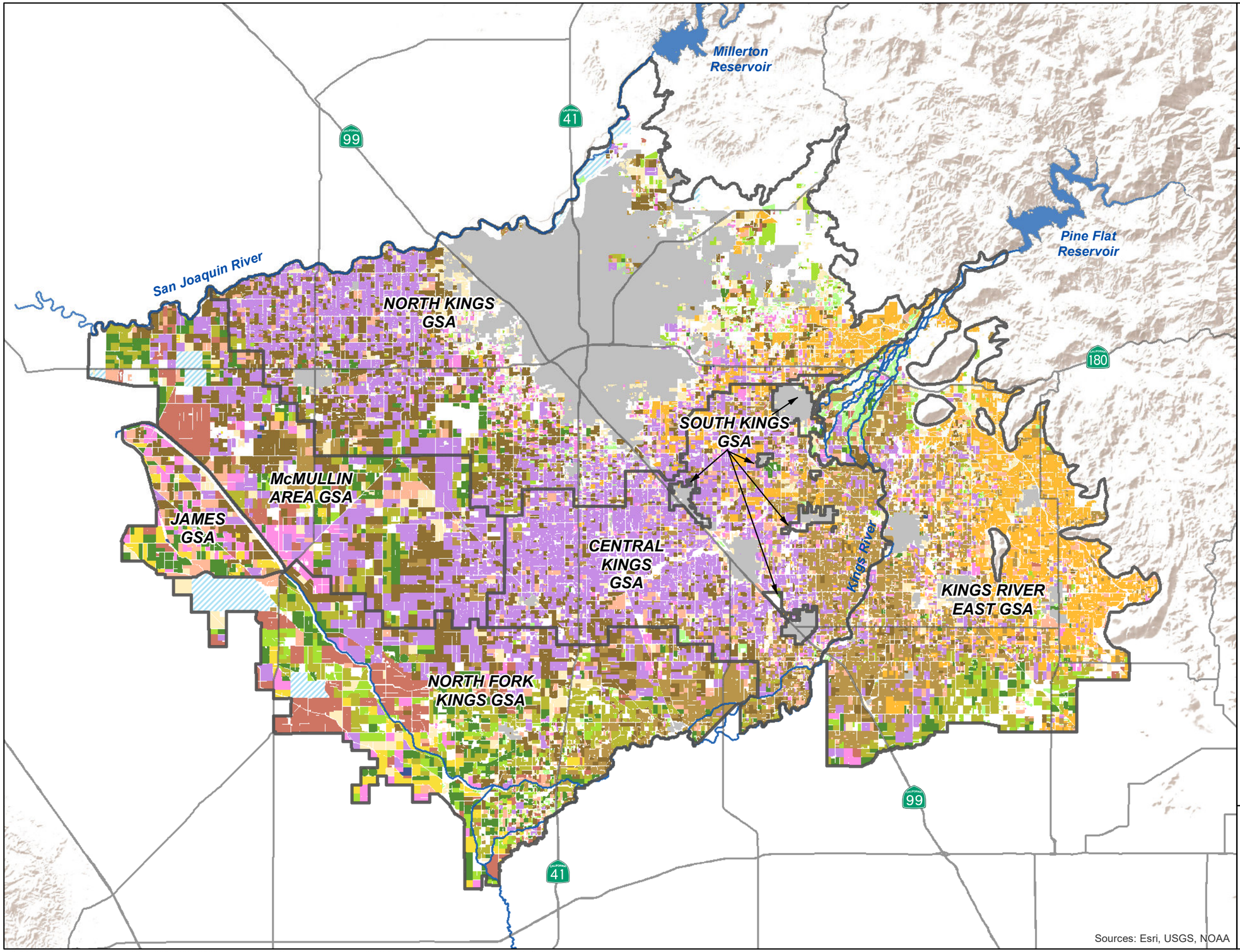
Surface water in the Kings Basin comes from several sources, including the Kings River and San Joaquin River, with smaller amounts imported from other areas. The Kings River provides about 85% of the surface water used in the Kings Basin. Central Valley Project water from the Friant Unit comprises about 10% of surface water use. The remaining surface water include South of Delta CVP water, San Joaquin River Settlement water, and riparian diversions from the Kings and San Joaquin Rivera.

2.2 Recent Land Use Data

Historically, DWR Land Use Maps have been utilized for land use data in the Kings Basin. These maps were used in developing all the Groundwater Sustainability Plans in the Subbasin, and for consistency, were also used in estimating water demands for 2019 in this report. The most recent DWR land use mapping was prepared in 2016. This is considered the best available information for the period from 2015 to 2019. **Figure 2-1** is the DWR Land Use Map for 2016.

Kings Subbasin

Land Use (DWR 2016)



Legend

- Kings Subbasin GSAs
- Highway
- Waterway

Land Use (DWR 2016)

- Citrus
- Grapes
- Pistachios
- Almonds
- Misc Deciduous
- Cotton
- Corn, Sorghum and Sudan
- Alfalfa and Alfalfa
- Misc Grain and Hay
- Mixed Pasture
- Misc Field Crops
- Truck, Nursery, and Berry Crops
- Young Perennials
- Managed Wetland
- Urban
- Idle

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Sources: Esri, USGS, NOAA

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Crop water demands for agricultural areas were calculated based on the land use map, estimated evapo-transpiration rates, and effective precipitation estimates. Evapotranspiration was based on DWR values published in DWR Bulletin 160 (DWR, 2019) for 1998-2011, with reference ETo adjusted for 2019 based on the California Irrigation Management Information System (CIMIS) station at Parlier. Effective precipitation was based on an empirical formula from DWR (1989). Annual precipitation contours were generated from several local weather stations, and the monthly distribution throughout the Basin was assumed to be similar to the long-term monthly distribution at the Fresno Airport Weather Bureau station.

The 2016 DWR Land Use Map was compared to the 2014 DWR Land Use maps for consistency and changes in land use. In general, the total irrigated area has slightly decreased. Unit evapotranspiration rates are also slightly higher than previous periods.

2.3 Description of Hydrology for Period

Table 2-1 shows the hydrologic year type for water years 2015 to 2019 based on an index created for the Kings Groundwater Sub-basin. The water year types were defined based on percentage of average long-term Kings River diversions to the Kings Subbasin from 1955-2019. The water year types include: Dry (<75%), Normal (75%-125%) and Wet (>125%). This index is used since Kings River water provides the majority of surface water in the Kings Groundwater Sub-basin and is considered a good overall indication of wetness and correlates with the amount of groundwater required to be pumped. Several years prior to 2019 are shown since they influence antecedent conditions, including groundwater levels, soil moisture content and surface water storage. Water years 2017-2019 were overall wetter than average but were preceded by an extemely dry period. Overall, the last five years result in near average conditions, but they include an extreme dry and an extreme wet year, which together may not equate to average pumping or recharge conditions.

Table 2-1 – Water Year Type (2015-2019)

Water Year	% Historical Diversions	Water Year Type
2015	20%	Dry
2016	74%	Dry
2017	158%	Wet
2018	99%	Normal
2019	134%	Wet
Average	97%	Normal

Note: Water Year includes October of previous year to September of current year

2.4 Surface Water Deliveries

Table 2-2 summarizes the surface water source and surface water uses in the Kings Basin in water year 2019.

Table 2-2 – Kings Basin Surface Water Deliveries (WY2019)

Source	Volume (AF)
Kings River	1,479,000
Other	160,000
Total	1,639,000

Notes:
1 - 'Other' Water Sources include Friant CVP water, South of Delta CVP water, Schedule 2 San Joaquin River Settlement water, riparian diversions from the Kings River and San Joaquin River, recycled water, and other surface water supplies.
2- Values rounded to nearest 1,000 AF, values may differ due to rounding errors

Table 2-3 summarizes surface water use by water use sector.

Table 2-3 – Kings Basin Surface Water Use (WY2019)

Water Use	Volume (AF)
Direct Use	1,258,000
Managed Recharge	381,000
Total	1,639,000

Notes:
1 – Direct use includes urban and agricultural use
2 – Managed Recharge only includes intentional recharge. Other sources of groundwater recharge including canal seepage, pipeline leakage and wastewater effluent recharge occur in the Subbasin but are not included in the value above, because they do not fall under DWR's definition of Managed Recharge.
3 – Values rounded to the nearest 1,000 AF, values may differ due to rounding errors

Accuracy

Accuracies of measured and estimated water surface and groundwater supplies are based on confidence intervals for water budgets developed by Cal Poly Irrigation Training and Research Center (1999). Surface water diversions for agricultural and urban uses are measured with flumes or weirs with accuracies of about +/-5%. Surface water for intentional recharge is based on deliveries to recharge basins. Some recharge basins are metered with accuracy estimated at +/-5%. Some recharge deliveries were not metered and were estimated based on deliveries to metered basins or observations by field staff, with overall accuracies estimated at +/- 25%. Overall, intentional recharge deliveries have an estimated accuracy of +/-15%.

More detailed surface water data is provided in **Appendix A,** including the DWR Surface Water Supply table with details added for each GSA.

3 Groundwater Pumping

356.2(b) (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.

Following are discussions on the types of groundwater pumping in the Kings Groundwater Basin, including the pumping volumes, source of the information, measurement method and level of accuracy.

3.1 Urban Groundwater Use

Urban groundwater use includes pumping for cities and other municipalities, collectively called Municipal and Industrial (M&I) use, and rural domestic pumping. M&I groundwater pumping is metered and recorded with accuracies of +/- 5%.

Rural domestic groundwater pumping is not measured and was estimated based on census data in rural areas, and an assumed 0.5 AF/capita/year based on typical indoor water usage and landscaped areas in the region. These estimates have an accuracy of +/-20% and only comprises a small portion of the total urban demands. This was the same method used in the GSPs prepared for the Kings Basin.

3.2 Irrigation Groundwater Use

Groundwater is used extensively for crop irrigation throughout the Kings Basin. In James GSA, there are private irrigation wells, and all irrigation groundwater is pumped by wells owned and operated by James Irrigation District (JID). JID also owns and operates some wells in McMullin Area GSA that deliver groundwater to the JID system. The JID wells are all metered with measurement accuracy of +/-5%.

Irrigation groundwater in the other GSAs is pumped from private wells that are not metered. Pumping from these wells was estimated through a water budget approach, which has an estimated accuracy of +/- 15%. This is also called the 'Land Use' method, since it is based largely on the water demands of the land use. Following are discussion on how this method was employed.

In a simple situation, groundwater pumping = crop applied water demands – surface water deliveries. However, in many areas surface water deliveries to growers differ from headgate diversions due to system losses and deliveries for intentional recharge. In these situations, irrigation groundwater pumping is estimated using the following formula:

Private Irrigation Pumping = (Crop evapotranspiration – effective precipitation) / irrigation efficiency – Surface water deliveries to growers

where:

Surface Water Deliveries to Growers = Headgate diversions – System losses – Intentional recharge

and

System Losses = Channel evaporation + Channel seepage + Reservoir evaporation + Reservoir seepage + Operational Spills

As a result, private irrigation pumping was calculated with the following formula:

Private Irrigation Pumping = (Crop evapotranspiration - effective precipitation) / Irrigation efficiency – Headgate diversions + Channel evaporation + Channel seepage + Reservoir evaporation + Reservoir seepage + Operational spills + Intentional recharge

These calculations were performed for each GSA for water years 2015 to 2019 (see calculations in **Appendix A**).

No groundwater is pumped for environmental use or other uses not described above.

3.3 Groundwater Pumping Volumes

Table 3-1 summarizes the volumes of estimated groundwater for each measurement method.

Table 3-1 – Groundwater Measurement Methods (WY 2019)

Water Sector	Method	Volume (AF)	Accuracy
Agricultural	Land Use	892,000	+/-15%
M&I and Agricultural	Metered	124,000	+/-5%
Rural Domestic	Estimated	45,000	+/-20%
-	Total	1,061,000	-

Note: Values rounded to the nearest 1,000 AF, values may differ due to rounding errors

These values are also presented by GSA in the DWR Groundwater Extraction Methods table found in **Appendix A**

Table 3-2 summarizes the groundwater pumped by water use sector in water year 2019

Table 3-2 – Groundwater Pumping by Water Use Sector (WY 2019)

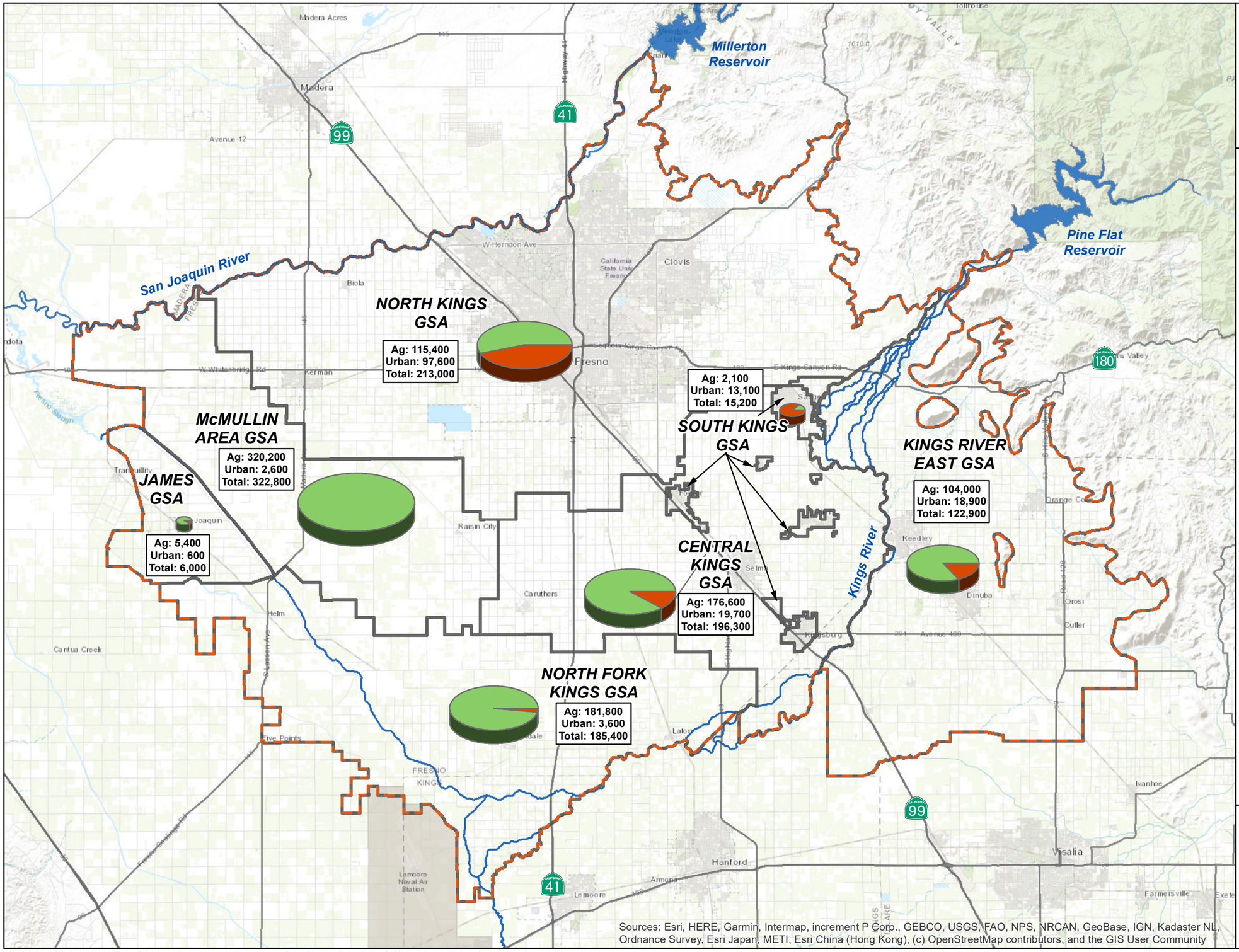
Source	Volume (AF)
Urban[1]	156,000
Agriculture[2]	906,000
Total	1,062,000

1 – Urban use includes M&I and rural domestic pumping
2 – Agricultural use includes crop irrigation and dairy water use
3 - Values are rounded to the nearest 1,000 AF, values may differ due to rounding errors

These values are also presented by GSA in the DWR Groundwater Extractions table found in **Appendix A**.

3.4 Geographic Distribution of Groundwater Pumping

Figure 3-1 shows estimated groundwater pumping (agricultural and urban) for each of the seven GSAs.



Kings Subbasin

Groundwater Extraction by GSA (Acre-Feet)

Figure 3-1

Kings Subbasin GSAs

Kings Subbasin (2019)

Pumping By Water Use Sector (AF)*

Agriculture

Urban

*Volumes rounded to the nearest 100 AF

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3.5 Total Water Use

> 356.2(b) (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.

Table 3-3 summarizes total water use by water use type and sector for WY2019

Table 3-3 – Summary of Total Water Use for WY 2019 (AF)

Description	Urban	Agriculture	Total
Groundwater	156,000	906,000	1,062,000
Surface Water	179,000	1,460,000	1,639,000
Total	335,000	2,366,000	2,701,000

Notes:
1 - Surface water includes use contract diversions, riparian diversions and recycled water used for both recharge and direct use
2 – Values rounded to the nearest 1,000 AF

These values are also presented by GSA in the DWR Total Water Use table found in **Appendix A**. Refer to discussions in previous sections for information on measurement methods and accuracy.

The data presented in **Table 3-3** is a short snapshot of water conditions, and not necessarily representative of long-term average hydrology. This information was not used to develop a 2019 annual water budget for comparison to change in groundwater storage. An annual water budget would likely not be accurate due to time lags in various forms of recharge, and inaccuracies that tend to balance out over longer time periods. However, this information will eventually be used in a long-term multi-year water budget analysis.

4 Sustainable Management Criteria

4.1 Sustainable Goal

As identified in Section 4.1 of each of the GSPs, the sustainability goal of the Kings Sub-basin and each GSA is to ensure that by 2040 the basin is being managed to maintain a reliable water supply for current and future beneficial uses without experiencing undesirable results. This goal will be met by balancing water demand with available water supply to stabilize declining groundwater levels without significantly and unreasonably impacting water quality, land subsidence, or interconnected surface water. The goal of the basin is to correct and end the long-term trend of a declining water table understanding that water levels will fluctuate based on the season, hydrologic cycle, and changing groundwater demands within the basin and its proximity.

4.2 Groundwater Levels

> 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.
> 356.2(b) (1) (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.

The Kings Subbasin monitoring network includes hundreds of wells used for developing groundwater contour maps and estimating change in storage. As identified in the GSPs of the subbasin, a subset of these wells includes one hundred and twenty-four (124) indicator wells (Sustainable Management Criteria or SMC) wells in the Kings Subbasin for which Interim Milestones, Measurable Objectives and Minimum Thresholds have been set (**Figure 4-1**). **Appendix B** contains the groundwater elevation and depth to water in tabular format from spring 2015 to spring 2019 and fall data from 2015 to 2018 for these wells. **Appendix C** contains hydrographs for the indicator wells. These hydrographs graphically show Interim Milestones, Measurable Objectives, Minimum Thresholds and the trend line over the hydrologic base period from 1997 to 2012. The hydrographs have inset maps showing the location of the well within the GSA. Additional information on the hydrographs includes the well names (local and/or state names as available) and the ground surface elevation.

In general, since 2015, water levels continued to decline at the end of a historic drought and in some cases reaching lowest points recorded in fall 2016. After the wet 2016/2017 winter groundwater levels generally rose though spring 2017 and continued to increase in some areas even through fall of 2017. Since 2017 some wells have continued to see increases in water levels, while some showed declines after the normal 2017/2018 winter. Some rebound occurred in the spring 2019 data after the wet 2018/2019 winter. However, Subbasin wide the general trend was decreasing water levels during the drought and increases in water levels after the drought.

There are only a few locations in the Subbasin where wells are known to be perforated solely below the Corcoran clay or the deeper confined portion of the aquifer east of the Corcoran clay. Newer community wells are typically sealed across shallow contaminated water and probably reflect hydraulic conditions in deeper groundwater. To date there is insufficient geographic distribution of data from wells know to be perforated below the Corcoran clay where it is present or from deeper wells east of the Corcoran clay to contour the lower aquifer zone or deep groundwater. The basin will continue to gather data to continue to better define the confined aquifer, but for now, only mapping of the unconfined aquifer has been prepared.

4.2.1 Water Level Maps/Contours

Water surface elevation contour maps were generated for the spring of each year from 2015 to 2019 and fall 2018 based on the available water level data and are included in **Appendix B.** The seasonal high and seasonal low groundwater conditions for 2018 are presented in **Appendix D** along with the spring groundwater contour maps from 2015 to 2019. At the time of this annual report the fall 2019 compilation was not complete but will be included in tabular format in subsequent annual reports. The fall 2019 data that was available at the time of this report can be seen on the hydrographs in **Appendix C.**

The water surface elevation contours represent the unconfined aquifer above the Corcoran clay and above the conceptual base of unconfined groundwater east of the Corcoran clay. In areas of the

Subbasin where the shallow A clay is present these contours are meant to represent the portion of the aquifer below it but above the Corcoran clay.

The number of wells evaluated in the Kings Subbasin to develop the groundwater surface elevation contours varied from about 630 in spring 2015 to about 740 wells in spring 2018. Additional well data was also evaluated outside of the Kings Subbasin but the number of wells with data available outside the Subbasin was variable and not included in the total number.

The process used to generate the contours was similar to what was used by the basin for development of the GSPs. Well locations and groundwater elevations were plotted on the Kings Subbasin maps for the spring of each year from 2015 to 2019 and fall 2018. Groundwater level elevations that appeared inconsistent with the majority of other wells in an area were typically not used. Wells with significantly different water levels may be perforated in the confined portion of the aquifer or in shallow groundwater above the A clay where it is present or other local clays. In some locations where a well reading was significantly different than other wells in the immediate vicinity, it was discarded because it was believed that these readings were likely erroneous or anomalous (well pumping nearby, well recently pumped, oil, etc). Effort was made to use the same wells year over year in this evaluation so that the storage change calculations, described below, were not unduly affected by the use of data from different wells or data from wells that did not have data in other year(s).

Groundwater Elevation contours were generated utilizing ArcGIS software and then the contours were reviewed and edited for consistency, and to remove apparently anomalous data. It should be noted that data was used, even if the data point was new or had not been used in other maps in the period, if the data was reasonably consistent with the contours. This is done so that through time more wells are used in the contouring process to better define the groundwater surface. ArcGIS was then used to convert the groundwater surface elevation contours (**Appendix D**) to depth to water maps using the states Digital Elevation Model or surveyed measuring point elevations if available, for use in the storage change evaluation discussed below.

Kings Subbasin Coordinated Effort

Water Level Monitoring Network

Figure 4-1

Legend

- Indicator Well
- Groundwater Sustainable Agency
- Township/Range

T11S
T12S
T13S
T14S
T15S
T16S
T17S
T18S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Madera Acres, Madera, Chowchilla, Fairmead, Millerton Lake, Tollhouse, Biola, Clovis, Fresno, Kerman, Tranquillity, San Joaquin, Raisin City, Helm, Cantua Creek, Five Points, Riverdale, Laton, Selma, Reedley, Dinuba, Orosi, Cutler, Orange Cove, Sanger, Parlier, Kingsburg, Ivanhoe, Visalia, Hanford, Armona, Lemoore, Lemoore Naval Air Station, Farmersville, Exeter

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Sources: Esri, USGS, NOAA

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4.3 Groundwater Storage

> 356.2(b) (5) (A) Change in groundwater in storage maps for each principal aquifer in the basin.
> 356.2(b) (5) (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.

Technical Memorandum 2 in the Kings Subbasin GSPs identifies the current specific yield values used in storage change calculations for the Kings Subbasin. The specific yield units from this process are illustrated on **Figure 4-2**. Specific yield values also vary by depth and Technical Memorandum 2 describes specific yield at depth intervals from 0'-50', 50'-100', 100'-200' and 200'-300', and below 300 feet. Storage change was estimated based on the storage above 400' below the groundwater surface.

The process for estimating the groundwater storage change from 2015 to 2019 was the same process utilized by all the GSAs in the basin in preparation of their GSPs and included the following steps:

1. The final wells selected from the water surface elevation review and contouring process were used to create depth to water surfaces, as described above.
2. Using the depth to water surfaces, the average depth to water value was determined for each unique specific yield unit. The average depth was determined using ArcGIS Spatial Analyst.
3. For each specific yield unit, the average depth to water of that area was used to determine the height of water above 400 feet for each depth zone.
4. The height of water in each depth zone was multiplied by the specific yield for that depth zone and then by the total acreage within that Specific Yield unit.
5. Values for each depth zone were added to determine total volume in storage above 400 feet.
6. The groundwater in storage volume by specific yield units were totaled by GSA to estimate the GSA total for that year.
7. Steps 1 through 6 were repeated for the ending year being considered.
8. The total volume in storage estimated for the starting year was subtracted from the total volume estimated for the ending year to determine the total change in volume between the two years.

Figure 4-2 shows the Subbasin specific yield units and which specific yield units had minimal (-.01 to +0.1 AF per acre), increasing (>+0.1 AF per acre) or decreasing (< -0.1 AF per acre) storage change from spring 2018 to spring 2019.

There is some inconsistent well data in certain areas that affects year to year estimations of storage change. The GSAs will continue to work to improve the reliability of data within the basin. **Table 4-4** below shows the estimates of storage change year by year and the total change in storage for the Kings Subbasin. The spring 2018 to spring 2019 estimated storage change is a positive 210,000 acre-feet across the entire Kings Basin. This report covers multiple years from 2015 to 2019. Over the spring 2015 to spring 2019 period the cumulative storage change from spring 2015 to spring 2019 was estimated to be positive by about 330,000 acre-feet (**Figure 4-3**). The positive increase in storage from spring 2016 to spring 2019 seems reasonable given the wet winters in 2016/2017 and 2018/2019, the normal 2017/2018 winter, and the ability of Pine Flat reservoir to maintain hold over storage for delivery in subsequent years. As well, the negative storage change from spring 2015 to spring 2016 is reasonable considering it was the last dry year of the drought. There are some data gaps as well as some inconsistent data from year to year in certain areas that affects year to year estimations of storage change. The GSAs will continue to work to improve the reliability of data within the basin.

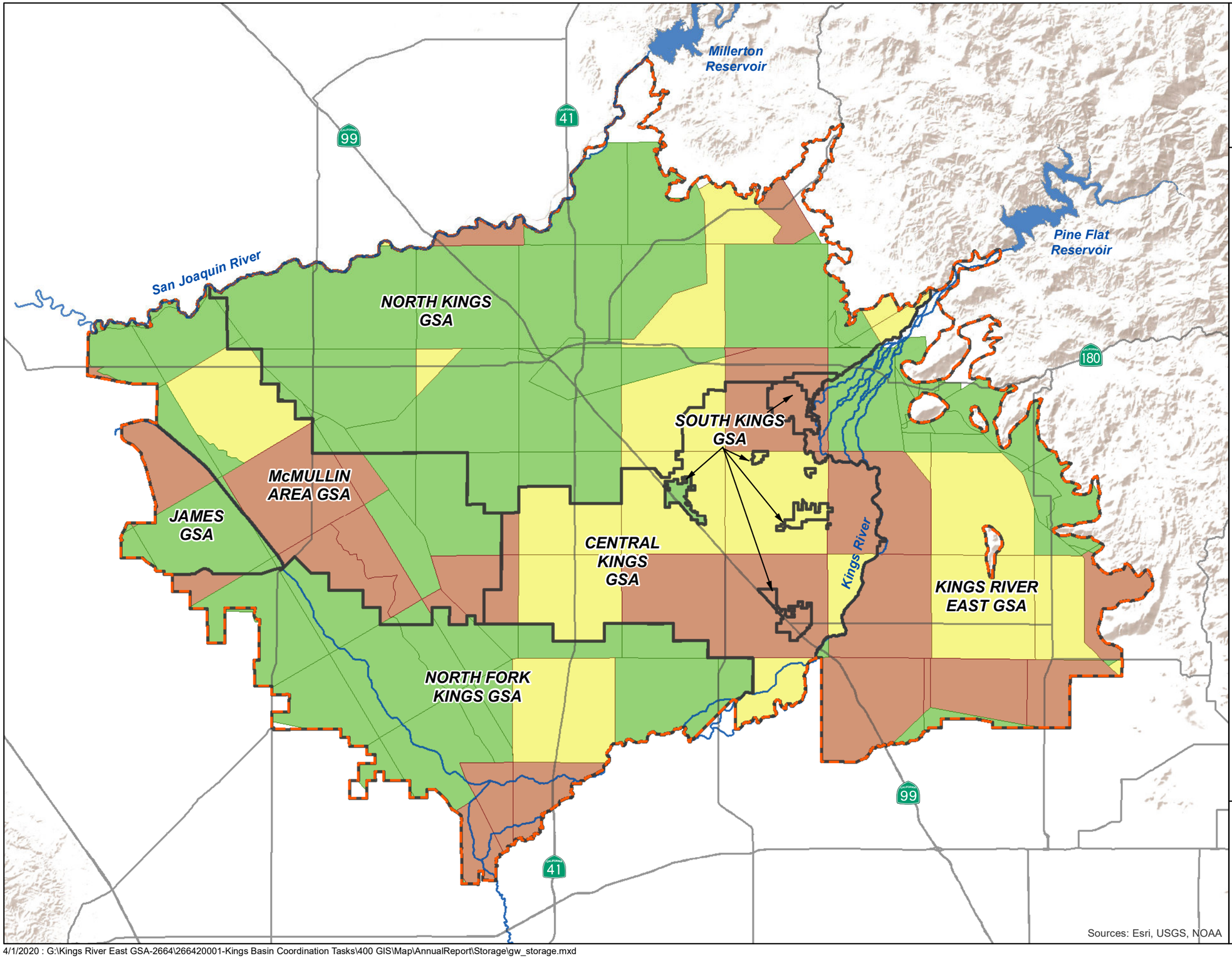
Table 4-1 – Kings Subbasin - Estimated Annual Change in Storage, Spring 2015 to Spring 2019

Kings Subbasin GSA	Est. Storage Change Sp. 15 to Sp. 16	Est. Storage Change Sp. 16 to Sp. 17	Est. Storage Change Sp. 17 to Sp. 18	Est. Storage Change Sp. 18 to Sp. 19
Total Est. Storage Change (AF)	**-300,000**	**180,000**	**240,000**	**210,000**

Kings Subbasin

Change in Storage from
Spring 2018 to Spring 2019

Figure 4-2



Legend

- Kings Subbasin GSAs
- Kings Subbasin (2019)
- Highway
- Waterway

Specific Yield Unit

Storage Change

- Decreasing (<-0.1 af/acre)
- Minimal (between -0.1 and 0.1 af/acre)
- Increasing (>0.1 af/acre)

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Sources: Esri, USGS, NOAA

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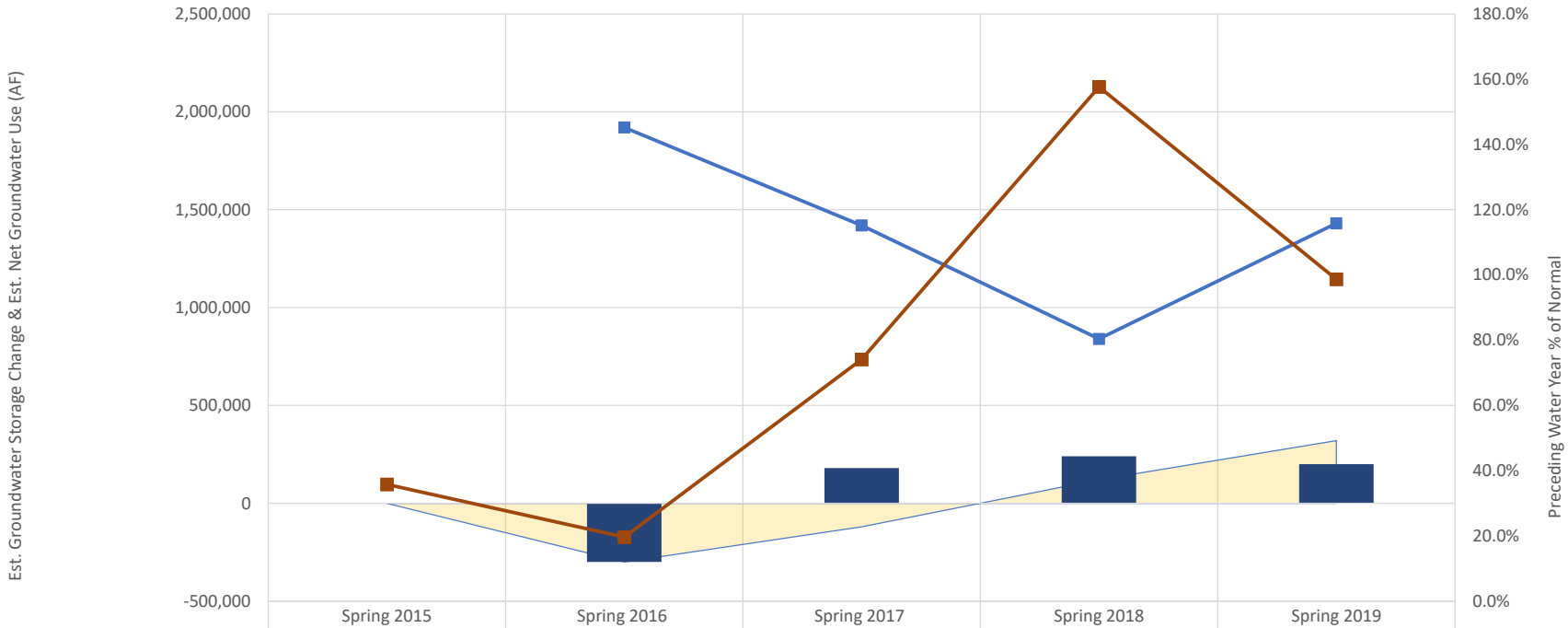
Kings Subbasin
Estimated Annual and Cumulative Groundwater Storage Change from Spring 2015 to Spring 2019



	Spring 2015	Spring 2016	Spring 2017	Spring 2018	Spring 2019
Cumulative Change in Storage, AF		-300,000	-120,000	120,000	320,000
Annual GW Storage Change, AF		(300,000)	180,000	240,000	200,000
Preceding WY Est. Total GW Use, AF		1,920,000	1,420,000	840,000	1,430,000
Preceding WY % of Normal	35.8%	19.6%	74.1%	157.6%	98.7%

Notes:
1 - Annual storage change is from spring to spring. Storage change is listed under the ending year evaluated. For example, storage change from Sp. 2015 to Sp. 2016 is under the Spring 2016 column.
2 - Storage was not esimated in spring 2014 therefore storage change from spring 2014 to spring 2015 was not estimated.
3 - Preceding WY ends Sept. 30 of the previous year, for example the 2016/2017 Water Year ends on Sept. 30, 2017 and is shown under the Spring 2018 column on this graph.
4 - Water Year begins Oct. 1 of proceeding year and runs through Sept. 30 of listed year. For example, the 2015 water year begins Oct. 1 2014 and continues through Sept. 30 2015.
5 - Values rounded to nearest 10,000 acre-feet.
6 - Kings River Water Year Types - less than 75% = Dry, from 75% to 125% = Normal, greater than 125% = Wet

Figure 4-3

4.4 Seawater Intrusion

The Kings Subbasin is not hydrologically located near the ocean nor near saline sinks. Therefore, no criteria has been established for undesirable results.

4.5 Groundwater Quality

The Kings Basin's Groundwater Quality Monitoring Network is comprised of the individual GSA groundwater quality monitoring networks described in each GSA's GSP. A map of the overall network is shown in **Figure 4-4.**

The groundwater quality monitoring networks for the GSAs are comprised primarily of community and non-community public supply wells. Groundwater quality data from these wells are publicly available from the water suppliers or through online databases such the State Safe Drinking Water Information System (http://sdwis.waterboards.ca.gov/PDWW/) or the California Water Boards' Electronic Data Transfer (EDT) database. McMullin also utilizes groundwater quality data from the American Avenue Landfill is publicly available on the California Water Board's online GeoTracker database as it becomes available. Some GSAs are also utilizing data from the Kings River Water Quality Coalition (KRWQC) under the Irrigated Lands Regulatory Program (ILRP). To date KRWQC has conducted one groundwater monitoring event in 2018 of domestic wells within the GSA where data is publicly available on the GAMA online database. Additional trend analysis as described in the GSP will be performed in subsequent annual reports, as needed, and as sufficient data is collected in time.

4.6 Land Subsidence

As discussed in the GSP, the basin is primarily relying on land subsidence survey information from observation points surveyed by KRCD as part of their land subsidence network. Data was provided from KRCD for measurements taken in April of 2016 and December of 2019. The cumulative elevation change over that more than 3 year period was mapped and is shown in **Figure 4-5**. The observations generally indicate little to no change throughout the basin, with a greater amount of change in the western and southwestern portion of the basin.

Kings Subbasin Coordinated Effort

Water Quality Monitoring Network

Figure 4-4

Legend

- Selected Representative Groundwater Monitoring Wells
- Groundwater Sustainable Agency
- Township/Range

T11S
T12S
T13S
T14S
T15S
T16S
T17S
T18S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Madera Acres, Madera, Chowchilla, Fresno, Clovis, Kerman, Tranquillity, San Joaquin, Raisin City, Caruthers, Selma, Cantua Creek, Five Points, Riverdale, Lemoore, Lemoore Naval Air Station, Hanford, Armona, Tollhouse, Millerton Lake, Friant, Reedley, Orange Cove, Dinuba, Orosi, Cutler, Ivanhoe, Visalia, Farmersville, Exeter

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Sources: Esri, USGS, NOAA

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Kings Subbasin

Land Subsidence Monitoring
Apr 2016- Dec 2019

Figure 4-5

Kings Subbasin GSAs

Kings Subbasin (2019)

Subsidence Monitoring Location

Elevation Changes from Apr 2016 to Dec 2019 (ft)

- 0.01 to 0.66
- -0.24 to 0.00
- -0.49 to -0.25
- -0.99 to -0.50
- -1.24 to -1.00
- -1.49 to -1.25
- -1.60 to -1.50
- No Data

Millerton Reservoir

Pine Flat Reservoir

San Joaquin River

Kings River

NORTH KINGS GSA

SOUTH KINGS GSA

McMULLIN AREA GSA

JAMES GSA

CENTRAL KINGS GSA

KINGS RIVER EAST GSA

NORTH FORK KINGS GSA

SUB031 SUB048 SUB067 SUB049 SUB044 SUB025 SUB051 SUB077 SUB056 SUB015 SUB079 SUB069 SUB082 SUB043 SUB103 SUB054 SUB052 SUB080 SUB010 SUB033 SUB019 SUB085 SUB058 SUB006 SUB014 SUB009 SUB064 SUB088 SUB041 SUB060 SUB073 SUB072 SUB017 SUB057 SUB097 SUB094 SUB042 SUB039 SUB084 SUB040 SUB021 SUB070 SUB092 SUB086 SUB029 SUB089 SUB032 SUB016 SUB068 SUB026 SUB022

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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4.7 Surface to Groundwater Interconnection

The Kings Subbasin GSAs have established a groundwater level monitoring network with an adequate density and which includes wells near the rivers that will be monitored to better understand potential surface to groundwater interconnections issues.

The Kings Subbasin Hydrographs presented in **Appendix C** indicate that groundwater near Kings River wells had declining groundwater levels during the drought period until approximately spring of 2016 when groundwater levels rose until 2018, corresponding with the wet time period at the end of the drought.

5 Monitoring Network

This is the first annual report following just a few months after completion of the GSPs within the basin, so there are no changes to the monitoring network at this time. GSAs have identified different data gaps within their GSPs that they intend to fill, likely modifying the monitoring network for the basin. If monitoring networks or protocols are changed, future annual reports will discuss those changes in this section.

6 Groundwater Projects and Management Actions Status

> 356.2(b) (5) (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.

The GSAs within the Kings Basin finalized their GSPs in late 2019 and submitted to DWR in January 2020 and are just beginning to implement their GSPs. Each of the GSAs includes a number of planned and possible projects and management actions to be implemented. Initial implementation work at this time includes project development and design, gathering of information to fill data gaps including well construction information, as well as continued stakeholder outreach and engagement. Most recently, on February 24, 2020, the GSAs helped conduct the third Kings Basin-wide GSP Community Workshop for Residents on Private Wells and Rural Communities coordinated by Self-Help Enterprises and KRCD in the community of Easton. This section will include a summary of implementation actions in future annual reports.

7 References

California Department of Water Resources, *California Water Plan Update – 2018*, Bulletin 160-18, 2019.

California Department of Water Resources, *Effective Precipitation - A Field Study to Assess Consumptive Use of Winter Rains by Spring and Summer Crops*, February 1989.

Cal Poly Irrigation Training and Research Center, "*Irrigation Water Balance Fundamentals*", USCID Conference on Benchmarking Irrigation System Performance Using Water Measurement and Water Balances, San Luis Obispo, March 10, 1999.

Appendix A – Water Supply Data

Kings Groundwater Basin
Groundwater Extractions

Basin Number	Water Year	Total Groundwater Extractions (AF)	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)[1]	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	1,061,594	156,073	0	897,723	0	381,436	0	7,798	-

Kings Groundwater Basin
Groundwater Extraction Methods

Basin Number	Water Year	Meters Volume (AF)	Meters Description	Meters Type	Meters Accuracy (%)	Meters Accuracy Description	Electrical Records Volume (AF)	Electrical Records Description	Electrical Records Type	Electrical Records Accuracy (%)	Electrical Records Accuracy Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	123,987	Flow meters	Direct	0-5%	Typical accuracy for propeller and magnetic meters	0	-	-	-	-

Basin Number	Water Year	Land Use Volume (AF)	Land Use Description	Land Use Type	Land Use Accuracy (%)	Land Use Accuracy Description	Groundwater Model Volume (AF)	Groundwater Model Description	Groundwater Model Type	Groundwater Model Accuracy (%)	Groundwater Model Accuracy Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	892,307	Calculated pumping from crop water demands minus surface water deliveries	Estimate	10-20%	Based on accuracy of Crop evapotranspiration estimates	0	-	-	-	-

Basin Number	Water Year	Other Method(s) Volume (AF)	Other Method(s) Description	Other Method(s) Type	Other Method(s) Accuracy (%)	Other Method(s) Accuracy Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	45,300	Rural domestic pumping estimated based on vegetated area and standard indoor use	Estimate	10-20%	Accuracy based on professional judgement

Kings Groundwater Basin
Surface Water

Basin Number	Water Year	Methods Used To Determine	Water Source Type Central Valley Project (AF)	Water Source Type State Water Project (AF)	Water Source Type Colorado River Project (AF)	Water Source Type Local Supplies - Kings River (AF)	Water Source Type Local Imported Supplies (AF)	Water Source Type Recycled Water (AF)	Water Source Type Desalination (AF)	Water Source Type Other (AF)	Water Source Type Other Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	Flumes and water meters	119,759	0	0	1,478,650	0	581	0	40,172	

Kings Groundwater Basin
Total Water Supply

Basin Number	Water Year	Total Water Use (AF)	Methods Used To Determine	Water Source Type Groundwater (AF)	Water Source Type Surface Water (AF)	Water Source Type Recycled Water (AF)	Water Source Type Reused Water (AF)	Water Source Type Other (AF)	Water Source Type Other Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	2,700,756	Sum of all water supplies	1,061,594	1,598,409	581	0	40,172	Riparian water diversions

Basin Number	Water Year	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)[1]	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
5-022.08	2019 (Oct. 2018 - Sept. 2019)	232,745	0	2,078,777	0	381,436	0	7,798	-

Appendix B – Groundwater Level Data

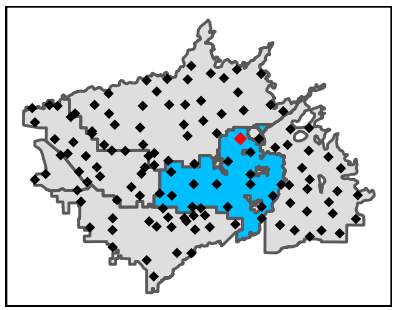
Unique Well ID	Local Well ID	GSA	DTW Sp. 18	WSE Sp. 18	DTW Fall 18	WSE Fall 18	DTW Sp. 19	WSE Sp. 2019
CID06	6	Central Kings GSA	48.4	294.0	57.4	285.0	59.0	283.4
CID12	12	Central Kings GSA	54.7	286.3	58.3	282.7	54.7	286.3
CID16	16	Central Kings GSA	73.2	245.6	73.6	245.2	72.0	246.8
CID28	28	Central Kings GSA						
CID31	31	Central Kings GSA	50.8	275.8	52.2	274.4	49.9	276.6
CID32	32	Central Kings GSA	57.9	259.7	58.4	259.2	56.2	261.4
CID41	41	Central Kings GSA	27.1	262.9	25.0	265.0	26.4	263.6
CID48	48	Central Kings GSA	141.6	95.9	143.3	94.2	139.9	97.6
CID56	56	Central Kings GSA	166.7	81.7	170.6	77.8	166.5	81.9
CID62	62	Central Kings GSA						
CID65	65	Central Kings GSA	64.2	230.9	65.1	230.1	67.1	228.1
CID67	67	Central Kings GSA	109.6	156.8	111.4	155.0	108.9	157.5
CID74	74	Central Kings GSA	132.5	121.3	136.0	117.8	131.3	122.4
1010034-002	1010034-002	James ID					109.5	63.1
15S16E28A003M		James ID	92.8	75.7	95.0	76.1	92.5	78.6
15S16E29N001M	Horn	James ID	101.7	71.8				
16S17E04P001M	D12	James ID	168.0	7.0	171.2	3.8	162.4	12.6
366502N1201782W001	C65	James ID	114.5	53.3	118.8	49.0	107.8	60.0
14S24E17C001MX	17C1	Kings River East GSA	16.1	448.7	15.0	447.9	14.3	448.6
15S24E11A001MX	11A1	Kings River East GSA	17.7	412.8	19.6	410.4	9.3	420.7
15S25E19A001MX	19A1	Kings River East GSA	51.5	407.8	49.3	409.3	45.2	413.4
16S25E10J001MX	10J1	Kings River East GSA	57.7	365.0	65.4	357.2	57.1	365.5
364425N1193860W001	143	Kings River East GSA	62.1	230.6	62.2	230.5		
365283N1194482W001	80	Kings River East GSA	70.7	246.0	73.8	242.8		
366767N1194568W001	4A	Kings River East GSA	50.2	311.3	51.7	310.8		
B013B	B013B	Kings River East GSA	14.9	375.9			15.1	375.6
I045A	I045A	Kings River East GSA	65.8	337.1	70.4	332.5	60.6	342.3
I055A	I055A	Kings River East GSA	81.1	284.5	93.9	271.7	81.1	284.5
I073A	I073A	Kings River East GSA	62.6	274.0	65.1	271.5		
KRWD04	KRWD04	Kings River East GSA	19.0	318.3	19.0	318.3	17.0	320.3
M065A	M065A	Kings River East GSA	86.5	274.7			89.8	271.4
M105A	M105A	Kings River East GSA						
M130B	M130B	Kings River East GSA	82.8	235.8	85.5	233.1	82.3	236.2
O123A	O123A	Kings River East GSA	54.2	298.5	55.5	297.2	59.7	293.0
T136A	T136A	Kings River East GSA						
T139A	T139A	Kings River East GSA	69.3	316.1	79.2	306.1	70.0	315.4
W172A	W172A	Kings River East GSA	70.3	222.4	68.2	224.4		
X156A	X156A	Kings River East GSA	60.2	286.6	59.9	286.9	62.1	284.7

Unique Well ID	Local Well ID	GSA	DTW Sp. 18	WSE Sp. 18	DTW Fall 18	WSE Fall 18	DTW Sp. 19	WSE Sp. 2019
X176A	X176A	Kings River East GSA	105.3	185.4			107.0	183.4
X213A	X213A	Kings River East GSA						
X234B	X234B	Kings River East GSA	93.6	234.2	99.1	228.6		
15S18E02A001MX	FD02A1	McMullin Area GSA						
365463N1199268W001	16S19E17C001M	McMullin Area GSA						
365963N1200529W001	15S18E30L001M	McMullin Area GSA					228.7	-33.3
366082N1201199W001	15S17E21J001M	McMullin Area GSA			216.2	-21.7	205.4	-10.9
366188N1199104W001	15S19E21C003M	McMullin Area GSA						
366196N1200632W001	15S17E13R002M	McMullin Area GSA			198.8	-16.2	179.4	3.2
367477N1201460W001	FD5D1	McMullin Area GSA						
367705N1202691W001	13S16E30L003M	McMullin Area GSA	117.0	60.4				
367757N1201874W001	13S16E26A001M	McMullin Area GSA	71.0	122.4			67.5	125.9
367782N1202141W001	13S16E27C001M	McMullin Area GSA	57.0	131.4	79.0	109.4	53.0	135.4
A01	A01	McMullin Area GSA	109.0	53.6	132.0	30.6	113.5	48.3
A07	A07	McMullin Area GSA	87.0	83.8	86.0	84.8	75.0	94.4
A17	A17	McMullin Area GSA	140.0	70.8	146.0	64.8	138.0	72.1
A20	A20	McMullin Area GSA						
A23	A23	McMullin Area GSA	176.0	15.1			176.5	12.5
A24	A24	McMullin Area GSA	134.0	41.3	140.0	35.3	130.5	42.8
A30	A30	McMullin Area GSA	213.0	-32.8	215.2	-35.0	197.5	-19.6
A34	A34	McMullin Area GSA	163.0	53.3	167.0	49.3	156.0	59.0
A46	A46	McMullin Area GSA	125.0	115.2	150.0	90.2		
A51	A51	McMullin Area GSA	189.0	40.8	193.0	36.8	180.0	48.5
A53	A53	McMullin Area GSA	242.0	-29.0	235.0	-22.0	229.0	-17.9
A58	A58	McMullin Area GSA			238.0	-43.2	233.0	-40.6
A62	A62	McMullin Area GSA	183.0	55.1	194.0	44.1	181.5	54.8
364002N1197624W001	18S20E02A001M	North Fork Kings GSA	165.0	77.8	172.0	70.8		
364591N1200135W001	17S18E09R001M	North Fork Kings GSA	219.0	-21.2				
364603N1197510W001	17S20E12Q001M	North Fork Kings GSA	146.2	96.5			142.2	100.5
364667N1197041W001	17S21E09M001M	North Fork Kings GSA	123.2	129.5	130.5	122.2	121.1	131.6
364668N1198257W001	17S20E08L001M	North Fork Kings GSA	178.2	54.5	193.2	39.5	171.2	61.5
364682N1198732W001	17S19E11H001M	North Fork Kings GSA					192.9	29.8
364739N1196227W001	17S22E07A001M	North Fork Kings GSA			110.0	162.7		
364813N1198968W001	17S19E03L001M	North Fork Kings GSA	218.5	1.5	201.6	18.4	191.2	28.8
364816N1197785W001	17S20E02M001M	North Fork Kings GSA						
364893N1200127W001	16S18E33Q001M	North Fork Kings GSA			244.0	-45.3		
364916N1198366W001	16S20E31P001M	North Fork Kings GSA			200.0	37.7	201.3	36.4
364960N1197554W001	16S20E35J001M	North Fork Kings GSA	143.5	106.2			143.4	106.3

Unique Well ID	Local Well ID	GSA	DTW Sp. 18	WSE Sp. 18	DTW Fall 18	WSE Fall 18	DTW Sp. 19	WSE Sp. 2019
364967N1197193W001	16S21E31J001M	North Fork Kings GSA	134.0	123.7	146.2	111.5	137.2	120.5
365143N1198529W001	16S19E25B001M	North Fork Kings GSA	216.9	19.8			184.9	51.8
365150N1197327W001	16S21E30C001M	North Fork Kings GSA	130.6	127.1	133.4	124.3	130.3	127.4
B06	B06	North Fork Kings GSA	182.0	0.7	183.0	-0.3		
B22	B22	North Fork Kings GSA	202.5	-3.3	208.0	-8.8		
B31	B31	North Fork Kings GSA	189.5	18.5				
CID51	KRCDCID051	North Fork Kings GSA	147.7	95.8	147.3	96.2	147.3	96.2
LID14	LID14	North Fork Kings GSA	151.0	84.9	181.0	54.9	155.0	80.9
LID21	LID21	North Fork Kings GSA	147.0	80.7	164.0	63.7	155.0	72.7
LID25	LID25	North Fork Kings GSA	171.0	41.9	174.0	38.9	174.0	38.9
LID26	LID26	North Fork Kings GSA	172.0	41.9	200.0	13.9	172.0	41.9
12S19E33P001MX	FC160	North Kings GSA	99.8	201.1	103.6	197.3	100.7	200.2
12S19E36J001MX	FC091	North Kings GSA	153.4	178.4	152.3	179.5	152.0	179.8
12S20E23D001MX	FC295	North Kings GSA						
12S20E34K001MX	FC092	North Kings GSA	161.9	198.2	170.5	189.6	165.3	194.8
12S21E29K001M	FC29K1	North Kings GSA	77.6	303.9	77.0	304.5	80.2	301.3
12S21E34H001M	FC34H1	North Kings GSA	61.8	330.7	61.5	331.0	61.0	331.5
12S22E19N001M	FC19N1	North Kings GSA	31.1	409.5	35.5	405.1	55.3	385.3
12S22E26L001M	FC26L1	North Kings GSA	22.7	464.9				
13S17E25C001MX	FD25C1	North Kings GSA	84.1	147.8	85.1	146.8	84.1	147.8
13S17E33M001MX	FD32H1	North Kings GSA	111.4	98.7	112.9	97.2	107.4	102.7
13S18E17A001MX	FD17A1	North Kings GSA					65.0	188.2
13S18E33M001MX	FD32J1	North Kings GSA	84.5	152.8	79.5	158.8	81.5	155.8
13S19E11L001MX	FC035	North Kings GSA	119.8	184.9	121.8	182.9	120.9	183.8
13S19E29A001MX	FD29A1	North Kings GSA	89.7	177.2	90.7	176.2	86.7	180.2
13S20E27C001MX	FC069	North Kings GSA	133.6	176.5	132.7	177.4	128.6	181.5
13S20E30B001MX	FC074	North Kings GSA	121.0	183.0	122.0	182.0	120.9	183.1
13S21E19E001MX	FC080	North Kings GSA	142.9	191.9	139.2	195.6	130.0	204.8
13S22E07R001MX	FD07R1	North Kings GSA	59.0	332.6	59.5	332.1	58.5	333.1
13S22E32A001MX	FD32A1	North Kings GSA	50.2	320.6	55.7	315.1	49.7	321.1
13S23E30B001MX	FD30B1	North Kings GSA	13.2	397.6	8.2	402.6	6.7	404.1
13S23E33B001MX	FD33B1	North Kings GSA	14.4	417.4	12.9	418.9	10.9	420.9
14S18E09H001MX	FD09H1	North Kings GSA	93.2	143.1	91.2	145.1	92.2	144.1
14S18E32D001MX	FD32D1	North Kings GSA						
14S19E17C001MX	FD17C1	North Kings GSA	90.9	158.9	92.9	156.9	92.4	157.4
14S19E33D001MX	FD33D1	North Kings GSA	74.5	165.0	87.5	152.0	80.0	159.5
14S20E10M001MX	FC003	North Kings GSA	106.1	185.3	104.1	187.3	101.0	190.4
14S20E22J001MX	FC040	North Kings GSA						

Unique Well ID	Local Well ID	GSA	DTW Sp. 18	WSE Sp. 18	DTW Fall 18	WSE Fall 18	DTW Sp. 19	WSE Sp. 2019
14S21E06Q001MX	FC077	North Kings GSA	112.9	196.6	110.3	199.3	113.7	195.9
14S21E22D001MX	FD22D1	North Kings GSA	79.2	238.6			79.7	238.1
15S19E02M001MX	FD03J1	North Kings GSA	111.3	131.6	110.3	132.6		
15S19E14M001MX	FD14M1	North Kings GSA	139.4	101.8	138.4	102.8	137.4	103.8
15S20E07Q001MX	FD07P1	North Kings GSA						
15S20E13E001MX	FD13E2	North Kings GSA	91.4	190.6	91.9	190.1	89.4	192.6
367113N1200785W001	14S17E14J001M	North Kings GSA	149.0	61.5	153.0	57.5	130.0	80.5
367556N1196666W001	13S21E34J002M	North Kings GSA			79.5	261.0	72.1	268.4
CID10	10	South Kings GSA	47.7	318.5	47.4	318.8	48.9	317.3
CID25	25	South Kings GSA	64.3	263.0	65.5	261.8	65.7	261.6
CID34	34	South Kings GSA	57.8	239.0	58.2	238.6	56.8	240.0

Appendix C – Groundwater Monitor Well Hydrographs



CID06

Ground Surface Elevation: 342 ft

Central Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

Measurements

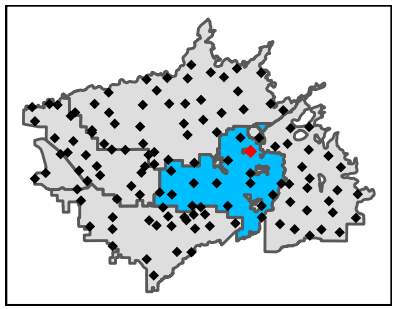
Minimum Threshold

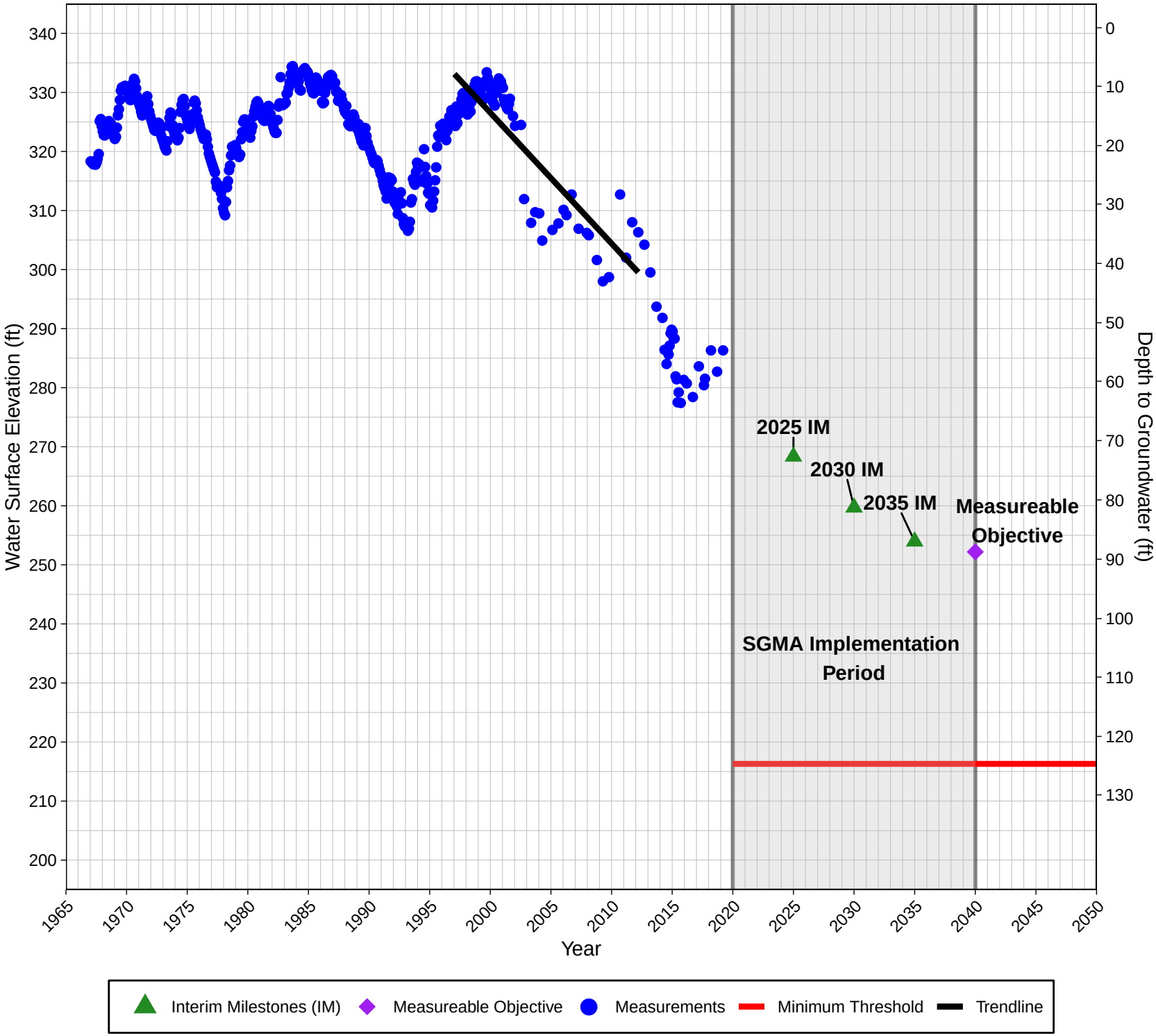
Trendline

CID12

Ground Surface Elevation: 341 ft

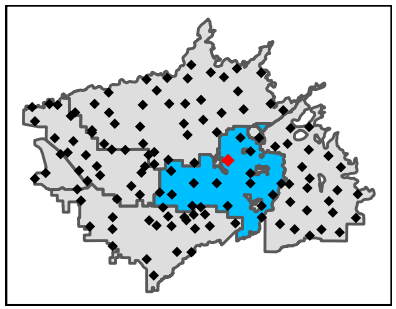
Central Kings GSA

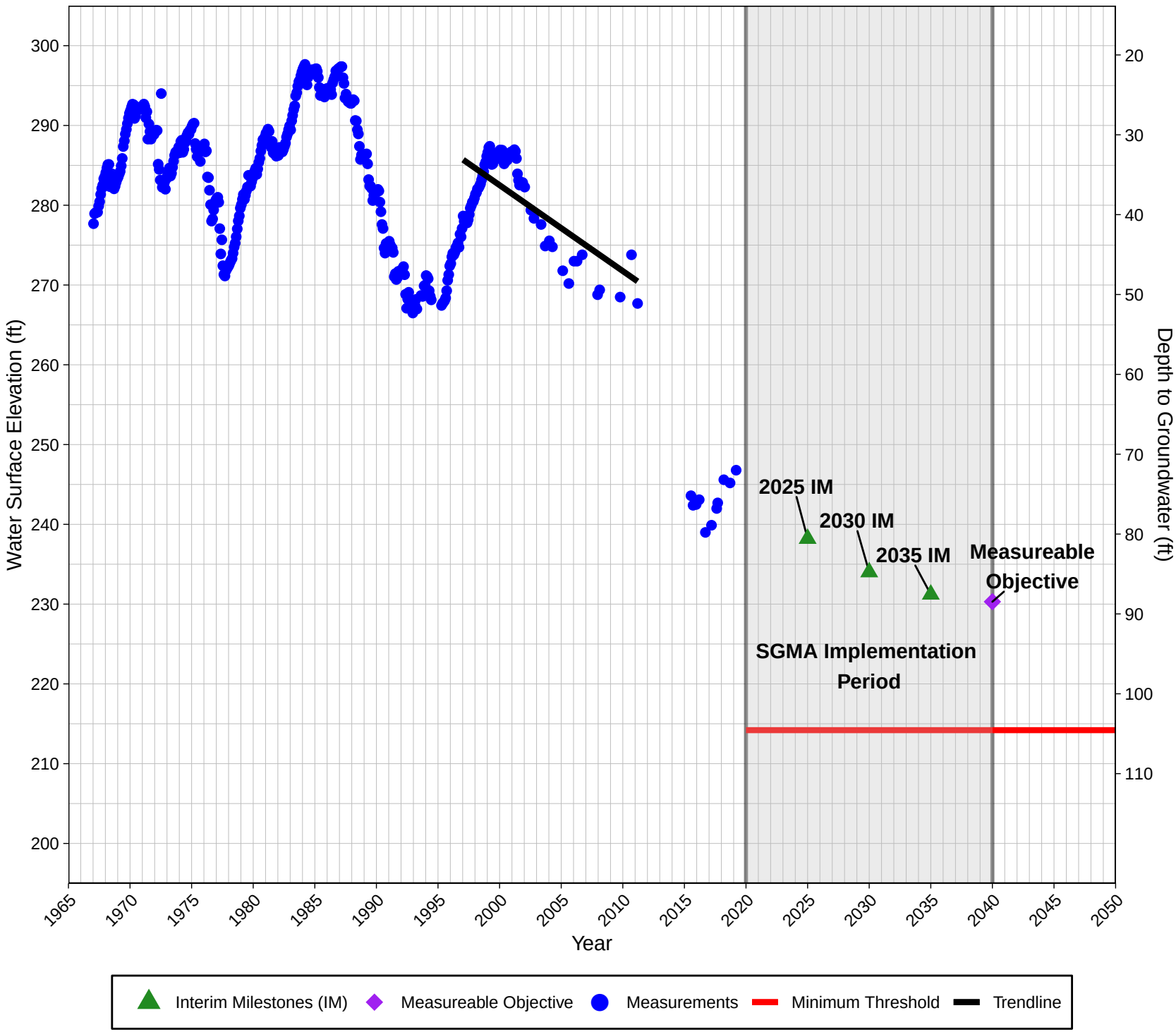




CID16

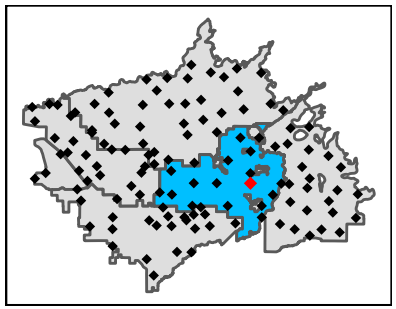
State Well ID: 15S21E14A001M
Ground Surface Elevation: 319 ft
Central Kings GSA

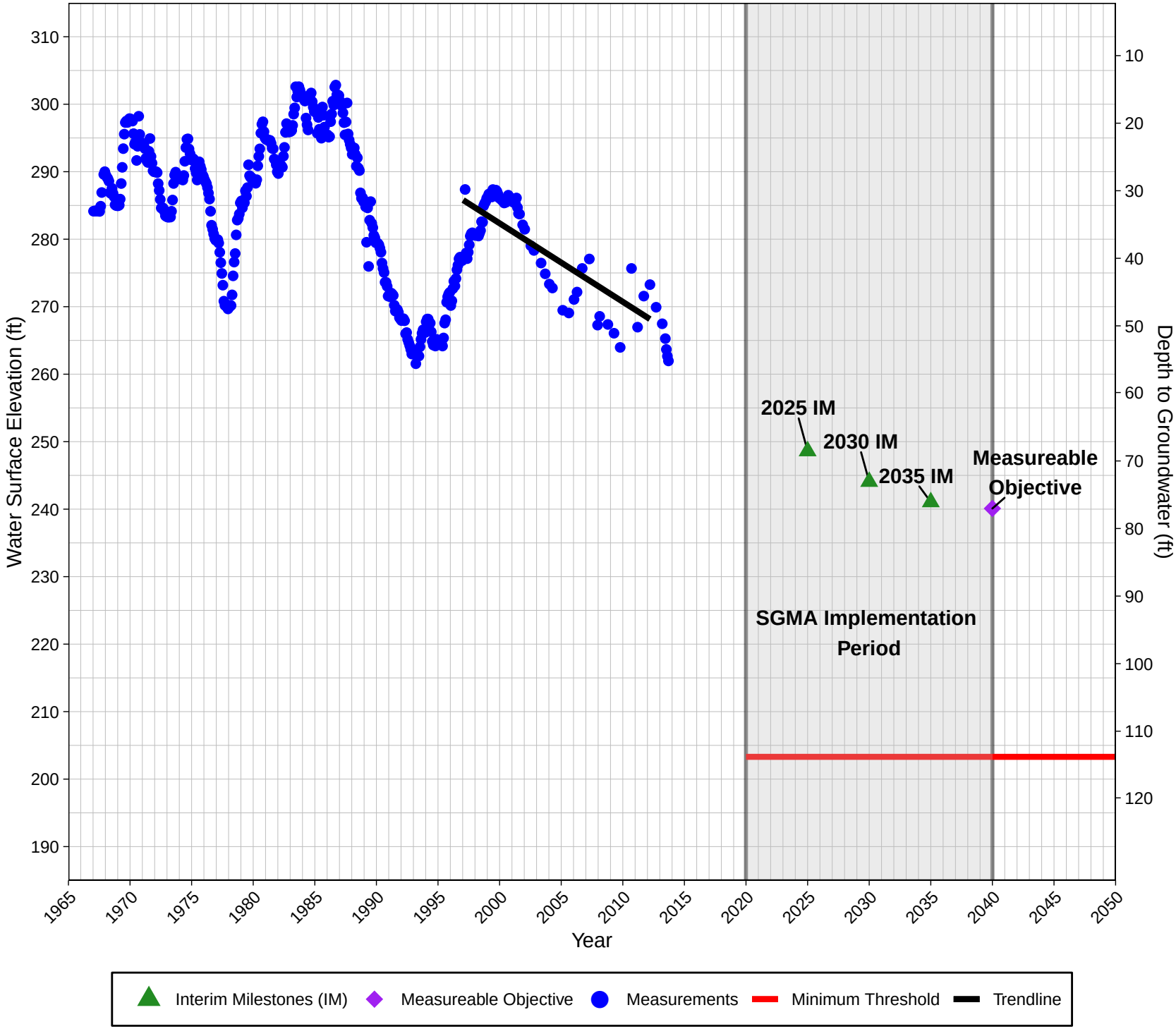




CID28

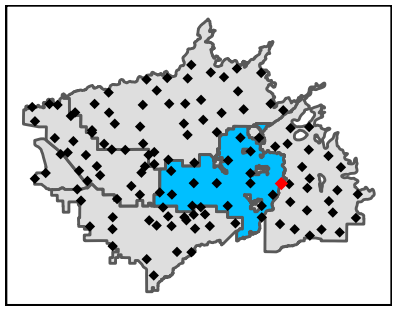
State Well ID: 15S22E33R001M
Ground Surface Elevation: 317 ft
Central Kings GSA

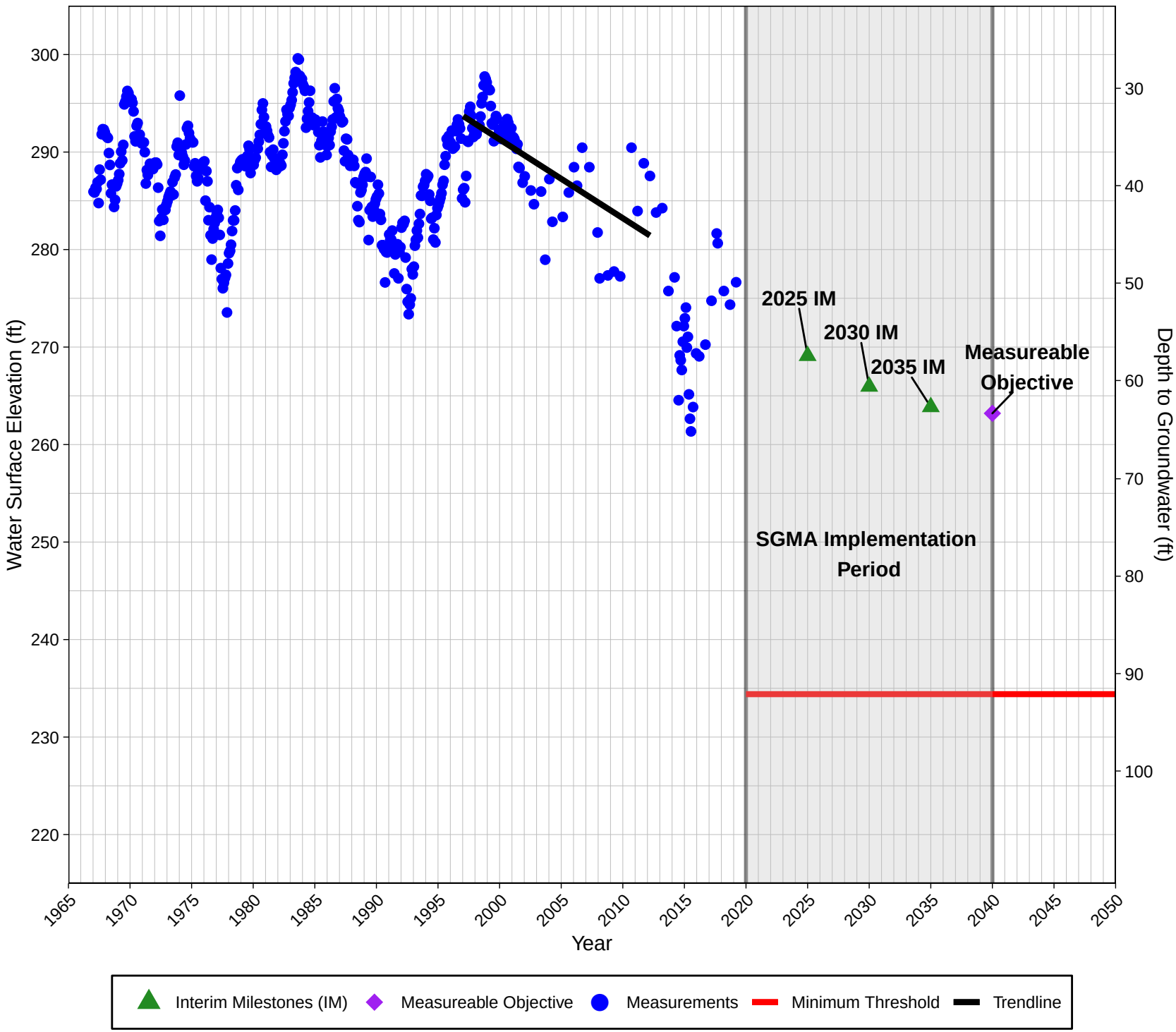




CID31

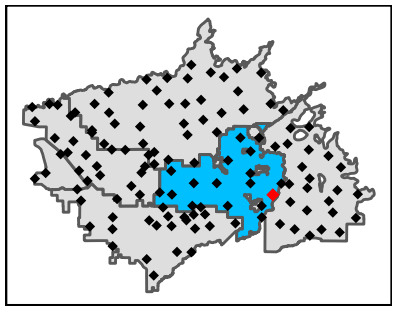
State Well ID: 15S23E33P001M
Ground Surface Elevation: 327 ft
Central Kings GSA

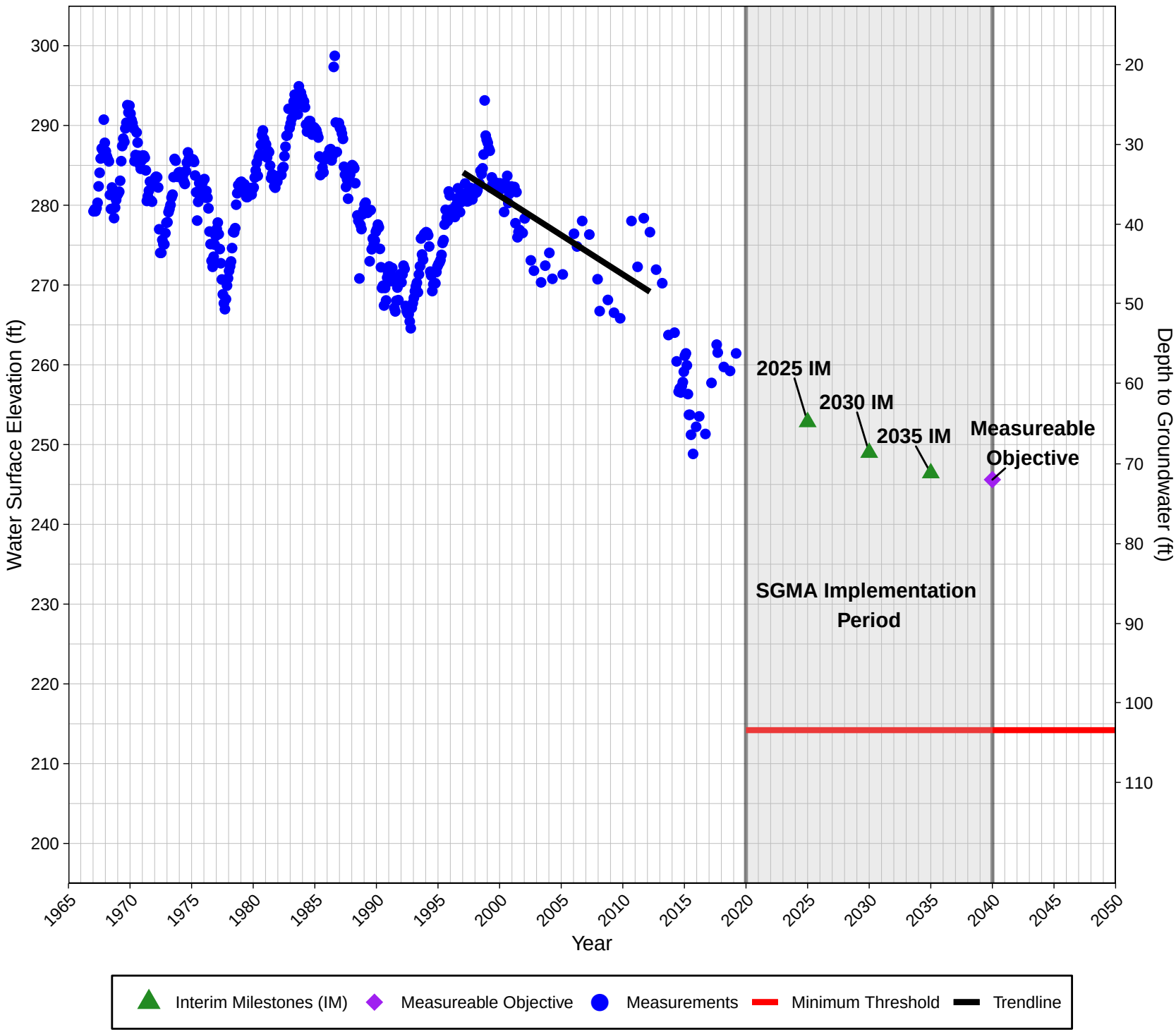




CID32

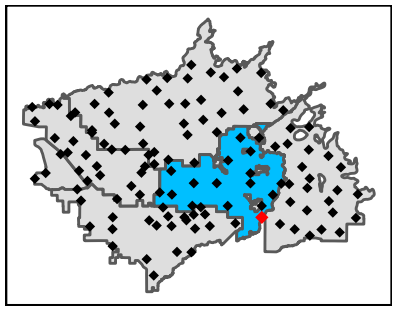
State Well ID: 16S23E18A001M
Ground Surface Elevation: 318 ft
Central Kings GSA

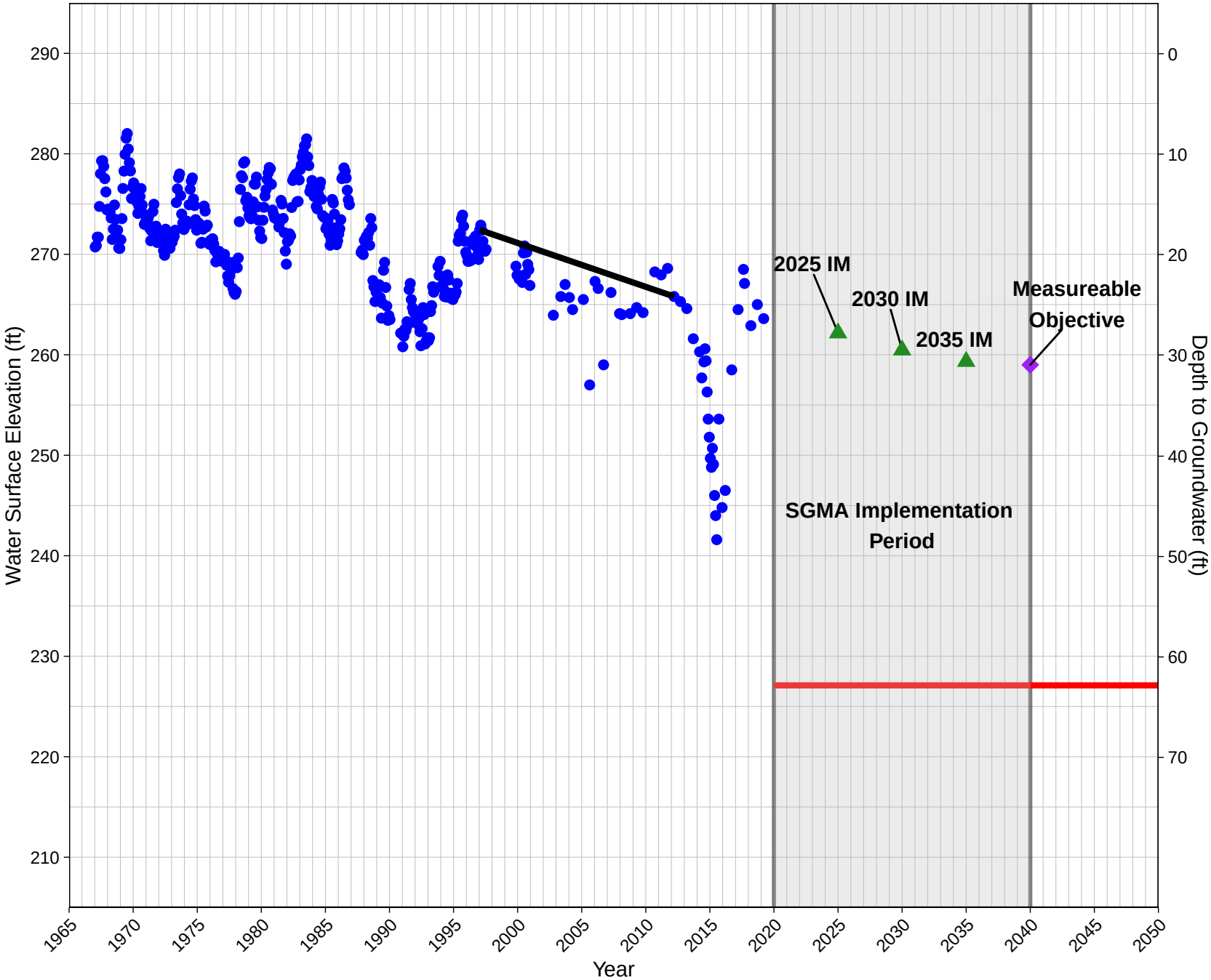


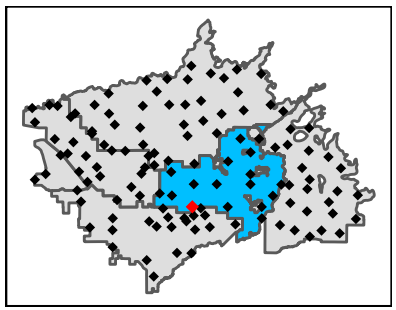


CID41

State Well ID: 17S22E01C001M
Ground Surface Elevation: 290 ft
Central Kings GSA







CID48

Ground Surface Elevation: 238 ft

Central Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

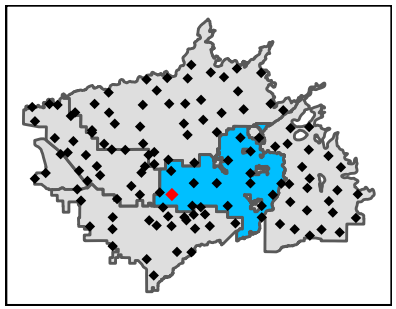
Measurements

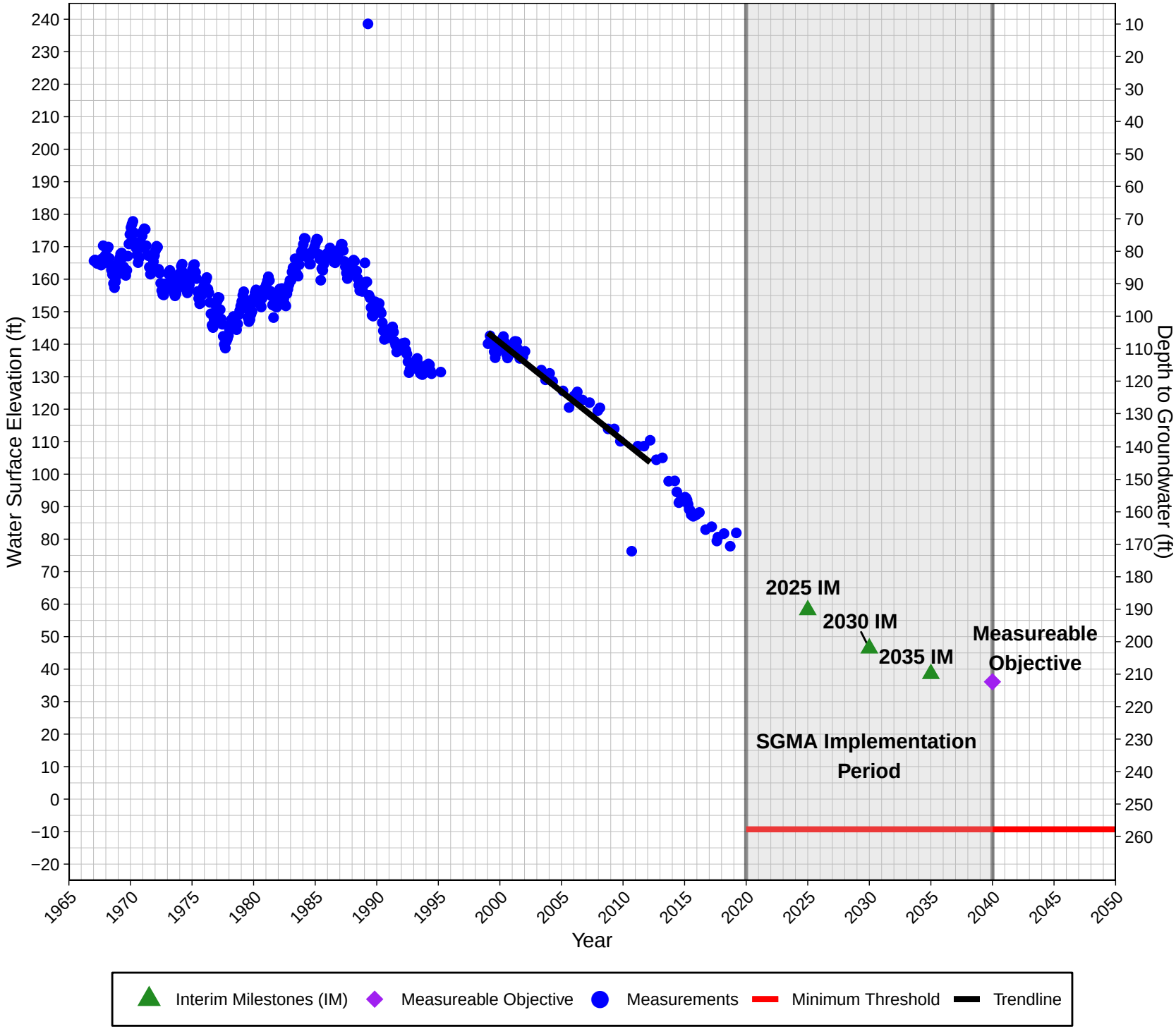
Minimum Threshold

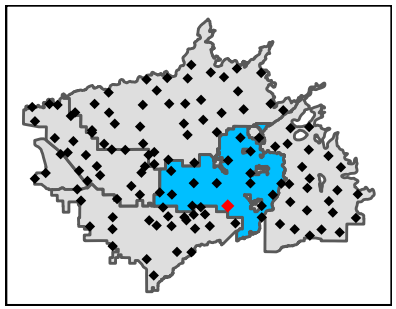
Trendline

CID56

State Well ID: 16S20E18A001M
Ground Surface Elevation: 248 ft
Central Kings GSA







CID62

State Well ID: 16S21E23R001M
Ground Surface Elevation: 279 ft
Central Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

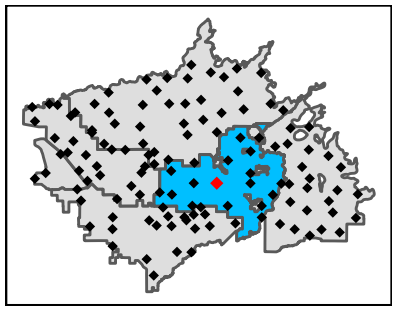
Measureable Objective

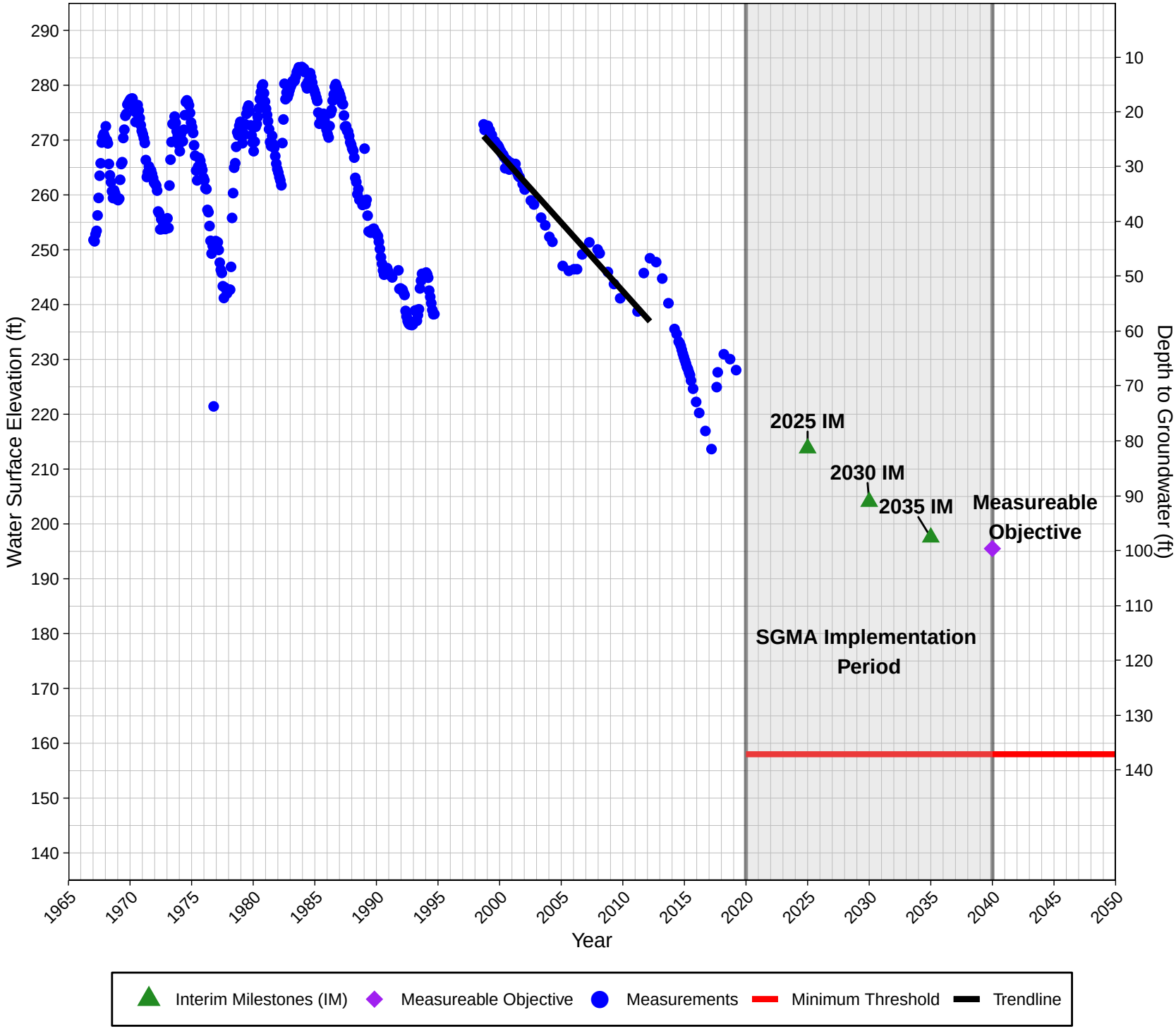
SGMA Implementation Period

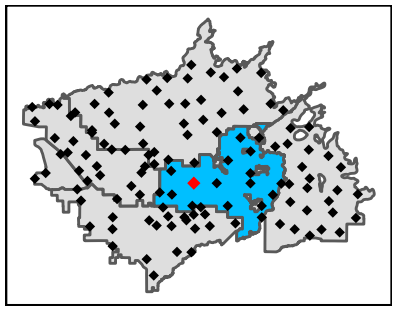
Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

CID65

State Well ID: 15S21E34N001M
Ground Surface Elevation: 295 ft
Central Kings GSA







CID67

Ground Surface Elevation: 266 ft

Central Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

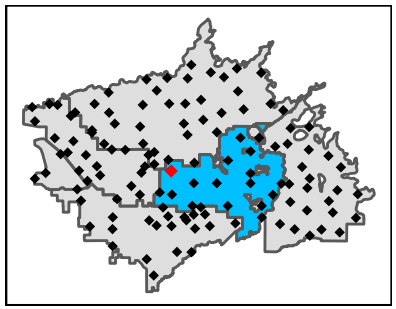
Measurements

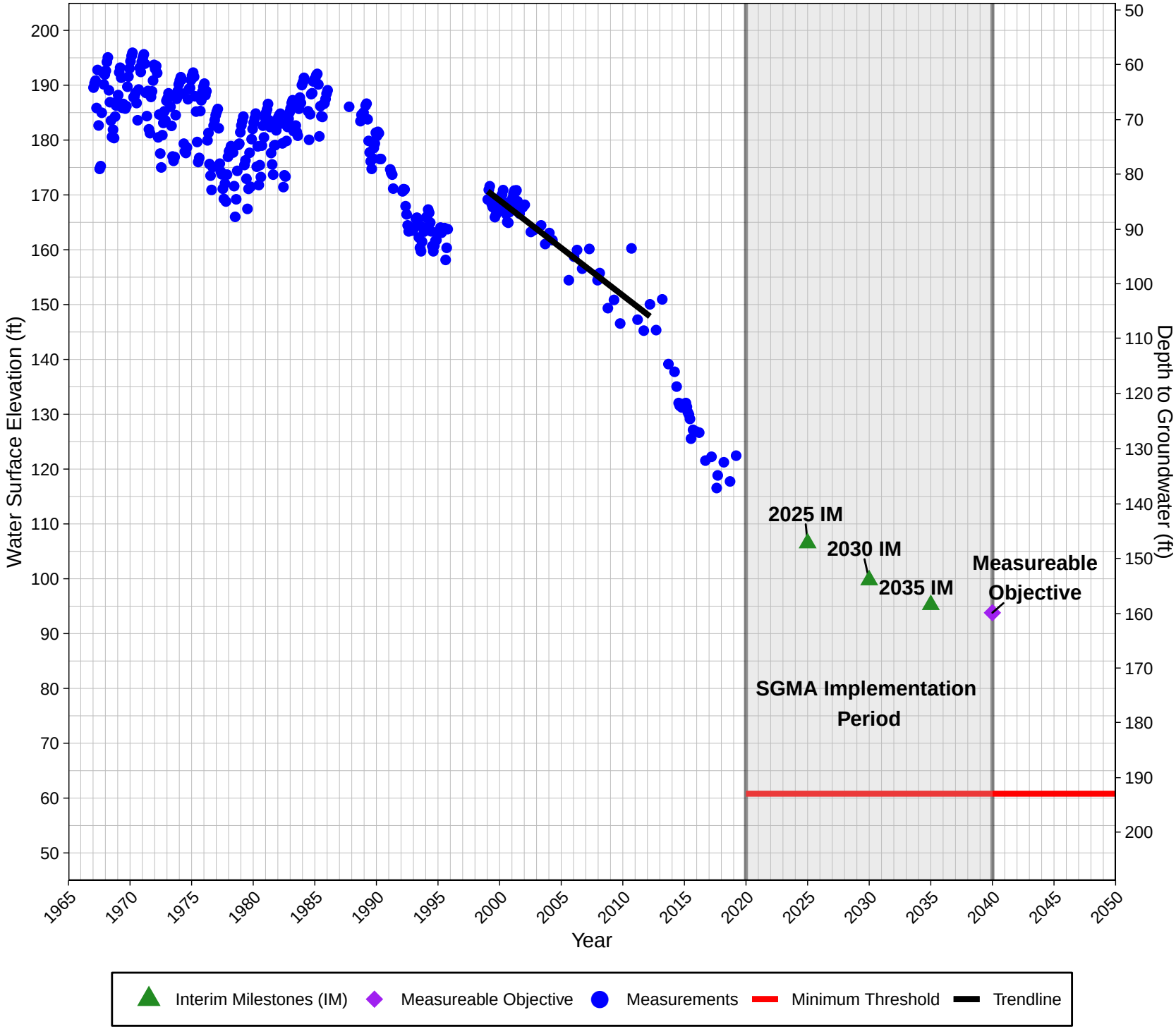
Minimum Threshold

Trendline

CID74

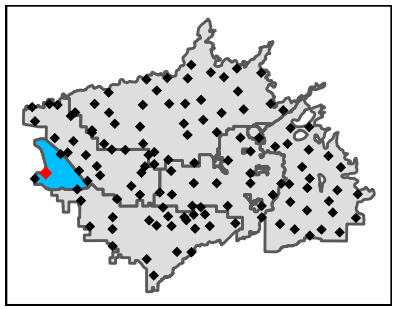
State Well ID: 15S20E19R001M
Ground Surface Elevation: 254 ft
Central Kings GSA

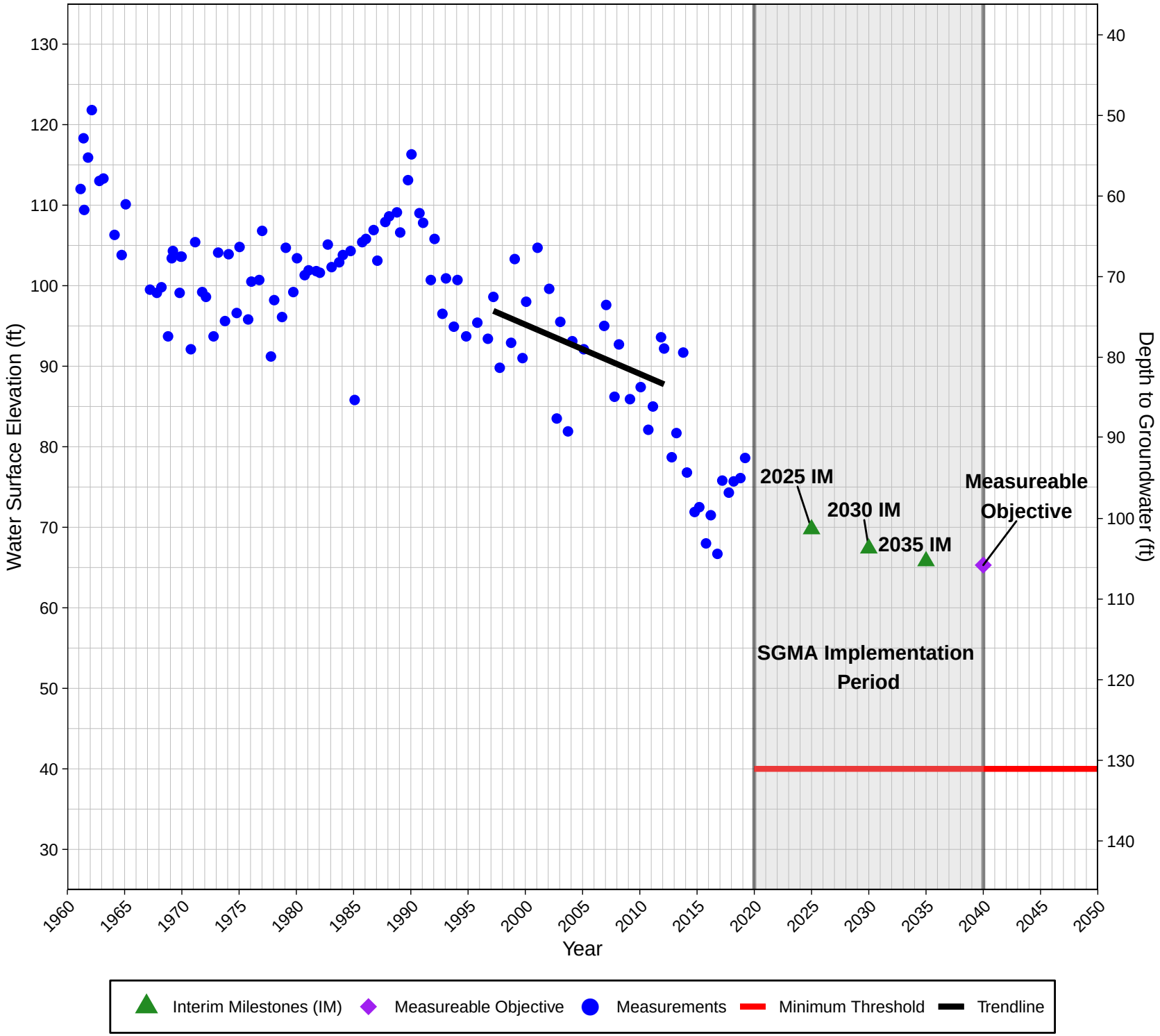




15S16E28A003M

Ground Surface Elevation: 171 ft
James ID

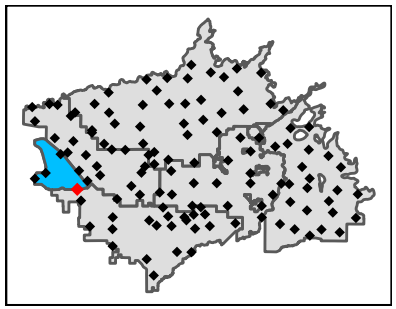


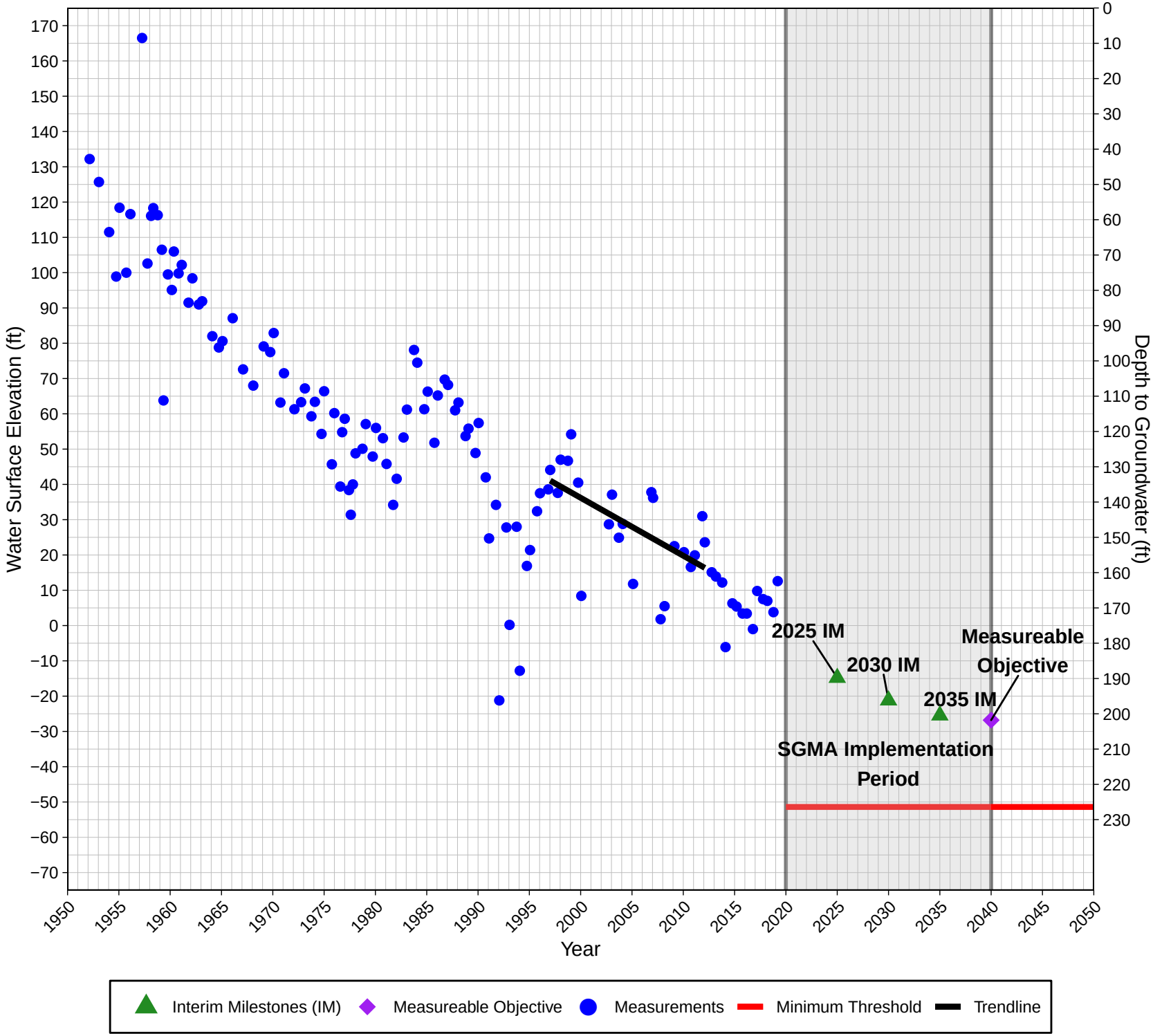


16S17E04P001M

Ground Surface Elevation: 175 ft

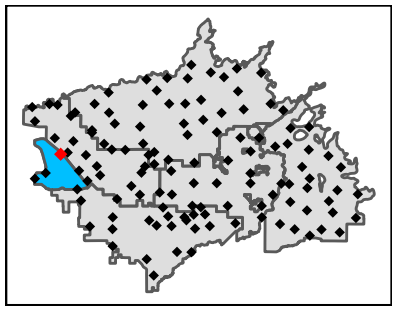
James ID

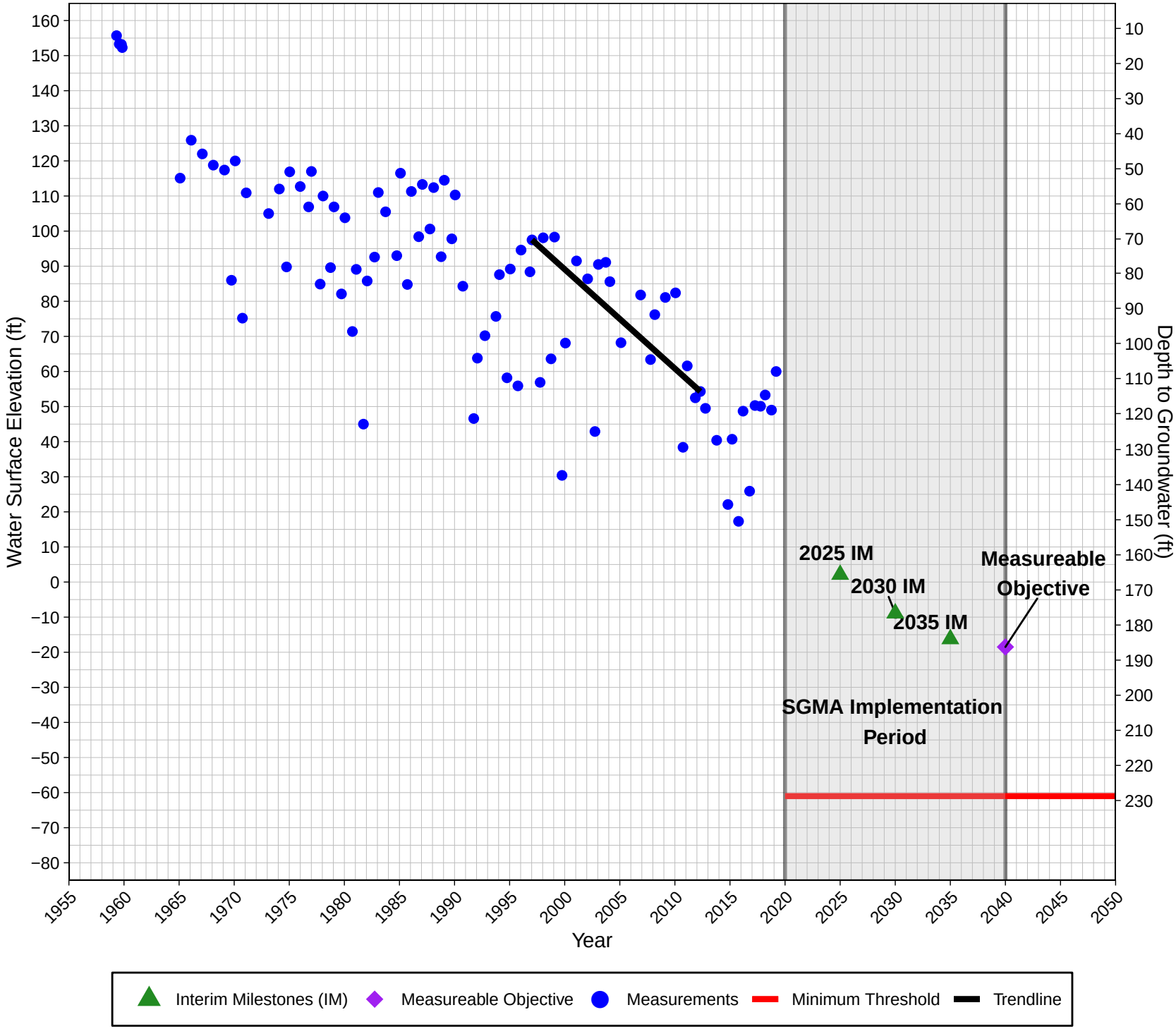


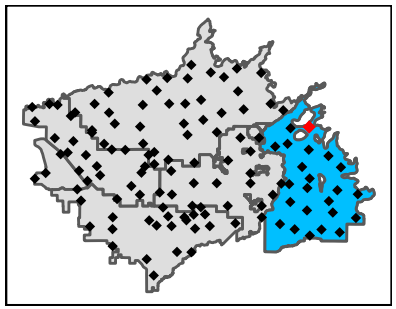


366502N1201782W001

State Well ID: 15S16E01Q002M
Ground Surface Elevation: 168 ft
James ID







14S24E17C001MX

Ground Surface Elevation: 463 ft

Kings River East GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

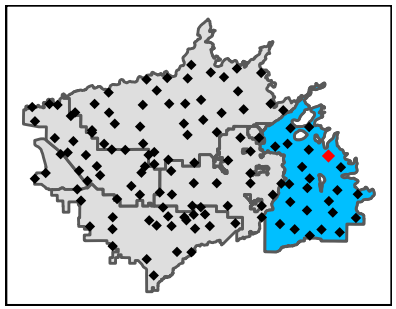
Measurements

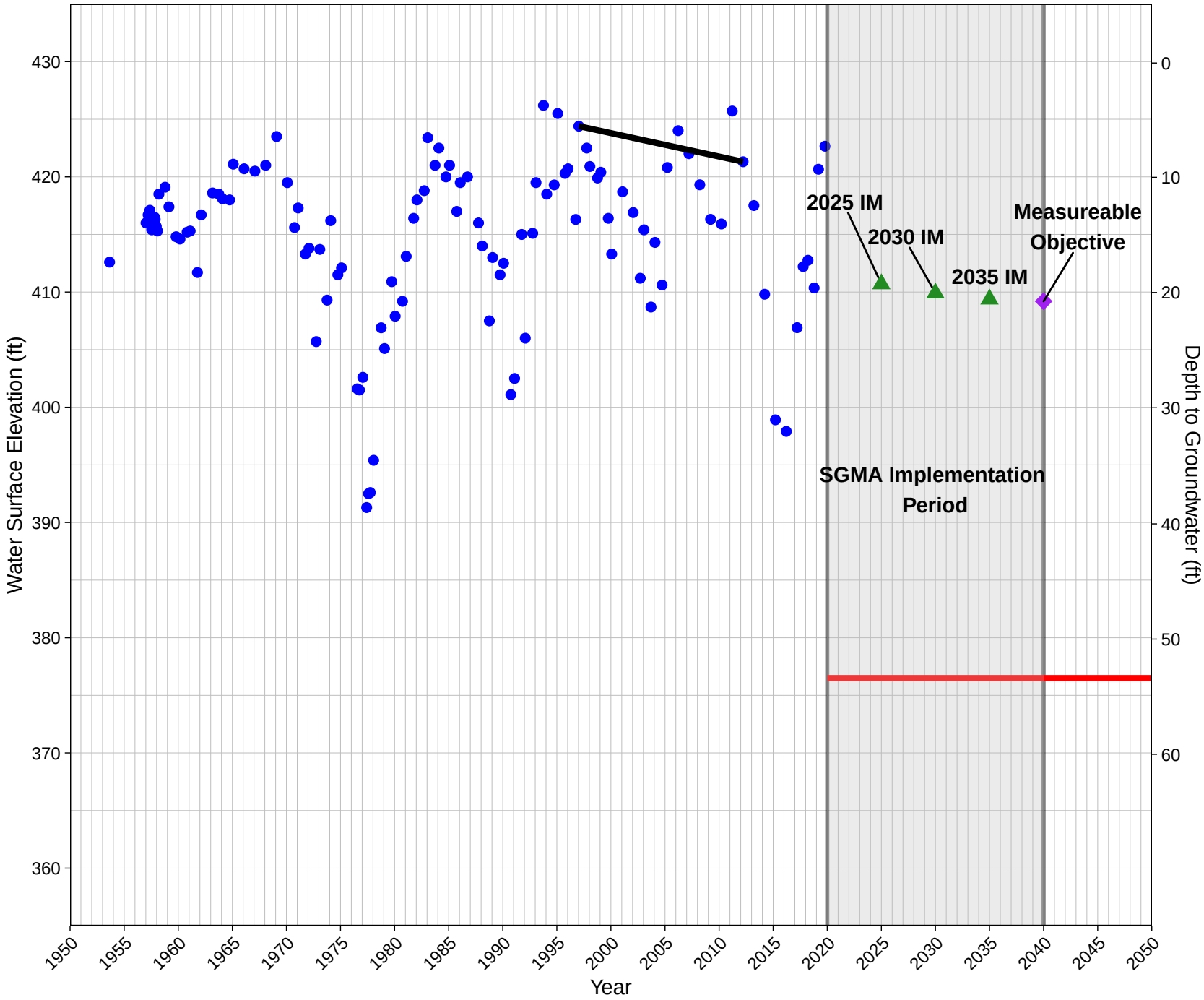
Minimum Threshold

Trendline

15S24E11A001MX

Ground Surface Elevation: 430 ft
Kings River East GSA

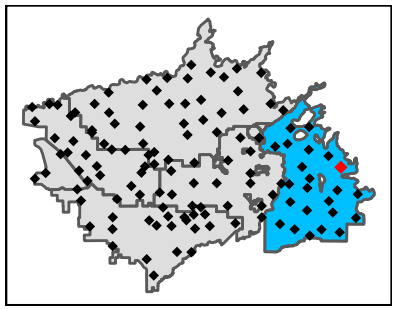


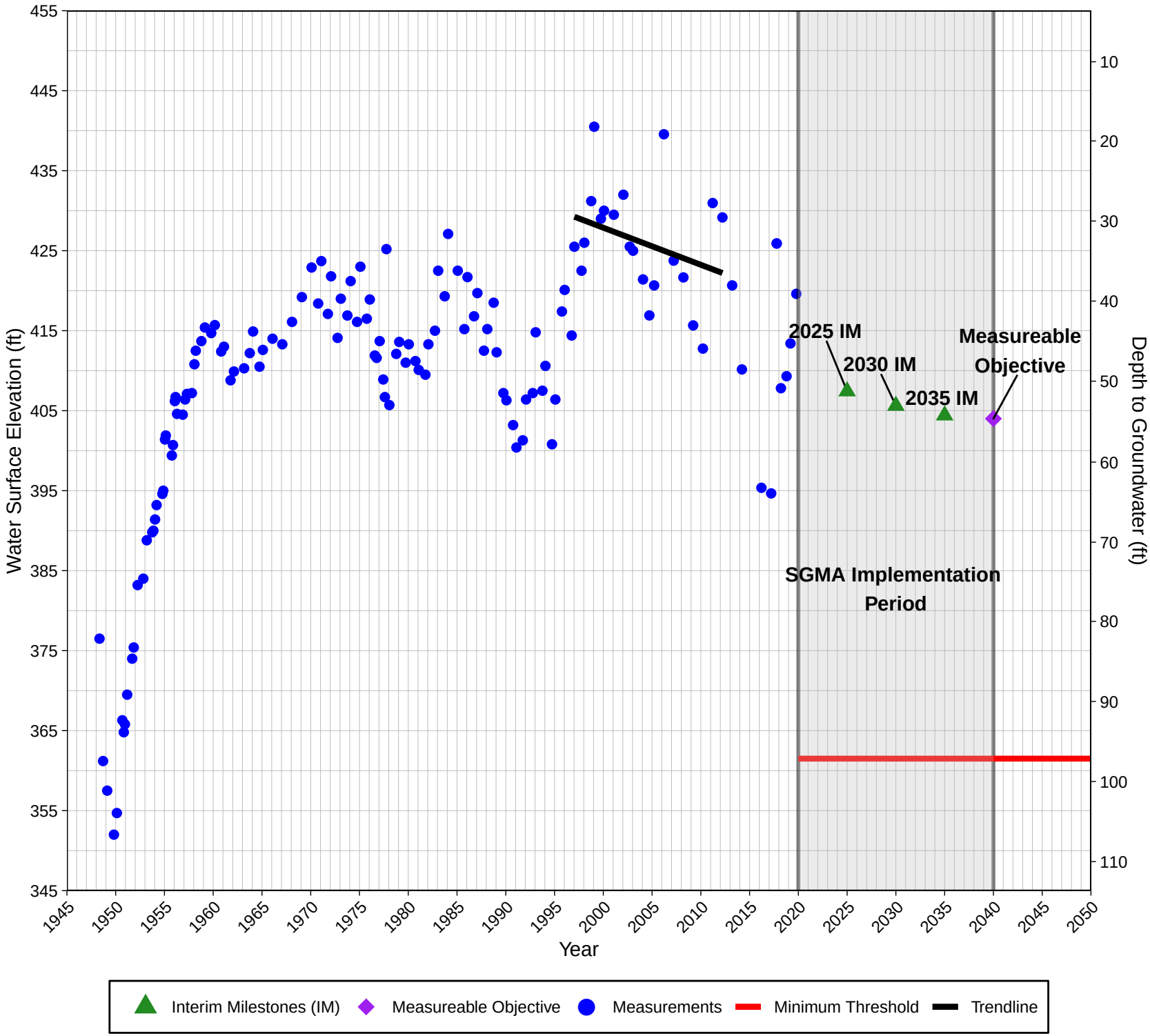


15S25E19A001MX

Ground Surface Elevation: 459 ft

Kings River East GSA

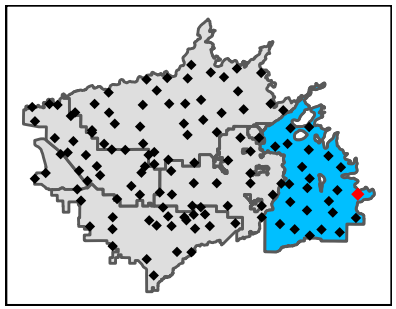


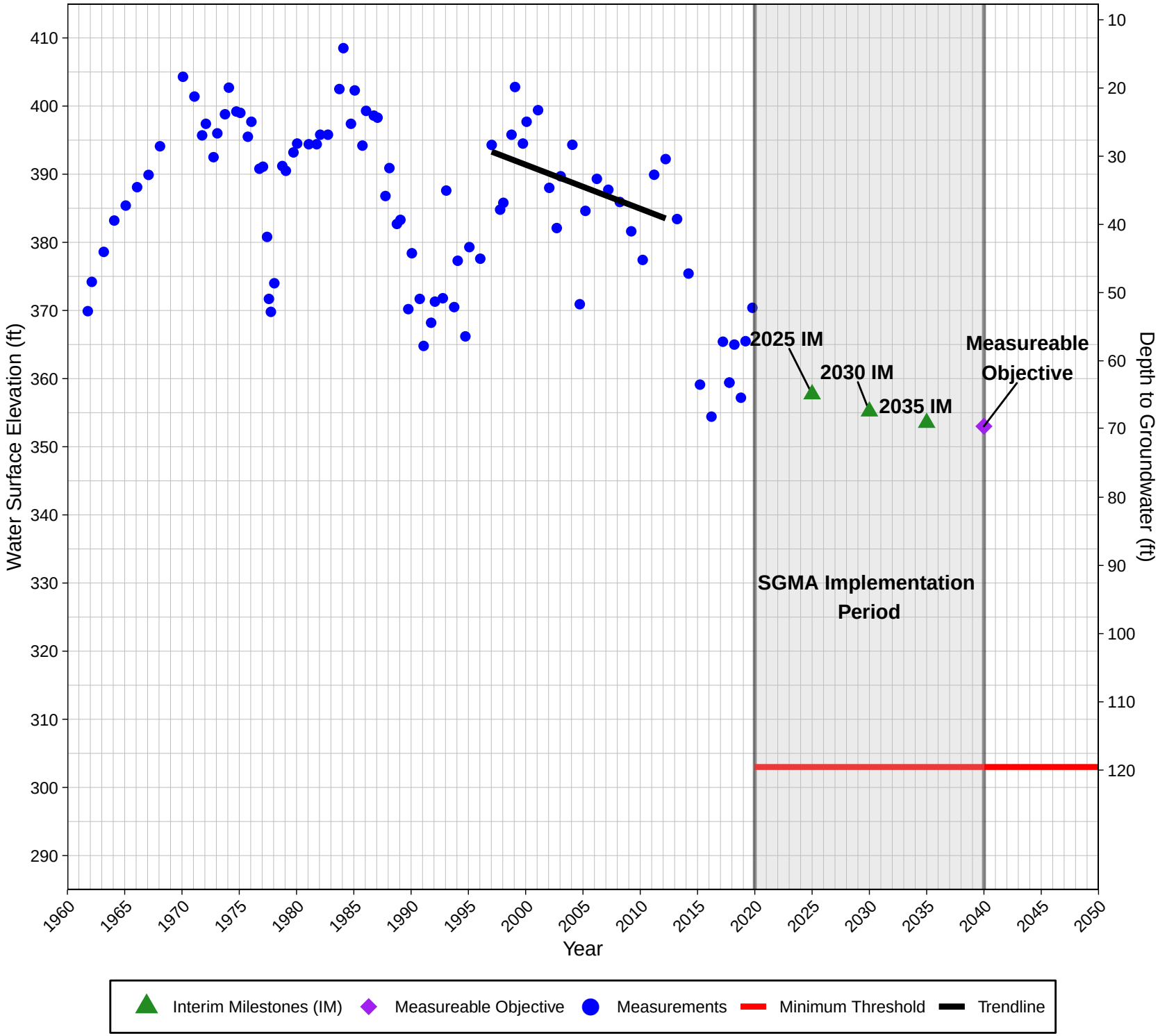


16S25E10J001MX

Ground Surface Elevation: 423 ft

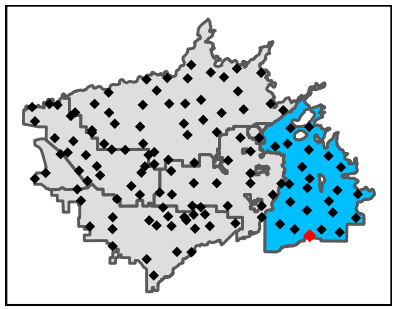
Kings River East GSA

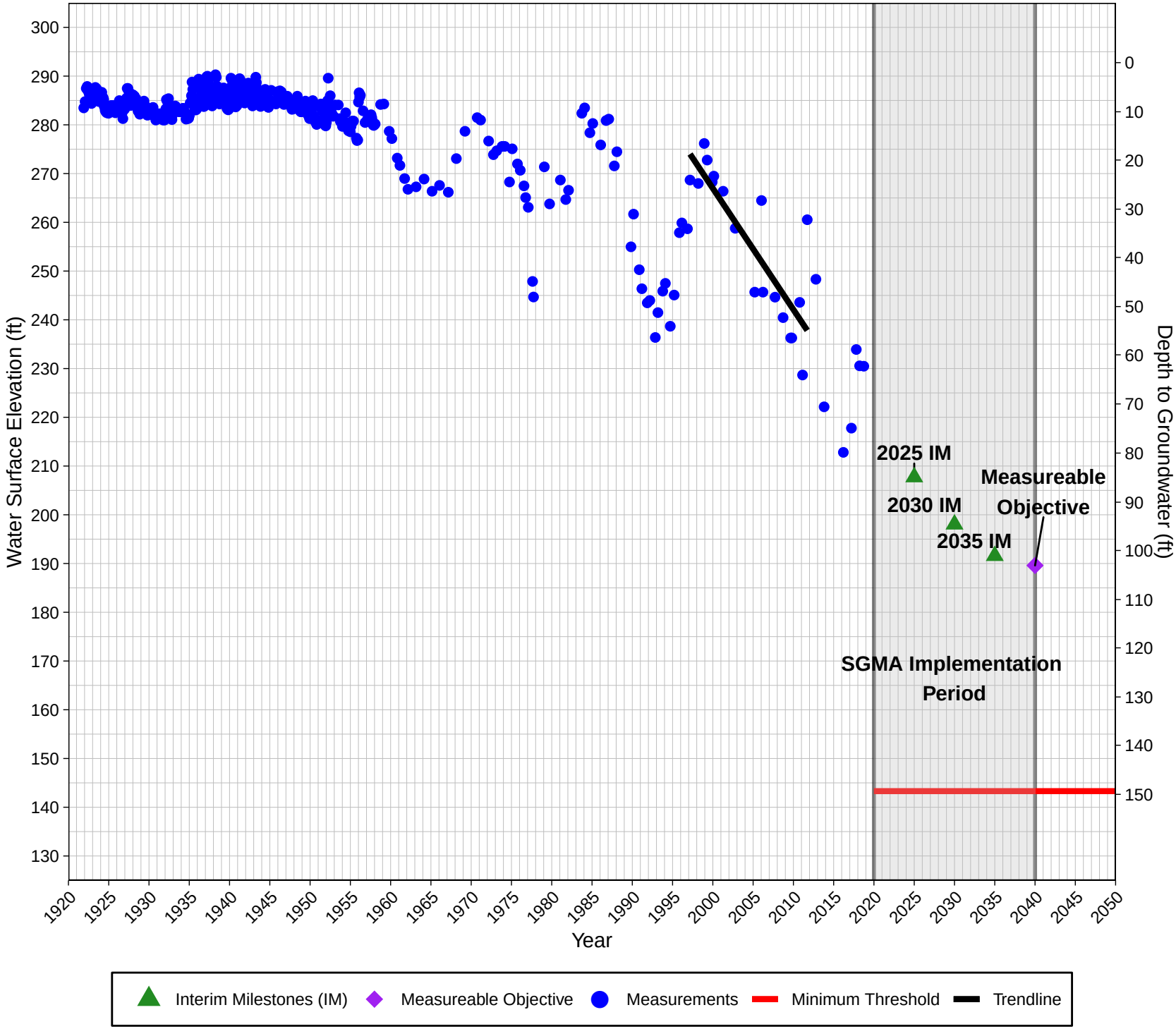




364425N1193860W001

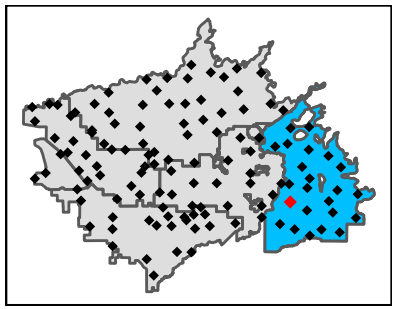
State Well ID: 17S24E20A001M
Ground Surface Elevation: 293 ft
Kings River East GSA

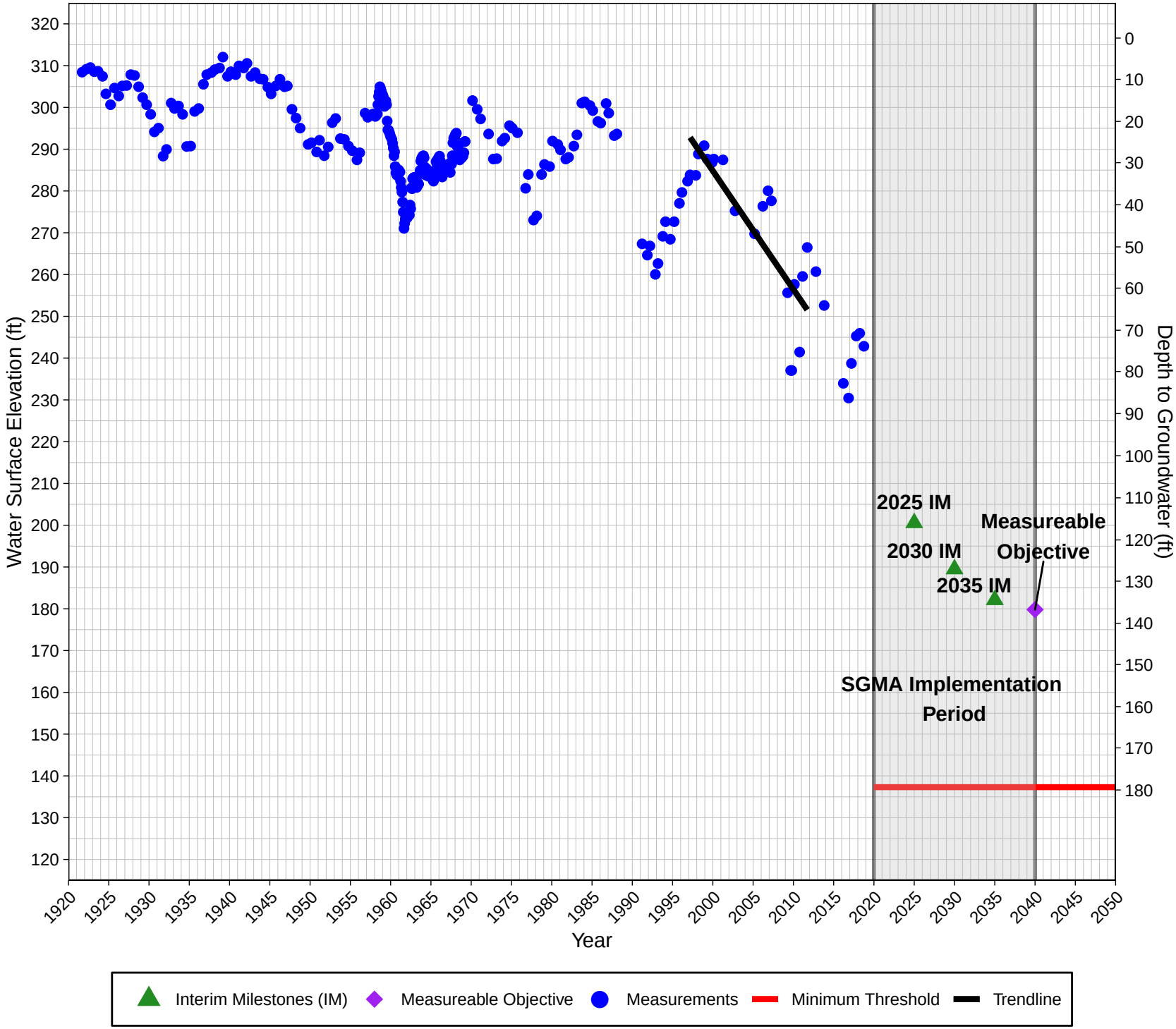




365283N1194482W001

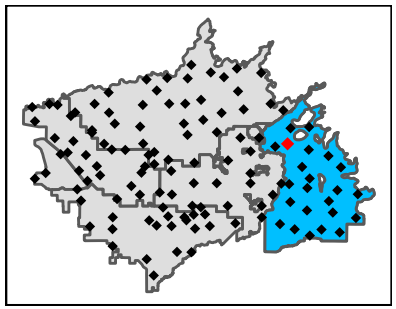
State Well ID: 16S23E23E001M
Ground Surface Elevation: 317 ft
Kings River East GSA

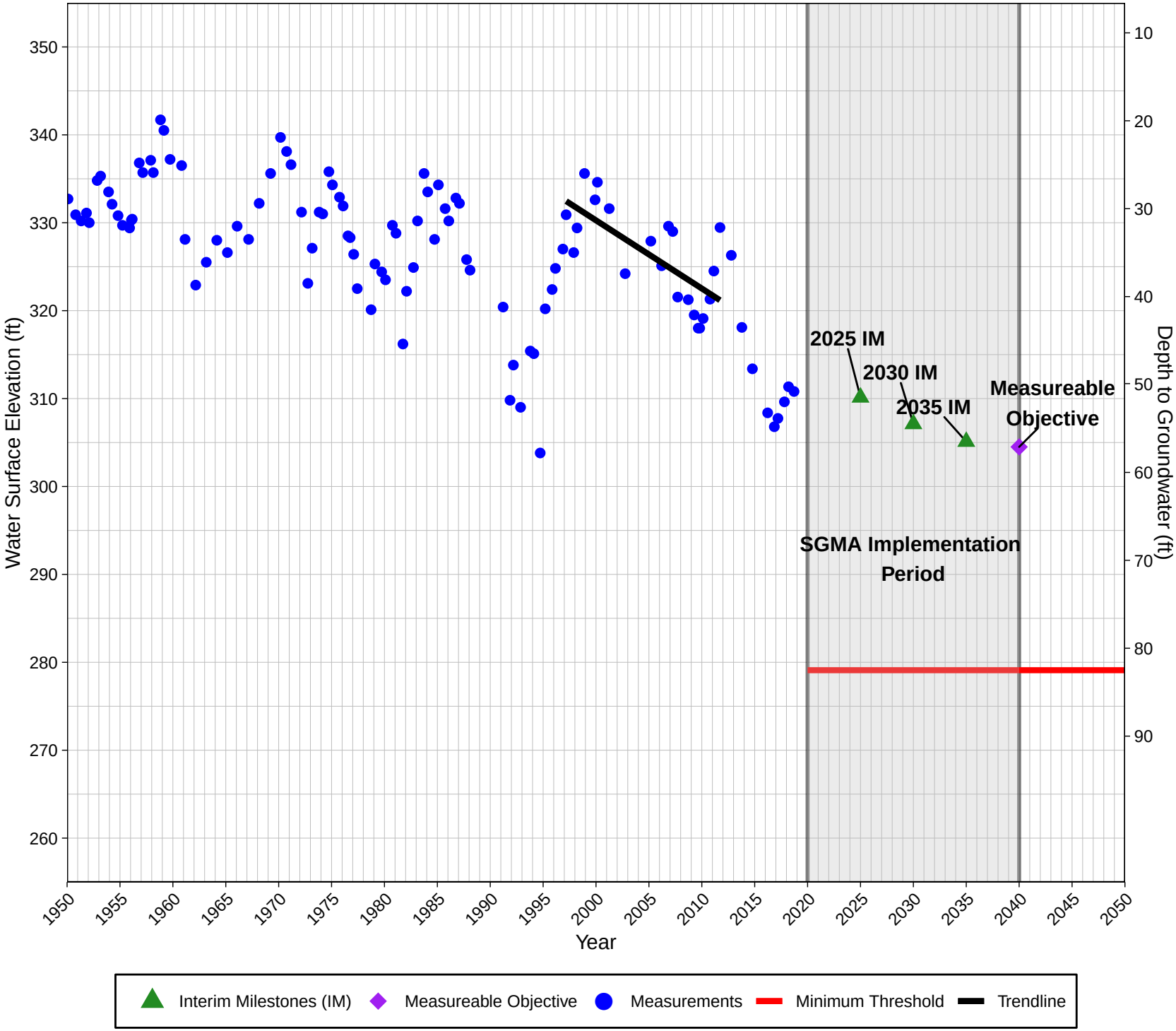




366767N1194568W001

State Well ID: 14S23E34B001M
Ground Surface Elevation: 362 ft
Kings River East GSA

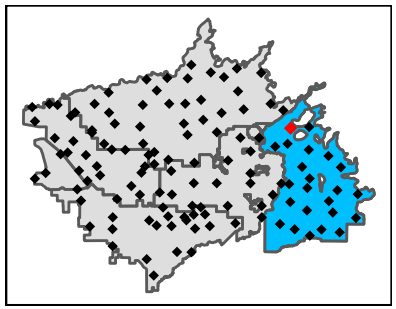


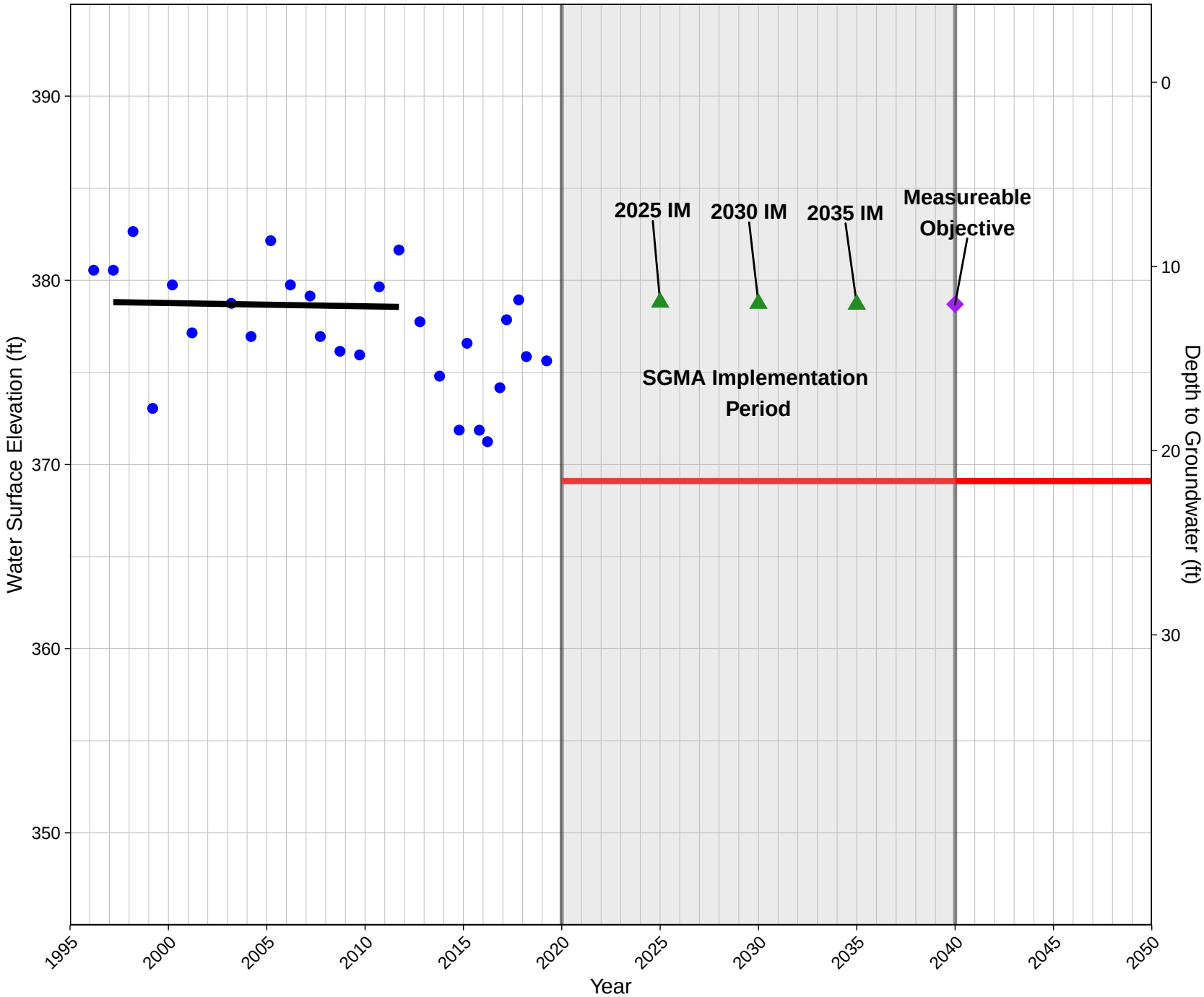


B013B

Ground Surface Elevation: 391 ft

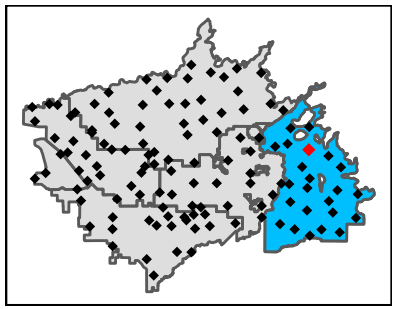
Kings River East GSA

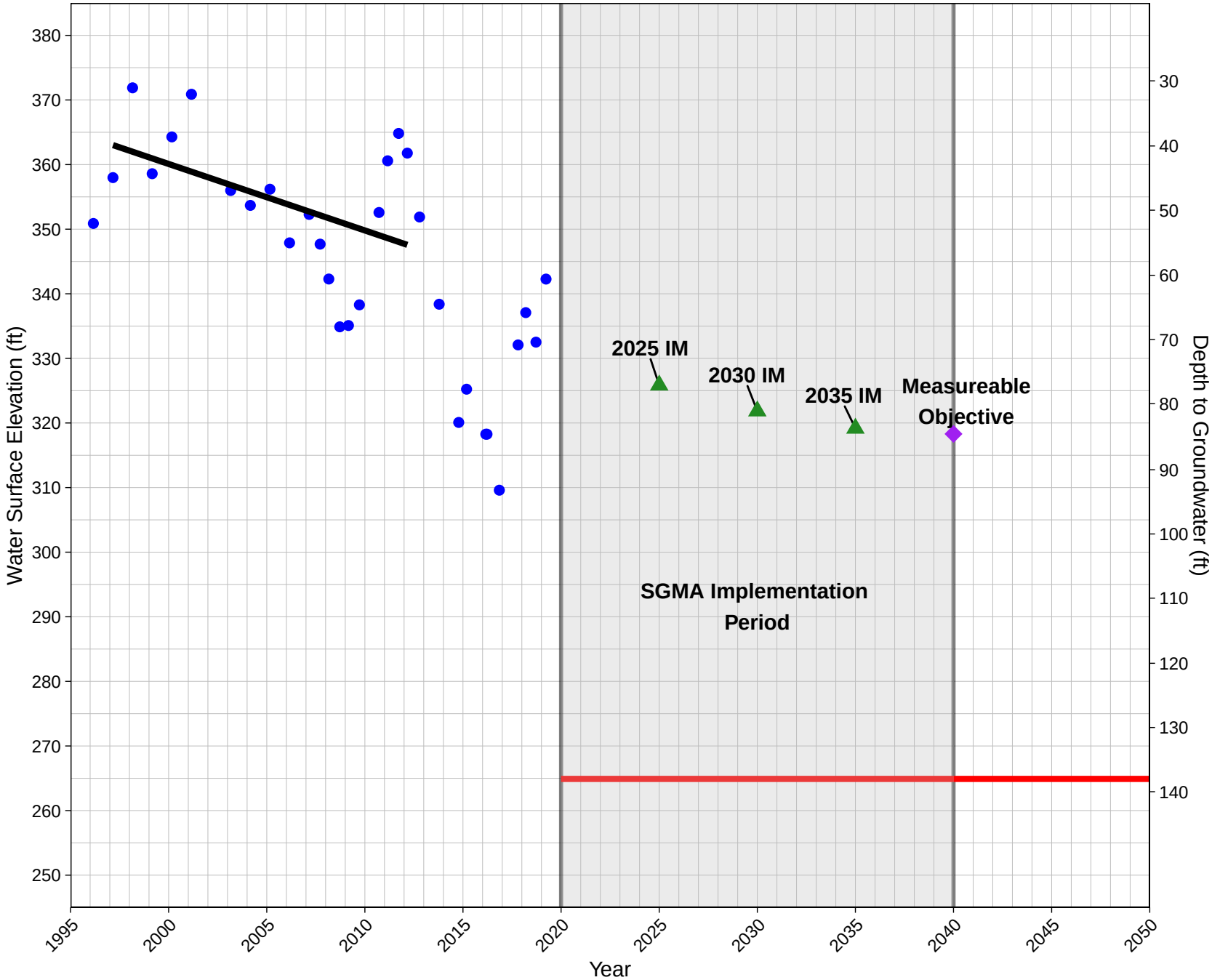




I045A

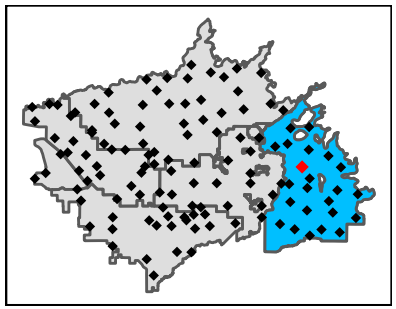
State Well ID: 15S24E05C001M
Ground Surface Elevation: 403 ft
Kings River East GSA

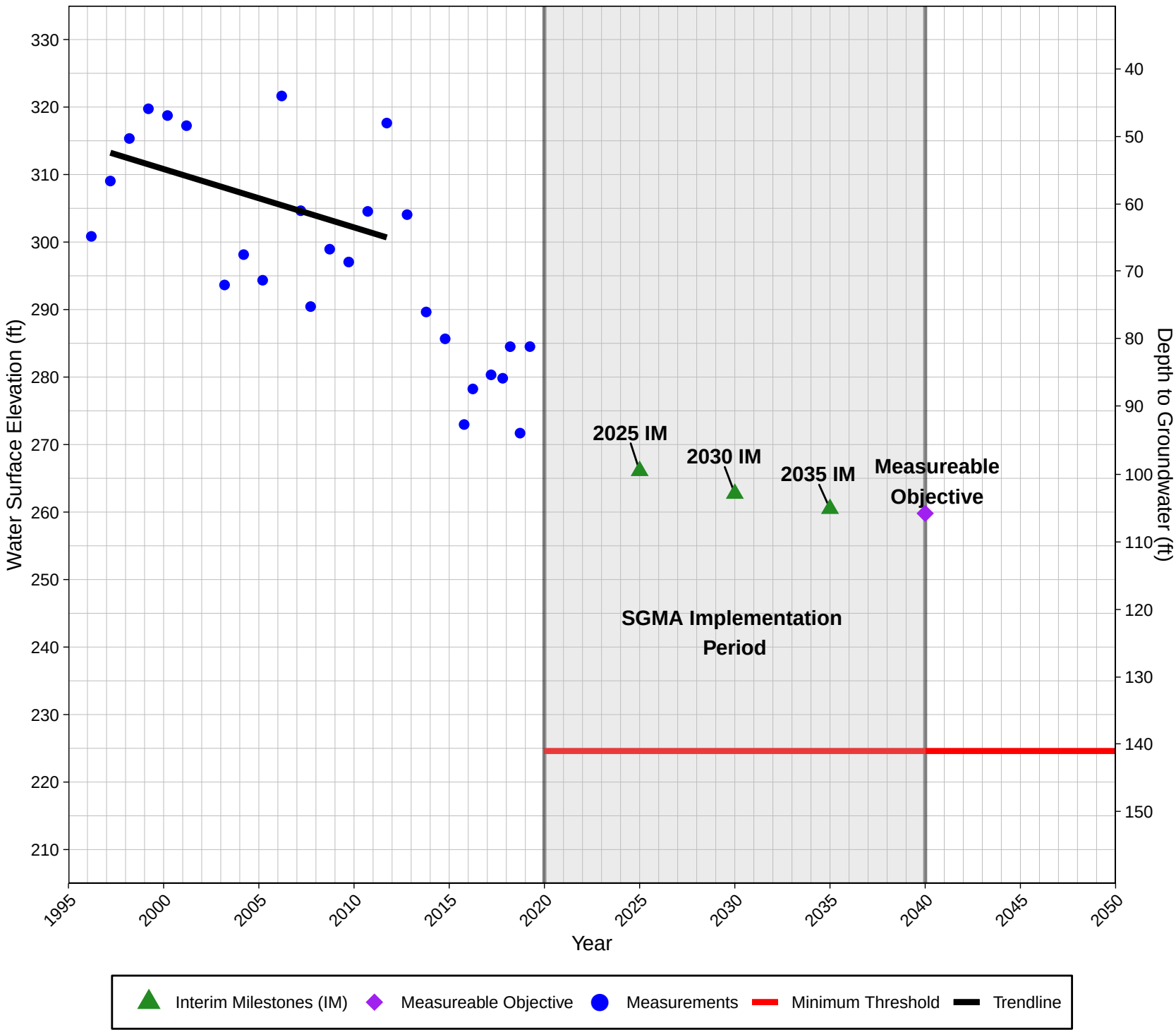




I055A

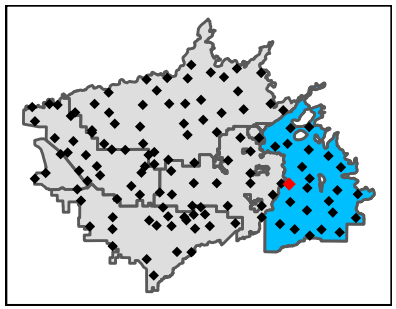
State Well ID: 15S24E19D002M
Ground Surface Elevation: 366 ft
Kings River East GSA

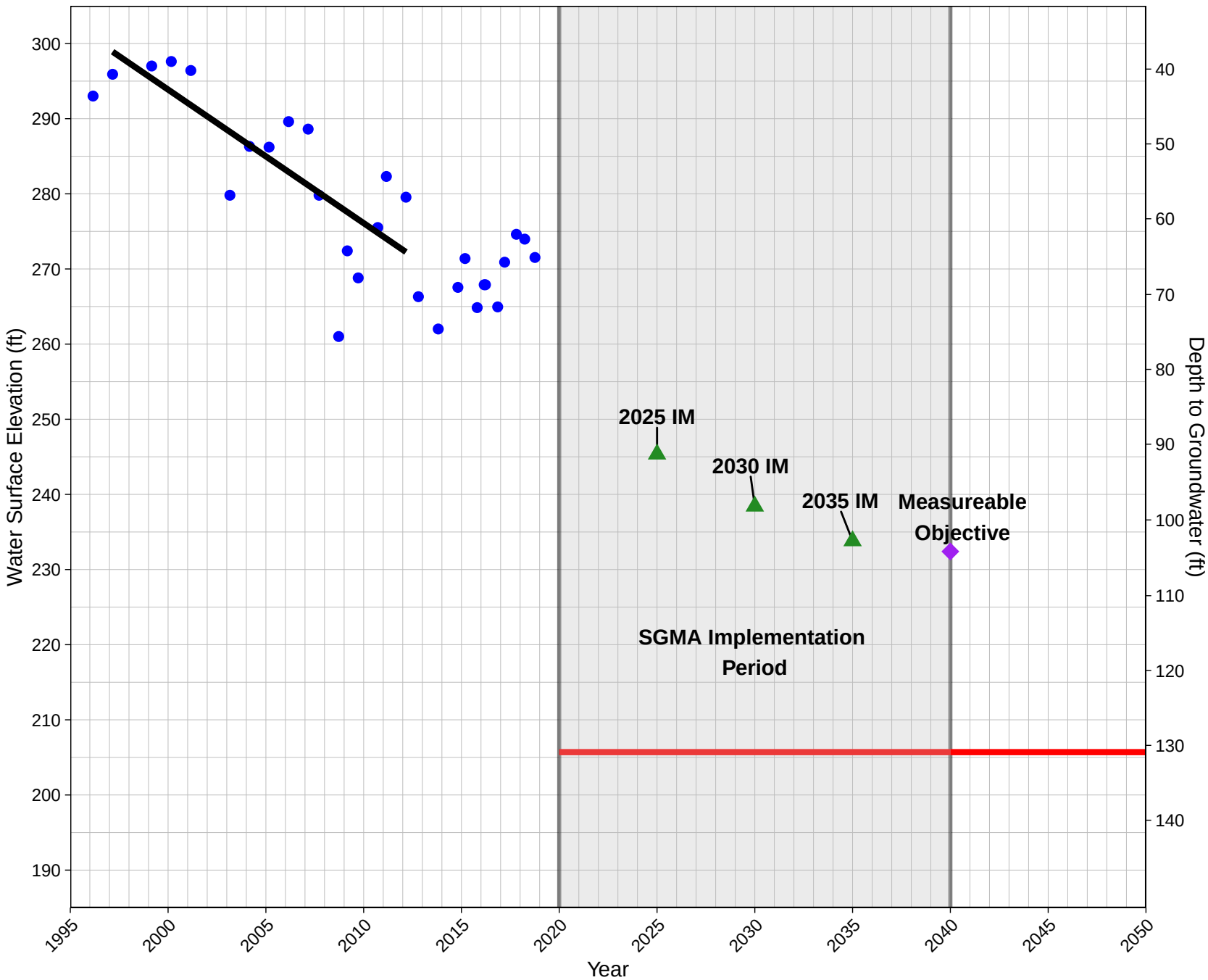




I073A

State Well ID: 16S23E03A001M
Ground Surface Elevation: 337 ft
Kings River East GSA

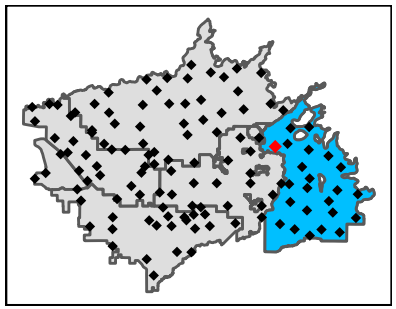


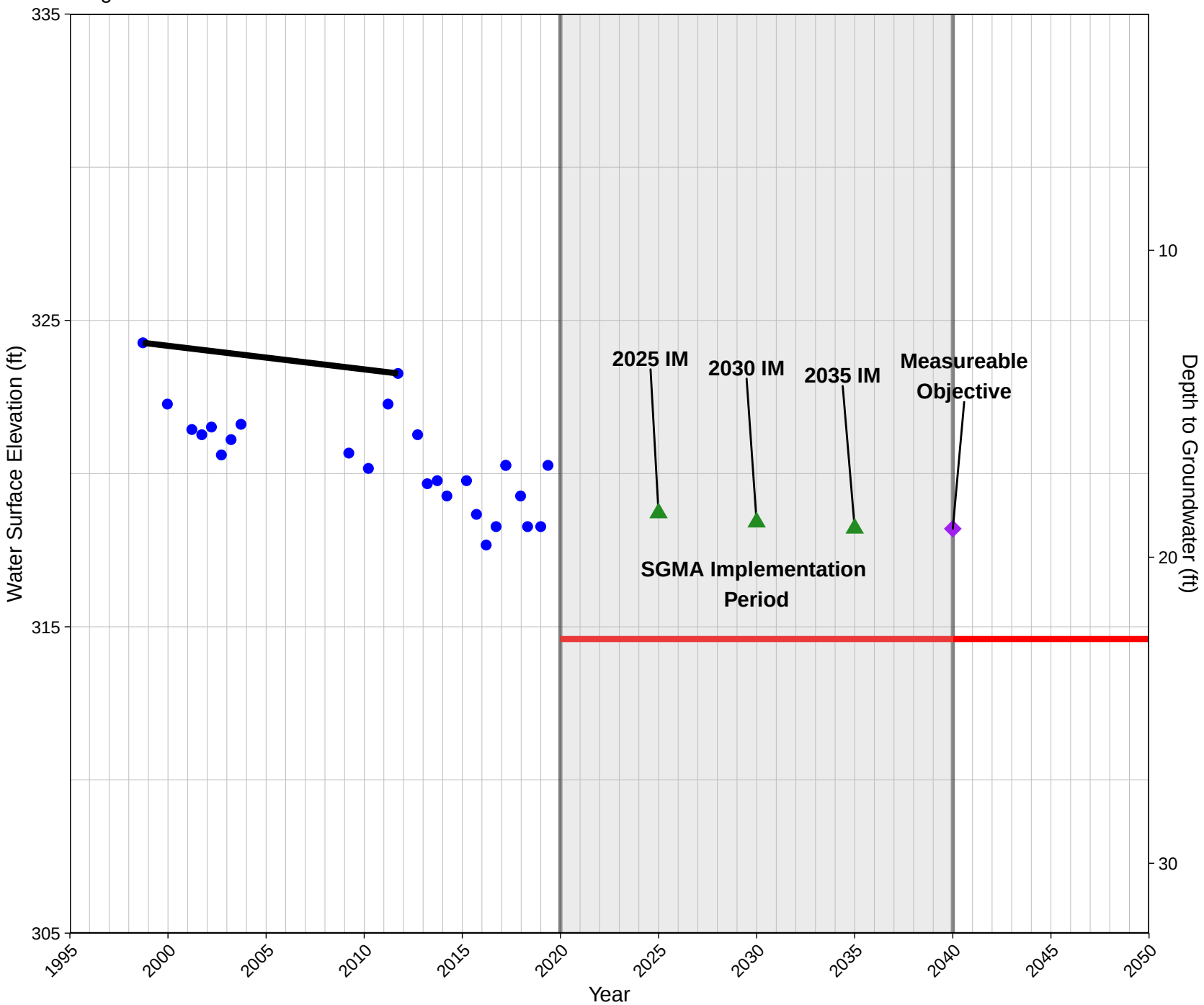


KRWD04

Ground Surface Elevation: 337 ft

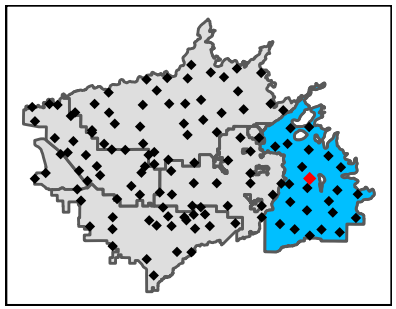
Kings River East GSA

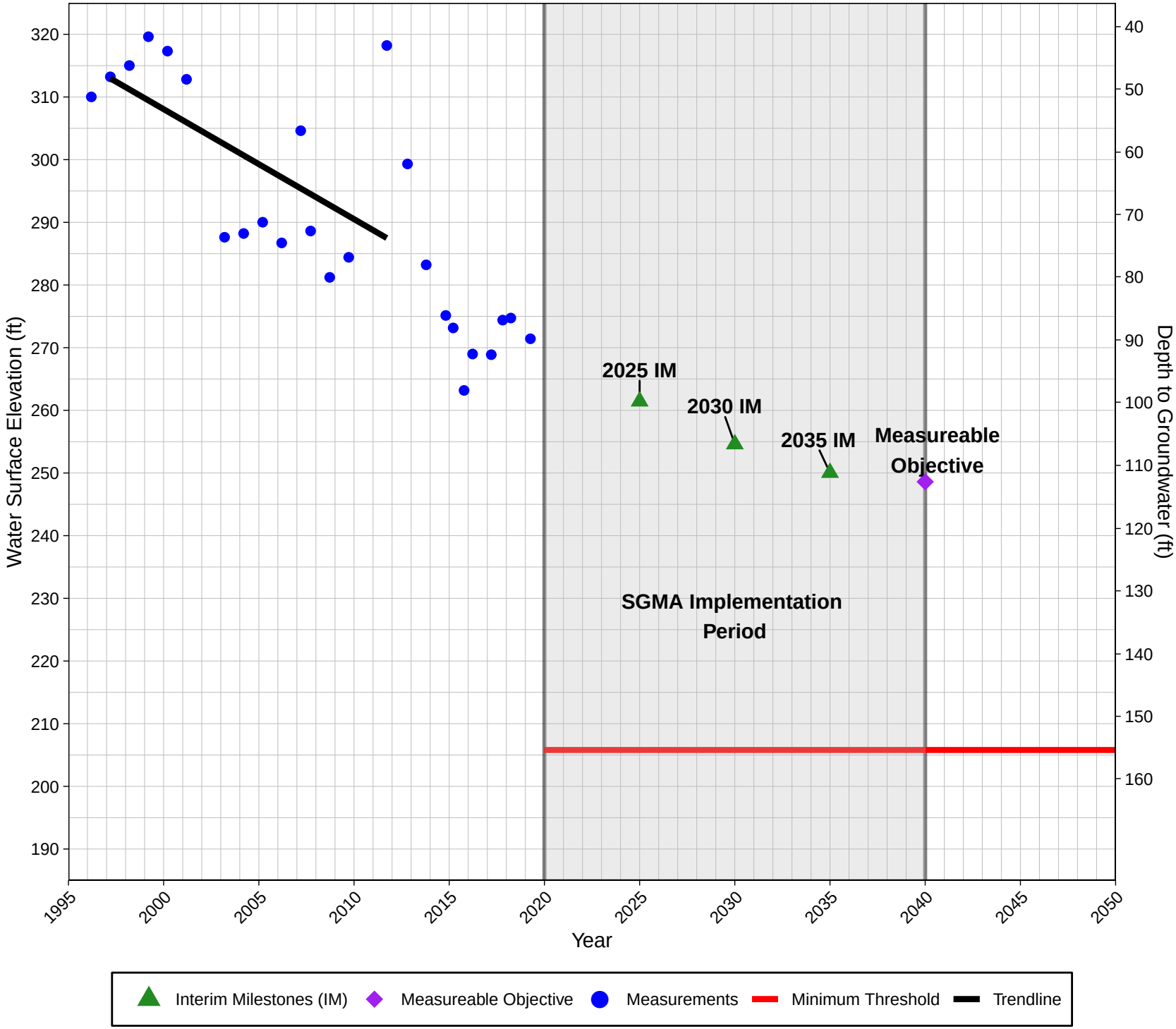




M065A

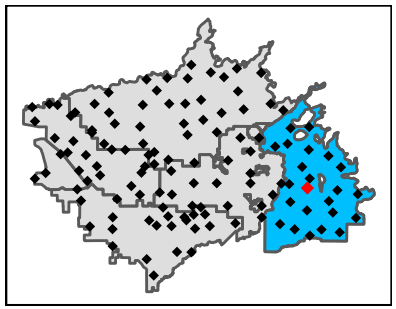
State Well ID: 15S24E32C001M
Ground Surface Elevation: 361 ft
Kings River East GSA

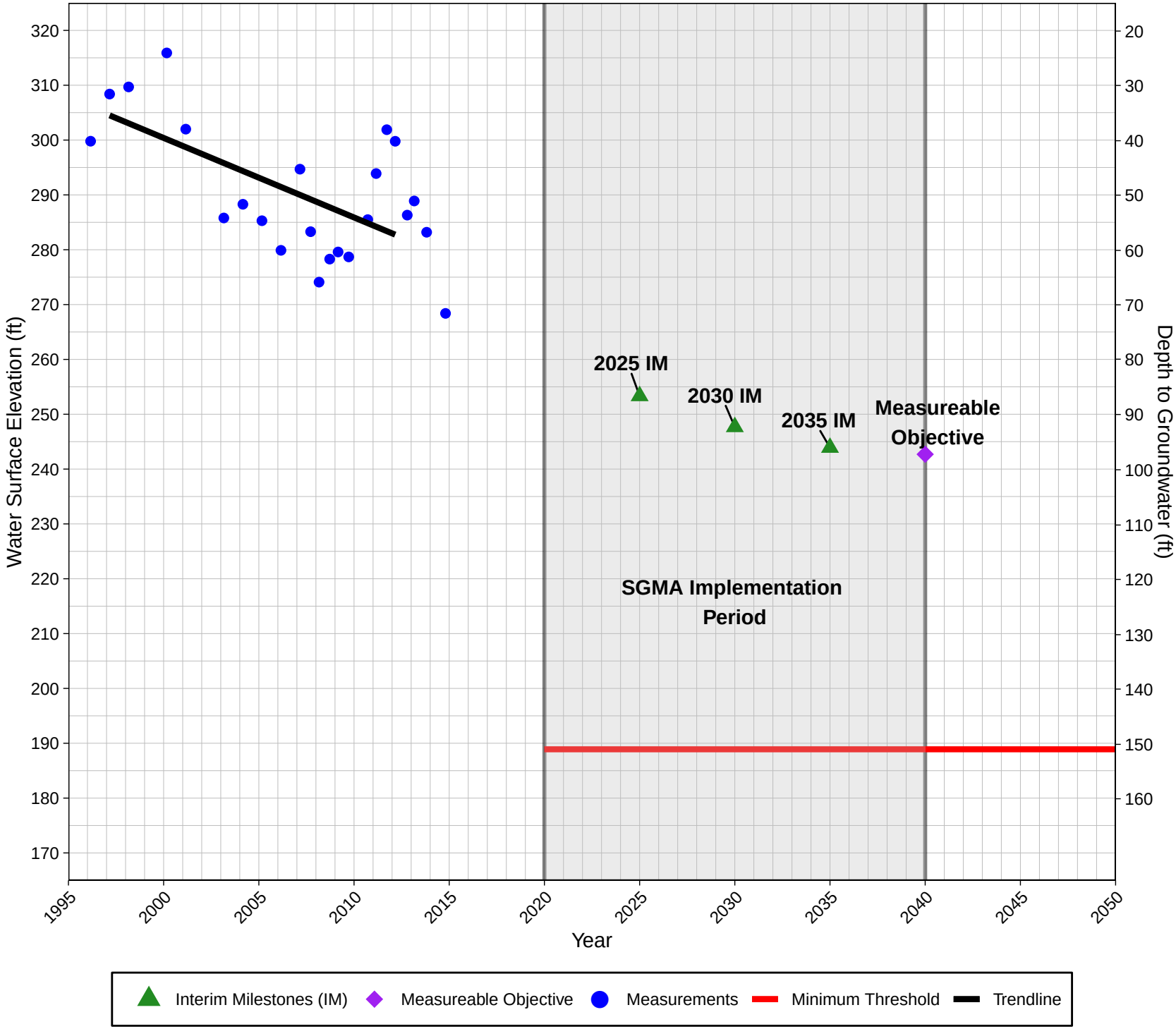




M105A

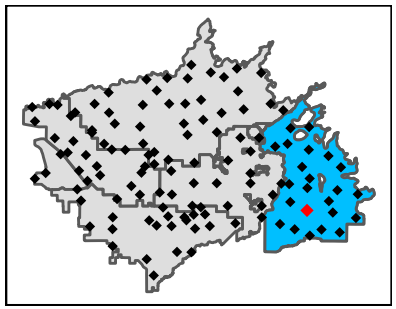
State Well ID: 16S24E05M001M
Ground Surface Elevation: 340 ft
Kings River East GSA

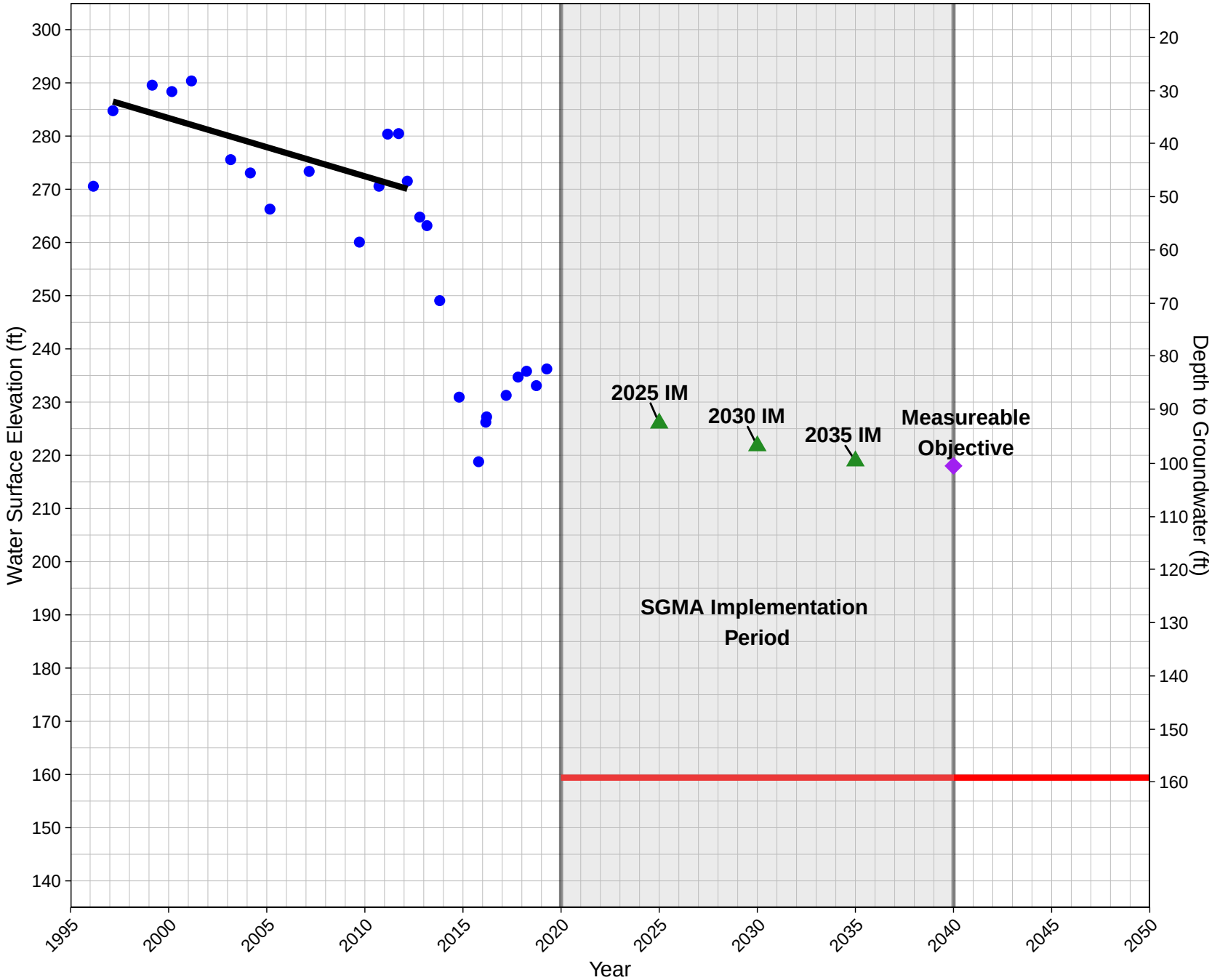


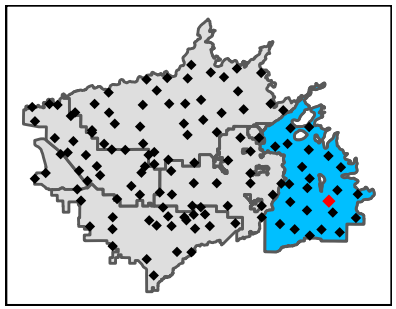


M130B

State Well ID: 16S24E30R001M
Ground Surface Elevation: 319 ft
Kings River East GSA







O123A

Ground Surface Elevation: 353 ft

Kings River East GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

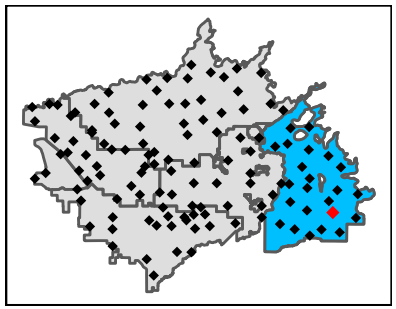
Interim Milestones (IM)

Measureable Objective

Measurements

Minimum Threshold

Trendline



T136A

Ground Surface Elevation: 339 ft

Kings River East GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

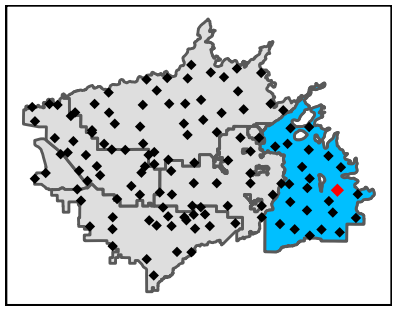
Measurements

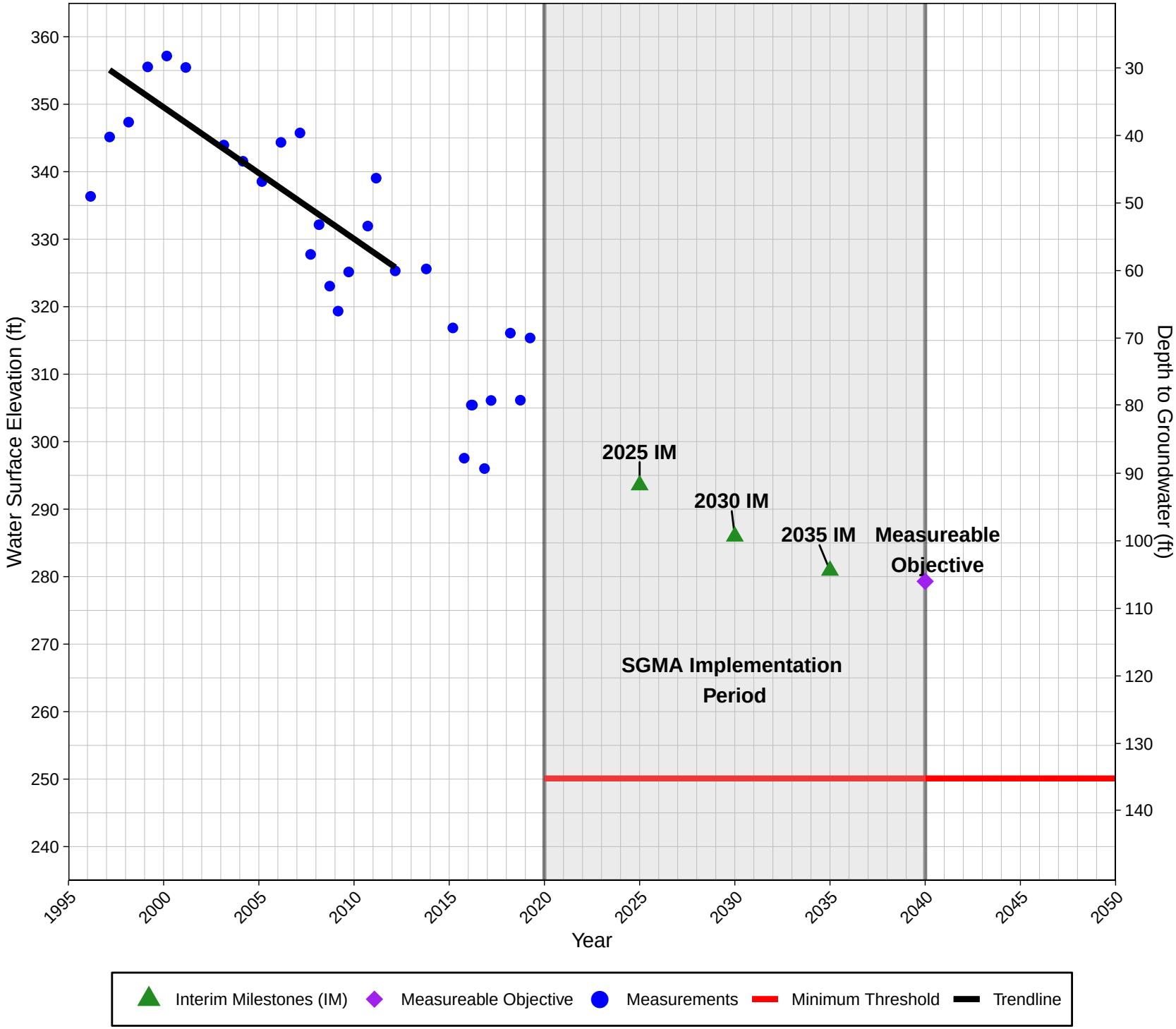
Minimum Threshold

Trendline

T139A

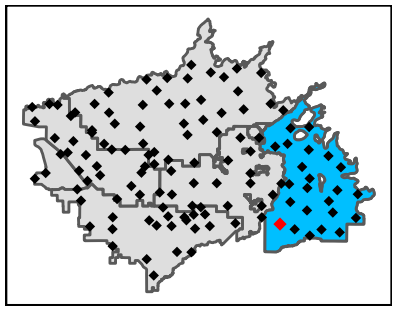
State Well ID: 16S25E07D001M
Ground Surface Elevation: 385 ft
Kings River East GSA

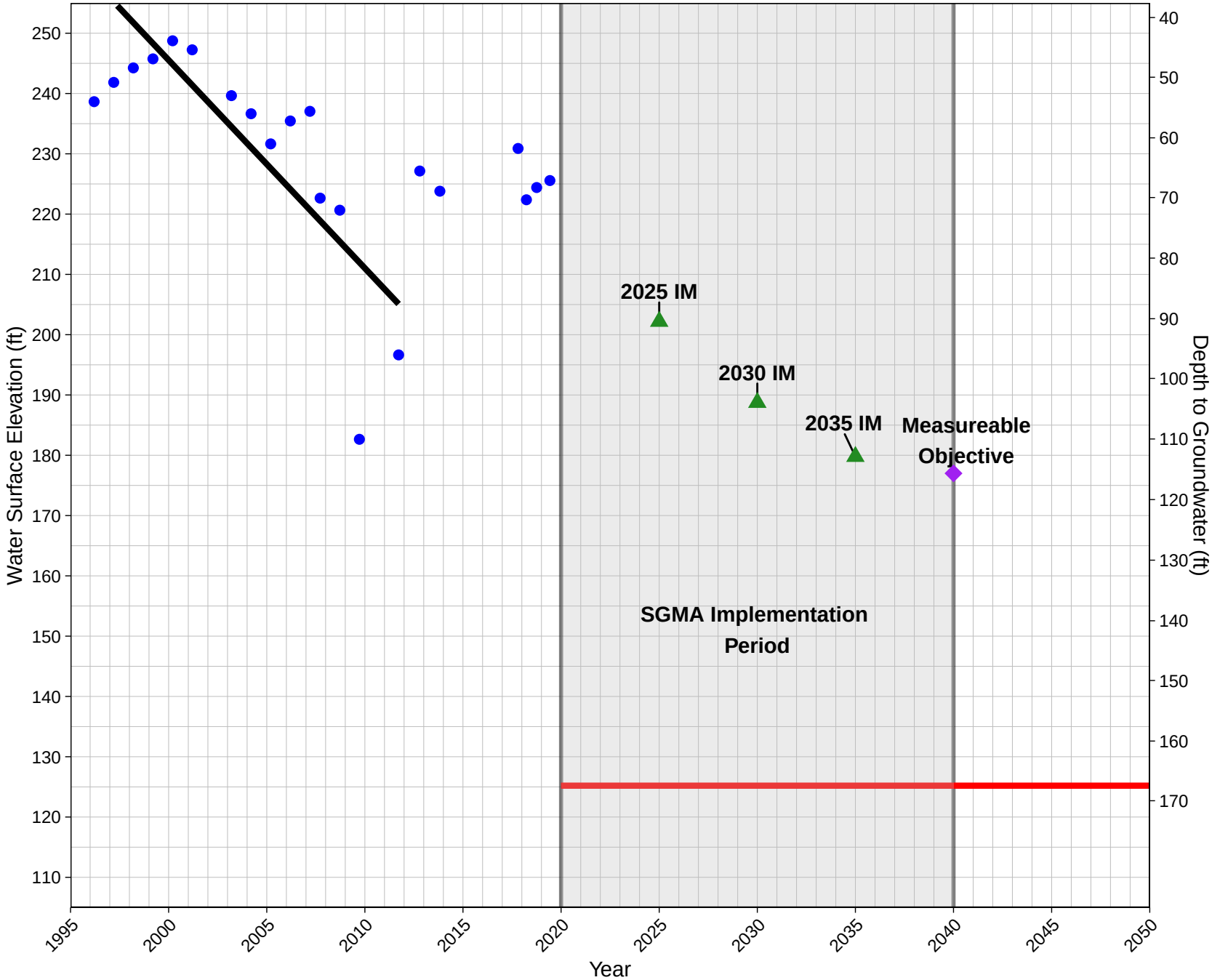




W172A

State Well ID: 17S23E09B001M
Ground Surface Elevation: 293 ft
Kings River East GSA

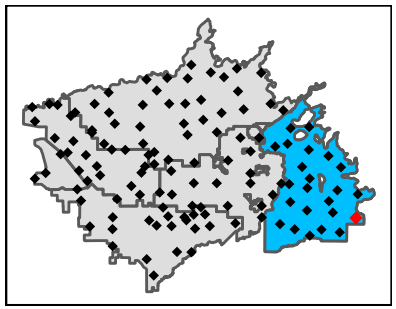


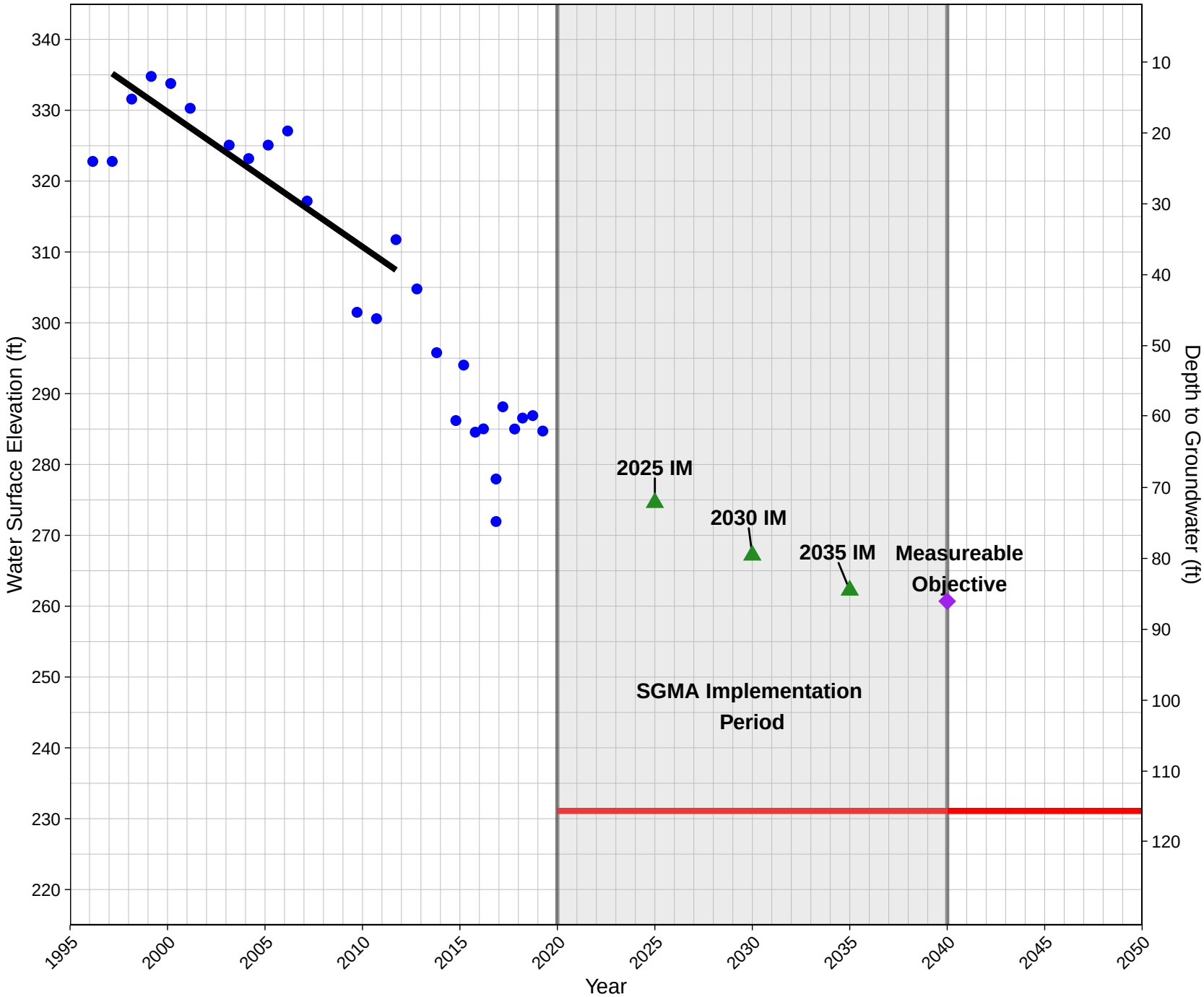


X156A

Ground Surface Elevation: 347 ft

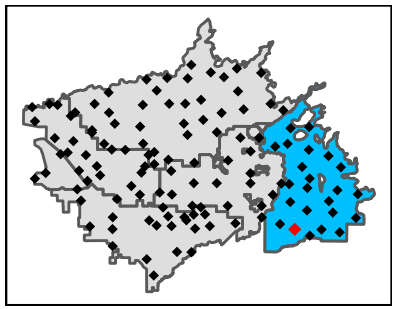
Kings River East GSA

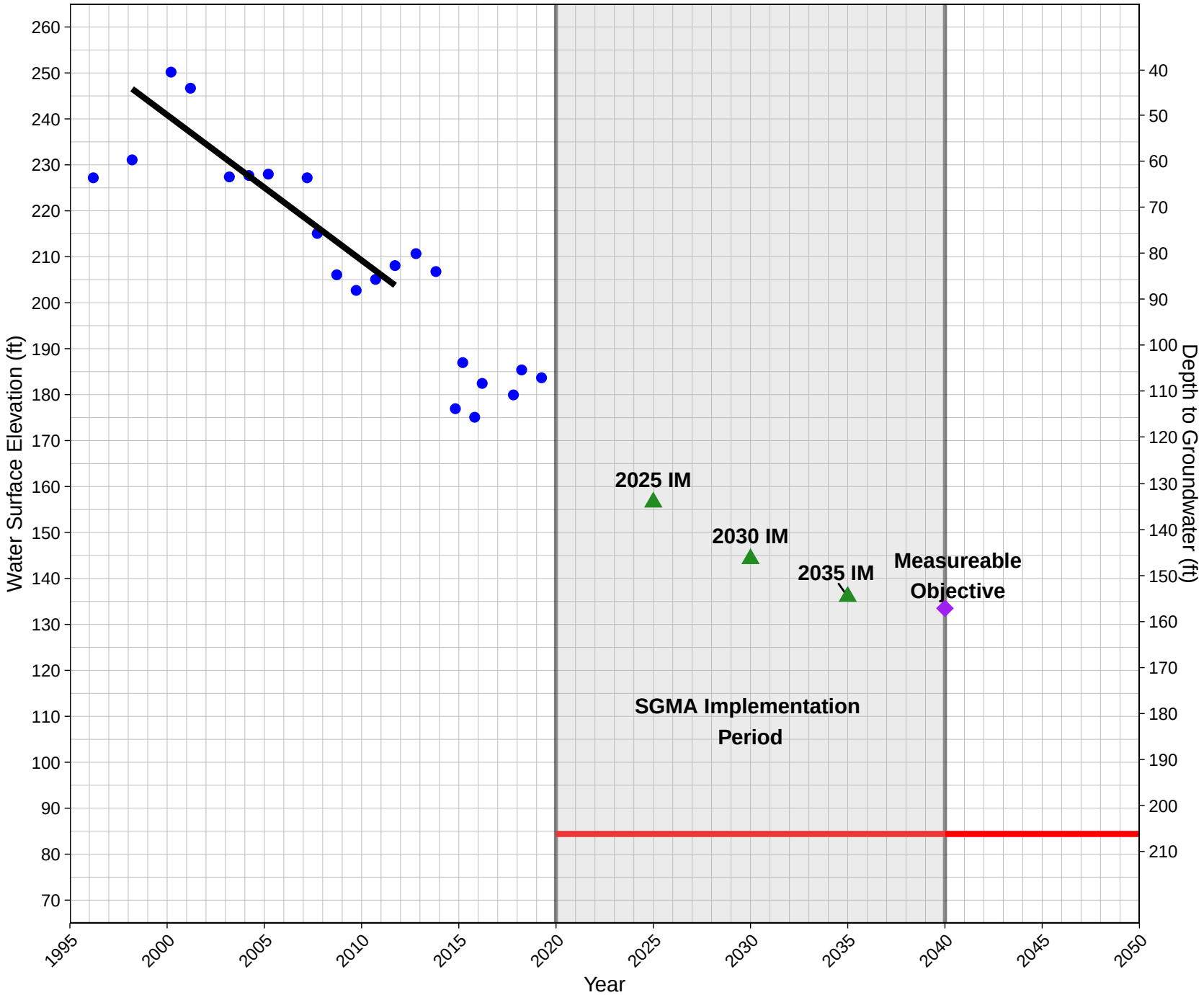




X176A

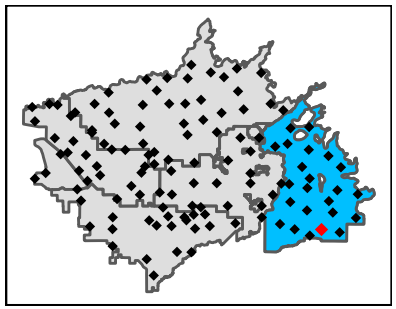
Ground Surface Elevation: 291 ft
Kings River East GSA

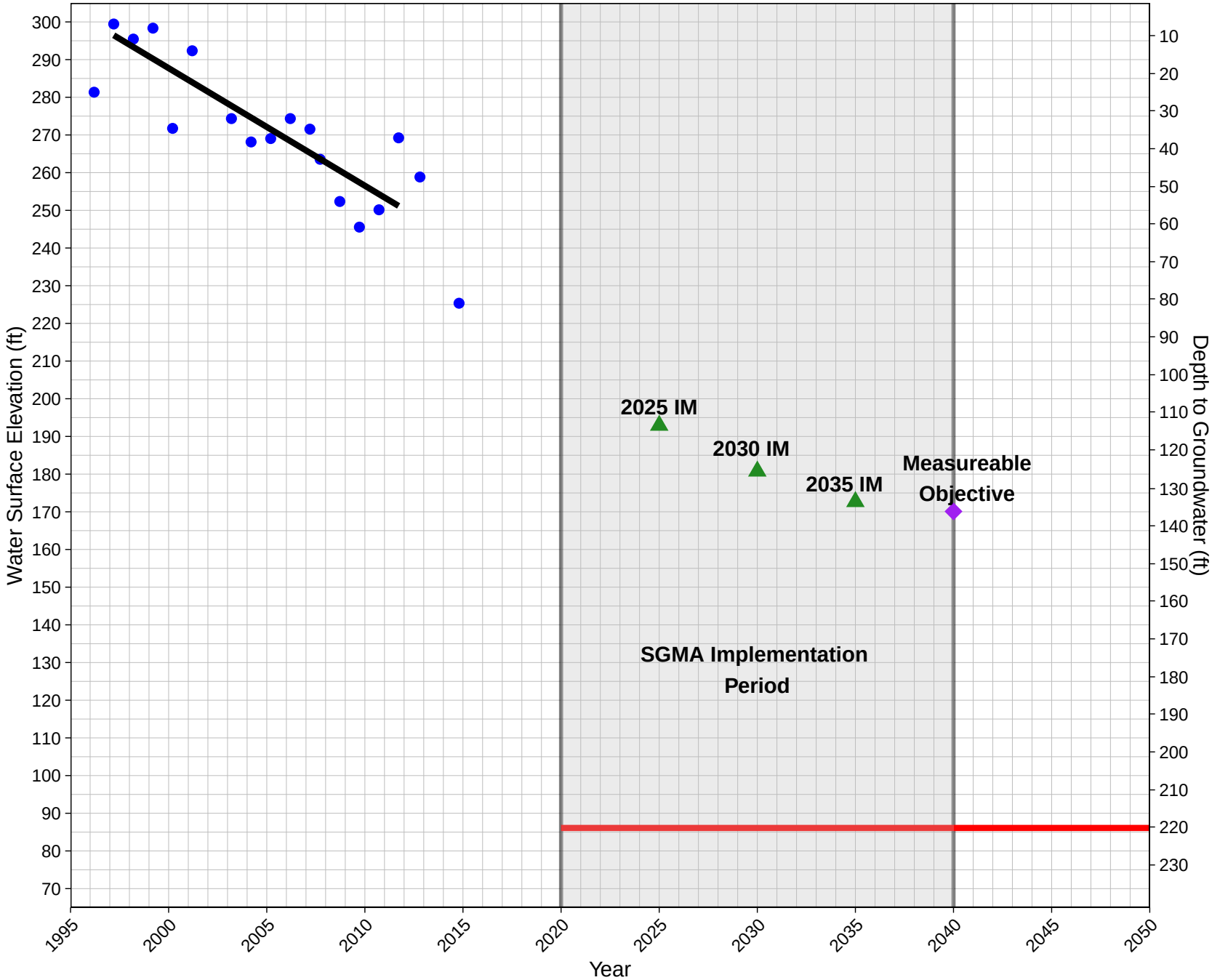




X213A

State Well ID: 17S24E15A002M
Ground Surface Elevation: 306 ft
Kings River East GSA

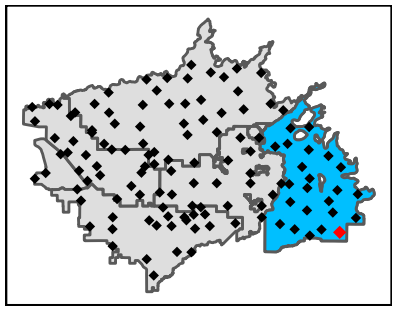




X234B

Ground Surface Elevation: 328 ft

Kings River East GSA



Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

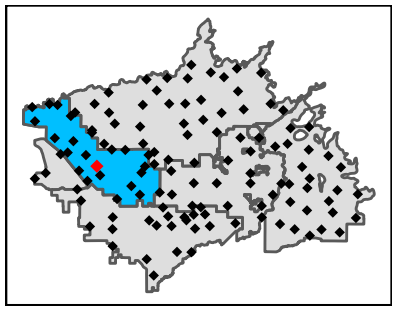
Measureable Objective

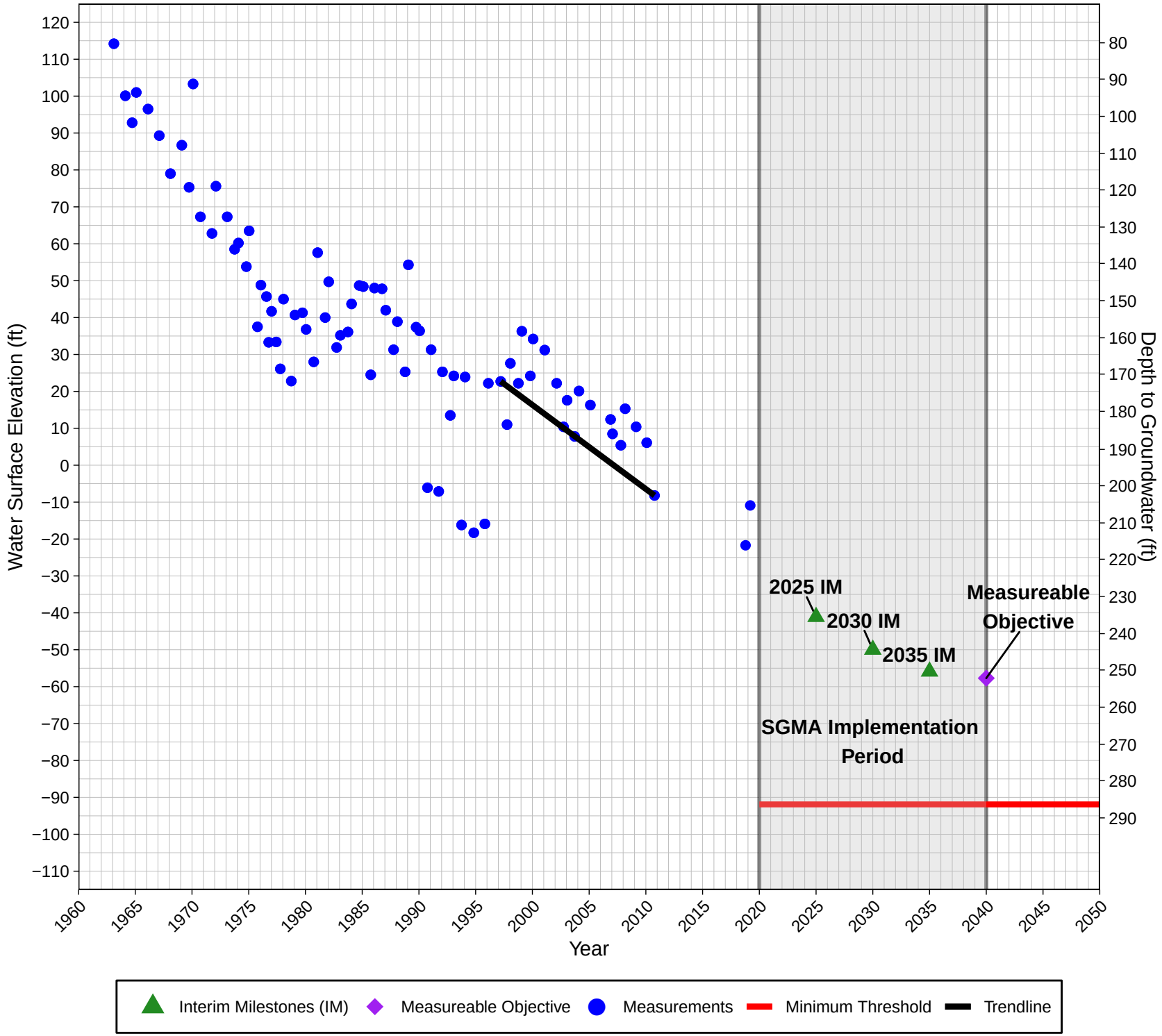
SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

15S17E13R002M

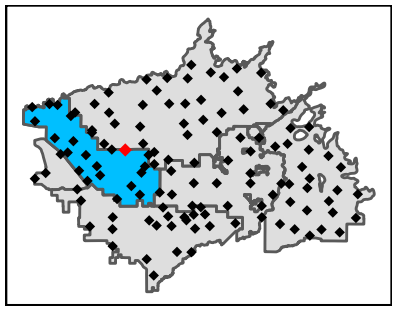
Ground Surface Elevation: 194 ft
McMullin Area GSA

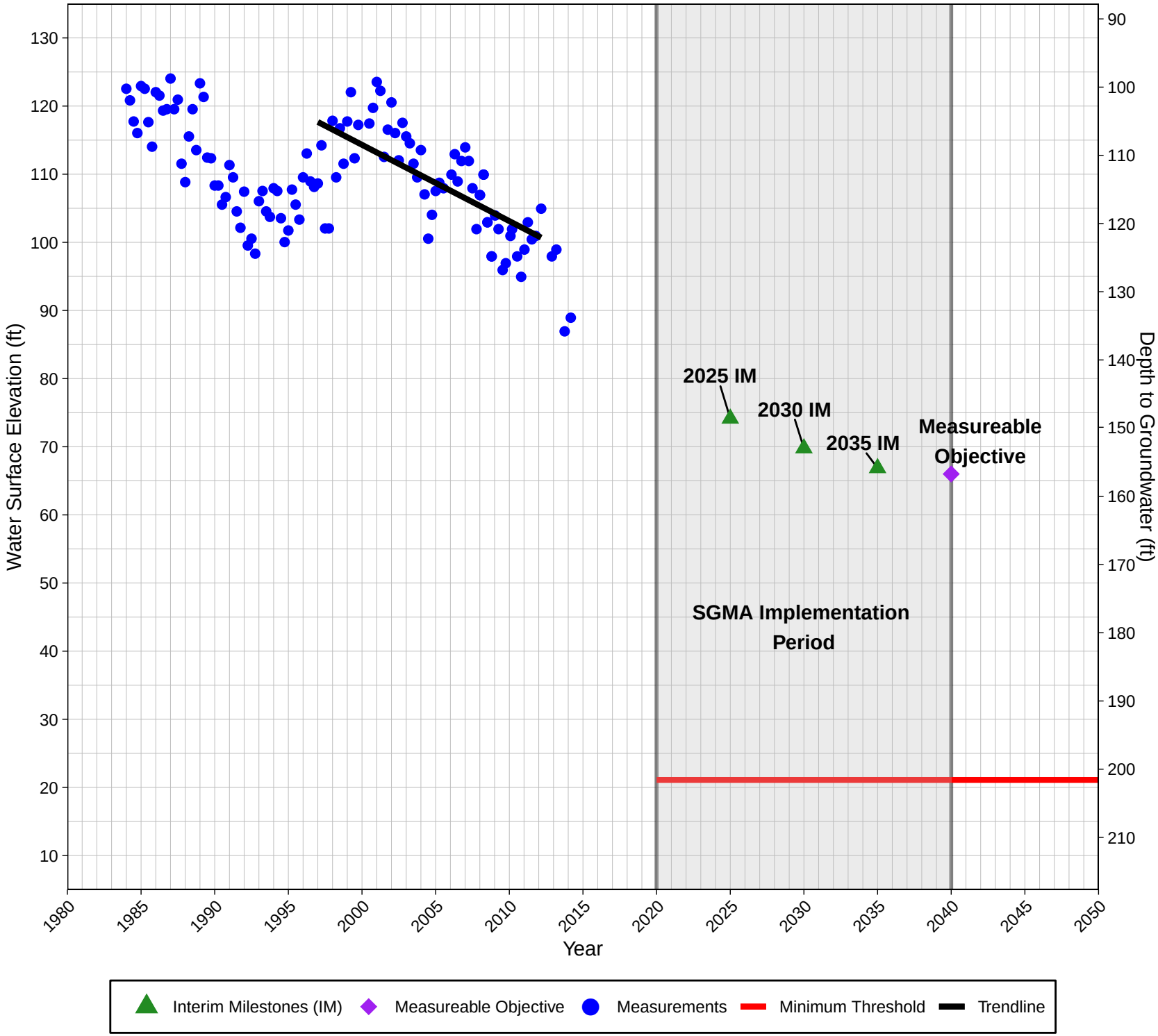




15S18E02A001MX

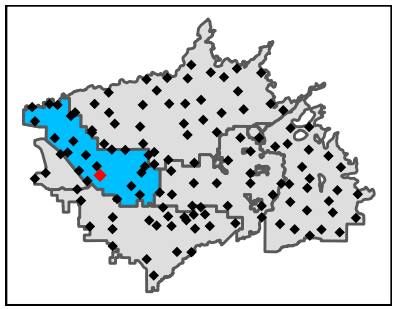
Ground Surface Elevation: 223 ft
McMullin Area GSA





15S18E30L001M

Ground Surface Elevation: 195 ft
McMullin Area GSA



Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

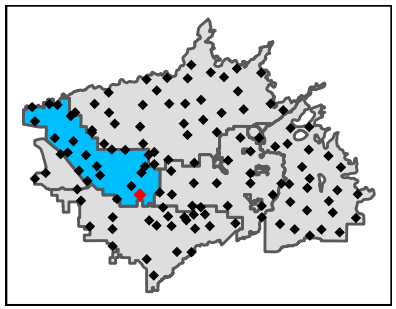
Measureable Objective

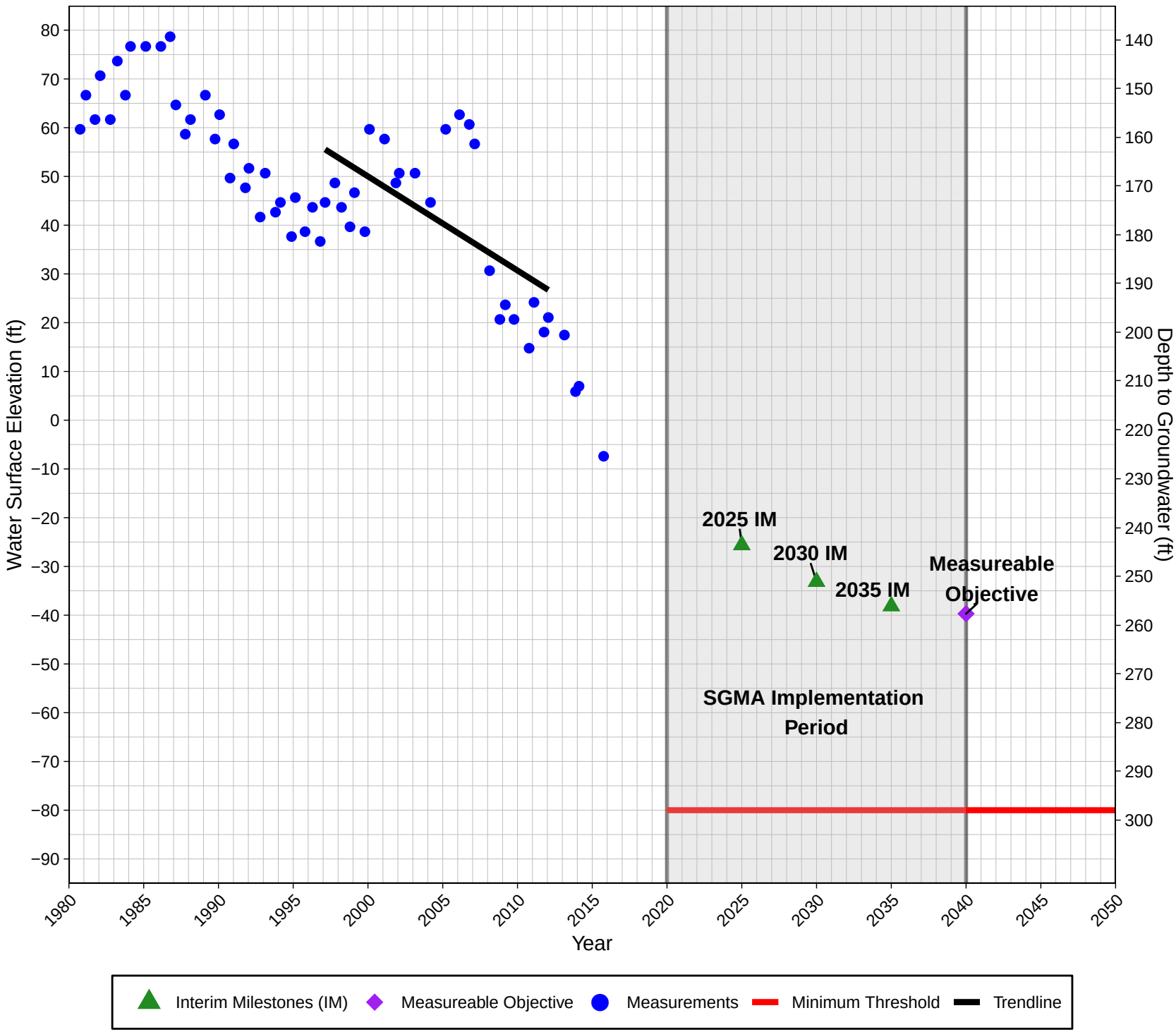
SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

365463N1199268W001

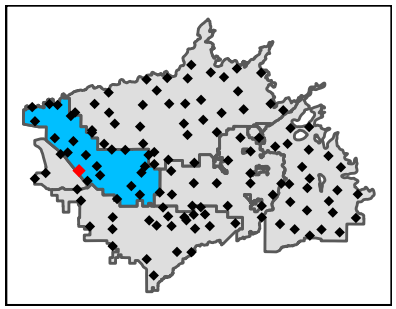
State Well ID: 16S19E17C001M
Ground Surface Elevation: 218 ft
McMullin Area GSA

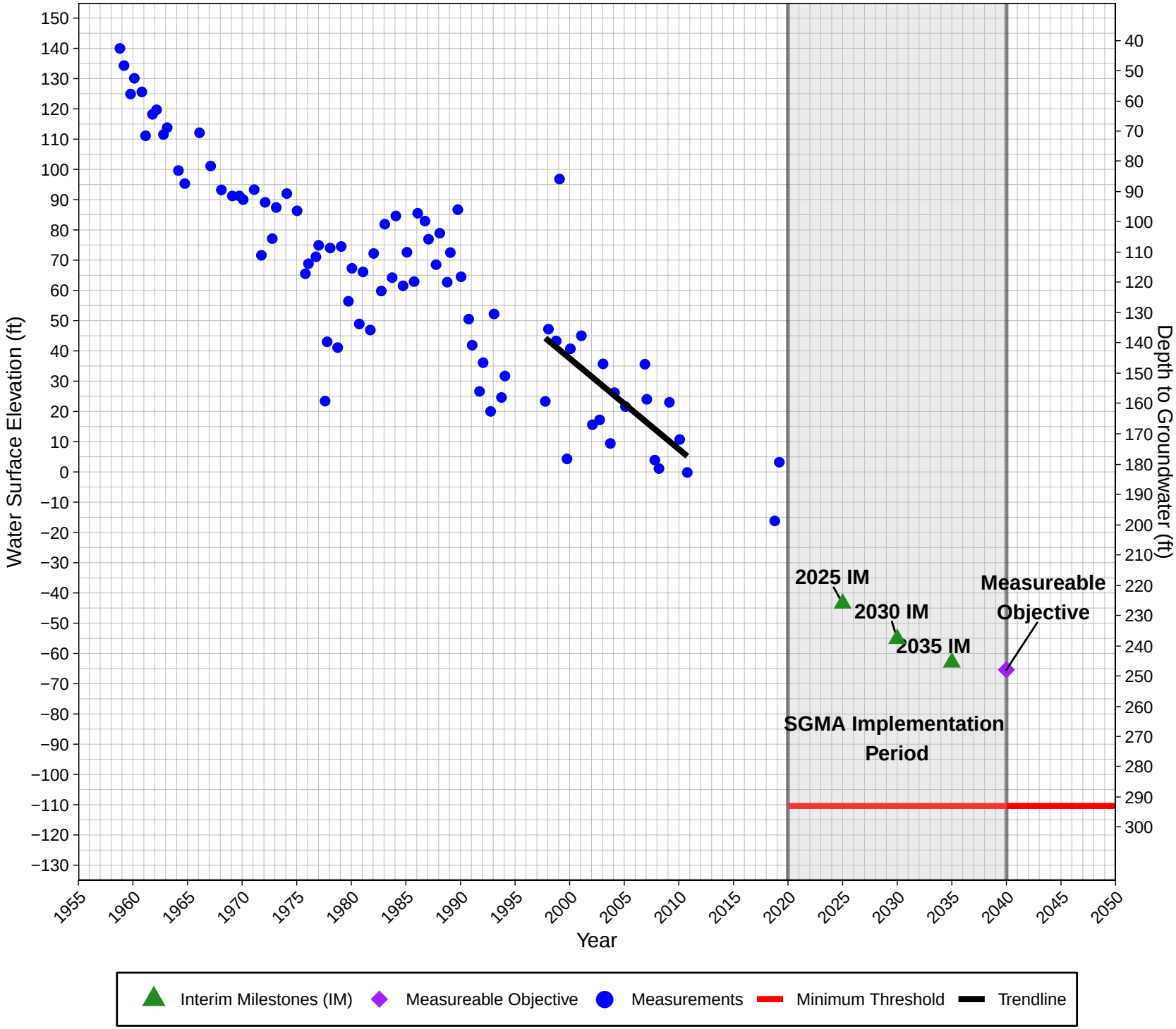




366082N1201199W001

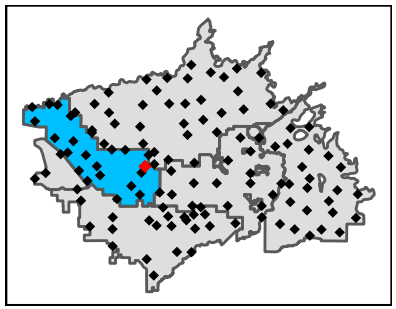
State Well ID: 15S17E21J001M
Ground Surface Elevation: 183 ft
McMullin Area GSA

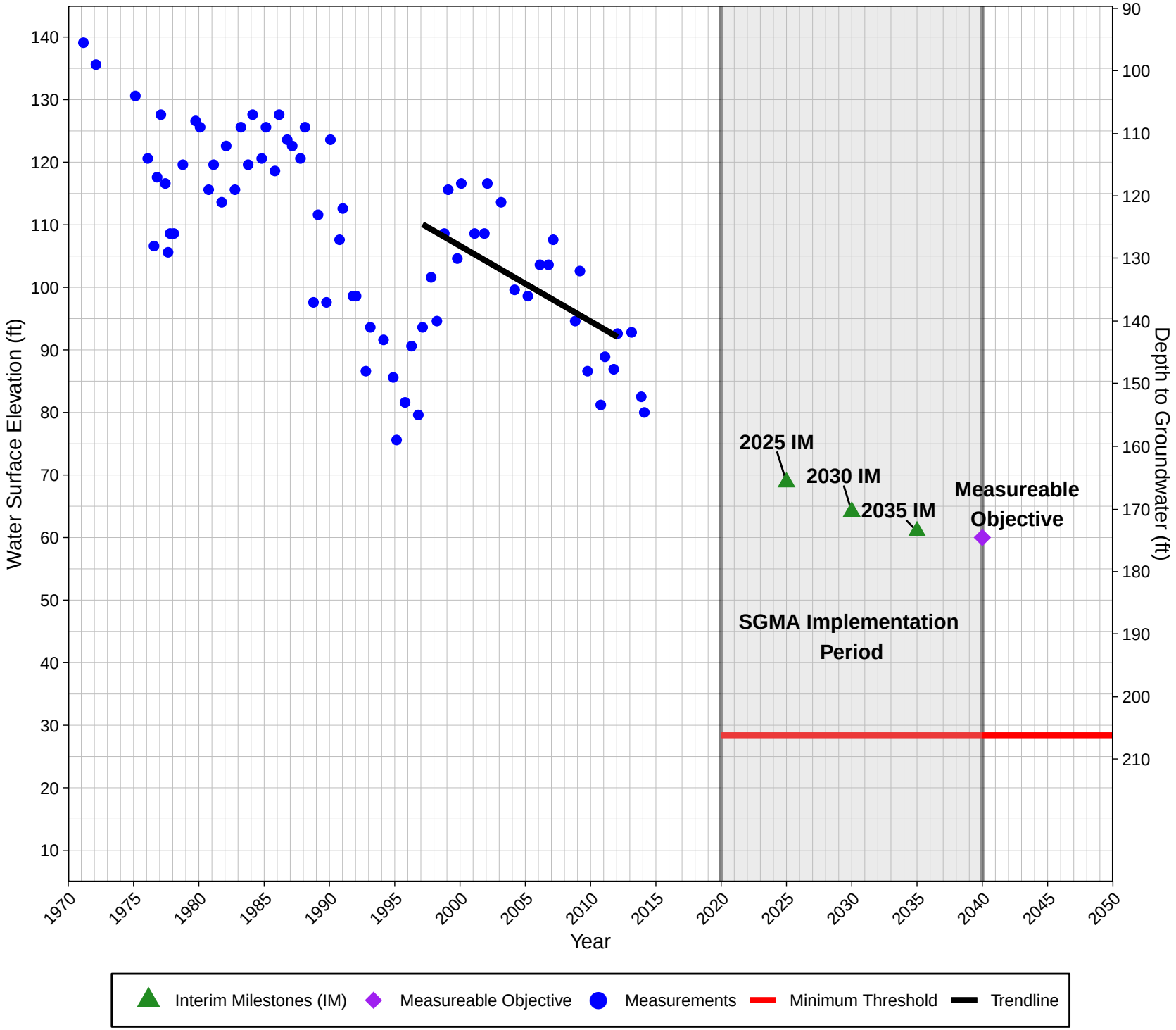


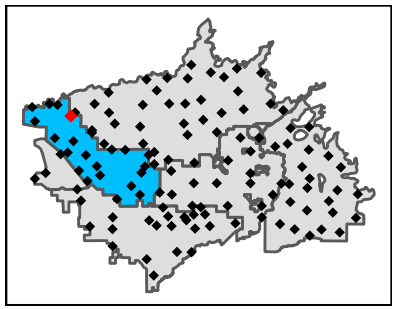


366188N1199104W001

State Well ID: 15S19E21C003M
Ground Surface Elevation: 235 ft
McMullin Area GSA







367477N1201460W001

State Well ID: 14S17E05D001M
Ground Surface Elevation: 205 ft
McMullin Area GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

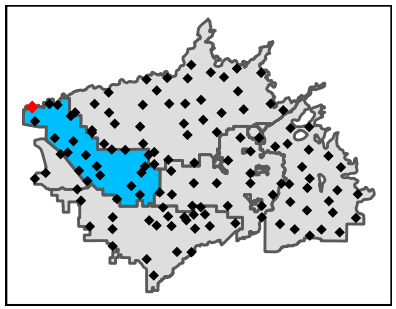
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



367705N1202691W001

State Well ID: 13S16E30L003M
Ground Surface Elevation: 177 ft
McMullin Area GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

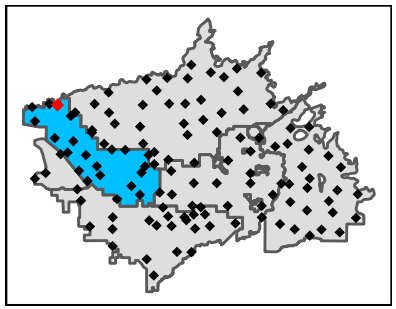
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



367757N1201874W001

State Well ID: 13S16E26A001M
Ground Surface Elevation: 193 ft
McMullin Area GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

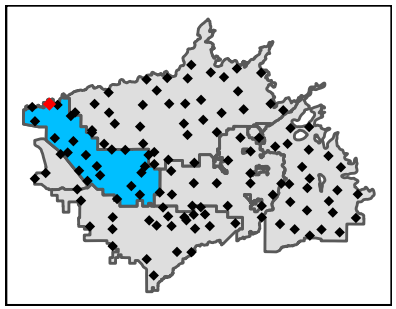
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



367782N1202141W001

State Well ID: 13S16E27C001M
Ground Surface Elevation: 188 ft
McMullin Area GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

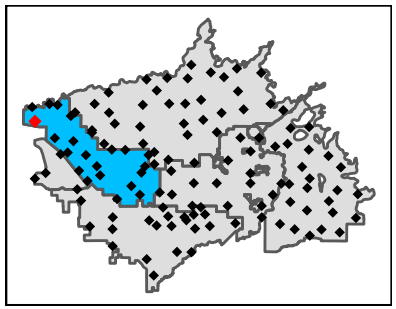
Measureable Objective

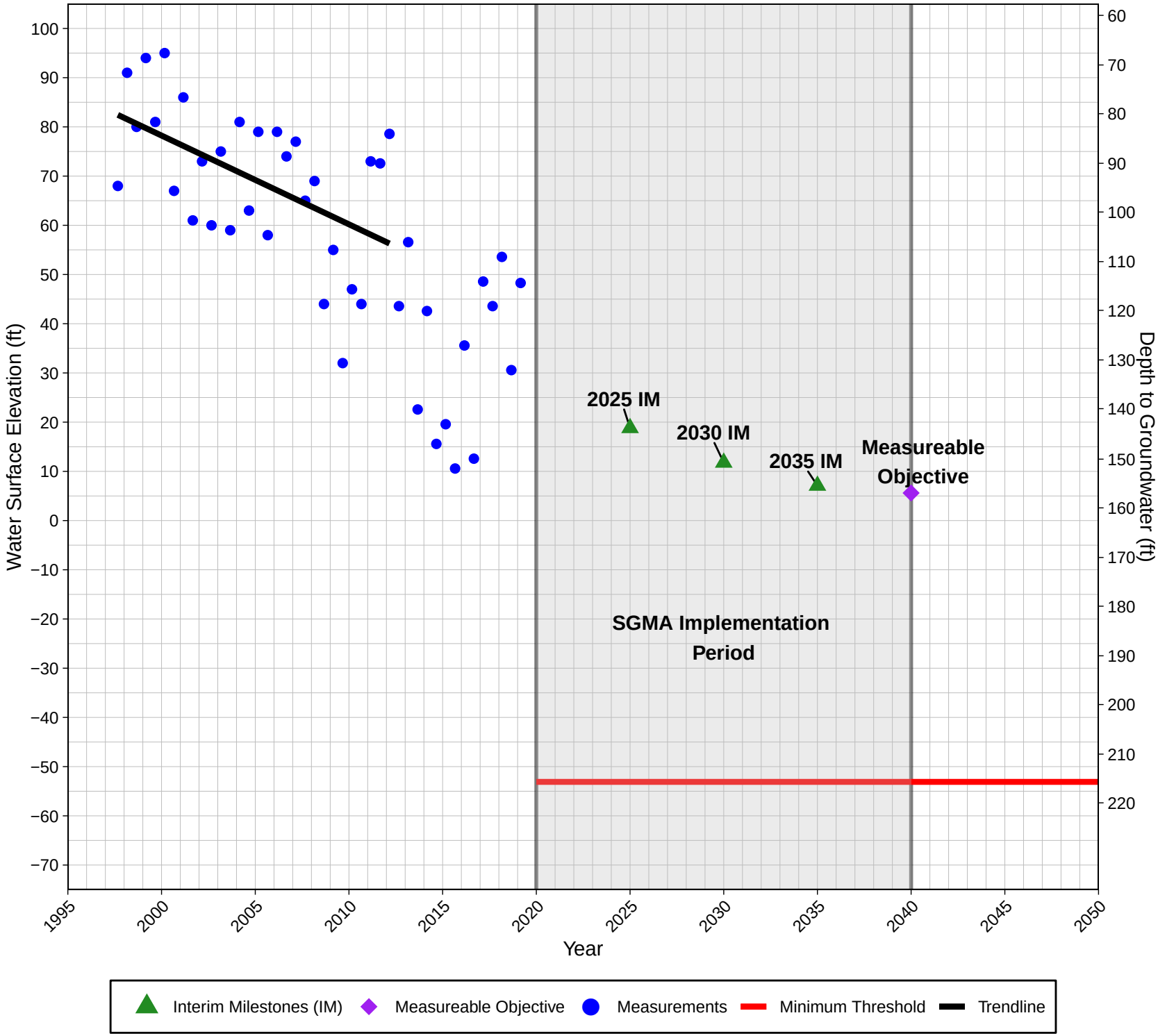
SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

A01

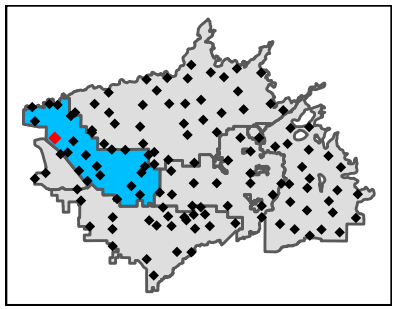
Ground Surface Elevation: 163 ft
McMullin Area GSA

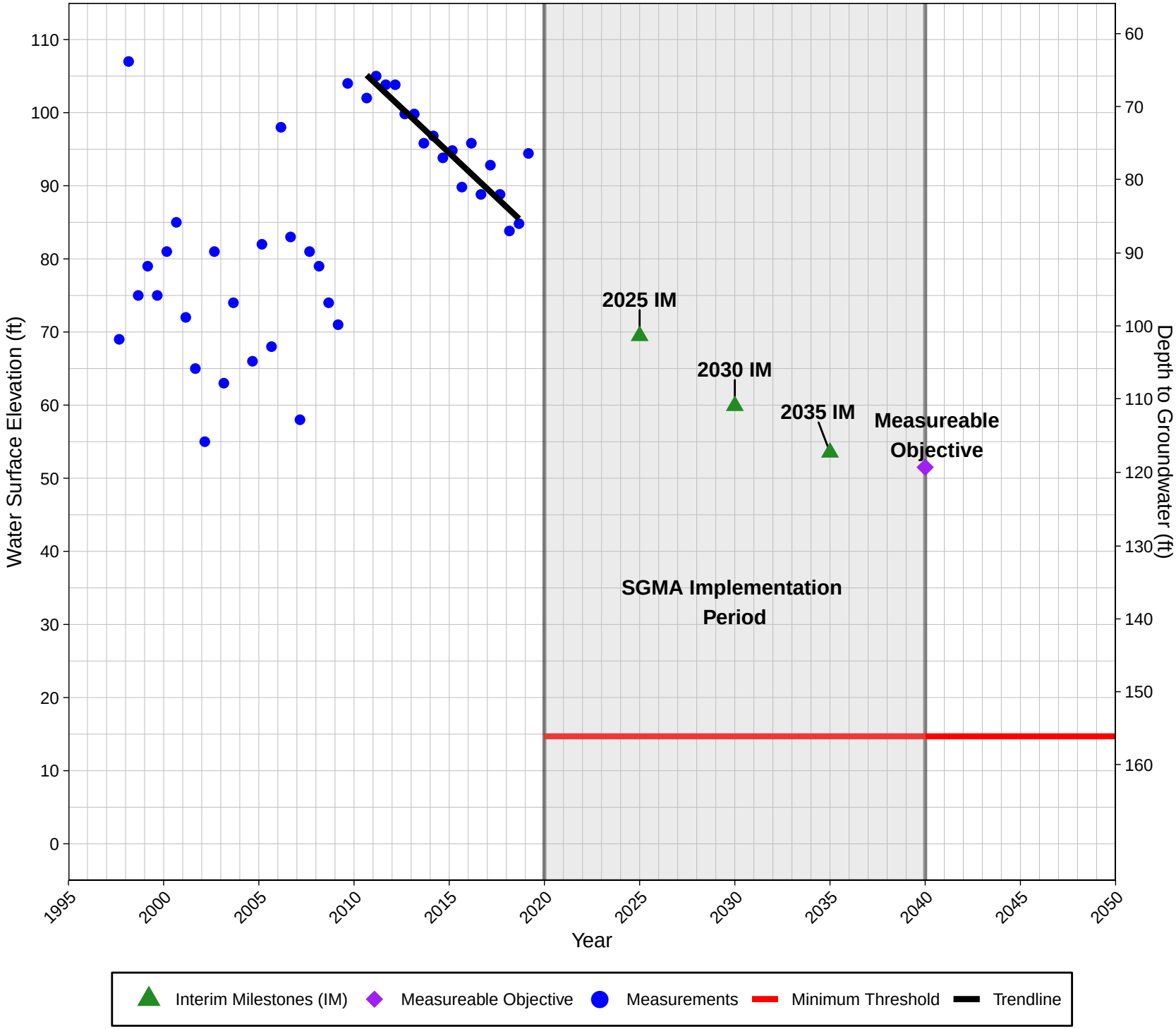


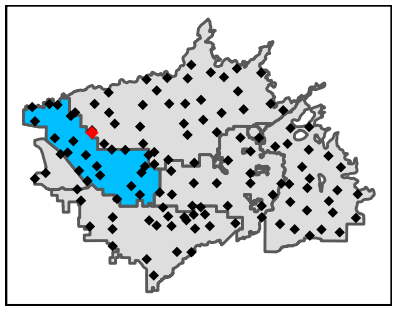


A07

State Well ID:
Ground Surface Elevation: 171 ft
McMullin Area GSA







A17

Ground Surface Elevation: 211 ft

McMullin Area GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

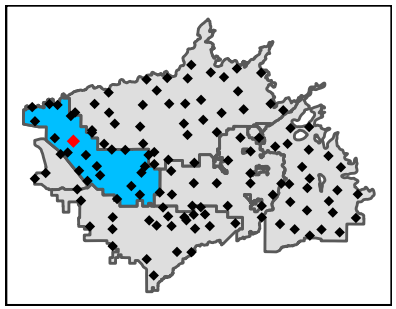
Interim Milestones (IM)

Measureable Objective

Measurements

Minimum Threshold

Trendline



A20

Ground Surface Elevation: 188 ft
McMullin Area GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

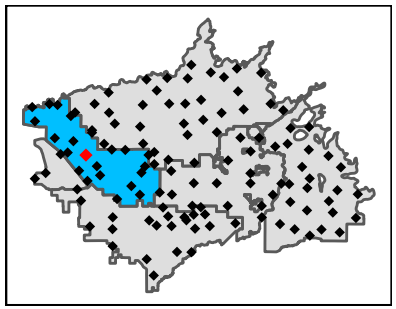
Measurements

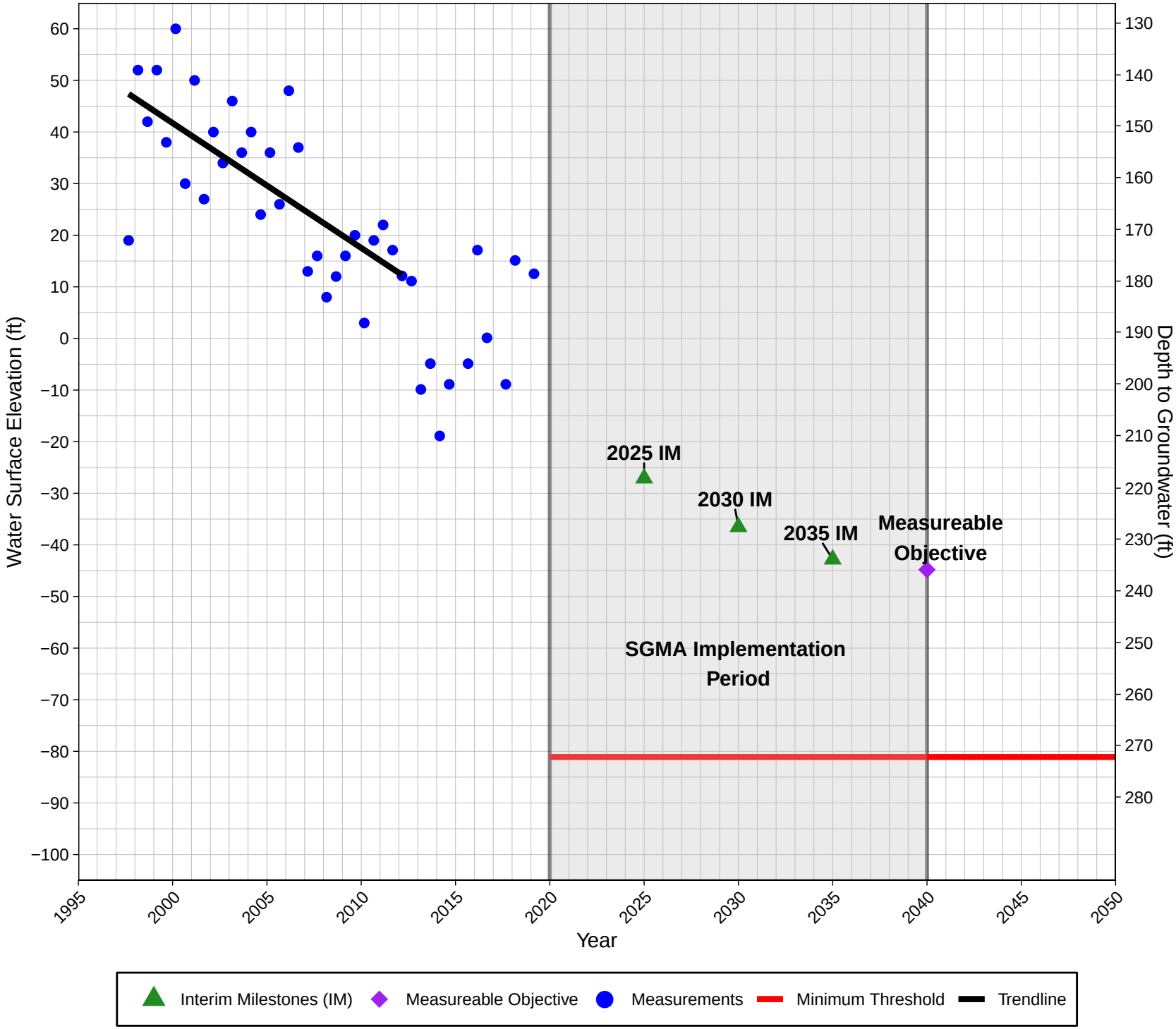
Minimum Threshold

Trendline

A23

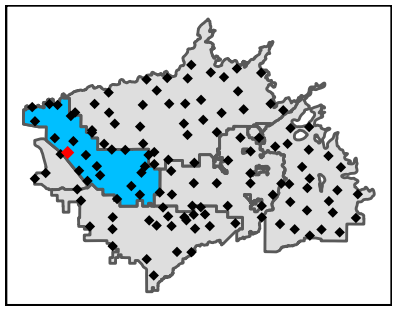
State Well ID:
Ground Surface Elevation: 191 ft
McMullin Area GSA





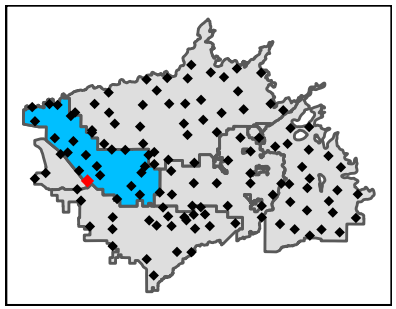
A24

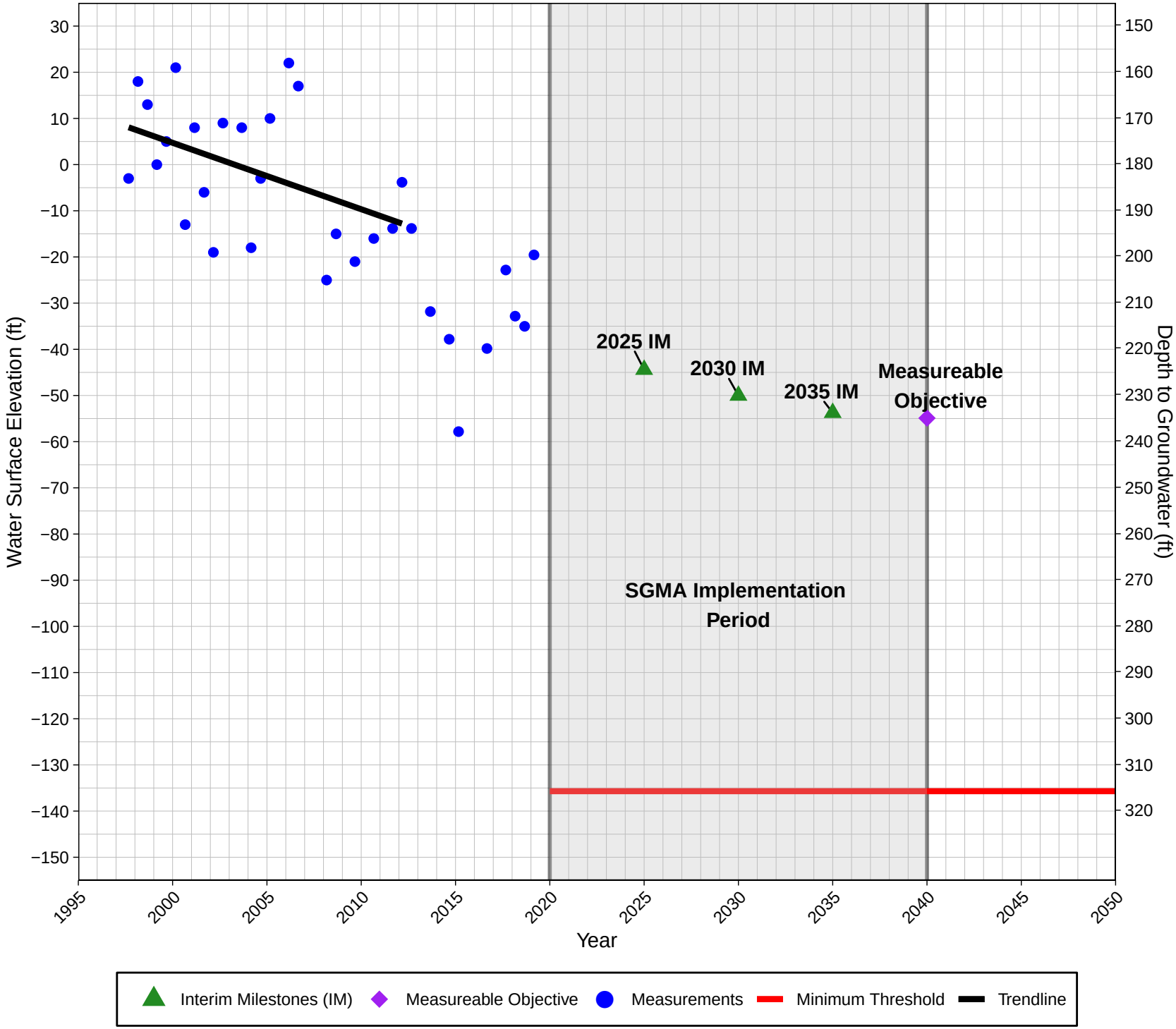
Ground Surface Elevation: 175 ft
McMullin Area GSA



A30

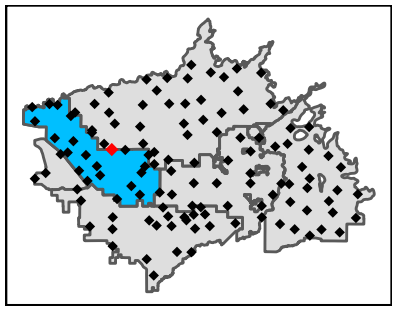
State Well ID:
Ground Surface Elevation: 180 ft
McMullin Area GSA

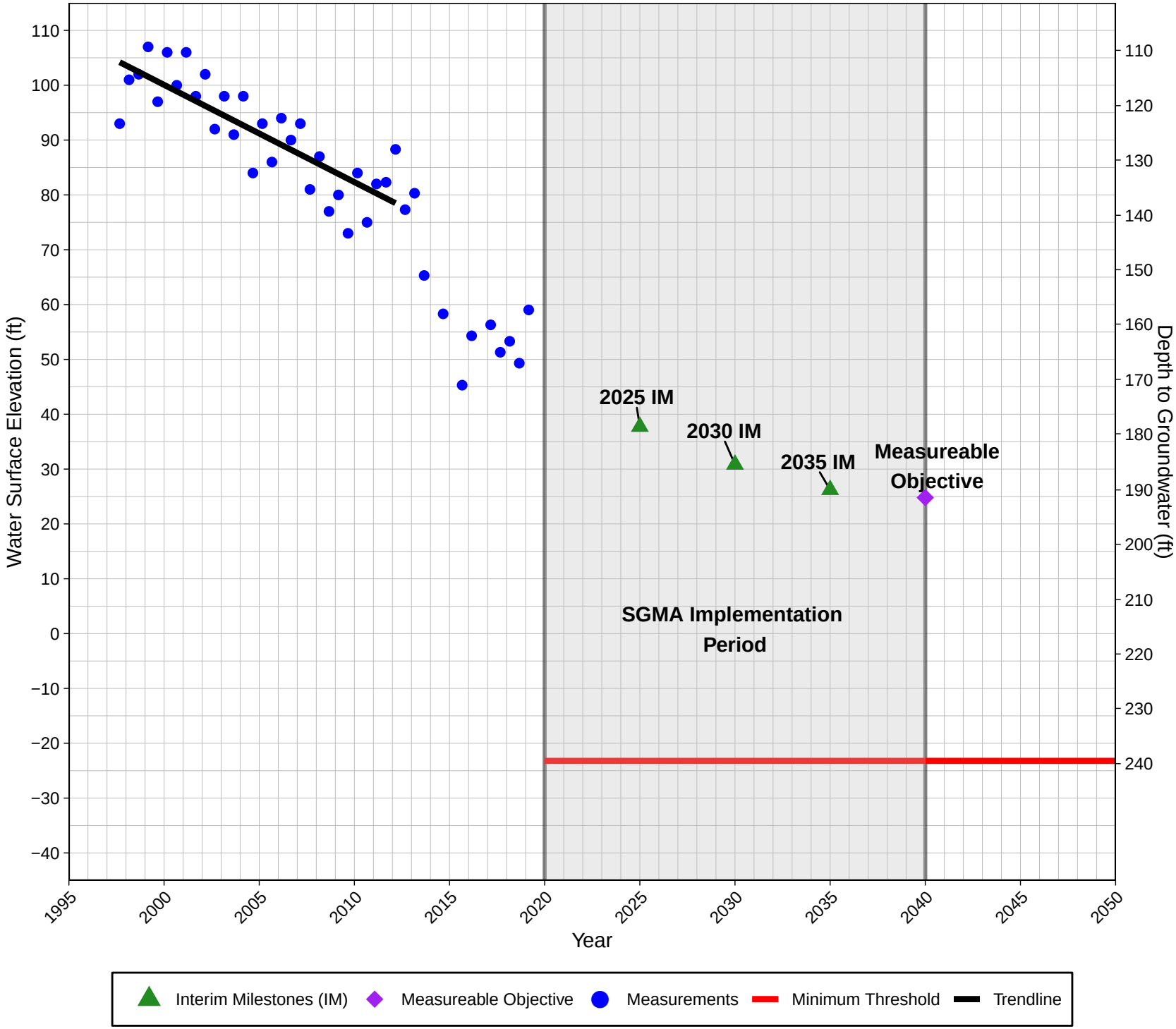




A34

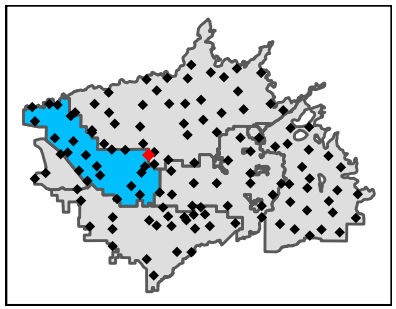
State Well ID:
Ground Surface Elevation: 216 ft
McMullin Area GSA

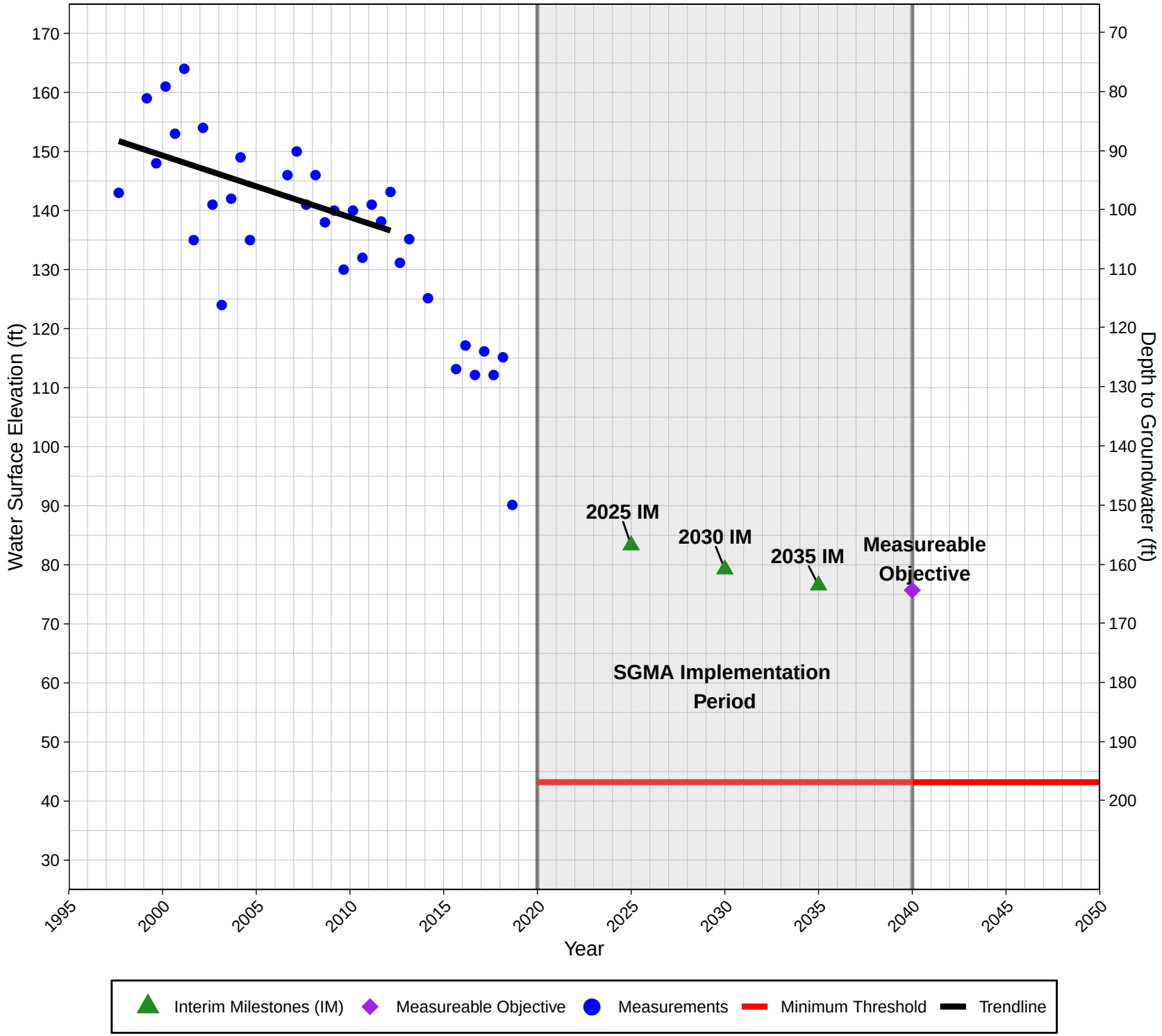




A46

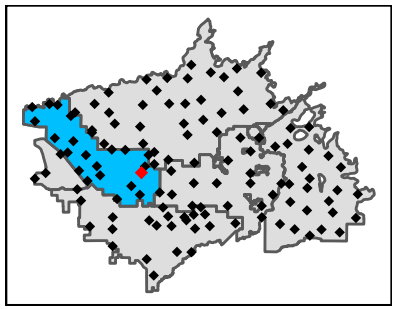
Ground Surface Elevation: 240 ft
McMullin Area GSA

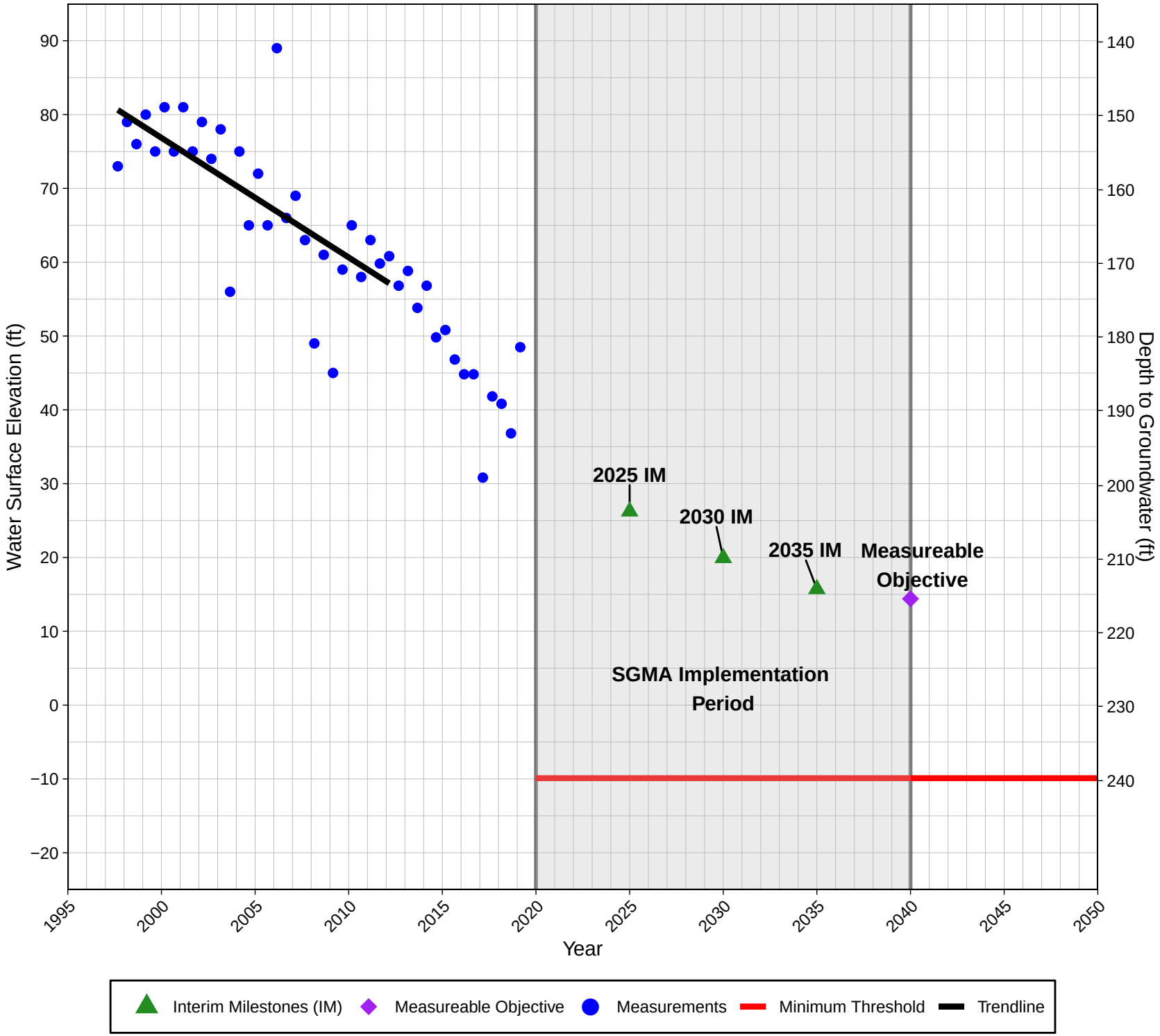




A51

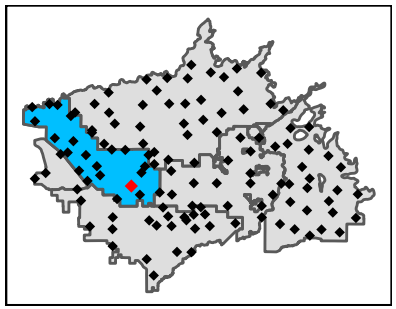
Ground Surface Elevation: 230 ft
McMullin Area GSA

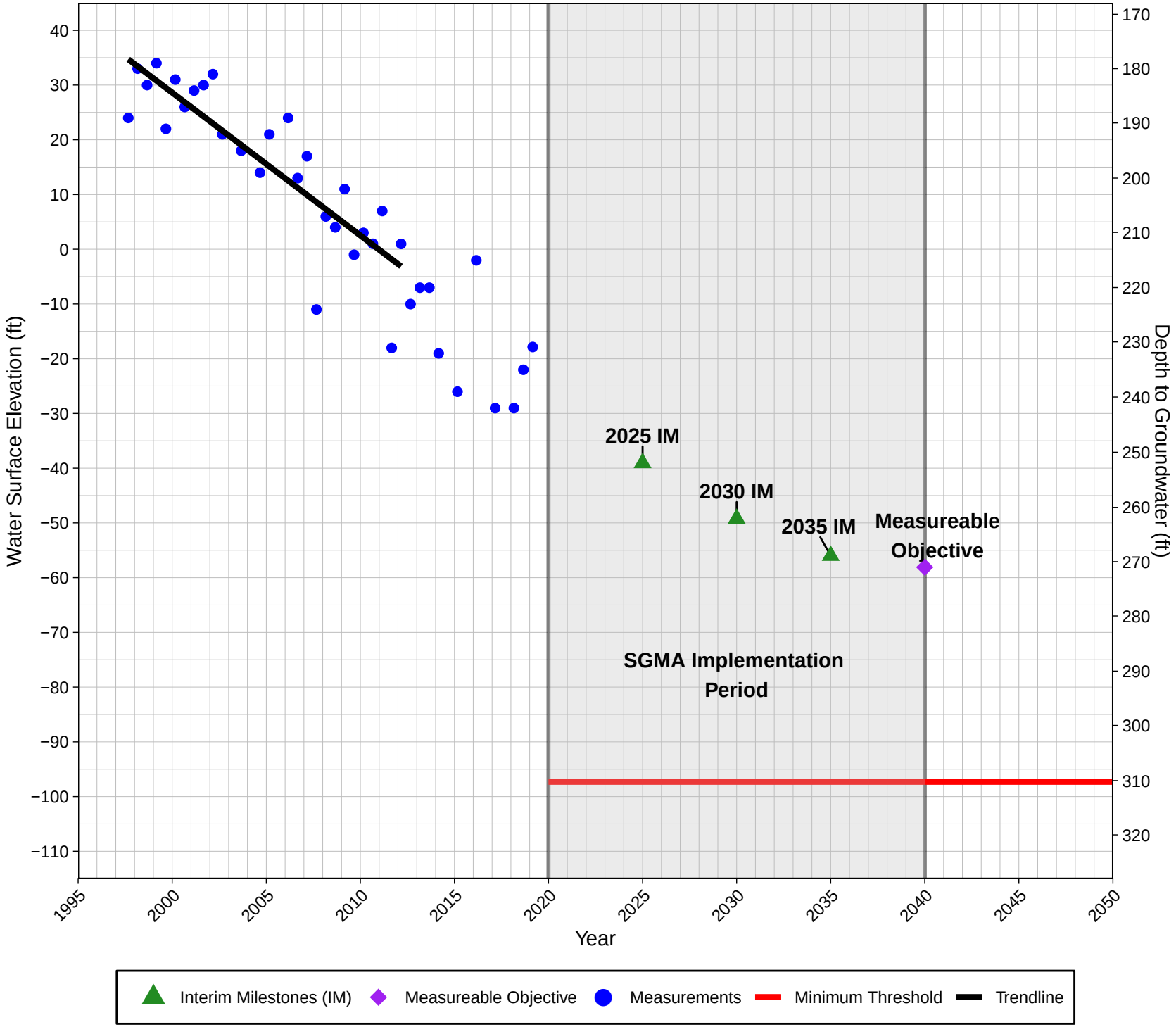




A53

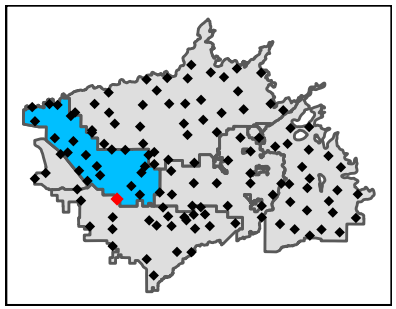
State Well ID:
Ground Surface Elevation: 213 ft
McMullin Area GSA

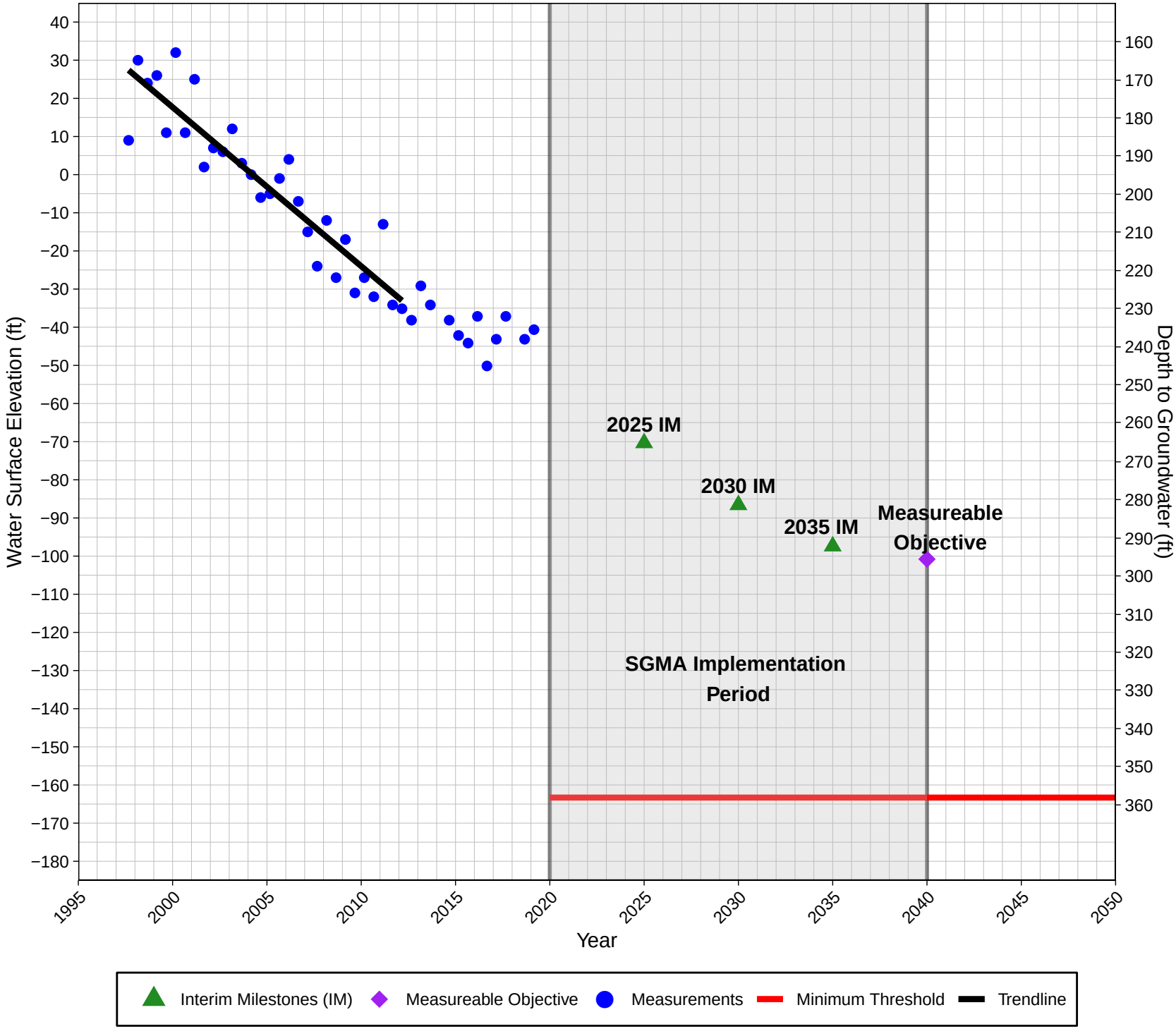




A58

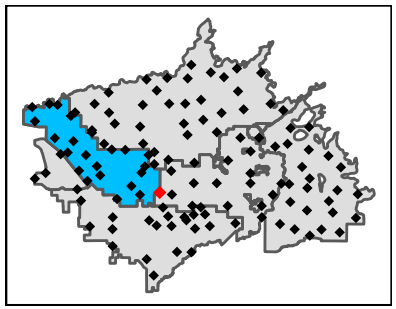
State Well ID:
Ground Surface Elevation: 195 ft
McMullin Area GSA

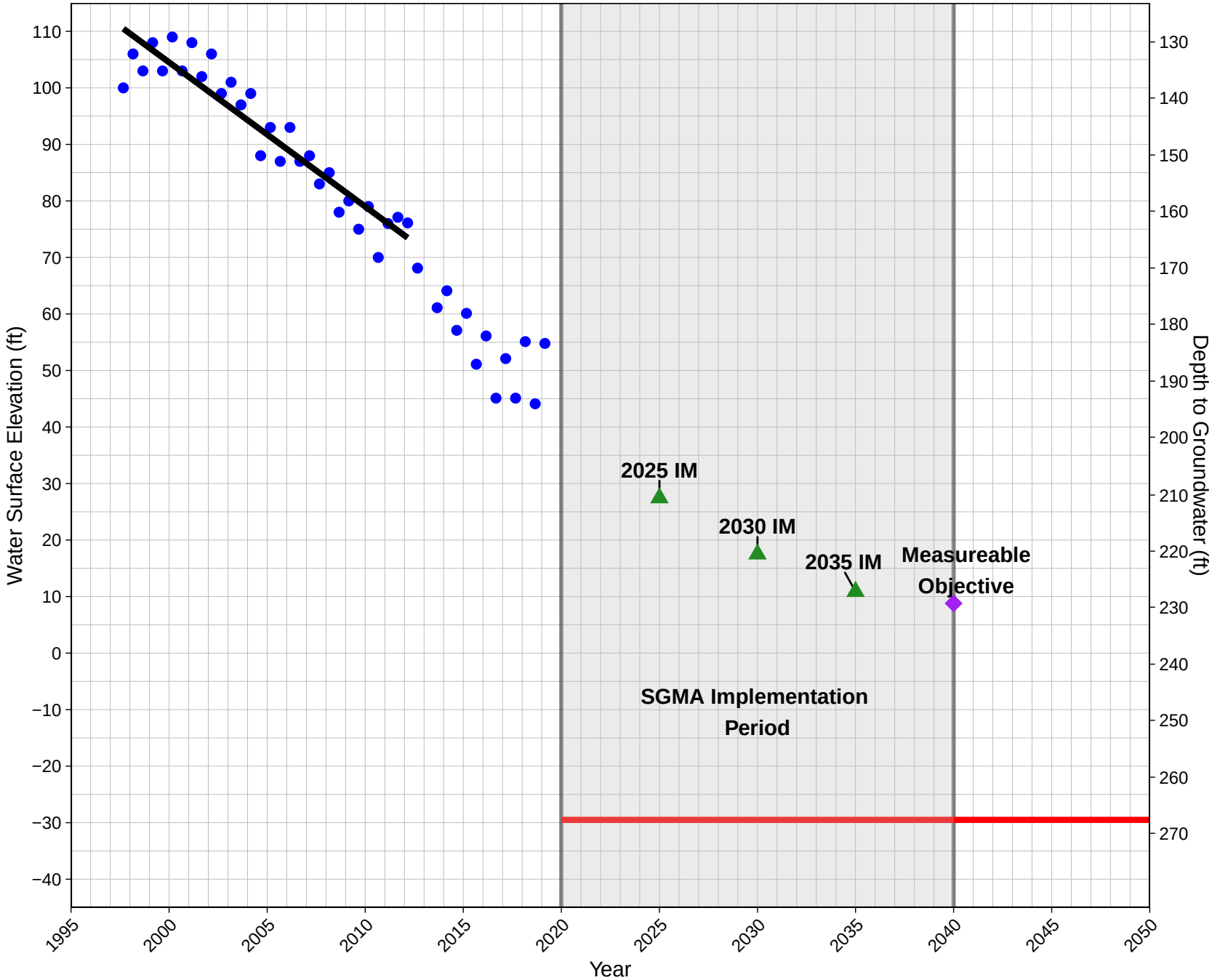




A62

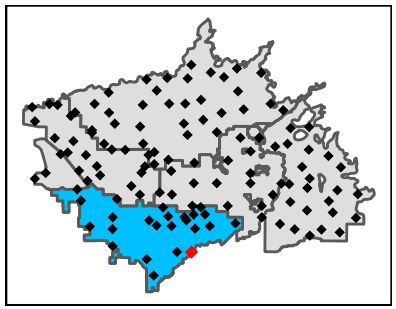
State Well ID: 16S19E14A001M
Ground Surface Elevation: 238 ft
McMullin Area GSA

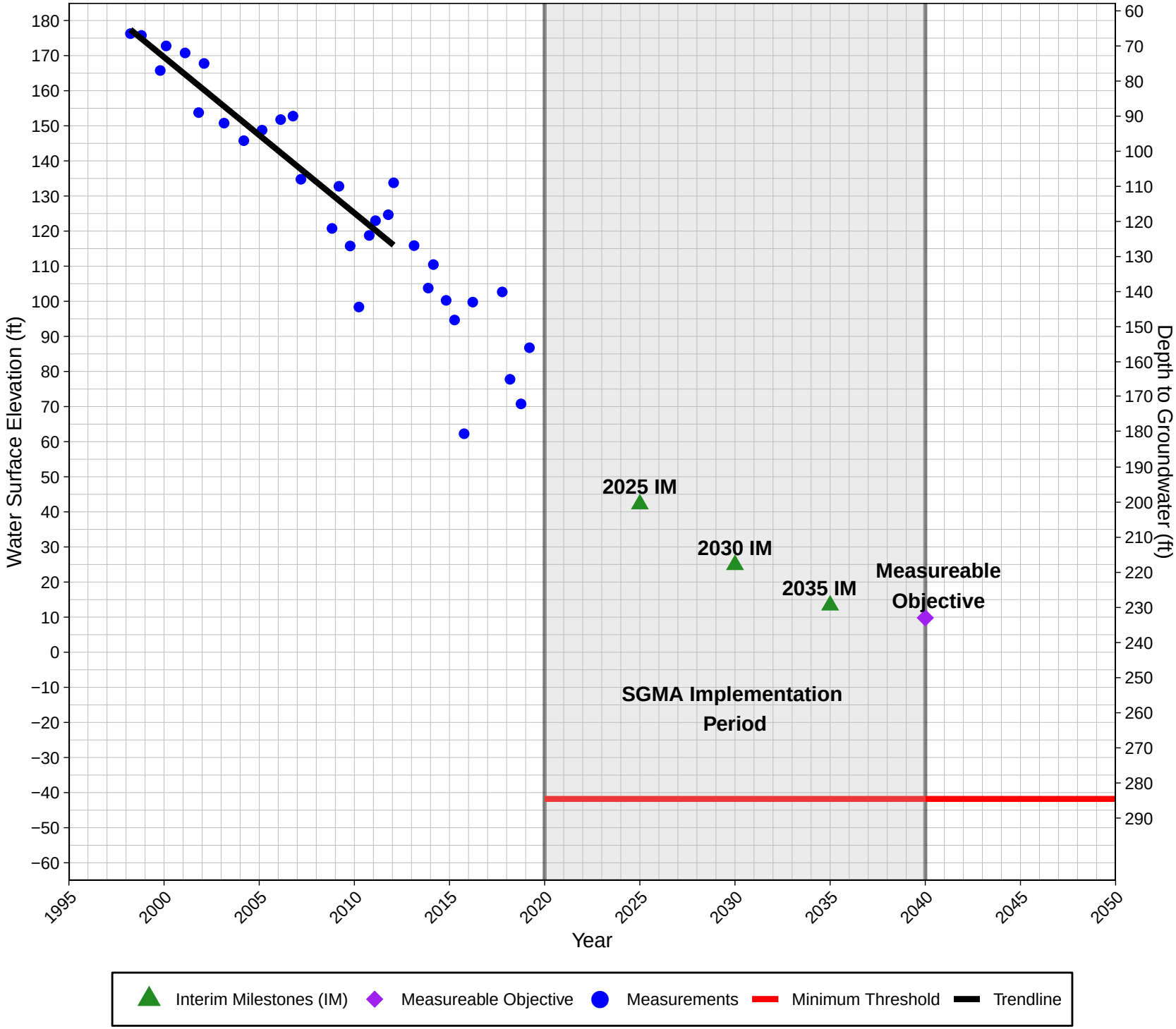




364002N1197624W001

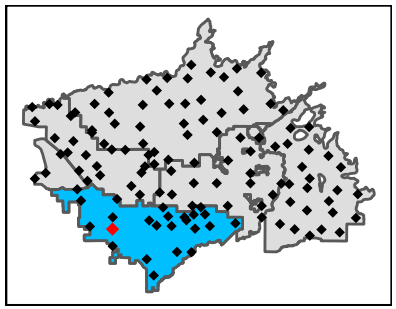
State Well ID: 18S20E02A001M
Ground Surface Elevation: 243 ft
North Fork Kings GSA

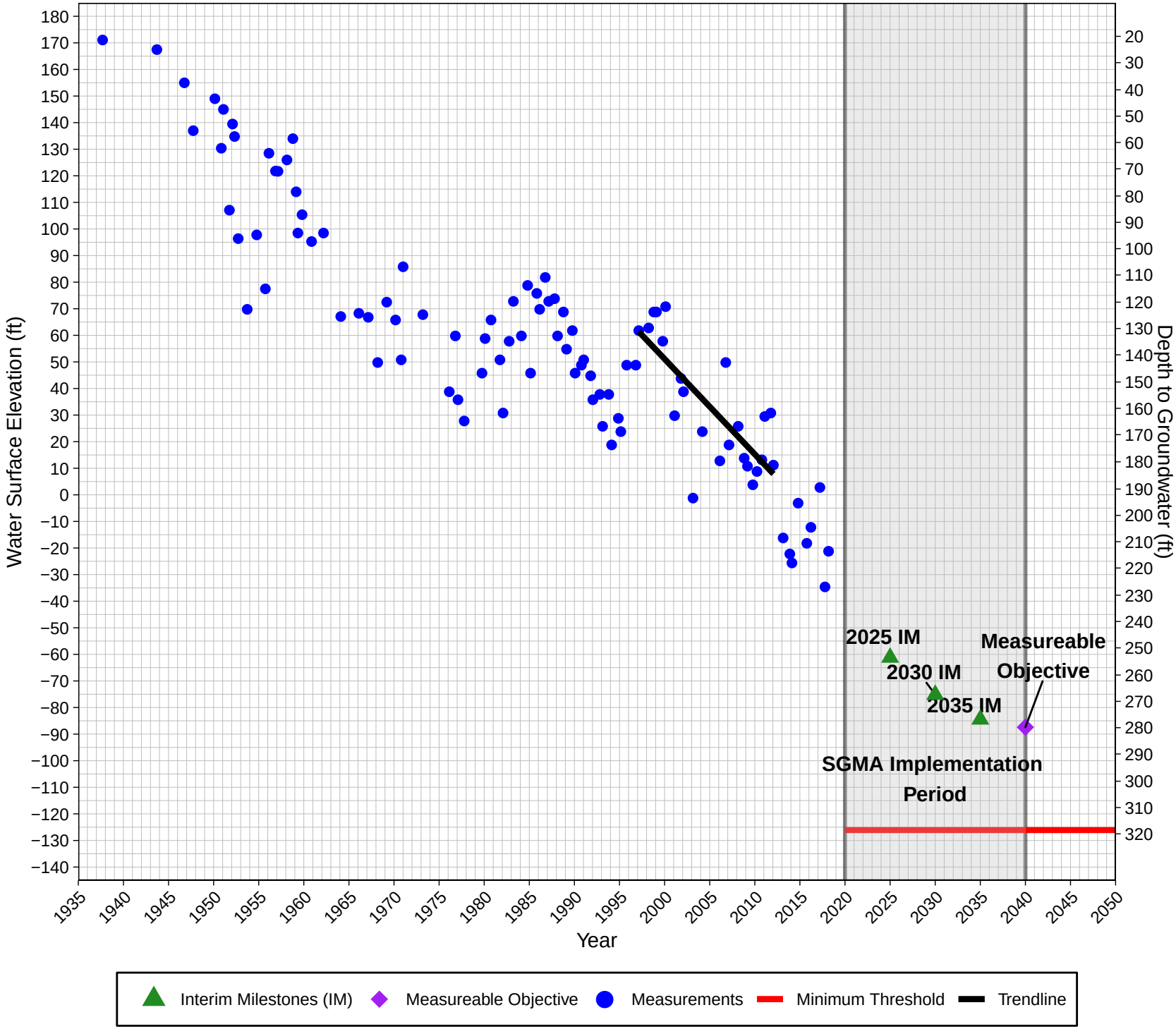




364591N1200135W001

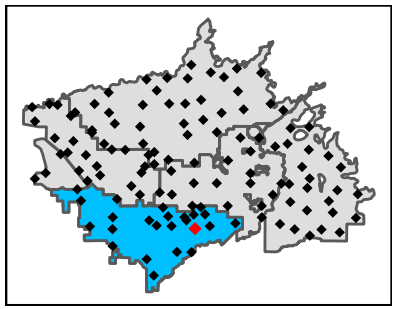
State Well ID: 17S18E09R001M
Ground Surface Elevation: 192 ft
North Fork Kings GSA

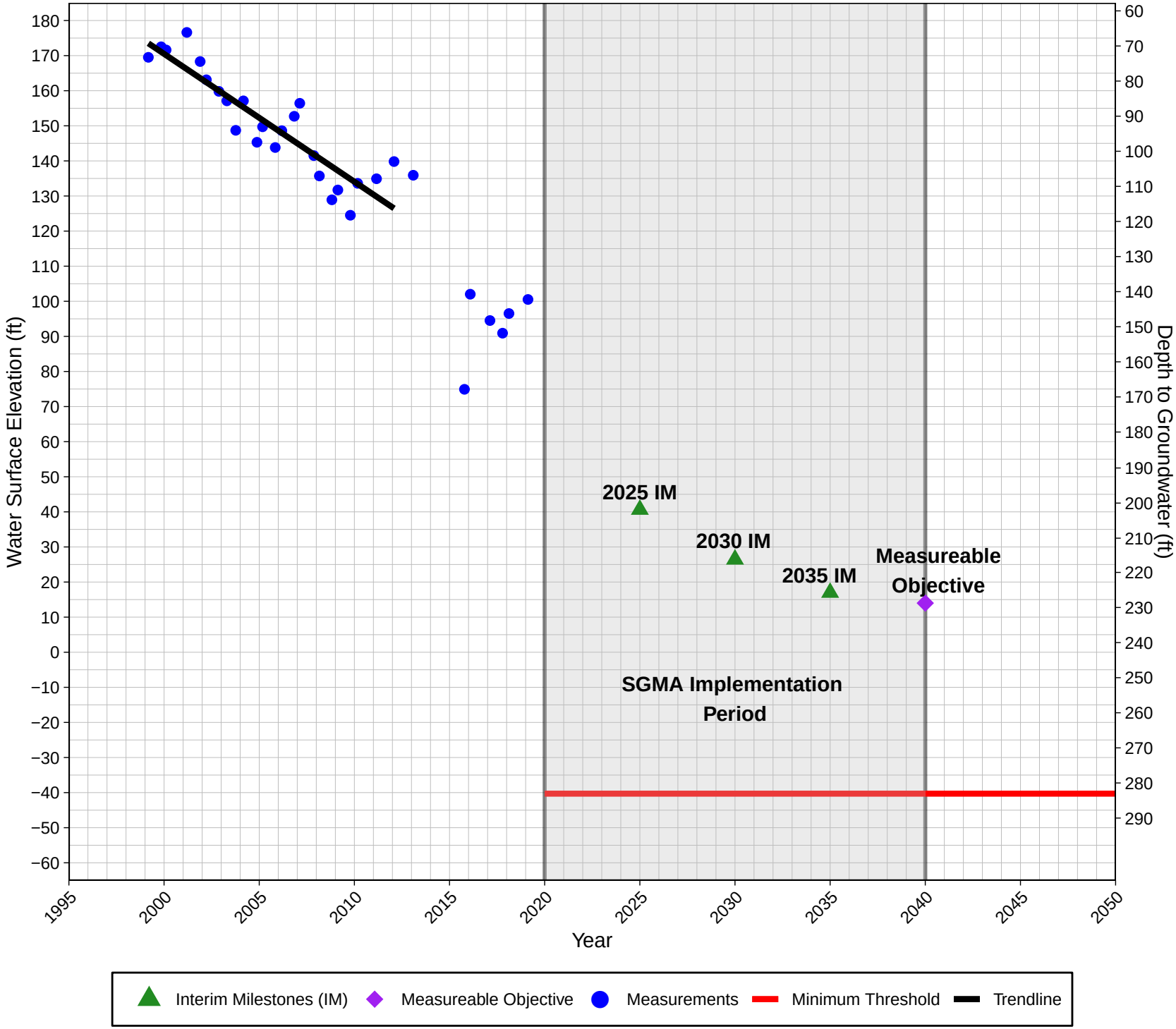




364603N1197510W001

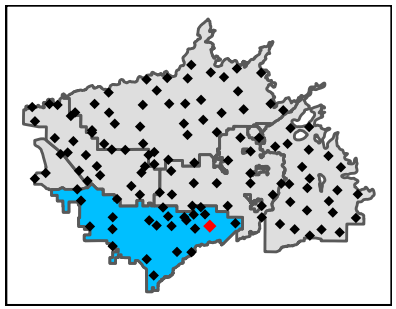
State Well ID: 17S20E12Q001M
Ground Surface Elevation: 243 ft
North Fork Kings GSA

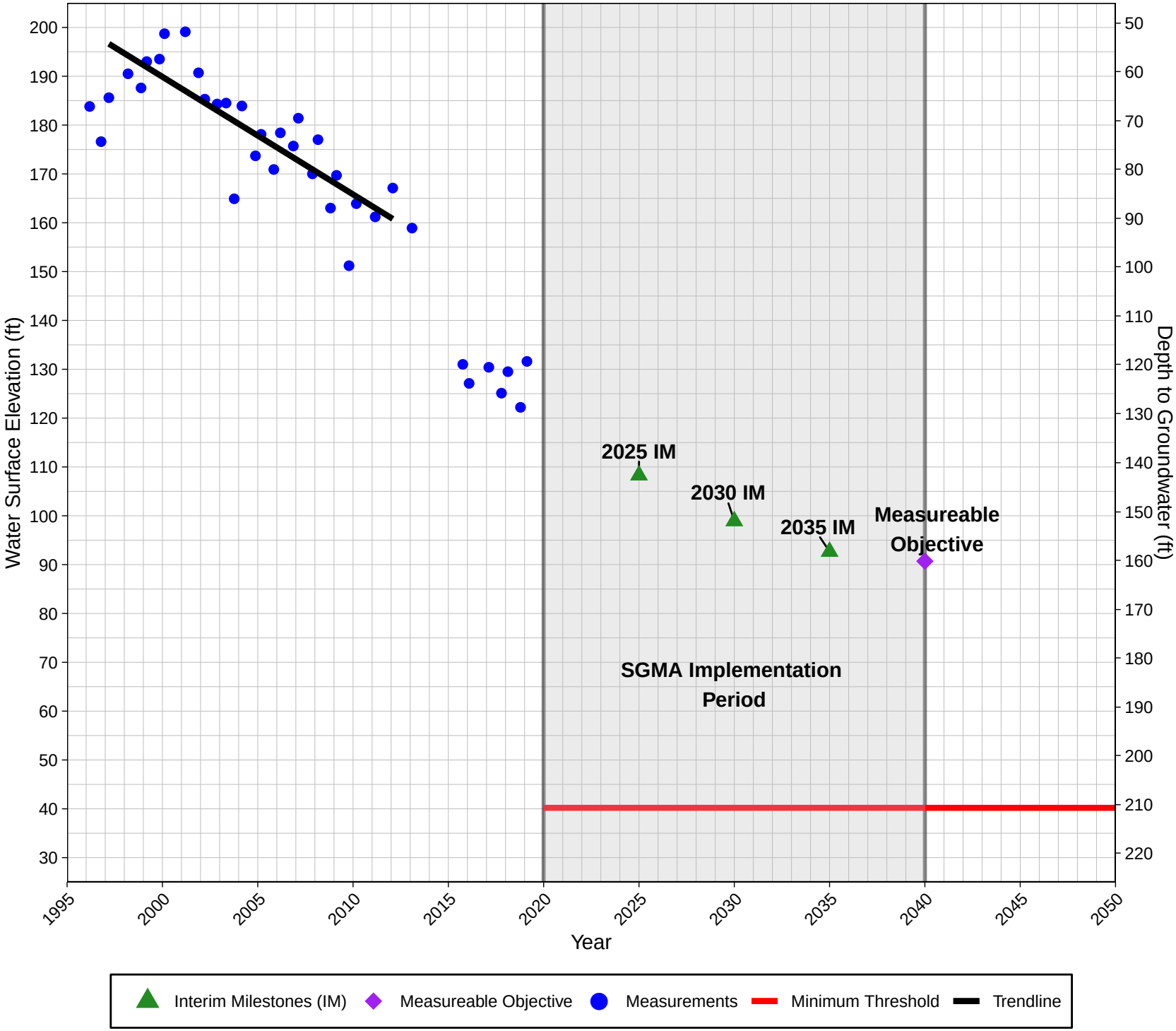




364667N1197041W001

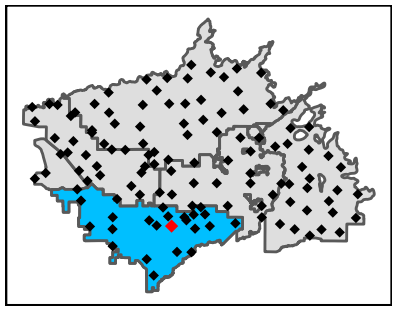
State Well ID: 17S21E09M001M
Ground Surface Elevation: 251 ft
North Fork Kings GSA

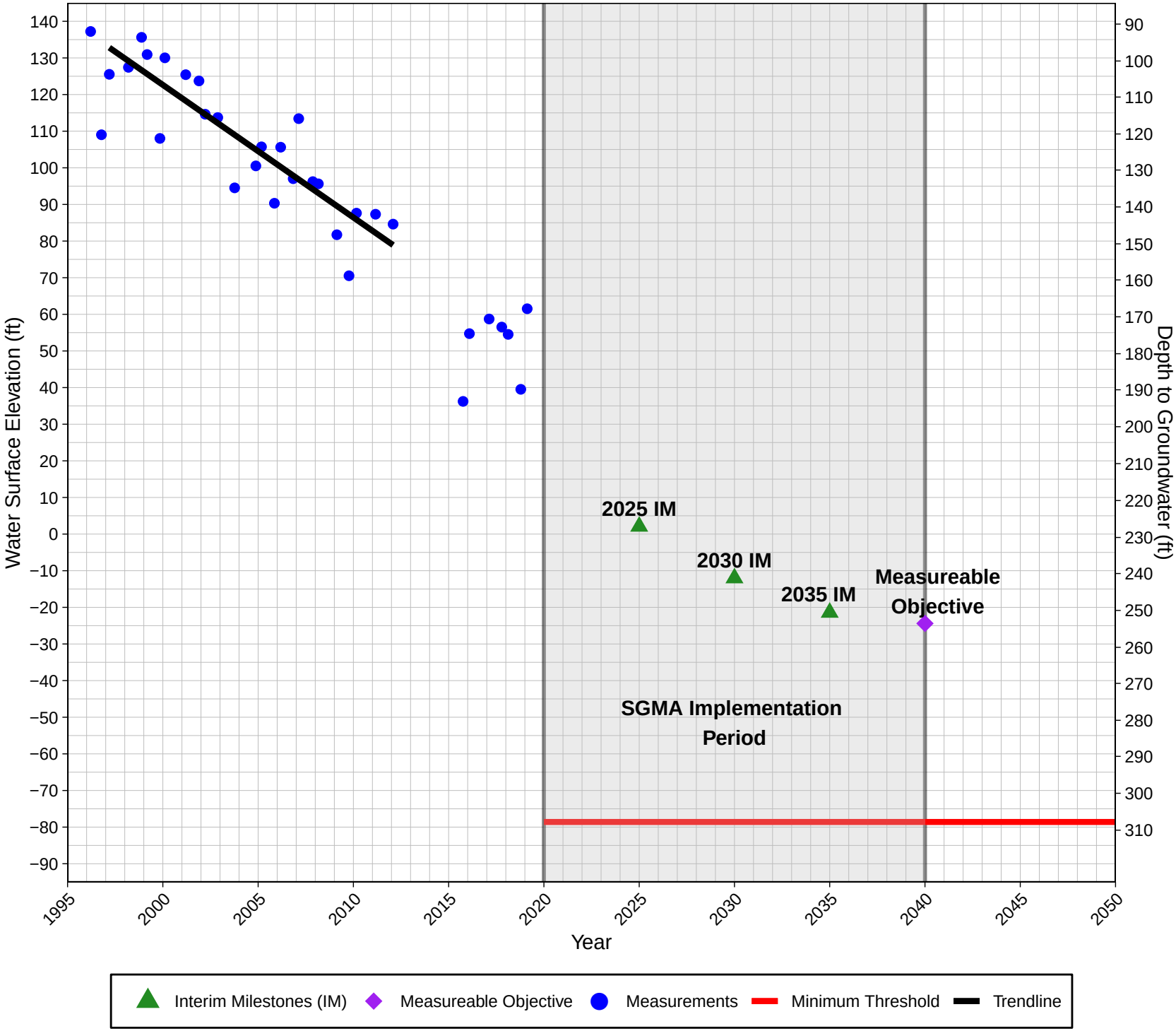




364668N1198257W001

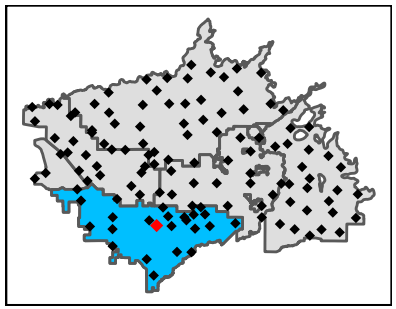
State Well ID: 17S20E08L001M
Ground Surface Elevation: 229 ft
North Fork Kings GSA

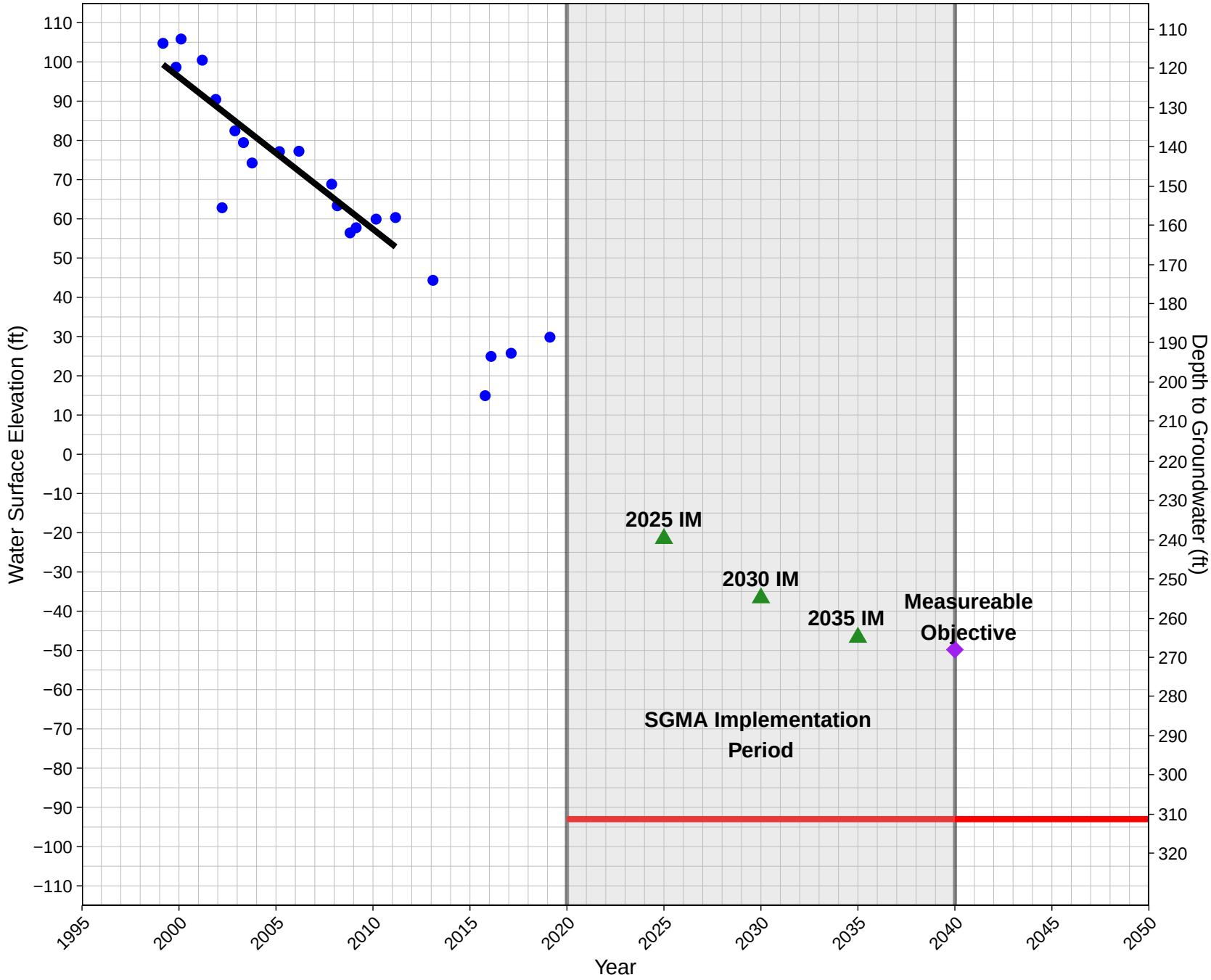




364682N1198732W001

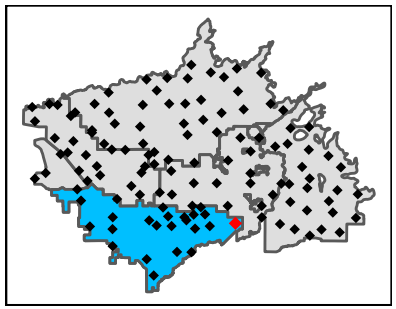
State Well ID: 17S19E11H001M
Ground Surface Elevation: 218 ft
North Fork Kings GSA

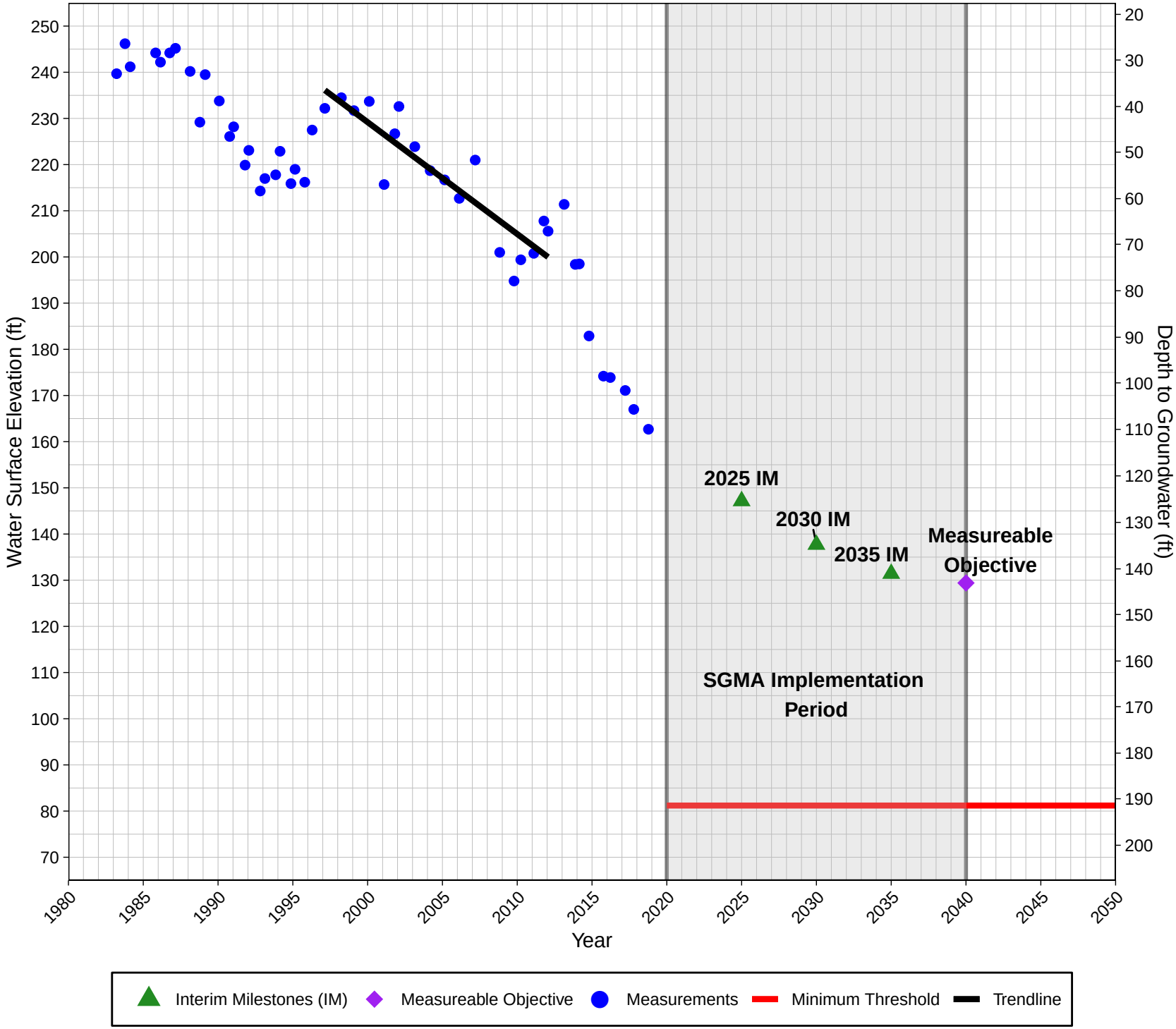




364739N1196227W001

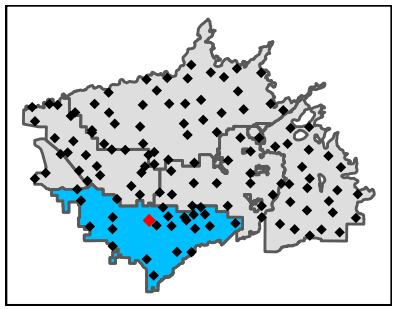
State Well ID: 17S22E07A001M
Ground Surface Elevation: 273 ft
North Fork Kings GSA

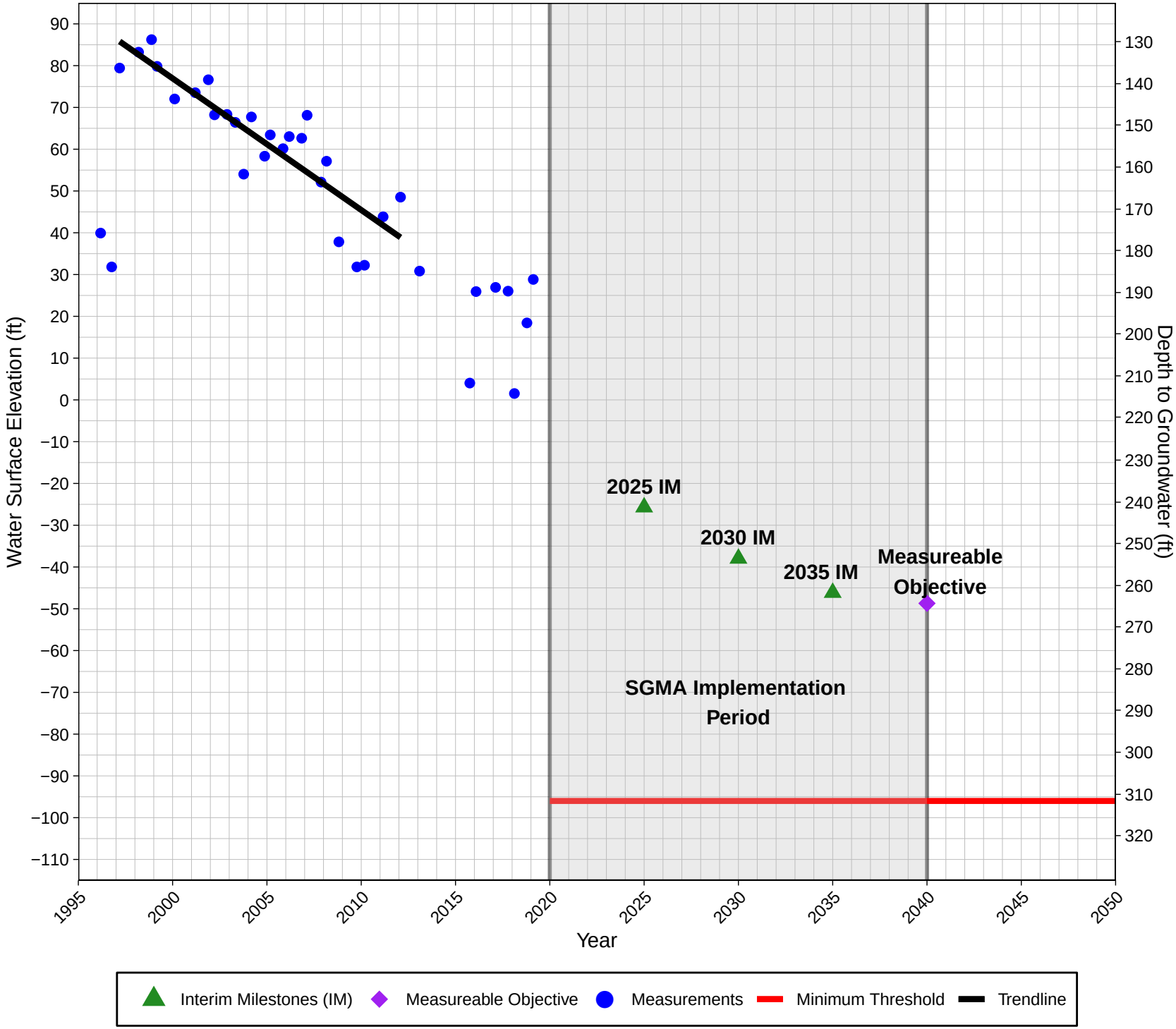




364813N1198968W001

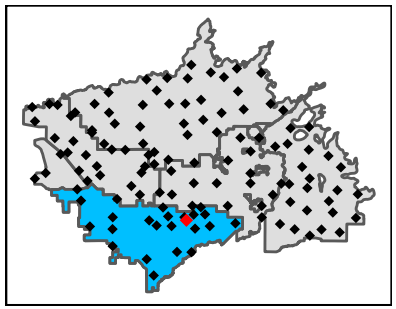
State Well ID: 17S19E03L001M
Ground Surface Elevation: 216 ft
North Fork Kings GSA

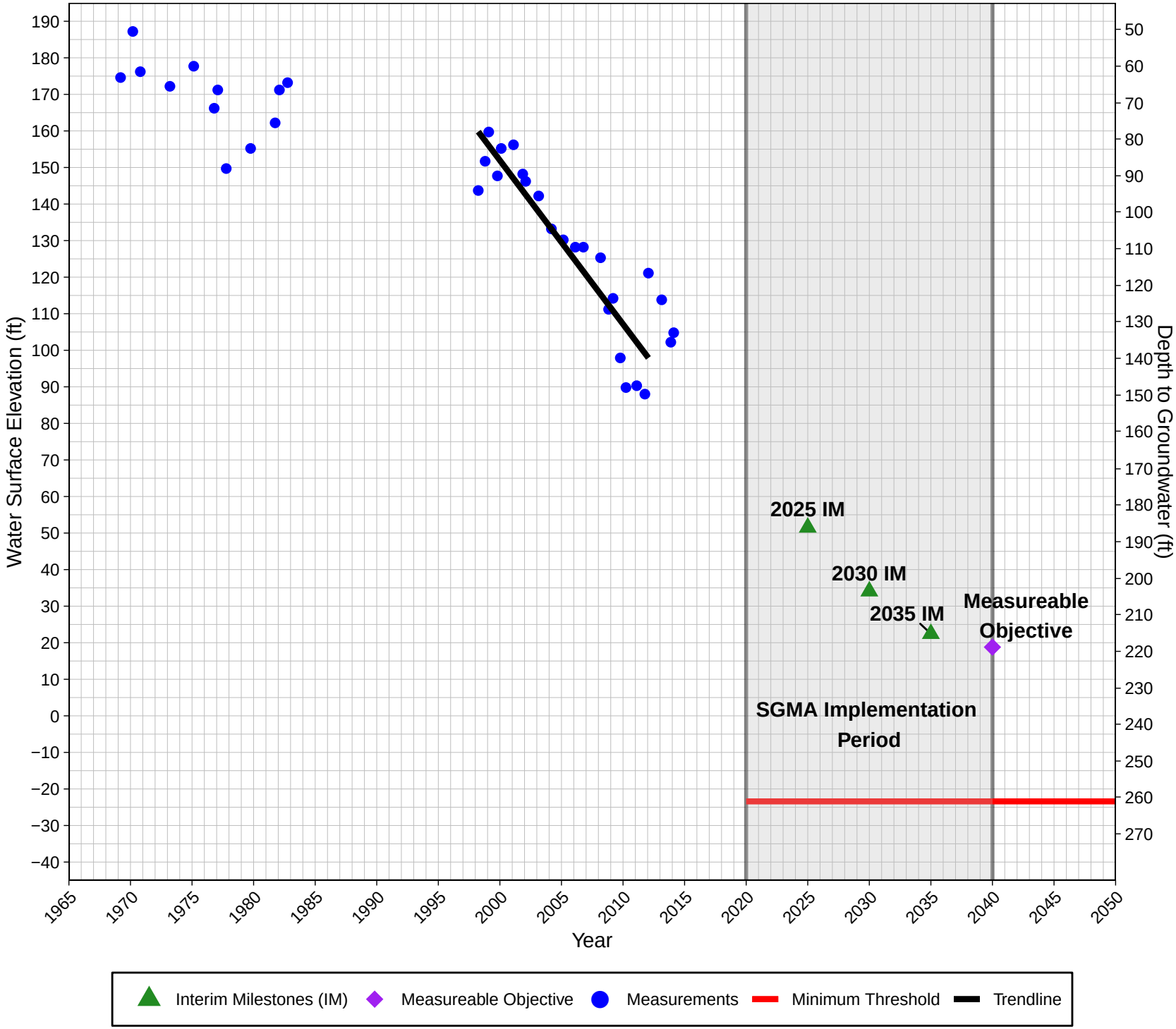




364816N1197785W001

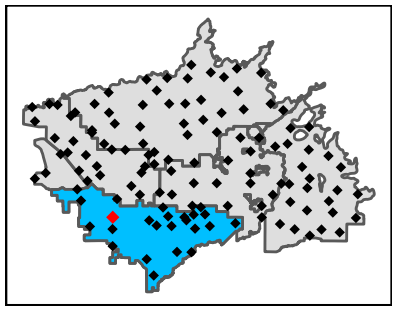
State Well ID: 17S20E02M001M
Ground Surface Elevation: 238 ft
North Fork Kings GSA

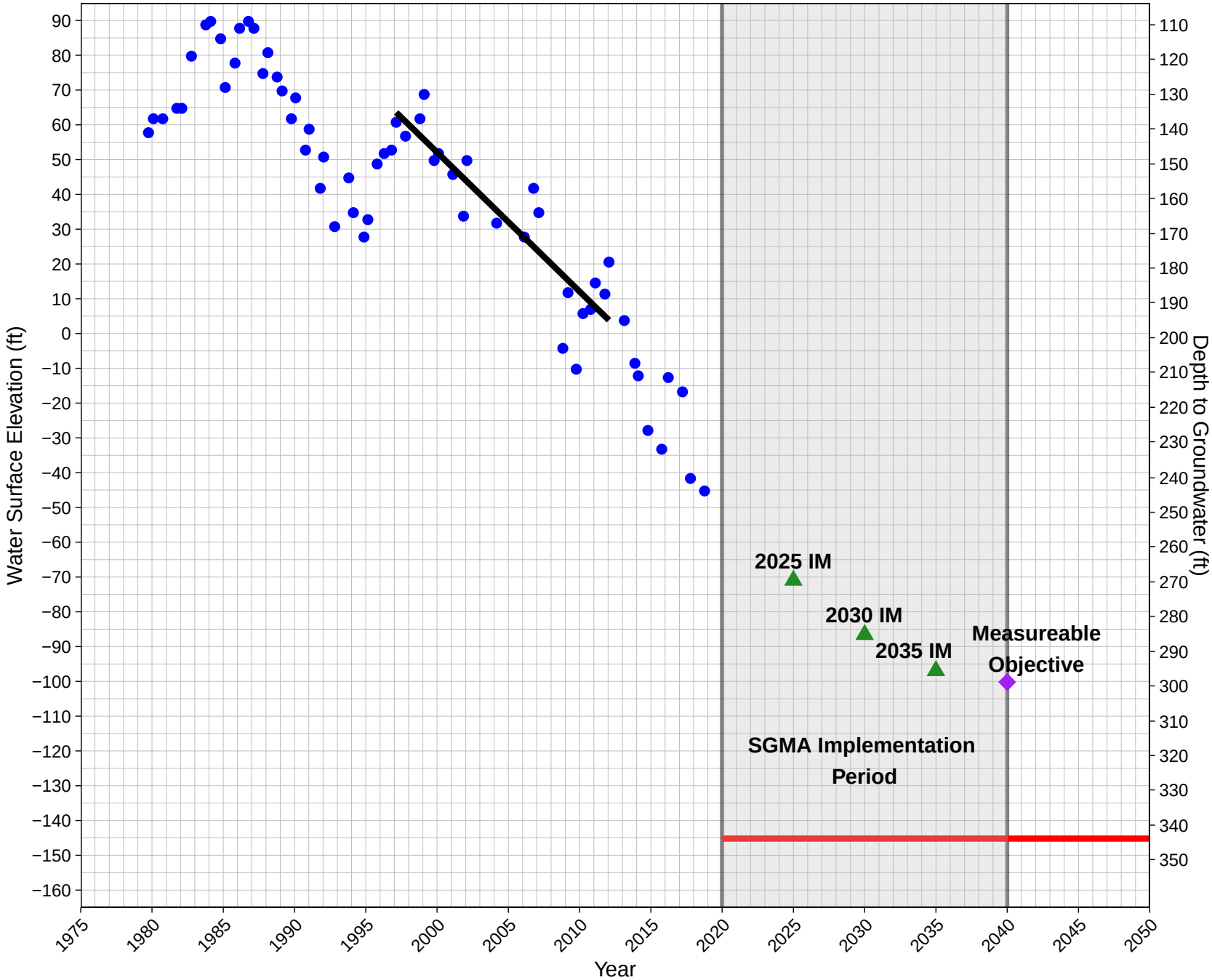




364893N1200127W001

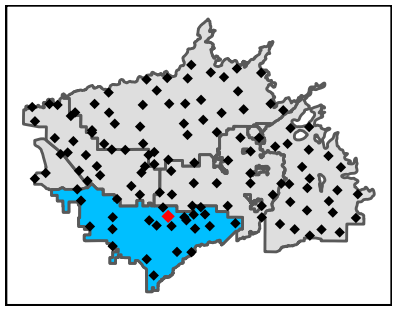
State Well ID: 16S18E33Q001M
Ground Surface Elevation: 199 ft
North Fork Kings GSA

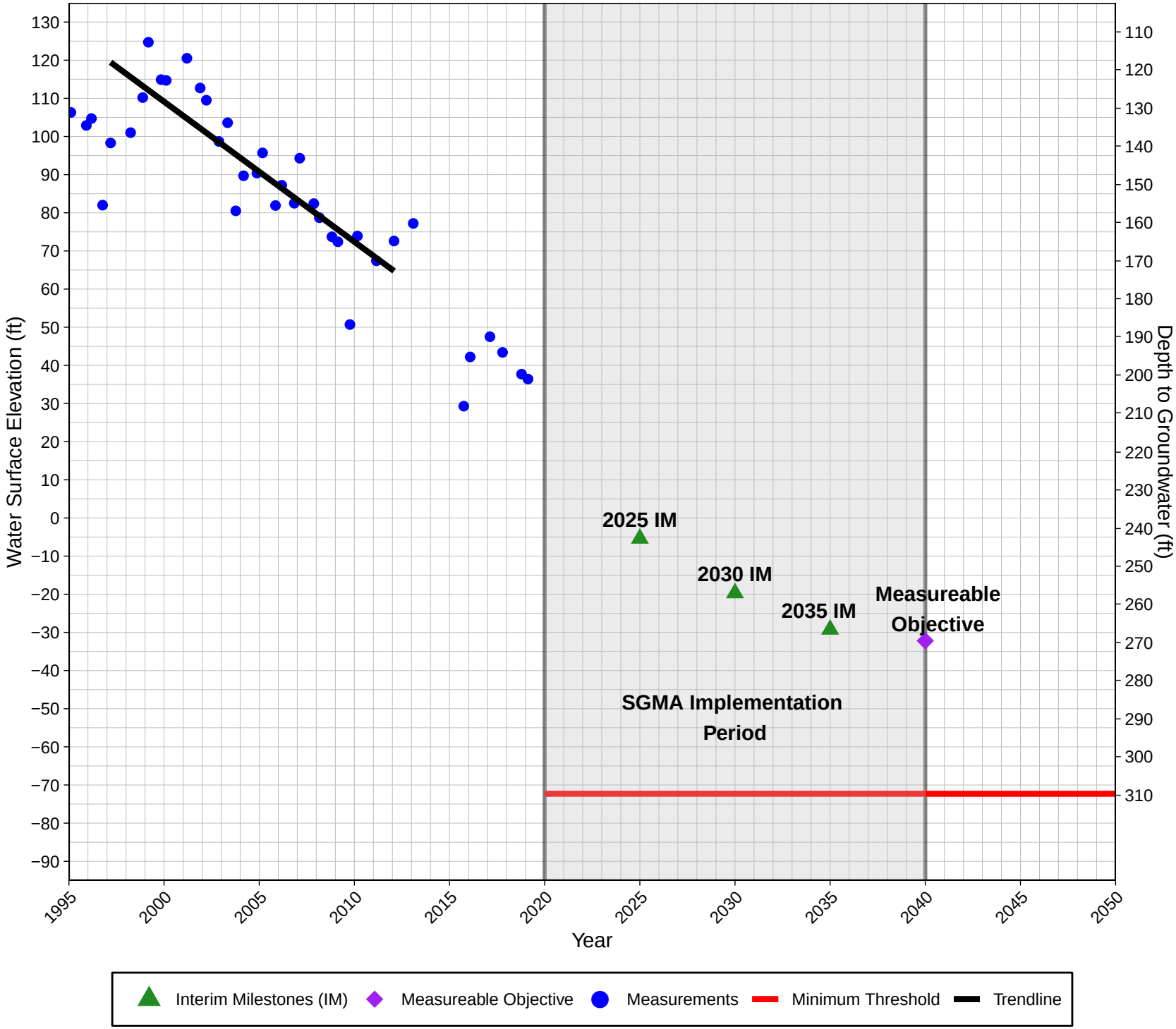




364916N1198366W001

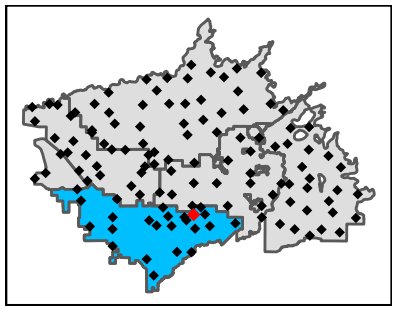
State Well ID: 16S20E31P001M
Ground Surface Elevation: 237 ft
North Fork Kings GSA

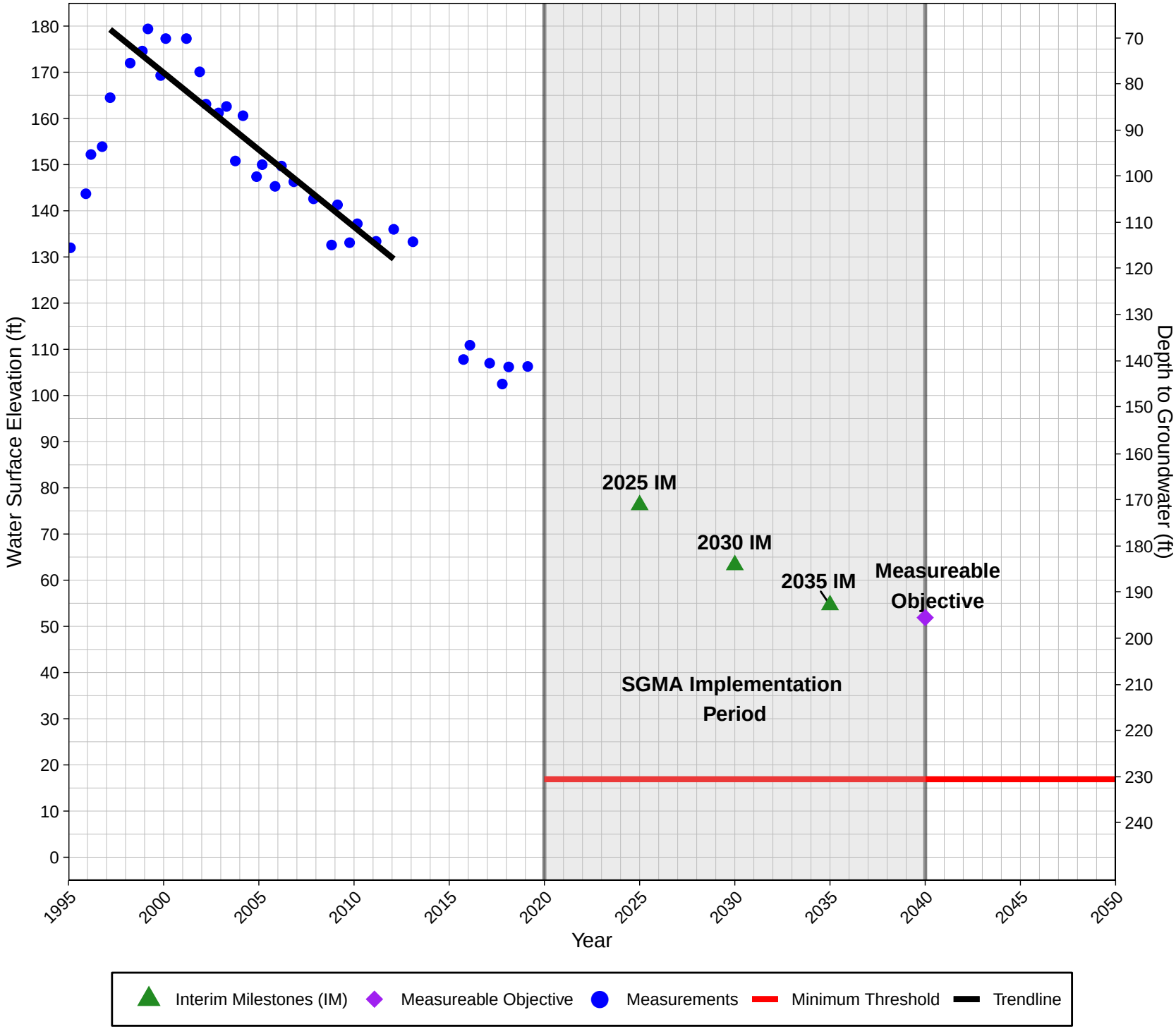




364960N1197554W001

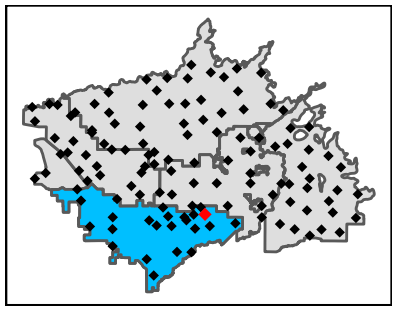
State Well ID: 16S20E35J001M
Ground Surface Elevation: 247 ft
North Fork Kings GSA

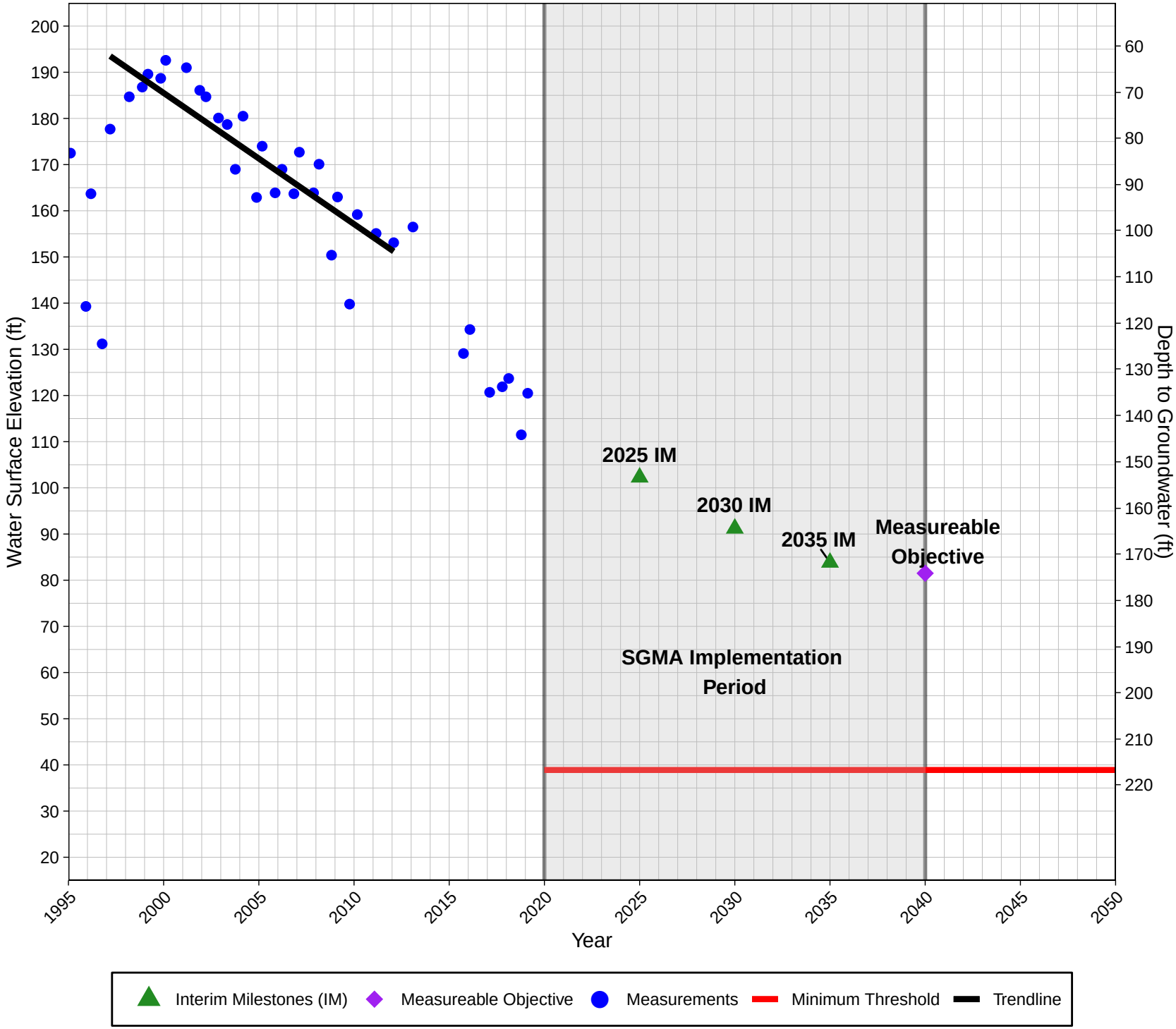




364967N1197193W001

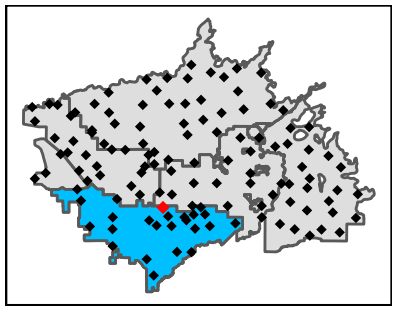
State Well ID: 16S21E31J001M
Ground Surface Elevation: 256 ft
North Fork Kings GSA

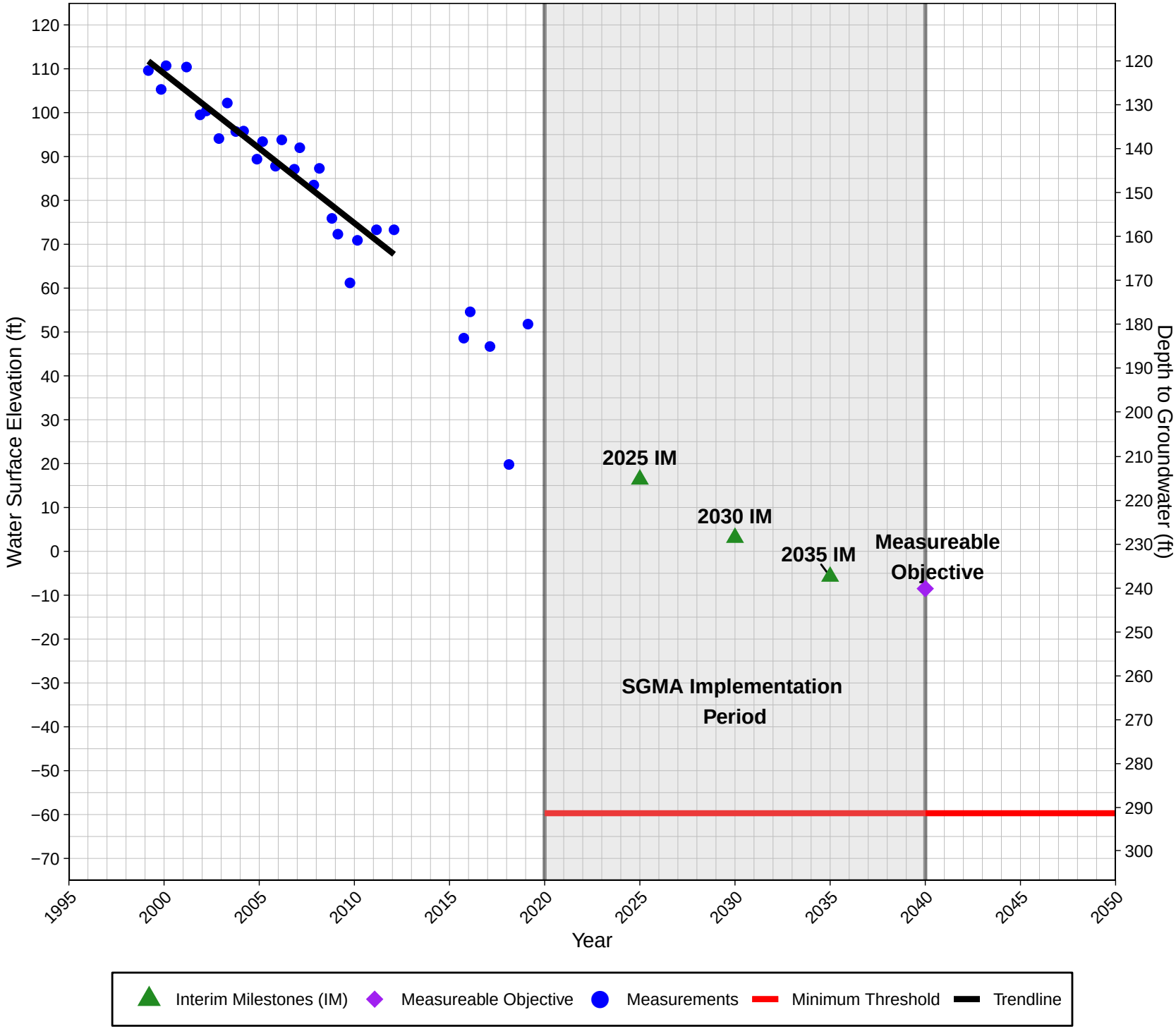




365143N1198529W001

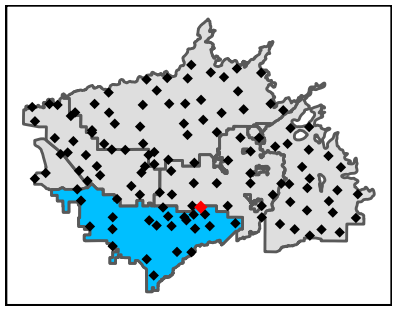
State Well ID: 16S19E25B001M
Ground Surface Elevation: 232 ft
North Fork Kings GSA

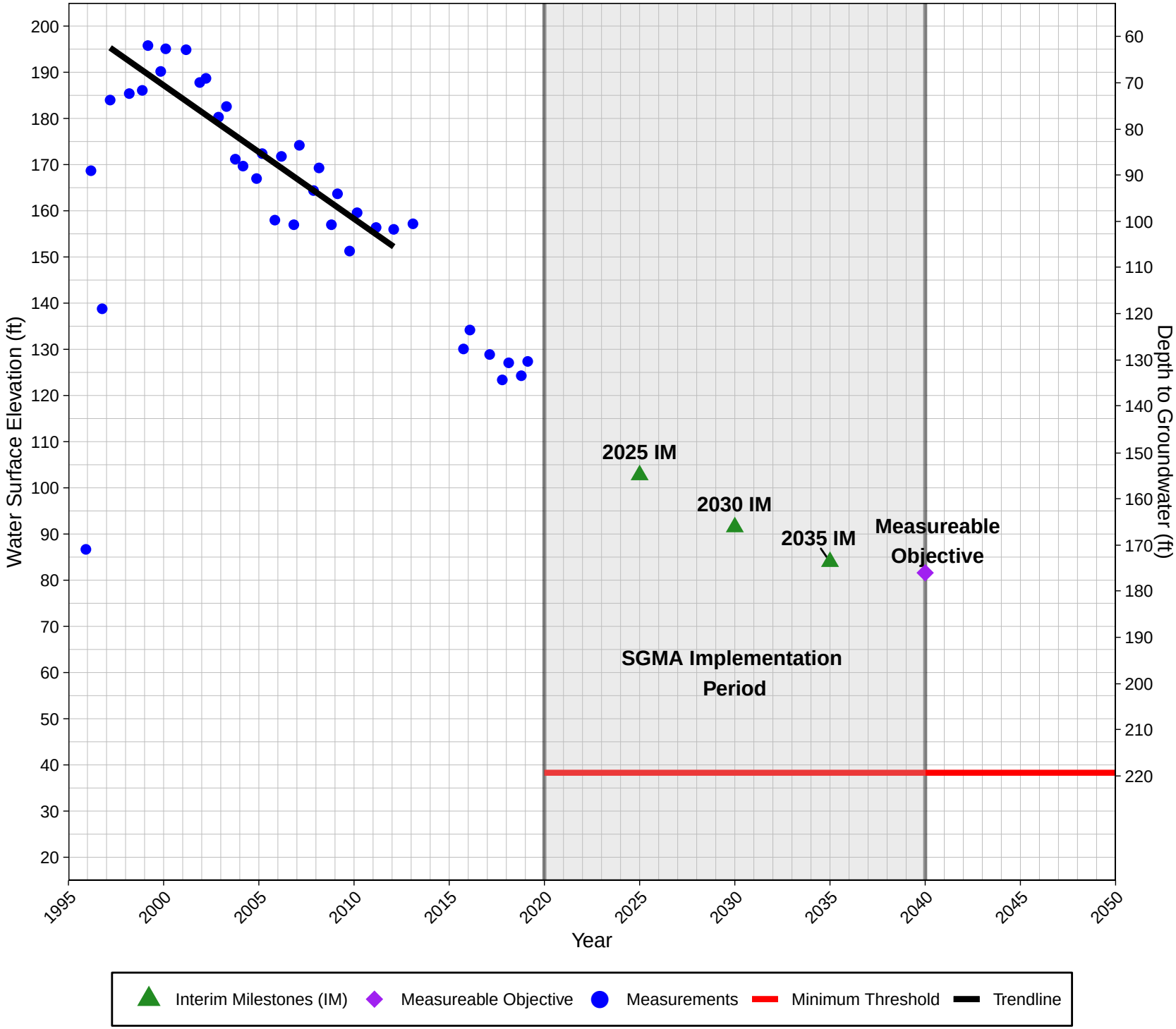


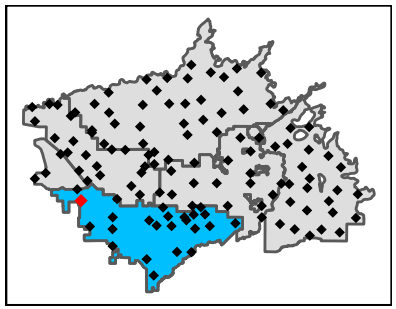


365150N1197327W001

State Well ID: 16S21E30C001M
Ground Surface Elevation: 258 ft
North Fork Kings GSA







B06

Ground Surface Elevation: 180 ft
North Fork Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

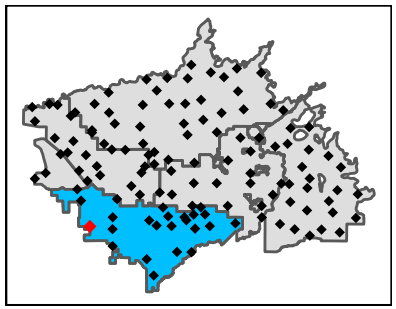
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



B22

Ground Surface Elevation: 196 ft

North Fork Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

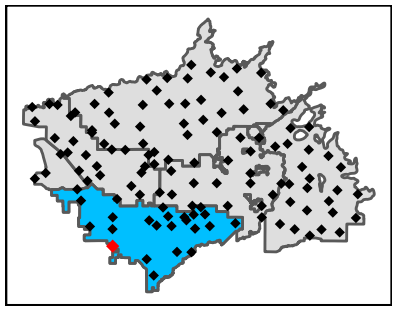
Interim Milestones (IM)

Measureable Objective

Measurements

Minimum Threshold

Trendline



B31

Ground Surface Elevation: 205 ft
North Fork Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

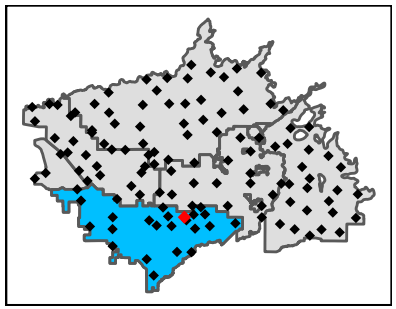
Measureable Objective

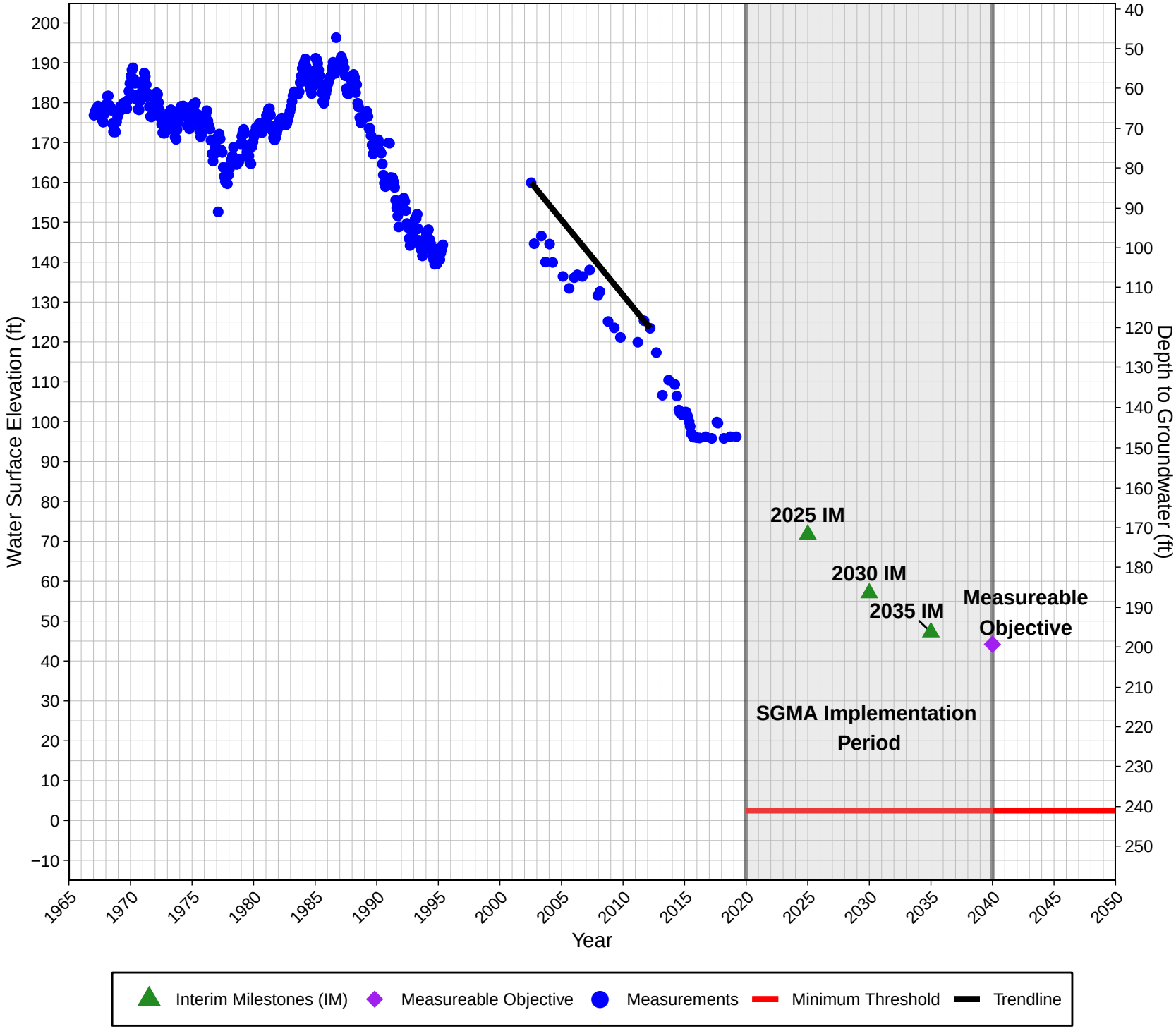
SGMA Implementation Period

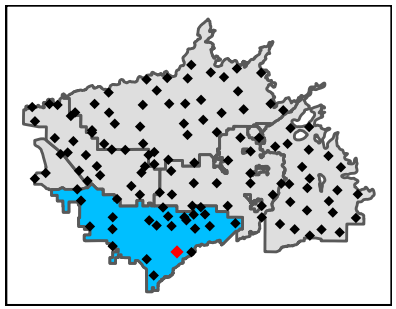
Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

CID51

State Well ID: 16S20E34P001M
Ground Surface Elevation: 244 ft
North Fork Kings GSA







LID14

Ground Surface Elevation: 224 ft
North Fork Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

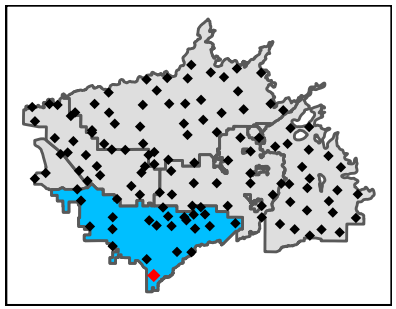
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



LID25

Ground Surface Elevation: 203 ft
North Fork Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

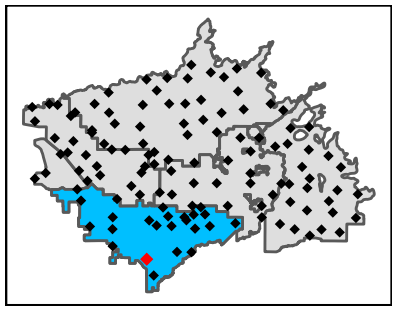
Measureable Objective

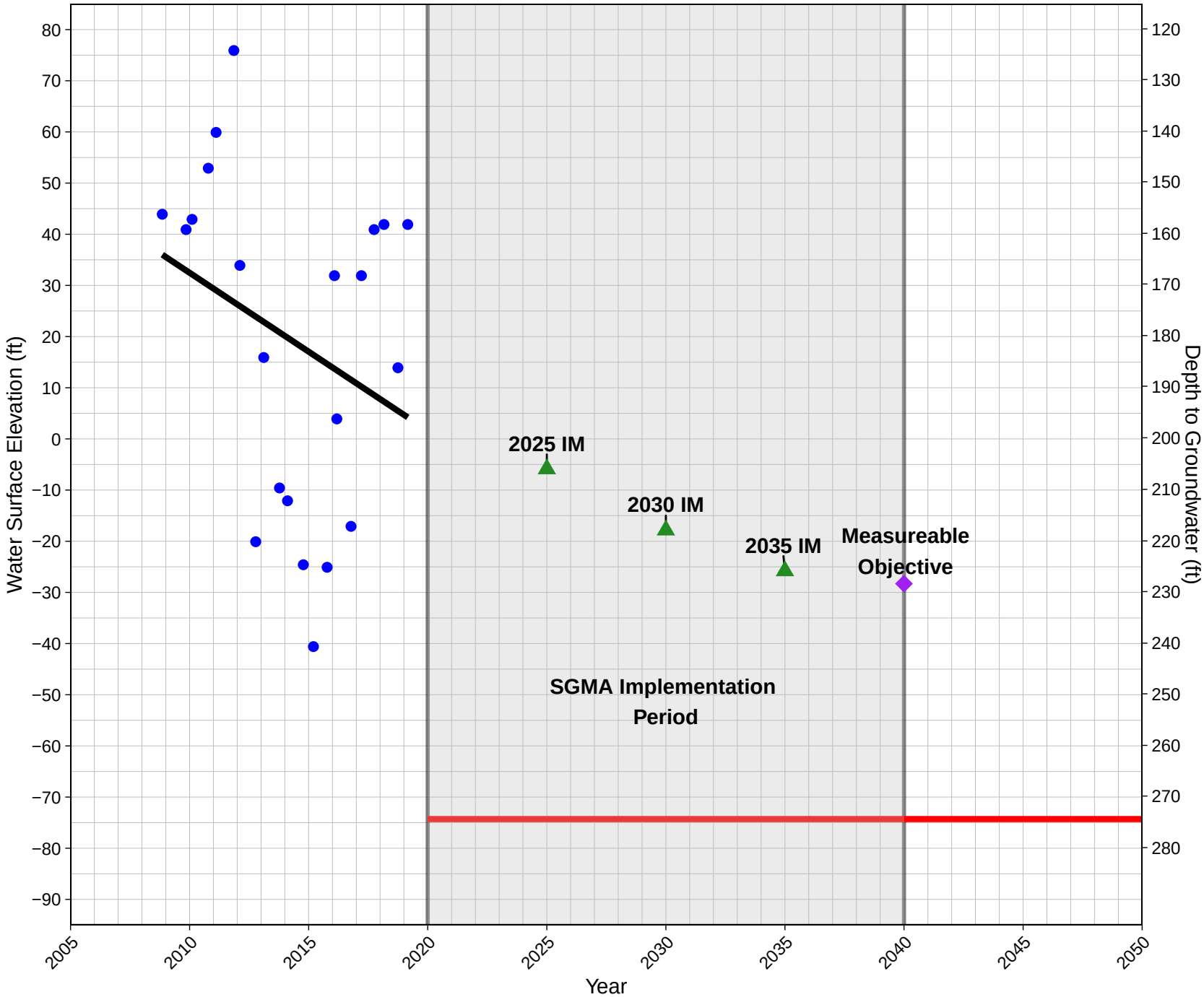
SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

LID26

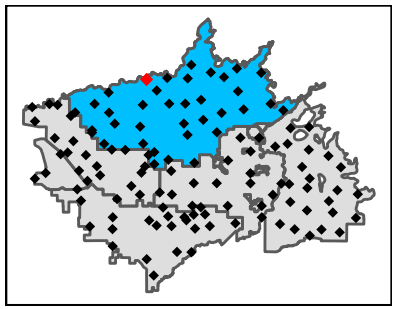
Ground Surface Elevation: 200 ft
North Fork Kings GSA

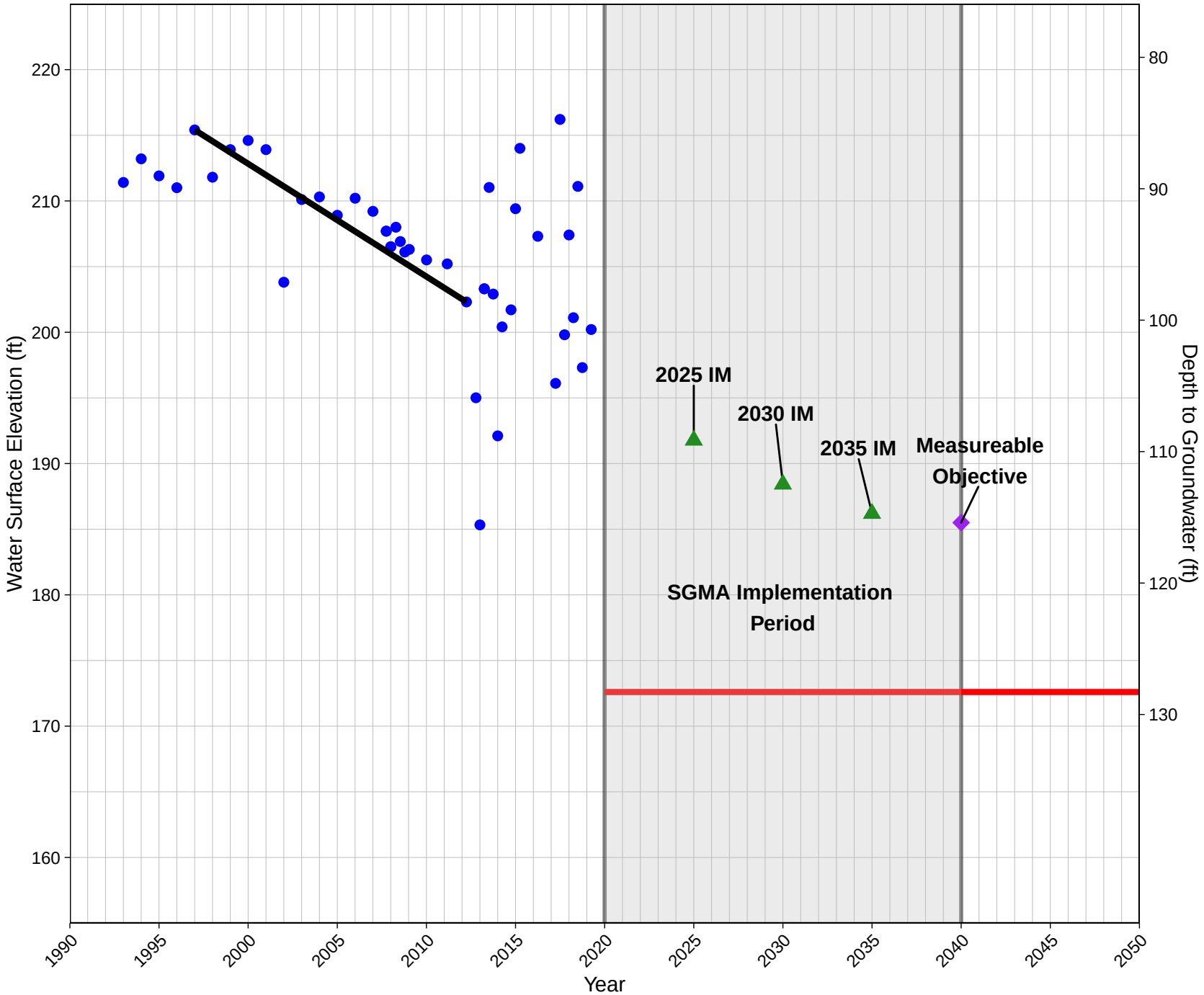




12S19E33P001MX

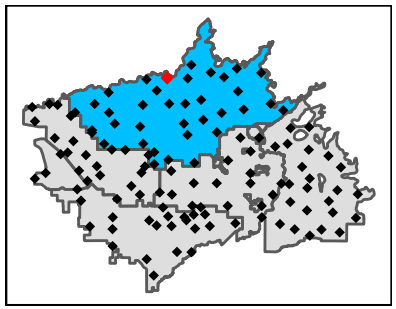
Ground Surface Elevation: 301 ft
North Kings GSA

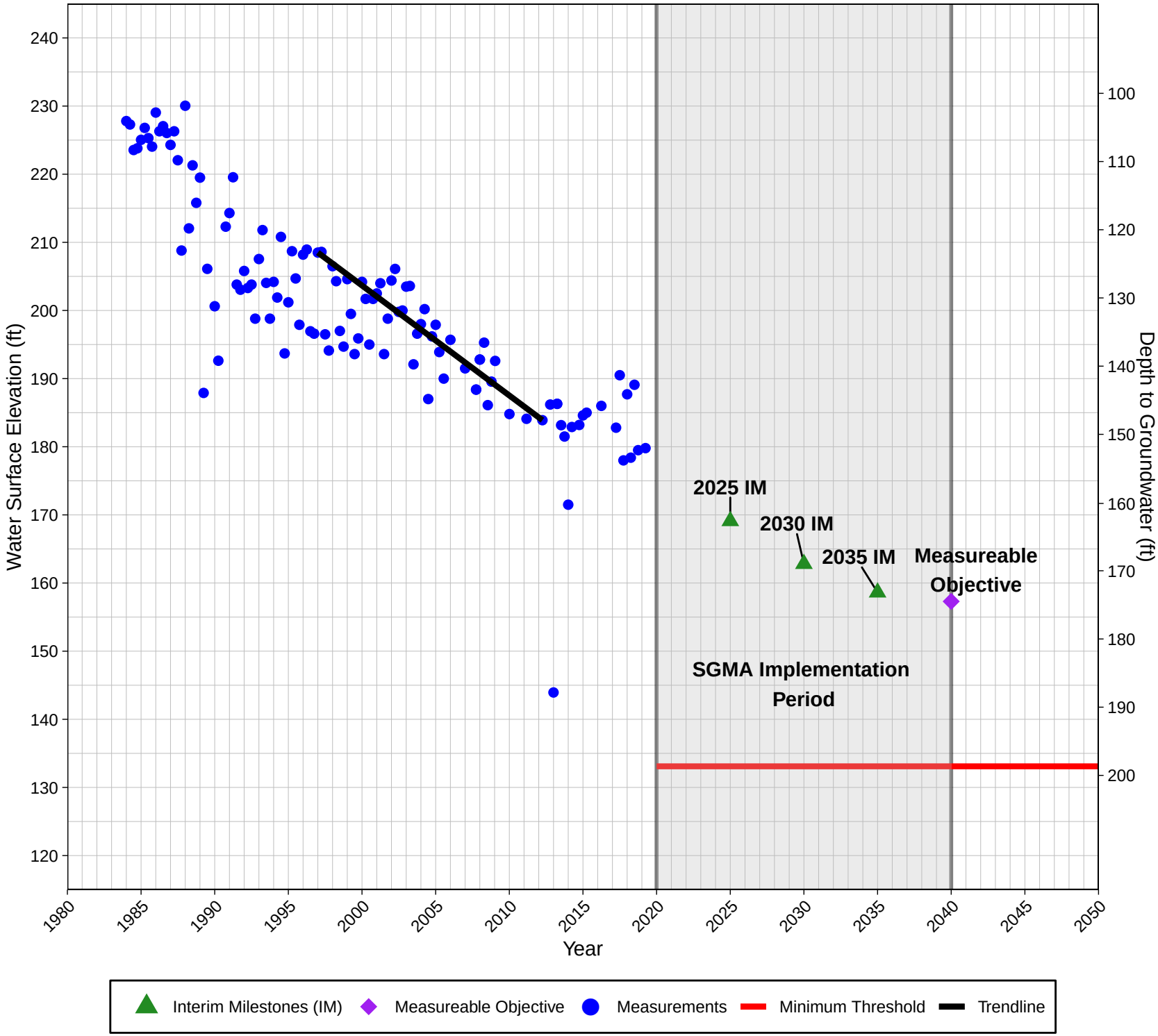


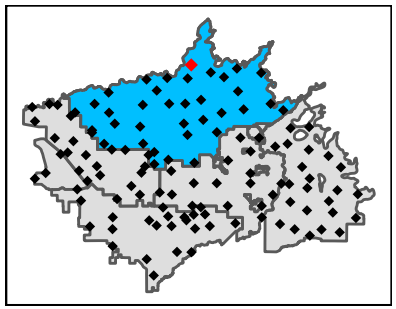


12S19E36J001MX

Ground Surface Elevation: 332 ft
North Kings GSA







12S20E23D001MX

Ground Surface Elevation: 364 ft

North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

Measurements

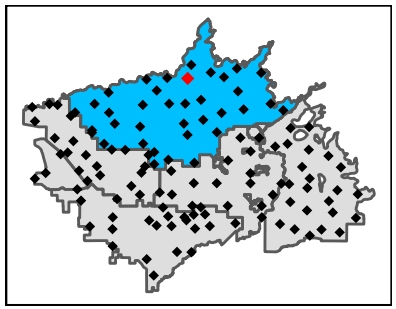
Minimum Threshold

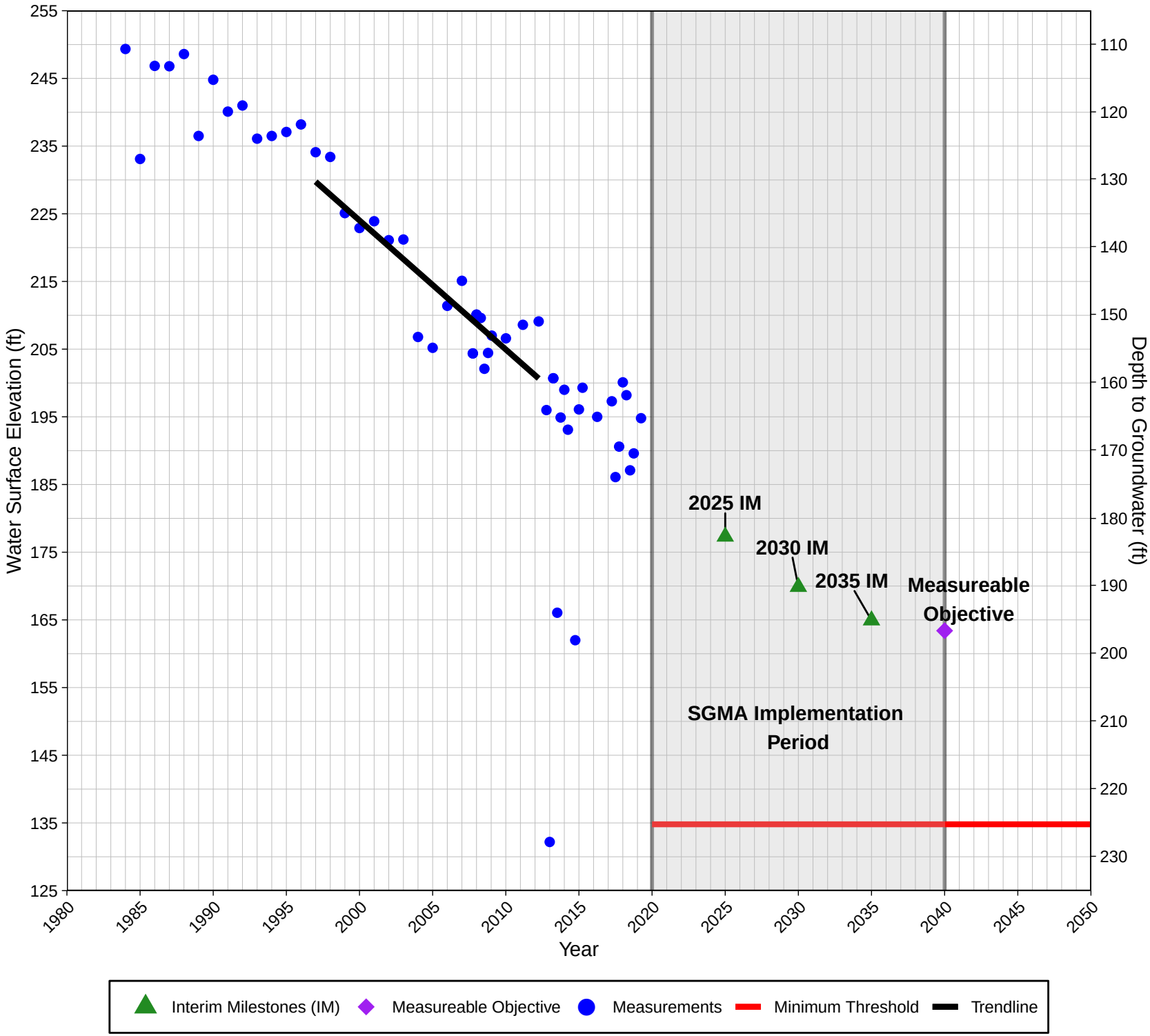
Trendline

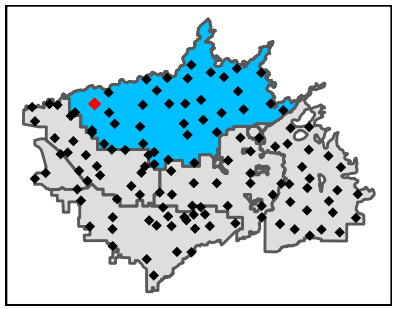
12S20E34K001MX

Ground Surface Elevation: 360 ft

North Kings GSA







13S17E25C001MX

Ground Surface Elevation: 232 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

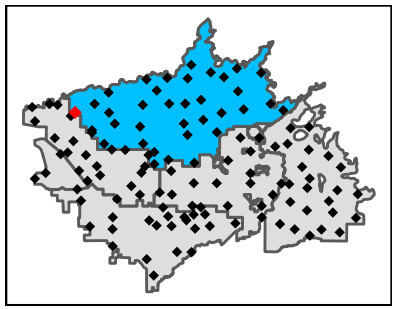
Measureable Objective

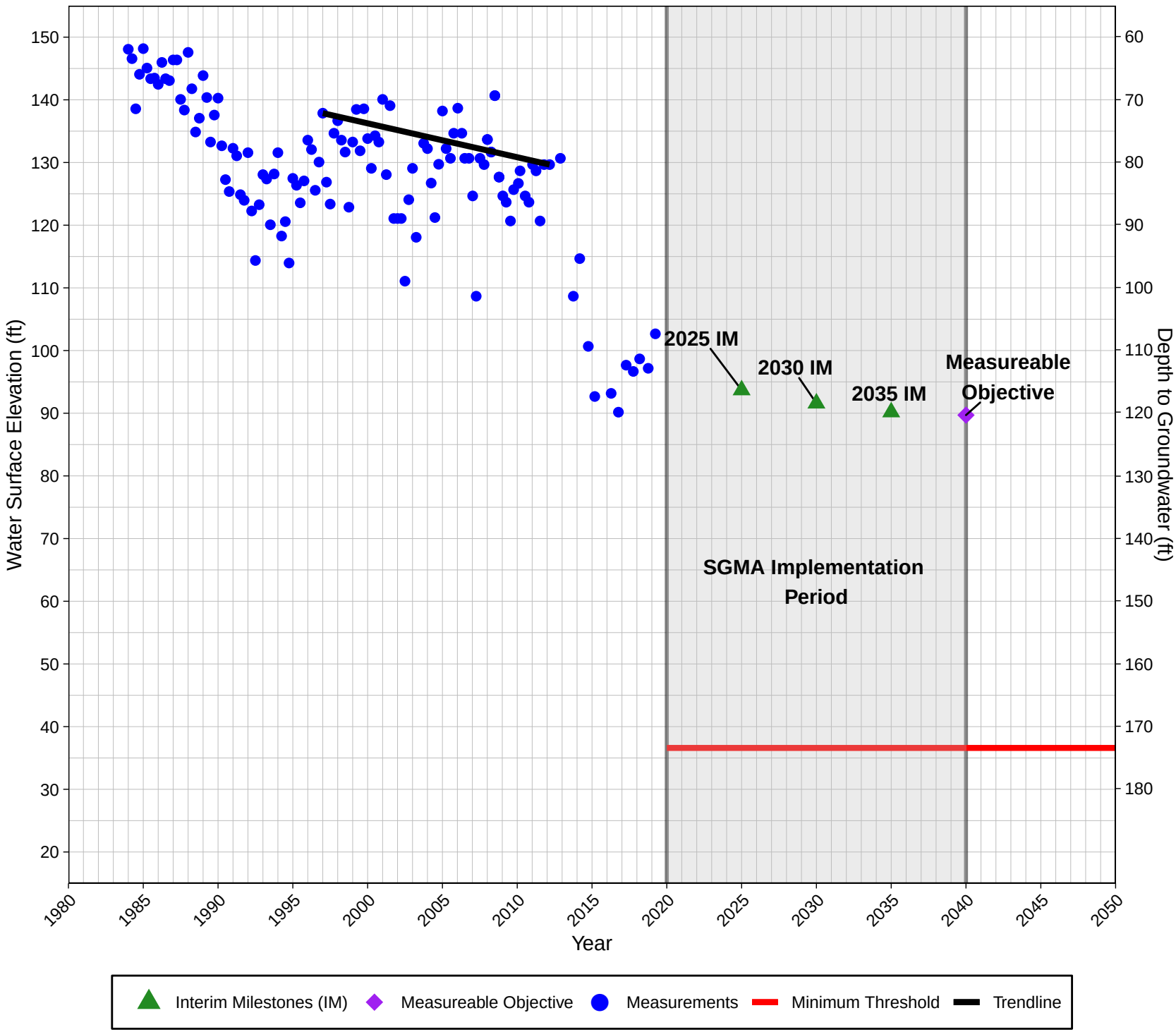
SGMA Implementation Period

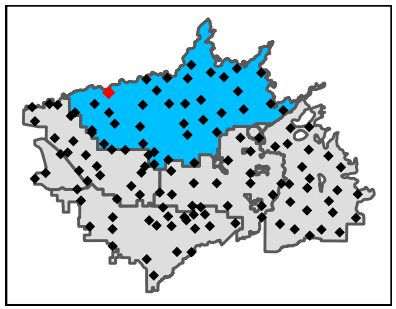
Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

13S17E33M001MX

State Well ID: 13S17E32H001M
Ground Surface Elevation: 210 ft
North Kings GSA







13S18E17A001MX

Ground Surface Elevation: 253 ft

North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

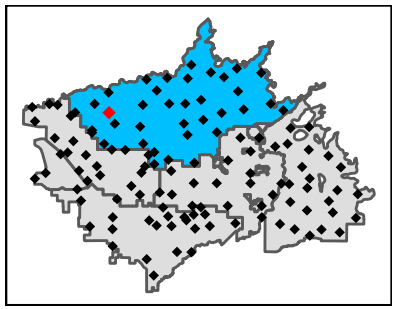
Measurements

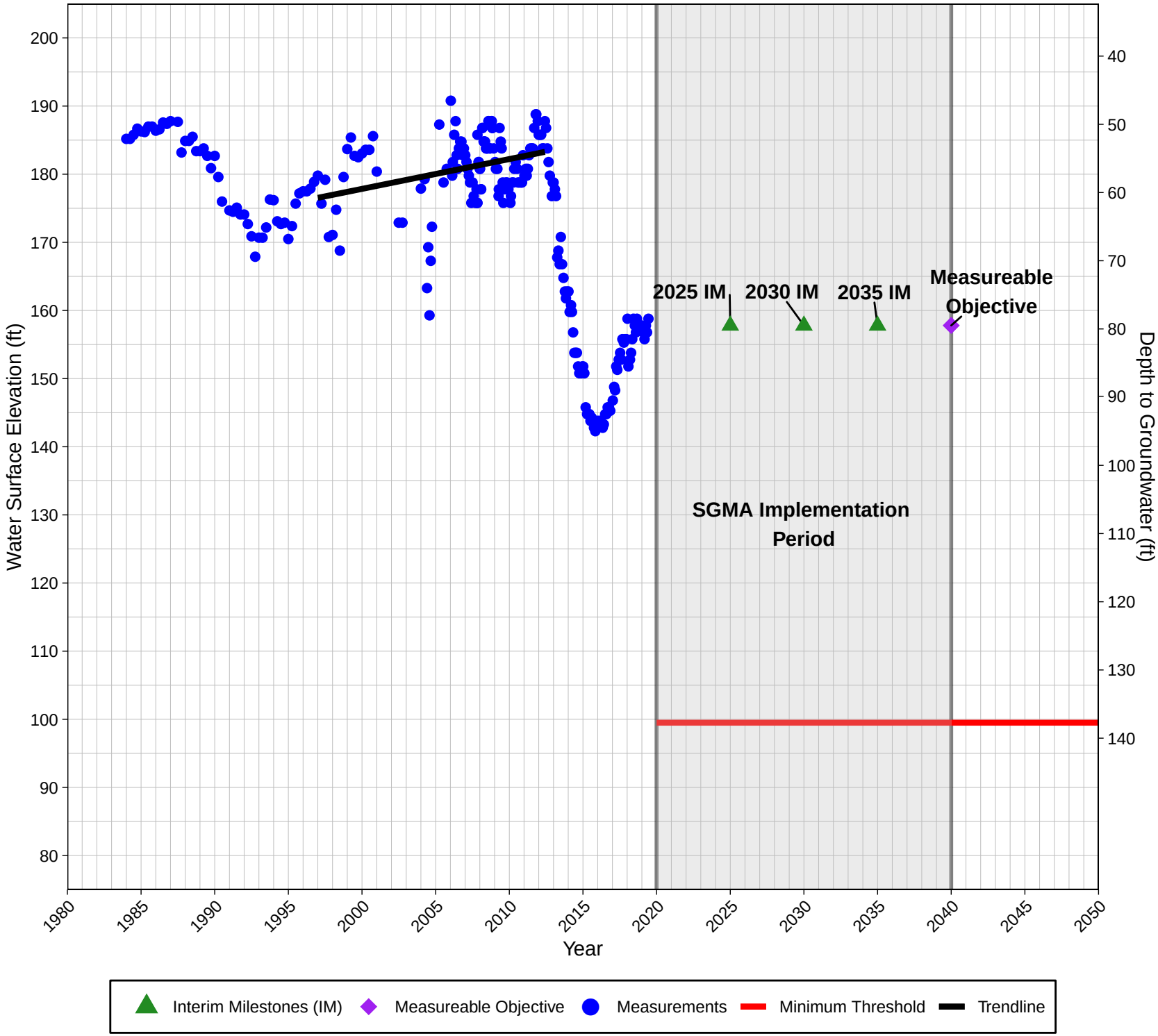
Minimum Threshold

Trendline

13S18E33M001MX

Ground Surface Elevation: 237 ft
North Kings GSA

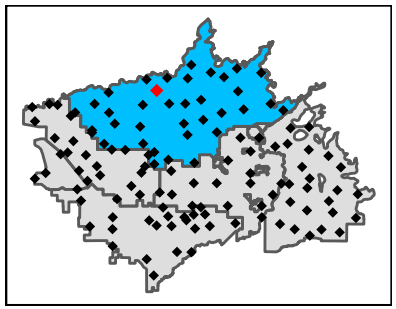


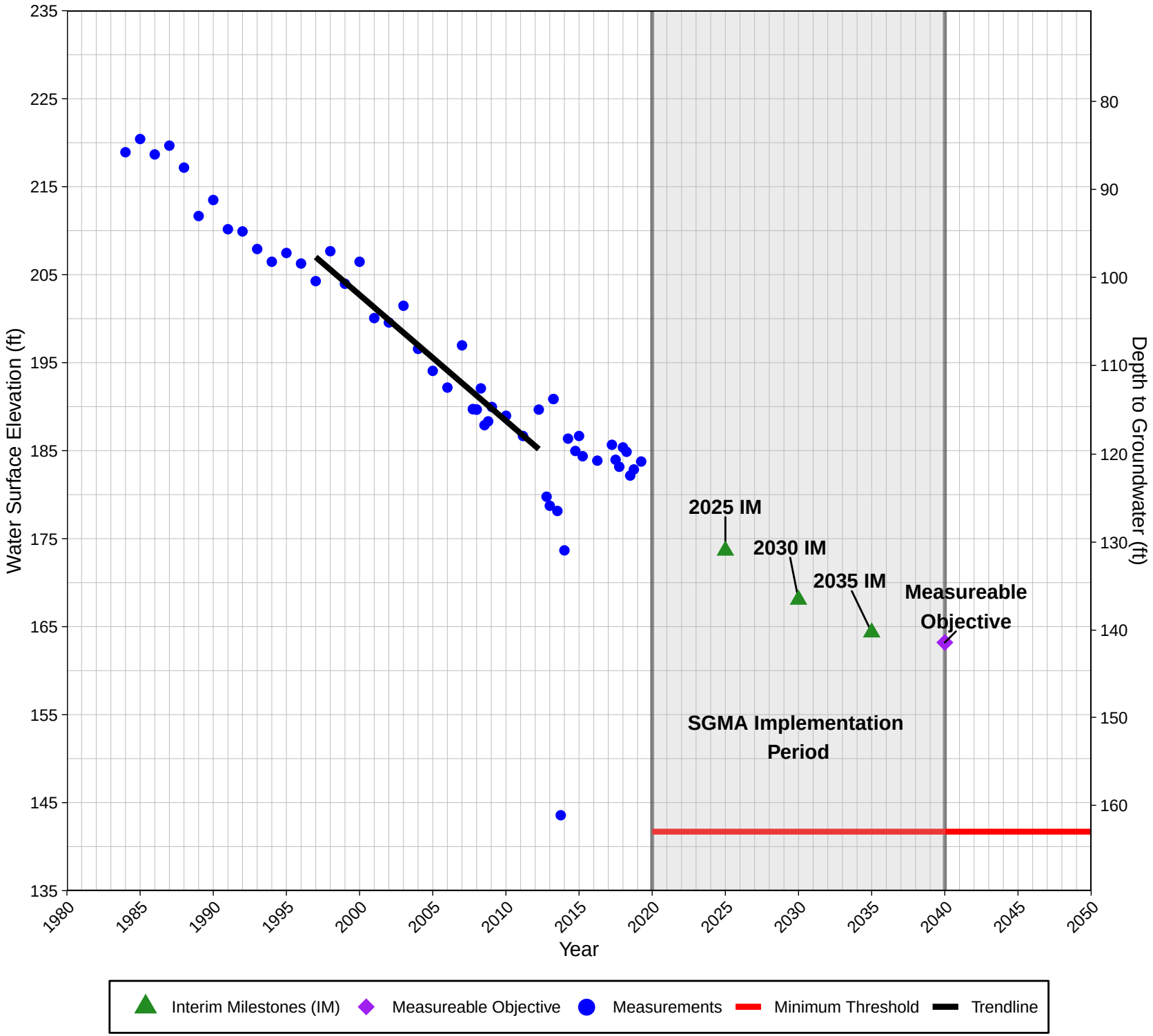


13S19E11L001MX

Ground Surface Elevation: 305 ft

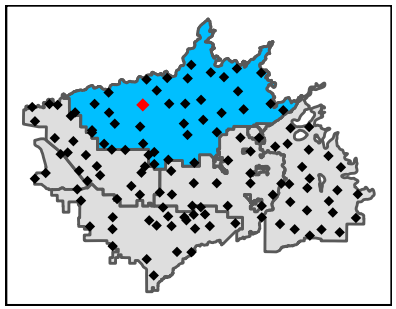
North Kings GSA

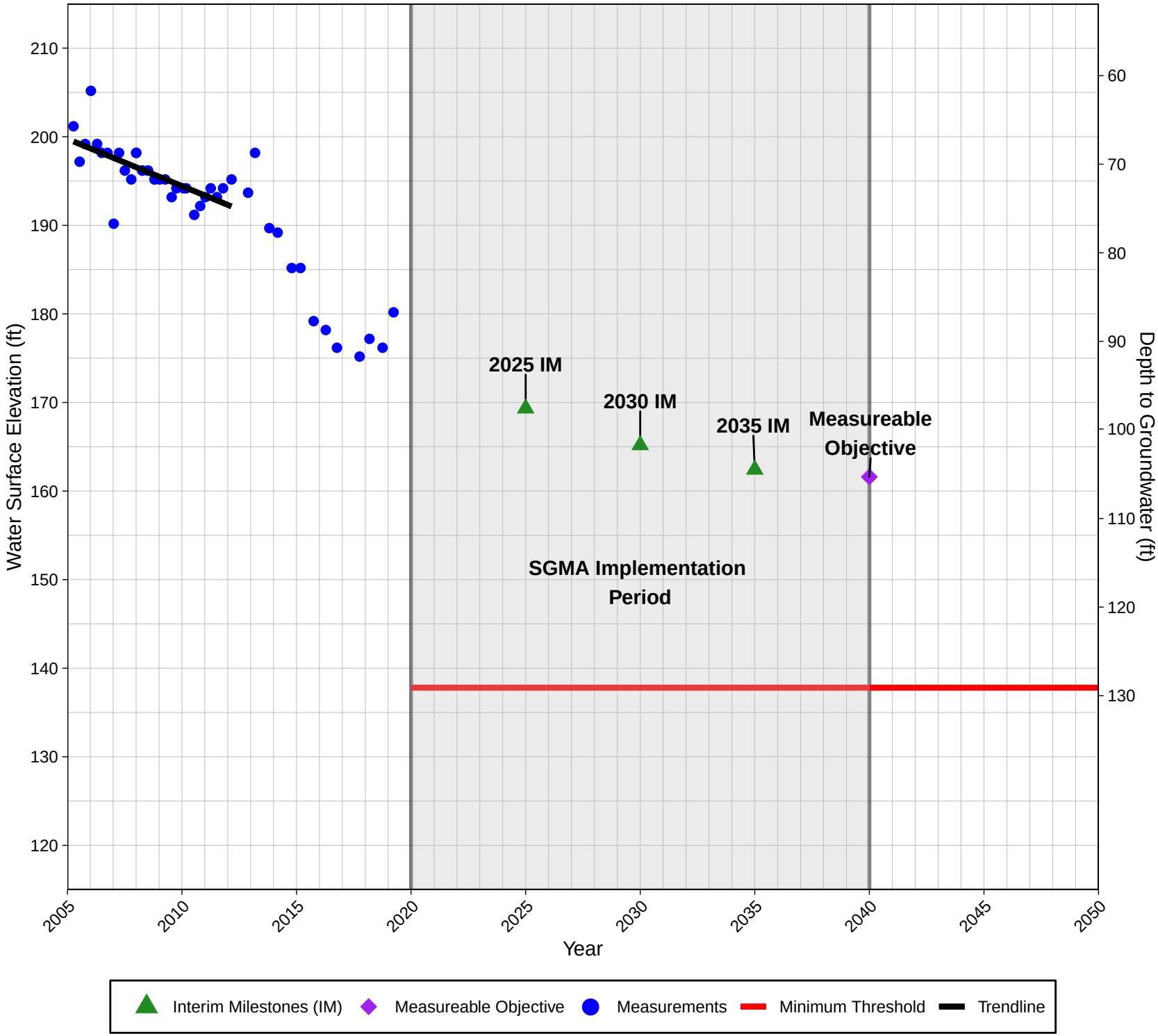


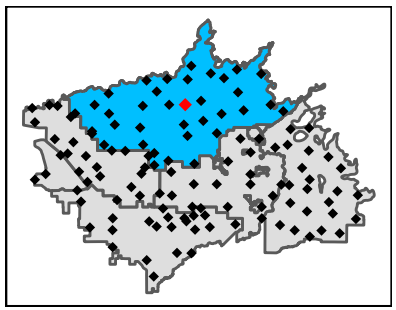


13S19E29A001MX

Ground Surface Elevation: 267 ft
North Kings GSA







13S20E27C001MX

Ground Surface Elevation: 310 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

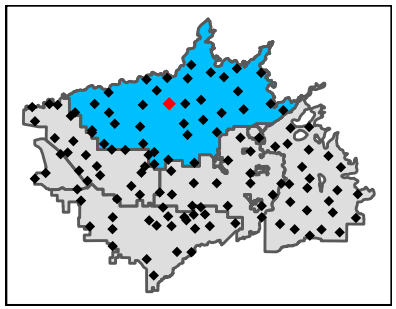
Interim Milestones (IM)

Measureable Objective

Measurements

Minimum Threshold

Trendline



13S20E30B001MX

Ground Surface Elevation: 304 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

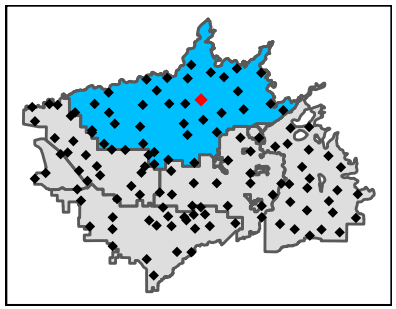
Measureable Objective

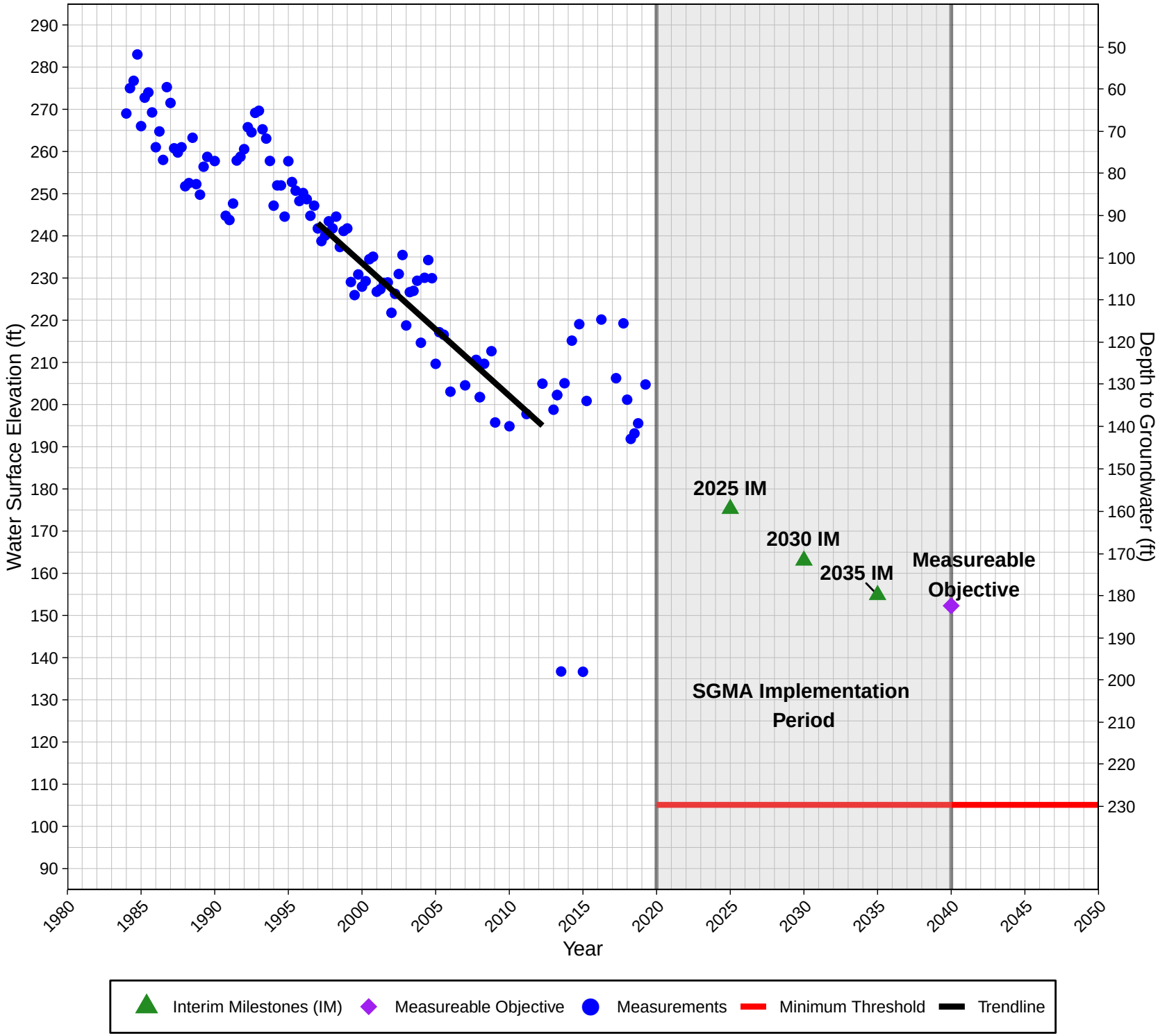
SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

13S21E19E001MX

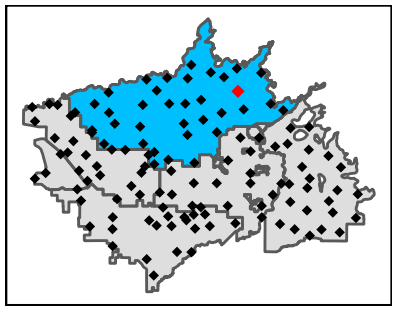
Ground Surface Elevation: 335 ft
North Kings GSA

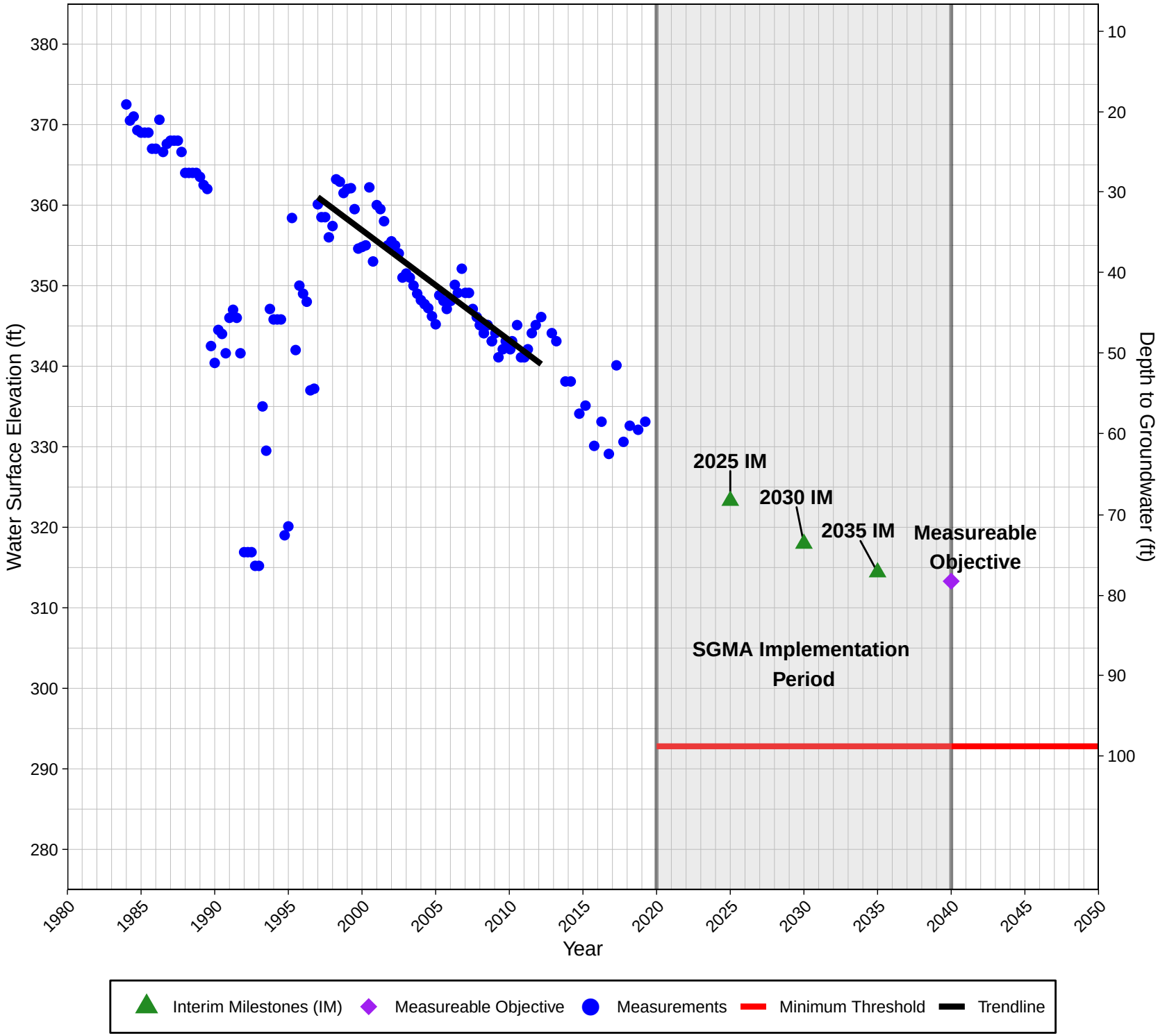




13S22E07R001MX

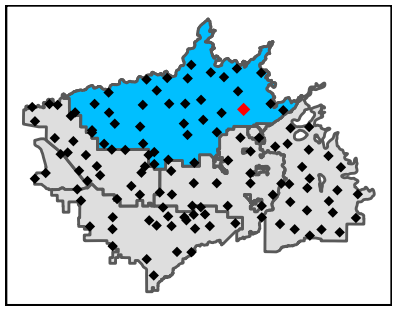
Ground Surface Elevation: 392 ft
North Kings GSA

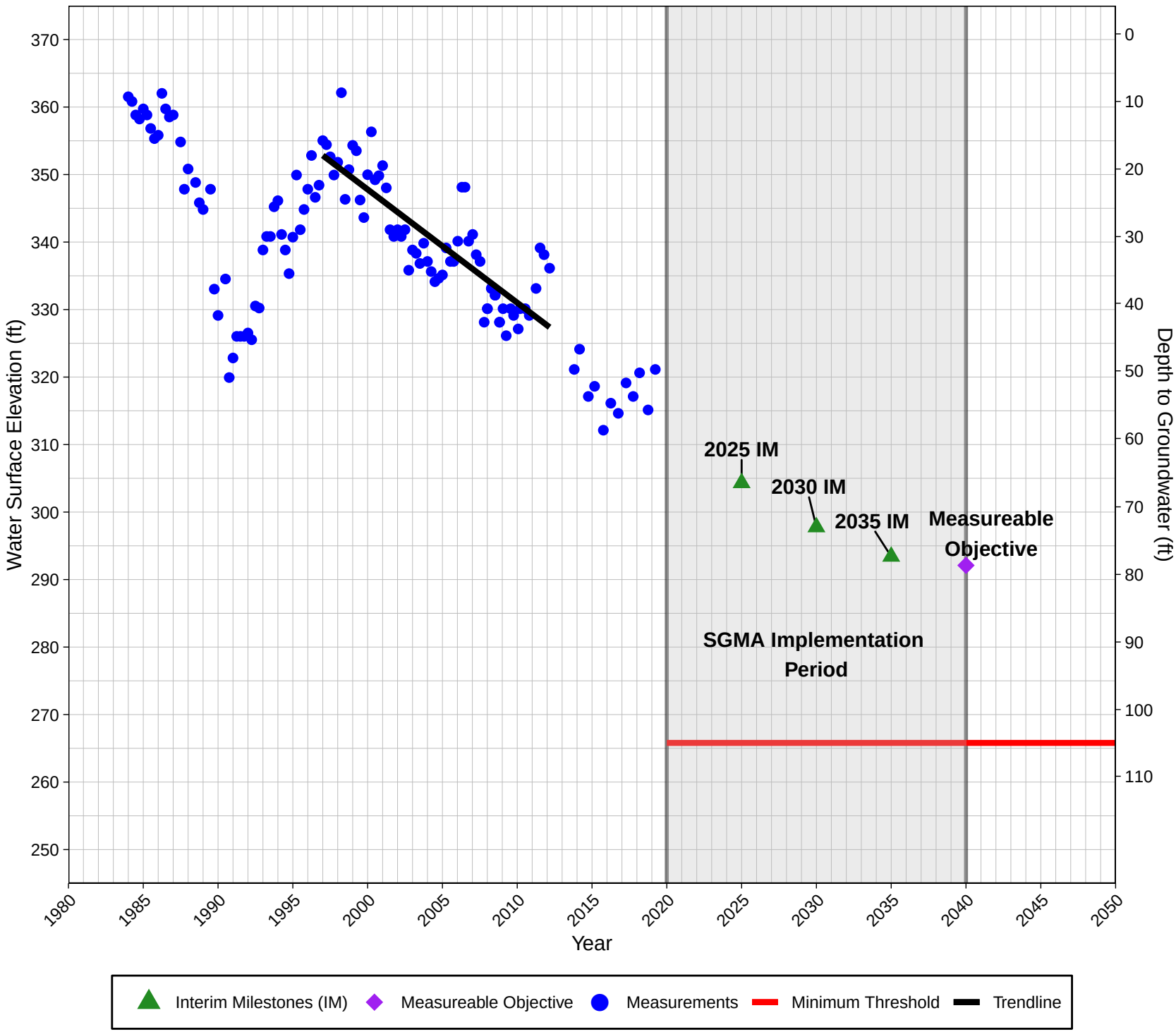




13S22E32A001MX

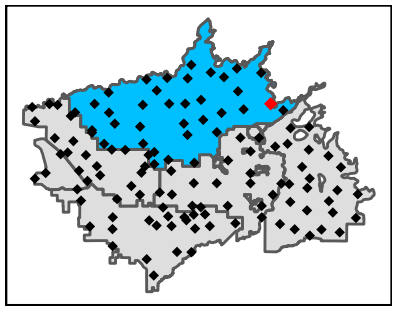
State Well ID: 13S22E32B001M
Ground Surface Elevation: 371 ft
North Kings GSA

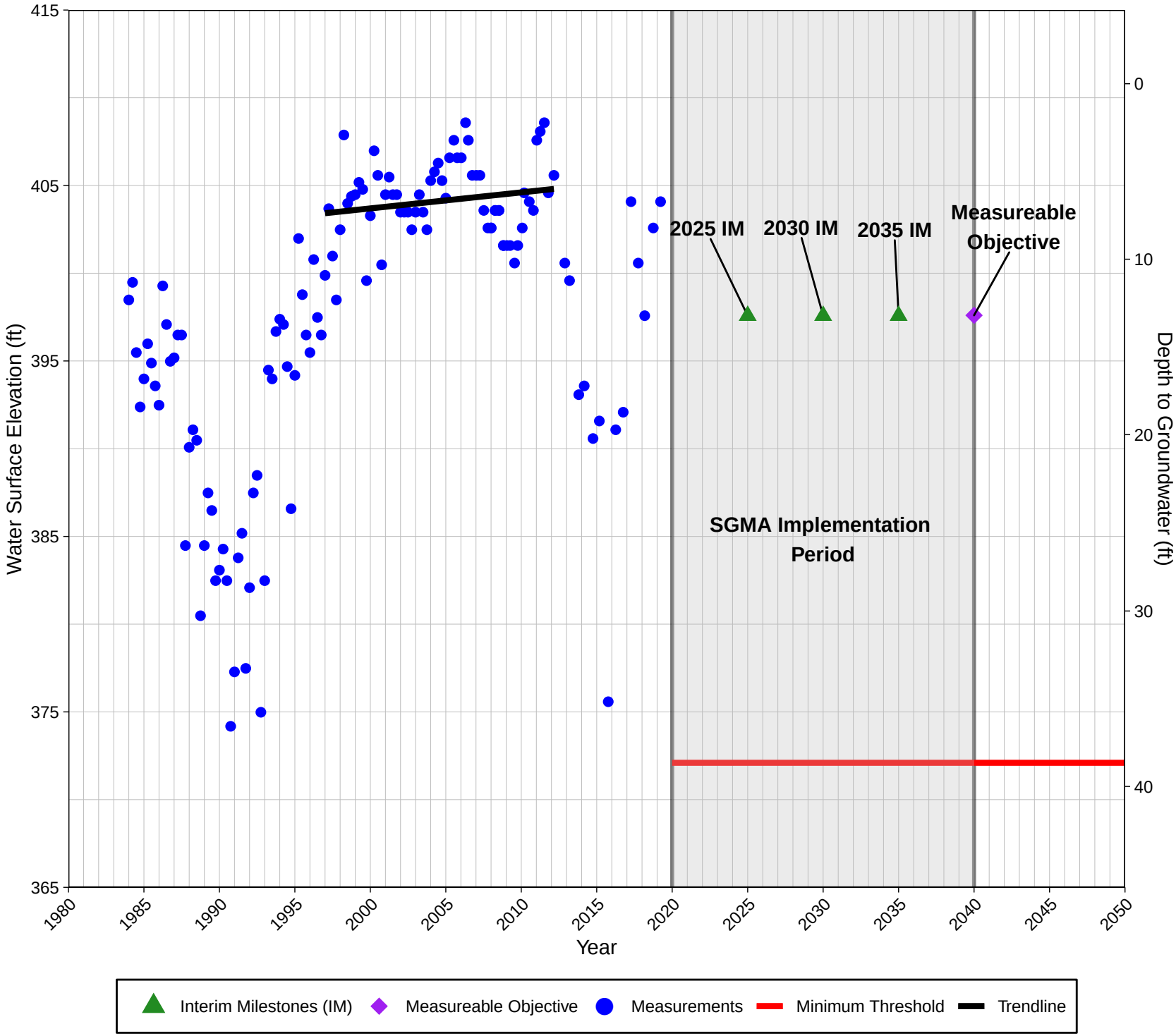


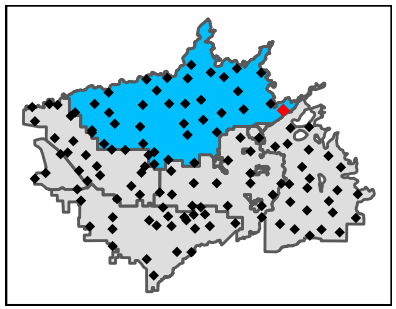


13S23E30B001MX

State Well ID: 13S23E30C001M
Ground Surface Elevation: 411 ft
North Kings GSA







13S23E33B001MX

Ground Surface Elevation: 432 ft

North Kings GSA

Water Surface Elevation (ft)

435

425

415

405

395

Depth to Groundwater (ft)

0

10

20

30

1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050

Year

2025 IM

2030 IM

2035 IM

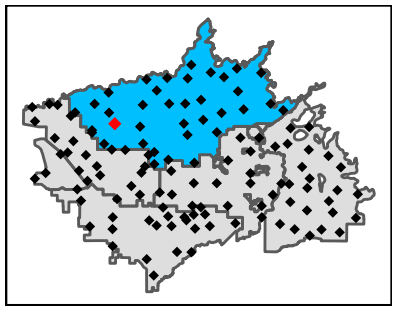
Measureable Objective

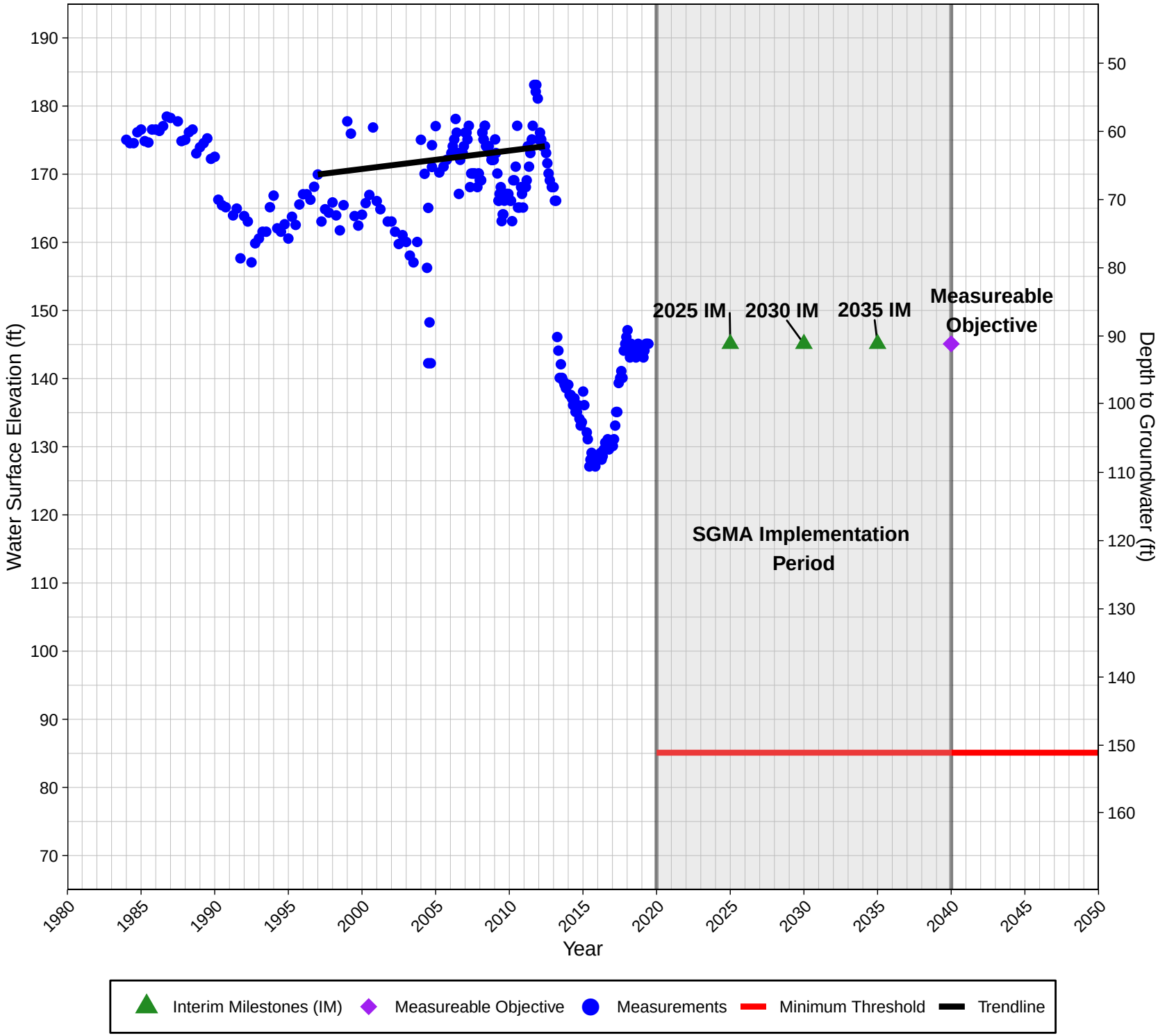
SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

14S18E09H001MX

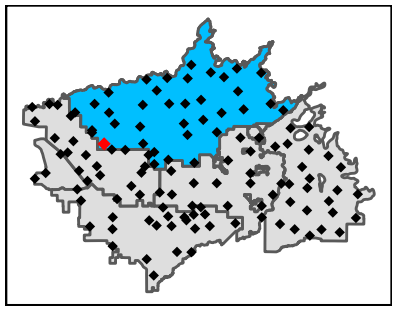
Ground Surface Elevation: 236 ft
North Kings GSA

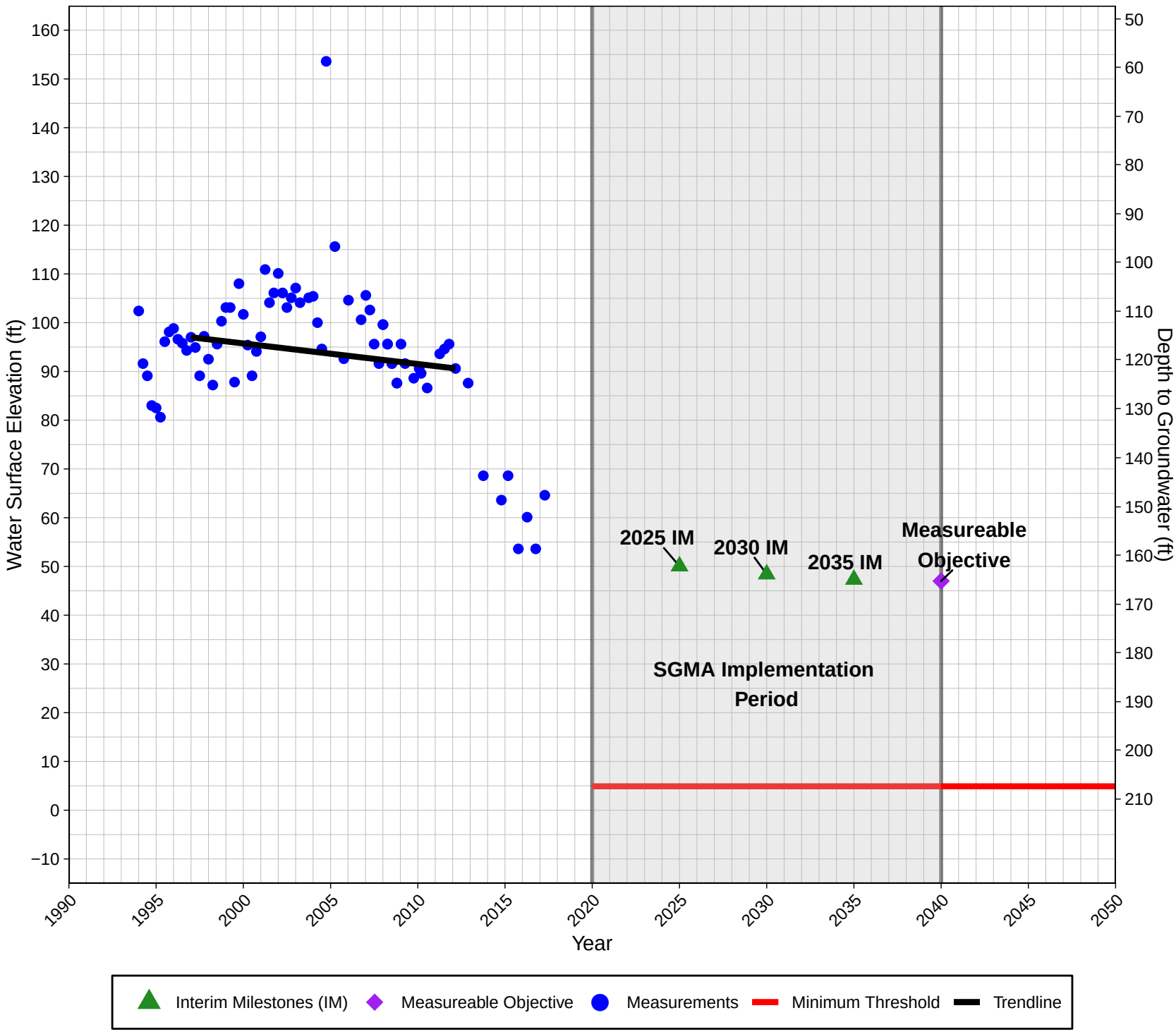




14S18E32D001MX

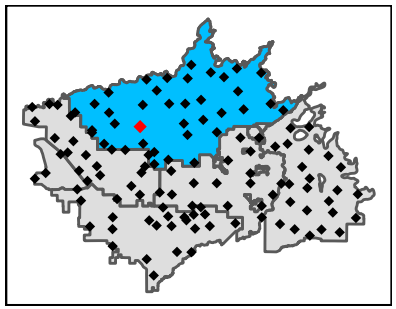
State Well ID: 14S18E32C001M
Ground Surface Elevation: 212 ft
North Kings GSA

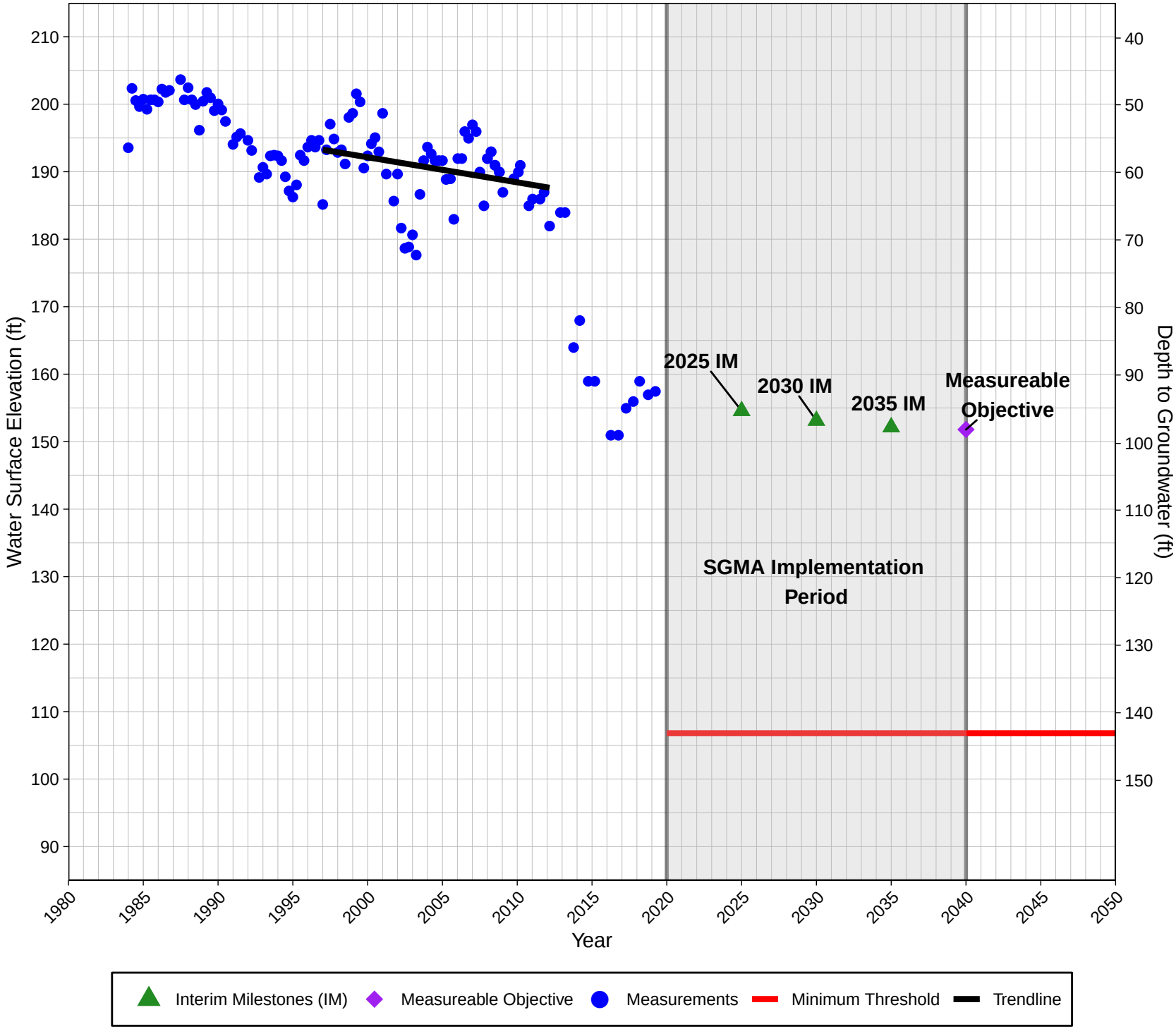


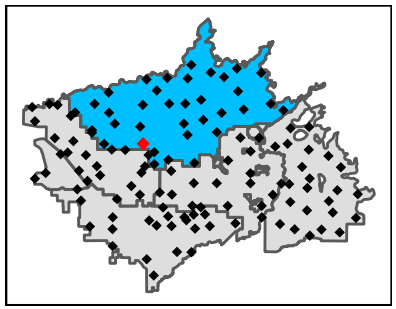


14S19E17C001MX

State Well ID: 14S19E17C003M
Ground Surface Elevation: 250 ft
North Kings GSA







14S19E33D001MX

Ground Surface Elevation: 239 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

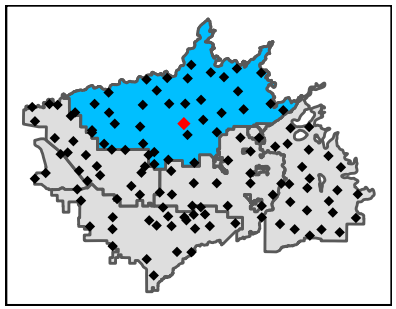
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



14S20E10M001MX

Ground Surface Elevation: 291 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

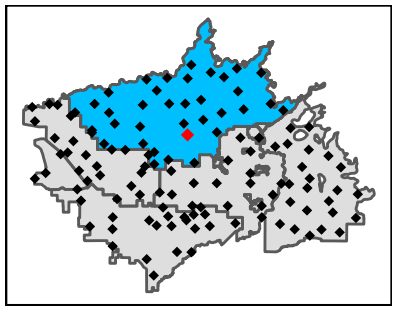
Interim Milestones (IM)

Measureable Objective

Measurements

Minimum Threshold

Trendline



14S20E22J001MX

Ground Surface Elevation: 283 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

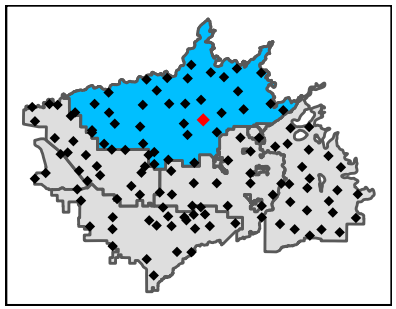
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



14S21E06Q001MX

Ground Surface Elevation: 310 ft

North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

Measurements

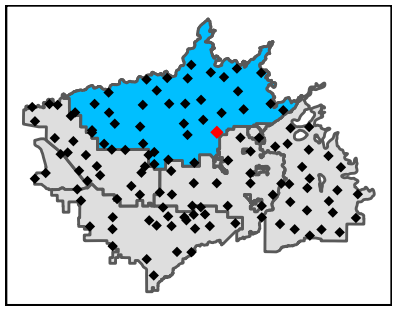
Minimum Threshold

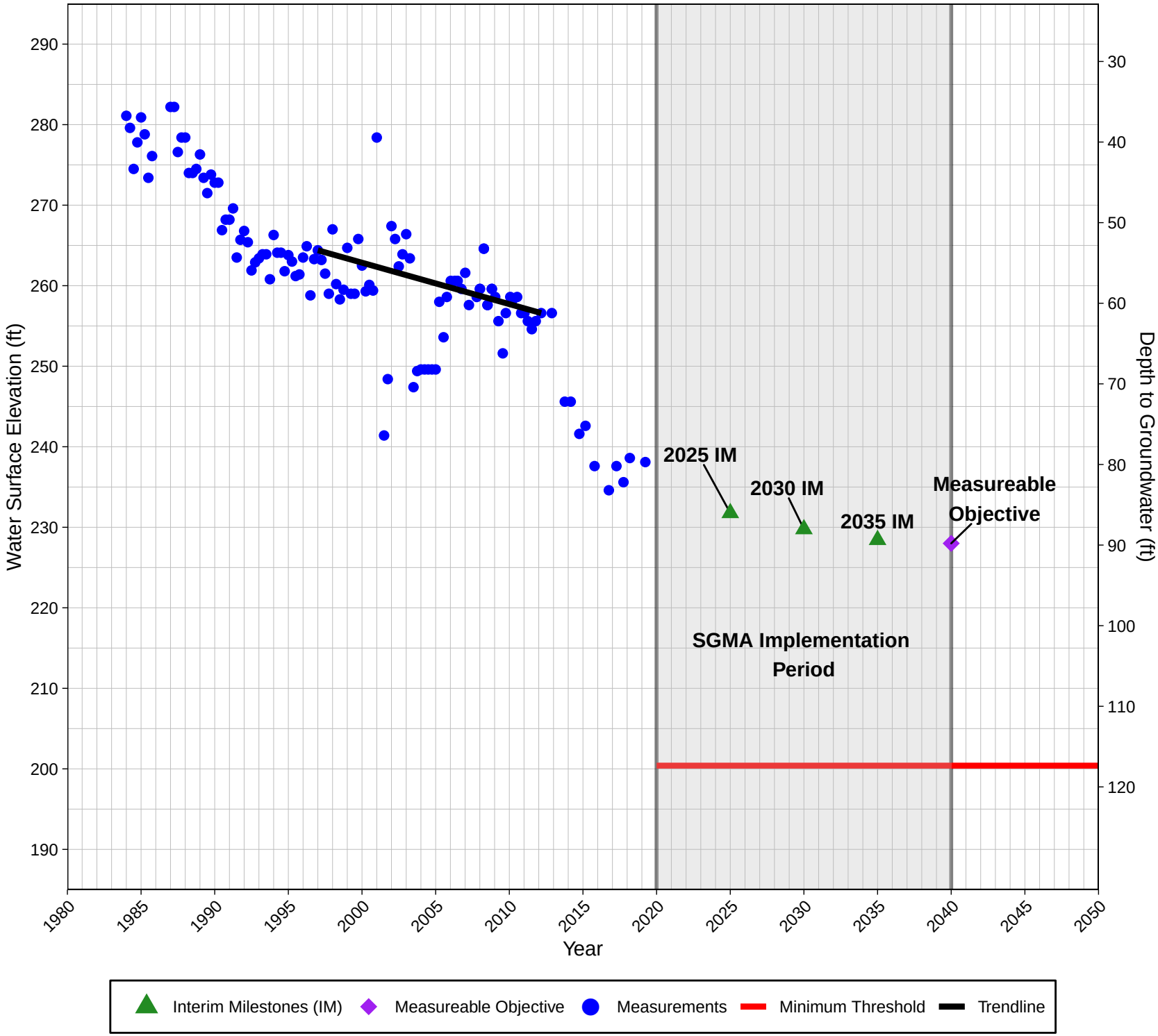
Trendline

14S21E22D001MX

Ground Surface Elevation: 318 ft

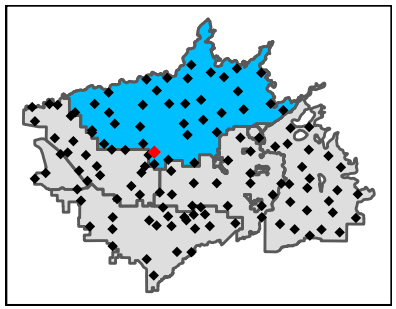
North Kings GSA

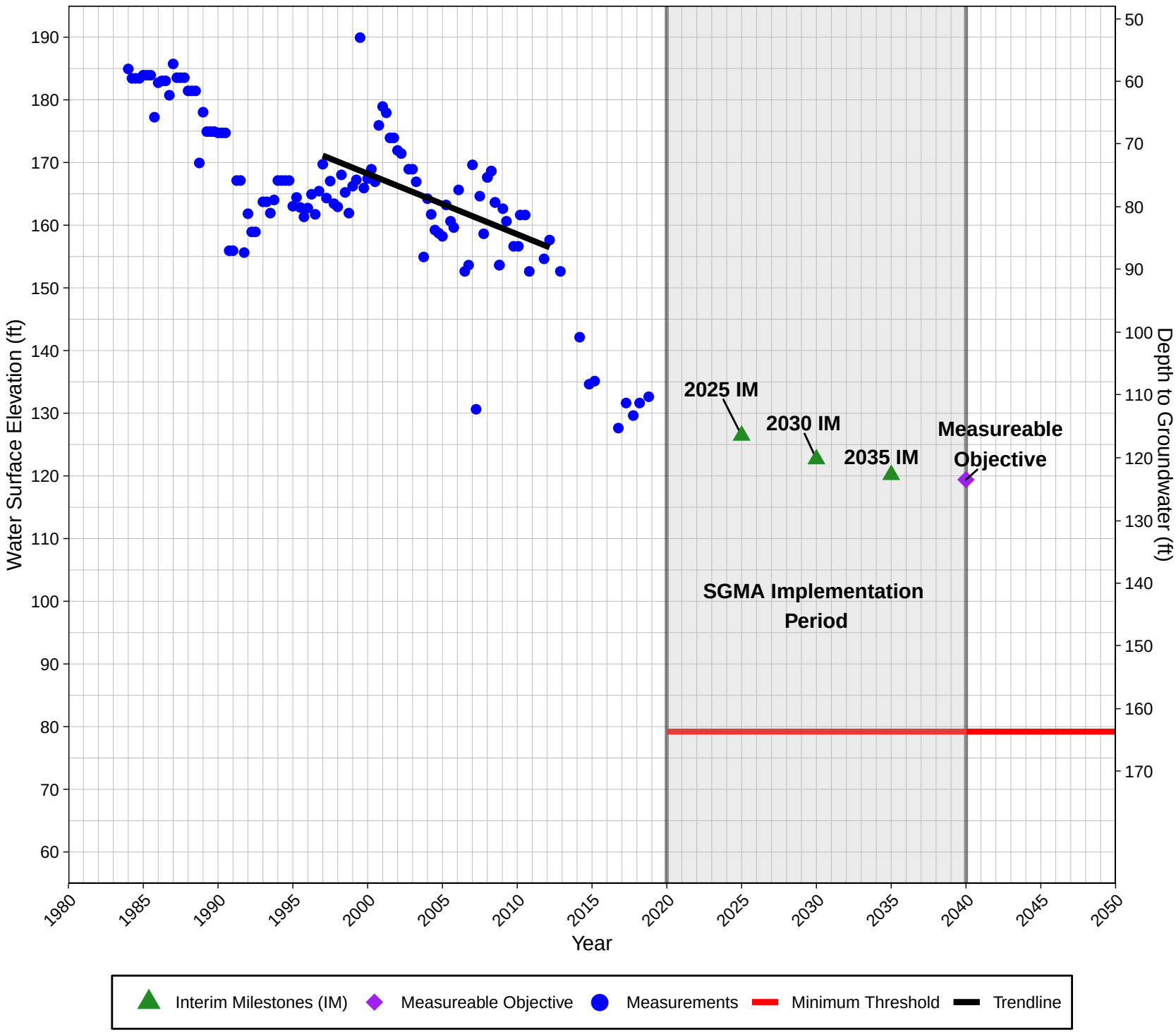




15S19E02M001MX

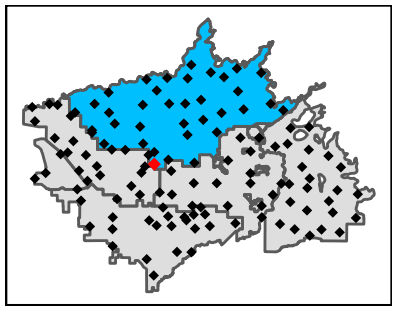
State Well ID: 15S19E03J001M
Ground Surface Elevation: 243 ft
North Kings GSA

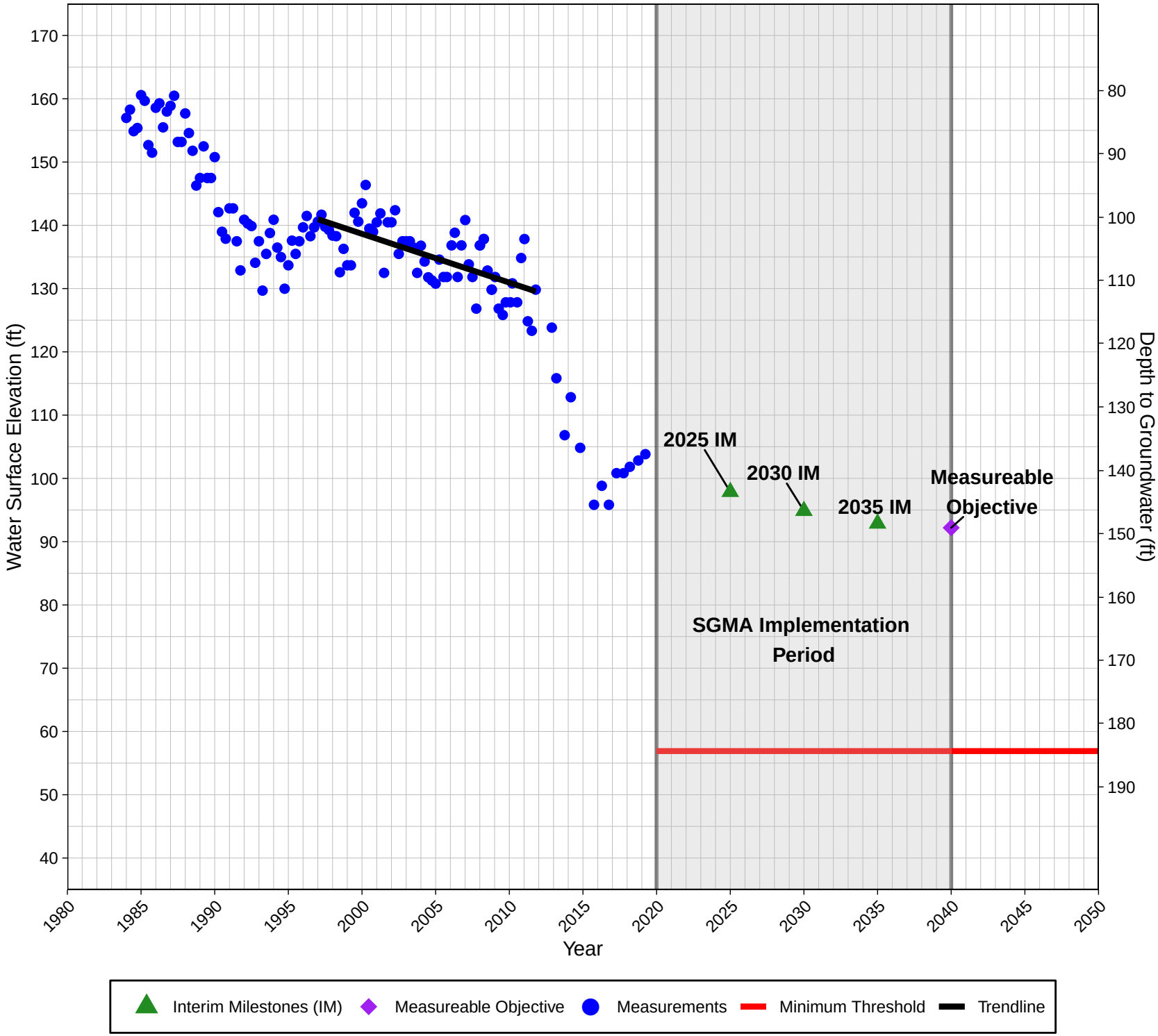


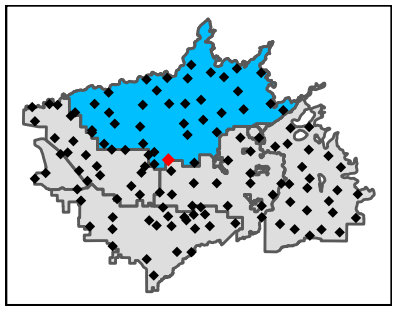


15S19E14M001MX

Ground Surface Elevation: 241 ft
North Kings GSA







15S20E07Q001MX

Ground Surface Elevation: 252 ft

North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

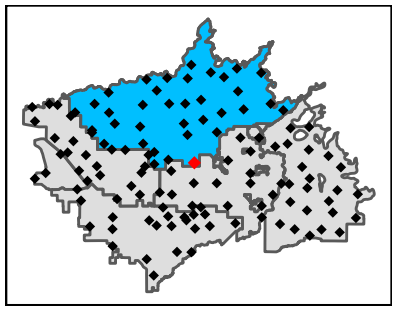
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



15S20E13E001MX

Ground Surface Elevation: 282 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

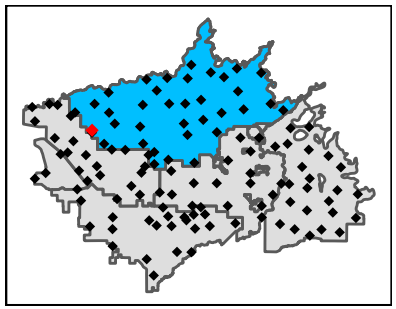
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



367113N1200785W001

State Well ID: 14S17E14J001M
Ground Surface Elevation: 210 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

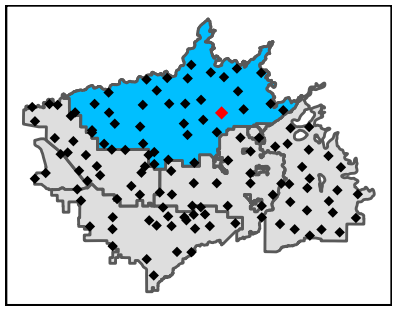
2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline



367556N1196666W001

State Well ID: 13S21E34J002M
Ground Surface Elevation: 341 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

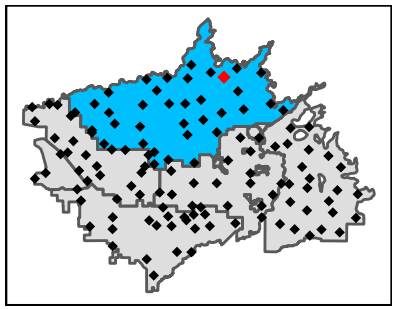
Measureable Objective

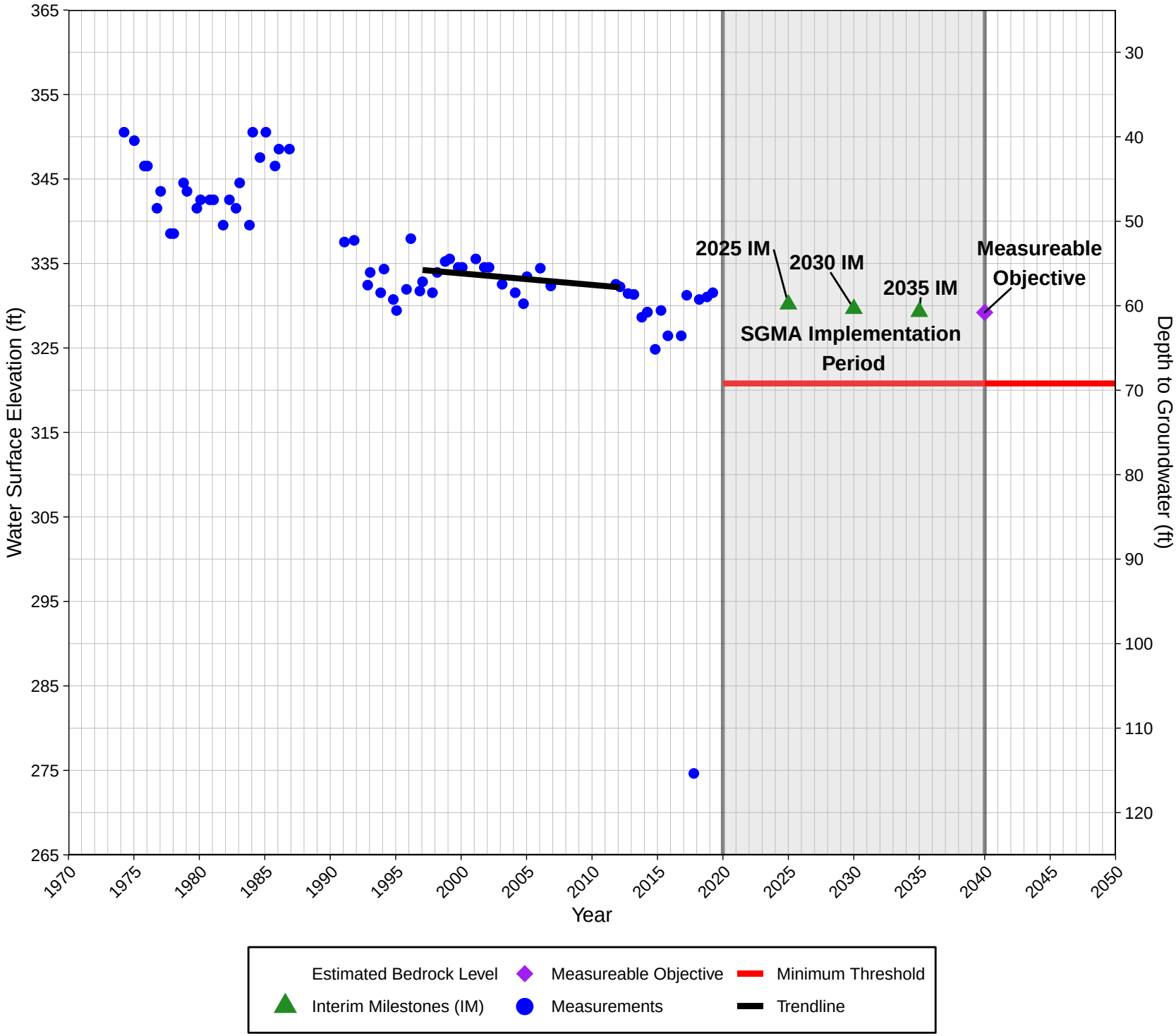
SGMA Implementation Period

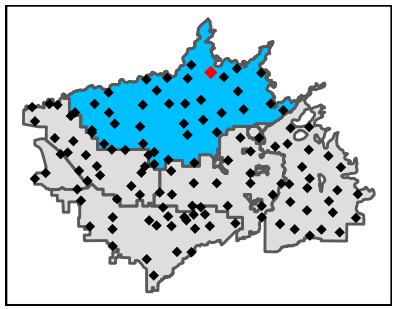
Interim Milestones (IM) | Measureable Objective | Measurements | Minimum Threshold | Trendline

368468N1196593W001

State Well ID: 12S21E34H001M
Ground Surface Elevation: 390 ft
North Kings GSA







368571N1197002W001

State Well ID: 12S21E29K001M
Ground Surface Elevation: 379 ft
North Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

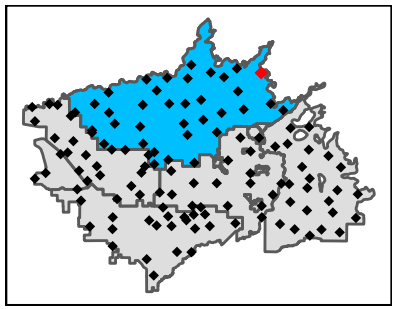
Measureable Objective

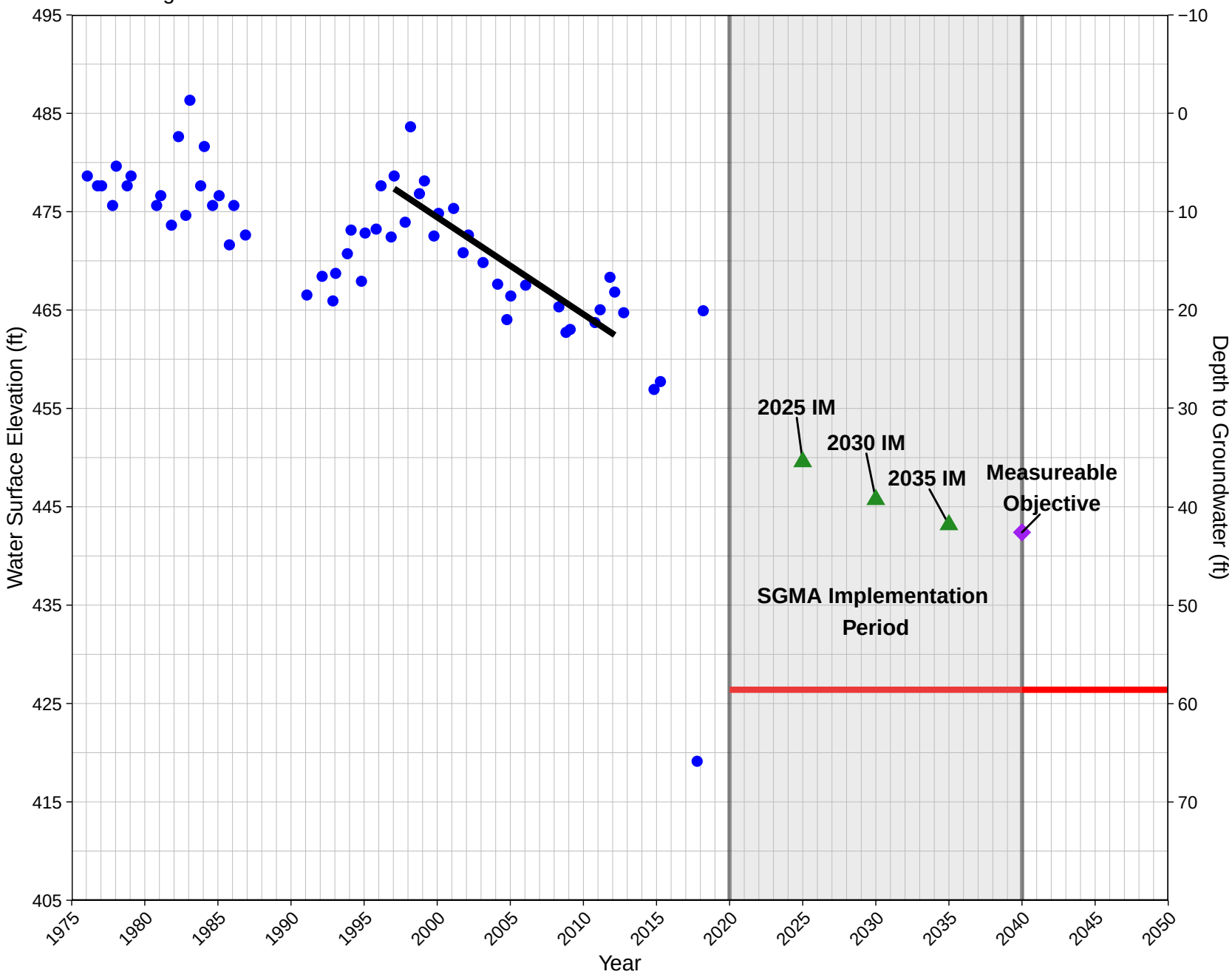
SGMA Implementation Period

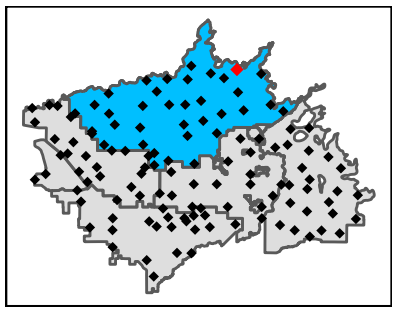
Interim Milestones (IM)
Measureable Objective
Measurements
Minimum Threshold
Trendline

368572N1195413W001

State Well ID: 12S22E26L001M
Ground Surface Elevation: 485 ft
North Kings GSA







368683N1196185W001

State Well ID: 12S22E19N001M
Ground Surface Elevation: 438 ft
North Kings GSA

Water Surface Elevation (ft)

435
425
415
405
395
385
375
365
355
345

Depth to Groundwater (ft)

10
20
30
40
50
60
70
80
90

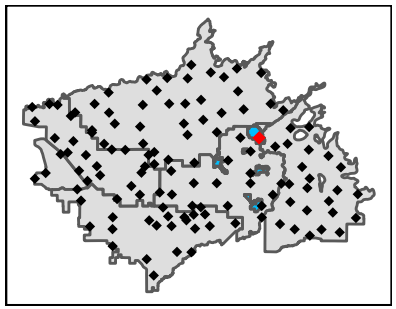
1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050

Year

2025 IM
2030 IM
2035 IM
Measureable Objective

SGMA Implementation Period

Estimated Bedrock Level
Measureable Objective
Minimum Threshold
Interim Milestones (IM)
Measurements
Trendline



CID10

Ground Surface Elevation: 366 ft

South Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

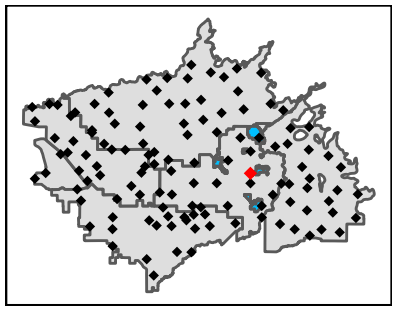
Interim Milestones (IM)

Measureable Objective

Measurements

Minimum Threshold

Trendline



CID25

Ground Surface Elevation: 327 ft

South Kings GSA

Water Surface Elevation (ft)

Depth to Groundwater (ft)

Year

2025 IM

2030 IM

2035 IM

Measureable Objective

SGMA Implementation Period

Interim Milestones (IM)

Measureable Objective

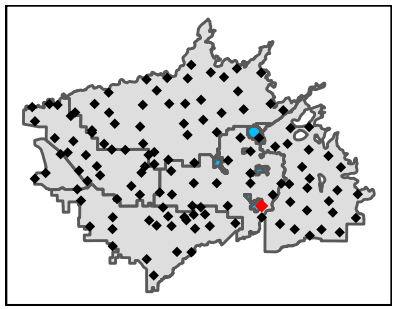
Measurements

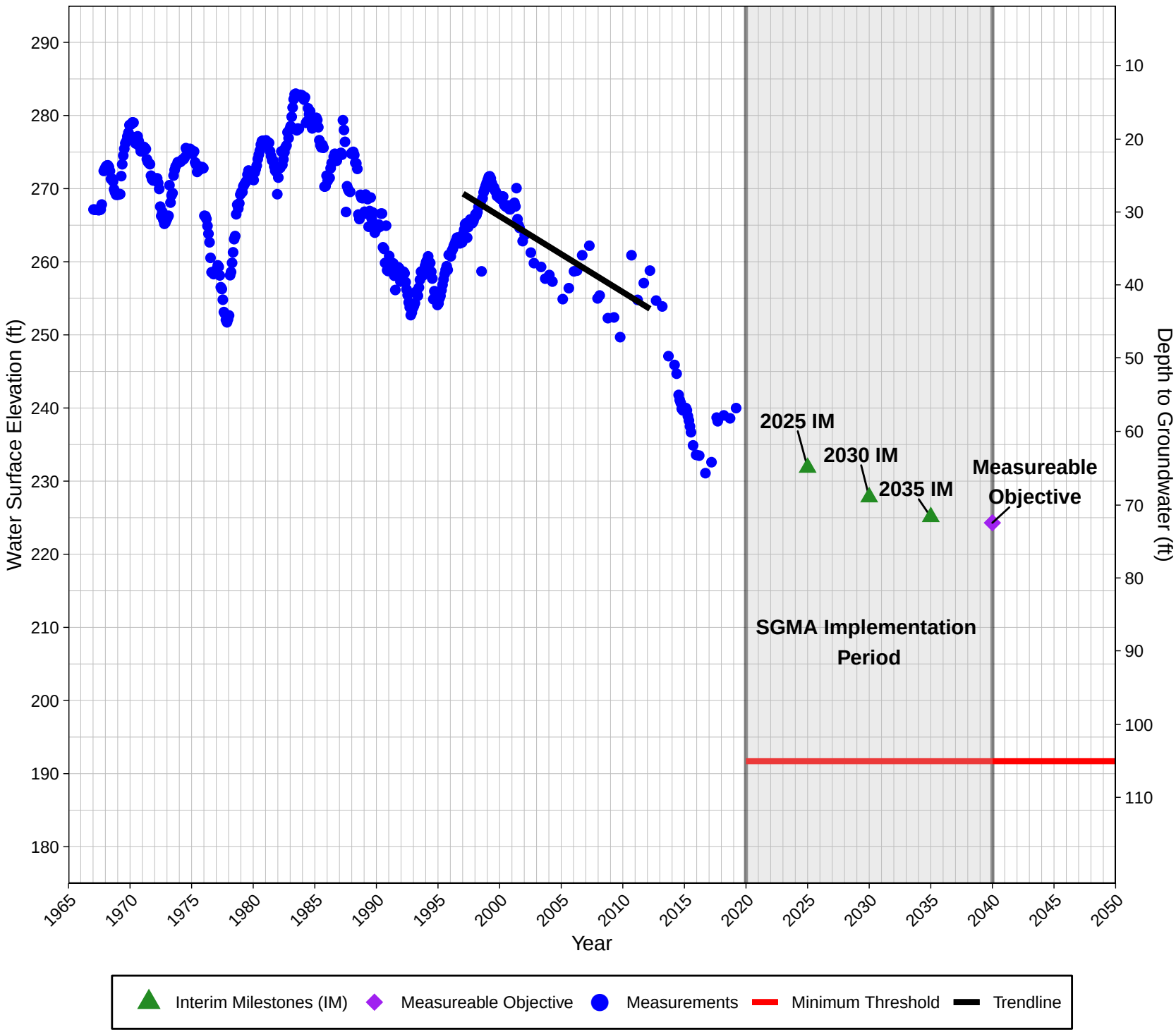
Minimum Threshold

Trendline

CID34

State Well ID: 16S22E23R001M
Ground Surface Elevation: 297 ft
South Kings GSA





Appendix D – Groundwater Contour Maps – Water Surface Elevations

Kings Subbasin Coordinated Effort

Kings Coordinated Effort GSAs

Spring 2015
Groundwater Elevation Contours

Legend

- Kings Subbasin GSAs
- Township/Range
- Well - Data Used
- Well - Data Not Used
- Indicator Well

Water Level Contours

- Line of Equal Elevation (10ft interval)

T11S
T12S
T13S
T14S
T15S
T16S
T17S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Kings Subbasin
Coordinated Effort

Kings Coordinated Effort GSAs

Spring 2016
Groundwater Elevation Contours

Legend

- Kings Subbasin GSAs
- Township/Range
- Well - Data Used
- Well - Data Not Used
- Indicator Well

Water Level Contours

- Line of Equal Elevation (10ft interval)

T11S
T12S
T13S
T14S
T15S
T16S
T17S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Kings Subbasin
Coordinated Effort

Kings Coordinated Effort GSAs

Spring 2017
Groundwater Elevation Contours

Legend

- Kings Subbasin GSAs
- Township/Range
- Well - Data Used
- Well - Data Not Used
- Indicator Well

Water Level Contours

- Line of Equal Elevation (10ft interval)

T11S
T12S
T13S
T14S
T15S
T16S
T17S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Kings Subbasin Coordinated Effort

Kings Coordinated Effort GSAs

Spring 2018
Groundwater Elevation Contours

Legend

- Kings Subbasin GSAs
- Township/Range
- Well - Data Used
- Well - Data Not Used
- Indicator Well

Water Level Contours

- Line of Equal Elevation (10ft interval)

T11S
T12S
T13S
T14S
T15S
T16S
T17S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Madera, Fresno, Kerman, Biola, Tranquillity, San Joaquin, Raisin City, Caruthers, Selma, Kingsburg, Reedley, Dinuba, Orosi, Cutler, Squaw Valley, Riverdale, Laton, Hanford, Armona, Lemoore, Lemoore Naval Air Station, Visalia, Ivanhoe, Farmersville, Exeter, Cantua Creek, Five Points

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Kings Subbasin
Coordinated Effort

Kings Coordinated Effort GSAs

Fall 2018
Groundwater Elevation Contours

Legend

- Kings Subbasin GSAs
- Township/Range
- Well - Data Used
- Well - Data Not Used
- Indicator Well

Water Level Contours

- Line of Equal Elevation (10ft interval)

T11S
T12S
T13S
T14S
T15S
T16S
T17S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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Kings Subbasin
Coordinated Effort

Kings Coordinated Effort GSAs

Spring 2019
Groundwater Elevation Contours

Legend

- Kings Subbasin GSAs
- Township/Range
- Well - Data Used
- Well - Data Not Used
- Indicator Well

Water Level Contours

- Line of Equal Elevation (10ft interval)

T11S
T12S
T13S
T14S
T15S
T16S
T17S

R16E R17E R18E R19E R20E R21E R22E R23E R24E R25E

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