Sacramento Groundwater Authority

Basin Management Report Update 2011

SGA

- Blank -

Table of Contents

List of Tables

List of Figures

SGA Basin Management Report

Introduction

This Basin Management Report[1] documents management activities of the Sacramento Groundwater Authority (SGA) and its member agencies between 2008 and 2011. The report is designed to document hydrologic conditions as well as management activities undertaken to help ensure the long-term sustainability of the region's vital groundwater resources. The report also documents the ongoing implementation of the SGA Groundwater Management Plan (GMP) and recommends future implementation activities.

SGA Background

The SGA is a joint powers authority (JPA) formed in 1998[2] to manage the groundwater basin in Sacramento County north of the American River. Known formally as the North Area Groundwater Basin (North Area Basin), the basin encompasses the southern one-third of the North American Subbasin (Basin 5-21.64) as defined by the California Department of Water Resources (Figure 1). Formed as an outgrowth of the Sacramento Area Water Forum, SGA is recognized as an essential part of implementing the groundwater management element of the historic Water Forum Agreement (WFA)[3] of 2000. A centerpiece of the agreement is a regional program to manage and conjunctively use groundwater and surface water to help meet water needs through the year 2030 while reducing diversions from the lower American River during environmentally sensitive times.

The SGA draws its authority from a joint powers agreement signed by the cities of Citrus Heights, Folsom and Sacramento and the County of Sacramento. The signatories chose to manage the basin cooperatively by delegating their common police powers to representatives of local public and private water purveyors (Figure

[1] This is the fourth report completed for the SGA area. The first was published for the 2002 calendar year in February 2004. Originally known as a State of the Basin Report, the name has been changed to more appropriately reflect SGA's basin management responsibilities. The most recent previous report covered 2006 and 2007. Previous reports are available on-line at http://www.sgah2o.org/sga/news/publications/

[2] The SGA was originally formed in 1998 as the Sacramento North Area Groundwater Management Authority. In 2002, it was renamed the Sacramento Groundwater Authority.

[3] The WFA is available on-line at http://www.waterforum.org.

2), agricultural groundwater users and self-supplied groundwater users within their jurisdiction. These representatives constitute the Board of Directors of the SGA[4]. The agreement cites the following purposes for establishing SGA:

- To maintain the long-term sustainable yield of the North Area Basin;
- To manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors;
- To coordinate efforts among those entities represented on the governing body of the joint powers authority to devise and implement strategies to safeguard groundwater quality; and
- To work collaboratively with other entities, including groundwater management authorities that may be formed in other areas of the County of Sacramento and adjacent political jurisdictions, to promote coordination of policies and activities throughout the region.

[4] The SGA Board includes representatives of: California American Water, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Sacramento, County of Sacramento, Del Paso Manor Water District, Fair Oaks Water District, Golden State Water Company, Natomas Central Mutual Water Company, Orange Vale Water Company, Rio Linda/Elverta Community Water District, Sacramento Suburban Water District, San Juan Water District, and individual representatives from agriculture and self-supplied groundwater users (principally parks and recreation districts). For convenience, water purveyors, whether public or private, are referred to as "agencies" throughout this report.

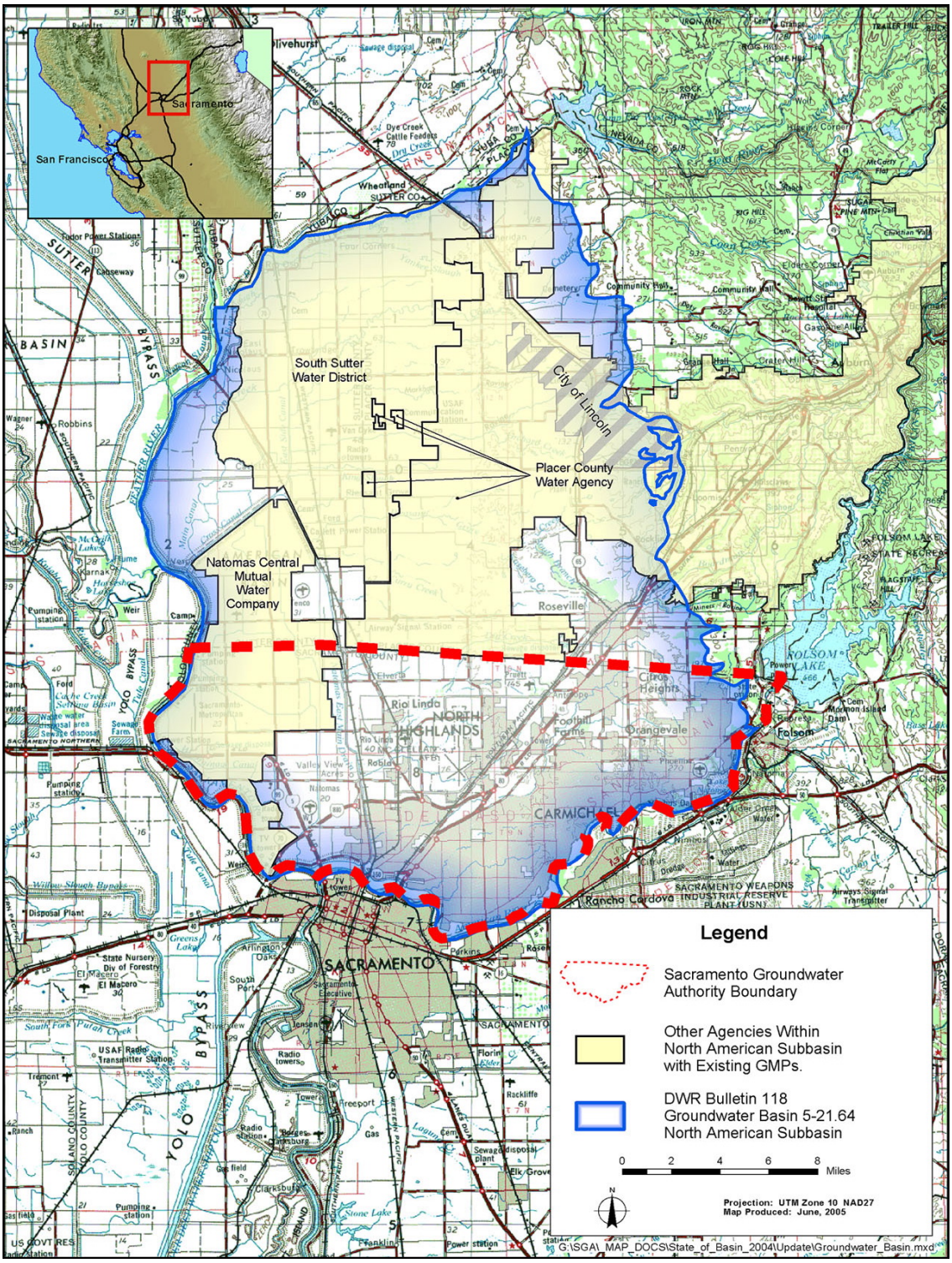

Figure 1. North American Subbasin

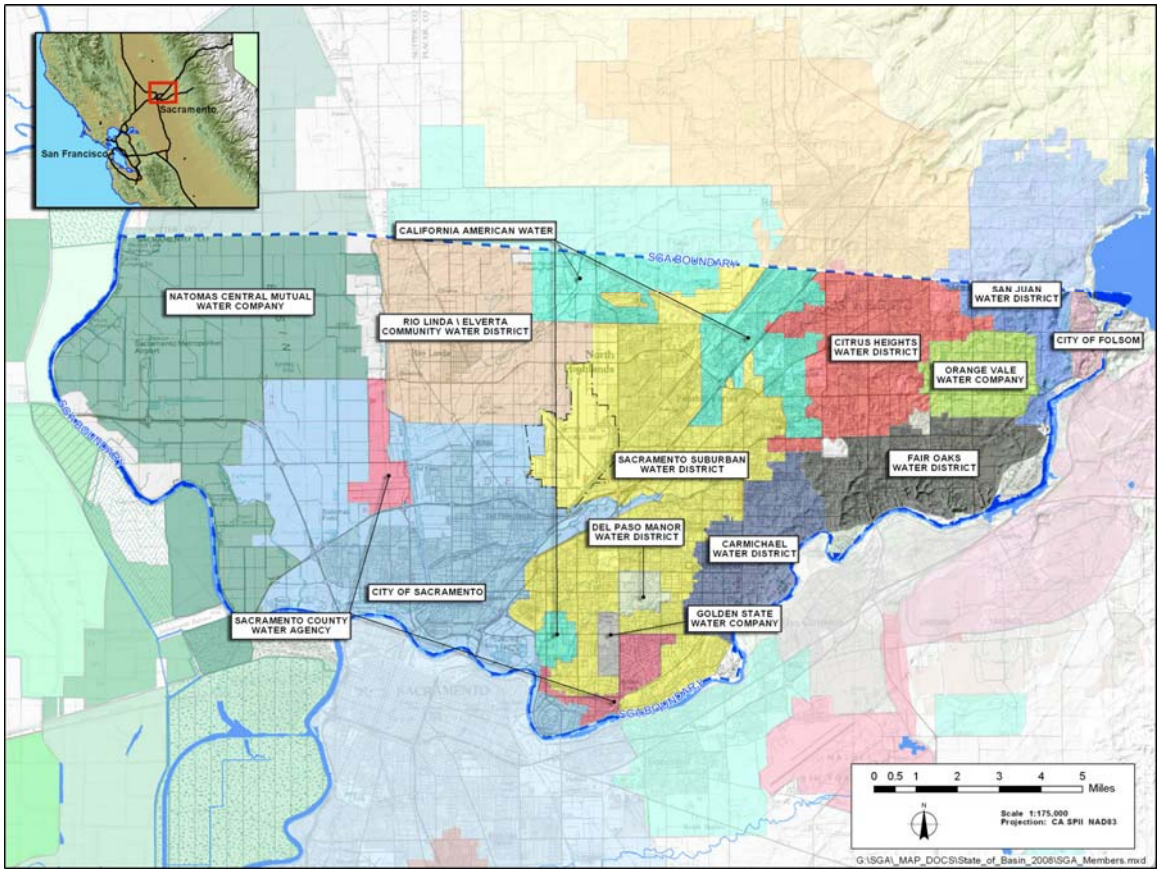

Figure 2. Local Water Purveyors in North Area Basin

SGA Groundwater Management Plan

SGA adopted its initial Groundwater Management Plan (GMP)[5] to create a framework for maintaining a sustainable, high-quality groundwater resource consistent with the objectives of the WFA in December 2003. The GMP was prepared under the authority of SGA's JPA and was consistent with the provisions of California Water Code § 10750 *et seq.* Additionally, the GMP included components recommended by the California Department of Water Resources in its 2003 update of *Bulletin 118: California's Groundwater*. In December 2008, SGA adopted a fully updated GMP. This five year review and update of the GMP was called for in the initial 2003 GMP.

A key component of the GMP is to report periodically on the implementation of the GMP itself. Accordingly, this Basin Management Report includes a summary of the GMP's action items and a description of progress to date on those items (see Appendix A).

[5] The most recent SGA GMP is available on-line at http://www.sgah2o.org/sga/programs/groundwater/

Report Organization

The report is organized into the following sections:

Section 1: Introduction. This section introduces the purpose of this report, the SGA, and the SGA GMP.

Section 2: Basin Conditions. This section describes the hydrologic conditions in the basin and groundwater elevations and water quality through 2010. Data for 2011 has not yet been collected from local agencies.

Section 3: Basin Management Activities. This section describes the most significant management actions taken by SGA and other local agencies that affected SGA during between 2008 and 2011.

Section 4: Conclusions and Recommendations. This section evaluates whether current basin management objectives are being met and makes recommendations for future management actions in the region.

Basin Conditions

Hydrologic Conditions

Hydrologic conditions from 2008 through 2010 saw a continuation of dry conditions begun in 2007 for the Sacramento Valley. More locally, in the American River watershed, a dry 2008 was followed by wetter conditions in 2009 and 2010. Three indicators are used here to describe hydrologic conditions for this period: 1) Sacramento River Water Year Index, 2) American River calculated full natural flow below Folsom Dam, and 3) local precipitation using a 6-station average.

Sacramento River Water Year Type

The Department of Water Resources (DWR) maintains a water year index based on Sacramento River and tributary runoff[6]. Hydrologic conditions are described as wet, above normal, below normal, dry, or critical. The 2008 through 2010 water years were classified as critical, dry, and below normal, respectively. Overall, the Sacramento Valley region appears to be in a drier period with four of the last five years classified as below normal, dry or critical. Table 1 summarizes the classifications from 1995 through 2010 and defines each classification.

Table 1. DWR Sacramento River Water Year Index Runoff

Water Year	Runoff (million acre-ft)	Year Type
1995	12.89	Wet
1996	10.26	Wet
1997	10.82	Wet
1998	13.31	Wet
1999	9.8	Wet
2000	8.94	Above Normal
2001	5.76	Dry
2002	6.35	Dry
2003	8.21	Above Normal
2004	7.51	Below Normal
2005	8.49	Above Normal
2006	13.2	Wet
2007	6.19	Dry
2008	5.16	Critical
2009	5.78	Dry
2010	7.08	Below Normal

Year Type	Water Year Index (million acre-feet)
Wet	Equal to or greater than 9.2
Above Normal	Greater than 7.8, and less than 9.2
Below Normal	Greater than 6.5, and equal to or less than 7.8
Dry	Greater than 5.4, and equal to or less than 6.5
Critical	Equal to or less than 5.4

[6] A description of the calculation method is available at http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST

Water Forum Agreement Year Type

March-through-November total unimpaired inflows into Folsom Lake are of particular relevance to Sacramento area water purveyors. This inflow total dictates the amount individual water purveyors may divert from Folsom Lake and the lower American River as specified in their purveyor-specific agreements under the WFA. The 2008, 2009, and 2010 water years were classified as drier, average, and wet, respectively. Note that in 2009 and 2010 conditions in the local watershed were considerably wetter than those in the broader water condition indicator of the Sacramento River index (Figure 3). Table 2 shows the definition of WFA water year types based on unimpaired inflow to Folsom Lake.[7]

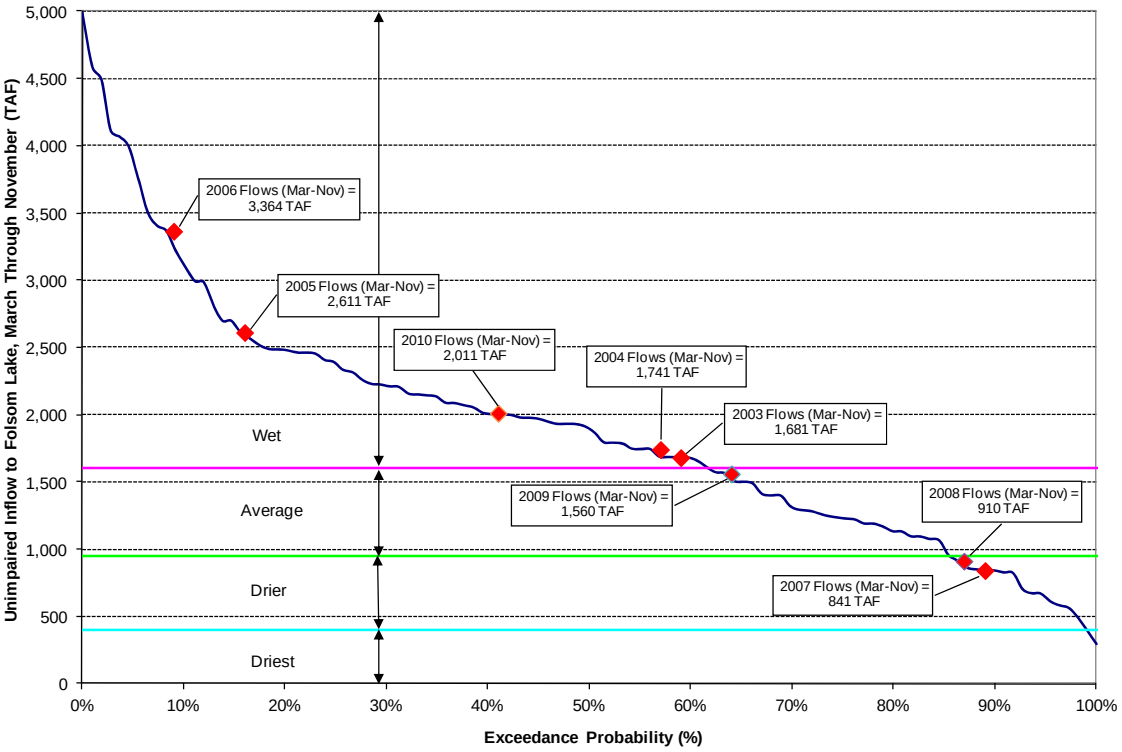

Figure 3. Unimpaired Inflow to Folsom Lake, March-November

[7] In past versions of this BMR, the flows presented above were taken from the final DWR Bulletin 120, which only includes actual data through May of any given year. The remaining data is an estimate for the year. Beginning with this BMR, all data now shown are for the calculated full natural flow below Folsom Dam as provided at the link: http://cdec.water.ca.gov/cgi-progs/queryMonthly?AMF.

Table 2. Water Year Types as Defined by Water Forum Agreement

Year Type	Unimpaired Inflow to Folsom Lake, March through November (acre-ft)
Wet	Greater than 1,600,000
Average	Greater than 950,000 and less than 1,600,000
Drier	Greater than 400,000 and less than 950,000
Driest[8]	Less than 400,000

Total Rainfall

DWR maintains precipitation data on its California Data Exchange Center (CDEC) Web site (http://cdec.water.ca.gov) for six stations within and adjacent to the SGA area. The locations of these stations are shown on Figure 4, along with the annual precipitation totals for 2008, 2009 and 2010 for those stations. Data is available for six stations located at: Sacramento International Airport (SMF), Rio Linda (RLN), Roseville (RSV), near the American River (ARW), in Fair Oaks (CHG), and near Folsom Dam (FLD). The average precipitation at these stations for 2008, 2009 and 2010 was 14.49", 17.83" and 24.26", respectively. Figure 5 shows the monthly average of the six CDEC sites for 2008, 2009 and 2010 in comparison to the long-term monthly average at Sacramento Executive Airport. The precipitation data shows that local precipitation does not directly correlate to the Water Year Type as discussed above. In 2009 and 2010, average annual precipitation was about average and above average, respectively, while the Sacramento River Index was classified as dry and below normal during those years.

[8] In these year types, diverters and others confer on how best to meet demands and protect the American River.

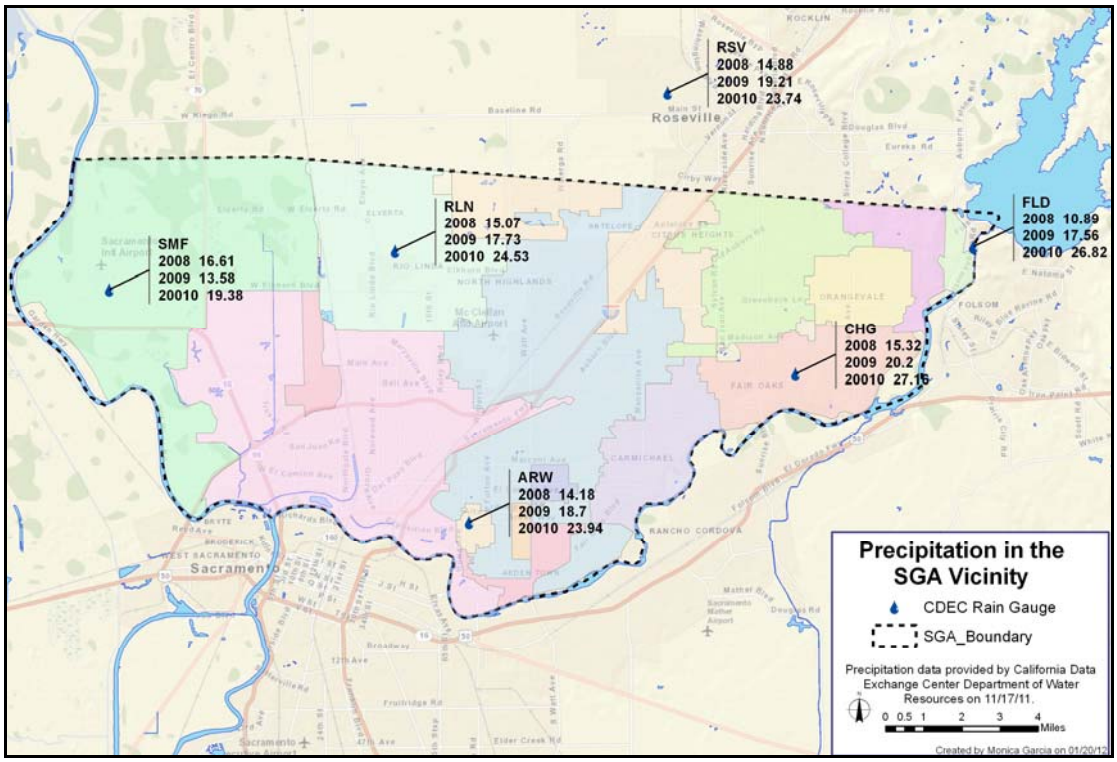

Figure 4. Locations and Precipitation Totals for Six CDEC Stations in SGA Vicinity

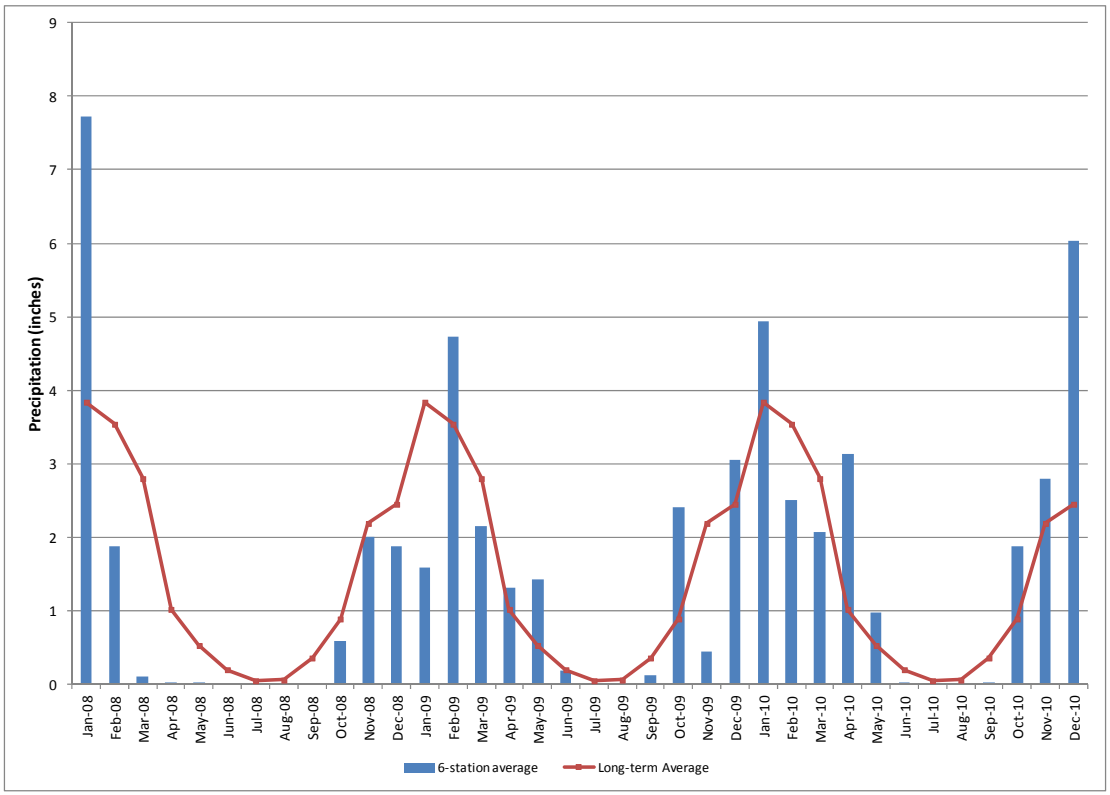

Figure 5. Monthly Six-Station Precipitation Average

Water Use

Historically, purveyors in the North Area Basin typically met about half of their public water supply needs with groundwater and about half with surface water. Table 3 shows the reported surface water and groundwater supplies by agency from 2006 through 2010[9]. While the region has been moving toward more conjunctive use of surface water and groundwater, the table shows that some agencies still continue to rely entirely on groundwater, while others rely predominantly on surface water. Based on the five most recent years, groundwater makes up an average of about 42% of supply ranging from just under 40% in 2008 to just under 45% in 2008. This shift in supply demonstrates successful implementation of a conjunctive use program in the basin.

Figure 6 shows total reported groundwater pumping from 2000 through 2010. Over the period, groundwater extraction has decreased as additional surface water has been used as part of conjunctive use operations are being implemented in the basin following the Water Forum Agreement in 2000. Groundwater use by public water suppliers has shown a significant downward trend except in 2007 when groundwater extractions jumped to over 89,000 acre-feet. This was expected because additional surface water was not available under the dry 2007 conditions. The years 2008 through 2009 continued the downward trend, with 2010 reported extraction just over 65,000 acre-feet. This is the lowest reported purveyor pumping in the SGA area since 1983.

[9] This data does not include surface water supplies for portions of the San Juan Water District, the City of Folsom, and the Natomas Central Mutual Water Company that are not within the SGA boundaries.

Table 3. Reported Surface and Groundwater Supplies by Agency

WATER PURVEYOR	YEAR	Surface Water	Ground Water	Total Water Deliveries
California American Water	2010	1,576	13,324	14,900
	2009	620	19,248	19,868
	2008	1,412	19,243	20,655
	2007	384	17,669	18,053
	2006	1,024	17,973	18,997
Carmichael Water District	2010	8,214	1,518	9,732
	2009	8,965	1,609	10,574
	2008	10,422	1,581	12,003
	2007	9,509	2,868	12,377
	2006	8,971	3,519	12,490
Citrus Heights Water District	2010	11,945	1,560	13,505
	2009	12,007	2,120	14,127
	2008	16,890	352	17,242
	2007	16,236	98	16,334
	2006	18,471	100	18,571
Del Paso Manor Water District	2010	0	1,409	1,409
	2009	0	1,504	1,504
	2008	0	1,610	1,610
	2007	0	1,638	1,638
	2006	0	1,654	1,654
Fair Oaks Water District	2010	10,606	1,194	11,800
	2009	11,072	1,109	12,181
	2008	10,534	2,225	12,759
	2007	11,533	899	12,432
	2006	11,178	845	12,023
Folsom, City of	2010	1,331	0	1,331
	2009	1,647	0	1,647
	2008	1,608	0	1,608
	2007	1,820	0	1,820
	2006	1,695	0	1,695
Golden State Water Company	2010	0	1,029	1,029
	2009	0	1,127	1,127
	2008	0	1,276	1,276
	2007	0	1,252	1,252
	2006	0	1,296	1,296
Natomas Central Mutual Water	2010	17,476	0	17,476
	2009	18,948	0	18,948
	2008	24,780	0	24,780
	2007	29,000	5	29,005
	2006	29,000	5	29,005
Orange Vale Water Company	2010	4,324	0	4,324
	2009	4,409	0	4,409
	2008	4,982	0	4,982
	2007	4,452	0	4,452
	2006	3,642	0	3,642

Table 3 (Cont'd). Reported Surface and Groundwater Supplies by Agency

WATER PURVEYOR	YEAR	Surface Water	Ground Water	Total Water Deliveries
Rio Linda/Elverta CWD	2010	3	2,719	2,722
	2009	11	2,914	2,925
	2008	2	3,340	3,342
	2007	109	3,305	3,414
	2006	0	3,378	3,378
Sacramento, City of	2010	18,324	17,768	36,092
	2009	21,609	18,867	40,476
	2008	25,431	18,414	43,845
	2007	25,431	18,618	44,049
	2006	22,560	20,917	43,477
Sacramento, County of	2010	0	4,950	4,950
	2009	0	5,202	5,202
	2008	0	5,028	5,028
	2007	0	5,353	5,353
	2006	0	5,133	5,133
Sacramento Suburban WD	2010	17,807	20,178	37,985
	2009	12,084	23,021	35,105
	2008	14,982	23,516	38,498
	2007	7,544	37,932	45,476
	2006	13,345	26,559	39,904
San Juan Water District	2010	3,011	0	3,011
	2009	3,249	0	3,249
	2008	4,270	0	4,270
	2007	4,213	0	4,213
	2006	4,038	0	4,038
Total for SGA Area	2010	94,617	65,649	160,266
	2009	94,621	76,721	171,342
	2008	115,313	76,585	191,898
	2007	110,231	89,637	199,868
	2006	113,924	81,379	195,303

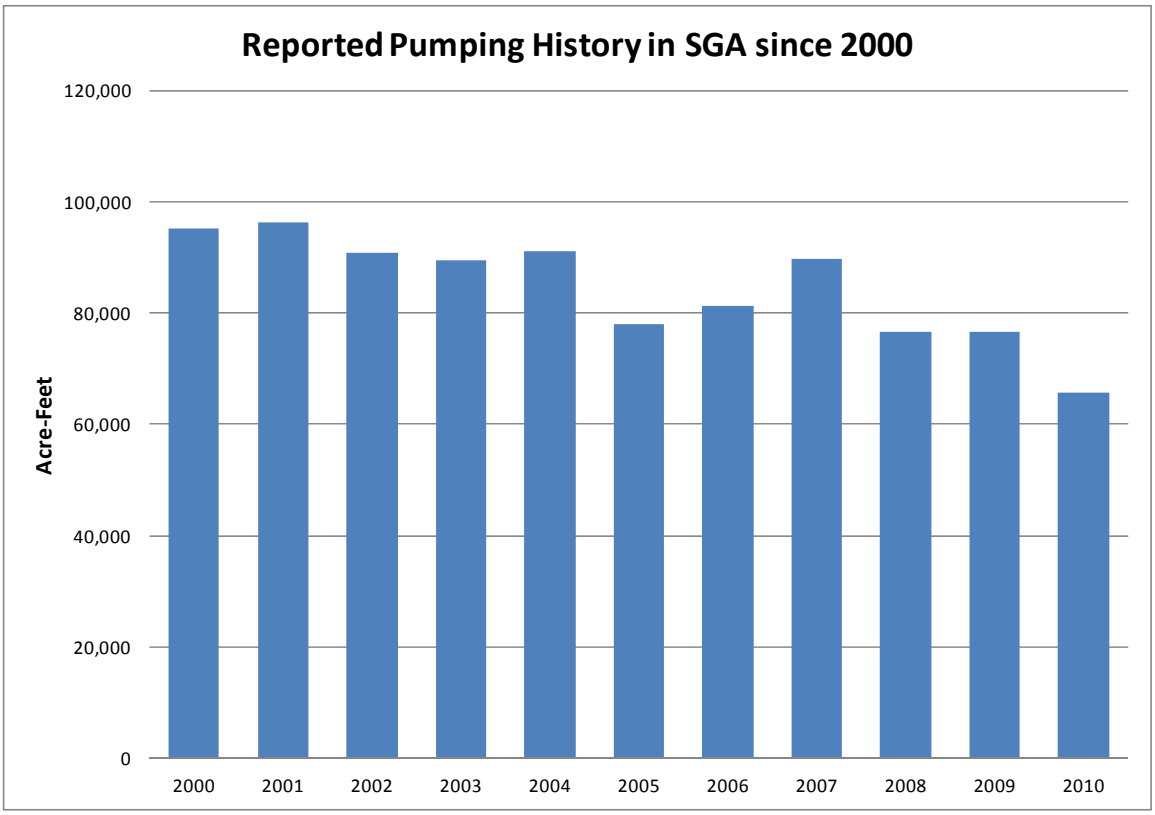

Figure 6. Groundwater Pumping in North Area Basin 2000-2007

Groundwater Elevation

DWR and Sacramento County Water Agency maintain a series of monitoring wells throughout Sacramento County with records typically dating back to the 1950s. Long-term hydrographs from the wells provide for observation of groundwater elevation trends throughout the period of major groundwater development of the underlying aquifer system. Additionally, there are many newer multiple-completion[10] monitoring wells within the basin. These wells offer a view of groundwater elevation trends as well as an understanding of the vertical gradients that exist between different depth intervals within the aquifer system.

Regional Groundwater Elevations

Since at least the 1950s, groundwater extraction was concentrated in the central part of the North Area Basin. This resulted in a regionally extensive cone of depression. Regional water purveyors have worked diligently over the past decade to finance and construct facilities to bring more surface water into the region when available, allowing groundwater levels to recover from their historical drawdown.

[10] Multiple-completion wells are wells that monitor more than one discrete depth from the same location.

Figure 7 is a contour plot of equal elevations of groundwater in the North Area Basin for Spring 2010. Note the continued presence of a cone of depression in the central part of the North Area Basin. The low elevation in the area is approximately 35 feet below mean sea level (MSL), represented within the -30 foot contour. In general, the rest of the North Area Basin does not show any distinctive patterns with respect to regional groundwater elevations, and the water table tends to mimic the local topography. This is also reflected in the increasing density of water elevation contours as the land surface elevation gradient increases in the eastern part of the North Area Basin.

Figure 8 is a contour plot of equal elevations of groundwater in the North Area Basin for Spring 1997. Note that although the low elevation in the area was in roughly the same location as the 2004 depression, the elevation in 1997 was approximately 40 feet below mean sea level. Comparing the 1997 and 2010 elevations, it can be seen that groundwater elevations increased an average of more than five feet during that time. The increase suggests that greater use of surface water in conjunction with groundwater (conjunctive use) is having a positive impact on the basin. The effect is most noticeable within the Sacramento Suburban Water District service area (shown in yellow in both figures).

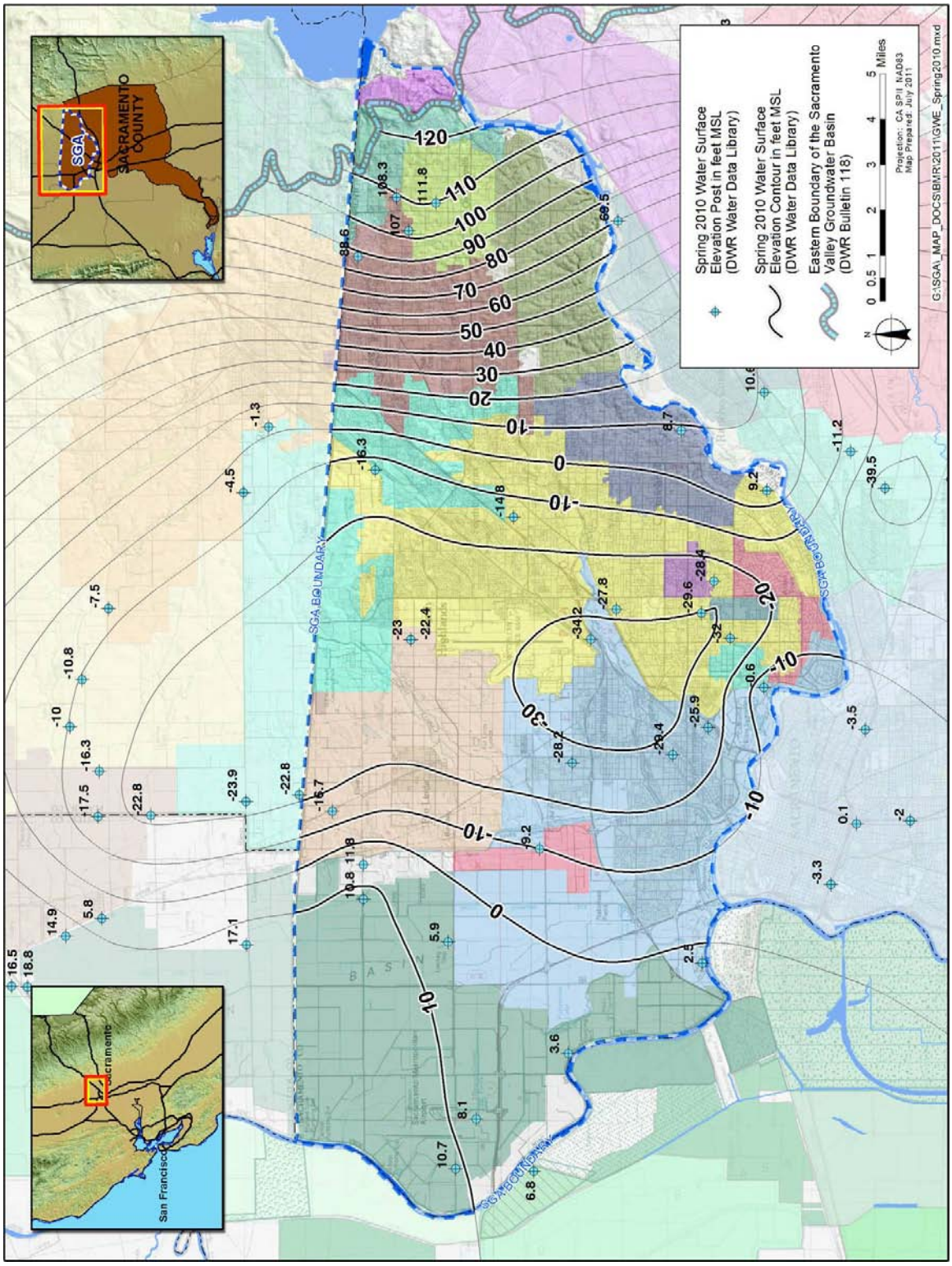

Figure 7. Groundwater Elevations in Spring 2010

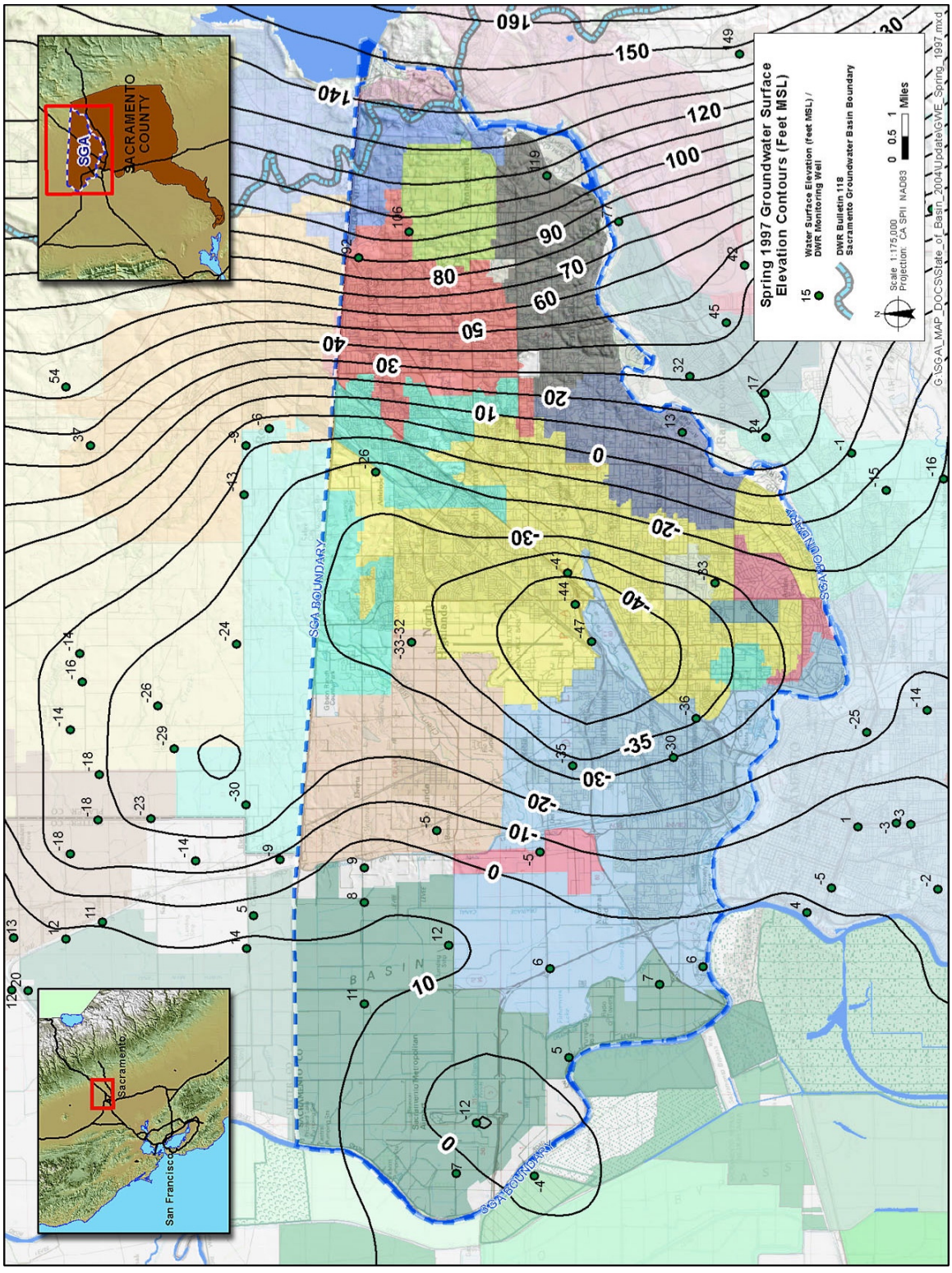

Figure 8. Groundwater Elevations in Spring 1997

Long-term Hydrographs

Figure 9 shows the locations and hydrographs of selected long-term monitoring wells in the basin. In general, data from 2008 through 2010 support observations since around the mid-1990s that water levels are remaining stable in the basin and in some cases groundwater elevations are continuing to increase slightly. For purposes of further discussion, the North Area Basin can be divided into three sub-areas.

Western Area

The western portion of the North Area Basin is bounded by the Sacramento River on the west and extends east to approximately the boundary between Natomas Central Mutual Water Company and Rio Linda/Elverta Community Water District (Figure 9). This area is served almost exclusively by surface water. Hydrographs for wells 09N04E27F001M, 10N03E35A001M, and 10N04E23A001M show that groundwater elevations range from about MSL to 10 feet above MSL as of late 2010. The hydrographs show that water levels have been fairly stable over the period of record. These wells typically experience only seasonal fluctuations.

Figure 10 shows a multiple-completion monitoring well constructed and maintained by DWR. This hydrograph shows that water elevations in the shallow aquifer have not changed over the period of record. The middle deep zone has not changed significantly over the period of record, but did decline in the 2006 through 2009 period, potentially due to dry conditions experienced in the State. Levels in that zone have since shown several feet of recovery. The hydrograph also demonstrates a downward vertical gradient from the shallow through the deep monitored zones.

Central Area

The central portion of the North Area Basin is bounded roughly on the west by the boundary between Natomas Central Mutual Water Company and Rio Linda/Elverta Community Water District and to the east by a line running approximately along San Juan Avenue (Figure 9). This area currently uses a combination of surface water and groundwater, but historically relied predominantly on groundwater. Hydrographs for 09N05E28K001M, 09N05E14B001M, 09N05E25J001M, 09N06E27D001M, and 10N05E14Q001M show that groundwater elevations currently range from about 10 feet above MSL to 35 feet below MSL. The most significant drawdown in these wells, about 80 feet, was observed in 10N05E14Q001M beginning in the early 1950s. Groundwater levels in this area continued to decline every year until around the mid-1990s, when water levels stabilized due, in substantial part, to expanded conjunctive use operations. Water levels have continued to rise overall since that time, with slight downticks during the 2007 through 2009 dry conditions in the State.

Figure 11 shows a multiple-completion monitoring well constructed and maintained by the Air Force Real Property Agency at the former McClellan Air Force Base. The well is consistent with other longer-term hydrographs that show groundwater elevations continuing to decline into the mid- to late-1990s. Water levels have since stabilized and continue to show slight recovery. Also note that the deepest zone monitored has the highest groundwater elevation, indicating a slight upward gradient.

Eastern Area

The eastern portion of the North Area Basin extends roughly east of San Juan Avenue to the eastern edge of the basin (Figure 9). This area has historically relied primarily on surface water. Hydrographs for wells 09N07E17K001M and 10N07E29G001M are in excess of 70 and 100 feet above MSL, respectively. Groundwater elevations can be highly varied from one well to another, as the area has rolling topography and the groundwater level tends to mimic ground elevations. Hydrographs indicate that groundwater elevations have not changed greatly with time, reflecting the limited use of groundwater in the area. There were no notable changes in recent groundwater elevations.

Figure 12 shows a multiple-completion monitoring well constructed and maintained by Aerojet north of the American River in connection with groundwater remediation activities at the Aerojet facility near Rancho Cordova. The upper two zones declined by about 10 feet between the early 1990s through 2010. The deeper zone shows a downward trend beginning in the late 1990s. These trends are likely localized effects associated with groundwater extractions as part of the American River Groundwater Extraction and Treatment (ARGET) facilities operated by Aerojet.

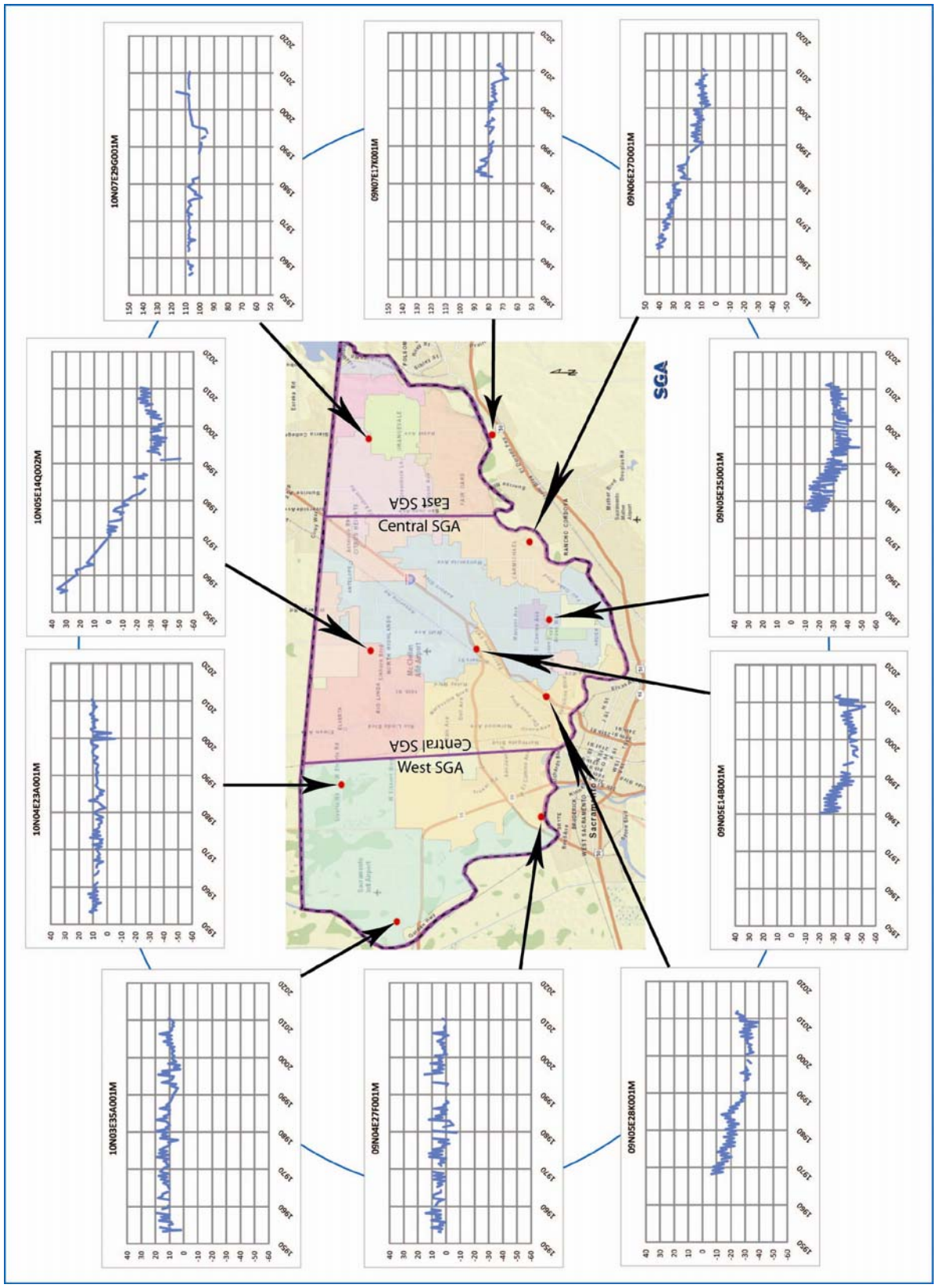

Figure 9. Long-Term Hydrographs for the North Area Basin

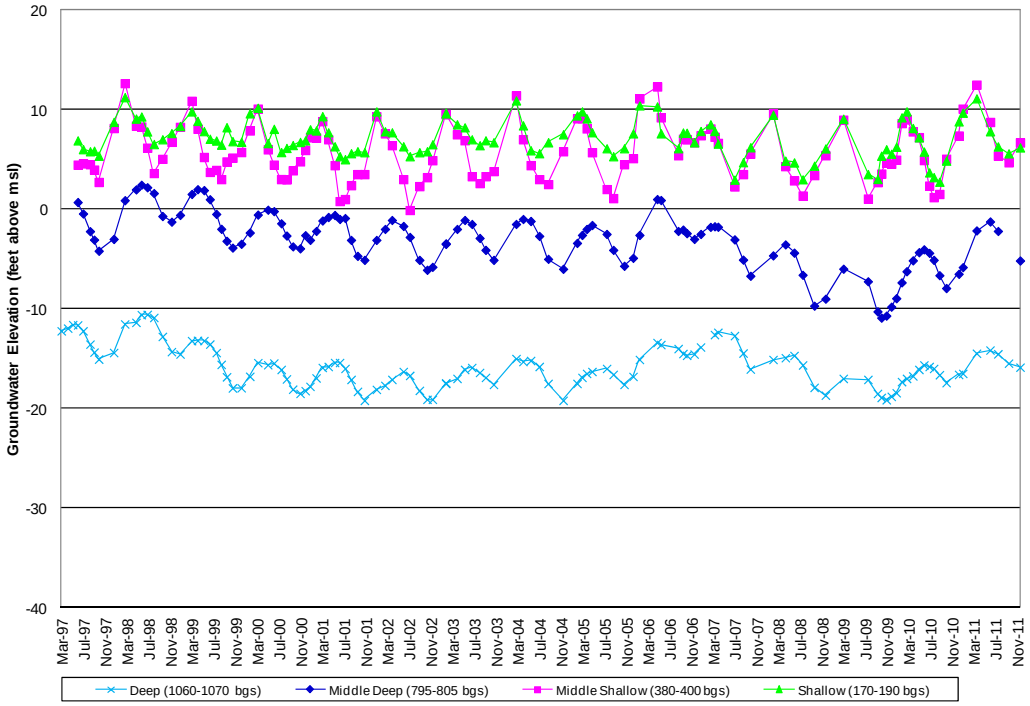

Figure 10. Multiple-Completion Monitoring Well Data for SGA Western Area

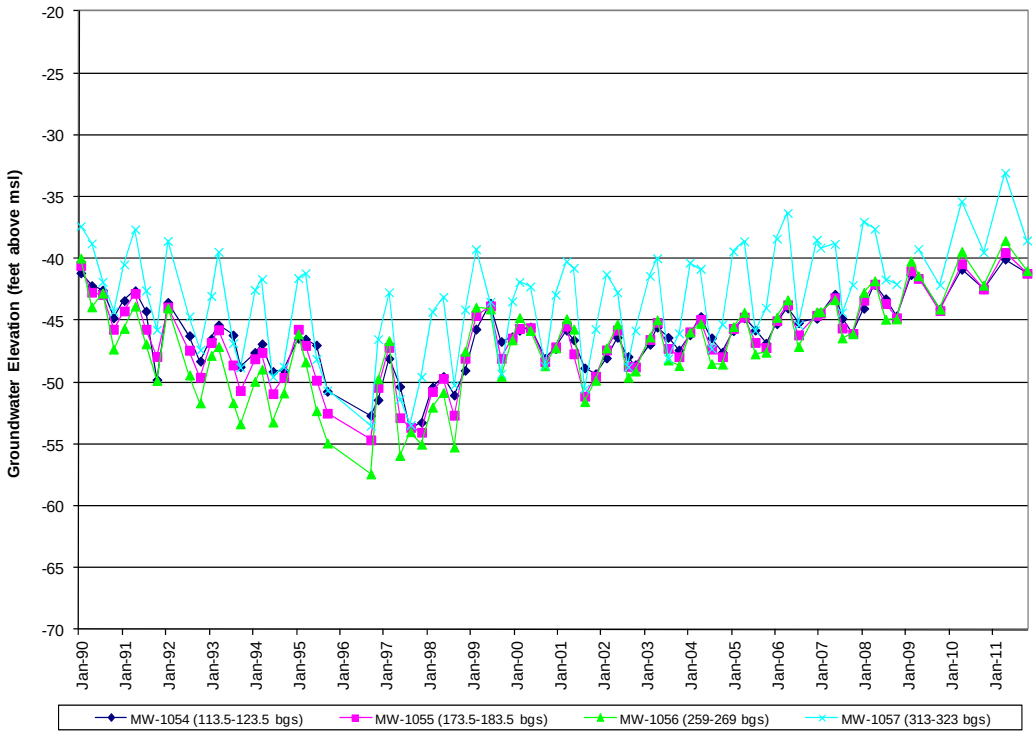

Figure 11. Multiple-Completion Monitoring Well Data for SGA Central Area

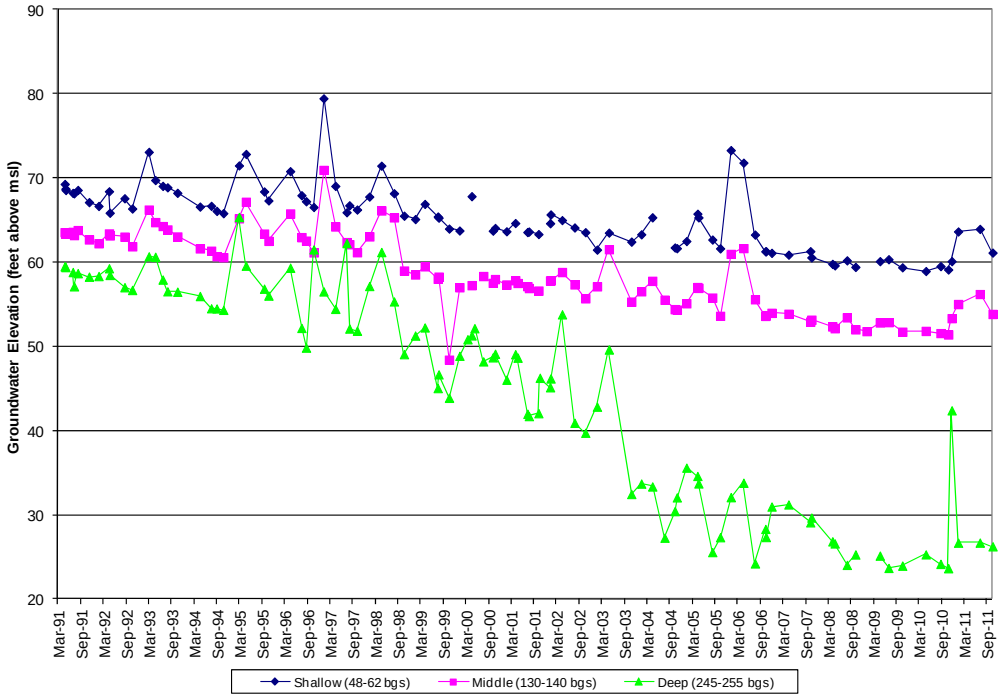

Figure 12. Multiple-Completion Monitoring Well Data for SGA Eastern Area

Groundwater Quality

Generally, the quality of groundwater in the basin is suitable for nearly all uses, with the exception of documented areas of contamination and localized quality issues discussed later in this section.

Water Quality in Public Supply Wells

As of 2011, there were 208 public supply wells in the North Area Basin classified as either "active" or "standby" by the California Department of Public Health. Additionally, there are 22 independent small water systems relying on groundwater that are monitored by the Sacramento County Environmental Management Department. To evaluate groundwater quality, SGA reviewed water quality data reported by SGA members to the California Department of Public Health between 2001 and 2010. While each member agency is responsible for its own compliance with drinking water regulations, SGA utilizes this information to evaluate regional conditions with respect to water quality parameters of interest.

This Basin Management Report describes available data from public supply wells for total dissolved solids (as an overall indicator of groundwater quality), arsenic, nitrate, radon, iron, manganese, hexavalent chromium, and tetrachloroethylene (PCE). Sampling frequencies for individual constituents vary considerably and are also subject to waivers granted by the Department of Public Health. To obtain a record for as many wells as possible, the water quality data were queried for records from

2001 through 2010, with the maximum concentration being used in wells that had multiple analyses. One exception to the data period noted above is radon, for which data has been collected since 1989 to allow for as large a dataset as possible. Each of the parameters is described further below. Also note that the water quality review included in this version of the Basin Management Report was performed as part of the Groundwater Quality Vulnerability Assessment completed by SGA in 2011. Therefore, data for some wells south of the SGA area are included in the summary and figures for the constituents described below with the exception of radon.

Total Dissolved Solids

Total dissolved solids (TDS) is a measure of all dissolved constituents in water, resulting primarily from rocks and sediments with which the water comes in contact. TDS has a secondary maximum contaminant level (MCL) drinking water standard (associated with the aesthetics of the water) of 500 milligrams per liter (mg/L). There were 255 distinct samples from wells analyzed in the period. With respect to TDS, the quality of water in the basin is excellent, with an average TDS of 268 mg/L and only six wells exceeding the secondary MCL. Figure 13 shows the general distribution of TDS in public supply wells.

Arsenic

Arsenic is a naturally occurring element in the earth's crust. In 2006, the federal drinking water standard for arsenic was lowered to 10 micrograms per liter (ug/L). In general, elevated arsenic in the Sacramento region is not the significant problem it is in many parts of the San Joaquin Valley. Of the 236 distinct arsenic samples from the period, 67 were at or below the analytical detection level of 2 ug/L. Of the remaining wells with values above the detection level, the average was only 3.6 ug/L, with one well exceeding the MCL. Figure 14 shows the general distribution of arsenic concentrations in public supply wells.

Nitrate

Nitrate is a naturally occurring element, but elevated concentrations are often associated with human activities such as wastewater discharge, urban runoff of applied fertilizers, and agricultural activities. High concentrations of nitrate interfere with the body's ability to transfer oxygen in the blood stream, most notably in "blue baby" syndrome. The primary MCL for nitrate (as NO3) in drinking water is 45 mg/L. Tests have shown that nitrate levels in public supply wells are generally not of concern in the SGA area. Of 252 samples from public supply wells tested during the period, the average concentration was 11.5 mg/L with a maximum observed concentration of 51 mg/L. Figure 15 shows the general distribution of nitrate concentrations in public supply wells.

Radon

Radon is a naturally occurring radioactive gas believed to cause lung cancer in humans. Although radon from drinking water sources contributes only a small percentage of overall exposure to radon from all sources, EPA issued a proposed rule for maximum concentrations of 300 picoCuries per liter (pCi/L) in 1999. That rule has

yet to be finalized and there is no updated estimate for its release. Therefore, there is no current standard for radon in drinking water.

Relative to the proposed rule, radon could be a potential future concern for local public water suppliers in the North Area Basin. Of 101 samples from public supply wells collected between 1994 and 2002, the average concentration of radon exceeded 395 pCi/L. Fifty-nine of the wells (58%) exceeded 300 pCi/L, with 16 of the wells exceeding 600 pCi/L. Local water purveyors will closely monitor this proposed rule as it is further examined in the future. Because this data has not been updated recently, no updated figure was developed for radon in this report.

Iron

Iron is a naturally occurring element in the earth's crust and is found in groundwater as a metallic ion. Iron has a secondary MCL of 300 ug/L because at elevated concentrations, it tends to have a bad taste and can precipitate as a red-brown solid on plumbing fixtures. In general, dissolved iron is not considered a significant problem in SGA-area public supply wells, but it is fairly routinely encountered. Of the 196 distinct wells sampled during the period, six wells were below the detection level of 10 ug/L. Of the wells with detections, 56 wells had concentrations exceeding the secondary MCL. Note that these represent the maximum detections observed in a given well, so the well may not routinely sample above these concentrations. Figure 16 shows the general distribution of iron concentrations in public supply wells.

Manganese

Manganese is a naturally occurring element in the earth's crust and is found in groundwater as a metallic ion. Manganese has a secondary MCL of 50 ug/L because at elevated concentrations, it can have a bad taste and can precipitate as a black solid on plumbing fixtures. In general, dissolved manganese is not a significant issue in SGA-area public supply wells, but it is fairly routinely encountered. Of the 183 distinct wells sampled during the period, 55 wells were below the detection level of 10 ug/L. Of the remaining wells, 35 wells had concentrations exceeding the secondary MCL. Figure 17 shows the general distribution of manganese concentrations in public supply wells in the North Area Basin.

Hexavalent Chromium

Hexavalent chromium (CrVI) is a heavy metal that is commonly found in low concentrations in driking water. It can occur naturally, but has also been sourced historically from industrial operations. CrVI is known to be a potent carcinogen when inhaled, and was also found to cause cancer in laboratory rats and mice that were exposed through drinking water. Currently, there is no MCL for CrVI, but a public health goal (PHG) has been established at 0.02 ug/L. The occurrence of CrVI is widespread in the SGA area. Of the 206 distinct wells sampled between 2001 and 2003 as part of the unregulated contaminants monitoring rule (UCMR) program, 126 wells were below 5 ug/L, 63 had concentrations from 5 ug/L up to 10ug/L, and 17 had concentrations greater than 10ug/L. Figure 18 shows the general distribution of CrVI concentrations in public supply wells.

Tetrachloroethylene

Tetrachloroethylene (PCE) is a volatile organic compound (VOC) used as a component of solvents, hydraulic fluids, paint thinners, and dry cleaning agents. PCE currently has an MCL of 5 ug/L, but could be lowered in the future. Of the 142 wells sampled from the period, 118 wells were below the detection level of 0.5 ug/L. Of the remaining wells with detections, six had concentrations exceeding the MCL. Figure 19 shows the general distribution of PCE concentrations in public supply wells. Notably, a number of wells with relatively high concentrations are being detected in the northern part of Sacramento County adjacent to Interstate 80. The number of detections is increasing through time downgradient from this area, which is a source of concern to SGA.

Known Contaminant Plumes in SGA and Vicinity

Groundwater contaminant plumes within or near the North Area Basin are present from source areas at the former McClellan Air Force Base, the former Mather Air Force Base, Aerojet, the Union Pacific Railroad site in Sacramento, and a number of industrial sites in north Sacramento. The extent of these plumes, based on available data through 2008, is shown in Figure 20. The presence of these plumes is an ongoing concern to SGA members as it may impact their ability to fully develop conjunctive use programs to implement the Water Forum Agreement. Further identification and tracking of these plumes and other more localized sources of groundwater contamination will continue to be a major focus of SGA.

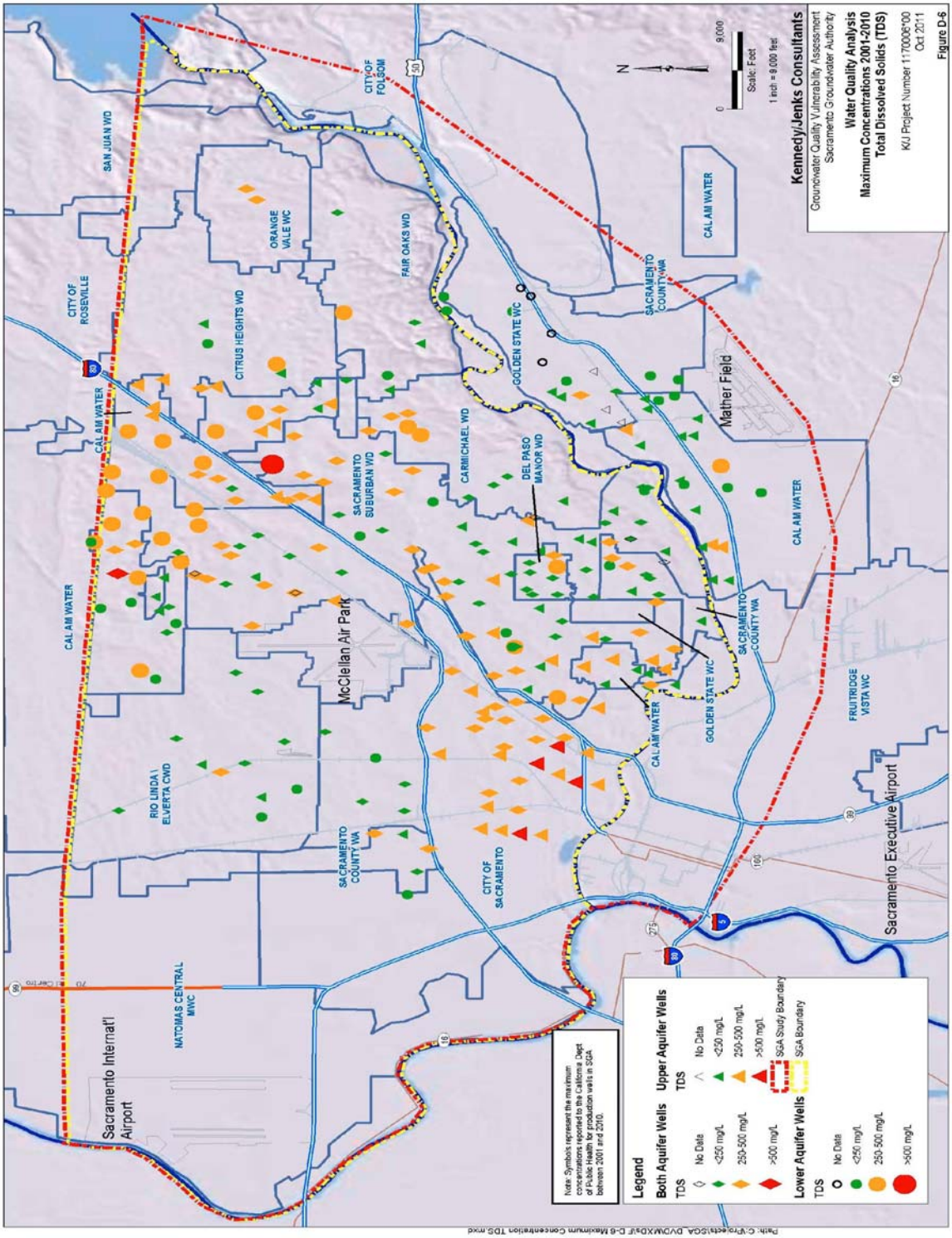

Figure 13. TDS Concentrations in Public Supply Wells

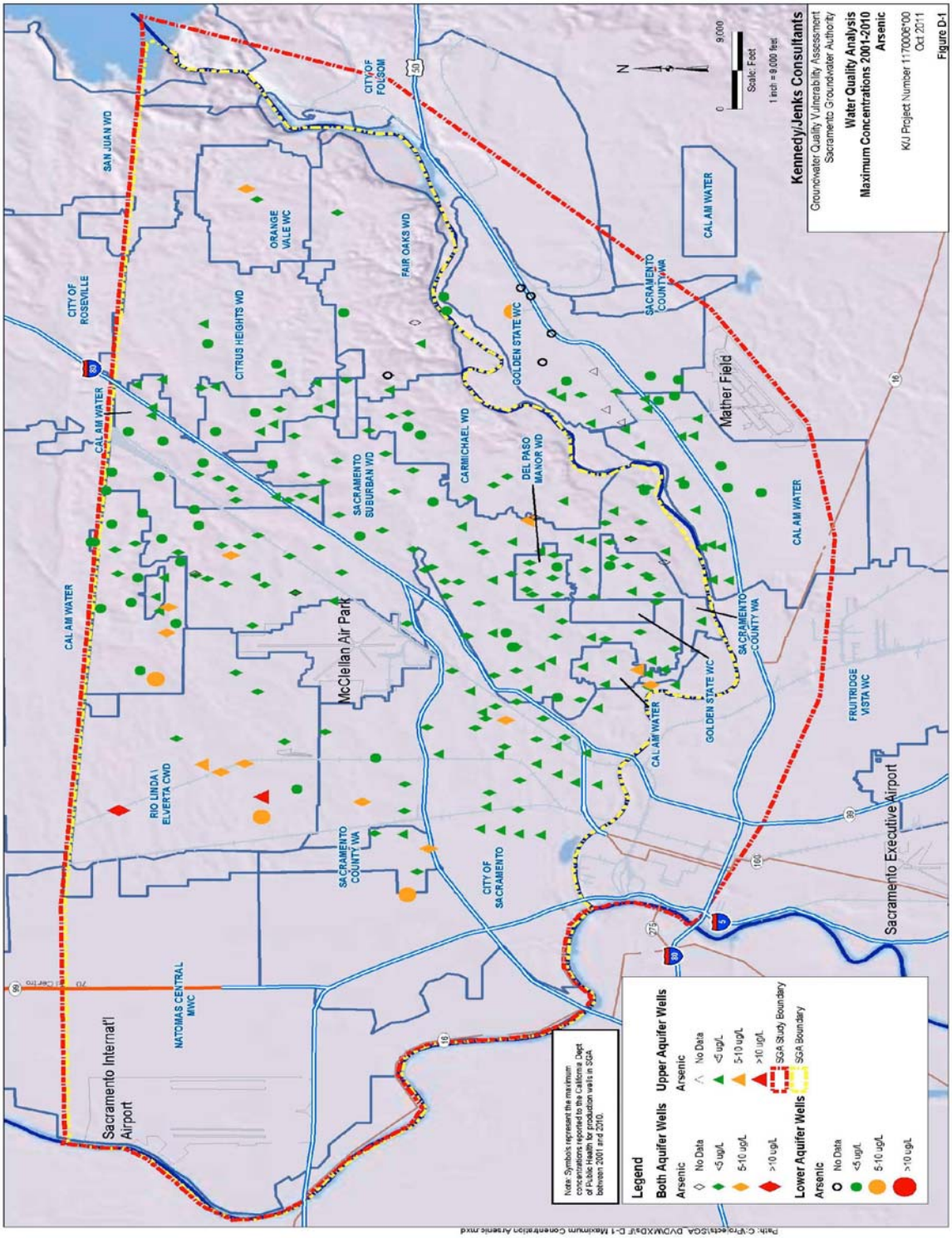

Figure 14. Arsenic Concentrations in Public Supply Wells

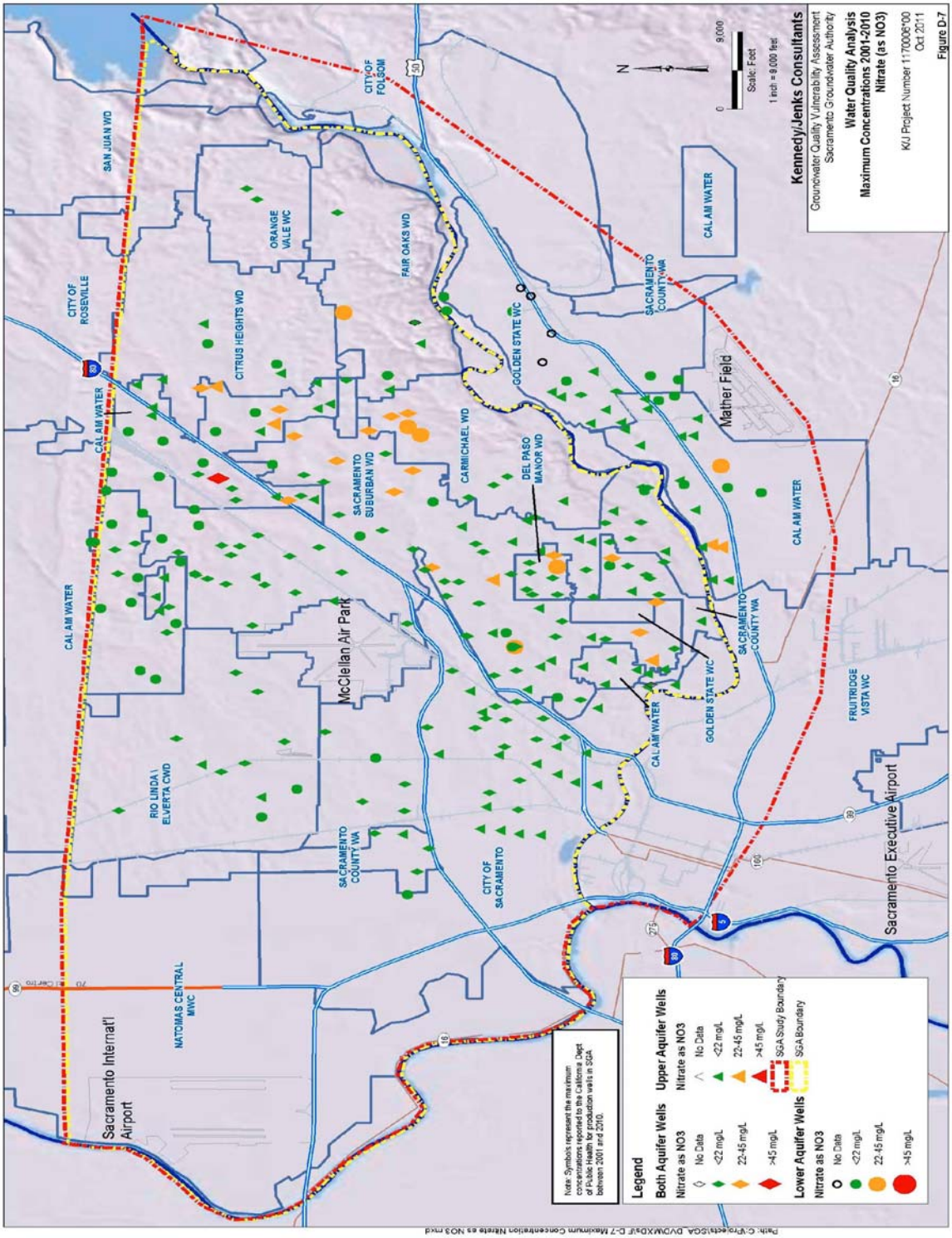

Figure 15. Nitrate Concentrations in Public Supply Wells

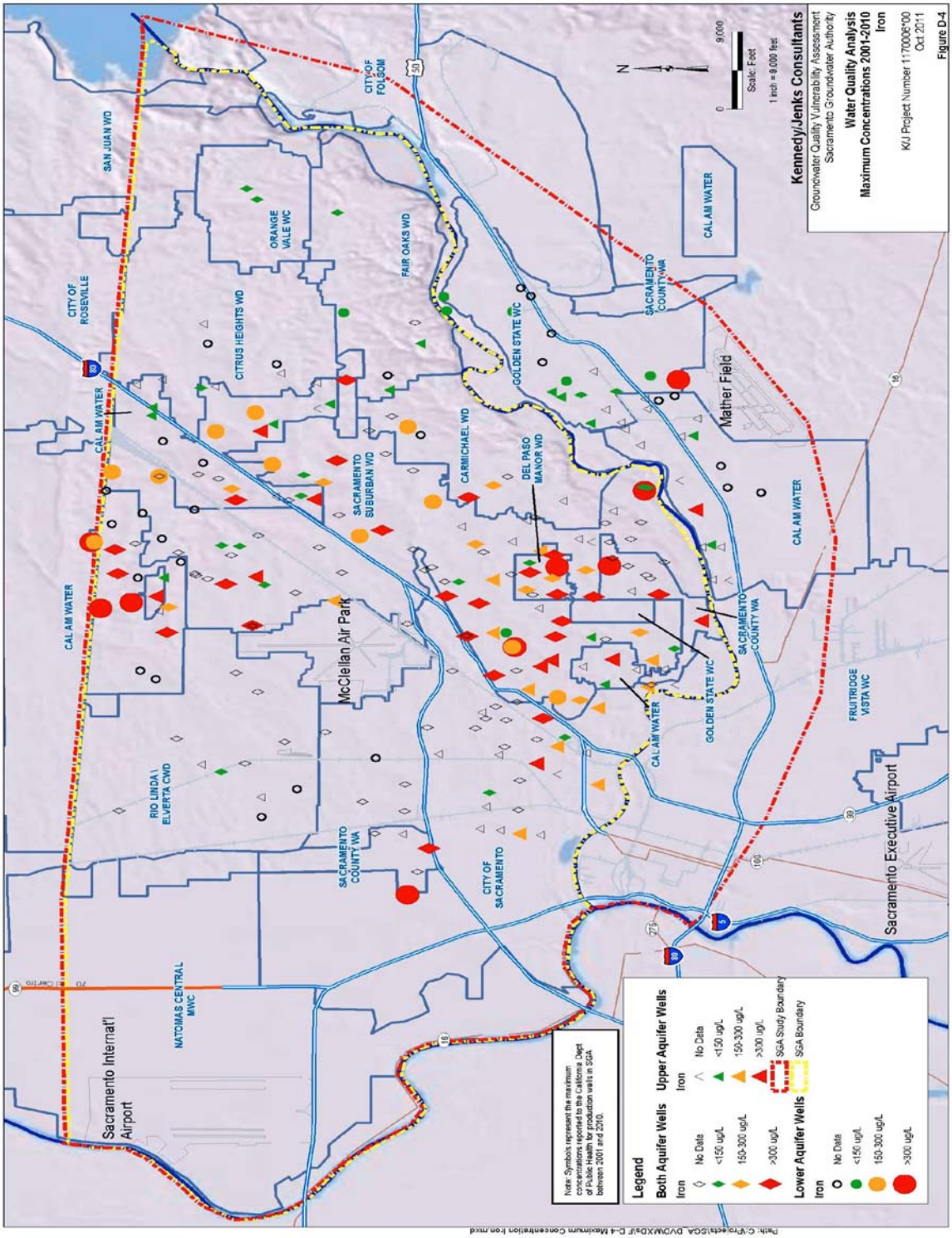

Figure 16. Iron Concentrations in Public Supply Wells

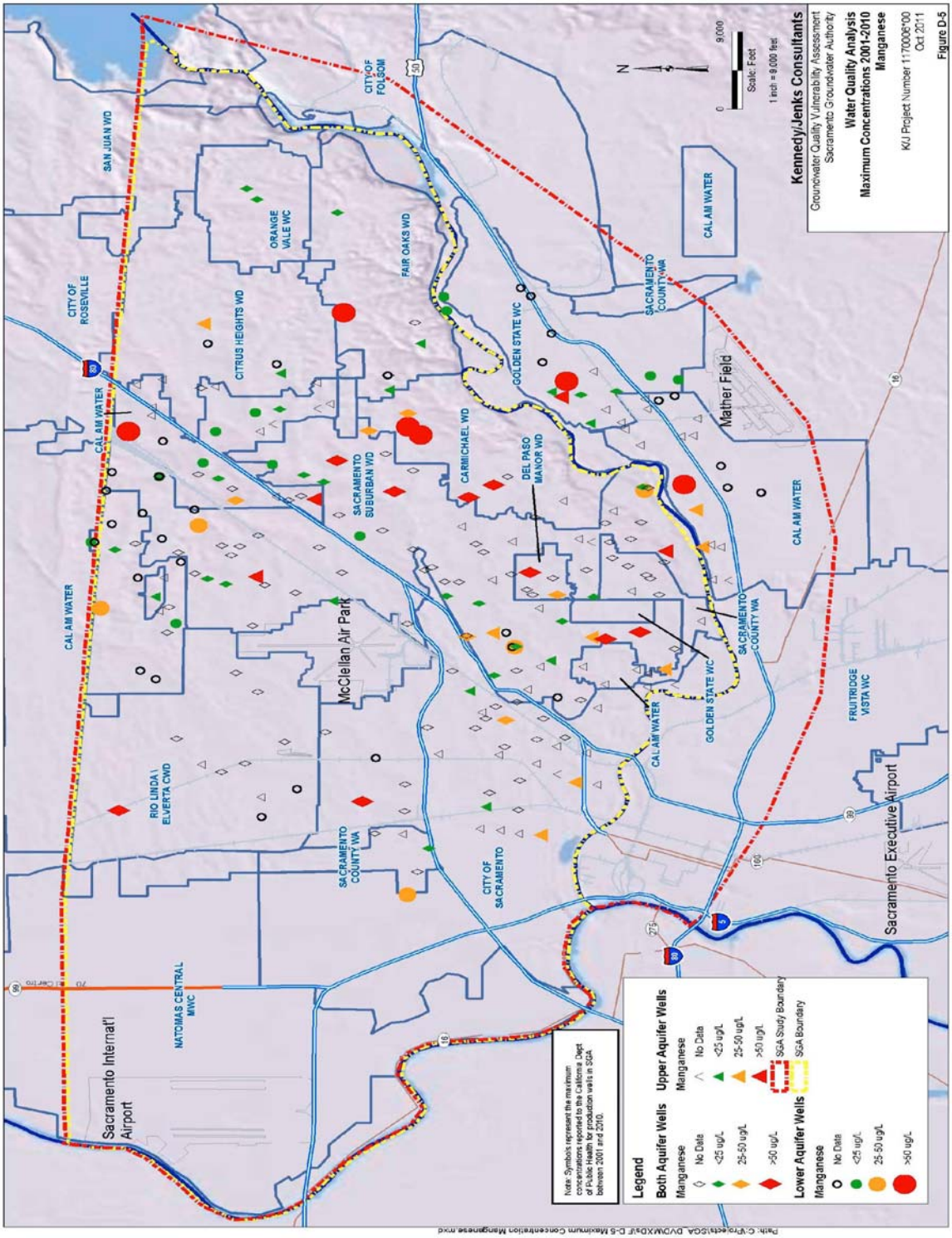

Figure 17. Manganese Concentrations in Public Supply Wells

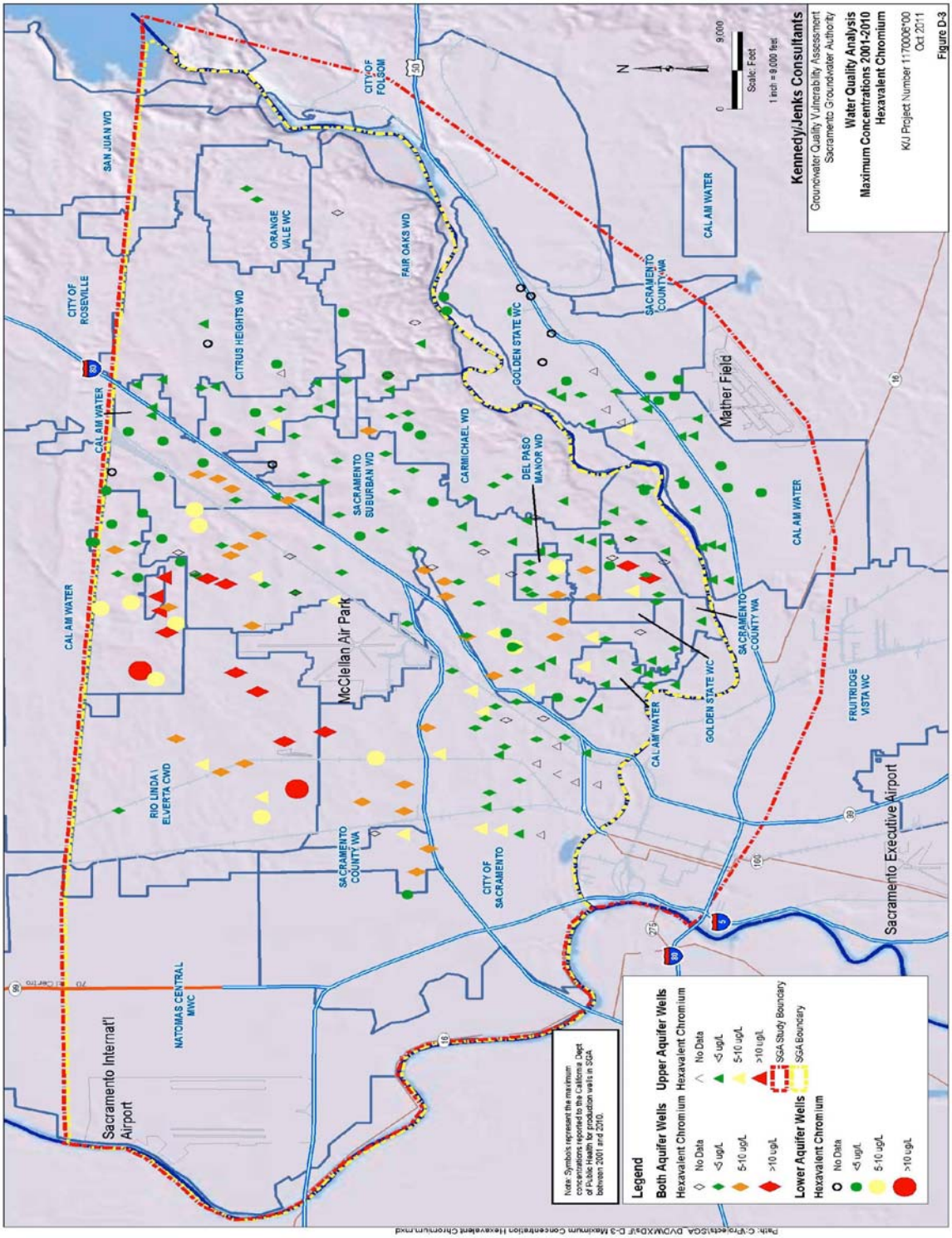

Figure 18. Hexavalent Chromium Concentrations in Public Supply Wells

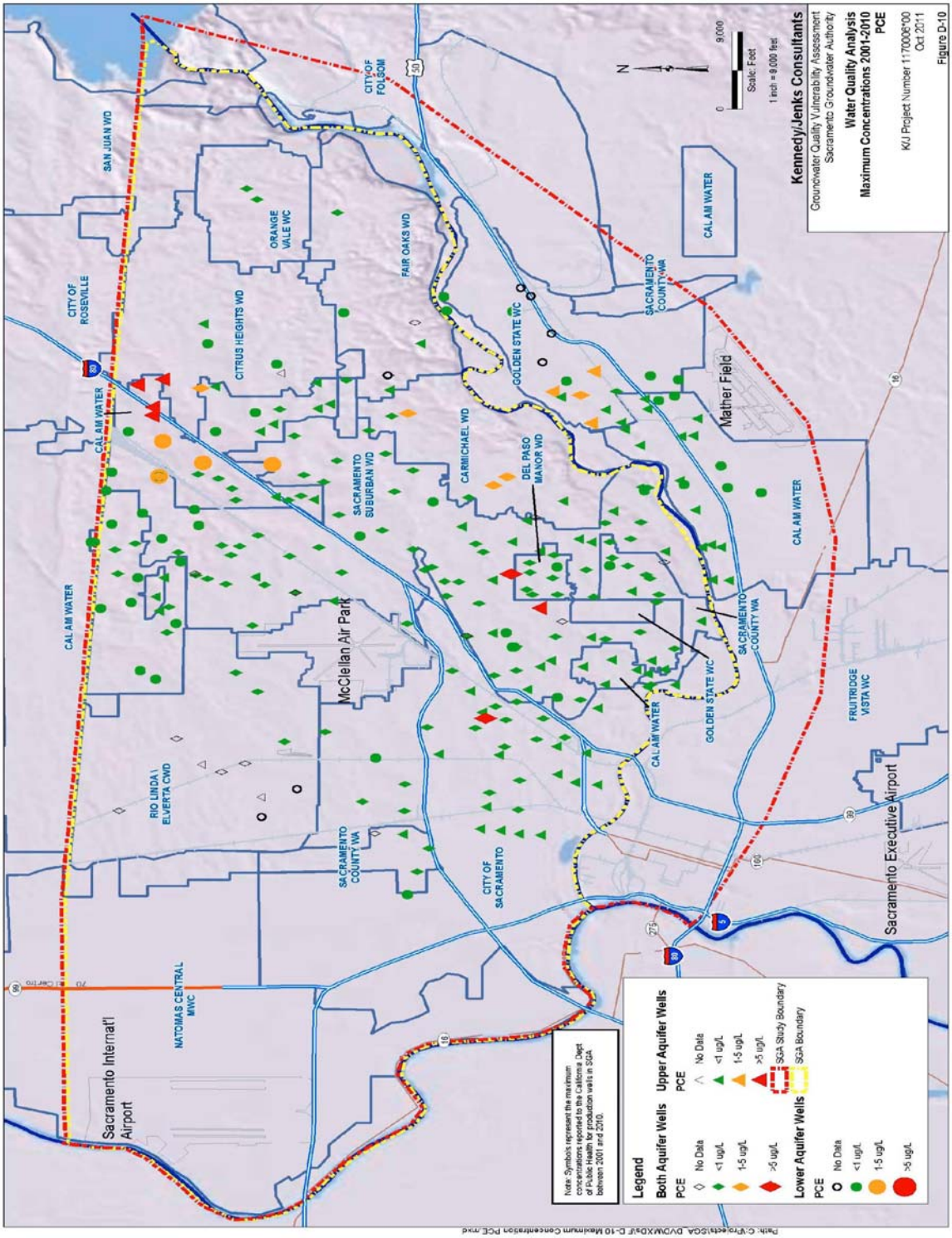

Figure 19. Tetrachloroethylene Concentrations in Public Supply Wells

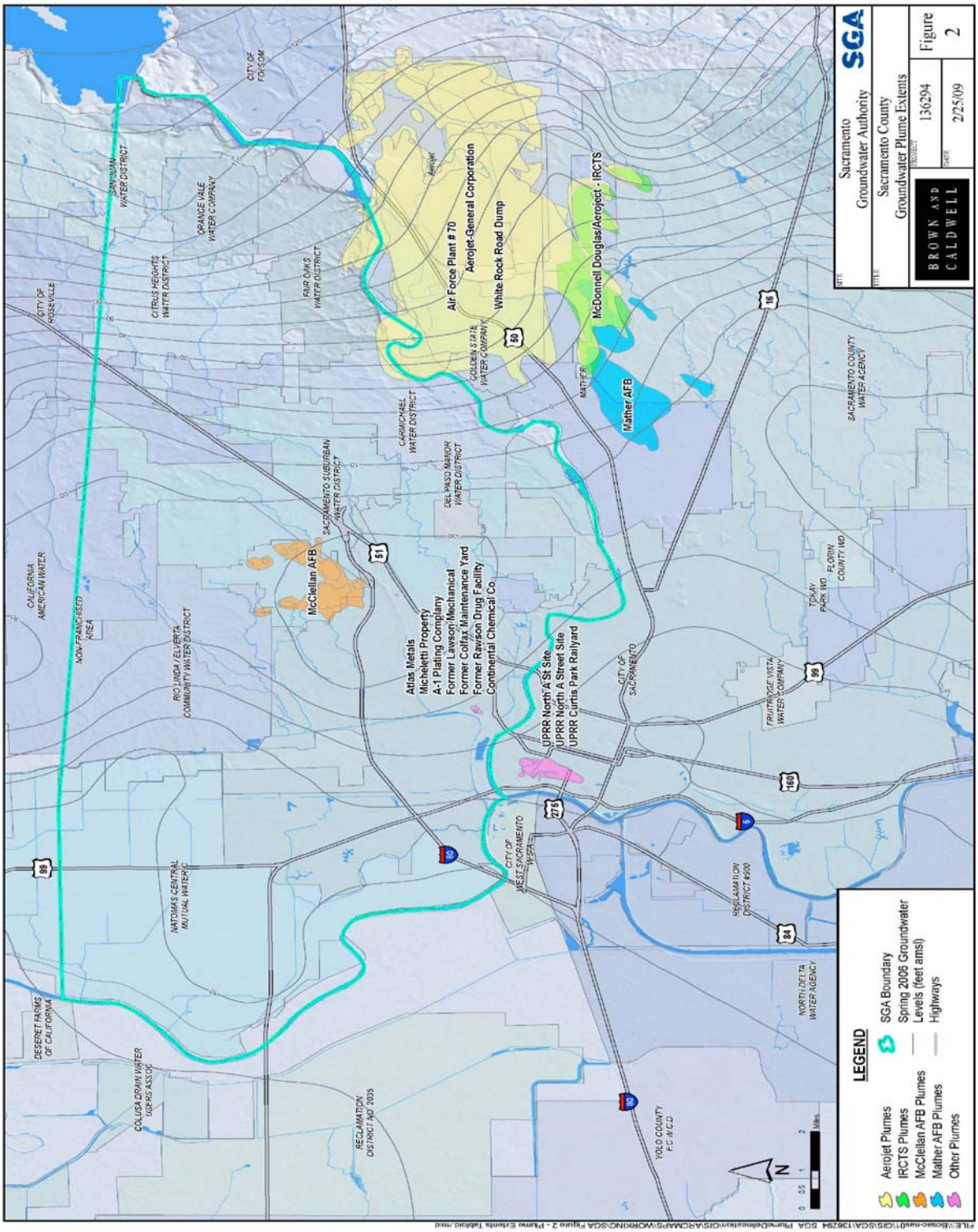

Figure 20. Extent of Contaminant Plumes in the North Area Basin and Vicinity

Basin Management Activity Highlights

Key management activities in the basin from 2008 through 2011 are described in this section.

Implementation of the SGA GMP

The updated GMP adopted by SGA in December 2008 identifies 79 specific management actions for the groundwater basin. Significant progress was achieved in implementing these actions since 2008. While many of the actions are considered ongoing, there are many others that have been completed. Appendix A provides a detailed status for each of the adopted actions.

Other SGA Management Actions

A few key management actions completed by SGA during the period warrant more description. These include: 1) completion of a Water Accounting Framework; 2) completion of a Groundwater Quality Vulnerability Assessment; and 3) completion of an approved CASGEM monitoring network.

Water Accounting Framework

The Water Accounting Framework (Framework) adopted by the SGA Board establishes policies and procedures to encourage and support conjunctive use operations within the SGA area. The Framework was developed in three phases, in part due to the complexity of resolving the issue of establishing an equitable conjunctive use program with a variety of interested parties, and in part because of evolving conditions in the basin. All three documents associated with the Framework phases are available at http://www.sgah2o.org/sga/programs/groundwater/.

Phase I of the Framework was completed in July 2006, and involved developing a white paper to establish the purposes of a Framework and to identify the current conditions in the basin that would influence the development of the Framework.

Phase II was completed in April 2007, and included technical analysis and additional stakeholder outreach. Phase II resulted in identifying the primary elements of the Framework and recommended developing a Model Banking Program for SGA members interested in potential banking and exchange operations.

Phase III was completed in June 2010, and establishes a set of policies and procedures that will encourage and support conjunctive use operations within the SGA area of jurisdiction to facilitate the long-term sustainability of the underlying groundwater basin as source of public water supply. The Framework recognizes investments by the SGA member agencies in the development of conjunctive use programs and supports groundwater banking programs that enhance the long-term sustainability of the groundwater basin. With adoption of Phase III, the SGA Board

established that the Framework is a living process and must include regular review to evaluate whether the Framework is accomplishing its intended objectives.

Groundwater Quality Vulnerability Assessment

This study was completed in October 2011 and was funded by a Local Groundwater Assistance (AB303) Grant from the Department of Water Resources. The purpose of the study was to assess the various threats to the long-term sustainability of groundwater in the basin underlying the SGA area. To assess the vulnerability of the region, three study elements were completed: 1) a groundwater quality threat assessment; 2) a sustainability assessment; and 3) an economic impact analysis. The study provided relative rankings of the vulnerability of the area underlying SGA based on potential and known sources of contamination combined with the physical characteristics of the basin. This can serve as a long-term planning tool for local water supply agencies. The final study report will be posted on the SGA website in 2012.

CASGEM Monitoring Network

In November 2009, the state legislature passed SBx7-6 requiring the monitoring of the state's groundwater basin for representative groundwater elevation trends. The legislation stresses locally-developed monitoring in basins that have the capacity to perform such monitoring, and tied compliance with this monitoring to eligibility for grant and loan programs administered by the state. In response to the legislation, DWR developed guidelines for what it termed the California Statewide Groundwater Elevation Monitoring (CASGEM) Program.

In response to the legislation, SGA applied to become the monitoring entity for the groundwater basin underlying the SGA area in December 2010, followed by submission of a monitoring plan in December 2011. SGA proposed a network based on observed long-term trends, known aquifer characteristics, and future planned groundwater production reported by public water suppliers. The approved network includes 23 distinct locations, 8 of which have multi-completion wells, for a total of 42 measurements to be collected. Of the wells, 12 will be monitored directly by SGA staff, 23 will be monitored by SSWD staff and reported to SGA, and 7 are monitored by DWR and posted in the WDL. Initial monitoring of the network occurred in October 2011. The full monitoring plan can be downloaded from the SGA website at http://www.sgah2o.org/sga/.

Conclusions and Recommendations

SGA has continued to make significant strides toward ensuring a reliable groundwater basin for future generations and advancing successful implementation of the Water Forum Agreement. With the development of critical monitoring and management tools, SGA now has a solid foundation for managing the basin. These tools included the SGA Data Management System, a regional monitoring well network, an updated regional IGSM model to help analyze future conjunctive use operations aimed at improving water supply reliability. All of these tools were used to successfully complete the projects described in the previous section.

During the revision of its GMP in 2008, SGA reviewed the original 2003 Basin Management Objectives and considered additional objectives. Furthermore, SGA evaluated the need to establish numeric targets associated with these objectives. SGA determined that there was little value in establishing quantified objectives at this time. The revised GMP adopted by SGA includes eight objectives. SGA and its members have made significant progress toward meeting each of these objectives. That progress is described in further detail below.

SGA Groundwater Management Plan Objectives

Maintain or improve groundwater quality in the SGA area to ensure sustainable use of the groundwater basin

SGA is making good progress toward meeting this objective. With the noted exception of regional contamination plumes, groundwater quality is very good in the basin and suitable for public water supply needs. SGA has taken a proactive approach to improving the basin's groundwater quality through its Regional Contamination Issues Committee. The committee meets regularly with regulatory agencies and responsible parties to ensure that the basin's importance as a public water supply is considered in developing clean-up strategies. Actions by this committee have helped ensure that clean-up efforts remain on track at McClellan and that effective clean-up strategies are aggressively pursued for recently detected contaminants associated with Aerojet. The recently completed Groundwater Quality Vulnerability Assessment provides an additional tool in ensuring basin sustainability from a water quality perspective.

Maintain groundwater elevations that provide for sustainable use of the groundwater basin

SGA member agencies have implemented a variety of programs in recent years that are helping to meet this objective. Groundwater elevation contour maps included in this report clearly show that conjunctive use programs continue to produce tangible results. More projects are underway that will further benefit the basin and support implementation of the Water Forum Agreement. The long-term hydrographs shown

previously in this report clearly demonstrate the benefits of conjunctive use in the basin.

Finally, SGA completed Phase III of the Water Accounting Framework in 2010. This will help ensure the basin is operated in a sustainable fashion and that some cost equity is achieved for those investing most heavily in conjunctive use facilities in the basin.

Protect against potential inelastic land surface subsidence

While subsidence is not a documented problem within the North Area Basin, SGA and its members have evaluated past subsidence in the region. Sacramento Suburban Water District has also recently completed surveys that demonstrate that subsidence is not a concern in the North Area Basin.

Manage groundwater to protect against adverse impacts to surface water flows in the American River, the Sacramento River, and other surface water bodies within the SGA area

SGA is continuing to meet this objective. In addition to direct monitoring, SGA completed enhancements to the IGSM in 2007. Enhancements included refining the model elements that represent the American River and improving the level of simulation to include daily as well as monthly data. This improved understanding of the surface water/groundwater relationship will allow SGA to develop operational scenarios if needed to ensure that surface water systems are adequately protected. The model was run in support of local agency participation in the 2009 and 2010 DWR water banks, and in support of the Water Accounting Framework. Both simulations demonstrated no significant adverse impacts to surface water flows.

Protect against adverse impacts to surface or groundwater quality resulting from interaction between groundwater in the basin and surface water flows in the American River, the Sacramento River, and other surface water bodies within the SGA area

SGA is making progress toward meeting this objective. The modeling and monitoring along the river systems demonstrate that groundwater is not discharging to the surface water to any appreciable degree, so the potential to have negative impacts from groundwater is negligible.

Educate on the need to achieve recharge to the aquifer of appropriate quality and quantity to ensure basin sustainability

SGA is making progress toward this objective. SGA is closely following the permitting of aquifer storage and recovery (ASR) wells in Placer County, which is part of the North American Subbasin. SGA is also coordinating with pilot projects to evaluate recharge in stormwater detention basins near Elk Grove and in a former gravel mining operations south of Rancho Cordova. SGA will also conduct additional assessment of its recharge areas in compliance with AB359.

Maintain a sustainable groundwater basin to help mitigate potential water supply impacts resulting from an uncertain climate future and an increasingly unreliable state and federal water delivery system

SGA is making good progress toward meeting this objective. The completion of the Water Accounting Framework, Phase III in 2010 was a significant step toward defining both the amounts and responsibilities of sustainable levels of groundwater use in the central part of the SGA area. SGA will also coordinate with RWA in 2012 to evaluate the potential impacts on the groundwater basin resulting from future climate changes scenarios.

Maintain a sustainable groundwater basin underlying the SGA area through coordination and collaboration with adjacent groundwater basin management efforts

SGA is making good progress toward meeting this objective. SGA continues to regularly coordinate with representatives of Placer County and the Sacramento Central Groundwater Authority. In 2011, SGA coordinated with these entities on development of a CASGEM monitoring network. In 2012, SGA will meet with these entities on long-term modeling and data management as well as evaluating other potential areas where coordination could lead to more effective groundwater management.

Recommendations for GMP Objectives and Action Items

While the GMP Implementation Table (see Appendix A) is used to track specific actions identified in the 2008 GMP, the following recommendations are priority recommendations for 2012 and 2013 that will help SGA implement its groundwater management mission.

- Reconvene the SGA GMP Implementation Committee in 2012 for guidance on content for the next iteration of the SGA BMR and the next update of the SGA GMP.
- Revise and re-adopt the SGA GMP by December 2013.
- Continue to manage and analyze the GIS tools developed for the SGA Groundwater Quality Vulnerability Assessment.
- Meet with representatives of Placer County and Sacramento Central Groundwater Authority to discuss long-term modeling and data management needs.
- Assist in the study of potential sources of continued detections of PCE in north Sacramento County as an emerging issue of regional concern.

Appendix A

GMP Action Items

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT			
1.1	***Involving the Public***		
1	Continue efforts to encourage public participation as opportunities arise.	On-going	Provide GMP Program status update at each publicly noticed SGA Board meeting.
2	Provide briefings, copies of Basin Management Reports, and a written annual summary to the Water Forum Successor Effort on GMP implementation progress.	12 months	Provided copies of the 2008 GMP and Biennial Basin Management Report to WFSE in February 2009.
3	Provide a written annual summary on GMP implementation progress to JPA signatories.	12 months	Initial annual summary covering 2011 sent to signatories in April 2012.
4	Work with SGA members to maximize outreach on GMP activities including the use of the SGA Web site, member Web sites, or bill inserts.	On-going	Posted 2008 GMP and BMR update on SGA website in February 2009. Electronic versions of all Board packets are posted on the SGA website.
1.2	***Involving Other Agencies Within and Adjacent to the SGA Area***		
1	To the extent practicable attend regular meetings of the Sacramento Central Groundwater Authority and the Placer Groundwater Authority and notify them of SGA Board meetings.	On-going	SGA staff participate in regular meetings of the SCGA. In Placer County, the groundwater management plan representatives have not formed as an official entity and do not currently have a standing meeting. All SGA Board meetings are noticed via e-mail to a representative of SCGA and the City of Roseville (representing the Placer County GMP).
2	Provide copies of the adopted GMP and subsequent Biennial Basin Management Reports to representatives from Placer Groundwater Authority, Sutter County, and Yolo County, and the Sacramento Central Groundwater Authority.	3 months	Copies of the 2008 GMP and BMR were sent to Placer County (Placer County Water Agency, City of Lincoln, City of Roseville), Sutter County (South Sutter Water District, Sutter County Public Works), Yolo County Water Resources Agency, and SCGA by June 2009.
3	Meet with representatives from Placer Groundwater Authority, Sutter County, and Yolo County, and the Sacramento Central Groundwater Authority as needed.	On-going	SGA coordinating with representatives of Sutter County during development of a GMP for Sutter County. The GMP was adopted in March 2012, and SGA has obtained a copy of the GMP. SGA attended a public scoping meeting for proposed ASR program in City of Roseville (Placer County) in July 2009. Commented on Notice of Preparation.
4	Coordinate with the Placer Groundwater Authority and Sacramento Central Groundwater Authority to develop a common data platform and share groundwater-related data to the greatest extent practicable to help ensure the mutual sustainability of our common groundwater resources.	12 months	Copies of the SGA database were provided to SCGA and Placer County in 2009. SCGA completed a grant-funded update of its database in 2011. Because the SGA and SCGA data were initially in the same dataset, the SGA data was migrated to the HydroDMS platform. Met with City of Roseville (representing the Placer County groundwater management effort) on October 29, 2009 to get briefing on their data gathering and storage effort. While the PGA will be using different software to manage its data, it can be exported in a compatible format. SGA staff will meet with SCGA and Placer County represnetatives in April 2012 to continue discussing data compatibility issues.
1.3	***Utilizing Advisory Committees***		
1	The GMP Implementation Committee will meet at least annually to review and guide implementation of the plan.	On-going	Did not meet in 2009-2011. SGA will seek Board direction on the need for the committee to convene in 2012.
1.4	***Developing Relationships with State and Federal Agencies***		

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
1	Continue to develop working relationships with local, state, and federal regulatory agencies.	On-going	Continue regular meetings of Regional Contamination Issues Committee to engage state and federal regulatory agencies.
1.5	***Pursuing Partnership Opportunities***		
1	Continue to promote partnerships that achieve both local supply reliability and achieve broader regional and statewide benefits.	On-going	SGA staff will promote partnerships as requested by SGA membership. Met with DWR staff at their request regarding member agency participation in 2009 Drought Water Bank. Assisted agencies in conducting exchanges in 2009 and 2010.
2	Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.	On-going	Attended AB 303 Local Groundwater Assistance grant Technical Advisory Committee meeting in June 2009. Expect release of 303 applications in April 2012.
COMPONENT CATEGORY 2: MONITORING PROGRAM			
2.1	***Groundwater Elevation Monitoring***		
1	Coordinate with member agencies to collect data from a group of representative wells for monitoring spring and fall groundwater elevation measurements.	6 months	Requested Fall 2011 measurements from members in October 2011. These measurements are part of the CASGEM network approved by DWR.
2	Coordinate with DWR and other well monitoring program partners, including SGA members, to ensure that the selected wells are maintained as part of a long-term monitoring network.	6 months	Met with DWR, Sacramento County and applicable members in 2011 to develop CASGEM network for long-term basin monitoring.
3	Coordinate with partners and request that the timing of water level data collection occur on or about April 15 and October 15 of each year.	6 months	Request measurements twice annually on schedule.
4	Coordinate with partner agencies to ensure that needed water level elevations are collected and verify that uniform data collection protocols are used among the agencies.	6 months	Water level measurement protocols were included in the SGA GMP, which was sent to General Managers of each SGA member agency. Additional CASGEM guidance was sent to SSWD as a cooperator in 2012.
5	Coordinate with the USGS to determine the potential for integrating USGS monitoring wells constructed for the NAWQA Program into the SGA monitoring network.	12 months	Met with USGS in September 2011 to discuss use of a subset of NAWQA network wells as part of the SGA CASGEM monitoring program. USGS has granted access to SGA for monitoring four of the NAWQA wells on a semi-annual basis.
6	Maintain the existing SGA monitoring well network for purposes of groundwater elevation monitoring.	On-going	Wells are being maintained and monitored and have been incorporated into CASGEM network. Pressure transducers have been removed from wells 5 and 6 because they are below grade and had recurring maintenance issues. The transducer has been removed from well 8 because no water level variability was observed.
7	Provide a biennial assessment of groundwater elevation trends and conditions to SGA's member agencies, the Water Forum Successor Effort, and adjoining groundwater authorities.	3 months	BMR covering 2006-07 released in December 2008 and posted on SGA website. Report covering 2008-10 to released in April 2012 and posted on SGA website.
8	Assess the adequacy of the groundwater elevation monitoring well network biennially.	12 months	Review in 2011 as part of CASGEM compliance. SGA has identified a representative set of wells that will be used fo CASGEM compliance. SGA has also identified additional wells that will be used for long-term hydrographs and preparation of an annual contour map. Data from these wells is included in the April 2012 SGA Basin Management Report.
2.2	***Groundwater Quality Monitoring***		
1	Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.	On-going	Agencies are using standards for collection of samples under Title 22 monitoring requirements.
2	Maintain the existing SGA monitoring well network for purposes of groundwater quality monitoring.	On-going	The wells are being maintained. The last water quality sampling occurred in 2007.
3	Coordinate with the USGS to continue to obtain water quality data from NAWQA wells.	12 months	Corresponded with USGS to understand status of NAWQA network in July 2010. USGS confirmed wells are monitored every 2 to 3 years for water quality depending on budget.

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
4	Coordinate with member agencies and other local, state, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data. Identify opportunities for collecting and analyzing water quality samples from those wells.	12 months	No areas of significant data gaps are currently identified.
5	Assess the adequacy of the groundwater quality monitoring well network in the Biennial Basin Management Report.	12 months	During the 2009-2011 study of groundwater quality vulnerability in the SGA area, the network was determined to be appropriate to understand most water quality concerns in the basin. Specific additional monitoring will need to be identified as specific issues arise.
2.3	***Land Surface Elevation Monitoring***		
1	Re-survey the benchmarks established at SGA monitoring wells.	24 months	Staff does not recommend that the monitoring wells be re-surveyed. Benchmarks were not established at these sites, so the value of surveying them would be questionable.
2	Coordinate with other agencies, particularly the City and County of Sacramento, the NGS, and SAFCA to determine if there are other available data in the SGA area to aid in the analysis of potential land surface subsidence.	6 months	In 2008 and 2009, staff attempted to identify appropriate sites through the www.ngs.noaa.gov website. Very little active and accessible data is available in the region. Sac Suburban has actively monitoring benchmarks at most of its well sites, and is not observing any appreciable subsidence. Staff recommends continued coordination with Sac Suburban at this time.
3	Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence.	On-going	Given the lack of evidence of subsidence in the SGA area, this item is being deferred at this time.
2.4	***Surface Water Groundwater Interaction Monitoring***		
1	Coordinate with local, state, and federal agencies to identify available surface water quality data from the American and Sacramento rivers adjacent to the SGA area.	12 months	The Sacramento Coordinated Water Quality Management Program completes an annual monitoring report including water quality and flow data at several locations along the American and Sacramento Rivers. SGA has obtained the 2007 version of this report, which was completed in early 2009.
2	Correlate groundwater level data from wells in the vicinity of river stage data to further establish whether the river and water table are in direct hydraulic connection, and if the surface water is gaining or losing at those points.	12 months	The Sacramento Coordinated Water Quality Management Program completes an annual monitoring report including water quality and flow data at several locations along the American and Sacramento Rivers. SGA has obtained the 2007 version of this report, which was completed in early 2009.
3	Continue to coordinate with local, state, and federal agencies and develop partnerships to investigate cost-effective methods that could be applied to better understand surface water-groundwater interaction along the Sacramento and American rivers.	12 months	This was completed as part of an evaluation of the 2010 Drought Water Bank and development of the SGA Water Accounting Framework. The SGA IGSM application was run to estimate the level of surface-water groundwater interaction in the region as a result of current conjunctive use operations. Results were presented to the SGA Board and DWR in February 2010.
4	Coordinate with CSUS to analyze data obtained from monitoring wells on the CSUS campus to better understand the relationship between the groundwater basin and surface water flows at that location.	12 months	SGA staff communicated with CSUS and discovered that the wells are not consistently monitored and data is not consistently analyzed. Staff recommends not further action on this item.
5	Coordinate with the Corps of Engineers and SAFCA to review projects that could negatively impact recharge from rivers to the underlying groundwater basin.	On-going	Staff is tracking progress on the American River Common Features General Re-evaluation Report (GRR). The GRR will investigate the flood protection system along the American River, Natomas, the east side of the Sacramento River, and the levees in North Sacramento to identify what improvements are needed to bring the system up to a 200-year standard (www.safca.org). The report is expected in 2014.
2.5	***Protocols for the Collection of Groundwater Data***		
1	Use a Standard Operating Procedure (SOP) for collection of water level data by each of the member agencies.	3 months	Water level measurement protocols are included in the SGA GMP. The final GMP was sent to member agency General Managers and Directors in 2009.
2	Provide member agencies with guidelines on the collection of water quality data developed by DHS for the collection, pretreatment, storage, and transportation of water samples (DHS, 1995).	6 months	This guidance document is out of date and is no longer available.
3	Provide training on the implementation of these SOPs to member agencies, if requested.	On-going	No training has been requested.
COMPONENT CATEGORY 3: DATA MANAGEMENT AND ANALYSIS			

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
3.1	***SGA Groundwater Model***		
1	Assemble a committee to review the current functionality of the SGA IGSM application and to discuss the pros and cons of the existing modeling tool and other tools (e.g., IWFM or MODFLOW) that may be available for longer-term modeling needs.	24 months	This activity did not occur, as the completion of completion of the Water Accounting Framework in 2009 and 2010 took a higher priority. Staff will seek direction from the SGA Board in 2012 on recommended actions.
2	Canvas the membership annually to determine if they have any upcoming modeling needs.	12 months	Used model to determine losses of banked water and streamflow losses resulting from participation in water transfers with state or federal programs in 2009-2010.
3	Work with the current modeling support consultant to identify tools (pre- and post-processing) that can make the model more efficient to operate and to create graphics that help better present modeling results.	12 months	The modeling consultant has made improvements to the pre- and post-processing tools. Staff will review these in 2012.
3.2	***Comprehensive Data Analysis***		
1	Prepare the Biennial Basin Management Report to assess basin conditions in even numbered years.	On-going	Report for 2008-2010 completed in April 2012.
2	Prior to preparation of the 2010 version of the Basin Management Report, review the content of the report with the GMP Implementation Committee to ensure the content of the report is addressing the needs of the SGA members.	18 months	Committee did not meet in 2009-2011. Staff will seek input from Board on the report issued in April 2012.
3	As requested, conduct more focused analyses on issues of concern to SGA members (e.g., cluster of contamination emerging or declining water elevations in a particular part of the basin).	On-going	Cal Am notified SGA of concerns of cluster of wells with high PCE in March 2009. SGA Board directed staff to apply for AB303 funding to study this problem. The applications are expected to be released in April 2012. SGA advised SSWD staff on follow-up to detected NDMA in a production well in March 2009.
3.3	***Data Management System***		
1	Continue to update the SGA database with current water purveyor data.	On-going	Requested 2007-2008 data in 2009. Will request data through 2012 in early 2013.
2	Make recommendations to the DMS developer on utilities to add to the DMS to increase its functionality.	On-going	The original SGA DMS is no longer being supported by the original developer. Staff will consult with Board in 2012 on recommendations for long-term SGA data maintenance.
3	Review the current database and recommend actions to increase the accuracy and efficiency of the SGA database.	12 months	Database review deferred pending migration from Access format to My SQL format. Expect QA/QC in 2012.
4	Work with adjacent groundwater authorities on shared data protocols to achieve the highest level of confidence in the comprehensive data analysis.	12 months	Staff to meet with representatives of Placer County and the Sacramento Central Groundwater Authority in April 2012.
COMPONENT CATEGORY 4: GROUNDWATER RESOURCE PROTECTION			
4.1	***Well Construction Policies***		
1	Ensure that all member agencies are provided a copy of the county well ordinance and understand the proper well construction procedures.	6 months	The County well ordinance was updated in April 2010. The update has been posted on the SGA website at http://www.sgah2o.org/sga/programs/groundwater/.
2	Inform member agencies of Sacramento County's Consultation Zone and provide a copy of the boundary of the former McClellan AFB prohibition zone to appropriate member agencies.	6 months	SGA Board was briefed on McClellan consutlation and prohibition zone in December 2010, along with proposed modifications to the prohibition zone.
3	Provide a copy of the most recently delineated plume extents at the former McClellan AFB, the former Mather AFB, and Aerojet to the EMD and SGA members for their review and possible use.	6 months	Updated plumes extents as part of Groundwater Quality Vulnerability Assessment completed in 2011. Presented to SGA Board and Regional Contamination Issues Committee.

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
4	Coordinate with member agencies to provide guidance as appropriate on well construction. Where feasible and appropriate, this could include the use of subsurface geophysical tools prior to construction of the well to assist in well design.	On-going	Staff provided information to Rio Linda/Elverta CWD in 2011 to assist in their design of a new production well. Staff coordinated with City of Sacramento in 2011/2012 on two future production wells.
4.2	***Well Abandonment and Well Destruction Policies***		
1	Ensure that all member agencies are provided a copy of the code and understand the proper destruction procedures and support implementation of these procedures.	12 months	The County destruction procedures have been posted on the SGA website at http://www.sgah2o.org/sga/programs/groundwater/.
2	Coordinate with the Sacramento County EMD to identify ways to ensure that wells in the SGA area are properly abandoned or destroyed.	On-going	Have communicated with County on possibility of pursuing joint application for AB303 grant to fund startup of program to be administered by EMD. The SGA Board directed staff to pursue AB303 grant funding for a different study in 2011, but staff will continue to work with the County to ensure wells are propoerly abandoned.
4.3	***Wellhead Protection Measures***		
1	Obtain an updated coverage of potentially contaminating activities and provide to member agencies for their use in protecting existing wells and in siting future wells.	12 months	Obtained in April 2010. Used in Groundwater Quality Vulnerability Assessment completed in 2011.
2	Canvas the SGA membership for current wellhead protection measures and provide a summary of actions taken by others as a tool in managing their individual wellhead protection programs.	18 months	Request information by mid-2012.
4.4	***Protection of Recharge Areas***		
1	Quantify, using the existing numerical SGA groundwater model, the potential recharge over the SGA area.	18 months	This was completed as part of an evaluation of the 2010 Drought Water Bank and development of the SGA Water Accounting Framework. The SGA IGSM application was run to estimate the level of surface-water groundwater interaction in the region as a result of current conjunctive use operations. Results also help identify the primary recharge areas in the basin.
2	Compare modeling results with existing geologic maps to develop a map of areas that are potentially contributing significant recharge in the basin.	18 months	This task has not yet been completed. AB359 was passed in 2011 and requires mapping of recharge areas in groundwater management plans. Staff expects to complete this task by the end of 2012.
3	Communicate with adjacent groundwater authorities and land-use planners to emphasize the need to protect prominent groundwater recharge areas.	18 months	This task will be completed following the identification of recharge areas described above.
4.5	***Control of the Migration and Remediation of Contaminated Groundwater***		
1	Continue facilitation of Regional Contamination Issues Committee to coordinate the efforts of regulators, responsible parties, and water purveyors to expedite the cleanup of contamination in the basin.	On-going	Met in February, April, August, and September 2009. Met in January, April, July 2010. Met in February, July, October 2011.
2	Coordinate with known responsible parties to develop a network of monitoring wells to act as an early warning system for public supply wells.	On-going	This issue has been discussed regarding contamination associated with Aerojet at Regional Contamination Issues Committee meetings. Aerojet has coordinated with Carmichael WD to resolve this.
3	If detections occur in these monitoring wells, facilitate meetings between the responsible parties and the potentially impacted member agency to develop strategies to minimize the further spread of contaminants. An example of a strategy would be to consider altering groundwater extraction patterns in the area to change to groundwater gradient.	On-going	Not applicable at this time.

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
4	Provide SGA members with all information on mapped contaminant plumes and LUST sites for their information in developing groundwater extraction patterns and in the siting of future production and monitoring wells.	12 months	Performed as part of Groundwater Quality Vulnerability Assessment completed in 2011. Data to be released by June 2012.
4.6	***Control of Saline Water Intrusion***		
1	Observe TDS concentrations in public supply wells that are routinely sampled under the DHS Title 22 Program. These data will be readily available in the SGA's DMS and are already an on-going task for the biennial assessment of basin conditions.	On-going	Most recent TDS concentrations are included in the April 2012 Basin Management Report.
2	Inform all member water purveyor managers of the presence of the saline water interface in the deep Mehrten formation and the approximate depth of the interface below their service area for their reference when siting potential wells. The SGA will also ensure that the EMD, which issues well permits, is aware of the interface. The SGA will provide a map indicating the contour of the elevation of the base of fresh water in Sacramento County to the EMD for their reference when issuing well permits.	12 months	DWR informed SGA in 2011 that it is attempting to update this information, so the task is not completed. SGA staff will post the information on the SGA website when it is completed by DWR.
COMPONENT CATEGORY 5: GROUNDWATER SUSTAINABILITY			
5.1	***Conjunctive Management Activities***		
1	Continue to investigate conjunctive use opportunities within the SGA area. The SGA and its members will coordinate with the RWA and its members, as appropriate.	On-going	Much of this work is being completed as part of the 2012/2013 update to the American River Basin Integrated Regional Water Management Plan (IRWMP).
2	Continue to investigate opportunities for the development of direct recharge facilities in addition to in-lieu recharge (e.g. aquifer storage and recovery wells or surface spreading facilities, through constructed recharge basins or in river or streambeds).	On-going	Staff began coordinating in 2010 on pilot studies of a former gravel mine pit near Rancho Cordova and a detention basin with dry wells near Elk Grove as possbile recharge optinos in the region. These studies should be completed by 2014. Staff is continuing to track efforts by City of Roseville to implement ASR in the region. Roseville certified an EIR on the project in March 2012.
3	Participate directly with the RWA IRWMP effort and ensure that SGA projects are included in the IRWMP.	On-going	Staff is ensuring that projects are being included in 2013 update of IRWMP. Projects are being intered into the web-based interface for the IRWMP at http://irwm.rmcwater.com/rwa/login.php.
4	Implement the SGA Water Accounting Framework to track the level of implementation of an appropriate conjunctive use program for the sustainability of the underlying groundwater basin.	12 months	WAF Phase III adopted in June 2010. Official reporting will commence in 2013, but staff has tracked 2010 and 2011 data and provided this to SGA Board at meetings.
5	Report annually, or as-needed, to the Water Forum Successor Effort on the planning and completion of projects that increase capacity to conjunctively manage the groundwater basin and also report on issues that reduce conjunctive management capacity (e.g., detection of contaminants).	12 months	Staff provided presentation on Water Accounting Framework to Water Forum Plenary in July 2010. Staff provided presentation on IRWMP to Water Forum Plenary in July 2010. Staff will coordinate with Water Forum Successor Effort during 2012 to determine if there areas of interest to the Plenary for an update.
6	Meet with representatives of the upper American River watershed to discuss their recently completed climate change analysis and identify opportunities for incorporating this information into a study for responding to changing future hydrologic conditions.	6 months	Received briefing in February 2010.

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
7	Coordinate with state and federal water agencies to determine if there are any forecasting resources available to give local water suppliers advance warning of expected water supply conditions for the upcoming year.	6 months	Reviewed available information prepared by DWR and USBR. Staff determined that the degree of uncertainty associated with this forecasting limits opportunities to effectively provide "advance warning." Staff continues to track monthly snow survey results and coordinates with RWA on issuing press releases based on those results.
8	Meet with representatives of the USBR to understand the status of any studies of future climate change impacts and other operational criteria that could impact operations at Folsom Reservoir, which could impact conjunctive use operations.	12 months	Staff has not met with USBR. SGA has obtained results of potential impacts to inflow into Folsom as a result of climate change modeling. This data will be used in 2012/2013 to estimate potential impacts to surface water supplies and resulting potential impacts to groundwater supply.
9	Coordinate with representatives from Sacramento Central Groundwater Authority and existing Placer County and Sutter County groundwater management efforts to communicate expected water elevation changes resulting from conjunctive use in the SGA area and to understand the efforts and expected results of implementing conjunctive use in their respective management areas.	12 months	Completed in 2010 as part of Water Accounting Framework. Results indicated no appreciable changes resulting from implementation of conjunctive use program. Placer County and SCGA received updates during Water Accounting Framework briefings in 2010.
5.2	***Assess Water Quality Threats to Groundwater Basin Sustainability***		
1	Using the existing SGA IGSM application and the locations of known contaminant plumes in the basin, run modeling scenarios that simulate the current planned conjunctive use program in the SGA basin to determine the potential future movement of contamination and the potential extent of threatened water supply facilities.	6 months	As of December 2008, the latest known extents of major contaminant plumes in the basin were compiled into a consolidated GIS coverage. The modeling exercise was completed in 2011. Based on the results, the conjunctive use operations do not appear to have an appreciable impact on the mobility of known contaminant plumes.
2	Update known potentially contaminating activities and other known point-source contaminants (e.g., leaking underground storage tanks) to determine where significant risks may exist to current or planned water supply facilities.	6 months	The data was purchased in April 2010. Results of analysis of the data are available in the Groundwater Quality Vulnerability Assessment completed in 2011.
3	Review potential upcoming regulatory changes to water quality standards that could negatively impact water supply facilities.	12 months	Attended July 14, 2009 talk by Bruce Macler of EPA regarding possible new drinking water regulations. Reviewed potential contaminants of concern in the Groundwater Quality Vulnerability Assessment completed in 2011.
4	Following completion of the actions above, recommend follow on studies where areas of significant concern or where data gaps exist.	18 months	The Groundwater Quality Vulnerability Assessment completed in 2011 did not reveal significant data gaps. However, the potential cause of contaminants emerging in the Cal Am north Sacramento County service area remains unresolved. The SGA Board has directed staff to puruse AB303 grant funding to investigate potential sources of PCE and TCE in the vicinity.
5.3	***Potable Supply Demand Reduction***		
1	Coordinate with the RWA and its members that have signed specific agreements to the WFA to understand if those conservation efforts are on track. For members that are not signatory, the SGA will ensure that they are informed of the benefits and regional importance of RWA's WEP.	12 months	Assisted local agencies in obtaining AB1420 compliance, which is related to complying with these conservation efforts in late 2010.
2	Coordinate with SRCSD through the RWA to investigate opportunities for expanded use of recycled water throughout the county as a non-potable supply for outdoor irrigation providing natural in-lieu recharge to the groundwater basin.	12 months	Began participating on SRCSD committee in mid-2010 to identify and promote uses of recycled water in the SRCSD service area. Successfully assisted SRCSD in applying for grant funds to expand recycled water to a SMUD Cogen Facility in late 2010.

SGA Adopted GMP Action Items
(as of 4/10/2012)

	Description of Action	Schedule	Comments
3	Encourage the appropriate application of treated remediated groundwater for beneficial uses to help reduce demands for potable water supply.	On-going	Met with EPA staff in October 2010 to begin discussing identifying more uses for remediated water.