Arroyo Grande Subbasin Groundwater Sustainability Plan

Draft Monitoring Network and Sustainable Management Criteria Chapters

JULY 2022

Arroyo Grande Subbasin Groundwater Sustainability Agencies

ARROYO GRANDE SUBBASIN

GROUNDWATER SUSTAINABILITY AGENCIES

Arroyo Grande Subbasin Groundwater Sustainability Plan

JULY 2022

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7.0 Monitoring Networks (§ 354.32 and § 354.34)

This chapter describes the proposed monitoring networks for the GSP in accordance with SGMA regulations in Sub article 4: Monitoring Networks.

IN THIS CHAPTER

Monitoring is a fundamental component of the GSP necessary to identify impacts to beneficial uses or Basin users, and to measure progress toward the achievement of any management goal. The monitoring networks must be capable of capturing data on a sufficient temporal and spatial distribution to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface water conditions, and to yield representative information about groundwater conditions for GSP implementation. There are three proposed monitoring networks for the Subbasin: a groundwater level network, a groundwater quality network, and a surface water flow network.

Chapter 7 describes the monitoring objectives, rationale, protocols, and data reporting requirements of the monitoring networks. Monitoring requirements for sustainability indicators are presented, and data gaps are identified, along with steps to be taken to fill the data gaps before the first five-year assessment. The following is a list of applicable SGMA sustainability indicators that will be monitored in the Subbasin:

- Chronic lowering of groundwater levels.
- Reduction in groundwater storage.
- Degradation of groundwater quality.
- Land subsidence.
- Depletion of interconnected surface water (includes GDE sustainability).

Sustainability indicators are discussed in detail in Chapter 8. This monitoring networks chapter focuses on the monitoring sites and data collection needed to support the evaluation of each sustainability indicator.

7.1 Monitoring Objectives

The proposed monitoring network must be able to adequately measure changes in groundwater conditions to accomplish the following monitoring objectives:

- Demonstrate progress toward achieving measurable objectives.
- Monitor impacts to the beneficial uses and users of groundwater.
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds for sustainability indicators.
- Quantify annual changes in water budget components.

The network must also provide data with sufficient temporal resolution to demonstrate short-term, seasonal and long-term trends in groundwater and related surface conditions.

7.1.1 Management Areas

Separate management areas have not been established for the Subbasin. The monitoring network includes representative wells across the Subbasin for which minimum thresholds and measurable objective have been selected based on local conditions, as described in Chapter 8.

7.1.2 Representative Monitoring Sites

Monitoring sites are the individual locations within a monitoring network and consist of groundwater wells and stream gages. While a monitoring network uses a sufficient number of sites to observe the overall groundwater conditions and the effects of Subbasin management projects, a subset of the monitoring sites may be used as representative for meeting the monitoring objectives for specific sustainability criteria.

Representative monitoring sites are the locations at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined. The criteria that were used to determine which wells to utilize are as follows:

- A minimum 10-year period of record of historical measurements spanning wet and dry periods.
- Available well information (well depth, screened interval).
- Access considerations.
- Proximity and frequency of nearby pumping wells.
- Spatial distribution relative to the applicable sustainability indicators.
- Groundwater use.
- Impacts on beneficial uses and Subbasin users.

7.1.3 Scientific Rationale

GSP monitoring program development is based on a combination of SGMA monitoring networks best management practices (BMPs), local hydrogeology, and the monitoring requirements for individual sustainability criteria. Some of the SGMA monitoring network BMPs implemented for this GSP include the following:

- Defining the monitoring objectives.
- Utilizing existing monitoring networks and data sources to the greatest extent possible to meet those objectives.
- Adjusting the temporal/spatial coverage to provide monitoring data consistent with the need.
- Efficient use of representative monitoring sites to provide data for more than one sustainability indicator.

County monitoring programs that existed before SGMA include sites that do not meet SGMA monitoring network BMPs with respect to known construction information, such as wells with no available Well Construction Report (WCR) and active wells that are used for groundwater supply. While not prohibiting the use of these wells as a monitoring site, SGMA regulations require that the GSP identify sites that do not meet BMPs and describe the nature of the divergence. If the monitoring network uses wells that lack construction information, the GSP shall include a schedule for acquiring monitoring wells with the necessary information or shall demonstrate that such information is not necessary to understand or manage groundwater in the Subbasin.

As discussed in Chapters 4 (Basin Setting) and 5 (Groundwater Conditions), the Alluvial Aquifer is the only aquifer present in the Subbasin. Although there are some deep wells within the Subbasin boundary that are producing from the bedrock formations, wells considered for the monitoring program are all producing from the alluvial aquifer. Obtaining well construction information for all monitoring network wells is not an immediate necessity and will be addressed (see Section 7.6).

7.1.4 Existing Monitoring Programs

Existing monitoring programs are discussed in Chapter 3. Figure 3-8 (Chapter 3) shows the locations of monitoring wells identified in the GAMA program (publicly available groundwater quality data), the SLOFCWCD semi-annual groundwater level program, and the CCRWQCB Irrigated Lands Regulatory Program (groundwater quality data). There are also groundwater level and quality data collected for various monitoring programs that are publicly available from the SWRCB GeoTracker website.

7.2 Monitoring Networks

This section introduces the proposed GSP monitoring networks and describes the networks in relation to the following SGMA sustainability indicators applicable to the Subbasin:

- Chronic lowering of groundwater levels.
- Reduction of groundwater in storage.
- Groundwater quality degradation.
- Land subsidence.
- Depletion of interconnected surface water (includes GDE sustainability).

The GSP monitoring program consists of three separate networks, one for groundwater levels, one for groundwater quality, and one for surface water flow. Each network is described below.

7.2.1 Groundwater Level Monitoring Network

Groundwater level monitoring is a fundamental tool in characterizing Subbasin hydrology. Groundwater levels (often reported as elevations relative to a reference point) in wells are measures of the hydraulic head in an aquifer. Groundwater moves in the direction of decreasing head (downgradient), and groundwater elevation contours can be used to show the general direction and hydraulic gradient associated with groundwater movement. Changes in the amount of groundwater in storage within an aquifer can also be estimated based on changes in hydraulic head, along with other parameters.

There are 13 monitoring wells in the GSP groundwater level monitoring network for the Subbasin, with 11 wells in the main Arroyo Grande Creek valley and two wells in the Tar Spring Creek tributary valley (Figure 7.1 and Table 7-1). Some construction information is available for 9 of the 13 wells. Eight of the wells are used for irrigation, two are private domestic wells, and three are dedicated monitoring wells.

Groundwater levels may be used as a proxy for monitoring other sustainability indicators (besides chronic lowering of water levels) provided that significant correlation exists between groundwater elevations and the sustainability indicator for which the groundwater elevations serve as a proxy. Four of the 13 groundwater level monitoring network wells are representative monitoring sites used for evaluating sustainability criteria. All four representative monitoring site wells are used for evaluating chronic lowering of groundwater level and reduction of groundwater in storage, which is correlated with groundwater levels (Chapter 6, Section 6.3.5). Three of the wells are used to evaluate depletion of interconnected surface water, which is also correlated with groundwater levels (Chapter 5, Section 5.7). The sustainability criteria and associated minimum thresholds and measurable objectives are presented in Chapter 8.

7.2.1.1 Groundwater Level Monitoring Data Gaps

SGMA regulations do not require a specific density of monitoring wells, other than being sufficient to represent groundwater conditions for GSP Implementation. The monitoring network well density is roughly 30 wells per 10 square miles, which is 15 times greater density than guidelines for the statewide CASGEM program. There are currently sufficient wells in the network to provide information for overall sustainable management of the Subbasin, although some local data gaps have been identified that have been addressed by the monitoring program or that will be addressed during GSP implementation.

A data gap was previously identified in Chapter 5 (Section 5.1.3) with respect to water level monitoring in the Tar Spring Creek tributary valley. There were no records for water levels in the tributary valley after 1989, so a water level survey was conducted in Spring 2021. Two wells (AGV-09 and AGV-10; Table 7-1) have been selected from the 2021 survey for the GSP groundwater level monitoring network, which will fill the data gap in future years.

A second data potential data gap was identified in Chapter 5 (Section 5.1.7) with respect to vertical gradients between alluvial deposits above and below the relatively extensive clay aquitard. The assumption of a downward vertical gradient between shallow alluvial sediments and the basal alluvial gravels appears to be confirmed in the vicinity of Cecchetti Road (adjacent to Arroyo Grande Creek), based on the Arroyo Grande Creek Integrated Model Field Data Collection and Investigation conducted during the summer of 2021 (CHG, 2021). An inactive, 118-foot-deep irrigation well on Cecchetti Road (AGV-07); Table 7-1) has been included in the GSP groundwater level monitoring network to help interpret vertical gradients.

Table 7-1 presents the GSP groundwater level monitoring network wells. Figure 7-1 shows the location of the groundwater level monitoring program wells.

Table 7-1. Groundwater Level Monitoring Network

GSP ID[1]	TRS / State ID[2]	Well Depth (feet)	Screen Interval (feet)	RP Elev.[3] (feet AMSL)	First Data Year	Last Data Year	Data period (years)	Data Count	Well Criteria[4]	Well Use[5]	GSA
AGV-01	**31S/14E-32F**	40	20-40	364.5	2006	2021	15	79	WL, GWS, ISW	MW	County
AGV-02	31S/14E-31L	20	10-20	332.7	2006	2021	15	80		MW	County
AGV-03	**31S/13E-36R01**			329.7	1968	2021	53	116	WL, GWS	IRR-A	County
AGV-04	32S/13E-12B									DOM-I	County
AGV-05	32S/13E-12F05	63	43 - 63	253.4	1981	2021	40	93		IRR-A	County
AGV-06	**32S/13E-12Q03**			229.1	1965	2021	56	187	WL, GWS, ISW	IRR-A	County
AGV-07	32S/13E-13C	118	88 - 118			2021	1	4		IRR-I	County
AGV-08	32S/13E-14R02	108	83 - 108	194.8	1965	2021	56	157		DOM-A	County
AGV-09	32S/14E-16N	49			2021		1	1		MW	County
AGV-10	32S/14E-19A01	125			1965	2021	56	37		IRR-A	County
AGV-11	32S/13E-23F03	120	80 - 120	153.6	1988	2021	33	47		IRR-A	County
AGV-12	**32S/13E-23M01**			151.1	2008	2021	13	26	WL, GWS, ISW	IRR-A	City
AGV-13	32S/13E-22R03	100	61 - 100	152.1	1972	2021	49	98		IRR-A	City

Notes:

1- Representative Monitoring Sites are in **bold**. Wells with known State Well Completion Reports are underlined.
2- TRS = Township Range Section and ¼-¼ section listed, State Well ID bolded where applicable.
3- Reference Point elevations from various sources with variable accuracy.
4- Representative well criteria include Subsidence (SUB), Interconnected Surface Water Depletion (ISW), Chronic Water Level Decline (WL), and Groundwater Storage Decline (GWS).
5- Well Use includes Monitoring Well (MW), Irrigation Well (IRR), and Domestic Well (DOM). Modifiers are Active (A) or Inactive (I). Information for some wells pending.

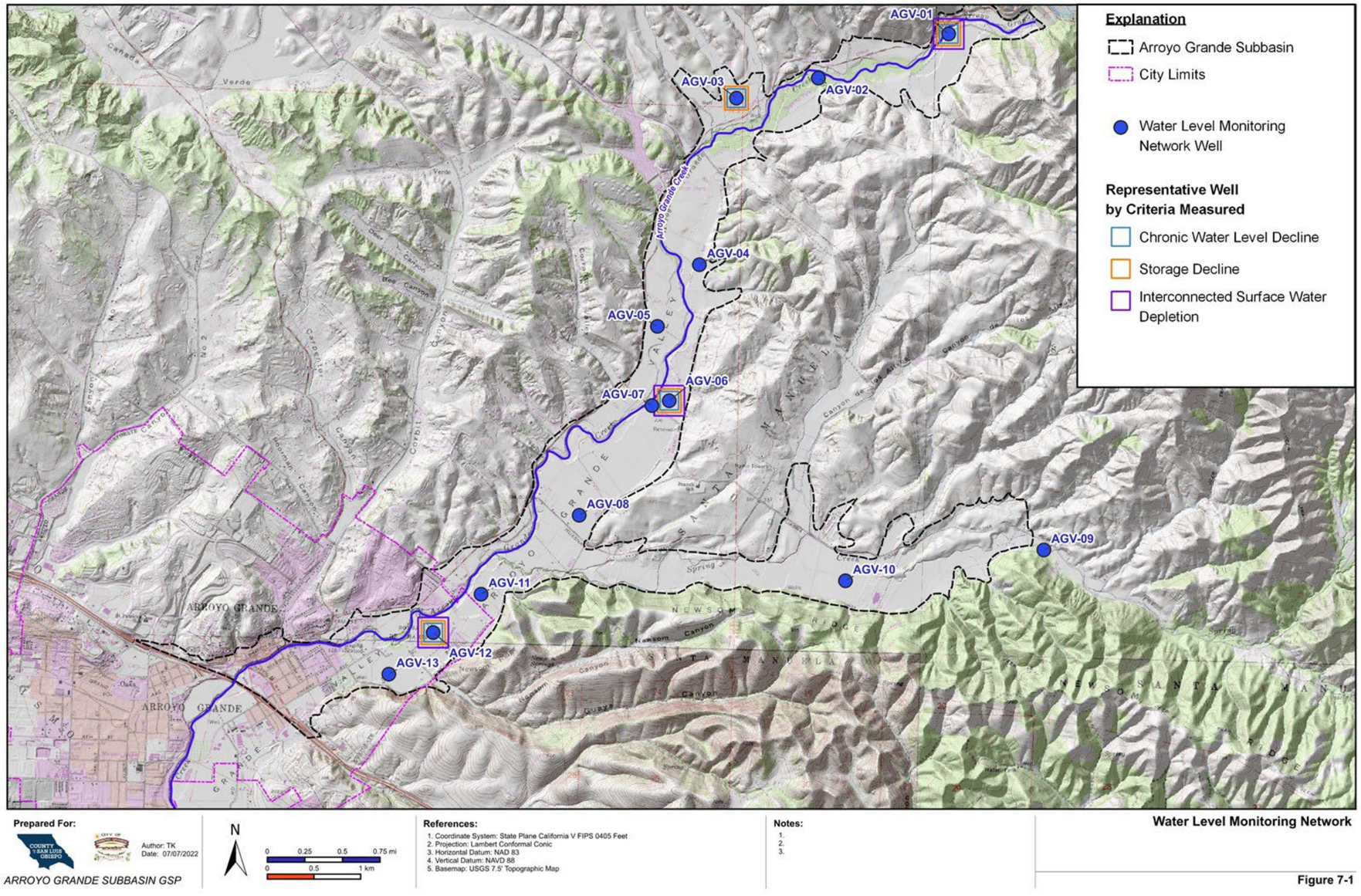

Figure 7-1. Water Level Monitoring Network

7.2.2 Groundwater Quality Monitoring Network

Groundwater quality monitoring refers to the periodic collection and chemical or physical analysis of groundwater from wells. As discussed in Chapter 5 (Section 5.6), the quality of groundwater in the Subbasin is generally good, although TDS concentrations are higher in the southwestern part of the subbasin and can exceed drinking water standards. Groundwater quality trends in the Subbasin appear stable, with no significant trends of ongoing deterioration of groundwater quality based on the Central Coast Basin Plan.

Groundwater quality networks should be designed to demonstrate that the degraded groundwater quality sustainability indicator is being observed for the purposes of meeting the sustainability goal (DWR Monitoring Networks BMP, 2016). In other words, the main purpose of the groundwater quality monitoring network is to support the determination of whether the degradation of groundwater quality is occurring at the monitoring sites, based on the sustainability indicator constituents and minimum thresholds selected. This GSP groundwater quality network is also designed to use existing monitoring programs to the greatest degree possible (DWR Monitoring Networks BMP, 2016).

Sustainability indicator constituents selected for groundwater quality are Total Dissolved Solids (TDS) and Nitrate. These constituents were introduced in Chapter 5 (Section 5.6.2) as diffuse or naturally occurring in the Subbasin and are further discussed in relation to sustainability indicators in Chapter 8.

The groundwater quality network consists of 7 sites (Figure 7-2), which includes five Public Water System supply wells, 1 private domestic well and 1 private irrigation well. Water quality for these wells can be accessed using the GAMA Groundwater Information System. Agricultural Order 4.0 of the Irrigated Lands Regulatory Program was approved in April 2021, which includes the requirement for annual sampling of major constituents including TDS and Nitrate. Selection of specific wells regulated under that program would not be recommended until the program is implemented and monitoring data is available for review. Annual sampling as part of this program will start in 2023. By comparison, the public water system wells have a history of groundwater quality data and specific wells are sampled at regular intervals for the two indicators recommended for groundwater quality monitoring in Chapter 8 – TDS and Nitrate.

7.2.2.1 Groundwater Quality Monitoring Data Gaps

Current groundwater quality monitoring within the Subbasin is generally sufficient to collect the spatial and historical data needed to determine groundwater quality trends for groundwater quality indicators in the Subbasin. The GAMA database includes 12 wells within the Subbasin boundaries that have been monitored for groundwater quality in the last three years, as well as several to the south of the Subbasin. Several of these wells either have limited data or are considered spatially redundant and have not been included in the monitoring network. The seven wells selected that are shown in Figure 7-2 provide representative Subbasin coverage

but can be supplemented with other data if needed to support sustainability indicator evaluation. The water quality network wells will be used collectively to provide the metric for use with the groundwater quality degradation sustainability indicator (Chapter 8). No data gaps in groundwater quality monitoring are currently identified.

Table 7-3 presents the GSP groundwater quality monitoring network. Figures 7-2 show the locations of the groundwater quality monitoring wells.

Table 7-2. Groundwater Quality Monitoring Network

GSP ID	State ID[1]	First Data Year	Last Data Year	Data period (years)	Data Count (TDS)[2]	Data Count (N)[3]	Well Use	GSA
WQ-1	4000815-001	2010	2021	11	4	14	Public	County
WQ-2	4000733-001	2002	2021	19	1	19	Public	County
WQ-3	4000678-001	1987	2021	34	6	25	Public	County
WQ-4	4000808-002	2006	2021	15	5	15	Public	County
WQ-5	AGL020013087-WELL #1	2014	2020	6	3	2	Private Domestic	County
WQ-6	4000784-007	2014	2020	6	4	65	Public	County
WQ-7	AGL020002547-PUMP18_IRR	2014	2019	5	2	4	Private Irrigation	City

Notes: Data accessed on GAMA Groundwater Information System

1- State ID in GeoTracker Data System
2- TDS = Total Dissolved Solids – typically measured every three years
3- N = Nitrate-Nitrogen – typically measured every year or quarterly

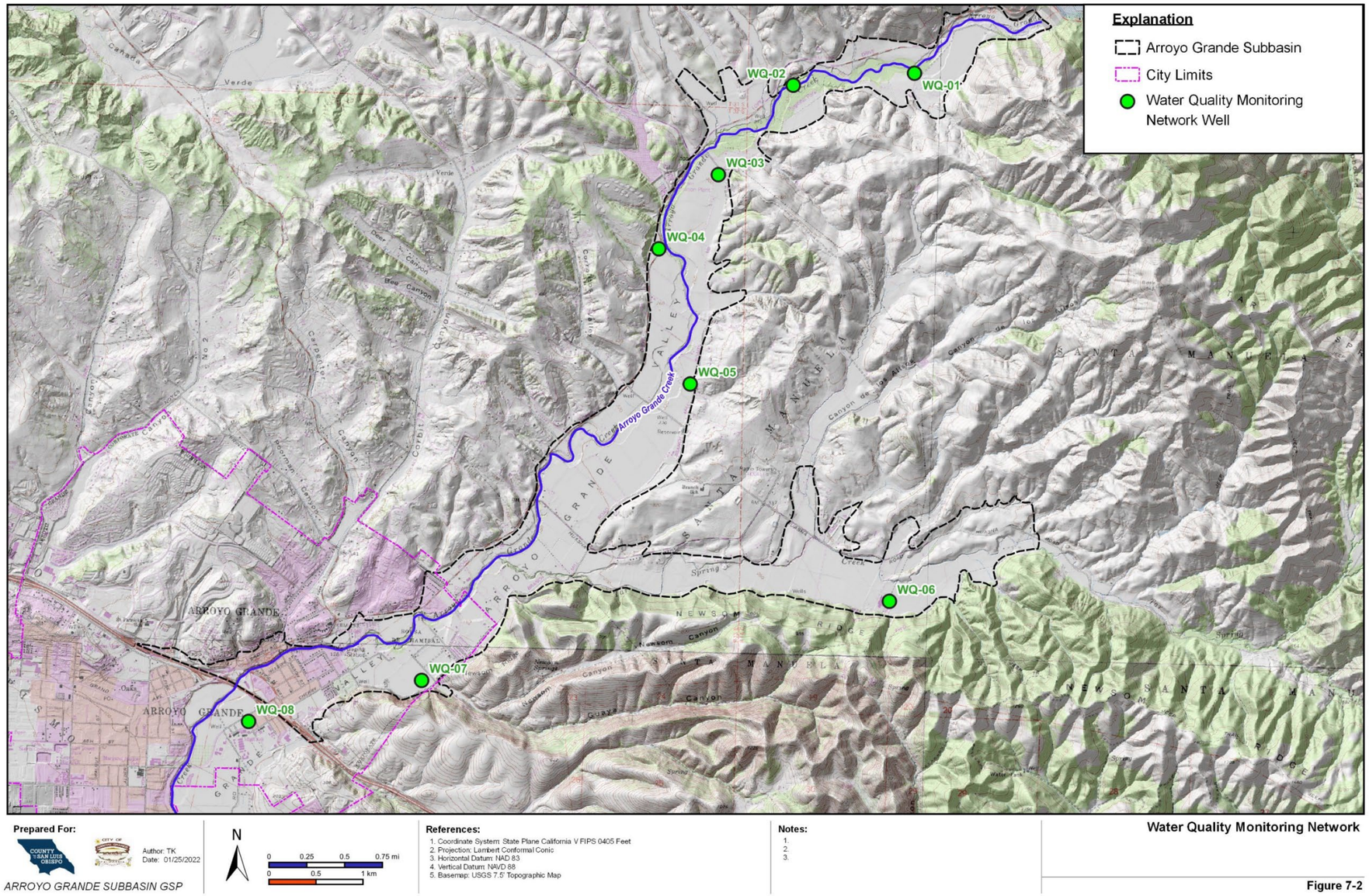

Figure 7-2. Water Quality Monitoring Network

7.2.3 Surface Water Flow Monitoring Network

Surface water flow monitoring can provide valuable information for the Subbasin model and for evaluating potential depletion of interconnected surface water for groundwater dependent ecosystems (GDEs), which is one of the sustainability indicators.

As summarized in Chapter 3, there are 3 permanent stream gages located in the Subbasin along Arroyo Grande Creek (Figure 7-3), as well as two additional downstream gages outside of the Subbasin but within the Arroyo Grande Creek watershed. The existing gaging stations only provide stage data, and not actual stream flow data. In addition, there is an active USGS stream gaging station (USGS 11141280) located in the same watershed above Lopez Lake that records discharge, as well as two inactive USGS stream gages that previously recorded discharge data: Tar Spring Creek (USGS 11141400) and AG Creek at AG Creek (USGS 11141500), which was discontinued in 1986 and converted to the current FCWCD-maintained SG-736, which measures stage data. Stream stage is the height of water level in the stream above an arbitrary point, usually at or below the stream bed. Stage data can be useful for identifying flow and no-flow conditions, flood stage alerts, and analyzing the timing of precipitation and runoff in watersheds. Streamflow data is critical for quantifying Subbasin recharge from stream seepage as part of the water budget/model and for addressing sustainability indicators related to GDEs and depletion of interconnected surface water.

Stage data can be converted to streamflow through the use of a rating curve, which incorporates information that is specific to each site, including the cross-sectional area of the channel and the average surface water velocity for a given flow stage. A description of the methodology for monitoring surface water flow in natural channels is presented in Appendix 7A. There are historical rating curves for the gages, and streamflow in cubic feet per second (CFS) has been estimated for use in modeling and for comparison with the water budget (Figure 6-8; Chapter 6).

7.2.3.1 Surface Flow Monitoring Data Gaps

The existing gages in the Arroyo Grande Creek watershed are sufficient to monitor surface flow where the majority of potential GDEs have been identified (Figure 5-15; Chapter 5). Table 7-4 presents the GSP surface water flow monitoring network. Figure 7-3 shows the locations of the existing gages.

Table 7-3. Existing Surface Water Flow Monitoring Network

Local ID	Water Course	Location	First Data Year	Data Interval	Data period (years)	GSA
SG-733	Arroyo Grande Creek	Rodriguez Bridge	2006	15-minutes	15	County
SG-735	Arroyo Grande Creek	Cecchetti Road	2003	15-minutes	18	County
SG-736	Arroyo Grande Creek	Stanley Avenue	1939	15-minutes	82	City

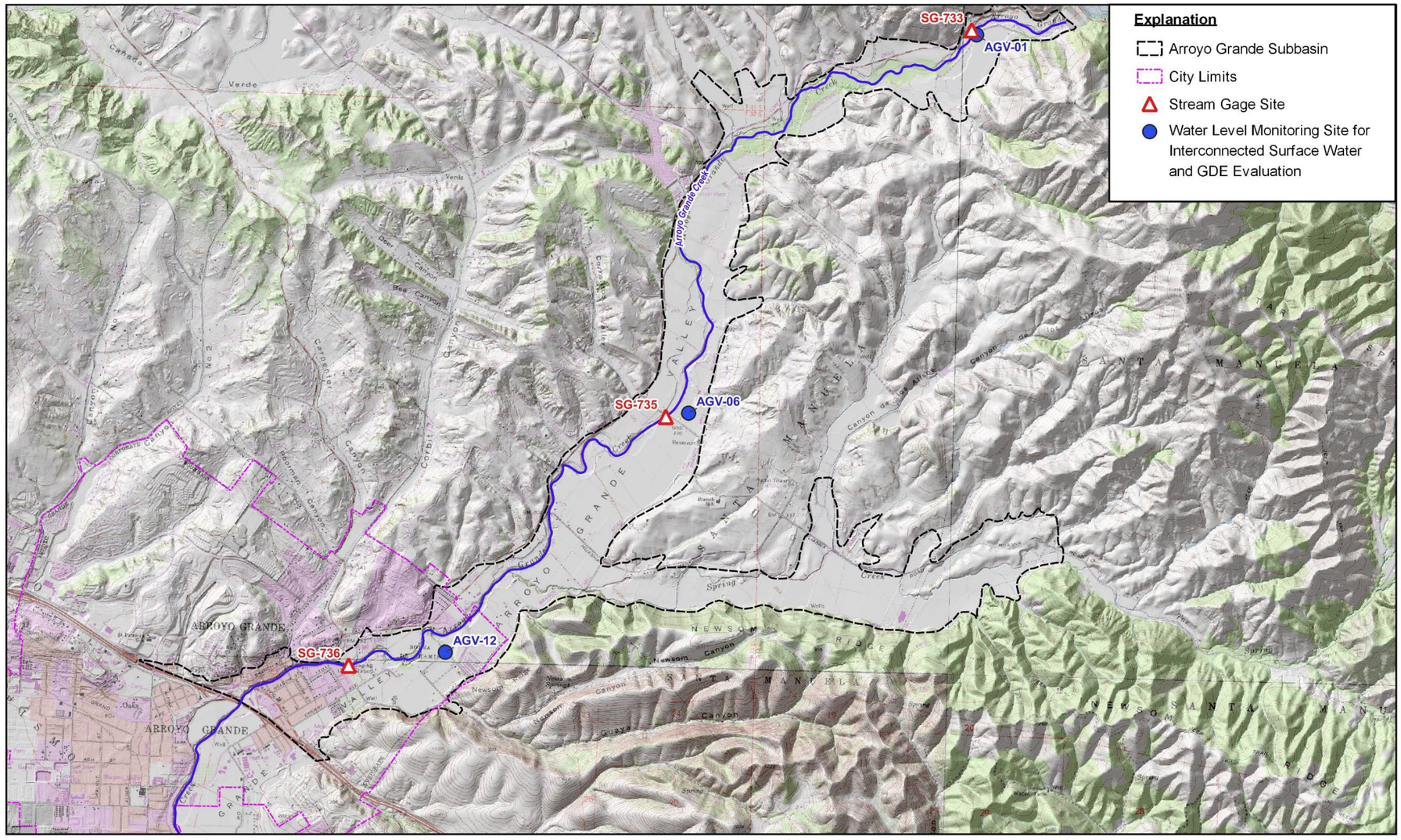

Figure 7-3. Surface Water Flow Monitoring Network

7.3 Sustainability Indicator Monitoring

Sustainability indicators are the effects caused by groundwater conditions occurring throughout the Subbasin that, when significant and unreasonable, become undesirable results. The SGMA sustainability indicators for GSP implementation are as follows:

- Chronic lowering of groundwater levels.
- Reduction in groundwater storage.
- Seawater Intrusion (this indicator is not applicable to Subbasin).
- Degraded groundwater quality.
- Land subsidence.
- Depletion of interconnected surface water (includes GDE sustainability).

7.3.1 Chronic Lowering of Groundwater Levels

Chronic lowering of groundwater levels can lead to a significant and unreasonable depletion of the water supply. All of the groundwater level monitoring network wells can be used for evaluating chronic lowering of groundwater levels, with a selected subset of four representative wells formally assigned to assess Minimum Thresholds and Measurable Objectives (Chapter 8). Groundwater monitoring network wells not included in the subset of representative wells are included in the network primarily for preparing groundwater level contour maps, which are used for evaluating hydraulic gradient and groundwater flow direction. Groundwater level contour maps can reveal groundwater pumping depressions that result from lowering of groundwater levels and can also be used to calculate change in groundwater storage. There is currently no indication of chronic lowering of groundwater levels in the Subbasin.

Static groundwater level measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions. Historically, the semi-annual groundwater level program conducted by SLOFCWCD has measured groundwater levels in April and October of each year. This schedule will be maintained for the GSP.

7.3.2 Reduction of Groundwater Storage

Groundwater storage and water levels are directly correlated, and chronic lowering of water levels also leads to a reduction of groundwater storage. Change in groundwater storage will be monitored using the overall monitoring network, while selected representative wells will track reduction of groundwater storage as the sustainability indicator.

The water level monitoring network will be used to contour groundwater elevations for seasonal high conditions, from which annual spring groundwater storage estimates will be estimated and the annual change in storage reported if required for Annual Reports. Groundwater storage will be calculated using the specific yield method, which is the product of total saturated Subbasin volume

and average specific yield. The saturated Subbasin volume is the volume between a groundwater elevation contour map for a specific period (such as Spring 2020) and the base of permeable sediments (Chapter 6; Section 6.3.5). Representative wells that will be used for monitoring reductions in groundwater storage are listed in Table 7-1 and shown in Figure 7-1. Chapter 8 discusses the Minimum Thresholds and Measurable Objectives assigned to the representative wells.

7.3.3 Seawater Intrusion

The Subbasin is not susceptible to seawater intrusion and will not be monitored for that indicator.

7.3.4 Degraded Groundwater Quality

The significant and unreasonable degradation of water quality would be an undesirable result. As discussed in Section 7.2.2, groundwater quality constituents in the Subbasin that have been selected for groundwater quality indicator monitoring include TDS and Nitrate. The selected water quality indicators represent common constituents of concern in relation to groundwater production for domestic, municipal and agricultural use that will be assessed by the monitoring network. TDS is selected as a general indicator of groundwater quality in the Subbasin. Nitrate is a widespread contaminant in California groundwater and selected due to the prevailing land use across the Subbasin associated with agricultural activities, septic systems, and landscape fertilizer. Other constituents of concern may be added to the list during GSP implementation. The sites currently best suited for evaluating trends over time are public supply wells. Sampling intervals vary by well and by constituent, ranging from every three years to monthly, but longer historical records are available, compared to other types of wells.

7.3.5 Land Subsidence

Land subsidence can lead to undesirable results when it interferes with surface land uses. Land subsidence is frequently associated with groundwater pumping. However, within the Arroyo Grande Creek Subbasin, there have been no long-term declines of groundwater levels and no documentation of subsidence (see Chapter 4; Section 4.7 and Chapter 6; Section 6.7.3). The purpose of land subsidence monitoring is to identify the rate and extent of land subsidence and to provide data for sustainability criteria thresholds. DWR maintains a land subsidence dataset derived from Interferometric Synthetic Aperture Radar (InSAR) data from satellite imagery. InSAR is a remote sensing method used to measure land-surface elevations over large areas, with accuracy on the order of centimeters to millimeters. InSAR uses satellites that emit and measure electromagnetic waves that reflect off of the earth's surface to produce synthetic aperture radar images with a spatial resolution of about 100 meters by 100 meters. Vertical displacement values associated with land subsidence can be estimated by comparing these images over time.

The DWR land subsidence dataset shows vertical displacement from 2015-2019 in California groundwater basins. The raster GIS dataset covers the entire Subbasin, with no data gaps. The dataset shows minimal vertical displacement of less than an inch from 2015-2019 throughout the Basin (Chapter 4). Continued evaluation of Subbasin land subsidence through monitoring the available InSAR data is planned. No additional sites are recommended for monitoring land subsidence. Groundwater level can be a proxy for land subsidence because the process is typically not reversible and maintaining groundwater levels above historic lows in areas susceptible to land subsidence can protect against future undesirable results (see Chapter 8).

7.3.6 Depletion of Interconnected Surface Water

Surface water provides beneficial uses, and depletion of interconnected surface water due to groundwater pumping can result in undesirable results by impacting these beneficial uses. The purpose of monitoring for depletion of interconnected surface water is to characterize the following:

- Flow conditions including surface water discharge, surface water head, and baseflow contribution.
- Identifying the approximate date and location where ephemeral or intermittent flowing streams cease to flow.
- Historical change in conditions due to variations in stream discharge and regional groundwater extraction.
- Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.

One of the beneficial uses of surface water is the environmental water demand which supports riverine, riparian, and wetland ecosystems. Locations where surface water is interconnected with groundwater have the potential for creating GDEs, which are ecological communities or species that depend on groundwater emerging from aquifers (rising into streams or lakes) or on groundwater occurring near ground surface where it may be used by riparian vegetation, wetland vegetation, or oak woodlands.

Depending on location and time of year, GDEs that overlie the Subbasin can be supported by a range of water sources including direct precipitation, surface runoff, shallow subsurface flow, and groundwater. Lopez Reservoir releases are regular and continue through the dry season within the Subbasin, which can affect groundwater recharge and support GDEs to a greater extent than would otherwise occur with naturally drained watersheds. No additional GDE monitoring sites are recommended at this time until further GDE investigation is performed in the Subbasin.

There are three existing County stream gages within the Arroyo Grande Subbasin (Table 7-4, Figure 7-3). The existing gages only currently report stage, as discussed in Section 7.2.3. Groundwater level monitoring occurs along Arroyo Grande Creek in the general vicinity of the

stream gages sites (Figure 7-3). Table 7-5 shows the pairing between the stream gages and the nearby water level monitoring sites for interconnected surface water and GDE indicator evaluation.

Table 7-4. Interconnected Surface Water and Associated Potential GDE indicator Monitoring Locations

Stream Gage	Monitoring Well	Area
SG-733	AGV-01	AG Creek at Rodriguez Bridge
SG-735	AGV-06	AG Creek at Cecchetti Rd
SG-736	AGV-13	AG Creek at Stanley Ave

The wells in Table 7-4 used for interconnected surface water and potential GDE monitoring should be representative of groundwater levels in the riparian zones. Well AGV-01 is immediately adjacent to the stream gage and taps the shallow alluvial deposits. The other two wells (AGV-06 and AGV-13) are not immediately adjacent to their paired stream gage but appear to have sufficient hydraulic connection to the local riparian corridor to be useful for potential GDE indicator evaluation. Depths to water in these wells are typically less than 30 feet.

Well AGV-08 (Figure 7-1) is an inactive irrigation well immediately adjacent to stream gage SG-735. This well is interpreted to tap the basal alluvial gravel below the clay aquitard and does not appear to be interconnected with surface water or shallow groundwater along the riparian corridor. Water levels in AGV-08 averaged 60 feet depth during the Arroyo Grande Creek Integrated Model Field Data Collection and Investigation (CHG, 2021). Monitoring at this well can be used to evaluate vertical gradients and to demonstrate the local hydraulic separation between surface water and alluvial groundwater below the aquitard.

7.4 Monitoring Technical and Reporting Standards

Monitoring technical and reporting standards include a description of the protocols, standards for monitoring sites, and data collection methods.

7.4.1 Groundwater Levels

Monitoring protocols and data collection methods for groundwater level monitoring and reporting are described in the attached Appendix 7B, and are based on SGMA monitoring protocols, standards and sites BMPs, USGS data collection methods, and practical experience. Wells used for monitoring program sites have been constructed according to applicable construction

standards, although not all the information required under the BMPs is available for every site. Table 7-2 lists the pertinent information available for the monitoring sites.

7.4.2 Groundwater Quality

Monitoring protocols and standards for groundwater quality sampling sites are those required for public water systems from which the groundwater quality data is obtained. Sample collection and field tests shall be performed by appropriately trained personnel as required by California Code of Regulations Title 22, Section 64415. All wells used for public supply are expected to meet applicable construction standards.

7.4.3 Surface Water Flow

As previously discussed, the existing gaging stations currently only provide stage data, and not actual stream flow data. Stage data can be converted to streamflow through the use of a rating curve, which incorporates information that is specific to each site, including the cross-sectional area of the channel and the average surface water velocity for a given flow stage. These rating curves are developed using depth profiles and flow velocity measurements during storm-runoff events (Appendix 7A). Historical rating curves have been prepared for existing gages within the Subbasin but need to be revised periodically as they can shift due to changes in channel geometry. Protocols and data collection methods will be based on applicable USGS standards and SLOFCWCD standards.

7.4.4 Monitoring Frequency

Monitoring frequency is the time interval between data collection. Seasonal fluctuations relating to groundwater levels or quality are typically on quarterly or semi-annual cycles, correlating with seasonal precipitation, recharge, groundwater levels, and well production. The monitoring schedule for groundwater levels collected under the GSP groundwater level monitoring program will coincide with seasonal groundwater level fluctuations, with higher levels (i.e., elevations) in April (Spring) and lower levels in October (Fall). A semi-annual monitoring frequency provides a measure of seasonal cycles, which can then be distinguishable from the long-term trends.

The monitoring frequency for groundwater quality sampling is variable and based on the schedule determined by the regulating agency (County Environmental Health Services for small public water systems and the State Division of Drinking Water for large public systems). TDS is typically monitored every three years, while nitrate may be monitored annually, quarterly, or even monthly at vulnerable systems. The frequency selected for monitoring individual constituents at each system is sufficient to protect public health, and therefore considered sufficient for Basin

management purposes.

Surface monitoring network frequency is a near-continuous record of flow stage, collected at 15-minute intervals. The stage data can then be converted to average daily flow (cubic feet per second) using a rating curve. Automatic gaging equipment (e.g., radar sensors or bubbler gages) at flow monitoring locations maintain the near-continuous monitoring frequency. Updated rating curves are needed at all gage sites, which requires manual flow measurements over a range of stream stages.

7.5 Data Management System

SGMA requires development of a Data Management System (DMS). The DMS stores data relevant to development of a groundwater Basin's GSP as defined by the GSP Regulations (California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2). To comply with SGMA, the Basin DMS was developed in this GSP and will store data that is relevant to development and implementation of the GSP as well as for monitoring and reporting purposes. Appendix 7D describes the data management plan associated with the DMS.

7.6 Assessment and Improvement of Monitoring Network

The current assessment of the monitoring networks has not identified critical data gaps with respect to sustainable management of the Subbasin.

As previously mentioned, obtaining well construction information for all monitoring network wells is not an immediate necessity or a requirement for Subbasin management purposes, provided the lack of information does not affect the usefulness of the monitoring results toward Subbasin management. Over time, wells for which construction information is not known may be inspected with a video camera to document construction, either within the next five years or at the earliest practical opportunity, such as when the well pump is being serviced. The monitoring networks will be re-evaluated at each five-year assessment.

7.7 Annual Reports and Periodic Evaluation by the GSAS

Reporting requirements for the Annual Report and for periodic evaluation of the GSP are contained in Article 7 of the GSP regulations. Because the Subbasin is a very low priority basin, however, it is not required to submit an Annual Report or five-year updates. Reporting is anticipated to take place as part of future HCP efforts and through the County's Master Water Report process.

GROUNDWATER SUSTAINABILITY PLAN

8.0 Sustainable Management Criteria (§354.22)

This chapter defines the conditions specified at each of the Representative Monitoring Sites (RMSs) that constitute Sustainable Management Criteria (SMCs), discusses the process by which the GSAs in the Subbasin will characterize undesirable results, and establishes minimum thresholds and measurable objectives for each Sustainability Indicator.

IN THIS SECTION

The chapter defines sustainability in the Subbasin for the purposes of managing groundwater in compliance with SGMA, and it addresses the regulatory requirements involved. The Measurable Objectives (MOs), Minimum Thresholds (MTs), and undesirable results presented in this chapter define the future sustainable conditions in the Basin and guide the GSAs in development of policies, implementation of projects, and promulgation of management actions that will achieve these future conditions.

Defining Sustainable Management Criteria (SMC) requires technical analysis of historical data, and input from the affected stakeholders in the Basin. This chapter presents the data and methods used to develop the SMC and demonstrate how they influence beneficial uses and users. The SMCs presented in this chapter are based on currently available data and application of the best available science. As noted in this GSP, data gaps exist in the hydrogeologic conceptual model. Uncertainty caused by these data gaps was considered when developing the SMC. Due to uncertainty in the hydrogeologic conceptual model, these SMCs are considered initial criteria and will be reevaluated and potentially modified during the 20-year implementation period as new data become available.

The discussion of SMC in this chapter is organized by Sustainability Indicators. The following Sustainability Indicators are applicable in the Basin:

- Chronic lowering of groundwater elevations
- Reduction in groundwater storage
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water

The sixth Sustainability Indicator, sea water intrusion, only applies to coastal basins, and is not applicable in the Subbasin.

To maintain an organized approach throughout the text, this chapter follows the same structure for each Sustainability Indicator. The description of each SMC contains all the information required by Section 354.22 et. seq of the SGMA regulations and outlined in the Sustainable Management Criteria BMP (DWR, 2017), including:

- How undesirable results were developed, including:
    - The criteria defining when and where the effects of the groundwater conditions that cause undesirable results based on a quantitative description of the combination of minimum threshold exceedances (§354.26 (b)(2))
    - The potential causes of undesirable results (§354.26 (b)(1))
    - The effects of these undesirable results on the beneficial users and uses (§354.26 (b)(3))
- How minimum thresholds were developed, including:
    - The information and methodology used to develop minimum thresholds (§354.28 (b)(1))
    - The relationship between minimum thresholds and the relationship of these minimum thresholds to other Sustainability Indicators (§354.28 (b)(2))

  - The effect of minimum thresholds on neighboring basins (§354.28 (b)(3))
  - The effect of minimum thresholds on beneficial uses and users (§354.28 (b)(4))
  - How minimum thresholds relate to relevant Federal, State, or local standards (§354.28 (b)(5))
  - The method for quantitatively measuring minimum thresholds (§354.28 (b)(6))
- How measurable objectives were developed, including:
  - The methodology for setting measurable objectives (§354.30)
  - Interim milestones (§354.30 (a), §354.30 (e), §354.34 (g)(3))

The SGMA regulations address minimum thresholds before measurable objectives. This order was maintained for the discussion of all applicable Sustainability Indicators.

8.1 Definitions (§ 351)

The SGMA legislation and regulations contain a number of new terms relevant to the SMCs. These terms are defined below using the definitions included in the SGMA regulations (§ 351, Article 2). Where appropriate, additional explanatory text is added in italics. This explanatory text is not part of the official definitions of these terms. To the extent possible, plain language, including limited use of overly technical terms and acronyms, was used so that a broad audience will understand the development process and implications of the SMCs.

1. ***Interconnected surface water (ISW)*** refers to surface water that is hydraulically connected at any point by a continuous saturated zone between the underlying aquifer and the overlying surface water. Interconnected surface waters are parts of streams, lakes, or wetlands where the groundwater table is at or near the ground surface and there is water in the lakes, streams, or wetlands.
2. ***Interim milestone (IM)*** refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan. Interim milestones are targets such as groundwater elevations that will be achieved every five years to demonstrate progress towards sustainability.
3. ***Management area*** refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.
4. ***Measurable objectives (MOs)*** refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin. Measurable objectives are goals that the GSP is designed to achieve.
5. ***Minimum thresholds (MTs)*** refer to numeric values for each Sustainability Indicator used to define undesirable results. Minimum thresholds are established at representative monitoring sites. Minimum thresholds are indicators of where an unreasonable condition might occur. For example, a particular groundwater elevation might be a minimum threshold if lower groundwater elevations would result in a significant and unreasonable reduction in groundwater storage.
6. ***Representative monitoring site (RMS)*** refers to a monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin.

7. ***Sustainability Indicator*** refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x). The five Sustainability Indicators relevant to the Basin are listed in the introductory section of Chapter 8.
8. ***Uncertainty*** refers to a lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed.
9. ***Undesirable Result*** Section 10721 of the Sustainable Groundwater Management Act states that Undesirable result means one or more of the following effects caused by groundwater conditions occurring throughout the basin:
    a. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
    b. Significant and unreasonable reduction of groundwater storage.
    c. Significant and unreasonable seawater intrusion.
    d. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
    e. Significant and unreasonable land subsidence that substantially interferes with surface land uses.
    f. Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Section § 354.26 of the SGMA regulations states that "The criteria used to define when and where the effects of the groundwater conditions cause undesirable results shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin."

8.2 Sustainability Goal (§ 354.24)

The sustainability goal for the Arroyo Grande Subbasin is a comprehensive statement that describes the important factors to be considered during the SGMA planning horizon. The sustainability goal was developed during a series of public workshops, and during ongoing input from the City, County, and affected stakeholders. The SGMA regulations require the sustainability goal to culminate in the absence of undesirable results within 20 years of the applicable statutory deadline. Per Section § 354.24 of the SGMA regulations the Sustainability goal has three parts:

- Description of the sustainability goal

- A discussion of the measures that will be implemented to ensure the Basin will be operated within sustainable yield, and
- An explanation of how the sustainability goal is likely to be achieved.

8.2.1 Description of Sustainability Goal

The sustainability goal for the Subbasin is to manage the Subbasin to ensure beneficial uses and basin users have access to a safe and reliable groundwater supply that meets current and future demand without causing undesirable results. Guiding principles of this goal are:

- Available groundwater supply supports diverse needs reliably and equitably.
- Stored groundwater equitably supports supply resilience and evolving needs.
- Groundwater levels support the sustained health of groundwater dependent ecosystems.
- Cost of maintaining sustainable groundwater levels is equitably distributed.
- Groundwater quality is maintained to a safe standard to meet diverse basin needs.

8.2.2 Sustainability Strategy

The water budget analysis detailed in Chapter 6 indicates that there is currently no overdraft in the Subbasin. This indicates that the Subbasin is sustainable under current conditions and operations. The sustainability strategy will be to maintain an increased effort for data collection in the Subbasin to document conditions on an ongoing basis. Chapter 9 (Projects and Management Actions) and Chapter 10 (Implementation Plan) will provide additional detail on the sustainability strategy for the Subbasin.

8.3 Generalized Process For Establishing Sustainable Management Criteria (§ 354.22-30)

SMCs for the Subbasin were developed after technical analysis of hydrogeologic and geotechnical data by the consulting team, input from the GSAs, stakeholder input received in public meetings, written public comments in response to GSA meeting and workshop presentations, and meetings with GSA staff. Public comments on alternative SMCs discussed during GSC meetings and responses to those comments are included in Appendix M. All presentations made at public meetings are available for review at the Arroyo Grande Subbasin web site created for this GSP, https://slocounty.ca.gov/agbasin

The general process for establishing minimum thresholds and measurable objectives for the SMC and assessing significant and unreasonable conditions constituting undesirable results in the Subbasin was iterative and included the following:

- Evaluating historical data on groundwater elevations from wells monitored by the City and County.

- Evaluating water budget information presented in Chapter 6, including sustainable yield estimates and average deficits for Subbasin.
- Holding a series of public meetings that outlined the GSP development process and introduced stakeholders to SMC, MOs, MTs, and other related information.
- Soliciting public comment and input on alternative minimum threshold and measurable options based upon preliminary technical analysis presented at GSC meetings.
- Evaluating public comment to assess what are significant and unreasonable effects relevant to SMC.
- Combining public comment, outreach efforts, hydrogeologic data and considering the interests of beneficial uses and groundwater users, land uses, and property interests in the Basin to describe undesirable results and setting preliminary conceptual MTs and MOs.
- Reviewing and considering public and GSC input on recommended preliminary SMCs with GSA staff.

Various alternative options for both MTs and MOs were considered for each RMS after evaluation of the historical record of groundwater elevations at each well, assessment of trends of groundwater elevation decline (where applicable), and input from stakeholders regarding their desired conditions. Details regarding the specific SMCs for each Sustainability Indicator are included in the following sections of this chapter describing each indicator.

The chronic lowering of groundwater levels sustainability indicator, the reduction of groundwater in storage sustainability indicator, and the depletion of interconnected surface water sustainability indicator all utilize direct measurements of groundwater elevation as a proxy metric to assess the SMC for the respective sustainability indicators. Water levels are measured directly at each RMS. The water quality sustainability indicator will be evaluated by leveraging existing water quality monitoring programs with data available through the GAMA Groundwater Information System. The land subsidence Sustainability Indicator will be monitored based on available InSAR data, published by DWR.

8.4 Chronic Lowering Of Groundwater Levels Sustainability Indicator

This section of the GSP describes the SMC for the Chronic Lowering of Groundwater Levels Sustainability Indicator. The definition of Undesirable Results is presented, and MTs and MOs are presented for each RMS in the monitoring network.

8.4.1 Undesirable Results (§ 354.26)

The definition of undesired conditions for the Chronic Lowering of Groundwater Indicator for the purposes of this GSP is as follows:

> *The Subbasin will be considered to have undesirable results if one or more RMSs for water levels display exceedances of the minimum threshold groundwater elevation*

values for two consecutive fall measurements. MT exceedances will require investigation to determine if local or basin wide actions are required in response.

Details addressing specific MTs and MOs are presented in the following sections. A summary of MTs and MOs used in the definition of Undesirable Conditions for the Chronic Lowering of Groundwater Sustainability Indicator are presented along with other indicators in Table 8-1. Figures 8-1 through 8-4 present historical groundwater elevation hydrographs and the MTs selected for the four RMS wells defined in the Subbasin. Figure 8-5 presents all of these hydrographs on a map of the Subbasin to demonstrate the spatial distribution of RMSs in the Subbasin.

Table 8-1. Summary of MTs, MOs, and IMs for Arroyo Grande Subbasin RMSs

RMS	MT	MO	2021 WL	2027 IM	2032 IM	2037 IM	Sustainability Indicator
Arroyo Grande Creek Valley							
AGV-01	326	335	331	332	334	335	Water Levels/Storage/ISW
AGV-03	284	315	306	309	312	315	Water Levels/Storage
AGV-06	190	208	195	199	204	208	Water Levels/Storage/ISW
AGV-12	114	127	119	122	124	127	Water Levels/Storage/ISW

Note: All water level and interim milestone measurements refer to fall measurements.

8.4.1.1 Criteria for Establishing Undesirable Results §354.26(b)(2)

Significant and unreasonable Chronic Lowering of Groundwater Levels in the Subbasin are those that:

- Reduce the ability of existing domestic wells of average depth to produce adequate water for domestic purposes (drought resilience).
- Cause significant financial burden to those who rely on groundwater.
- Interfere with other SGMA Sustainability Indicators.

8.4.1.2 Potential Causes of Undesirable Results §354.26(b)(1)

Conditions that could theoretically lead to an undesirable result include the following:

- Development of additional municipal or agricultural pumping at significantly higher rates than are currently practiced.
- Expansion of de minimis pumping. Adding domestic de minimis pumpers in the areas of the Subbasin administered by the County may result in lower groundwater elevations, and an exceedance of the proxy minimum threshold.
- Extensive, unanticipated drought. Minimum thresholds are established based on reasonable anticipated future climatic conditions. Extensive, unanticipated droughts more severe than those on record may lead to excessively low groundwater recharge and unanticipated high pumping rates that could cause an exceedance of the proxy minimum threshold.

8.4.1.3 Effects of Undesirable Results on Beneficial Users and Land Uses - §354.26 (b)(3)

Beneficial users may experience undesirable results associated with the lowering of groundwater levels following multiple exceedances in succession of the MT at an RMS. Allowing one exceedance in an RMS is reasonable if subsequent monitoring indicates groundwater level have recovered above the respective MT. If an MT at an RMS is exceeded in succession during two or more monitoring events, it indicates that significant and unreasonable effects are likely being experienced by, at a minimum, some beneficial users in the Subbasin. Exceedances of MTs will require investigation to determine the significance and causes of the observed conditions.

8.4.2 Minimum Thresholds - §354.28(c)(1)

Section §354.28(c)(1) of the SGMA regulations states that “The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results”.

MTs were developed at each of the four selected RMSs (see Chapter 7 for RMS selection rationale) for the chronic lowering of groundwater levels sustainability indicator based on the evaluation of historical groundwater elevations over the available period of record (including consideration of average water levels over various time periods, long term trends, response to the recent drought, etc.), consideration of likely future use of groundwater, well construction data, assessment of remaining available saturated thickness, and public input from stakeholders. The following sections present details on the development of MTs for specific RMSs in the Subbasin.

8.4.2.1 Information and Methods Used for Establishing Chronic Lowering of Groundwater Level Minimum Thresholds - §354.28(b)(1)

The primary source of data that was evaluated for the Sustainability Indicator of chronic lowering of groundwater levels is historical groundwater elevation data collected by the County (SLOFCWCD semi-annual groundwater level program). The information used for establishing the MTs for the chronic lowering of groundwater levels Sustainability Indicator included:

- Historical groundwater elevation data from wells monitored by the County.
- Depths and locations of existing wells.
- Maps of current and historical groundwater elevation data.
- Input from stakeholders regarding significant and unreasonable conditions and desired current and future groundwater elevations communicated during public meetings on December 12, 2021 and July 25, 2022, and solicitation of public comment on various options of MTs presented in the public forum.

Observed hydrograph signatures for wells located in Arroyo Grande Creek valley and Tar Spring Creek tributary valley are similar as they are all alluvial wells dominated by seasonal fluctuations and changes in annual groundwater levels often on the order of tens of feet. Due to current, ongoing, drought conditions (beginning in at least WY 2012), measured water levels in three of the four RMSs were observed to be at historical lows during the Fall 2021 monitoring event. Although only groundwater levels in Arroyo Grande Creek valley wells are moderated by Lopez Reservoir releases and spills, none of the RMS wells in the Subbasin indicate a chronic lowering of groundwater levels (see Section 5.2), nor have Subbasin stakeholders reported experiencing any undesirable results related to lowering of groundwater levels. Therefore, the minimum threshold for the chronic lowering of groundwater levels sustainability indicator is equal to the historical low groundwater level measured at each RMS plus an additional 5 feet of decline.

Figure 7-1 displays the locations of RMSs in the Subbasin. MTs are presented in Table 8-1. Hydrographs with SMC for the four RMSs are presented on Figures 8-1 through 8-4.

Hydrographs for all four RMSs (AGV-1, AGV-3, AGV-6, and AGV-12) indicate water level declines over the past 5-10 years. This period of decline corresponds with the current drought. Water level decline in AGV-1, AGV-3, and AGV-12 over the last decade has been steady. Conversely, water levels in AGV-6 declined steeply between Spring 2017 and Fall 2018. The flux in water levels during this period is also apparent in the other three RMS hydrographs, however total water level decline over the period was greatest in AGV-6. Although three of the four RMS hydrographs indicate the Fall 2021 measurement as the historical low, taking the current drought conditions into consideration, current water levels in all RMSs are nearly within the historical observed range.

Various alternative approaches were considered to establish MTs including designation of current water levels, water levels higher than current water levels, historical low water levels, and levels lower than the historical low. Per SGMA, groundwater conditions, including groundwater levels, occurring prior to 2015 are not required to be restored. Additionally, per SGMA, current groundwater levels within the Subbasin occur at a sustainable operational range. The decision to establish 5 feet below the historical low groundwater level measured at each RMS as the MT for the chronic lowering of groundwater levels sustainability indicator was based on the following: none of the RMS wells in the Subbasin indicate a groundwater pumping induced chronic lowering of groundwater levels, Subbasin stakeholders have not reported experiencing any undesirable results related to lowering of groundwater levels, the Subbasin water budget (see Chapter 6) indicates the Subbasin is in approximate equilibrium, groundwater recharge in the Subbasin is moderated by managed releases from Lopez Reservoir, and recent historical low groundwater levels measured at RMS correspond with the current drought period.

In order to assess the risk on shallow, typically domestic, wells of having groundwater elevations lower than recent drought low levels, a review was completed of data available data through DWR's California Groundwater Live online tool[1]. The online tool displays "California's latest groundwater information and conditions" including current conditions, groundwater levels, well infrastructure, and land subsidence. Within "Well Infrastructure" is a "Dry Domestic Well Susceptibility within Groundwater Basins" tool as well as a "Reported Dry Wells" tool. The Dry Domestic Well Susceptibility within Groundwater Basins tool displays susceptibility per square mile based on analysis by combining the latest information on domestic well locations, depths, and local groundwater level conditions (DWR, 2022). Based on the Dry Domestic Well Susceptibility within Groundwater Basins tool, one square mile, located near the confluence of Arroyo Grande Creek Valley and Tar Spring Creek tributary indicates a dry domestic well susceptibility within the 0 to 10th percentile, or 1 of 2 domestic wells reported being susceptible. Within the most northern reach of the Tar Spring Creek tributary is a square mile categorized in the 30 to 40th percentile, with 4 of 17 domestic wells reported being susceptible. The rest of the Subbasin is categorized as "Domestic wells present, not susceptible". According to the Reported Dry Wells tool, one well, located near the intersection of Branch Mill Road and Via dos

[1] Available at https://sgma.water.ca.gov/CalGWLive/.

Ranchos was reported as dry in Fall 2015. No other wells have been reported dry in the Subbasin.

The objective of this data review is to assess the level of impact to domestic wells associated with water level reduction below historical low groundwater levels. This is not intended to be a definitive analysis, given that depth and location data of the domestic wells are typically incomplete. However, it is intended to provide a general indication of how many additional domestic wells might be impacted if water levels were decreased. The conclusion of this analysis is that lowering water levels 5 feet below the historical low measured at RMSs constitutes an acceptable level of risk for all stakeholders, and the proposed MT for the chronic lowering of groundwater levels does not constitute unreasonable or undesirable conditions.

8.4.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators - §354.28(b)(2)

Section 354.28 of the SGMA regulations requires that the description of all MTs include a discussion of the relationship between the MTs for each Sustainability Indicator. In the SMC Best Management Practices document (DWR, 2017), DWR has clarified this requirement. First, the GSP must describe the relationship between each Sustainability Indicator's MT by describing why or how a water level MT set at a particular RMS is similar to or different to water level thresholds in a nearby RMS. Second, the GSP must describe the relationship between the selected MT and MTs for other Sustainability Indicators; in other words, describe how (for example) a water level minimum threshold would not trigger an undesirable result for land subsidence.

Groundwater elevation MTs are derived from examination of the historical record reflected in hydrographs at the RMS. Because the MTs are largely based on observed historical groundwater conditions, the minimum thresholds derived from these objectives are not expected to conflict with each other. Groundwater elevation MTs can theoretically influence other Sustainability Indicators. Examples are listed below:

1. **Change of groundwater in storage.** Changes in groundwater elevations are directly correlated to changes in the amount of stored groundwater. Pumping at or less than the sustainable yield will maintain or raise average groundwater elevations in the Subbasin. The groundwater elevation MTs are set to establish a minimum elevation that will not lead to undesirable conditions, and that are acceptable to the stakeholders in the area. Therefore, if the groundwater elevation MTs are met, they will not result in long term significant or unreasonable changes in groundwater storage.
2. **Subsidence.** A significant and unreasonable condition for subsidence is permanent pumping-induced subsidence that substantially interferes with surface land use. One cause for subsidence is dewatering and compaction of clay-or peat-rich sediments in response to lowered groundwater levels. As discussed in Section 4.7, no significant

subsidence has been observed in the Subbasin over the period of record of the available DWR InSAR dataset, and historically based on anecdotal information. If groundwater elevations MTs are maintained at or above the historical low groundwater levels observed in the RMS, based on available subsidence data, no significant subsidence or an increase in rate of subsidence is anticipated to occur in the Subbasin.

3. **Degraded water quality.** Protecting groundwater quality is critically important to all groundwater users in the Subbasin, particularly for drinking water and agricultural uses. Maintaining groundwater levels protects against degradation of water quality or exceeding regulatory limits for constituents of concern in supply wells due to actions proposed in the GSP. Water quality in the Subbasin could theoretically be affected through two processes:
    a. Low groundwater elevations in an area could theoretically cause deeper, poorer-quality groundwater to flow upward from bedrock into existing supply wells. Should groundwater quality degrade due to lowered groundwater elevations, the groundwater elevation MTs may be raised to avoid this degradation. However, since MTs are set to avoid significant declines of groundwater elevations below historically observed levels, and the historical low water levels did not result in water quality degradation, this is not expected to occur.
    b. Changes in groundwater elevation due to actions implemented to achieve sustainability could change groundwater gradients, which could cause poor quality groundwater to flow towards supply wells that would not have otherwise been impacted. Based on available groundwater level data, the Subbasin is in approximate equilibrium, despite periods of drought, due to the managed releases from Lopez Reservoir. Therefore, no project or management actions, aside from monitoring, is proposed for the Subbasin. Additionally, MTs are established so as not to change the basin patterns or gradients of groundwater flow, so this is not expected to occur in the Subbasin.
4. **Depletion of Interconnected Surface Water.** Groundwater levels measured at RMSs (AGV-01, AGV-06, and AGV-12) will serve as a proxy for depletion of interconnected surface water. In addition, stream flow gages along Arroyo Grande Creek will continue to measure surface water conditions in Arroyo Grande Creek Valley. Reported releases from Lopez Reservoir and measured stream flow data from the three existing stream gage sites along Arroyo Grande Creek are adequate to allow for generation of information on surface water inflow and outflow in the Subbasin, allowing for direct measurement of surface water gains and losses to the groundwater systems based on future hydrologic and pumping conditions in the Subbasin. Groundwater level MTs are defined at levels designed to avoid significant water declines, including surface water, with the goal of minimizing any potential significant depletion of interconnected surface water flows. It is important to note that the Lopez Reservoir Dam is currently undergoing a relicensing process which includes the development of a Habitat Conservation Plan.

The Habitat Conservation Plan is subject to review and approval which contains elements including managed Lopez Reservoir releases. Any potential modification to planned releases could have an impact on groundwater levels, and consequently interconnected surface water, in the Subbasin.

5. **Seawater intrusion.** This Sustainability Indicator is not applicable to this Groundwater Basin.

8.4.2.3 Effect of Minimum Thresholds on Neighboring Basins - §354.28(b)(3)

Two neighboring groundwater basins share a boundary with the Subbasin; the San Luis Obispo Valley Basin to the northwest near Orcutt Road, and the Santa Maria River Valley – Santa Maria Subbasin to the southwest with U.S. Highway 101 coincident with the boundary. The shared boundary with both of these basins is not extensive. In the Subbasin there have been no trends indicating pumping induced chronic groundwater declines that would affect either neighboring basin. The Hydrogeologic Conceptual Model (HCM) posits that a groundwater divide separates the groundwater between the San Luis Obispo Basin and the Arroyo Grande Subbasin. Also, the elevation of groundwater in the Subbasin is up to 50 feet higher than groundwater elevations in the downgradient Santa Maria Basin, so any hydrogeologic changes in the Subbasin are not expected to significantly impact conditions in the Santa Maria Basin.

Additionally, the Subbasin's GSAs have developed a cooperative working relationship with both the San Luis Obispo Valley Basin GSA and the Northern Cities Management Area. Hydrogeologic conditions near the basin boundaries will be monitored, and any issues potentially affecting those basins will be communicated.

8.4.2.4 Effects of Minimum Thresholds on Beneficial Users and Land Uses - §354.28(b)(4)

Agricultural land uses and users

The agricultural stakeholders in the Subbasin have maintained an active role during the development of this GSP. The groundwater elevation MTs place a practical limit on the acceptable lowering of groundwater levels in the Subbasin, thus conceptually restricting the current level of agriculture in the region without projects to supplement water supply to the Subbasin, or management actions to reduce current pumping. In the absence of other mitigating measures, this has been the practical effect of potentially limiting the amount of groundwater pumping in the Subbasin. Limiting the amount of groundwater pumping could limit the additional amount and type of crops that can be grown in the Subbasin, which could result in a reduction of economic viability for some properties. The groundwater elevation MTs could therefore limit the Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- There could be an economic impact to agricultural employees and suppliers of agricultural production products and materials, as well as the tourism industry supported by the wineries and vineyards in the Subbasin. Many parts of the local economy rely on a vibrant agricultural industry, and they too will be hurt proportional to the losses imparted to agricultural businesses.
- Growth of city, county, and state tax rolls could be slowed or reduced due to the limitations imposed on agricultural growth and associated activities.

Urban land uses and users

The groundwater elevation MTs effectively limit the amount of groundwater pumping in the Subbasin. However, the MTs in the Subbasin are established below currently observed groundwater elevations (historical lows at select RMSs) to allow for reasonable future operational range of water levels while avoiding significant and undesirable results associated with lowering of groundwater levels. If groundwater elevations decline in the immediate vicinity of Arroyo Grande Creek, this could potentially result in less groundwater discharge to the creek due to areas of interconnected surface water. Impacts to stream flows will be monitored with the current data collection programs in the Subbasin.

Domestic land uses and users

The groundwater elevation MTs are established to protect as many domestic wells as possible. Therefore, the MTs will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells within the Subbasin. Additionally, the groundwater elevation MTs may limit the increase of non-de minimis groundwater use in order to limit future declines in groundwater levels caused by non-de minimis pumping.

Ecological land uses and users

Groundwater elevation MTs protect the groundwater resource and the existing ecological habitats that rely upon it because they are set to avoid long term declines in groundwater levels. As noted above, groundwater level MTs may limit increases in non-de minimis and agricultural groundwater uses. Ecological land uses and users may benefit by this potential reduction in future non-de minimis and agricultural groundwater uses.

8.4.2.5 Relevant Federal, State, or Local Standards - §354.28(b)(5)

No Federal, State, or local standards exist for chronic lowering of groundwater elevations.

8.4.2.6 Method for Quantitative Measurement of Minimum Thresholds - §354.28(b)(6)

Conformance of Subbasin conditions to the established groundwater elevation MTs will be assessed through direct measurement of water levels from existing RMS. Groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Chapter 7 and will comply with the requirements of the technical and reporting standards included in SGMA

regulations. As noted in Chapter 7, the existing groundwater monitoring network in the Subbasin includes 13 wells.

8.4.3 Measurable Objectives - §354.30(a)-(g)

The MOs for chronic lowering of groundwater levels represent target groundwater elevations that are established to achieve the sustainability goal by 2042. MOs are groundwater levels established at each RMS. MO groundwater levels are higher than MT groundwater levels and provide operational flexibility above MTs to ensure that the Subbasin be sustainably managed over a range of climate and hydrologic variability. MOs are subject to change by the GSAs after GSP adoption as new information and hydrologic data become available.

8.4.3.1 Information and Methods Used for Establishing Chronic Lowering of Groundwater Level Measurable Objectives §354.30(b)

Preliminary MOs were established based on historical groundwater level data, along with input and desired future groundwater levels from domestic groundwater users, agricultural interests, environmental interests, and other Subbasin stakeholders. The input and desired conditions were used to formulate a range of alternative MO options, which were discussed by the GSA. Final MOs were discussed with and approved by the GSA.

Preliminary MOs were established based on evaluation of historical groundwater level data and input regarding desired future groundwater levels from domestic groundwater users, agricultural interests, environmental interests, and other public stakeholders. The input and desired conditions were used to formulate a range of conceptual MO scenarios. These scenarios were evaluated during this GSP preparation to project the effects of future Basin operation and to select measurable objectives for the GSP.

The MOs for the chronic lowering of groundwater levels sustainability indicator is equal to the average Spring water level at each RMS during the period of 2015 through 2021. The MO takes the following into consideration: none of the RMS wells in the Subbasin indicate a groundwater pumping induced chronic lowering of groundwater levels, Subbasin stakeholders have not reported experiencing any undesirable results related to lowering of groundwater levels, the Subbasin water budget (see Chapter 6) indicates the Subbasin is in approximate equilibrium, groundwater recharge in the Subbasin is moderated by managed releases from Lopez Reservoir, and recent historical low groundwater levels measured at RMS correspond with the current drought period. In addition to the previously listed factors, the period of Spring 2015 through Spring 2021 was selected to represent recent groundwater level conditions, and not to attempt to restore groundwater conditions, including water levels, to those occurring prior to 2015 (SGMA implementation).

MTs and MOs will be reviewed throughout the twenty-year SGMA planning horizon to assess if the RMSs and the assigned MOs and MTs remain protective of sustainable conditions in the Subbasin. MTs and MOs may be modified in the future as hydrogeologic conditions are monitored through the implementation phase of SGMA.

8.4.3.2 Interim Milestones §354.30(a)(e)

Interim milestones (IMs) are required to be included in the GSP. IMs at 5-year intervals for the MOs established at each RMS are included on Table 8-1.

Preliminary IMs were developed for the 4 RMS wells established for the Subbasin. Although there has been no chronic lowering of groundwater levels in the Subbasin, IMs were generally selected to define a smooth linear increase in water levels between the observed groundwater elevation at the RMS in 2021, and the MO as presented in Table 8-1.

IMs may be adjusted at any time during the SGMA timeline. Failure to meet IMs is not in and of itself an indication of undesired conditions but is meant to provide information determining whether the 20-year goals are on track to being achieved. Alternative projects and management actions may be considered or pursued if the IMs are not being met. Table 8-1 summarizes the interim milestones for the RMS.

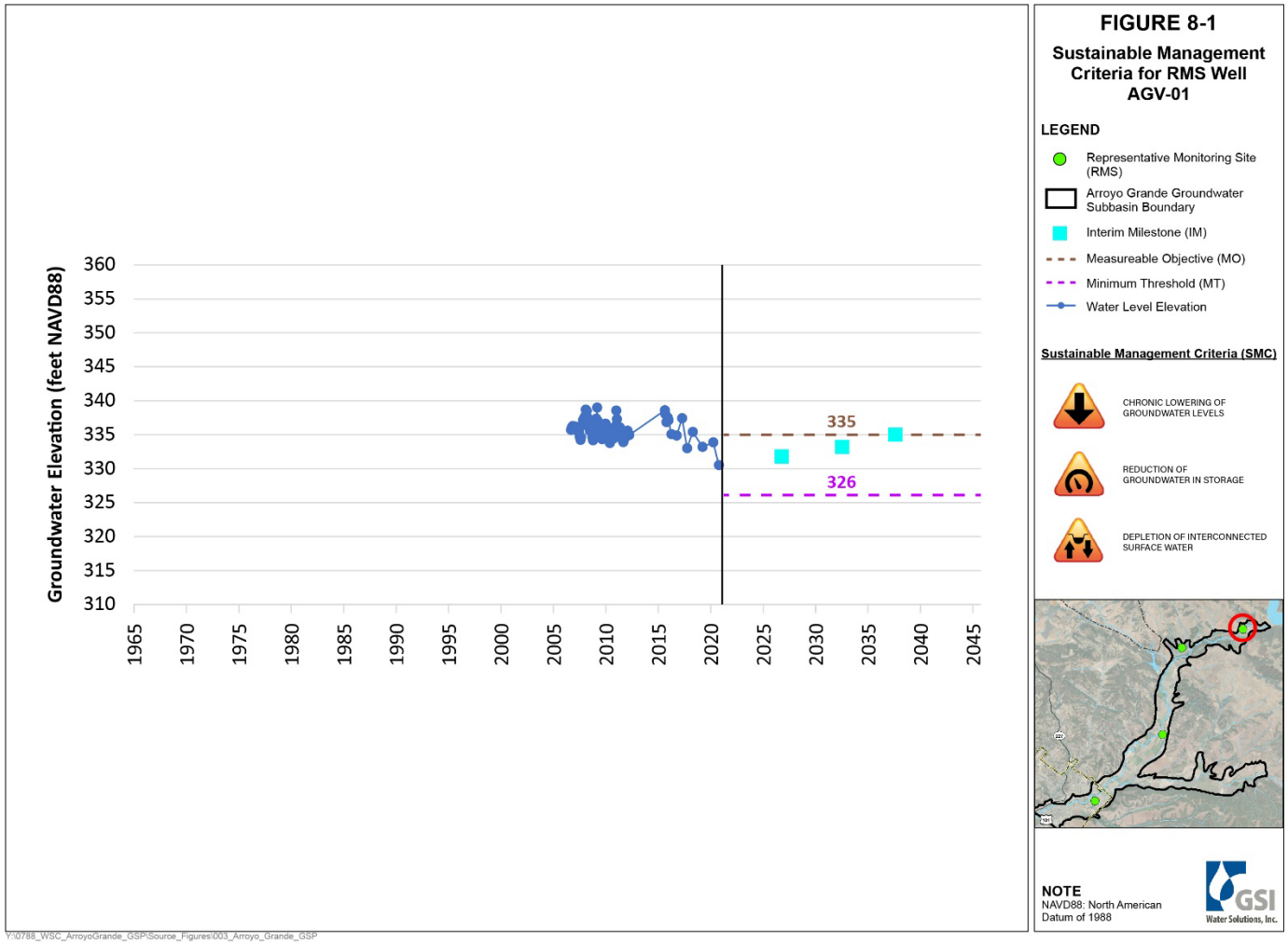

Figure 8-1 Sustainable Management Criteria for RMS Well AGV-01

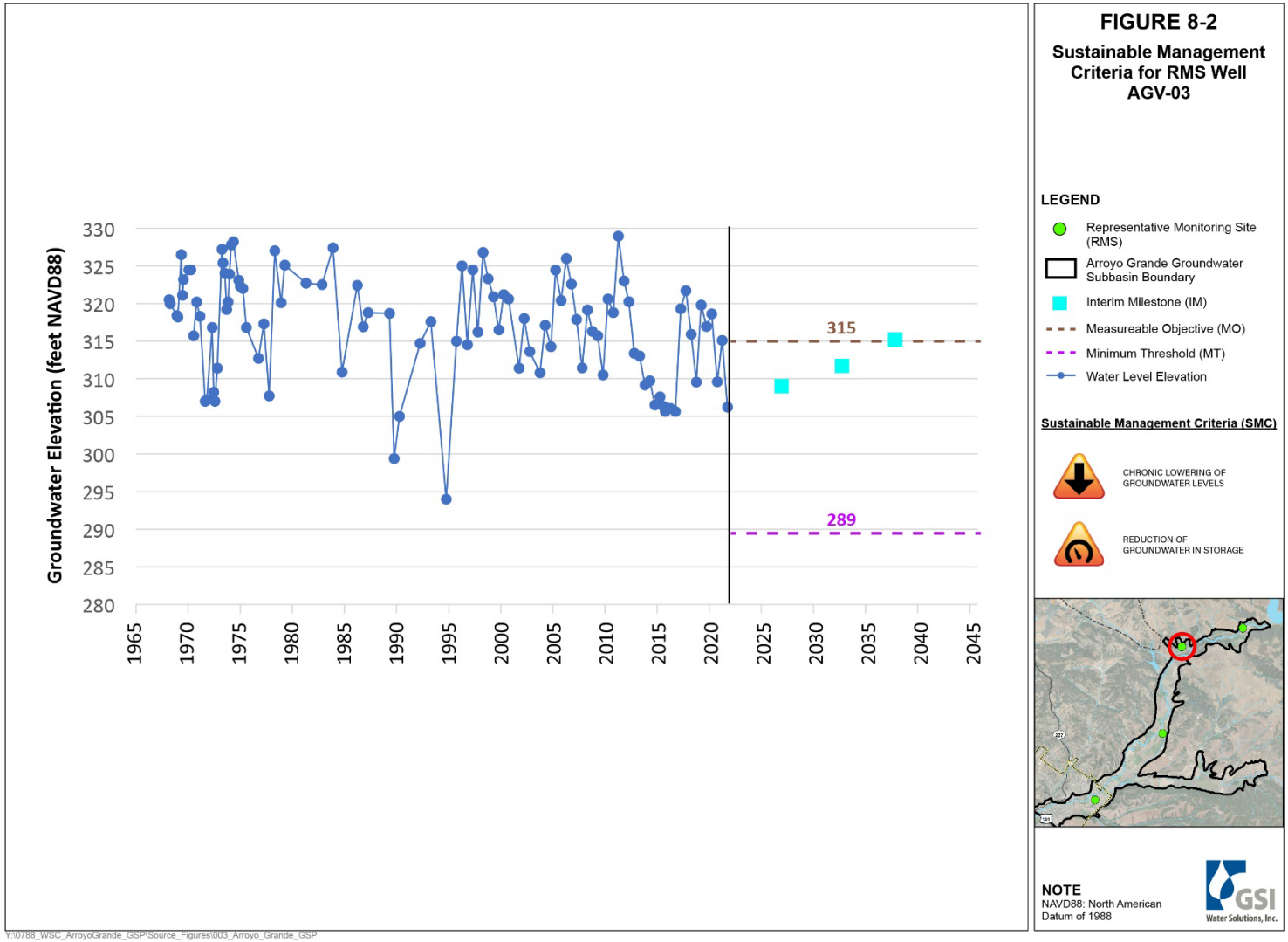

Figure 8-2 Sustainable Management Criteria for RMS Well AGV-03

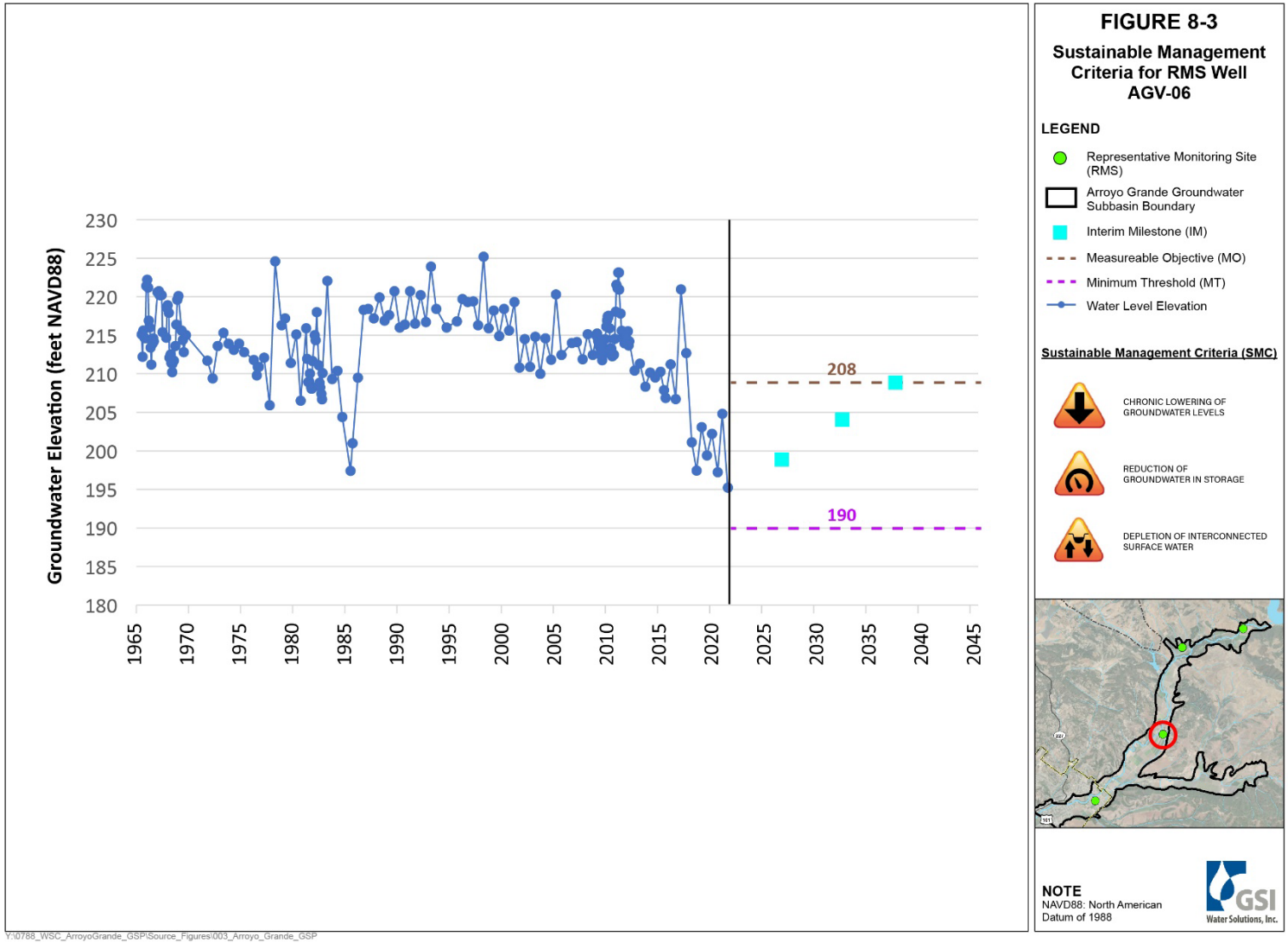

Figure 8-3 Sustainable Management Criteria for RMS Well AGV-06

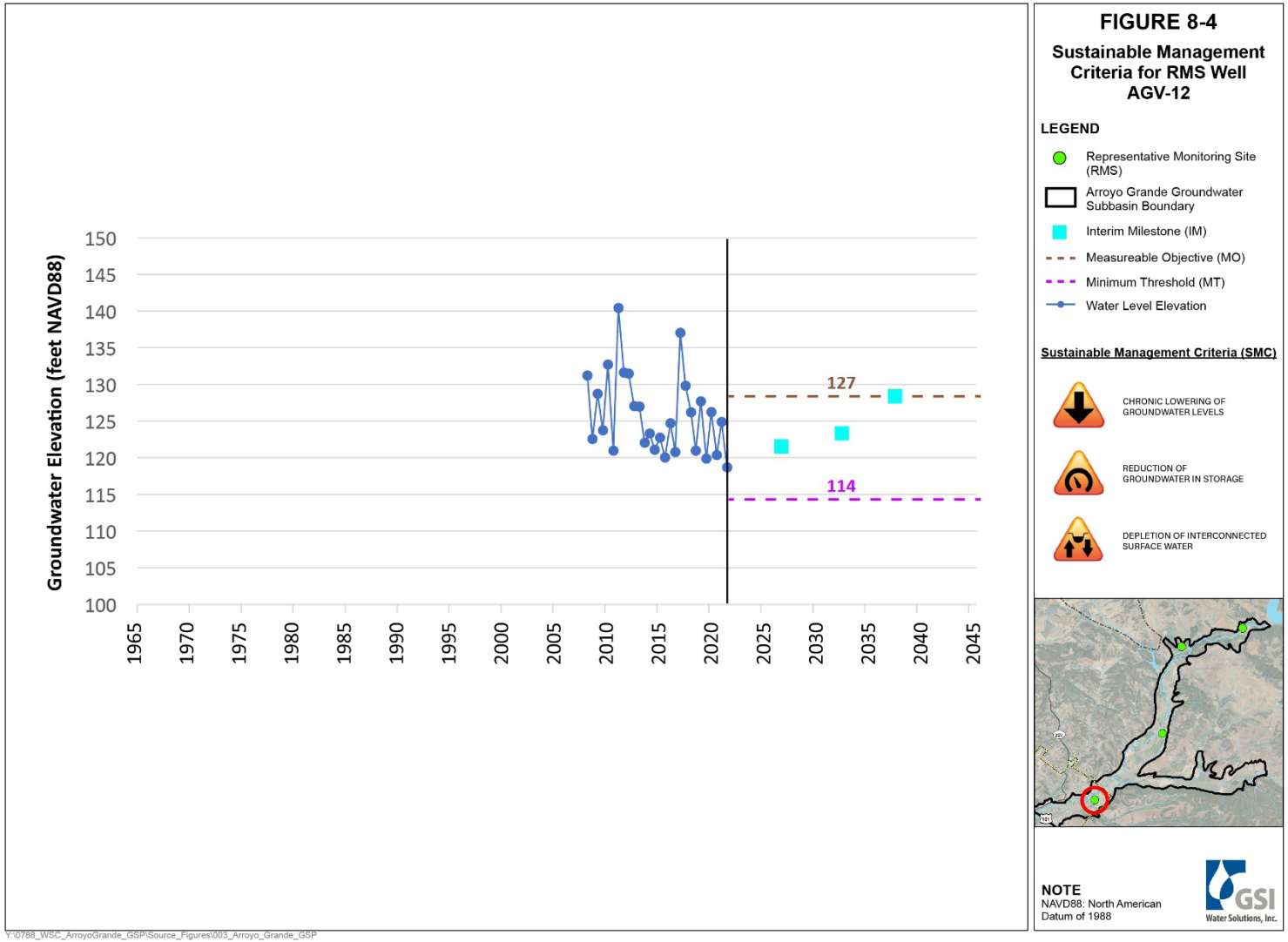

Figure 8-4 Sustainable Management Criteria for RMS Well AGV-12

8.5 Reduction of Groundwater in Storage Sustainability Indicator §354.28(c)(2)

8.5.1 Undesirable Results

As per §354.26 of the SGMA regulations, locally defined significant and unreasonable conditions were assessed based on review of historical groundwater data and stakeholder input during public meetings, analysis of available data, and discussions with GSA staff. It is recognized based on well-established hydrogeologic principles that the Reduction of Groundwater Storage Sustainability Indicator is directly correlated to the lowering of water level Sustainability Indicator. Significant and unreasonable changes in groundwater storage in the Subbasin are those that:

- Lead to long-term reduction in groundwater storage.
- Interfere with other Sustainability Indicators.

Assessment of groundwater in storage will initially be evaluated with the same RMS wells and associated water level MTs and MOs as the chronic lowering of groundwater levels sustainability criteria. As additional data is collected in the monitoring network described in Chapter 7, new RMS wells may be established, and revised SMCs may be determined by the GSAs, if they judge it to be appropriate.

For the purposes of this GSP, the definition of undesired conditions for the Reduction of Groundwater Storage Sustainability Indicator is as follows:

> *The Subbasin will be considered to have undesirable results if one or more RMSs for water levels display exceedances of the minimum threshold groundwater elevation values for two consecutive fall measurements. MT exceedances will require investigation to determine if local or basin wide actions are required in response.*

8.5.1.1 Criteria for Establishing Undesirable Results §354.2(b)(2)

Significant and unreasonable Reduction of Groundwater Storage in the Subbasin are those that:

- Reduce the ability of existing domestic wells of average depth to produce adequate water for domestic purposes (drought resilience).
- Cause significant financial burden to those who rely on the groundwater subbasin.
- Interfere with other SGMA Sustainability Indicators.

8.5.1.2 Potential Causes of Undesirable Results §354.2(b)(1)

Conditions that could theoretically lead to an undesirable result include the following:

- Development of additional municipal or agricultural pumping at significantly higher rates than are currently practiced.
- Expansion of de minimis pumping. Adding domestic de minimis pumpers in the areas of the Subbasin administered by the County may result in lower groundwater elevations, and an exceedance of the proxy minimum threshold.
- Extensive, unanticipated drought. Minimum thresholds are established based on reasonable anticipated future climatic conditions. Extensive, unanticipated droughts more severe than those on record may lead to excessively low groundwater recharge and unanticipated high pumping rates that could cause an exceedance of the proxy minimum threshold.

8.5.1.3 Effects of Undesirable Results on Beneficial Users and Land Uses §354.2(b)(3)

The effects of these undesirable results on the beneficial users and uses are the same effects as those discussed for the Chronic Lowering of Groundwater Levels Sustainability Indicator. The primary effects on the beneficial users (§354.26 (b)(3)) occurs from allowing consecutive exceedances of the MT at any RMS. Allowing one exceedance in an RMS is reasonable if subsequent monitoring indicates groundwater level have recovered above the respective MT. If an MT at an RMS is exceeded in succession during two or more monitoring events, it indicates that significant and unreasonable effects are likely being experienced by, at a minimum, some beneficial users in the Subbasin. Exceedances of MTs will require investigation to determine the significance and causes of the observed conditions.

8.5.2 Minimum Thresholds §354.28(c)(2)

Section §354.28(c)(2) of the SGMA regulations states that “The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.”

As allowed in §354.36(b)(1) of the SGMA regulations, groundwater elevation data at the RMS will be reported annually as a proxy to track changes in the amount of groundwater in storage. Based on well-established hydrogeologic principles, stable groundwater elevations maintained above the MTs will limit depletion of groundwater from storage. Therefore, using groundwater elevations as a proxy, the MT is that the groundwater surface elevation averaged across all the wells in the groundwater level monitoring network will remain stable above the MT for chronic lowering of groundwater levels. A summary of MTs and MOs used in the definition of Undesirable Conditions for the Reduction of Groundwater in Storage Sustainability Indicator are presented along with other indicators in Table 8-1. Figures 8-1 through 8-4 present historical groundwater elevation hydrographs and the MTs selected for the four RMS wells defined in the

Subbasin. Figure 8-5 presents all of these hydrographs on a map of the Subbasin to demonstrate the spatial distribution of RMSs in the Subbasin.

8.5.2.1 Information and Methods Used for Establishing Reduction of Storage Minimum Thresholds §354.28(b)(1)

As with the chronic reduction of groundwater levels Sustainability Indicator, the primary source of data that was evaluated for the Sustainability Indicator of reduction of groundwater storage is historical groundwater elevation data maintained by the County. The information used for establishing the MOs and MTs for the chronic lowering of groundwater levels Sustainability Indicator included:

- Historical groundwater elevation data from wells monitored by the County of San Luis Obispo.
- Depths and locations of existing wells.
- Maps of current and historical groundwater elevation data.
- Input from stakeholders regarding significant and unreasonable conditions and desired current and future groundwater elevations communicated during public meetings and solicitation of public comment on various options of MTs and MOs presented in the public forum.

Storage MTs will be measured by collecting water level measurements at the RMS sites in the monitoring network. The monitoring network and protocols used to measure groundwater elevations at the RMS are presented in Chapter 7. The Water Level Monitoring Network is presented in Figure 7-1. This data will be used to monitor groundwater elevations and assess changes in groundwater storage.

8.5.2.2 Relationship between Individual Minimum Thresholds and Other Sustainability Indicators §354.28(b)(2)

The reduction in groundwater storage MT could influence other Sustainability Indicators. The reduction in groundwater storage MT was selected to avoid undesirable results for other Sustainability Indicators, as outlined below:

- **Chronic lowering of groundwater levels.** Because groundwater elevations will be used as a proxy for estimating changes in groundwater storage, the potential reduction in groundwater storage would not cause undesirable results for this Sustainability Indicator.
- **Seawater intrusion.** This Sustainability Indicator is not applicable to this Subbasin.
- **Degraded water quality.** The chronic lowering of groundwater levels minimum threshold being used as a proxy for the reduction of groundwater in storage sustainability indicator is not expected to lead to a degradation of groundwater quality because groundwater levels would remain approximately within historical range.
- **Subsidence.** No significant land subsidence has historically occurred in the Subbasin. Therefore, the proposed minimum thresholds for this sustainability indicator will not

induce any significant subsidence, because water levels would remain approximately within the historical range.

- **Depletion of interconnected surface waters.** Groundwater levels measured at RMSs (AGV-02, AGV-07, and AGV-13) will serve as a proxy for depletion of interconnected surface water. In addition, stream flow gages along Arroyo Grande Creek will continue to measure surface water conditions in Arroyo Grande Creek Valley. Reported releases from Lopez Reservoir and measured stream flow data from the three existing stream gage sites along Arroyo Grande Creek are adequate to allow for generation of information on surface water inflow and outflow in the Subbasin, allowing for direct measurement of surface water gains and losses to the groundwater systems based on future hydrologic and pumping conditions in the Subbasin. Groundwater level MTs are defined at levels designed to avoid significant water declines, including surface water, with the goal of minimizing any potential significant depletion of interconnected surface water flows. It is important to note that the Lopez Reservoir Dam is currently undergoing a relicensing process which includes the development of a Habitat Conservation Plan. The Habitat Conservation Plan is subject to review and approval which contains elements including managed Lopez Reservoir releases. Any potential modification to planned releases could have an impact on groundwater levels, and consequently interconnected surface water, in the Subbasin.

8.5.2.3 Effects of Minimum Thresholds on Neighboring Basins §354.28(b)(3)

Two neighboring groundwater basins share a boundary with the Subbasin; the San Luis Obispo Valley Basin to the northwest near Orcutt Road, and the Santa Maria River Valley – Santa Maria Subbasin to the southwest with U.S. Highway 101 coincident with the boundary. The shared boundary with both of these basins is not extensive, and the HCM posits that a groundwater divide separates the groundwater between those basins and the Subbasin. In the Subbasin there have been no trends indicating pumping induced chronic groundwater declines that would affect either neighboring basin. It is not anticipated that actions, if any, associated with the GSP will have any significant impact on either the San Luis Obispo Valley Basin or the Santa Maria River Valley – Santa Maria Subbasin.

Additionally, the Subbasin's GSAs have developed a cooperative working relationship with both the San Luis Obispo Valley Basin GSA and the Northern Cities management Area of the Santa Maria River Valley Groundwater Basin. Hydrogeologic conditions near the basin boundaries will be monitored, and any issues potentially affecting those basins will be communicated.

8.5.2.4 Effects of Minimum Thresholds on Beneficial Uses and Users §354.28(b)(4)

The MT for reduction in groundwater storage will maintain approximately historical groundwater elevations but may require a reduction in the amount of groundwater pumping in the Subbasin, or development of sources of supplemental water if additional pumping is proposed in the Subbasin. Reducing pumping may impact the beneficial uses and users of groundwater in the Subbasin.

The practical effect of this GSP for protecting against the reduction in groundwater storage undesirable result is that it encourages minimal long-term net change in groundwater elevations and storage. Seasonal and drought cycle variations are expected, but during average conditions and over the long-term, beneficial users will have access to adequate volumes of water from the aquifer to service the needs of all water use sectors. The beneficial users of groundwater are protected from undesirable results.

Agricultural Land Uses and Users

The MT for reduction in groundwater storage may limit expansion of non-de minimis production in the Subbasin by reducing the amount of available water. The practical effect of these MTs on agricultural users is that expansion of current agricultural pumping may not be sustainable without development of additional sources of water to the Subbasin. Owners of undeveloped agricultural lands that are currently not irrigated may be particularly impacted because the additional groundwater pumping needed to irrigate these lands could increase the Subbasin pumping beyond the sustainable yield, exceeding the MT. Existing agricultural operations may also be limited in their use of more water-intensive crops, expansion of existing irrigated lands, and by periods of extended drought that decrease the quantity of water naturally returning to the Subbasin.

Urban Land Uses and Users

The MTs effectively limit the amount of groundwater pumping in the Subbasin. However, the MTs in the Subbasin are established below currently observed groundwater elevations (historical lows at select RMSs) to allow for reasonable future operational range of water levels while avoiding significant and undesirable results associated with lowering of groundwater levels. If groundwater elevations decline in the immediate vicinity of Arroyo Grande Creek, this could potentially result in less groundwater discharge to the creek due to areas of interconnected surface water. Impacts to stream flows will be monitored with the current data collection programs in the Subbasin.

Domestic Land Uses and Users

The groundwater elevation MTs are established to protect as many domestic wells as possible. Therefore, the MTs will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells within the Subbasin. Additionally, the groundwater elevation MTs may limit the increase of non-de minimis groundwater use in order to limit future declines in groundwater levels caused by non-de minimis pumping.

Ecological Land Uses and Users

Groundwater dependent ecosystems would generally benefit from this MT. Maintaining groundwater levels close to current levels keeps groundwater supplies near present levels, which will continue to support groundwater dependent ecosystems.

8.5.2.5 Relation to State, Federal, or Local Standards §354.28(b)(5)

No federal, state, or local standards exist for reductions in groundwater storage.

8.5.2.6 Methods for Quantitative Measurement of Minimum Threshold §354.28(b)(6)

The quantitative metric for assessing compliance with the reduction in groundwater in storage MT is monitoring groundwater elevations. The approach for quantitatively evaluating compliance with the MT for reduction in groundwater in storage will be based on evaluating groundwater elevations at the RMS wells.

8.5.3 Measurable Objectives §354.30(a)-(g)

The change of groundwater in storage Sustainability Indicator uses groundwater levels as a proxy for direct calculation of groundwater in storage. The same MTs and MOs are used as are defined in the chronic lowering of groundwater level indicator to protect against significant and unreasonable reduction of groundwater in storage.

8.5.3.1 Information and Methods Used for Establishing Reduction of Groundwater Storage Measurable Objectives §354.30(b)

The reduction of groundwater in storage Sustainability Indicator uses the chronic lowering of groundwater levels Sustainability Indicator as a proxy; therefore, the same MOs and information and methods to establish MOs described in Section 8.4.3 apply. MOs for each RMS included on Table 8-1.

8.5.3.2 Interim Milestones §354.30(a)(e)

Interim milestones for groundwater storage are the same as those established for chronic lowering of groundwater elevations. Achieving the groundwater elevation interim milestones will also eliminate long term reductions of groundwater in storage. Interim milestones for each RMS are included on Table 8-1.

8.6 Seawater Intrusion Sustainability Indicator §354.28(c)(3)

This Sustainability Indicator does not apply to the Basin since the Basin is not a coastal basin.

8.7 Degradation of Groundwater Quality Sustainability Indicator §354.28(c)(4)

The purpose of the Degraded Water Quality Indicator in SGMA is to prevent any degradation in groundwater quality as a result of groundwater management under the GSP. SGMA is not intended to serve as impetus to improve water quality within the Subbasin. The Subbasin's current water quality is not considered degraded. For these reasons, the SMC in this section is set to maintain current conditions in the Subbasin, protecting groundwater quality from potential degradation as a result of groundwater management under this GSP.

8.7.1 Undesirable Results §354.26(a)-(d)

Section §354.28(c)(2) of the SGMA regulations states that "The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin."

By SGMA regulations, the Degraded Groundwater Quality undesirable result is a quantitative combination of groundwater quality minimum threshold exceedances. As discussed in Chapter 5, the primary constituents of concern in the Subbasin are TDS and Nitrates. Additionally, water quality samples are collected at irregular intervals at these wells under existing regulatory programs but are not collected annually. The undesirable results for the Degraded Water Quality Sustainability Indicator as defined for the purposes of this GSP are as follows:

> *The Basin will be considered to have Undesirable Results if, during the first five-year implementation period, groundwater quality minimum threshold exceedances are observed at more than two of the representative monitoring sites in the Basin, in relation to 2015 Basin conditions, as a result of groundwater management implemented as part of the GSP.*

There are seven wells in the Water Quality Monitoring Network (Figure 7-2). Since the undesirable result is based on a total number of these wells exceeding the MTs, all seven wells displayed in Figure 7-2 are effectively RMS wells (I.e., there is no subset of the Water Quality network defined as RMSs; all seven wells serve as RMSs.) The undesirable conditions for degraded water quality in the Basin are based on the goal of no more than two of the 7 of the RMSs for water quality exceedances that can occur as a result of GSP groundwater management activities over each 5-year management period. Based on the current number of wells (seven) in the existing water quality monitoring network described in Chapter 7, a maximum of two wells that can exceed the minimum thresholds.

Specifics regarding the definition of the MTs used in defining the Undesirable Results are detailed in the following sections. A summary of the MTs defined for the Degradation of Water Quality Sustainability Indicator are presented in Table 8.2.

Table 8-2 Water Quality Minimum Thresholds

ID	TDS MT (ppm)	NO3 MT (ppm)
WQ-1	800	10
WQ-2	800	10
WQ-3	800	10
WQ-4	800	10
WQ-5	800	10
WQ-6	900	10
WQ-7	900	10

8.7.1.1 Criteria for Establishing Undesirable Results §354.26(b)(2)

Criteria used to establish the Undesirable Results for Degraded Water Quality Sustainability Indicator are observed water quality data and trends that:

- Reduce capacity of public water supply systems or unreasonably increase costs for public or private water supply.
- Reduce crop production.
- Result in constituent concentrations above regulatory primary drinking water standards at supply wells.
- Results in constituent concentrations significantly above the established baseline or mean for secondary standards (TDS)

8.7.1.2 Potential Causes of Undesirable Results §354.26(b)(1)

Conditions that may lead to an undesirable result include the following:

- Changes to Basin Pumping: If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could cause movement of one of the constituents of concern towards a supply well at concentrations that exceed relevant water quality standards or induce the movement of poorer quality water from underlying bedrock formations into the alluvial aquifer.

- Recharge of Poor-Quality Water: Recharging the Basin with water that exceeds a primary or secondary MCL or concentration that reduces crop production could lead to an undesirable result. However, permitting requirements generally preclude this circumstance.

8.7.1.3 Effects of Undesirable Results on Beneficial Users and Land Uses §354.26(b)(3)

As defined in this GSP, undesirable results are established to prevent degradation of water quality within the Basin prior to the implementation of any actions inherent in the management of groundwater in the Basin. This limits the potential impacts of undesirable water quality on beneficial users in the Basin. However, potential effects of undesirable results include:

- Increased water treatment costs for public or private supply wells
- Reduced agricultural production

8.7.2 Minimum Thresholds § 354.28(c)(4)

8.7.2.1 Information and Methods Used for Establishing Degradation of Water Quality Minimum Thresholds § 354.28 (b)(1)

Locally defined significant and unreasonable conditions were assessed based on federal and state mandated drinking water and groundwater quality regulations, the Sustainable Management Criteria survey, public meetings, and discussions with GSA staff. Significant and unreasonable changes in groundwater quality in the Basin are increases in a chemical constituent that either:

- Result in groundwater concentrations in a public supply well above an established primary MCL, or
- Lead to reduced crop production.

The information used for establishing the degraded groundwater quality minimum thresholds included:

- Historical groundwater quality data from production wells in the Basin
- Federal and state primary drinking water quality standards
- RWQCB Basin objectives for groundwater quality (2019) for TDS
- Feedback about significant and unreasonable conditions from GSA staff members or public stakeholders.

Based on the review of groundwater quality in Chapter 5, water quality in the basin is generally adequate for agricultural purposes and domestic use. The primary constituents of concern that exist for both agricultural wells and public supply wells are:

- Total Dissolved Solids (TDS)
- Nitrate

The historical groundwater quality data used to evaluate groundwater quality minimum thresholds are presented in Chapter 5 (Figures 5-16 and 5-17).

As stated in Section 8.7.1, the SGMA regulations allow three options to develop an approach for setting degraded water quality minimum thresholds (number of wells, volume of water, or location of concentration isocontour).

In the Subbasin, degraded water quality minimum thresholds for nitrates are based on EPA-published water quality standards (EPA, 2018); the primary MCL for nitrate in drinking water is 10 mg/L.

The published Basin Objective for TDS in the Arroyo Grande Creek Valley is 800 mg/L (RWQCB, 2017). However, it should be noted that the area for which this Basin Objective is applicable is not entirely coincident with the Subbasin; it includes the area downstream of the Subbasin as well. In addition, it is established that groundwater in portions of the Subbasin has TDS concentrations that currently exceed this objective (Figure 5-16). It is not the objective of SGMA to promulgate unreasonable goals for water quality improvement. Therefore, if historical data for the Water Quality RMS wells indicates a time series of values that exceed the Basin Objective, the MTs for TDS are defined as the maximum observed TDS concentration in the period of record for that well.

As noted in Section 354.28 (c)(4) of the SGMA regulations, minimum thresholds are based on a degradation of groundwater quality, not an improvement of groundwater quality. Therefore, this GSP was developed to avoid taking actions that may inadvertently move groundwater constituents that have already been identified in the Basin in such a way that they have a significant and unreasonable impact that would not otherwise occur.

The MTs for the constituents of concern are presented in Table 8-2.

8.7.2.2 Relation of Minimum Thresholds to Other Sustainability Indicators § 354.28(b)(2)

The groundwater quality minimum thresholds were set for each of four constituents previously discussed. These minimum thresholds were derived from existing data measured at individual wells and applicable regulatory criteria. There are no conflicts between the existing groundwater quality data. Because the underlying groundwater quality distribution is reasonable and realistic, there is no conflict that prevents the Basin from simultaneously achieving all minimum thresholds.

No actions regarding the MTs for Water Quality will directly influence other Sustainability Indicators. However, preventing migration of poor groundwater quality (for example, actions required to prevent additional migration of contaminant plumes) could theoretically limit activities needed to achieve minimum thresholds for other Sustainability Indicators, as discussed below:

- **Change in groundwater levels.** Groundwater quality minimum thresholds could influence groundwater level minimum thresholds by limiting the types of water that can

be used for recharge to raise groundwater levels or locations where it could be recharged. Water used for recharge cannot exceed any of the groundwater quality minimum thresholds.

- **Change in groundwater storage.** Nothing in the groundwater quality minimum thresholds promotes pumping in excess of the sustainable yield. The groundwater quality minimum thresholds will not result in an exceedance of the groundwater storage minimum threshold.
- **Seawater intrusion.** This Sustainability Indicator is not applicable to this basin.
- **Subsidence.** Nothing in the groundwater quality minimum thresholds promotes a condition that will lead to additional subsidence and therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable level of subsidence.
- **Depletion of interconnected surface waters.** Nothing in the groundwater quality minimum thresholds promotes additional pumping or lower groundwater elevations in areas where interconnected surface waters may exist. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of interconnected surface waters.

8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins § 354.28(b)(3)

Because the HCM posits a groundwater divide between the Arroyo Grande Subbasin and the adjacent San Luis Obispo Basin, there is no anticipated effect of the degraded groundwater quality minimum thresholds on the neighboring Basins. The Northern Cities Management Area of the Santa Maria Groundwater Basin is routinely monitored for water quality, and the MTs established herein for the Arroyo Grande Subbasin are not expected impact water quality in the NCMA.

8.7.2.4 Effects of Minimum Thresholds on Beneficial Users and Land Uses § 354.28(b)(4)

The practical effect of the MTs for the Degraded Groundwater Quality Sustainability Indicator is that it deters any significant long-term changes to groundwater quality in the Basin. Therefore, Basin management that prevents the undesirable results from occurring will not constrain the use of groundwater, nor have a negative effect on the beneficial users and uses of groundwater.

Agricultural land uses and users. The degraded groundwater quality minimum thresholds generally benefit the agricultural water users in the Basin by maintaining groundwater quality suitable for use in agriculture. For example, limiting the number of additional agricultural supply wells that may exceed constituent of concern concentrations (for example, TDS) that could reduce crop production ensures that a supply of usable groundwater will exist for beneficial agricultural use.

Urban land uses and users. The degraded groundwater quality minimum thresholds generally benefit the urban water users in the Basin, although the City's wells in the Subbasin are rarely used for municipal supply. Limiting the number of additional wells where constituents of concern could exceed primary or secondary MCLs ensures an adequate supply of quality groundwater

for municipal use. Management of the Basin to prevent occurrences of these MTs may also result in lowered costs for water treatment. Existing State, Federal, Public Health or Municipal regulations may require that a well not be used if MCLs are exceeded and may supersede any actions related to SGMA-related MT exceedances. Wells in violation of federal, state, and local water quality regulations will have to comply with the specific regulations.

Domestic land uses and users. The degraded groundwater quality minimum thresholds generally benefit the domestic water users in the Basin by maintaining current and acceptable water quality.

Ecological land uses and users. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degraded groundwater quality minimum thresholds generally benefit the ecological water uses in the Basin. Preventing constituents of concern from migrating will prevent unwanted contaminants from impacting ecological groundwater supply.

8.7.2.5 Relevant Federal, State, or Local Standards § 354.28(b)(5)

The Degraded Groundwater Quality minimum thresholds specifically incorporate federal and state drinking water standards.

8.7.2.6 Method for Quantitative Measurement of Minimum Thresholds § 354.28(b)(6)

The Degraded Groundwater Quality minimum thresholds will be directly measured using analytical laboratory results of sampling conducted at the RMSs of the Water Quality Monitoring Network presented in Chapter 7. Groundwater quality will initially be measured using existing monitoring programs.

- Exceedances of primary or secondary MCLs will be monitored by reviewing water quality reports submitted to the California Division of Drinking Water by municipalities and small water systems for the wells that are included in the Water Quality Monitoring Network, and of agricultural wells being monitored under the Irrigated Lands program.

8.7.3 Measurable Objectives § 354.30(a)-(g)

Groundwater quality should not be degraded due to actions taken under this GSP and, therefore, the measurable objectives are defined as zero exceedances as a result of groundwater management, in samples from the Water Quality Monitoring Network wells over the 20-year SGMA planning horizon.

8.7.3.1 Information and Methods Used for Establishing Degradation of Water Quality Measurable Objectives § 354.30(b)

Because protecting groundwater quality is important to the beneficial users and uses of the resource, the measurable objective for the Degradation of Water Quality Sustainability Indicator is defined as zero exceedances of the MTs over the 20-year SGMA planning horizon. Any exceedance will be reviewed by the GSAs to determine its significance and potential responses.

8.7.3.2 Interim Milestones § 354.28(a)(e)

Interim milestones show how the GSAs anticipate moving from current conditions to meeting the measurable objectives. For water quality, measurable objectives are set at the current number of water quality exceedances, which in this case is zero. Interim milestones are set for each five-year interval following GSP adoption. The interim milestones for degraded groundwater quality are defined as zero exceedances of the MT for each constituent of concern for 5, 10 and 15 years after GSP adoption.

8.8 Land Subsidence Sustainability Indicator § 354.28(c)(5)

8.8.1 Undesirable Results § 354.26(a)-(d)

Locally defined significant and unreasonable conditions for the Land Subsidence Sustainability Indicator were assessed based on public meetings and discussions with GSA staff. Significant and unreasonable rates of land subsidence in the Basin are those that lead to a permanent subsidence of land surface elevations that impact infrastructure. For clarity, this Sustainable Management Criterion references two related concepts:

- Land Subsidence is a gradual settling of the land surface caused by, among other processes, compaction of subsurface materials due to lowering of groundwater elevations from groundwater pumping. Land subsidence from dewatering subsurface clay layers can be an inelastic process, and the potential decline in land surface could be permanent.
- Land Surface Fluctuation is the periodic or annual measurement of the ground surface elevation. Land surface may rise or fall in any one year. Declining land surface fluctuation may or may not indicate long-term permanent subsidence.

As discussed in Chapter 4 (Basin Setting), no significant subsidence has historically been documented in the Subbasin. Currently, InSAR data provided by DWR shows that no significant land subsidence occurred in the Basin during the period between June 2015 and September 2019 (Figure 4-13).

By regulation, the ground surface Land Subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the Basin, no long-term

subsidence that impacts infrastructure (including commercial buildings, homes, utility infrastructure, etc.) is acceptable. The Undesirable Results for the land subsidence Sustainability Indicator as defined for the purposes of this GSP are as follows:

> *The Basin will be considered to have Undesirable Results if measured subsidence using InSAR data, between June of one year and June of the subsequent year is greater than 0.1 foot in any 1-year, or a cumulative 0.5 foot in any 5-year period, as a result of groundwater management under the GSP, or any long-term permanent subsidence is attributable to groundwater management.*

Should potential subsidence be observed, the GSAs will first assess whether the subsidence may be due to elastic processes. If the subsidence is not elastic, the GSAs will undertake a study to evaluate potential correlation between the observed subsidence and measured groundwater levels.

8.8.1.1 Criteria for Establishing Undesirable Results § 354.26(b)(2)

Criteria used to establish the Undesirable Results for Land Subsidence Sustainability Indicator are satellite-measured subsidence data (InSAR data) collected by DWR.

8.8.1.2 Potential Causes of Undesirable Results § 354.26(b)(1)

Conditions that may lead to an undesirable result include:

- A shift in pumping locations, which could lead to a substantial decline in groundwater levels.
- Shifting a significant amount of pumping and causing groundwater levels to fall in an area that is susceptible to subsidence, such as certain areas underlaying the City, could trigger subsidence in excess of the minimum threshold.

8.8.1.3 Effects of Undesirable Results on Beneficial Users and Land Uses § 354.26(b)(3)

The effects of these undesirable results on the beneficial users and uses (§354.26 (b)(3)) include the potential damage of critical infrastructure, and the potential damage of private or commercial structures that would adversely affect their uses. Staying above the minimum threshold will avoid the subsidence undesirable conditions.

8.8.2 Minimum Thresholds § 354.28(c)(5)

Section 354.28(c)(5) of the SGMA regulations states that “The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.”

Based on an analysis of potential errors in the InSAR data, as discussed in the following section, the subsidence minimum threshold is: The InSAR measured subsidence between June

of one year and June of the subsequent year shall be no more than 0.1 foot in any single year and a cumulative 0.5 foot in any five-year period, resulting in no long-term permanent subsidence.

8.8.2.1 Information and Methods Used for Establishing Land Subsidence Minimum Thresholds § 354.28(b)(1)

Minimum thresholds are established to protect groundwater supply, land uses and property interests from substantial subsidence that may lead to undesirable results. Changes in surface elevation are measured using InSAR data available from DWR. The general minimum threshold is the absence of long-term land subsidence due to pumping in the Basin. The InSAR data provided by DWR, however, are subject to measurement error. DWR has stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2018, the errors are as follows (GSP, Paso Robles Basin, 2020):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 feet) with a 95% confidence level.
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level.

For the purposes of this GSP, the errors for InSAR data are considered the sum of errors 1 and 2, combined total error of 0.1 foot. Thus, measured land surface change of greater than 0.1 feet will be assessed as potential subsidence. As discussed previously, land surface elevations can fluctuate naturally. Therefore, subsidence will be monitored at the same time each year to reduce the effect of general fluctuations of elevation on observed data. Additionally, if subsidence is observed, a correlation to lowered groundwater elevations at RMS SLV-09 must exist for the minimum threshold to be exceeded.

Locally defined significant and unreasonable conditions are assessed based on historically observed water levels in areas of known past land subsidence, satellite-based measurements of land subsidence provided by DWR, public meetings, and discussions with GSA staff.

8.8.2.2 Relation of Minimum Thresholds to Other Sustainability Indicators § 354.28(b)(2)

Land Subsidence minimum thresholds have little or no impact on other minimum thresholds, as described below:

- **Chronic lowering of groundwater elevations.** The Land Subsidence minimum thresholds will not result in significant or unreasonable groundwater elevations.
- **Change in groundwater storage.** The Land Subsidence minimum thresholds will not change the amount of pumping and will not result in a significant or unreasonable change in groundwater storage.
- **Seawater intrusion.** This Sustainability Indicator is not applicable in the Basin.

- **Degraded water quality.** The Land Subsidence minimum thresholds will not change the groundwater flow directions or rates, and therefore and will not result in a significant or unreasonable change in groundwater quality.
- **Depletion of interconnected surface waters.** The Land Subsidence minimum thresholds will not change the amount or location of pumping and will not result in a significant or unreasonable depletion of interconnected surface waters.

8.8.2.3 Effect of Minimum Thresholds on Neighboring Basins § 354.28(b)(3)

The ground surface subsidence minimum thresholds are set to prevent any long-term subsidence that could harm infrastructure. Therefore, the subsidence minimum thresholds will not prevent the San Luis Obispo Basin or the Northern Cities Management Area from achieving sustainability.

8.8.2.4 Effects of Minimum Thresholds on Beneficial Users and Land Uses § 354.28(b)(4)

The Land Subsidence minimum thresholds are set to prevent subsidence that could harm infrastructure. Available data indicate that there is currently no subsidence occurring in the Basin that affects infrastructure, and reductions in pumping are already required by the reduction in groundwater storage Sustainability Indicator. Therefore, the Land Subsidence minimum thresholds do not require any additional reductions in pumping. However, in general the amount of pumping in the Los Osos Valley Road area must be kept at levels significantly lower than implemented in the 1990s.

Staying above the minimum threshold will avoid the Land Subsidence undesirable result and protect the beneficial uses and users from impacts to infrastructure and interference with surface land uses.

8.8.2.5 Relevant Federal, State, or Local Standard § 354.28(b)(5)

There are no federal, state, or local regulations related to subsidence.

8.8.2.6 Method for Quantitative Measurement of Minimum Thresholds § 354.28(b)(6)

Minimum thresholds will be assessed using DWR-supplied InSAR data.

8.8.3 Measurable Objectives § 354.30(a)-(g)

The measurable objectives for subsidence represent target subsidence rates in the Basin. Long-term ground surface elevation data do not suggest the occurrence of permanent subsidence in the Basin. Therefore, the measurable objective for subsidence is maintenance of current ground surface elevations.

8.8.3.1 Information and Methods Used for Establishing Land Subsidence Measurable Objectives 0§ 354.3(b)

The measurable objectives are set based on maintaining current conditions and changes are measured by DWR-supplied InSAR data.

8.8.3.2 Interim Milestones § 354.28(a)(e)

Interim milestones show how the GSAs anticipate moving from current conditions to meeting the measurable objectives. Interim milestones are set for each five-year interval following GSP adoption. Land Subsidence measurable objectives are set at current conditions of no long-term subsidence. There is no change between current conditions and sustainable conditions. Therefore, the interim milestones are identical to the minimum thresholds and measurable objectives.

8.9 Depletion of interconnected surface water Sustainability Indicator § 354.28(c)(6)

Natural hydraulic connections can exist between shallow groundwater systems and some surface water bodies. These surface water bodies can be gaining (receiving discharge from the alluvial aquifer) or losing (discharging water to the alluvial aquifer). These relationships may change in magnitude and direction across wet and dry cycles, and in response to changes in surface water operations or groundwater management practices.

Depletions of interconnected surface water occurs when there are decreased gains or increased losses in volumes of streamflow caused by lowered groundwater elevations associated with groundwater use. At certain levels, depletions may have adverse impacts on beneficial uses of the surface water and may lead to undesirable results.

Direct measurement of flux between an aquifer and an interconnected stream is not feasible using currently available data. Options to improve the collection of surface water and interconnected groundwater data are discussed in Chapter 7 (Monitoring Networks), and potential details for these tasks are discussed in Chapter 10 (Implementation Plan). Until immediately adjacent such time as this data is available, this GSP uses water level measurements in representative wells located near Arroyo Grande Creek as the SMCs for the Depletion of Interconnected Surface Water Sustainability Indicator.

8.9.1 Undesirable Results § 354.26(a)-(d)

The undesirable result for Depletions of Interconnected Surface Water is a result that causes significant and unreasonable adverse effects on beneficial uses of interconnected surface water within the Basin over the planning and implementation horizon of this GSP. As discussed in Section 8.9, measurement of the fluxes between the aquifer and Basin creeks is not feasible

with currently available data. Therefore, water level measurements at the RMSs designated for the Depletion of Interconnected Surface Water Sustainability Indicator will be used as the basis MTs and Undesirable Results until better data becomes available under future monitoring activities.

The statement defining undesirable results for the Depletion of Interconnected Surface Water for this GSP is as follows:

> *The Basin will be considered to have undesirable results if any of the representative wells monitoring groundwater/surface water interaction display exceedances of the minimum threshold values for two consecutive Fall measurements.*

8.9.1.1 Criteria for Establishing Undesirable Results § 354.26(b)(2)

Criteria used to define undesired conditions for this Sustainability Indicator are those that:

- Impact the ability of the stream system to meet instream flow requirements and maintain groundwater dependent ecosystems (GDEs)
- Impact the ability to provide surface water supplies to direct diverters
- Interfere with other SGMA Sustainability Indicators.

The information used for establishing the criteria for undesirable results for the Depletion of Interconnected Surface Water Sustainability Indicator is water levels data collected from three RMS wells (i.e., AGV-1, AGV-6, AGV-12) that are located adjacent to Arroyo Grande Creek. For the present, water levels in these wells will be used as a proxy indicator of undesirable results.

8.9.1.2 Potential Causes of Undesirable Results § 354.26(b)(1)

Potential causes of undesirable results include increases in pumping in the proximity of a Subbasin creeks, or instream projects that could alter the natural flow regimes of the creeks.

8.9.1.3 Effects of Undesirable Results on Beneficial Users and Land Uses § 354.26(b)(3)

If depletions of interconnected surface water were to reach undesirable results, adverse effects could include the reduced ability of the stream flows to meet instream flow requirements for local fisheries and critical habitat, or reduced ability to deliver surface water supplies to direct users of surface water in the Basin.

8.9.2 Minimum Thresholds

Section 354.28(c)(6) of the SGMA regulations states that “The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results.”

Current data are insufficient to determine the rate or volume of surface water depletions in the creeks. Therefore, groundwater elevations in the RMSs intended to monitor surface water/groundwater interaction (i.e., AGV-1, AGV-6, AGV-12) are used as a proxy for the Depletion of Interconnected Surface Water Sustainability Indicator. If in the future, data from a more comprehensive monitoring program (as discussed in chapter 7 and Chapter 10) succeed in quantifying surface water depletions, those data may be used to re-define minimum thresholds for areas of interconnection. Minimum thresholds for these representative wells are presented in Table 8-1 and Figure 8-1, 8-98, and 8-10.

Arroyo Grande Creek is a significant feature in the Basin. It is a regulated (I.e., dammed) creek, with the dam structure creating the impoundment of Lake Lopez, a significant piece of infrastructure for water resources management in the Subbasin and the Northern Cities Management Area downstream. The dam is operated primarily for municipal water supply, and as such always allows some water to pass through the dam gates. As discussed in Chapter 5 (Groundwater Conditions), these operations have the ancillary effect of recharging the alluvial aquifer in the valley on a continual basis. A more extensive description and quantification of the stream/aquifer interaction is included in Chapter 5 – Groundwater Conditions and Chapter 6 – Water Budget.

As described in Chapter 4, Hydrogeologic Conceptual Model and Chapter 5, Groundwater Conditions, there are insufficient data to quantitatively assess the extent of the connection between surface water and groundwater in the Basin. As described in Chapter 7, Monitoring Networks, a more expansive monitoring network may be developed during GSP implementation to improve understanding of interconnection between surface water and groundwater in the Basin. A recent County-sponsored study performed by Cleath Harris Geologists and GSI Water Solutions (Appendix _) evaluated synoptic stream measurements and nearby groundwater levels and identified losing and gaining reaches on Arroyo Grande Creek between Lake Lopez and the ocean. Chapter 10 (Implementation Plan) addresses details of the plan to accumulate better data for this Sustainability Indicator. If in the future, better data are generated to quantify the connection between surface water and groundwater, undesirable results may be revised to reflect this data. However, for this GSP, groundwater elevations in AGV-1, AGV-6, AGV-12 will be used as a proxy for the Depletion of Interconnected Surface Water Sustainability Indicator.

8.9.2.1 Information and Methods Used for Establishing Depletion of Interconnected Surface Water Minimum Thresholds

As with the other Sustainability Indicators, the primary methods for development of SMCs for this Sustainability Indicator are monitoring of groundwater elevations in the three RMSs established for the purpose of monitoring hydrogeologic conditions in the adjacent creeks.

As with the chronic reduction of groundwater levels Sustainability Indicator, the primary source of data that was evaluated for the Depletion of Interconnected Surface Water Sustainability

Indicator is historical groundwater elevation data maintained by the GSAs. The information used for establishing the MOs and MTs for the chronic lowering of groundwater levels Sustainability Indicator included:

- Historical groundwater elevation data from wells monitored by the County of San Luis Obispo.
- Construction details of RMS wells
- Long-term trends displayed in hydrographs of the RMS wells identified for this Sustainability Indicator.

The use of groundwater elevation as a proxy metric for the Depletion of Interconnected Surface Water Sustainability Indicator is adopted given the challenges and cost of direct monitoring of depletions of interconnected surface water. The depletion of interconnected surface water is driven by the gradient between water surface elevation in the surface water body and groundwater elevations in the connected, shallow groundwater system. By defining minimum thresholds in terms of groundwater elevations in shallow groundwater wells near surface water, the GSAs will monitor and manage this gradient, and in turn, manage potential changes in depletions of interconnected surface.

The initial concept for defining the MTs for Interconnected Surface Water proposed defining the MT as the lowest observed water level in the RMSs in the observed period of record. However, the Fall 2021 water levels were observed to be the lowest groundwater levels on record for the three proposed ISW RMS wells. Because the current drought could extend beyond the current period, it is possible that next fall's water levels could be lower than Fall 2021. In order to avoid the possibility of an immediate exceedance of the MTs in the first year of the SGMA implementation period, MTs were defined as 5 feet lower than the lowest observed water level for the period of record in each RMS well. The DWR Dry Domestic Well Susceptibility study described in Section 8.4.2.1 indicates domestic wells in the Subbasin are at low risk. Additionally, no domestic wells have been reported as going dry to date during this drought. Therefore, it was considered that defining the MTs to be 5 feet lower than the lowest observed levels imparts a low level of risk for domestic users in the Subbasin.

8.9.2.2 Relationship between Individual Minimum Thresholds and Other Sustainability Indicators

The MTs for the Depletion of Interconnected Surface Water Sustainability Indicator are defined as the lowest water levels observed in the period of record for each of the three RMSs. Therefore, the concept of potential conflict between MTs at different locations in the Basin is not applicable. The Depletion of Interconnected Surface Water Sustainability Indicator could influence other Sustainability Indicators. The Depletion of Interconnected Surface Water Sustainability Indicator MTs was selected to avoid undesirable results for other Sustainability Indicators, as outlined below:

- **Chronic lowering of groundwater levels.** Because groundwater elevations will be used as a proxy for estimating Depletion of Interconnected Surface Water Sustainability Indicator, and the definitions of the MTs are set at historically observed conditions, the MTs will not cause undesirable results for this Sustainability Indicator.
- **Depletion of Groundwater Storage.** Because groundwater elevations will be used as a proxy for estimating Depletion of Interconnected Surface Water Sustainability Indicator, and the definitions of the MTs are set at historically observed conditions, the MTs will not cause undesirable results for this Sustainability Indicator.
- **Seawater intrusion.** This Sustainability Indicator is not applicable to this Basin.
- **Degraded water quality.** The minimum threshold proxy of stable groundwater levels is not expected to lead to a degradation of groundwater quality.
- **Subsidence.** Because future groundwater levels will be above historically observed conditions, they will not induce any additional subsidence.

8.9.2.3 Effects of Minimum Thresholds on Neighboring Basins

Two neighboring groundwater basins share a boundary with the Arroyo Grande Subbasin Basin; the San Luis Obispo Basin to the northwest, and the Northern Cities Management Area of the Santa Maria Valley Groundwater Basin to the southwest. Neither of these shared boundaries are extensive, and the HCM posits that a groundwater divide separates the groundwater between the Subbasin and the SLO Basin. Therefore, conditions in the Subbasin are not expected to impact conditions in the SLO Basin. Arroyo Grande Creek flows into the NCMA Management Area. The synoptic flow study (Appendix ??) indicates that when measured flow leaves the Subbasin, it percolates into the subsurface and the creek reaches zero flow before it reaches the ocean. Therefore, conditions in NCMA indicate losing reaches in their area, and conditions in the Subbasin will not impact conditions in NCMA.

The Subbasin GSAs have developed a cooperative working relationship with the SLO Basin Groundwater Sustainability Committee and the Northern Cities Management Area. Groundwater conditions near the borders with these basins will be monitored and shared.

8.9.2.4 Effects of Minimum Thresholds on Beneficial Uses and Users

The practical effect of this GSP for protecting against the Depletion of Interconnected Surface Water MTs is that it encourages minimal long-term net change in groundwater elevations in the vicinity of Arroyo Grande Creek. Seasonal and drought cycle variations are expected, but during average conditions and over the long-term, beneficial users will have access to adequate volumes of water from the aquifer to service the needs of all water use sectors. The beneficial users of groundwater are protected from undesirable results.

Agricultural Land Uses and Users

The water levels set as MTs are approximately within the historical range of data, implying that surface water/groundwater interaction will be within historical norms. Additionally, operation at

Lake Lopez maintain flow in the creek year-round. Therefore, existing agricultural operations are not expected to be affected by the Depletion of Interconnected Surface Water MTs.

Urban Land Uses and Users

Development of real estate along streams and creeks is generally constrained by prohibiting development in mapped floodplains in the Basin. Therefore, the Depletion of Interconnected Surface Water MTs are not anticipated to affect urban land users in the Basin.

Domestic Land Uses and Users

Development of real estate along streams and creeks is generally constrained by prohibiting development in mapped floodplains in the Basin. Therefore, the Depletion of Interconnected Surface Water MTs are not anticipated to affect urban land users in the Basin.

Ecological Land Uses and Users.

Groundwater dependent ecosystems would generally benefit from this MT. Maintaining groundwater levels close to within historically observed ranges will continue to support groundwater dependent ecosystems. More detailed mapping of GDEs, and other expected fisheries-related work that will be required during the development of the Habitat Conservation Plan, will clarify the effects of these MTs on ecological uses.

8.9.2.5 Relation to State, Federal, or Local Standards

As previously discussed, current federal licensing activities associated Lopez Dam are being pursued by the county and member agencies supplied by lake Lopez.

8.9.2.6 Methods for Quantitative Measurement of Minimum Threshold

The quantitative metric for assessing compliance with the Depletion of Interconnected Surface Water MTs is monitoring groundwater elevations at the three RMSs designated for this Sustainability Indicator (AGV-1, AGV-6, AGV-12). The approach for quantitatively evaluating compliance with the MT for reduction in groundwater storage will be based on evaluating groundwater elevations semi-annually. All groundwater elevations collected from the groundwater level monitoring network will be analyzed.

8.9.3 Measurable Objectives

Similar to minimum thresholds, measurable objectives were defined using water level data based on the historical water level data observed in RMSs intended to monitor streamflow conditions. Measurable objectives for these wells are presented in Table 8-1 and Figure 8-1. If future data from a more comprehensive surface water monitoring program documents quantitative estimates of stream flow depletion, those data may be used to re-define the measurable objectives for areas of interconnection.

8.9.3.1 Method for Quantitative Measurement of Measurable Objectives

The measurable objectives are set based on maintaining current conditions of seasonal high water level elevations observed in the RMS wells during rainy periods. The quantitative method for assessing compliance with the MOs is monitoring of groundwater elevations at the selected RMSs.

8.9.3.2 Interim Milestones

Interim milestones show how the GSAs anticipate moving from current conditions to meeting the measurable objectives. Interim milestones are set for each five-year interval following GSP adoption. MOs for the Depletion of Interconnected Surface Water are set at historically observed conditions of high groundwater elevations during wet climatic periods. Therefore, the interim milestones are defined to be identical to the water levels associated with the Mos.

8.10 Management Areas

Management areas are not established in the Basin. The GSAs and GSC members did not find it necessary to sub-divide the Basin into smaller management areas with specific administrative requirements.

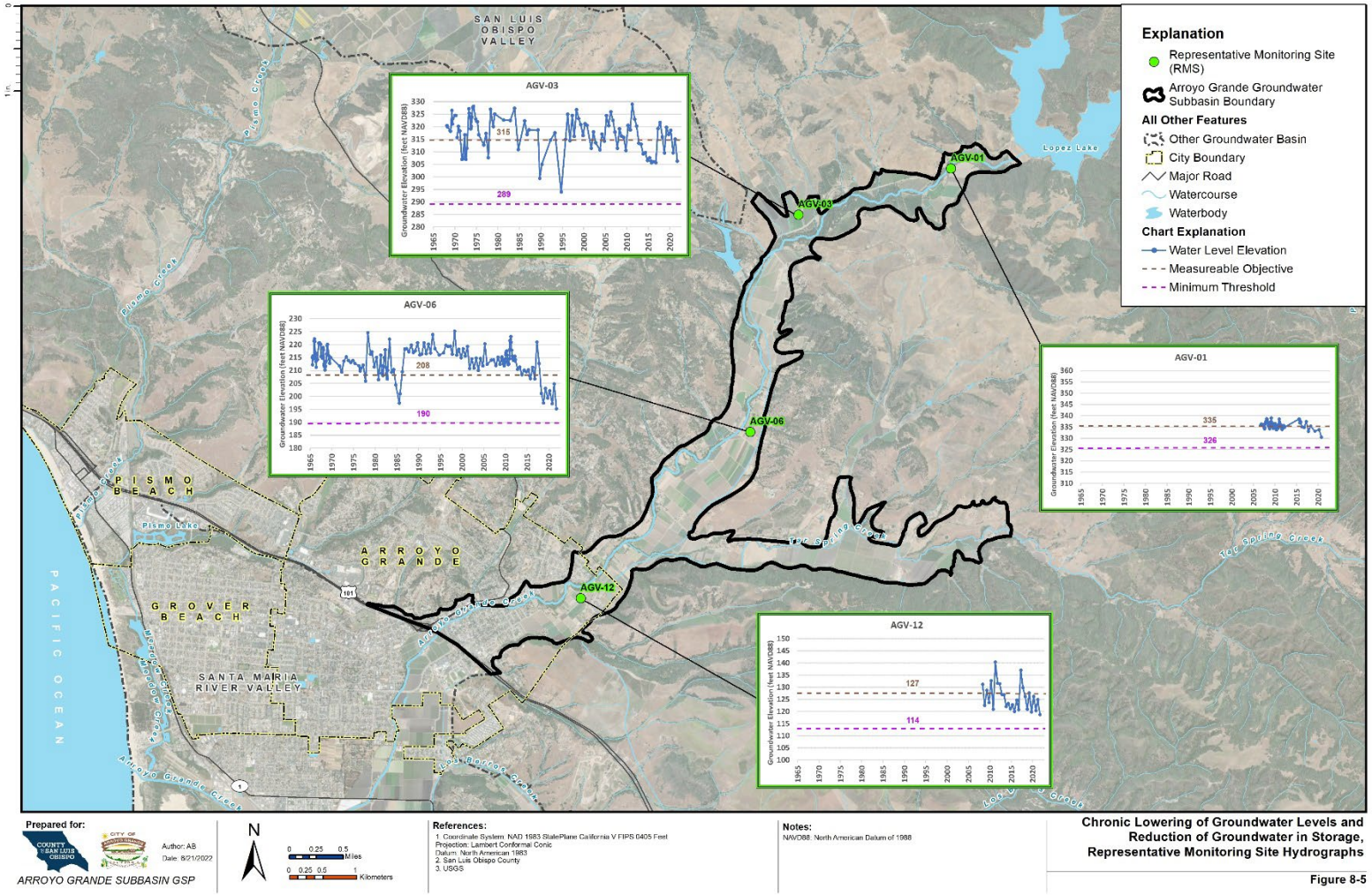

Figure 8-5 Chronic Lowering of Groundwater Levels and Reduction in Groundwater in Storage, Representative Monitoring Site Hydrographs