Sacramento Groundwater Authority Groundwater Management Plan

SGA

December 2008

SACRAMENTO GROUNDWATER AUTHORITY

GROUNDWATER MANAGEMENT PLAN

December 2008

Sacramento Groundwater Authority
Managing Groundwater Resources in Northern Sacramento County

February 6, 2009

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Members:
California American Water
Carmichael Water District
Citrus Heights Water District
Del Paso Manor Water District
Fair Oaks Water District
Folsom, city of
Golden State Water Company
Natomas Central Mutual Water Company
Orange Vale Water Company
Rio Linda/Elverta Community Water District
Sacramento, city of
Sacramento, county of
Sacramento Suburban Water District
San Juan Water District
agricultural and self-supplied representatives

To Interested Parties and Individuals:

The Sacramento Groundwater Authority (SGA) is pleased to release this revised Groundwater Management Plan (GMP), adopted December 11, 2008 by the SGA Board of Directors. The plan represents a continuation of the GMP initially adopted in 2003 with a goal of maintaining a sustainable groundwater basin in Sacramento County north of the American River. While the initial GMP was effective in helping to achieve this goal, SGA committed to a comprehensive review of its plan every five years to ensure that management objectives and actions remain responsive to developing needs.

SGA and its members are committed to the regional objectives established by the historic Sacramento Water Forum Agreement, and these objectives are incorporated into the plan. Since SGA's formation in 1998, SGA members have taken many steps to preserve the valuable groundwater resources underlying our region.

SGA is grateful for the partnerships with the U.S. Army Corps of Engineers and the California Department of Water Resources that have allowed us to significantly advance our understanding and enhance our management decision-making in the basin. SGA also appreciates the efforts of member agencies and their respective Board representatives that ensure successful management in the basin.

Comments and suggestions to improve our management of the basin are always welcome. To view our most recent Basin Management Report, which biennially reviews GMP actions and results, please visit the SGA web site at www.sgah2o.org.

Sincerely,

John K. Woodling
Executive Director

RESOLUTION NO. 2008-04

A RESOLUTION OF THE SACRAMENTO GROUNDWATER AUTHORITY ADOPTING AN UPDATED GROUNDWATER MANAGEMENT PLAN AND A FINDING OF EXEMPTION FROM THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

The Board of Directors of the Sacramento Groundwater Authority (SGA) does hereby find that:

WHEREAS, the SGA was formed under the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code) on August 11, 1998 by the Cities of Citrus Heights, Folsom, and Sacramento, and the County of Sacramento; and

WHEREAS, the SGA was created for the purposes of protecting, preserving, and enhancing, for current and future beneficial uses, the groundwater resources in the North Area Groundwater Basin, in Sacramento County, north of the American River; and

WHEREAS, the SGA has previously adopted a Groundwater Management Plan for the North Area Groundwater Basin on December 11, 2003; and

WHEREAS, the SGA has committed to a five-year comprehensive review interval of its Groundwater Management Plan for the North Area Groundwater Basin; and

WHEREAS, the updated Groundwater Management Plan will further ongoing efforts to protect groundwater and interdependent environmental resources in the North Area Groundwater Basin, will facilitate collection of information to further understand and evaluate additional policies and programs for protection of the groundwater resources in the North Area Groundwater Basin, and will assist in other ongoing efforts to study the feasibility of conjunctive use programs utilizing the North Area Groundwater Basin.

NOW, THEREFORE, be it resolved that:

1. The SGA Board hereby adopts a Groundwater Management Plan for the North Area Groundwater Basin, in Sacramento County, north of the American River, copy attached hereto as Exhibit A.

2. The SGA Board further finds that the adoption of the Groundwater Management Plan is exempt from the requirements of the California Environmental Quality Act pursuant to CEQA Guidelines Section 15262 because the Groundwater Management Plan is a planning study which identifies potential projects, programs, and policies for possible future actions which have not yet been approved, adopted or funded; and Sections 15306, 15307, and 15308 because the Plan consists of basic data and information collection and includes possible actions, subject to future adoption and approval, which would protect natural resources and the environment.

PASSED AND ADOPTED by the Board of Directors of the Sacramento Groundwater Authority, on December 11, 2008.

By: _____
Chairperson, Sacramento Groundwater Authority

Attest: _____
Nancy Marrier, Finance and Administrative Services Officer/Clerk

TABLE OF CONTENTS

SECTION 1 INTRODUCTION 1
1.1 OTHER REGIONAL MANAGEMENT EFFORTS 3
1.1.1 SMWA 3
1.1.2 Water Forum 3
1.1.3 Cooperating Agencies 4
1.1.4 RWA 4
1.1.5 Other Ongoing Groundwater Management-Related Activities within the SGA Area 5
1.2 PURPOSE OF THE SGA GMP 5
1.3 AUTHORITY TO PREPARE AND IMPLEMENT A GMP 5
1.4 GMP COMPONENTS 5

SECTION 2 WATER RESOURCES SETTING 7
2.1 GROUNDWATER SUPPLIES 7
2.1.1 Overview of the Hydrogeologic Setting of the SGA Area 7
2.2 SURFACE WATER SUPPLIES 15
2.2.1 Water Rights/Contract Entitlements 19
2.2.2 Surface Water Quality 20
2.3 "OTHER" SUPPLIES 22
2.4 EXISTING FACILITIES AND OPERATIONS FOR MUNICIPAL AND INDUSTRIAL SUPPLIES 22
2.4.1 Major Infrastructure 23
2.4.2 Operations 24

SECTION 3 MANAGEMENT PLAN ELEMENTS 29
3.1 GROUNDWATER MANAGEMENT GOAL 29
3.2 BASIN MANAGEMENT OBJECTIVES 29
3.3 GMP COMPONENTS 32
3.4 COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT 32
3.4.1 Involving the Public 32
3.4.2 Involving Other Agencies Within and Adjacent to the SGA Area 33
3.4.3 Utilizing Advisory Committees 35
3.4.4 Developing Relationships with State and Federal Agencies 35
3.4.5 Pursuing Partnership Opportunities 36
3.5 COMPONENT CATEGORY 2: MONITORING PROGRAM 37
3.5.1 Groundwater Elevation Monitoring 37
3.5.2 Groundwater Quality Monitoring 39
3.5.3 Land Surface Elevation Monitoring 40
3.5.4 Surface Water Groundwater Interaction Monitoring 43
3.5.5 Protocols for the Collection of Groundwater Data 44
3.6 COMPONENT CATEGORY 3: DATA MANAGEMENT AND ANALYSIS 44
3.6.1 SGA Groundwater Model 44
3.6.2 Comprehensive Data Analysis 45
3.6.3 Data Management System 45
3.7 COMPONENT CATEGORY 4: GROUNDWATER RESOURCE PROTECTION 47
3.7.1 Well Construction Policies 47
3.7.2 Well Abandonment and Well Destruction Policies 47
3.7.3 Wellhead Protection Measures 48
3.7.4 Protection of Recharge Areas 50
3.7.5 Control of the Migration and Remediation of Contaminated Groundwater 52
3.7.6 Control of Saline Water Intrusion 52
3.8 COMPONENT CATEGORY 5: GROUNDWATER SUSTAINABILITY 53
3.8.1 Conjunctive Management Activities 54

3.8.2 Assess Water Quality Threats to Groundwater Basin Sustainability 55
3.8.3 Potable Supply Demand Reduction 56

SECTION 4 PLAN IMPLEMENTATION 59

SECTION 5 REFERENCES 67

Appendices

Appendix A – SGA Joint Powers Agreement

Appendix B – SGA 2003 Groundwater Management Plan Action Items Tracking Table

Appendix C – Public Notices to Begin and Adopt an Updated GMP in Sacramento Bee

Appendix D – Standard Operating Procedures for Manual Water Level Measurements

LIST OF TABLES

TABLE 1. LOCATION OF SGA GMP COMPONENTS 6
TABLE 2. TREATMENT CAPACITY AT WTPS PROVIDING SURFACE WATER WITHIN THE SGA BOUNDARIES 23
TABLE 3. GROUNDWATER WELLS WITHIN SGA BOUNDARIES 24
TABLE 4. SGA TOTAL MUNICIPAL AND INDUSTRIAL WATER DELIVERIES IN THE SGA AREA 26
TABLE 5. SCHEDULE FOR IMPLEMENTATION OF GMP ACTION ITEMS 59

LIST OF FIGURES

FIGURE 1. BOUNDARY OF THE SGA NORTH AREA BASIN COVERED BY THIS GMP 2
FIGURE 2. LOCATION OF NORTH AMERICAN GROUNDWATER SUBBASIN 8
FIGURE 3. REGIONAL STRATIGRAPHIC COLUMN 10
FIGURE 4. PRINCIPAL CONTAMINANT PLUMES 13
FIGURE 5. SPRING 2008 GROUNDWATER ELEVATION CONTOURS 14
FIGURE 6. REPRESENTATIVE GROUNDWATER HYDROGRAPHS IN THE SGA AREA 17
FIGURE 7. SINGLE LONG-TERM HYDROGRAPH IN THE SGA AREA 19
FIGURE 8. TOTAL SGA ANNUAL GROUNDWATER EXTRACTION IN NORTH AREA BASIN 25
FIGURE 9. ORGANIZATION OF MANAGEMENT PLAN ELEMENTS 30
FIGURE 10. EXISTING AND PROPOSED WELLS FOR SGA'S GROUNDWATER ELEVATION MONITORING NETWORK 38
FIGURE 11. EXISTING AND PROPOSED WELLS IN SGA'S GROUNDWATER QUALITY MONITORING NETWORK 41
FIGURE 12. DMS SCREEN CAPTURE 49
FIGURE 13. SURFACE GEOLOGY OF THE SGA AREA – IMPLICATIONS FOR SURFACE RECHARGE RATES 52

ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
Aerojet	Aerojet-General Corporation facility
AF	Acre-feet
AF/year	Acre-feet per year
AFRPA	Air Force Real Property Agency
ARBCUP	American River Basin Regional Conjunctive Use Program
ARWRI	American River Water Resources Investigation
BMO	Basin Management Objective
Cal Am	California American Water
CALFED	CALFED Bay-Delta Program
CAS	California Aquifer Susceptibility
cfs	Cubic feet per second
CHWD	Citrus Heights Water District
CMP	Sacramento Coordinated Water Quality Monitoring Program
COC	Contaminants of concern
Cooperating Agencies	American River Basin Cooperating Agencies
CSUS	California State University, Sacramento
CTP	Cooperative Transmission Pipeline
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWC	California Water Code
CWD	Carmichael Water District
DCA	1,2-dichloroethane
DCE	cis-1,2-dichloroethene
Delta	Sacramento/San Joaquin River Delta
DHS	Department of Health Services (now known as the Department of Public Health)
DPH	Department of Public Health (formerly known as the Department of Health Services)
DPMWD	Del Paso Manor Water District

ABBREVIATIONS AND ACRONYMS (Continued)

DMS	Data Management System
DWR	California Department of Water Resources
DWSAP Program	Drinking Water Source Assessment and Protection Program
EMD	Sacramento County Environmental Management Department
EWA	Environmental Water Account
Folsom	City of Folsom
FOWD	Fair Oaks Water District
GMP	Groundwater Management Plan
GSWC	Golden State Water Company
gpm	Gallons per minute
Groundwater Forum	Central Sacramento County Groundwater Forum
IGSM	North American River and Sacramento County Combined Integrated Groundwater and Surface Water Model
IRCTS	Inactive Rancho Cordova Test Site
ISI	Integrated Storage Investigation
JPA	Joint Powers Authority
Lincoln	City of Lincoln
LSCE	Luhdorff & Scalmanini Consulting Engineers
LUST	Leaking Underground Storage Tank
M&I	Municipal and industrial
Mather AFB	Mather Air Force Base
McClellan AFB	McClellan Air Force Base
MCL	Maximum Contaminant Level
MWH	Montgomery Watson Harza
μg/L	micrograms per liter
μmhos/cm	micromhos per centimeter
mg/L	Millgrams per liter
mgd	Million gallons per day
msl	Mean sea level
NAWQA	National Water Quality Assessment

ABBREVIATIONS AND ACRONYMS (Continued)

NCMWC	Natomas Central Mutual Water Company
NDMA	n-nitrosodimethylamine
NGS	National Geodetic Survey
North Area Basin	Sacramento County Portion of the North American Subbasin
NTP	Northridge Transmission Pipeline
OVWC	Orange Vale Water Company
PBE	Physical Barrier Effectiveness
PCAs	Potential Contaminating Activities
PCE	Tetrachloroethene
PCWA	Placer County Water Agency
PL	Public Law
POU	Place of Use (e.g., American River Water Rights)
PSA	WFA Purveyor Specific Agreement
Reclamation	U.S. Bureau of Reclamation
RLECWD	Rio Linda/Elverta Community Water District
Roseville	City of Roseville
RWA	Regional Water Authority
RWMP	Regional Water Master Plan
Sac Regional	Sacramento Regional Wastewater Treatment Plant
Sac Suburban	Sacramento Suburban Water District
SACOG	Sacramento Area Council of Governments
Sacramento	City of Sacramento
SAFCA	Sacramento Area Flood Control Agency
SCGA	Sacramento Central Groundwater Authority
SCWA	Sacramento County Water Agency
SGA	Sacramento Groundwater Authority
SJWD	San Juan Water District
SMWA	Sacramento Metropolitan Water Authority
SOP	Standard Operating Procedure
South Sutter	South Sutter Water District

ABBREVIATIONS AND ACRONYMS (Continued)

SRCSD	Sacramento Regional County Sanitation District
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
TDS	Total dissolved solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
Water Forum	Sacramento Area Water Forum
WEP	Water Efficiency Program
WFA	Water Forum Agreement
WTP	Water treatment plant

Section 1 INTRODUCTION

The Sacramento Groundwater Authority (SGA) is a joint powers authority (JPA) created to manage the Sacramento region's North Area Groundwater Basin (North Area Basin). The SGA's formation in 1998[1] resulted from a coordinated effort by the Sacramento Metropolitan Water Authority (SMWA) and the Sacramento Area Water Forum (Water Forum) to establish an appropriate management entity for the basin. The SGA is recognized as an essential element to implement a comprehensive solution for preserving the lower American River and ensuring a reliable water supply through the year 2030.

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 to exercise their common police powers to manage the underlying groundwater basin. In turn, these agencies chose to manage the basin in a cooperative fashion by allowing representatives of the 14 local water purveyors and representatives for agricultural and self-supplied pumpers to serve as the Board of Directors of the SGA[2]. The joint powers agreement is included as **Appendix A** of the GMP.

At the core of the SGA's management responsibility is a commitment to not exceed the average annual sustainable yield of the basin, which was estimated to be 131,000 acre-feet[3] in the Water Forum Agreement (WFA)[4]. To accomplish this objective and to provide a safe, reliable water supply for the rapidly growing northern Sacramento County, this groundwater management plan (GMP) provides a framework for the many actions needed in the North Area Basin. This GMP represents a renewed commitment to groundwater management in that it is a comprehensive update to the initial SGA GMP first adopted in December 2003[5]. As this GMP is a comprehensive update of 2003 SGA GMP, many of the key plan actions have changed to reflect recent conditions. A complete listing of the original 2003 action items and their status is included in **Appendix B**. The SGA's boundary, the area covered by this GMP, includes only the portion of Sacramento County north of the American River (**Figure 1**).

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

[2] SGA Board members include 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).

[3] This value was estimated based on long term average water use, supply conditions, and facilities in the basin at the time of the WFA. This value was not intended to be a fixed value that could not be modified as conditions and assumptions changed in the basin. Examples of changed conditions include new or improved water conveyance, treatment, and storage facilities or changes in water supply contracts.

[4] The WFA is available online at http://www.waterforum.org or contact the Water Forum office at (916) 808-1999.

[5] The 2003 version of the SGA GMP is available online at http://www.sgah2o.org.

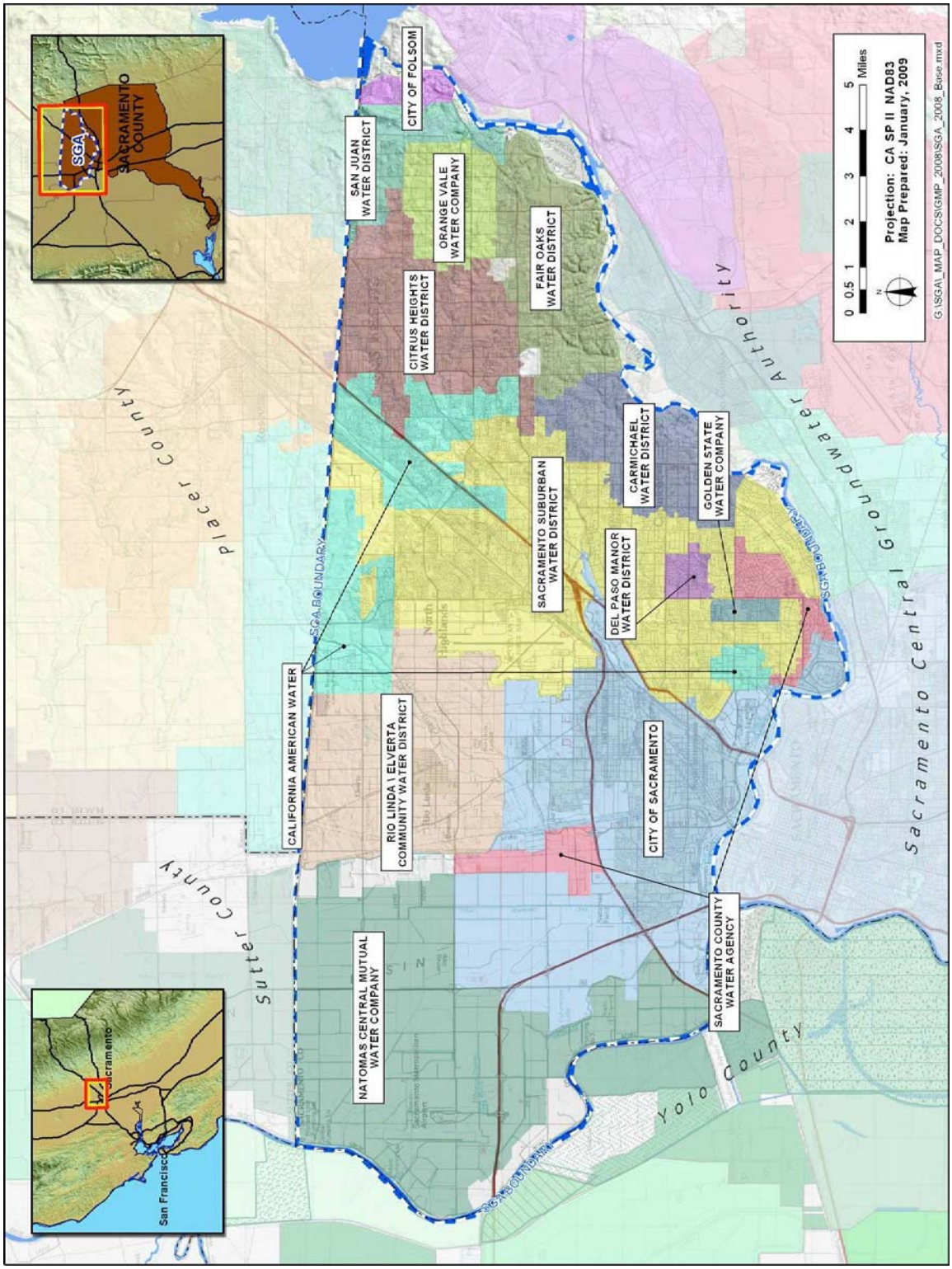

Figure 1. Boundary of the SGA North Area Basin Covered by this GMP

1.1 OTHER REGIONAL MANAGEMENT EFFORTS

Over the past several decades, the water supplies of the region have been impacted by:

- Prolonged drought and prolonged wet periods.
- Increasing pressure to dedicate surface water for environmental purposes.
- Declining groundwater levels.
- Impacts and growing threats to surface water quality and groundwater quality.

All the while, demand for water in the region has continued to grow.

To address these problems, water purveyors in the region have invested substantial time and resources in a progression of regional planning efforts. In particular, the planning efforts most directly related to the SGA's efforts include:

- The SMWA.
- The Water Forum.
- The American River Basin Cooperating Agencies (Cooperating Agencies).
- The Regional Water Authority (RWA).

Each of these regional planning efforts is discussed further below.

1.1.1 SMWA

Formed in 1990, the SMWA was a combined JPA and non-profit public benefit association of 17 public water suppliers within Sacramento County[6]. A primary objective of the SMWA was to facilitate actions needed to restore and maintain the quantity and the quality of the groundwater in the area. In support of that objective, the SMWA was a vital participant in the development of the WFA (see below). The SMWA also developed and adopted a GMP as authorized by Assembly Bill (AB) 3030 of 1992 (commonly referred to as AB 3030 Plans, see the California Water Code (CWC) § 10750 *et seq.*), but the plan was not fully implemented. In 2001, the SMWA was superceded by the RWA (see description below).

1.1.2 Water Forum

Begun in 1993, the Water Forum is a group comprised of business and agricultural leaders, citizens groups, environmentalists, water managers, and local governments in the Sacramento Region that joined together to fulfill two co-equal objectives:

- To provide a reliable and safe water supply for the region's economic health and planned development through the year 2030.
- To preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

In April 2000, Water Forum members approved the WFA, which consists of seven integrated actions necessary to accomplish these co-equal objectives. The WFA prescribes a local conjunctive use program for Folsom Reservoir, the lower American River, and the adjacent

[6] The SMWA members were located both north and south of the American River and included: City of Folsom, City of Galt, Arden Cordova Water Service Company, Arcade Water District, Carmichael Water District, Citrus Heights Water District, Clay Water District, Del Paso Manor Water District, Elk Grove Water Works, Fair Oaks Water District, Galt Irrigation District, Northridge Water District, Omochumne-Hartnell Water District, Orange Vale Water Company, Rancho Murieta Community Services District, Rio Linda/Elverta Community Water District, and San Juan Water District (note that some purveyor names have been changed and/or undergone consolidation since the formation of the SMWA).

groundwater basins. To help facilitate this conjunctive use program, one of the seven WFA elements is groundwater management. This element divides Sacramento County groundwater basins into three subunits, the North, Central, and South areas, and recommends that the SGA (then known as the Sacramento North Area Groundwater Management Authority) serve as the governing body for the North Area Basin. The groundwater element also estimated and recommended an average annual sustainable groundwater yield for the North Area Basin of 131,000 acre-feet per year (AF/year). The Water Forum continues to function with a dedicated staff in the Water Forum Successor Effort program to coordinate with other agencies and groups, such as the SGA, to ensure that the elements of the WFA are carried out.

1.1.3 Cooperating Agencies

The Cooperating Agencies were an ad-hoc group of local water purveyors in northern Sacramento County and southern Placer County[7]. Each member of the Cooperating Agencies was a signatory of the WFA. The Cooperating Agencies formed to complete a Regional Water Master Plan (RWMP), the objective of which was to identify the facilities and operational agreements necessary to implement the WFA for the northern Sacramento/Placer area. This plan identified opportunities to improve the availability of water supplies through additional conjunctive use of surface water and groundwater in the region. Expanded conjunctive use operations are a key component to assuring a sustainable groundwater resource within the SGA area. Upon completion of the RWMP in 2003, the Cooperating Agencies dissolved as an organization. Many of the functions of the Cooperating Agencies were then assumed by the RWA.

1.1.4 RWA

The RWA superceded the SMWA in 2001 through a JPA to serve and represent the regional water supply interests and assist members in protecting and enhancing the reliability, availability, affordability, and quality of water resources. One of the principal activities of the RWA is facilitating implementation of the conjunctive use program prescribed by the WFA and the RWMP. The RWA currently has nineteen members and three associate members[8] including each of the Cooperating Agencies except the Sacramento County Water Agency (SCWA). Nearly all members are signatory to the WFA.

As with the Cooperating Agencies, the success of implementing additional conjunctive use opportunities will be an important factor in the SGA's ability to ensure a reliable groundwater supply within North Area Basin. The activities of the RWA and SGA are highly coordinated as they share a common office and staff.

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[7] The "Cooperating Agencies" included water purveyors in both Sacramento County and Placer County: California American Water, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Roseville, City of Sacramento, Del Paso Manor Water District, Fair Oaks Water District, Placer County Water Agency, Rio Linda/Elverta Community Water District, Sacramento County Water Agency, Sacramento Suburban Water District, and San Juan Water District.

[8] The membership of the RWA encompasses water users in Sacramento, Placer, El Dorado, and Yolo counties including: California American Water, Carmichael Water District, Citrus Heights Water District, City of Folsom, City of Lincoln, City of Roseville, City of Sacramento, City of West Sacramento, Del Paso Manor Water District, El Dorado Irrigation District, Fair Oaks Water District, Fruitridge Vista Water Company, Golden State Water Company, Orange Vale Water Company, Placer County Water Agency, Rancho Murieta Community Services District, Rio Linda/Elverta Community Water District, Sacramento Suburban Water District, and San Juan Water District.. Associate members do not directly retail drinking water and do not vote in RWA matters. Associate members include: El Dorado County Water Agency, Sacramento Municipal Utility District, and Sacramento Regional County Sanitation District.

1.1.5 Other Ongoing Groundwater Management-Related Activities within the SGA Area

In addition to the on-going water supply and conservation programs being implemented by individual SGA members, there are several strictly groundwater-related activities taking place that affect the North Area Basin. The activities closely related to the SGA's groundwater management efforts include, but are not limited to, the following:

- Groundwater contamination investigation and remediation activities at the former McClellan Air Force Base (McClellan AFB).
- Groundwater contamination investigation and remediation activities at the Aerojet-General Corporation facility (Aerojet).
- Monitoring of groundwater levels and quality by the California Department of Water Resources (DWR) and Sacramento County.
- Monitoring of groundwater quality by the U.S. Geological Survey (USGS) as part of its National Water Quality Assessment (NAWQA) Program.
- Monitoring of site investigations and remediation efforts at known leaking underground storage tanks (LUSTs) coordinated by the Sacramento County Environmental Management Department (EMD) and the Central Valley Regional Water Quality Control Board (CVRWQCB).
- Natomas Central Mutual Water Company (NCMWC) is currently updating its GMP for its service area in Sacramento and Sutter counties (see **Figure 1**). The plan will characterize the availability of groundwater for use during periods in which surface water supplies are insufficient to meet demands.

Coordination between these efforts and the SGA will be discussed in more detail later in this GMP.

1.2 PURPOSE OF THE SGA GMP

The groundwater management goal of the SGA is to maintain a sustainable, high-quality groundwater basin underlying Sacramento County north of the American River consistent with the objectives of the WFA. To meet that goal, the purpose of this GMP is to serve as the framework for coordinating the many independent management activities into a cohesive set of management objectives and related actions for implementation by the SGA.

1.3 AUTHORITY TO PREPARE AND IMPLEMENT A GMP

The authority of the SGA to manage the North Area Basin is provided through the joint powers agreement (see **Appendix A**). The SGA Board of Directors elected to prepare this GMP as one of the tools necessary to effectively manage the basin. The SGA is preparing this GMP consistent with the provisions of CWC § 10750 *et seq.* as amended January 1, 2003.

1.4 GMP COMPONENTS

The SGA GMP includes the following required and recommended components:

- CWC § 10750 *et seq.* (seven mandatory components). Recent amendments to the CWC § 10750 *et seq.* require GMPs to include several components to be eligible for the award of funds administered by DWR for the construction of groundwater projects or groundwater quality projects[9].

[9] These amendments to the CWC were included in Senate Bill 1938, effective January 1, 2003.

- DWR Bulletin 118 (2003) components (seven recommended components).
- CWC § 10750 *et seq.* (12 voluntary components). CWC § 10750 *et seq.* includes 12 specific technical issues that could be addressed in GMPs to manage the basin optimally and protect against adverse conditions.

Table 1 lists the section(s) in which each component is addressed.

Table 1. Location of SGA GMP Components

Description	Section(s)
A. CWC § 10750 *et seq.*, Mandatory Components	
1. Documentation of public involvement statement.	3.4.1
2. Basin Management Objectives (BMOs).	3.2
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping.	3.5
4. Plan to involve other agencies located within groundwater basin.	3.4.2
5. Adoption of monitoring protocols by basin stakeholders.	3.5.5
6. Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in DWR Bulletin 118.	Figure 2
7. For agencies not overlying groundwater basins, prepare GMP using appropriate geologic and hydrogeologic principles.	
B. DWR's Suggested Components	
1. Manage with guidance of advisory committee.	3.4.3
2. Describe area to be managed under GMP.	Section 2
3. Create link between BMOs and goals and actions of GMP.	Figure 9
4. Describe GMP monitoring program.	3.5
5. Describe integrated water management planning efforts.	3.8.1
6. Report on implementation of GMP.	3.4.1
7. Evaluate GMP periodically.	3.4.3
C. CWC § 10750 *et seq.*, Voluntary Components	
1. Control of saline water intrusion.	3.7.6
2. Identification and management of wellhead protection areas and recharge areas.	3.7.3
3. Regulation of the migration of contaminated groundwater.	3.7.5
4. Administration of well abandonment and well destruction program.	3.7.2
5. Mitigation of conditions of overdraft.	3.8.1
6. Replenishment of groundwater extracted by water producers.	3.8
7. Monitoring of groundwater levels and storage.	3.5.1
8. Facilitating conjunctive use operations.	3.8
9. Identification of well construction policies.	3.7.1
10. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.	1.1 an 3.8
11. Development of relationships with state and federal regulatory agencies.	3.8.1 Action 7
12. Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination.	3.7.3

Section 2 WATER RESOURCES SETTING

Locations of water purveyors within the North Area Basin are shown in **Figure 1**. Within the SGA boundaries, water purveyors use both surface water and groundwater. Some rely exclusively on either groundwater or surface water to meet their needs; others use a combination of surface water and groundwater. The groundwater and surface water supplies available to the region are summarized below.

2.1 GROUNDWATER SUPPLIES

This section provides a regional description of the geologic and hydrogeologic conditions of the underlying groundwater basin. A map showing the area of the groundwater basin, as defined by DWR Bulletin 118 (2003), and the SGA boundaries within this basin is presented in **Figure 2.**

The North American Subbasin is defined by DWR as the area bounded on the west by the Feather and Sacramento rivers, on the north by the Bear River, on the south by the American River, and on the east by the Sierra Nevada (DWR, 2003). DWR Bulletin 118 (2003) provides additional information about the North American Subbasin on the agency's web site[10] including:

- Surface Area: 548 square miles.
- The eastern basin boundary is a north-south line extending from the Bear River south to Folsom Reservoir. This represents the approximate edge of the alluvial basin where little or no groundwater flows into or out of the groundwater basin from the Sierra Nevada.
- The western portion of the subbasin consists of nearly flat flood basin deposits from the Bear, Feather, Sacramento and American rivers, and several small east side tributaries.

The SGA area is located in the southern portion of the North American Subbasin extending as far north as the Sacramento-Placer County line.

2.1.1 Overview of the Hydrogeologic Setting of the SGA Area

The groundwater resources of Sacramento County have been extensively investigated and reported in DWR Bulletin 118-3, Evaluation of Ground Water Resources: Sacramento County (DWR, 1974). DWR Bulletin 118-3 identifies and describes the various geologic formations that constitute the water-bearing deposits underlying Sacramento County. These formations include an upper, unconfined aquifer system consisting of the Riverbank (formerly known as Victor), and Turlock Lake (formerly known as Fair Oaks), Laguna, and a lower, semi-confined aquifer system consisting primarily of the Mehrten Formation. These formations are shown on **Figure 3** and are typically composed of lenses of inter-bedded sand, silt, and clay, interlaced with coarse-grained stream channel deposits. **Figure 3** illustrates that these deposits form a wedge that generally thickens from east to west.

[10] At: http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/5-21.64_North_American.pdf.

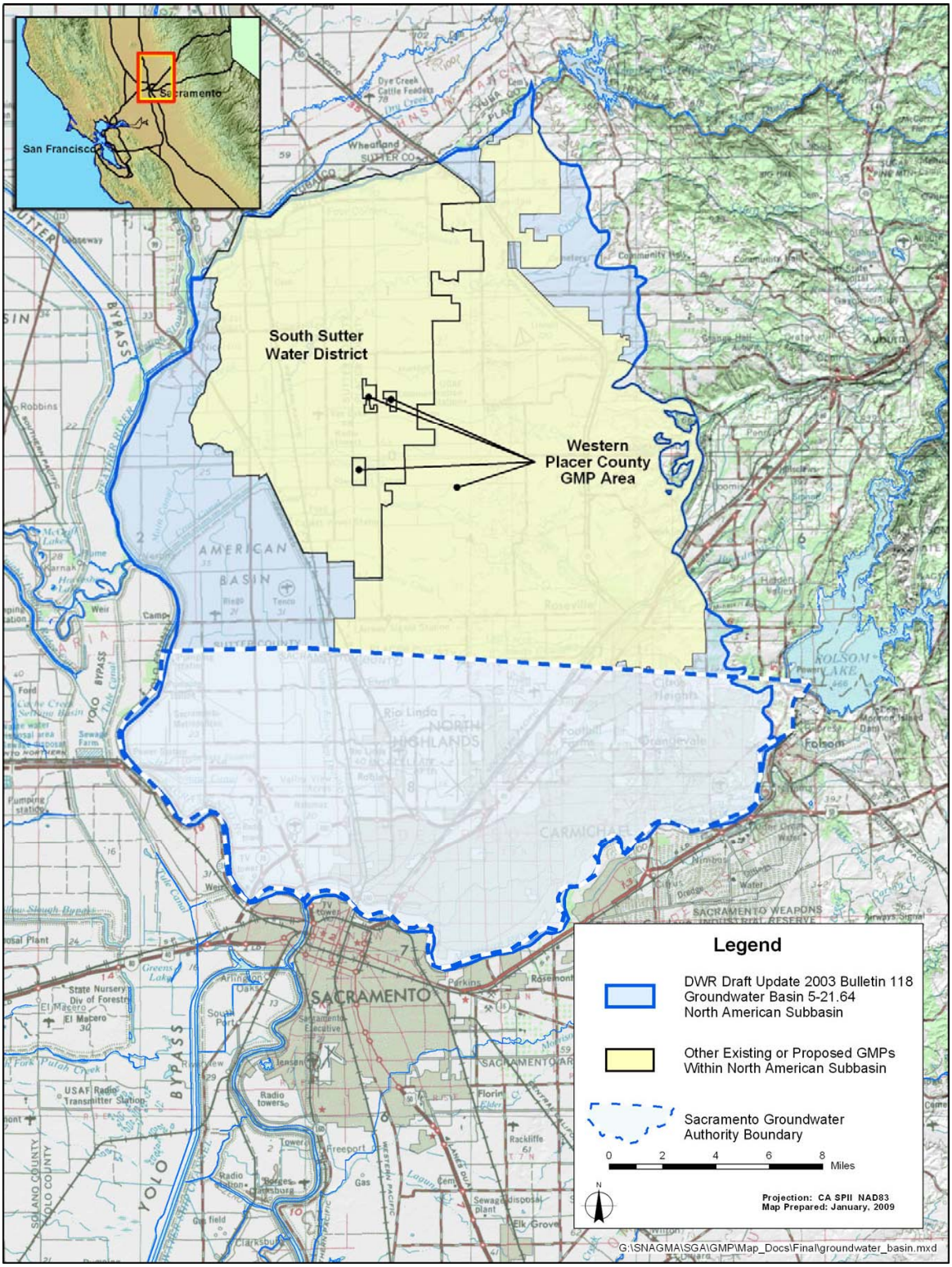

Figure 2. Location of North American Groundwater Subbasin

As described within DWR Bulletin 118-3, these formations form a maximum thickness of about 2,000 feet under the Sacramento River. The primary water-bearing formations (Laguna and Mehrten) are overlain by much younger basin, natural levee/channel, and alluvium deposits (CDMG, 1981). The Ione and Valley Springs formations exist beneath the Mehrten Formation and are thought to be a transitional aquifer system that contains a mixture of saline and fresh groundwater. There are no regionally-extensive fine grained layers in the subsurface to create a regionally confined aquifer such as is observed in the San Joaquin Valley from the Corcoran Clay layer.

2.1.1.1 Water –Bearing Formation Characteristic within the SGA Area

Groundwater occurs in unconfined to semi-confined states throughout the North American Subbasin. Semi-confined conditions occur in localized areas; the degree of confinement typically increases with depth below the ground surface. Groundwater in the Riverbank, Turlock Lake, and Laguna Formations (the "upper aquifer") is typically unconfined. However, due to the heterogeneous nature of the alluvial depositional system, semi-confined conditions can be encountered at shallow depths in the aquifer. The deeper Mehrten Formation (the "lower aquifer") typically exhibits semi-confined conditions. Provided below is a more detailed description of the water-bearing formation characteristics within the SGA area.

Turlock Lake and Riverbank Formations – Within the SGA area, these Formations, designated Qtl and Qr on **Figure 3**, overlie the Laguna Formation and have been laid down along the American River downstream of Folsom Dam. These Formations are relatively young (Pleistocene in age) and largely unconsolidated. Formation sediments are primarily derived from decomposed granite and metamorphic rock of the western Sierra (CDWR, 1974).
Laguna Formation – The Laguna Formation, designated as Tl on **Figure 3**, is late Pliocene to early Pleistocene in age and is non-volcanic, comprised of heterogeneous deposits of silt, clay, sands and fine gravels that vary from tan to brown in color. The lower portion of the Laguna Formation often consists of a gradational contact with the Mehrten Formation that has been named the Laguna-Mehrten Transitional Zone (Schlemon, 1967). This transitional zone consists of non-volcanic, micaceous Laguna sediments that are interbedded with volcanic Mehrten sediments, sometimes referred to as reworked Mehrten deposits. The Laguna formation will yield moderate quantities of water to wells screened in fine grained deposits with wells screened in well sorted Laguna granitic sands producing higher yields (DWR, 1974).

Mehrten Formation – The Mehrten Formation designated as Tm on **Figure 3**, is very different than the overlying Laguna Formation. The Mehrten Formation's gray and black andesitic sands, interbedded with blue to brown clays and gray tuff-breccia sand, are all volcanic in origin in contrast with the tan to brown color non-volcanic sediments of the Laguna Formation. The Mehrten Formation was derived from reworked andesitic volcanic mudflow deposits that are late Miocene to early Pliocene in age. The Mehrten formation can be divided into two different units: the upper sedimentary unit is composed of well sorted black andesitic sands, sometimes with cobbles and boulders, (reported by well drillers as "black sands") and interbedded blue to brown clays; the lower consolidated unit is a hard and very dense gray tuff-breccia (reported by well drillers as "lava"). The Mehrten units range in thickness from 200 to 1,200 feet and form a semi-confined aquifer, which dips toward the west at approximately 1 to 2 degrees. The most resistant beds in the Mehrten are andesite mudflow breccias that form steep cliffs where they are exposed along the lower American River north of Lake Natoma. The Mehrten formation is a major aquifer and provides copious quantities of groundwater to many wells within the North

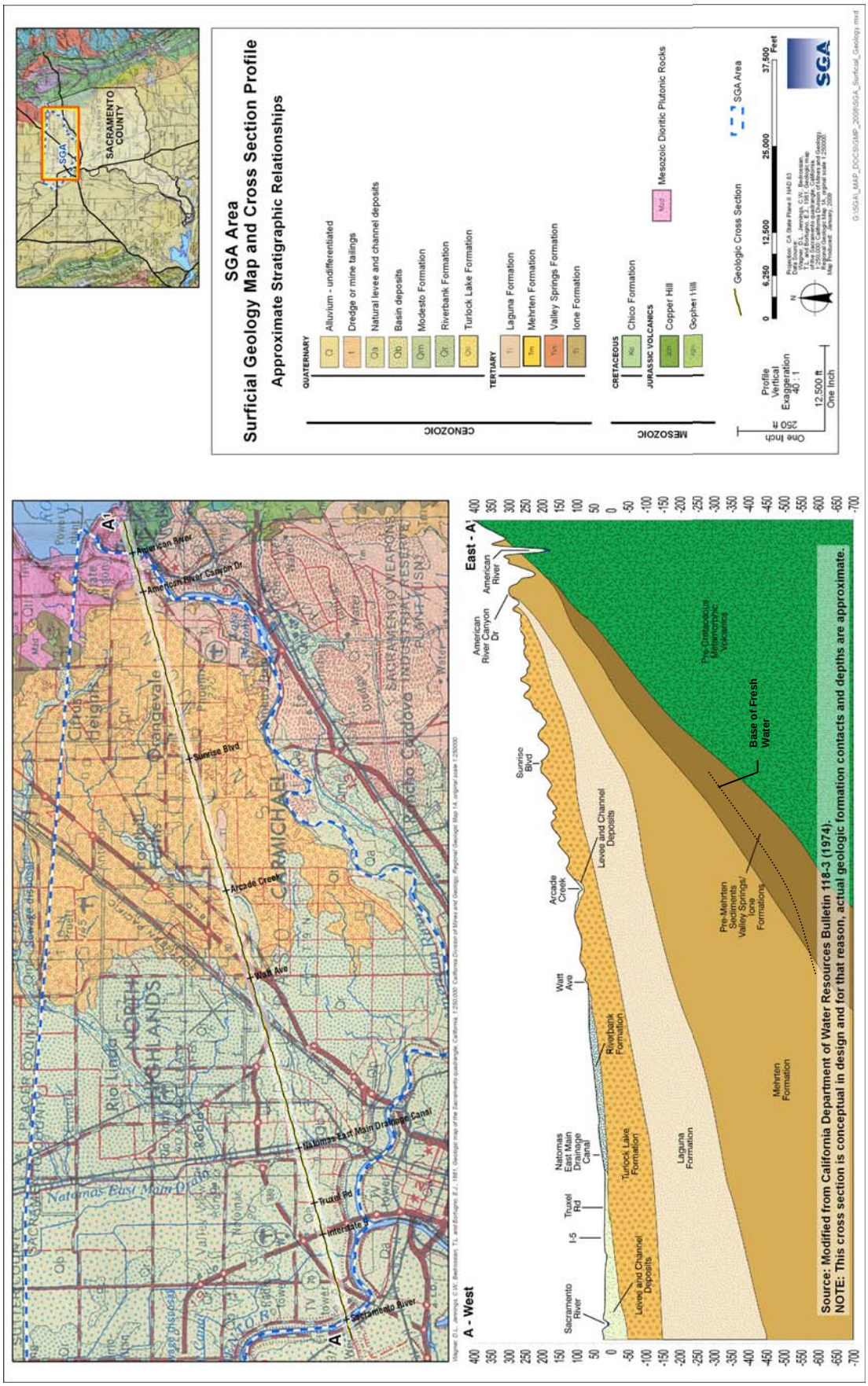

Figure 3. Regional Stratigraphic Column

Area Basin. The volcanic sands and gravels yield large quantities of water to wells, while the clays yield little water and the tuff-breccias yield low quantities (DWR, 1974).

2.1.1.2 Groundwater Quality

The water quality in the upper aquifer system is regarded as superior to that of the lower aquifer system. The upper aquifer is preferred over the lower aquifer principally because the lower aquifer system (specifically the Mehrten formation) contains higher concentrations of iron and manganese. Water from the upper aquifer generally does not require treatment (other than disinfection). The lower aquifer system is prone to having higher concentrations of total dissolved solids (TDS, a measure of salinity) than the upper aquifer. In general, at depths of approximately 1,200 feet or greater (actual depth varies throughout the basin), the TDS concentration exceeds 2,000 milligrams per liter (mg/L). At such concentrations, the groundwater is considered to be non-potable.

This description of water quality is based on data used to populate the region's Data Management System (DMS) and on contaminant information tracked by the CVRWQCB and the Sacramento County EMD. Available groundwater quality data from monitoring between 1991 and 2006 for approximately 260 public supply wells are currently in the DMS. Groundwater in the North Area Basin is highly suitable as a source of public drinking water supply from a general chemistry perspective. Specifically, the primary constituents referred to for "general chemistry" include total dissolved solids (TDS), iron, manganese, arsenic, and nitrate. The general chemistry analysis below is based on required monitoring of public supply wells during 2005 and 2006.

Despite the very good general chemistry of groundwater in the North Area Basin, there are several contaminant plumes and many point sources of contamination (e.g., leaking underground storage tanks) that local water managers must consider when managing the basin to ensure a sustainable water supply. These water quality data are discussed further below.

Total Dissolved Solids. Based on a sample size of 107 supply wells, TDS results in most wells are within the secondary drinking water standard[11] of 500 milligrams per liter (mg/L). TDS ranges from 100 mg/L to 840 mg/L, with only three wells exceeding the 500 mg/L standard. The average TDS of these samples is 266 mg/L.

Iron. Iron has a secondary MCL of 300 micrograms per liter (μg/L). This is a secondary standard, because, at elevated concentrations, iron tends to have a bad taste and can precipitate as a red-brown solid on plumbing fixtures. In general, dissolved iron is not a problem in SGA-area public supply wells. Of the 122 wells sampled from 2005 through 2006, 80 wells were below the reporting limit of 10 μg/L. Of the 42 wells with detections, 18 wells had concentrations exceeding the secondary MCL.

Manganese. Manganese has a secondary MCL of 50 μg/L. Elevated concentrations of manganese 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. Of the 119 wells sampled from 2005 through 2006, 89 wells were below the reporting limit of 10 μg/L g/L. Of the 30 wells with detections, 14 wells had concentrations exceeding the secondary MCL.

[11] For many of the more commonly occurring constituents found in water, primary or secondary standards are established by Federal or State agencies for drinking water. Primary standards are established to reduce health risks to consumers, while secondary deal mainly with taste and aesthetics concerns.

Arsenic. As of January 26, 2006, the federal drinking water standard for arsenic was lowered to 10 micrograms per liter (μg/L). In general, elevated arsenic in the northern Sacramento region is not the significant problem it is in many parts of the southern San Joaquin Valley. Of the 120 distinct arsenic samples from wells during the period from 2005 through 2006, 8 were below the analytical detection level of 2 μg/L. Of the remaining wells with values above the detection level, the average was only 3.7 μg/L, with two wells exceeding the new federal MCL.

Nitrate. 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 within the North Area Basin. Of the 185 samples from public supply wells tested during 2005 and 2006, the average concentration was 9.3 mg/L with a maximum observed concentration of 33 mg/L.

Known "Principal" Plumes. Principal groundwater contaminant plumes within or near the SGA area are known to exist from source areas identified as the former McClellan AFB, the former Mather Air Force Base (Mather AFB), Aerojet-General Corp, and the Inactive Rancho Cordova Test Site (IRCTS) are shown on **Figure 4**.

Although other localized plumes exist within the SGA area, the principal plumes shown in **Figure 4** are the largest and have the greatest current impact on existing groundwater use. The aerial extent of these plumes generally represents the composite California drinking water MCL for one or more of the primary contaminants of concern (COC).

For the McClellan AFB plumes, the COCs are trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-ichloroethene (DCE), and 1,2-dichloroethane (DCA). For the Mather AFB plumes, the primary COCs are TCE, PCE, and carbon tetrachloride. For the Aerojet and IRCTS plumes, the primary COCs are TCE, n-nitrosodimethylamine (NDMA), and perchlorate..

Point Source Contamination. There are typically about 200 active leaking underground storage tank (LUST) sites within the SGA area at any given time. A precise number is difficult to track as new sites are continually being identified while some sites are concluding cleanup activities. The latest information on the status of each LUST site is available through the State Water Resource Control Board (http://geotracker.swrcb.ca.gov). While many of these sites can be fully remediated, the aggregate impact from undetected contamination on groundwater quality in the basin cannot be determined and may ultimately be considerable.

2.1.1.3 Groundwater Levels

Intensive use of the groundwater basin has resulted in a general lowering of groundwater elevations near the center of the basin away from the sources of recharge. As early as 1968, pumping depressions were evident in northern Sacramento County. These depressions have grown and coalesced into a single cone of depression centered in the SGA area as shown in **Figure 5**. **Figure 5** is a representative contour plot of equal elevations of groundwater in the North Area Basin for Spring 2008. The low elevation in the area is approximately 40 feet below mean sea level (MSL), represented within the -40 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.

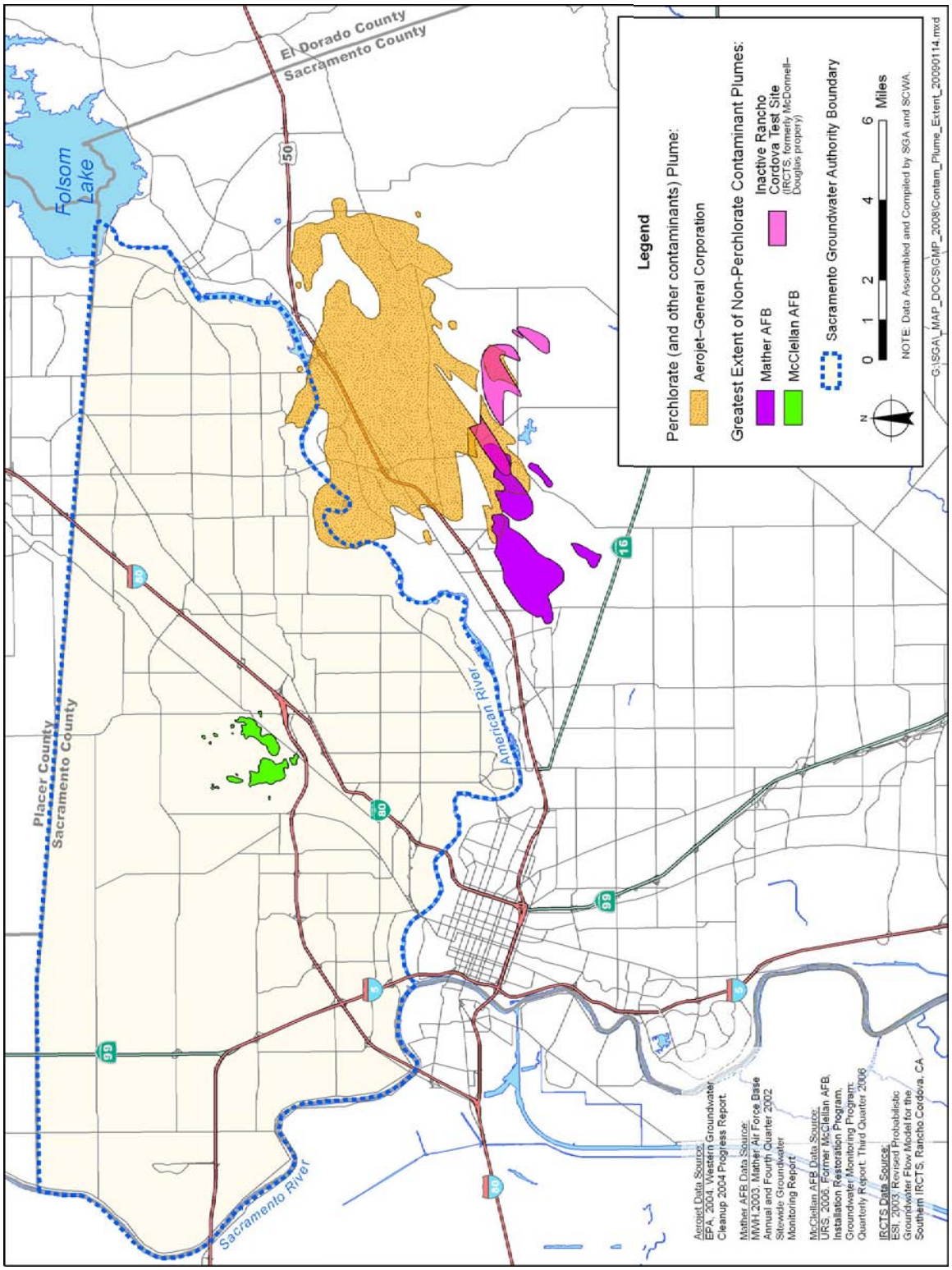

Figure 4. Principal Contaminant Plumes

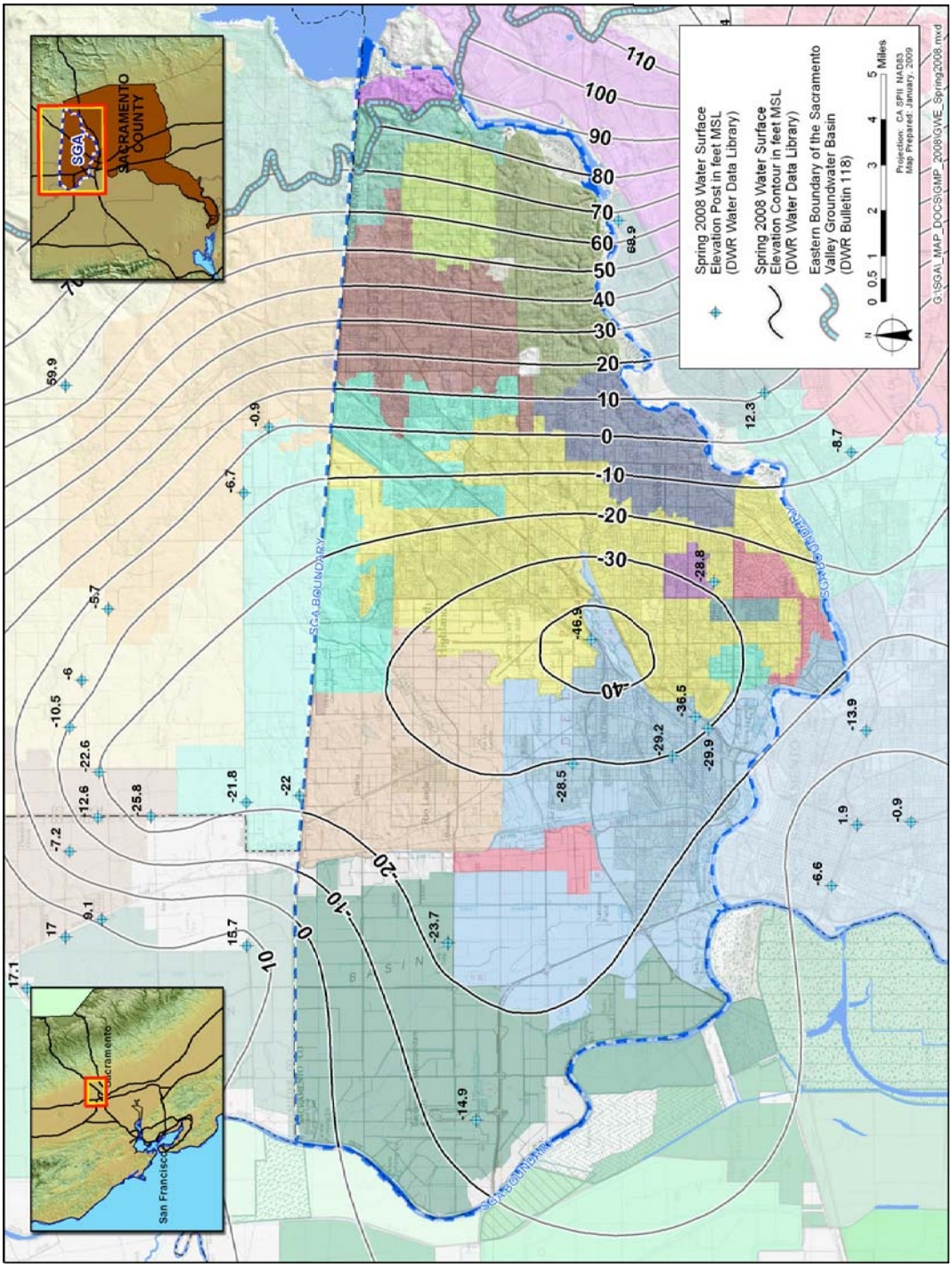

Figure 5. Spring 2008 Groundwater Elevation Contours

Groundwater Level Trends. **Figure 6** shows the locations and hydrographs of selected long-term monitoring wells in the basin. In general, past data shows that in the central portion of the North Area Basin groundwater elevations declined at a rate of nearly 1.5 feet per year from around the 1950s through the mid-1990s. Since the mid-1990s, groundwater elevations have stabilized within the regional cone of depression and, in some cases, groundwater elevations are continuing to increase slightly. This trend is largely due to operational changes as noted later in this section. 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 6**). This area is served almost exclusively by surface water. Hydrographs for SWP-216, SWP-261, and SWP-263 show that groundwater elevations range from about five feet below MSL to 20 feet above MSL. The hydrographs show that groundwater elevations have been fairly stable over the period of record, with very modest increases in 2003 and 2004. These wells typically experience only seasonal fluctuations.

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 6**). This area currently uses a combination of surface water and groundwater, but has historically relied predominantly on groundwater. Hydrographs for SWP-220, SWP-229, SWP-232, SWP-240, SWP-270 (also shown in **Figure 7**), and SWP-276 show that groundwater elevations currently range from about 10 feet above MSL to 40 feet below MSL. The drawdown in these wells over the past 60 years has been in excess of about 70 feet. Groundwater elevations in this area continued to decline every year until around the mid-1990s, when groundwater elevations stabilized due, at least in part, to expanded conjunctive use operations. Groundwater elevations have increased slightly over previous years despite the increase in groundwater extraction in the basin in 2007. This is likely because groundwater for public supply has been reduced in the immediate vicinity of McClellan to help contain the movement of contamination.

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 6**). This area has historically relied primarily on surface water. Hydrographs for wells SWP-236 and SWP-283 are typically in excess of 100 feet above MSL. Groundwater elevations can be highly varied from one well to another, as the area has rolling topography and the groundwater elevation 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.

2.2 SURFACE WATER SUPPLIES

Individual water purveyors utilize both surface water and groundwater. The supply mix may include combinations of groundwater; American River water diverted pursuant to water rights, contract entitlements, or other agreements; or Sacramento River water diverted pursuant to water rights or contract entitlements. This section describes surface water supplies available to the water purveyors within the SGA.

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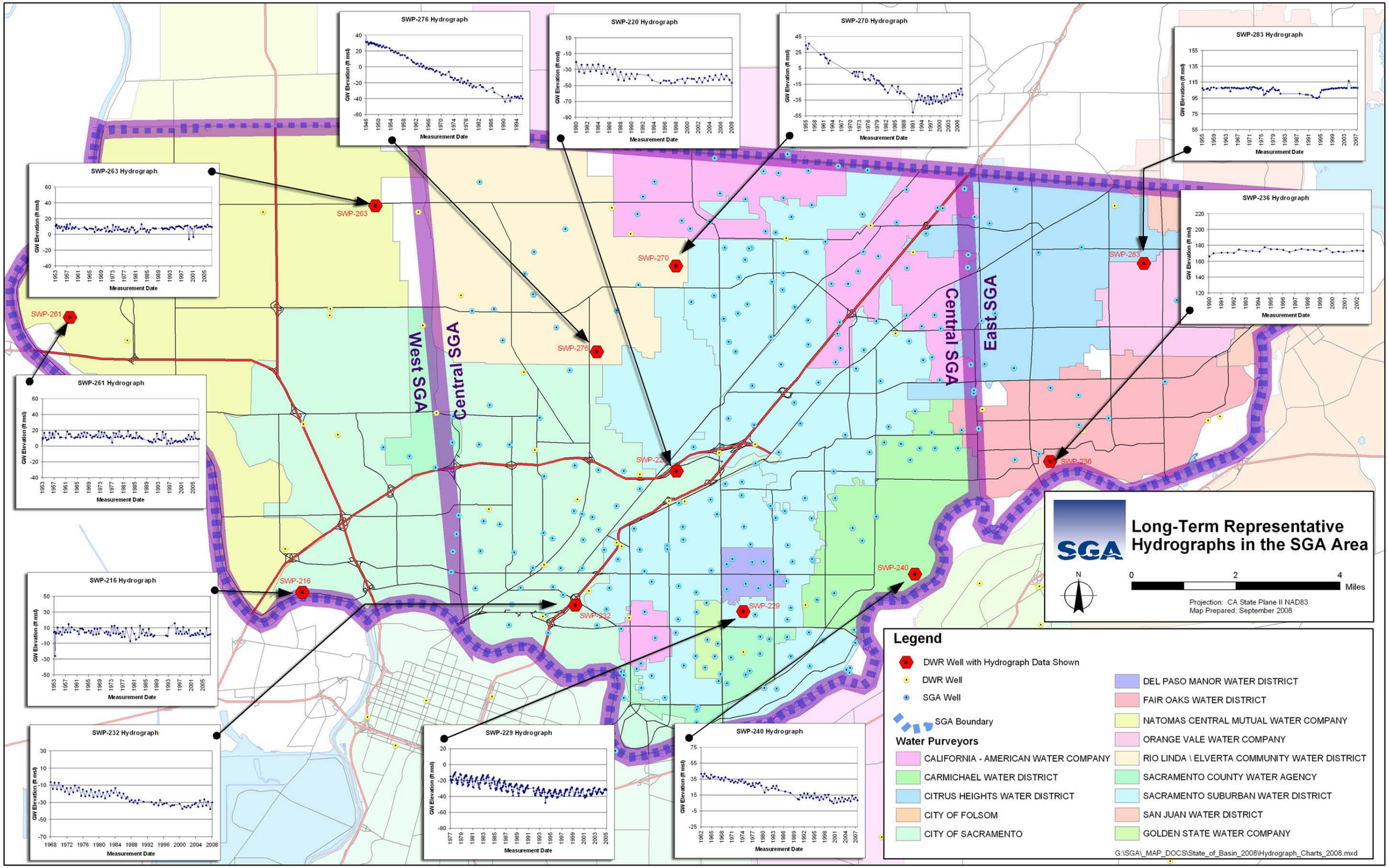

Figure 6. Representative Groundwater Hydrographs in the SGA Area

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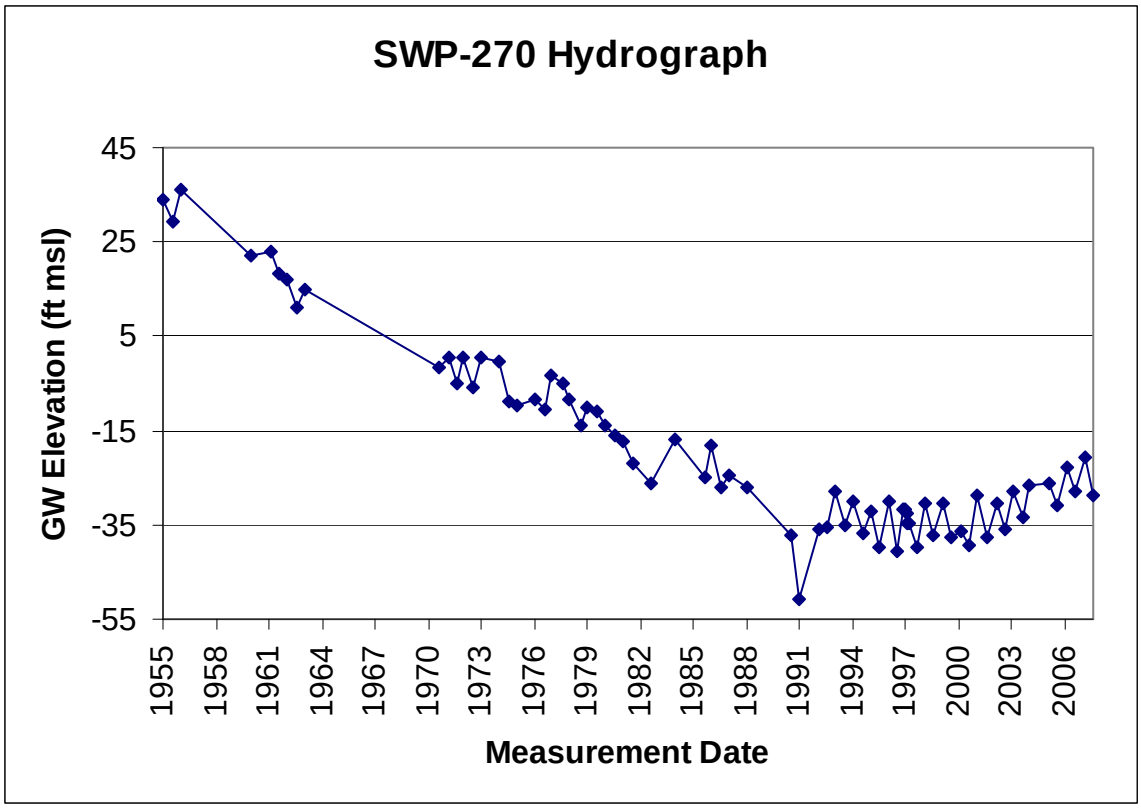

Figure 7. Single Long-Term Hydrograph in the SGA Area

2.2.1 Water Rights/Contract Entitlements

The following section provides information on water rights and contract entitlements on the American and Sacramento rivers within the SGA area.

2.2.1.1 American River Water Rights

Four of the water purveyors within the SGA boundaries have water rights on the American River: Carmichael Water District (CWD), City of Folsom (Folsom), City of Sacramento (Sacramento), and San Juan Water District (SJWD). These are described as follows:

- The place of use (POU) for CWD's water right is coincident with the boundaries of the District.
- The POU for Folsom's water right is coincident with the city limits and portions of the lands owned by Aerojet.
- The POU for Sacramento's water rights on the American River extends beyond the boundaries of the city limits. The authorized POU outside the city limits includes (1) portions of California American Water's (Cal Am) Arden service area; (2) Del Paso Manor Water District (DPMWD); (3) Sacramento Suburban Water District (Sac Suburban,) Arcade service area (Town and Country subarea) and portions of their Northridge service area; (4) SCWA, Arden Park Vista service area; (5) Golden State Water Company (GSWC), Arden Town service area; and (6) portions of CWD. In

addition, a portion of Sacramento's American River POU overlaps with the place of use for the Sacramento River water rights and contract entitlements of NCMWC.

- The POU for SJWD's water rights is the District's wholesale service area which encompasses SJWD retail service areas in Sacramento and Placer Counties, Citrus Heights Water District (CHWD), Fair Oaks Water District (FOWD), Orange Vale Water Company (OVWC), and that portion of Folsom that lies north of the American River.

2.2.1.2 American River Contract Entitlements

In Sacramento County, two water purveyors have existing water supply contract entitlements with the U.S. Bureau of Reclamation (Reclamation) Central Valley Project (CVP): Folsom and SJWD. SJWD provides CVP water to agencies within its wholesale service area.

In addition, SJWD and SCWA executed a water supply contract entitlement with Reclamation from Public Law (PL) 101-514 (commonly referred to as "Fazio Water") in 1999. However, the contract is currently being renegotiated under the CVP long-term contract renewals. SJWD's contract entitlement is for 13,000 AF/year, and this supply is used within SJWD's Sacramento County wholesale area. SCWA's contract entitlement is for 22,000 AF/year, and this supply is used within Zone 40 (south of the American River). Folsom has a subcontract with SCWA for 7,000 AF/year (out of the potentially available 22,000 AF/year).

Sac Suburban has a water sale agreement with Placer County Water Agency (PCWA). The POU for this water includes Sac Suburban's Northridge service area and Arcade service area (North Highlands subarea only) and the service areas of SJWD, FOWD, OVWC, CHWD, the former McClellan AFB, Cal Am (Antelope and Lincoln Oaks service areas), and Rio Linda/Elverta Community Water District (RLECWD).

2.2.1.3 Sacramento River Water Rights

Two of the water purveyors within the SGA boundaries have water rights on the Sacramento River: Sacramento and NCMWC. The POU for NCMWC's water rights on the Sacramento River is the water company service area that includes both the Sacramento County and Sutter County areas. The POU for Sacramento's water rights on the Sacramento River is the city limits.

2.2.1.4 Sacramento River Contract Entitlements

One water purveyor within the SGA boundaries has a CVP contract entitlement on the Sacramento River: NCMWC. The POU for this water is the water company service area that includes both the Sacramento County and Sutter County areas.

2.2.1.5 Other Agreements

Sacramento has agreements with Sac Suburban (for use within the Arcade Service Area only) and DPMWD to make surface water available for use within the portions of their service areas that lie within Sacramento's American River POU.

Sac Suburban has a temporary contract with Reclamation for surplus water (often referred to as Section 215 water). This contract has been exercised since 1991. Sac Suburban's Section 215 supplies ranged between approximately 100 AF/year and 11,880 AF/year during the period 1991 through 2000. Section 215 water is available on an intermittent basis subject to hydrologic conditions.

2.2.2 Surface Water Quality

Surface water quality is a function of the mass balance of water quality from tributary streams, diversions, agricultural return flows, subsurface drainage flows, permitted discharges from

municipal and industrial (M&I) sources, and urban runoff. Based on current Update Reports to the Watershed Sanitary Surveys for the American and Sacramento Rivers, these are both excellent supplies for drinking water in the Sacramento Metropolitan Area. The source waters can be treated to meet all Title 22 drinking water standards using conventional and direct filtration processes, as well as membranes. There are no persistent constituents in the raw waters that require additional treatment processes. However, there are sometimes seasonal treatment requirements for rice herbicides on the Sacramento River, which can be addressed through chemical oxidation processes. High turbidities during storm events are sometimes a treatment challenge, which can be managed by optimizing operations including adjusting chemical types and dosing schemes and reducing plant flow (Montgomery Watson and Archibald & Wallberg, 2000).

2.2.2.1 American River

In general, the quality of water in the American River is high from the river's headwaters to its confluence with the Sacramento River. It is low in alkalinity, low in disinfection by-product precursor materials, low in mineral content, and low in organic contamination. Limited data also indicate that the source of water is low in microbial contamination from *Giardia* and *Cryptosporidium*. Turbidity levels in the American River tend to be higher in the winter than summer because of higher flows associated with winter storms.

Folsom Reservoir. Water diverted from Folsom Reservoir is provided to the following SGA members: SJWD, CHWD, FOWD, OVWC, Folsom, and Sac Suburban[12]. Because the treatment facilities serving these areas share a common Folsom Dam intake facility, the raw water is considered to be similar with respect to quality. Characterization of Folsom Reservoir raw water quality is based on data collected by the Cities of Folsom and Roseville as well as SJWD.

Water diverted from the Folsom Dam is treated by SJWD and Folsom using conventional filtration processes with chlorine disinfection. Treated water quality varies depending on the specific type of treatment provided, but meets or exceeds all federal and state drinking water standards for both SJWD and Folsom under current operations. Both agencies include corrosion control practices in their treatment of the water.

American River at CWD's Bajamont Way Membrane Filtration Water Treatment Plant. CWD uses American River water diverted by three Ranney collectors[13] for water supply; therefore this is groundwater under the direct influence of surface water and is subject to the Environmental Protection Agency's (USEPA's) Surface Water Treatment Rule. The collectors are located within the American River floodplain and adjacent to the streambed. They serve as intake and pump structures to provide pre-filtered water to the Bajamont Way Membrane Filtration (Bajamont) Water Treatment Plant (WTP). The WTP is composed of microfiltration membrane units. After filtration, the water is chlorinated with sodium hypochlorite and the pH is adjusted with caustic soda prior to distribution. The treated water meets all current Title 22 drinking water quality standards (Archibald & Wallberg and MWH, 2003).

Lower American River at Sacramento's E.A. Fairbairn Water Treatment Plant. Water is diverted by Sacramento on the lower American River just downstream of the Howe Avenue crossing at the E.A. Fairbairn WTP. This water may be used by other entities within the American River POU on a wholesale basis. Water diverted at the plant undergoes conventional

[12] Water is also diverted, treated, and distributed by Roseville, located within Placer County.

[13] Ranney collectors capture water through a series of perforated pipelines that are drilled horizontally under (or near) a river from a large well or caisson ranging 12 to 16 feet in diameter where the water is pumped for use as a water supply.

treatment and disinfection. The treated water meets all current Title 22 drinking water quality standards (Archibald & Wallberg and MWH, 2003).

2.2.2.2 Sacramento River

In general, the quality of the Sacramento River is high in the vicinity of the SGA boundary. There are moderate amounts of alkalinity and minerals and low levels of disinfection by-product precursors. Turbidity levels in the Sacramento River are higher during the winter and early spring months, usually associated with reservoir releases or runoff from storm events. There are very infrequent detects of organic chemicals, many of which are pesticides or herbicides from agricultural operations. Data collected to date indicate that there is a low prevalence of *Giardia* and *Cryptosporidium* in the river, with protozoa only detected sporadically and at very low concentrations.

The characterization of the Sacramento River water quality in the vicinity of the SGA boundary is based on reports for the Sacramento River Water Treatment Plant (Sacramento River Watershed Sanitary Survey; 1995 Report and 2000 Update, prepared by MWH and Archibald & Wallberg).

Sacramento River at Sacramento's Sacramento River Water Treatment Plant. Water is diverted by Sacramento on the Sacramento River just downstream of the confluence with the American River. Characterization of the Sacramento River raw water quality at the Sacramento River WTP is based on data collected by Sacramento (Sacramento River Water Treatment Plant – Finalization of Preliminary Design, prepared by Montgomery Watson, 1998).

Water is treated by Sacramento using conventional filtration processes with chlorine disinfection. Treated water quality meets or exceeds all federal and state drinking water standards under current operations. Sacramento includes corrosion control in their treatment of the water.

Primary drinking water standards are set for constituents that cause an adverse impact to human health. Secondary drinking water standards are set for constituents that cause an unpleasing aesthetic impact on the water quality; these are not health-based standards. There were no violations of primary or secondary drinking water standards reported for any of the characterization points discussed above.

2.3 "OTHER" SUPPLIES

Currently, the opportunities for using recycled water north of the American River are limited. In Sacramento County, the most probable recycled water opportunity exists at the Sacramento Regional County Sanitation District's Wastewater Treatment Plant (Sac Regional) located in South Sacramento with a treated water effluent discharge on the Sacramento River near Freeport (south of the American River and outside the SGA boundaries). At this time, however, Sac Regional does not appear to be a likely source of recycled water for the area north of the American River. The cost of pumping recycled water from Sac Regional to areas north of the American River is currently prohibitive. A more economic recycled water program might include the scalping of wastewater flows north of the American River for treatment at satellite tertiary plants.

2.4 EXISTING FACILITIES AND OPERATIONS FOR MUNICIPAL AND INDUSTRIAL SUPPLIES

The SGA member agencies own, operate, and maintain numerous raw and treated water facilities to improve and sustain the delivery of drinking water to existing and future customers. Many of these facilities have a direct impact on the South Area Basin and are of interest to SGA in the implementation of its actions.

2.4.1 Major Infrastructure

For the purposes of this GMP, only the major surface water supply diversion facilities and groundwater supply facilities are described.

2.4.1.1 Surface Water Supply Facilities

There are four major diversion and treatment facilities on the American and Sacramento rivers that provide surface water within the SGA boundaries (see **Table 2**). The combined treatment capacity of these facilities is approximately 502 million gallons per day (MGD).

2.4.1.2 Groundwater Supply Facilities

The water purveyors within the SGA boundaries operate 209 groundwater wells (see Error! Reference source not found.) on an active or standby status as of late 2006. Most production capacities are in the range of 330 to 2,250 gallons per minute (gpm).

Table 2. Treatment Capacity at WTPs Providing Surface Water within the SGA Boundaries

Source Water/Facility/Owner	Treatment Capacity (million gallons per day, mgd)
Folsom Reservoir	
Peterson WTP (SJWD)	**120**
Lower American River	
Bajamont WTP (CWD)	**22**
E.A. Fairbairn WTP (Sacramento)	**200**
Sacramento River	
Sacramento River WTP (Sacramento)	**160**

Table 3. Groundwater Wells within SGA Boundaries

Water Purveyor/Agency	Number of Active or Standby Groundwater Wells
Cal Am	42
CWD	5
CHWD	3
City of Folsom	0
City of Sacramento	31
DPMWD	8
FOWD	7
GSWC	6
NCMWC	0
OVWC	2
RLECWD	11
Sac Suburban	
Arcade Service Area	57
Northridge Service Area	26
SCWA	11
SJWD	0
Individual representatives from agriculture and self-supplied groundwater users (principally parks and recreation districts)	-- [1]

Source: DMS, Data Current as of 2006

NOTES:
[1] SGA does not have information on these wells.

2.4.2 Operations

Recent (2000 through 2007) surface water and groundwater use within the SGA boundaries are shown in **Table 4**. **Table 4** shows that the water supplies of the individual purveyors ranges from all surface water to all groundwater, with many purveyors having access to both sources. The aggregate of these purveyors' supplies results in about a 50/50 blend of surface water and groundwater for municipal uses.

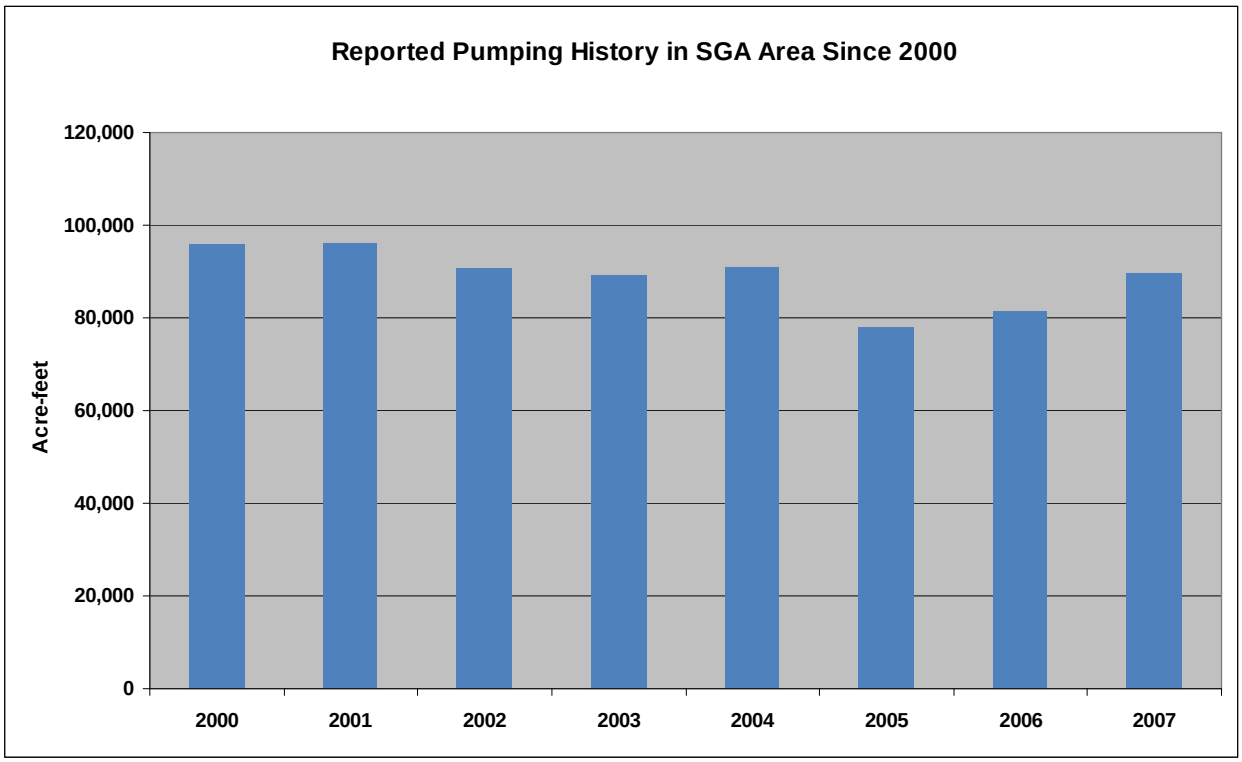

Figure 8. Total SGA Annual Groundwater Extraction in North Area Basin

The total groundwater extraction by SGA member agencies from 2000 through 2007 is summarized in **Figure 8** above. Over the period of record from 2000 to 2007, **Figure 8** shows groundwater extraction decreased as additional surface water supplies were used under conjunctive use operations implemented in the basin following the Water Forum Agreement in 2000. Groundwater use by public water suppliers dipped below 80,000 acre-feet in 2005 and increased slightly in 2006. Previously, reported groundwater use by public water suppliers had not been below 80,000 acre-feet since 1989. In 2007, groundwater extraction increased to over 89,000 acre-feet. This was expected because additional surface water was not available under the dry 2007 conditions. This shift in supply demonstrates successful implementation of a conjunctive use program in the basin.

Table 4. SGA Total Municipal and Industrial Water Deliveries in the SGA Area
2003-2007 (Calendar Years)

WATER PURVEYOR	YEAR	Surface Water (AF/year)	Ground Water (AF/year)	Total Water Deliveries (AF/year)
California American Water	2007	384	17,669	18,053
`	2006	1,024	17,973	18,997
	2005	0	17,968	17,968
	2004	0	19,784	19,784
	2003	0	19,240	19,240
Carmichael Water District	2007	9,509	2,868	12,377
	2006	8,971	3,519	12,490
	2005	9,722	2,347	12,069
	2004	9,843	3,836	13,679
	2003	9,358	3,265	12,623
Citrus Heights Water District	2007	16,237	98	16,335
	2006	18,736	100	18,836
	2005	18,994	100	19,094
	2004	19,753	1,347	21,100
	2003	17,938	573	18,511
Del Paso Manor Water District	2007	0	1,638	1,638
	2006	0	1,654	1,654
	2005	0	1,657	1,657
	2004	0	1,747	1,747
	2003	0	1,477	1,477
Fair Oaks Water District	2007	11,533	899	12,432
	2006	11,178	845	12,023
	2005	12,282	172	12,454
	2004	13,629	312	13,941
	2003	12,333	240	12,573
Folsom, City of	2007	1,820	0	1,820
	2006	1,695	0	1,695
	2005	1,561	0	1,561
	2004	1,415	0	1,415
	2003	1,107	0	1,107
Golden State Water Company	2007	0	1,252	1,252
	2006	0	1,296	1,296
	2005	0	1,248	1,248
	2004	0	1,372	1,372
	2003	0	1,311	1,311
Orange Vale Water Company	2007	4,452	0	4,452
	2006	3,642	0	3,642
	2005	3,376	0	3,376
	2004	4,165	0	4,165
	2003	3,816	0	3,816

Table 4. SGA Total Municipal and Industrial Water Deliveries in the SGA Area (Continued)
2003-2007 (Calendar Years)

WATER PURVEYOR	YEAR	Surface Water (AF/year)	Ground Water (AF/year)	Total Water Deliveries (AF/year)
Rio Linda/Elverta CWD	2007	109	3,305	3,414
	2006	0	3,378	3,378
	2005	0	3,209	3,209
	2004	0	3,407	3,407
	2003	0	3,163	3,163
Sacramento, City of	2007	25,431	18,618	44,049
	2006	22,560	20,917	43,477
	2005	25,213	19,415	44,628
	2004	42,804	20,339	63,143
	2003	31,594	22,621	54,215
Sacramento, County of	2007	0	5,353	5,353
	2006	0	5,133	5,133
	2005	0	5,111	5,111
	2004	0	5,691	5,691
	2003	0	5,034	5,034
Sacramento Suburban WD	2007	7,544	37,932	45,476
	2006	13,345	26,559	39,904
	2005	14,364	26,830	41,194
	2004	15,338	33,261	48,599
	2003	15,214	32,494	47,708
San Juan Water District	2007	4,213	0	4,213
	2006	4,038	0	4,038
	2005	3,839	0	3,839
	2004	4,379	0	4,379
	2003	4,261	0	4,261
Total for SGA Area	2007	81,232	89,632	170,864
	2006	84,165	81,374	165,539
	2005	89,351	78,057	167,408
	2004	111,326	91,096	202,422
	2003	95,621	89,418	185,039

Notes: This data does not include agricultural surface water supplies delivered by Natomas Central Mutual Water Company and groundwater extraction by agricultural and self-supplied users. It also does not include surface water supplies for portions of the San Juan Water District and the City of Folsom that are not within the SGA boundaries.

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Section 3 MANAGEMENT PLAN ELEMENTS

The elements of this GMP include an overall goal, a set of management objectives, and a series of plan components that discuss and identify the specific actions necessary for meeting the goal and objectives (see **Figure 9**).

3.1 GROUNDWATER MANAGEMENT GOAL

The goal of this GMP is to ensure a viable groundwater resource for beneficial uses including agricultural, industrial, and municipal supplies that support the WFA's co-equal objectives of providing a reliable and safe water supply and preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River.

3.2 BASIN MANAGEMENT OBJECTIVES

To meet the goal stated above, the SGA has adopted eight specific basin management objectives (BMOs). These BMOs include the following:

1. **Maintain or improve groundwater quality in the SGA area to ensure sustainable use of the groundwater basin.** The groundwater supplied for public consumption meets all public health criteria. However, occurrences of large-scale groundwater contamination are documented in the basin. It is the intent of the SGA that use of groundwater by member agencies in the basin is not hindered by contamination, and that such use does not cause degradation of the quality of the resource. Where contamination is documented, or occurs in the future, the SGA will coordinate with appropriate state and federal regulatory agencies to pursue actions that result in the containment and eventual remediation of the contaminant.

2. **Maintain groundwater elevations that provide for sustainable use of the groundwater basin.** The lowering of groundwater elevations can have adverse impacts ranging from increased energy costs to the need to deepen existing wells or even construct new ones. The regional use of groundwater has and will continue to result in a persistent cone of depression within the central portion of the North Area Basin. The SGA members have and will continue to implement conjunctive use programs that reduce further declines in the regional cone-of-depression. The SGA members intend that overall groundwater elevations in the basin be improved over time, and that the groundwater basin be managed such that the impacts during drier years will be minimized when surface water supplies are curtailed and are replaced by increased groundwater supplies.

3. **Protect against potential inelastic land surface subsidence.** Land subsidence can cause significant damage to essential infrastructure. Historic land surface subsidence within the SGA area has been minimal, with no known significant impacts to existing infrastructure. Given the historical trends, the potential for land surface subsidence from groundwater extractions in the SGA portion of the groundwater basin is remote. However, the SGA intends to monitor for potential land surface subsidence. If inelastic subsidence is documented in conjunction with declining groundwater elevations, the SGA will investigate appropriate actions to avoid adverse impacts.

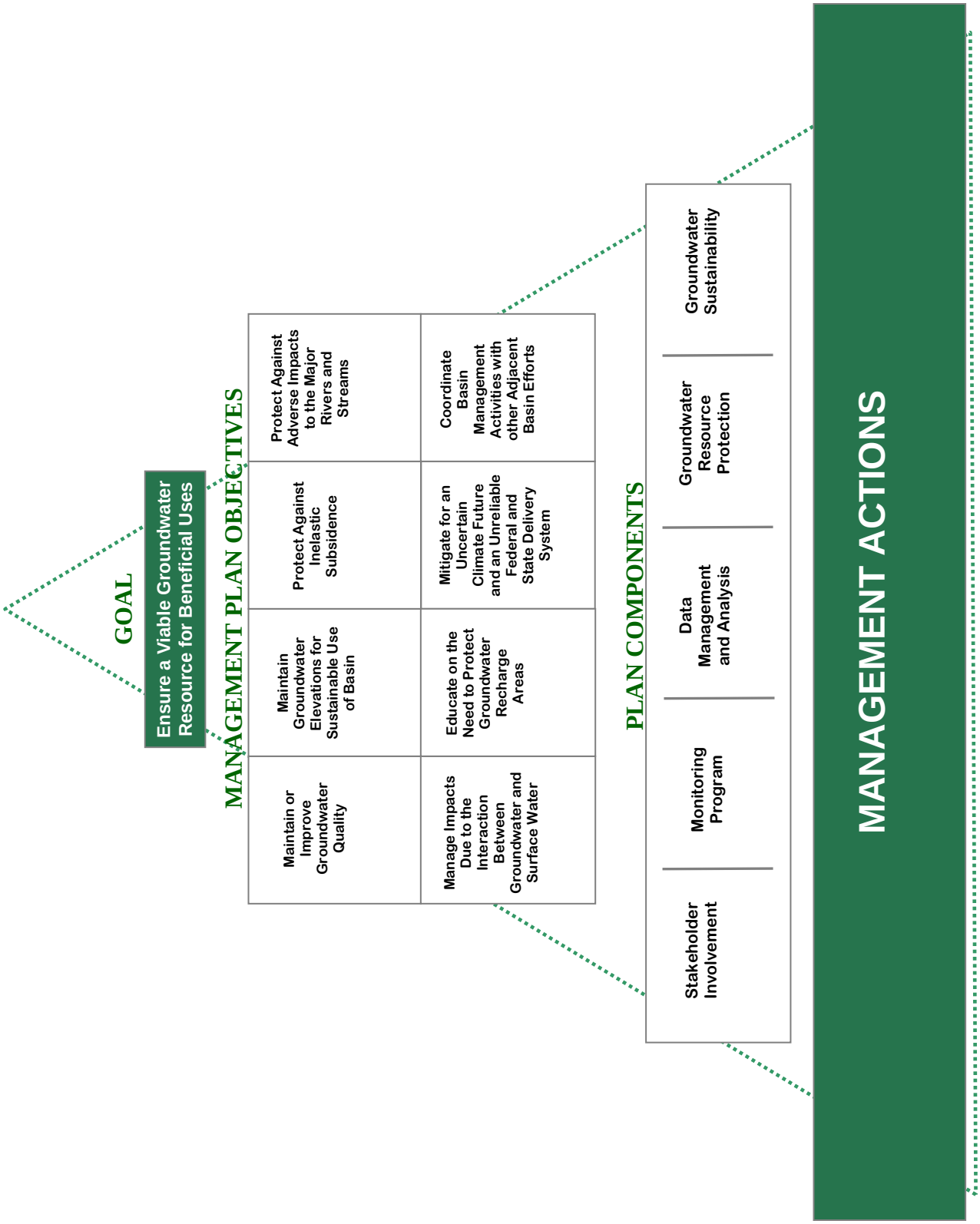

Figure 9. Organization of Management Plan Elements

4. **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.** Among other important uses, the American and Sacramento rivers and their tributaries provide habitat for a variety of fish and wildlife species. The SGA and its members are committed to the objectives of the WFA, including the objective to protect and enhance the lower American River. Important elements of the WFA include commitments to reduce lower American River diversions and to not exceed agreed upon groundwater extractions of 131,000 AF/year on average.

5. **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.** Surface water is a primary recharge source for groundwater in the SGA portion of the regional groundwater basin. The interaction of the two water supplies is well documented and the impacts of management actions from one supply could be detrimental to the other. Because the natural flow regime is such that groundwater is not discharging to either of the major rivers or local stream systems in the SGA area, surface water quality is not impacted by the difference in water quality constituents typically found in the region's groundwater supplies. While it is possible that future SGA management actions could temporarily alter that condition, it is the SGA's intent that operation of the groundwater system will not negatively impact the water quality of the area's rivers and local streams.

6. **Educate on the need to achieve recharge to the aquifer of appropriate quality and quantity to ensure basin sustainability.** There is an important link between activities that take place on the overlying surface of the groundwater basin and the effects that these uses have on the quality and quantity of natural recharge to the aquifer. Implementation of this objective will likely be through programs that educate on the need to protect groundwater recharge areas and pay attention to practices that either impede (e.g., large pavement areas) or could pollute (e.g., proper oil disposal) water as it makes its way from the surface to the aquifer.

7. **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.** Through local and statewide water planning efforts, there is an ever increasing need of placing value on groundwater as a buffer against predicted prolonged droughts. These planning efforts could call for increased conjunctive use beyond that considered under the WFA. This emphasizes the need to continue to plan for surface water in areas where use of groundwater is currently the sole source of water supply.

8. **Maintain a sustainable groundwater basin underlying the SGA area through coordination and collaboration with adjacent groundwater basin management efforts.** The SGA acknowledges that management of their portion of the groundwater basin influences, and is influenced by, the adjacent groundwater subbasins and the larger Central Valley groundwater basin. The SGA's primary delineation by county, city and water provider service boundaries does not account for the interrelationship amongst the

neighboring groundwater basins. As a result, the SGA will continue to seek coordination and collaboration with neighboring groundwater basin management programs.

3.3 GMP COMPONENTS

The GMP includes a variety of components that are required by CWC § 10753.7, recommended by DWR Bulletin 118 (2003), optional under CWC § 10753.8, and other components that SGA has initiated based on the needs of its members and their respective water service area customers. These components can be grouped into five general categories: (1) stakeholder involvement, (2) monitoring program, (3) data management and analysis, (4) groundwater resource protection, and (5) groundwater sustainability. Each category and its components are presented in this section. Under each component is a discussion, proposed actions, and identification of the objectives toward which the component is directed. As this GMP is a comprehensive update of SGA's GMP adopted in 2003, many of the actions have changed to reflect recent conditions. A complete listing of the original 2003 action items and their status is included in **Appendix B.**

3.4 COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT

The management actions taken by the SGA may have a wide range of impacts on a broad range of individuals and agencies that ultimately have a stake in its successful management of the basin. The local consumer may be most concerned about water rates or assurances that each time the tap is turned a steady, safe stream of water is available. To large state and federal water resource agencies, the degree to which the SGA can achieve local supply reliability and further banking and exchange programs enhances the state and federal programs' opportunity to meet statewide needs, particularly in drier years or under drought conditions. To address the needs of all of these stakeholders, the SGA has pursued several means of achieving broader involvement in the management of the SGA groundwater basin. These include: (1) involving members of the public, (2) involving other local agencies and groundwater management groups within and adjacent to the SGA area, (3) using advisory committees for development and implementation of the GMP, (4) developing relationships with state and federal water agencies, and (5) pursuing a variety of key partnerships to achieve local water supply sustainability. Each of these is discussed further below.

3.4.1 Involving the Public

Groundwater in California is a public resource, and the SGA is committed to involving the public in the ongoing implementation of its GMP. Creation of SGA was accomplished through a Joint Powers Authority signed by the cities of Citrus Heights, Folsom, and Sacramento and the County of Sacramento. The four entities chose an inclusive governance structure consisting of Board membership from all water suppliers overlying the SGA portion of the basin. Many of these Board members are elected officials representing the various water districts and the citizens they serve.

The original 2003 GMP had, as one of its goals, an update of the GMP every five years due to the constantly changing landscape for water supply and groundwater management in the State of California. In the preparation of this, the 2008 GMP, the SGA has filed two separate notices in the Sacramento Bee (**Appendix C**). In accordance with CWC § 10753.2, a notice of intent to prepare a GMP was published for the August 14, 2008 SGA Board Meeting inviting the public to attend. A second notice was published inviting the public for the adoption of the resolution to adopt the 2008 GMP at the December 11, 2008 SGA Board meeting.

Over the past five years, the SGA has demonstrated its commitment to outreach and education. In November 2003, the SGA launched a Web site (www.sgah2o.org) that has and will continue to be an effective means for public education on the status of SGA actions and its successes, and serves as a repository for downloading of all scanned public documents. The SGA will continue to use its Web site to distribute information on GMP implementation activities to the public.

Actions. The SGA will take the following actions:

1. Continue efforts to encourage public participation as opportunities arise.
2. Provide briefings, copies of Basin Management Reports, and a written annual summary to the Water Forum Successor Effort on GMP implementation progress.
3. Provide a written annual summary on GMP implementation progress to JPA signatories.
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.

3.4.2 Involving Other Agencies Within and Adjacent to the SGA Area

The SGA's legal boundary is limited to that of the JPA signatories in Sacramento County north of the American River. This includes all of Sacramento County north of the American River. All water purveyors in northern Sacramento County are SGA members and participate in the development and implementation of this GMP. **Figure 1** shows the SGA purveyors and some of the key adjacent entities that SGA has coordinated with during implementation of the GMP. One key agency within the SGA boundary that is not a water purveyor is the Air Force Real Property Agency (AFRPA), which oversees remediation efforts of contaminated soil and groundwater at the former McClellan AFB. The SGA and the AFRPA have regularly met to discuss issues related to groundwater management and remediation efforts at the former McClellan AFB, and have integrated some of the monitoring wells at McClellan AFB into the SGA Biennial Management Report.

Other users in the basin not noted on **Figure 1** include agriculture and other self-supplied groundwater producers. The SGA will outreach to these groups as needs arise.

As noted in **Figure 1** the SGA boundary covers approximately the southern one-third of the North American Subbasin as defined by DWR (**Figure 2**). The remainder of the subbasin includes portions of Sutter and Placer counties.

In 2000, NCMWC prepared a GMP for its service area in both Sacramento and Sutter counties (Luhdorff & Scalmanini Consulting Engineers (LSCE, 2002). That GMP continues to apply to NCMWC's service area, and it is currently being updated. While the SGA GMP is intended to benefit all users within the basin, the primary focus of SGA's management efforts to date have been on municipal and industrial uses in the central portion of the basin where a persistent cone of depression and extensive groundwater contamination have existed for many years. In the western portion of the SGA area (see **Figure 1**), a large number of agricultural operations exist within and adjacent to the NCMWC service area. This primarily agricultural area has not historically experienced significant concerns with respect to groundwater conditions. SGA and NCMWC are coordinating on management issues in this portion of the basin to ensure that groundwater management needs are met throughout the North Area Basin.

In Placer County, the SGA is closely connected to groundwater management activities through the RWA. In November 2007, the City of Roseville, the City of Lincoln, Placer County Water Agency (PCWA), and California American Water (Cal AM) cooperatively developed the Western Placer County Groundwater Management Plan (WPCGMP). The SGA GMP and WPCGMP are separate and apart based on their respective overlying regions, yet both share the same groundwater basin. SGA has participated in WPCGMP development meetings and have briefed staff responsible for the WPCGMP implementation on groundwater management activities taking place as part of the SGA GMP. The WPCGMP is currently in the data collection phase with groundwater basin characterization being the next phase prior to the implementation and management phase of their GMP.

In Sutter County, much of the subbasin is managed either by South Sutter Water District (South Sutter) or by NCMWC. NCMWC is an SGA member although the Sutter County portion of the district does not fall under this GMP, because it is beyond the boundaries of the SGA's authority. South Sutter adopted an AB 3030 GMP in 1995. South Sutter provided a copy of that GMP to the SGA, and the SGA has provided briefings to the South Sutter General Manager on its GMP implementation efforts. Finally, the SGA appointed a representative from Sutter County Department of Public Works as a member of the SGA GMP Technical Review Committee during development of the original 2003 GMP. Sutter County is currently in the process of developing an updated GMP, and is coordinating with SGA during its development.

In addition to involving other agencies within the North American Subbasin, the SGA also attends public meetings and briefs representatives of Yolo County (representing the Yolo Subbasin) to the west, the Sacramento Central Groundwater Authority for the portion of Sacramento County's aquifer that lies between the American and Cosumnes rivers, and the current stakeholder effort currently developing a South Sacramento GMP for the portion of the Sacramento County groundwater basin between the Cosumnes River and South Dry Creek (i.e., southern boundary of Sacramento County).

Actions. The SGA will take the following actions:

1. To the extent practicable attend regular meetings of the Sacramento Central Groundwater Authority and the Western Placer GMP group and notify them of SGA Board meetings.
2. Provide copies of the adopted GMP and subsequent Biennial Basin Management Reports to representatives from the Western Placer, Sutter County, and Yolo County management groups as well as the Sacramento Central Groundwater Authority and the on-going stakeholder efforts taking place in South Sacramento County.

3. Meet with representatives from the Western Placer, Sutter County, and Yolo County management groups, as well as the Sacramento Central Groundwater Authority and the on-going stakeholder efforts taking place in South Sacramento County, as needed.

4. Coordinate with the Western Placer management group, and the 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.

3.4.3 Utilizing Advisory Committees

The SGA is committed to using advisory committees in its GMP development and implementation. Prior to beginning development of the original 2003 GMP, the SGA Board appointed an ad hoc committee to make recommendations for the composition of a Policy Committee and Technical Review Committee to guide development of the GMP. The ad hoc committee recommended that the Policy Committee be composed of SGA members representing the overall composition of the groundwater users within the SGA boundaries and that the Technical Review Committee include broader membership including agencies outside the SGA boundaries to consider technical issues related to the plan.

The updated 2008 GMP utilized the existing GMP Implementation Committee comprised of Board appointed members of SGA to provide oversight in revising objectives and action items. The product of this effort was approved by the SGA Board of Directors at their December 11, 2008 Board Hearing.

Actions. The SGA will take the following action:

1. The GMP Implementation Committee will meet at least annually to review and guide implementation of the plan. Ad-hoc use of Technical Review Committees will take place, as needed.

3.4.4 Developing Relationships with State and Federal Agencies

Working relationships between the SGA and the local, state, and federal regulatory agencies are critical to developing and implementing the various groundwater management strategies and actions detailed in this GMP.

One issue of particular importance to SGA is the presence of groundwater contamination plumes (**Figure 4**) associated primarily with federal defense-related activities. This contamination is known to limit local water purveyors' access to a significant portion of high-quality groundwater in the basin. Ultimately, this could leave surface water as the best replacement alternative, which in turn would threaten the region's ability to implement the WFA.

In February 2004, SGA learned that N-nitrosodimethylamine (NDMA) associated with a contaminant plume from the Aerojet facility near Rancho Cordova had been detected in a monitoring well within Carmichael Water District (CWD). In late June 2004, SGA representatives joined forces with the Water Forum to establish what is now known as the Regional Contamination Issues Committee (RCIC) in recognition of the Water Forum's stake in addressing regional groundwater contamination issues.

The RCIC is a forum for water purveyors, regulators and responsible parties to raise issues and discuss solutions for dealing with groundwater contamination issues that impact the region. SGA and local water purveyors have also briefed members of Congress and their staff on regional groundwater contamination issues associated with federal defense-related activities. SGA has

continued to request funding from the Department of Defense and the USEPA to support studies and other activities to protect the region's groundwater resources.

The SGA has also been working with the Sacramento Area Flood Control Agency (SAFCA) and United States Army Corps of Engineers (USACE) in understanding the effects on groundwater of placing deep slurry walls to strengthen existing levees in Sacramento County along the Sacramento and American rivers. As a result of SGA comments, groundwater experts have been called upon by SAFCA to better understand and quantify the potential loss in natural recharge that may result from the placement of impervious barriers along these two natural recharge sources.

The SGA also coordinates and develops working relationships with other local, state, and federal regulatory agencies (e.g., SAFCA, Sacramento County, California Department of Public Health, USEPA, USACE, etc.), as appropriate.

Actions. The SGA will take the following action:

1. Continue to develop working relationships with local, state, and federal regulatory agencies.

3.4.5 Pursuing Partnership Opportunities

The SGA is committed to facilitating partnership arrangements at the local, state, and federal levels. In the past two decades, the Sacramento-area water community and other local leaders have made great strides toward regional planning and collaboration on water issues. The historic WFA, which involved over 40 stakeholders and 7 years of facilitated discussions, resulted in a regional framework to balance the competing demands for increased use of surface water and groundwater with the environmental needs of the lower American River through the year 2030. Several important partnerships have been formed to implement the WFA as well as provide a host of other benefits to water agencies and the customers that they serve.

The SGA itself is a unique partnership between the cities and county entering a joint powers agreement and allowing the agency to be overseen by a board of local water purveyors and self-supplied and agricultural interests. Regionally, the SGA is closely partnered with the RWA, the Water Forum Successor Effort, and the IRWMP participating agencies. Together these activities define and support a conjunctive use program, which is critical to supporting the overall management goal of a safe and reliable water supply.

While the facilities necessary for local supply reliability through 2030 have been identified through the regional-based IRWMP, the potential exists to expand conjunctive use operations in the basin to achieve broader regional and statewide benefits. The needed facilities, however, would require substantial resources, and the change in water use would require agreement from the Water Forum Successor Effort. To investigate any further opportunities would require resources provided through partnerships from potential beneficiaries.

Actions. The SGA will take the following actions:

1. Continue to promote partnerships and work alongside the Water Forum Successor Effort to achieve both local supply reliability and broader regional and statewide benefits.
2. Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.

3.5 COMPONENT CATEGORY 2: MONITORING PROGRAM

At the heart of this GMP is a monitoring program capable of assessing the status of the basin and responses in the basin to future management actions. The program includes the monitoring of groundwater elevations, monitoring of groundwater quality, monitoring and assessing the potential for inelastic land surface subsidence resulting from groundwater extraction, and continuing to improve our understanding of the relationship between surface water and groundwater along the American and Sacramento rivers. Also important is the continued use of monitoring protocols to ensure the accuracy and consistency of data collected.

3.5.1 Groundwater Elevation Monitoring

The SGA has compiled historic water level data measurements extending from prior to 1950 through 2008. Sources of historic water level data for the SGA area include:

- DWR/SCWA
- SGA Member Agencies
- USGS
- CSUS

DWR has maintained a multi-agency program of measuring more than 30 wells in the SGA portion of the groundwater basin. However, the wells monitored have been added to and dropped off of the network over time, so it is difficult to compare a historic contour plot to a recent one. For this reason, the SGA is working to continue the use of a standardized network of wells that combines those already monitored through the DWR program with wells from member water purveyors and other sources. It is the SGA's intent that these wells be maintained as a consistent long-term network that represents overall groundwater elevation conditions in the basin with a minimum of two measurements a year to represent spring and fall conditions. **Figure 10** shows the existing and proposed wells for this network as of 2008.

The wells have been selected to provide uniform geographic coverage throughout the 195 square mile SGA area, and in an area around the northern, western, and southern perimeter of the SGA[14]. The well network was developed by first establishing a network of sampling grids using the following method:

- Overlay a matrix of evenly spaced points over the SGA area.
- Surround matrix of points with polygons.
- Conform boundaries of polygons to the SGA boundaries and regenerate area grids.

[14] No wells were selected east of the boundary because it is in consolidated rock outside of the groundwater basin.

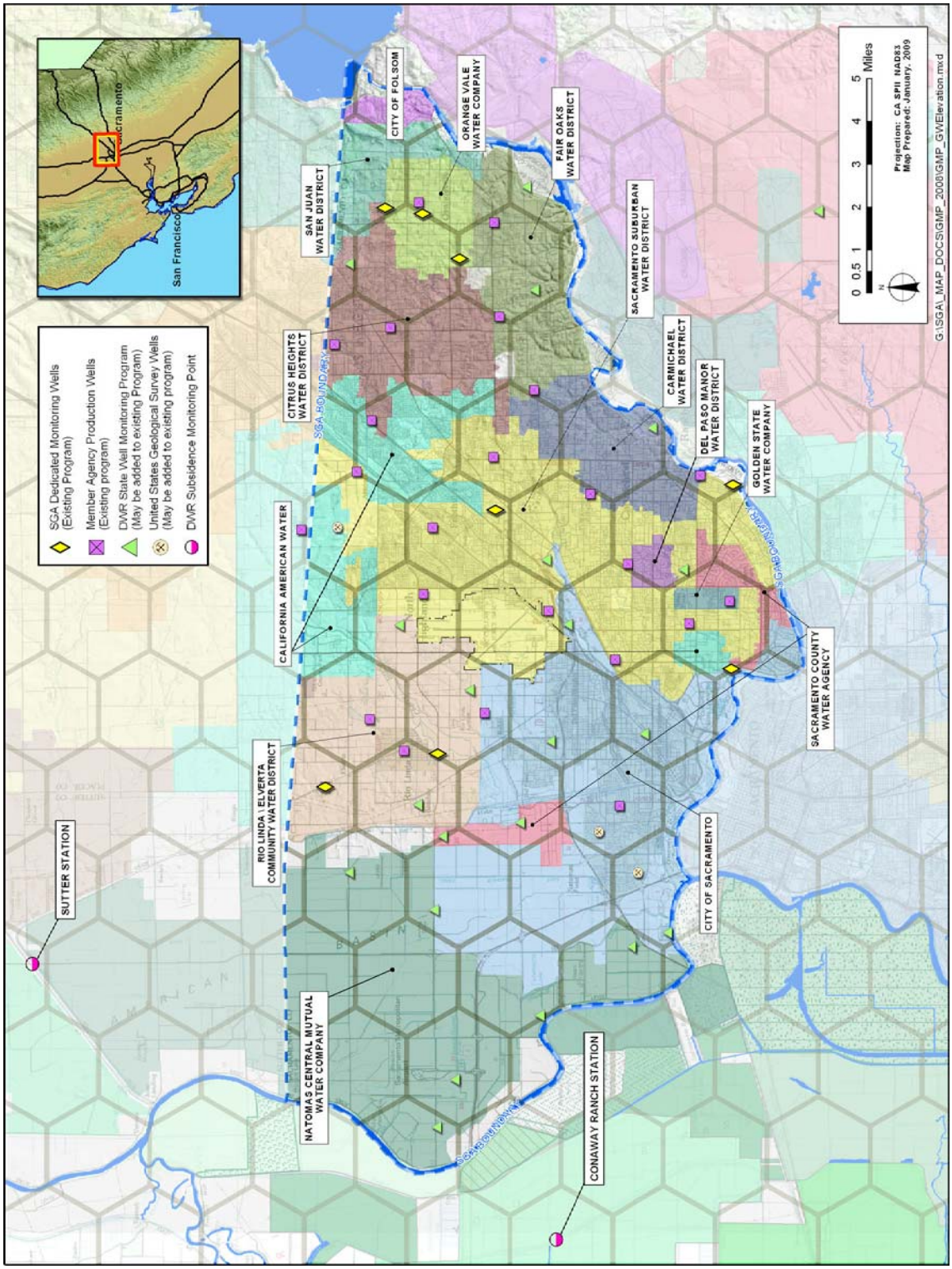

Figure 10. Existing and Proposed Wells for SGA's Groundwater Elevation Monitoring Network

The resulting grid, shown on **Figure 10,** includes 44 polygons of roughly equal area of about five square miles each. The member agency monitoring wells has been selected from the DMS to represent water levels for as many polygons as possible. Individual wells were selected by:

- Giving preference to wells currently in DWR's monitoring program. These wells were selected because (a) they have long records of historic water level data and are useful in assessing trends within the groundwater basins, (b) uniform protocols were used in measuring and recording the water level data, and (c) these are typically non-producing wells, so water level readings represent relatively static levels. Wells were screened further based on having a well completion report that identifies the depth and, if available, the well screen elevations. Additional screening is taking place on a continuous basis to insure that measurements are true indicators of the regional groundwater elevations (e.g., older wells that have historically used oils to lubricate the pump and drive assembly create a false reading unless adjustments in depth to water are made based on the depth of oil in the well column. The oil stands on top of fresh water and can accumulate to as much as 10 feet or more.)
- Identifying member agency wells with well construction information, long records of water level data and giving preference to those wells with the lowest recent extraction volumes where standard protocols are followed.
- Plotting the location of USGS wells within the SGA area and choosing wells in those areas void of DWR or member agency wells.

Actions. Additional actions by the SGA will include:

1. Coordinate with member agencies to collect data from a group of representative wells for monitoring spring and fall groundwater elevation measurements.
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.
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.
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.
5. Coordinate with the USGS to determine the potential for integrating USGS monitoring wells constructed for the NAWQA Program into the SGA monitoring network.
6. Maintain the existing SGA monitoring well network for purposes of groundwater elevation monitoring.
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.
8. Assess the adequacy of the groundwater elevation monitoring well network biennially.

3.5.2 Groundwater Quality Monitoring

Because most of the wells in the basin are used for public water supply, an extensive record of water quality data is available for most wells dating from about 1985 to present. The SGA has compiled available historic water quality data for constituents monitored as required by the

California Department of Public Health (DPH) under Title 22. Sources of water quality data include:

- SGA Member Agencies
- DWR
- USGS
- CSUS

This level of monitoring is sufficient under existing regulatory guidelines to ensure that the public is provided with a safe, reliable drinking water supply. It is also important to have in place a network of shallow (less than 200 feet deep) dedicated monitoring wells to serve as an early warning system for contaminants that could make their way to the greater depths in the basin where SGA members primarily extract groundwater. The SGA has installed a series of monitoring wells in the basin through a Local Groundwater Assistance Grant from DWR (see **Figure 11**). Additionally, SGA has incorporated water quality data from wells in with the USGS NAWQA program and worked with AFRPA to identify a subset of the approximately 400 monitoring wells located in and around the former McClellan AFB for integration into the SGA monitoring effort.

Figure 11 shows the existing SGA member agency production wells. Title 22 water quality reporting is required by DPH for each of these public drinking water supplies. The SGA's water quality monitoring network also includes these wells. The water quality monitoring well network will continue to be expanded to include additional DWR, USGS, McClellan, Aerojet, CVRWQCB, and privately owned wells are opportunities arise.

Actions. The following actions will be taken by the SGA to monitor and manage groundwater quality:

1. Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.
2. Maintain the existing SGA monitoring well network for purposes of groundwater quality monitoring.
3. Coordinate with the USGS to continue to obtain water quality data from NAWQA wells.
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.
5. Assess the adequacy of the groundwater quality monitoring well network in the Biennial Basin Management Report.

3.5.3 Land Surface Elevation Monitoring

Subsidence of the land surface resulting from compaction of underlying formations affected by head (water level) decline is a well-documented concern throughout much of the Central Valley.

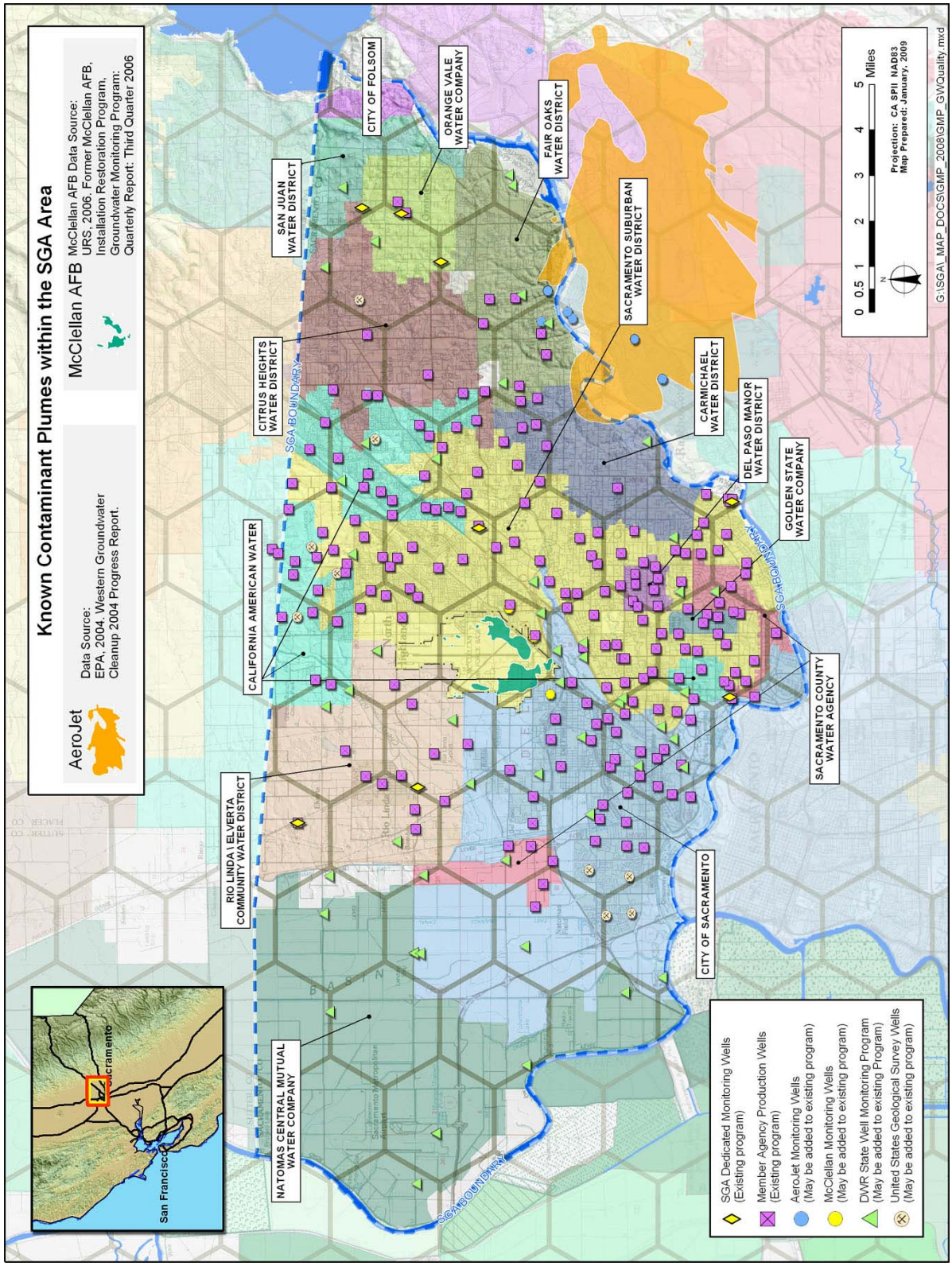

Figure 11. Existing and Proposed Wells in SGA's Groundwater Quality Monitoring Network

During a typical pumping season, changes in land surface elevation can be observed as a result of both elastic and inelastic subsidence in the underlying basin. Elastic subsidence results from the reduction of pore fluid pressures in the aquifer and typically rebounds when pumping ceases or when groundwater is otherwise recharged resulting in increased pore fluid pressure. Inelastic subsidence occurs when pore fluid pressures decline to the point that aquitard (a clay bed of an aquifer system) sediments collapse resulting in permanent compaction and reduced ability to store water in that portion of the aquifer.

While some land surface subsidence from compaction of water-bearing deposits caused by the removal of groundwater is known to have occurred west of the Sacramento River[15], the extent of subsidence east of the Sacramento River has been minimal.

DWR maintains two subsidence monitoring stations near the North Area Basin (see **Figure 10**). The Sutter Station is located just north of the SGA area, where State Highway 99 crosses the Natomas Cross-Canal. Total subsidence at the Sutter Station from spring 1995 to spring 2003 has been 0.026 feet (0.312 inch)[16]. Total subsidence at the Conaway Ranch Station, located west of the SGA area, from spring 1992 to spring 2003 has been 0.044 feet (0.526 inch)[17].

Historical benchmark elevation data for the period from 1912 through the late 1960s obtained from the National Geodetic Survey (NGS) were used to evaluate land subsidence in north Sacramento County. From 1947 to 1969 the magnitude of land subsidence measured at benchmarks north of the American River in Sacramento County ranged from 0.13 feet to 0.32 feet, with a general decrease in subsidence in a northeastward direction. This decrease is consistent with the geology of the area: formations along the eastern side of the Sacramento Valley are older than those on the western side and are subject to a greater degree of pre-consolidation making them less susceptible to subsidence. The maximum documented land subsidence of 0.32 feet was measured at benchmarks located approximately two miles northeast of the former McClellan AFB, and approximately one mile northeast of the intersection of Greenback Lane and Elkhorn Boulevard.

Another land subsidence evaluation was performed in the Arden-Arcade area[18] of Sacramento County from 1981 to 1991. Elevations of nine wells in the Arden-Arcade area were surveyed in 1981, 1986, and 1991. The 1986 results were consistently higher than the 1981 results; this was attributed to extremely high rainfall totals in early 1986 that recharged the aquifer and caused a rise in actual land surface elevations. The 1991 results were consistently lower than the 1986 results; this was attributed to five years of drought immediately preceding the 1991 measurements, which caused depletion of the aquifer and resulting land surface subsidence. Comparison of eight[19] of the locations indicates that seven benchmarks have lower elevations in 1991 than in 1981 and one benchmark has a higher elevation in 1991. Of the seven benchmarks with lower elevations in 1991, the maximum difference is 0.073 feet (less than one inch).

[15] From 1988-1992 cumulative net sediment compaction of 0.78 feet was measured at the extensometer in Yolo County between June 15, 1988 and October 1, 1992 (USGS data from the Woodland land subsidence monitoring station, Yolo County, California, water years 1988-1992, USGS Open File Report 94-494)

[16] Based on information provided by Central District of DWR to MWH on 12/11/03.

[17] Based on information provided by Central District of DWR to MWH on 12/17/03.

[18] The boundaries of the Arden-Arcade area are (1) Sacramento's city limits on the west, (2) Sacramento's city limits and the American River on the south, (3) CWD on the east, and (4) Sacramento's city limits and Sac Suburban (Northridge Service Area) on the north.

[19] One of the nine wells could not be compared between 1981 and 1991 because the benchmark was destroyed and replaced between 1981 and 1986.

Whether this is inelastic subsidence is indeterminate from the data, but it is clear that the magnitude of the potential subsidence in the benchmarks during that period is negligible.

In an effort to further the monitor land subsidence, SGA surveyed elevations of its monitoring well network and is coordinating with SSWD to monitor surveys of benchmarks established at SSWD monitoring wells..

Actions. The SGA will continue to monitor land subsidence and pursue additional possible actions, if necessary. These will include:

1. Re-survey the elevations established at SGA monitoring wells.
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.

3.5.4 Surface Water Groundwater Interaction Monitoring

The interaction between groundwater and surface water continues to be evaluated within the region. The SGA has and will continue to pursue activities in support of a better understanding on how these two water supplies are related. SGA is currently aware of the following:

- A draft decision by the State Water Resources Control Board (SWRCB, 2003) regarding the American River. The SWRCB concluded that from Nimbus Dam to about 6,000 feet below the dam, groundwater elevations and surface water elevations were similar enough to each other that the river could be either a losing or a gaining reach. Beyond 6,000 feet downstream from Nimbus Dam, groundwater elevations are sufficiently lower than the river channel to conclude that the American River is a losing reach down to the confluence with the Sacramento River.
- Updated higher resolution groundwater models have been developed over the past five years (See **Section 3.6.1**) and are now being used to estimate flow volumes between surface water and groundwater for various hydrologic conditions.

Actions. The SGA will pursue actions to better understand the relationship between surface and groundwater in the SGA area, including:

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.
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. Also use this same data to calibrate groundwater models that simulate this interaction.
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.
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.
5. Coordinate with the Corps of Engineers and SAFCA to review projects that could potentially impact recharge from rivers to the underlying groundwater basin.

3.5.5 Protocols for the Collection of Groundwater Data

The SGA has evaluated the accuracy and reliability of groundwater data collected by member agencies (MWH, 2002). The evaluation indicated a significant range of techniques, frequencies and documentation methods, for the collection of groundwater level and groundwater quality data. Although the groundwater data collection protocol may be adequate to meet the needs of the individual water districts, the lack of consistency between districts in the past yields an incomplete picture of basin-wide groundwater conditions. Other types of groundwater data collection protocols are included in **Sections 3.5.1** and **3.5.2** above.

Actions. To improve the comparability, reliability and accuracy of groundwater data, the SGA take the following actions:

1. Use a Standard Operating Procedure (SOP) for collection of water level data by each of the member agencies. **Appendix D** includes an SOP for Manual Water Level Measurements. This SOP was prepared using guidance documents available through USEPA and was included in the SGA technical memorandum summarizing the accuracy and reliability of groundwater data (MWH, 2002).
2. Provide member agencies with guidelines on the collection of water quality data developed by DPH for the collection, pretreatment, storage, and transportation of water samples (DHS, 1995).
3. Provide training on the implementation of these SOPs to member agencies, if requested.

3.6 COMPONENT CATEGORY 3: DATA MANAGEMENT AND ANALYSIS

This category will ensure that SGA maintains a centralized database of well status and construction information, groundwater quality and elevation data, and known groundwater contamination sites for application in annual reporting and use in technically appropriate model(s) for analyzing basin management activities. Three activities are taking place on a continuous basis to insure that the SGA is using current data that is screened for its quality and use in portraying the data in the biennial Basin Management Report.

3.6.1 SGA Groundwater Model

In September 2007, an update to the Integrated Groundwater and Surface Water Model (IGSM) application for the North Area Basin was successfully completed. The previous IGSM application was developed in the mid-1990s. Since that time, several improvements were made to the programming to warrant an update of the model datasets. In particular, the model is now capable of simulating daily surface water flows, which could greatly improve simulation of the interaction between groundwater and surface water systems. Additionally, improvements have been made to the algorithm that calculates the surface water/groundwater interaction. Finally, improvements to desktop computer processor speeds enable a much greater number of calculations to be made in shorter time periods. This in turn enables more model nodes, resulting in a more refined model grid and more detailed simulations in areas of particular interest.

Half of the update was funded through a $250,000 grant from the Department of Water Resources' Local Groundwater Assistance Program (AB 303) to SGA. The remaining half of the update was funded through a partnership between the Regional Water Authority (RWA), the U.S. Army Corps of Engineers, and a Proposition 50 planning grant from DWR.

The model improvements included: 1) updating the hydrology for the calibration period (1970 through 2004) from monthly to daily; 2) refining the model grid to improve the model simulation, particularly along stream nodes where recharge to the aquifer system may be

occurring; 3) identifying additional monitoring wells to increase the number of groundwater elevation measurements used in calibrating aquifer hydrogeologic parameters; and 4) developing baseline models of existing and future conditions to evaluate potential impacts of various conjunctive use scenarios.

Actions. The SGA will utilize the existing SGA IGSM application and, if necessary, other groundwater model(s) through education, improvements and continuous calibration. To achieve this, the SGA will take the following actions:

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 MODLFOW) that may be available for longer-term modeling needs.
2. Canvas the membership annually to determine if they have any upcoming modeling needs.
3. Work with modeling support consultant(s) 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.

3.6.2 Comprehensive Data Analysis

The SGA has and will continue to update the member agencies and public at-large on the current state of the SGA portion of the groundwater basin through Biennial Basin Management Reports. The SGA has produced a 2004/05 and a 2006/07 report currently available for download on the SGA website (http://www.sgah2o.org)

Actions. The SGA will continue biennial reporting on the basin management activities and will work with member agencies to improve reporting, if necessary.

1. Prepare the biennial Basin Management Report to assess basin conditions in even numbered years.
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.
3. If 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).

3.6.3 Data Management System

The SGA membership includes 14 public agency and investor-owned water purveyors. Historically, the member agencies have maintained a varying range of groundwater-related data in a wide variety of formats. In order for the SGA to achieve its primary objective of sustaining its groundwater resource, it is essential to develop a data storage and analysis tool, the DMS. The DMS was developed by MWH under contract with the USACE. Other local sponsors included DWR and the SGA.

Development of the DMS includes both the population of a database and the development of a user interface to easily access the database. Phase I of the DMS development was completed in January 2003 and included initial development of the user interface and population of the DMS to a demonstration level of approximately one-fourth of the water purveyor wells. Phase II fully populated the database and added further customization of the user interface with additional analysis features. The input of new data has taken place with each biennial Basin Management

Report. Quality-control measures are also implemented to remove questionable data and to verify the quality and completeness of new data.

The DMS is a public domain application developed in a Microsoft Visual Basic environment and is linked to a database of the SGA purveyor data and groundwater model data. The DMS provides the end-user with ready access to both enter and retrieve data in either tabular or graphical formats. Data in the DMS include:

- Well construction details.
- Known locations of groundwater contamination and potentially contaminating activities.
- Long-term monitoring data on:
  - Monthly extraction volumes.
  - Water elevations.
  - Water quality.
- Aquifer characteristics based on well completion reports.
- Groundwater model input and output data.

The DMS allows for the viewing of regional trends in water level and water quality not previously available to the SGA (see **Figure 12** for a DMS screen capture). The DMS has the capability of quickly generating well hydrographs and groundwater elevation contour maps using historic groundwater level data. The DMS also has the ability to view water quality data for Title 22 required constituents as a temporal concentration graph at a single well or any constituent can be plotted with respect to concentration throughout the SGA area. Some additional features include the ability to view cross-sectional data using well lithology data across the groundwater basin, and the ability to incorporate groundwater model calibration results and compare the results with actual monitored groundwater elevation data.

Presentation of groundwater elevation data and groundwater quality data in these ways are useful for making groundwater basin management decisions. The SGA is currently in the process of establishing data transfer protocols so that groundwater data within the SGA area (by member agencies, DWR, AFRPA, USGS, etc.) can be readily appended to the database and analyzed through the DMS. Annual summaries of groundwater monitoring data will be prepared using the analysis tools in the DMS and presented in the biennial update to Basin Management Report (see **Section 3.6.2**).

Actions. To maintain and improve the usability of the DMS, the SGA will take the following actions:

1. Continue to update the SGA database with current water purveyor data.
2. Make recommendations to the DMS developer on utilities to add to the DMS to increase its functionality.
3. Review the current database and recommend actions to increase the accuracy and efficiency of the SGA database.
4. Work with adjacent groundwater authorities on shared data protocols to achieve the highest level of confidence in the comprehensive data analysis.

3.7 COMPONENT CATEGORY 4: GROUNDWATER RESOURCE PROTECTION

The SGA considers groundwater protection to be one of the most critical components of ensuring a sustainable groundwater resource. In this GMP, resource protection includes both prevention of contamination from entering the groundwater basin and remediation of existing contamination. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, and protection of recharge areas.

3.7.1 Well Construction Policies

The Sacramento County EMD administers the well permitting program for Sacramento County. The standards for construction are identified in Sacramento County Code, Chapter 6.28 (Sacramento County Ordinance No. 1246) as amended on July 22, 2003. In addition to general well construction standards, Sacramento County receives and scans all well completion reports for wells constructed in Sacramento County.

The Sacramento EMD maintains a policy of special review by appropriate regulatory agencies for well permits within 2,000 feet of a known contaminant plume (referred to as Consultation Zones) and prohibits the drilling of new public supply wells at the former McClellan AFB. As part of the development of the DMS, the most recent extents of known contaminant plumes associated with the former McClellan AFB, the former Mather AFB, and Aerojet were delineated for the SGA.

Actions. The SGA will take the following actions:

1. Ensure that all member agencies are provided a copy of the county well ordinance and understand the proper well construction procedures.
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.
3. Provide a copy of the most recently delineated plume extents at the former McClellan AFB, the former Mather AFB, and Aerojet to the Sacramento County EMD and SGA members for their review and possible use.
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.

3.7.2 Well Abandonment and Well Destruction Policies

The Sacramento EMD also administers the well destruction program for Sacramento County. While in its very early stages, the Sacramento County EMD is overseeing and participating in a "Special Environmental Project" (SEP) as part of an EMD enforcement action settlement that resulted in funding for the identification of an estimated 1,000 abandoned supply wells in Sacramento County. The goal is to locate abandoned wells, collect GPS coordinates for the wells, and get the wells properly destroyed, with or without financial assistance from our SEP funding source.

Historically, the north part of Sacramento County has been served by organized water districts, so there are not many privately owned domestic wells. As part of development of the DMS, DWR well records for all known wells in the basin were reviewed for reported abandonment and destruction. The wells were rated for the confidence of proper destruction based on the information provided on the report. This information was entered into the DMS. The actions

listed below will further provide improved protection of groundwater quality within the SGA area.

Actions. The SGA will take the following actions:

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.
2. Coordinate with the Sacramento County EMD to identify ways to ensure that wells in the SGA area are properly abandoned or destroyed.

3.7.3 Wellhead Protection Measures

Identification of wellhead protection areas is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by the DPH. The DPH set a goal for all water systems statewide to complete Drinking Water Source Assessments by mid-2003. All SGA member agencies have completed their required assessments by performing the three major components required by DPH:

- Delineation of capture zones around sources (wells).
- Inventory of Potential Contaminating Activities (PCAs) within protection areas.
- Vulnerability analysis to identify the PCAs to which the source is most vulnerable.

Delineation of capture zones includes using groundwater gradient and hydraulic conductivity data to calculate the surface area overlying the portion of the aquifer that contributes water to a well within specified time-of-travel periods. Typically, areas are delineated representing 2-, 5-, and 10-year time-of-travel periods. These protection areas need to be managed to protect the drinking water supply from viral, microbial, and direct chemical contamination.

Inventories of PCAs include identifying potential origins of contamination to the drinking water source and protection areas. PCAs may consist of commercial, industrial, agricultural, and residential sites, or infrastructure sources such as utilities and roads. Depending on the type of source, each PCA is assigned a risk ranking, ranging from “very high” for such sources as gas stations, dry cleaners, and landfills, to “low” for such sources as schools, lakes, and non-irrigated cropland.

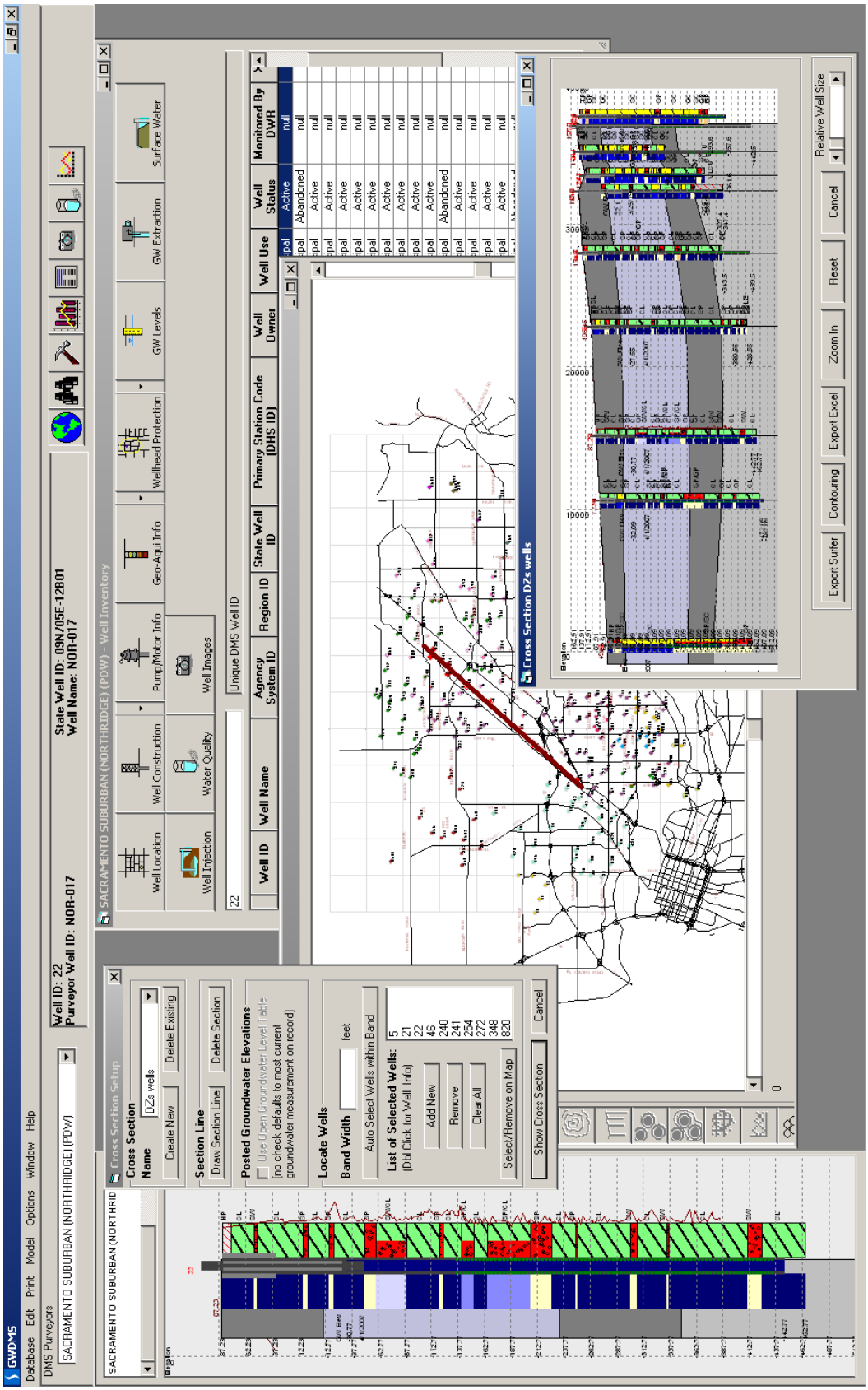

Figure 12. DMS Screen Capture

Vulnerability analysis includes determining the most significant threats to the quality of the water supply by evaluating PCAs in terms of risk rankings, proximity to wells, and Physical Barrier Effectiveness (PBE). PBE takes into account factors that could limit infiltration of contaminants including type of aquifer, aquifer material (for unconfined aquifers), pathways of contamination, static water conditions, hydraulic head (for confined aquifers), well operation, and well construction. The vulnerability analysis scoring system assigns point values for PCA risk rankings, PCA locations within wellhead protection areas, and well area PBE; the PCAs to which drinking water wells are most vulnerable are apparent once vulnerability scoring is complete.

The SGA has already added PCA and capture zone information from the DWSAP into the DMS. The DMS includes a feature that will automatically calculate wellhead protection areas if no data are available or if new well locations are proposed.

Actions. The SGA will take the following actions:

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.
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.

3.7.4 Protection of Recharge Areas

The SGA recognizes the important link between activities that take place on the surface and the potential impact of these activities on the quality and quantity of groundwater recharge. Implementation for the protection of groundwater recharge areas starts with educational programs directed at groundwater and land use authorities that emphasize the need to protect groundwater recharge areas and pay special attention to overlying land use practices that either impede (e.g., large pavement areas) or could pollute (e.g., proper oil disposal) water as it makes its way from the surface to the aquifer.

In the past, the SGA has evaluated surface geology through a limited desktop study to identify and delineate areas of potentially high recharge rates. Surface geology and qualitative estimates of relative recharge rates are shown on **Figure 13**. The SGA recognizes the importance of more accurately identifying recharge areas not only within the SGA area but within adjacent groundwater subbasins in consultation with adjacent groundwater management agencies.

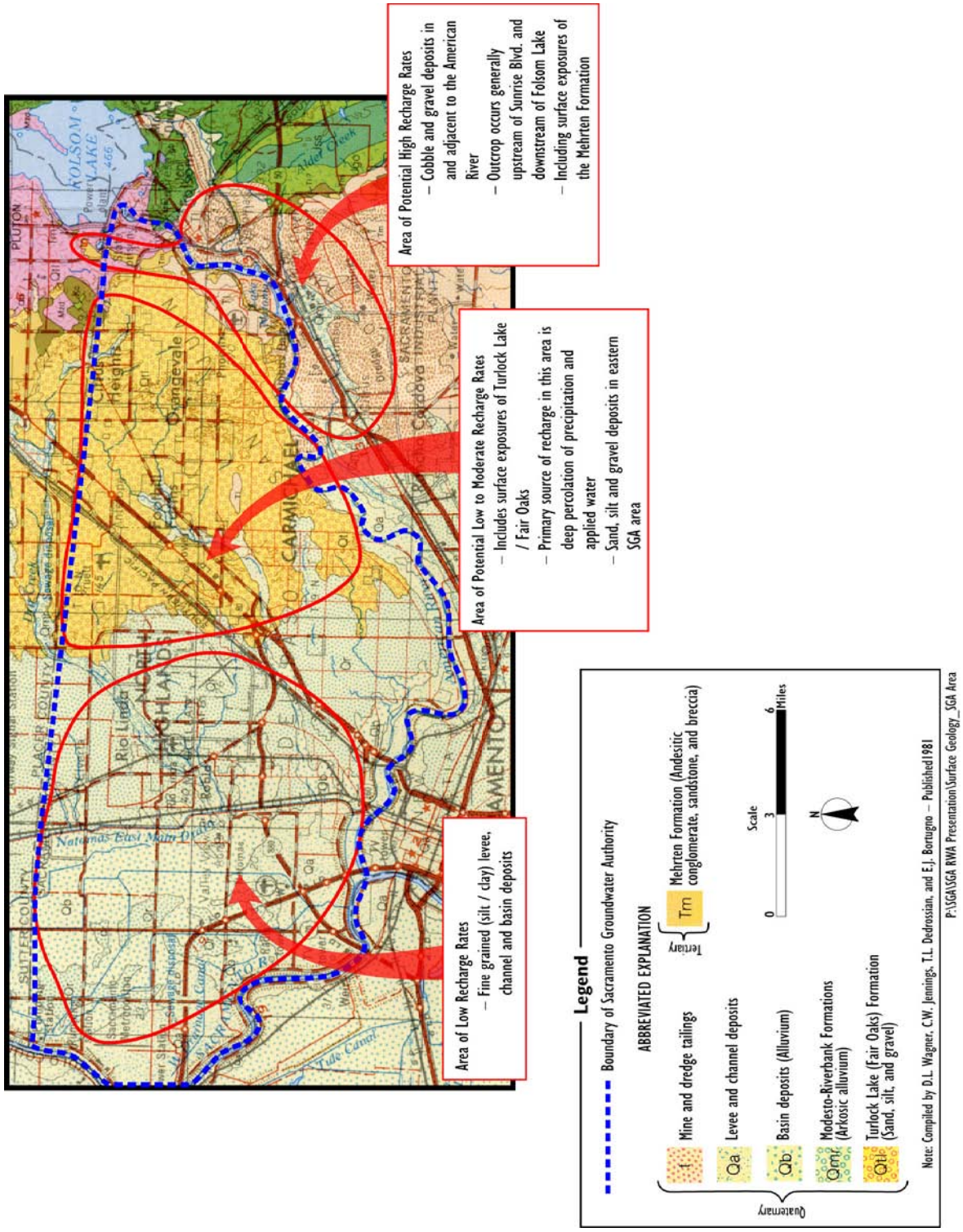

Figure 13. Surface Geology of the SGA Area – Implications for Surface Recharge Rates

Actions. The SGA will take the following action:

1. Quantify, using the existing numerical SGA groundwater model, the potential surface recharge over the SGA area.
2. Compare modeling results with existing geologic maps to develop a map of areas that are potentially contributing significant recharge in the basin.
3. Communicate with adjacent groundwater authorities and land-use planners to emphasize the need to protect prominent groundwater recharge areas and pursue mutual joint efforts in pursuing grants for the purpose of understanding the value and need for protecting undeveloped groundwater recharge areas.

3.7.5 Control of the Migration and Remediation of Contaminated Groundwater

The migration of contaminated groundwater in the SGA area is of primary concern from the McClellan and Aerojet groundwater contamination plumes as shown in **Figure 4**. Also of concern is the localized contamination of groundwater by industrial point sources such as dry cleaning facilities and numerous fuel stations throughout the SGA area.

While the SGA does not have authority or the responsibility for remediation of this contamination, it is committed to coordinating with responsible parties and regulatory agencies to keep SGA members informed on the status of known contamination in the basin. For example, the SGA has requested and entered into its DMS the coverage of known LUSTs within the basin. This information is maintained by the SWRCB and CVRWQCB.

As detailed in **Section 3.4.4,** SGA's water quality committee joined forces with the Water Forum to establish what is now known as the Regional Contamination Issues Committee (RCIC). The RCIC is a forum for water purveyors, regulators and responsible parties to raise issues and discuss solutions for dealing with groundwater contamination issues that impact the region. Also, the SGA has been in communication with the AFRPA, which is overseeing remediation efforts at McClellan (see **Section 3.4.2**).

Actions. The SGA will take the following actions:

1. Continue facilitation of the Regional Contamination Issues Committee to coordinate the efforts of regulators, responsible parties, and water purveyors to expedite the cleanup of contamination in the basin.
2. Coordinate with known responsible parties to develop a network of monitoring wells to act as an early warning system for public supply wells.
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 the directional flow of groundwater.
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.

3.7.6 Control of Saline Water Intrusion

Saline water intrusion from the Sacramento/San Joaquin River Delta (Delta) is not currently a problem in Sacramento County as a whole or in the North Area Groundwater Basin, and it is not

expected to become a problem in the future. Higher groundwater elevations associated with recharge in the American and Sacramento rivers have maintained a historical positive gradient preventing significant migration of any saline water bodies associated with the Delta from migrating east into the Sacramento County region. These groundwater gradients will continue to serve to prevent any localized pumping depressions in the basin from inducing flow from the Delta into the North Area Groundwater Basin.

A more local source of saline water is beneath the base of fresh water in the North Area Groundwater Basin. Berkstresser (1973) mapped the base of fresh water (the point below which the specific conductivity of the water is greater than about 3,000 micromhos per centimeter (μmhos/cm)) for the Sacramento Valley. As noted in **Section 2.1.1** and illustrated in **Figure 3,** the North Area Basin has a minimum depth of fresh water at an elevation of about 800 feet below mean sea level near the eastern basin margin and increases to a depth of approximately 2,000 feet below mean sea level on the western margin of the basin. The SGA member agencies generally extract groundwater from depths of less than 500 feet, so their extractions are substantially above the base of fresh water. Therefore, current pumping practices would not be expected to create a situation where deeper saline water is being drawn into the fresh water aquifer.

Actions. The SGA will take the following actions:

1. Observe TDS concentrations in public supply wells that are routinely sampled under the DPH 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.
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 Sacramento County 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.

3.8 COMPONENT CATEGORY 5: GROUNDWATER SUSTAINABILITY

The SGA is committed to continuing its role in supporting regional activities relevant to the long term sustainability of the region's groundwater resources. To ensure a long-term viable supply of groundwater, SGA members are seeking To Whom It May Concern: maintain or increase the amount of groundwater stored in the basin over the long-term. The WFA's groundwater management element provides a framework by which the groundwater resource in the Sacramento County-wide area can be protected and used in a sustainable manner. It recommends an average annual sustainable groundwater yield within the SGA area of 131,000 AF/year. As documented in **Section 2** of the GMP, historic groundwater extractions have resulted in a net depletion of groundwater stored under the SGA area. To ensure a sustainable resource, SGA and RWA members have undertaken several actions toward increased conjunctive use of groundwater and surface water in the basin and will continue to do so. Historically, water purveyors in the basin away from the rivers did not have access to surface water and a large cone of depression resulted in the middle of the SGA area. Recent conjunctive use activities have resulted in providing new surface water supplies to these areas. Although water purveyors in the region will rely more heavily on groundwater during dry periods, the net increase in available surface water will result in a maintained or improved amount of groundwater in storage in the basin over the long term.

Two primary activities have and will continue to result in an improved ability to sustain the viability of the groundwater resource for the region. Conjunctive management activities include the planning and construction of facilities to increase the available surface water supply to the area as well as to create opportunities for the banking and exchange of water with partners after local needs are met. These partnerships will result in some of the necessary capital improvements to help sustain the resource in a cost-effective way. Additionally, the SGA's ability to sustain the groundwater resource will be met in part through reductions in potable water demand through conservation measures and through the use of recycled water for landscape irrigation supply. These groundwater sustainability activities are discussed below.

3.8.1 Conjunctive Management Activities

The SGA and RWA members are committed to expanded conjunctive use operations and are investigating a variety of ways of recharging water into the available storage space in the basin. Opportunities for direct recharge from overlying land in the basin are limited, because much of the land is developed or is overlain by flood basin deposits. Most of the recharge occurring through current conjunctive use is from in-lieu recharge (i.e., this is recharge that occurs naturally from rivers, streams, and surface percolation by simply reducing groundwater extractions).

The SGA has also embarked upon a Water Accounting Framework (WAF) to ensure a safe and sustainable water supply for the greater Sacramento region by encouraging water purveyors to "bank" water in the basin, when available, for use during dry periods. This includes the establishment of a WAF that supports groundwater banking programs by setting forth rules for operating a model groundwater bank, and monitoring the basin to ensure its sustainability as the program is implemented.

In June 2007, the SGA Board adopted Phase II of the WAF, which established that SGA would:

1. Maintain the various modeling and management tools needed to assess the results of conjunctive use operations in the basin.

2. Maintain an accounting of groundwater "deposits" and "withdrawals" associated with implementing a conjunctive use program.

3. Communicate with regional stakeholders on the progress of implementing the conjunctive use program.

With the adoption of the Phase II framework, the SGA Board directed staff to conduct a Phase III effort to establish the following:

1. Survey how various water banks operate in the state, and recommend criteria on how local agencies conducting conjunctive use programs could potentially participate in banking and exchange agreements with partners external to the North Area Basin.

2. Recommend monitoring criteria that would allow SGA to assess the long-term sustainability of the groundwater basin as conjunctive use and potential banking programs are operated in the North Area Basin.

Phase III was initially targeted for completion by December 2007. However, a variety of factors caused delays in the completion of this phase. In addition, the USBR and SGA Basin Management Report recently established criteria for participating in a drought water bank accounting for climate change that should be incorporated into a WAF banking and exchange program. SGA staff is reviewing these criteria and expects to complete Phase III of the Framework by mid-2009.

Actions. The SGA will take the following actions:

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.
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).
3. Participate directly with the RWA IRWMP effort and ensure that SGA projects are included in the IRWMP.
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.
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).
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.
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.
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.
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.

3.8.2 Assess Water Quality Threats to Groundwater Basin Sustainability

While the presence of contaminant plumes and point sources of contamination have been recognized in the basin for some time, no attempt at understanding which contaminants constitute the highest priority threats to a sustainable groundwater supply. To address this, SGA secured a Local Groundwater Assistance Grant from DWR to investigate the various threats and priority them based on the risk they pose to existing groundwater facilities. This study is expected to occur in 2009/2010.

Actions. The SGA will take the following actions:

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.

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.
3. Review potential upcoming regulatory changes to water quality standards that could negatively impact water supply facilities.
4. Following completion of the actions above, recommend follow on studies where areas of significant concern or where data gaps exist.

3.8.3 Potable Supply Demand Reduction

Another way to stay within the sustainable yield of the basin and continue to achieve in-lieu recharge is by reducing demand on potable water supplies through conservation and by making recycled and remediated water available for irrigation of landscaping.

Water Conservation. The RWA has developed and implemented a regional Water Efficiency Program (WEP). The WEP assists members to meet their water conservation agreements with the Water Forum, the California Urban Water Conservation Council, and for some members the Central Valley Project Improvement Act (CVPIA). The water conserved as part of this effort is essential to the Water Forum's ability to meet its objectives of providing a safe, reliable water supply to 2030 and protecting the lower American River in two ways. First, the conserved water will serve to meet increased future demands. Second, the conserved water will reduce the overall demand on the groundwater basin in drier years and can reduce the demand for water diverted from the lower American River.

Recycled Water The SRCSD treats wastewater for the entire County of Sacramento at its wastewater treatment plant located near Freeport between Interstate 5 and Franklin Boulevard, and north of Laguna Blvd. Over the past two decades SRCSD has been developing a recycled water program that is intended to grow over the coming years as water quality restrictions of treated water effluent become more constrained. In the late 1990's, in cooperation with SCWA, SRCSD successfully constructed a 4 mgd recycled water treatment plant for commercial/industrial outdoor landscaping in two large development projects (Laguna West and Lakeside) south of the wastewater treatment plant. Looking to further expand their recycled water program, SRCSD joined the RWA as an associate member in September 2003. By joining the RWA, SRCSD can work closely with other member agencies to investigate opportunities to use recycled water throughout the area to more effectively develop recycle water on a regional scale. SRCSD is currently expanding its recycled water treatment plant to 9 mgd, and has a goal of expanding its recycled water treatment capacity to between 30 and 40 mgd within 20 years.

Remediated Groundwater Both McClellan and Aerojet facilities treat contaminated groundwater to water quality levels that meet their respective National Pollution Discharge Elimination System (NPDES) permits. Currently both clean-up sites extract contaminated groundwater, treat the water, and then discharge the treated water to local streams that eventually flow to the American and Sacramento rivers. Given the high quality of remediated water after treatment, there has been some interest in making use of the water in-basin to avoid eroding of the WFA sustainable groundwater yields both north and south of the American River. This would require infrastructure similar to recycled water where non-potable can be used for outdoor irrigation that may also include residential landscape irrigation.

Actions. The SGA will take the following actions:

1. Coordinate with the RWA and its members that have signed PSAs to the WFA to understand if agreed upon 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.
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.
3. Encourage the appropriate application of treated remediated groundwater for beneficial uses to help reduce demands for potable water supply and to prevent the erosion of the sustainable yields of the North and Central Area Basins.

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Section 4 PLAN IMPLEMENTATION

SGA has a well-documented history of implementing GMP elements since its initial GMP adoption in December 2003 (see **Appendix B**). The following table summarizes the revised action items of the updated GMP and a planned implementation schedule. Many of these actions involve communicating and coordinating by SGA with other local, state, and federal agencies. The timeline for beginning implementation of the GMP action items range from already ongoing to up to 24 months from adoption of the GMP. The majority of the actions begin within 6 months of the GMP adoption. Updates of the status of GMP implementation will be provided at SGA Board meetings and in the biennial Basin Management Report.

Table 5. Schedule for Implementation of GMP Action Items

GMP Component Category 1 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT(Section 3.4)	
Actions. These actions provide multiple opportunities for public interest and involvement and serve to continue regional partnerships and information sharing between multiple water agencies and stakeholders.	
1.1 Involving the Public (Section 3.4.1)	
1. Continue efforts to encourage public participation as opportunities arise.	ongoing
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
3. Provide a written annual summary on GMP implementation progress to JPA signatories.	12 months
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.	ongoing
1.2 Involving Other Agencies Within and Adjacent to the SGA Area (Section 3.4.2)	
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.	ongoing
2. Provide copies of the adopted GMP and subsequent Biennial Basin Management Reports to representatives from the Western Placer, Sutter County, and Yolo County management groups as well as the Sacramento Central Groundwater Authority and the on-going stakeholder efforts taking place in South Sacramento County.	3 months
3. Meet with representatives from the Western Placer, Sutter County, and Yolo County management groups, as well as the Sacramento Central Groundwater Authority and the on-going stakeholder efforts taking place in South Sacramento County, as needed.	ongoing
4. Coordinate with the Western Placer management group, and the 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	12 months

Table 5. Schedule for Implementation of GMP Action Items

GMP Component Category 1 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
of our common groundwater resources.	
1.3 Utilizing Advisory Committees (Section 3.4.3)	
1. The GMP Implementation Committee will meet at least annually to review and guide implementation of the plan. Ad-hoc use of Technical Review Committees will take place, as needed.	ongoing
1.4 Developing Relationships with State and Federal Agencies (Section 3.4.4)	
1. Continue to promote partnerships and work alongside the Water Forum Successor Effort to achieve both local supply reliability and broader regional and statewide benefits.	ongoing
1.5 Pursuing Partnership Opportunities (Section 3.4.5)	
1. Continue to promote partnerships that achieve both local supply reliability and achieve broader regional and statewide benefits.	ongoing
2. Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.	ongoing

GMP Component Category 2 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
COMPONENT CATEGORY 2: MONITORING PROGRAM (Section 3.5)	
Actions. These actions are being undertaken as part of a comprehensive monitoring program that records and documents groundwater elevations, water quality, and land subsidence, and characterizes the behavior of the SGA groundwater basin with mutual sharing of data with adjoining groundwater management agencies (or authorities).	
2.1 Groundwater Elevation Monitoring (Section 3.5.1)	
1. Coordinate with member agencies to collect data from a group of representative wells for monitoring spring and fall groundwater elevation measurements.	6 months
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
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
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
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

GMP Component Category 2 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
6. Maintain the existing SGA monitoring well network for purposes of groundwater elevation monitoring.	ongoing
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
8. Assess the adequacy of the groundwater elevation monitoring well network biennially.	12 months
2.2 Groundwater Quality Monitoring (Section 3.5.2)	
1. Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.	ongoing
2. Maintain the existing SGA monitoring well network for purposes of groundwater quality monitoring.	ongoing
3. Coordinate with the USGS to continue to obtain water quality data from NAWQA wells.	12 months
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
5. Assess the adequacy of the groundwater quality monitoring well network in the Biennial Basin Management Report.	12 months
2.3 Land Surface Elevation Monitoring (Section 3.5.3)	
1. Re-survey the benchmarks established at SGA monitoring wells.	24 months
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
3. Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence.	ongoing
2.4 Surface Water Groundwater Interaction Monitoring (Section 3.5.4)	
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
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. Also use this same data to calibrate groundwater models that simulate this interaction.	12 months
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
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

GMP Component Category 2 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
5. Coordinate with the Corps of Engineers and SAFCA to review projects that could negatively impact recharge from rivers to the underlying groundwater basin.	ongoing
2.5 Protocols for the Collection of Groundwater Data (Section 3.5.5)	
1. Use a Standard Operating Procedure (SOP) for collection of water level data by each of the member agencies. **Appendix D** of the GMP includes an SOP for Manual Water Level Measurements. This SOP was prepared using guidance documents available through USEPA and was included in the SGA technical memorandum summarizing the accuracy and reliability of groundwater data (MWH, 2002).	3 months
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 (DPH, 1995).	6 months
3. Provide training on the implementation of these SOPs to member agencies, if requested.	ongoing

GMP Component Category 3 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
COMPONENT CATEGORY 3: DATA MANAGEMENT AND ANALYSIS (Section 3.6)	
Actions. Actions completed under this category will ensure that SGA maintains a centralized database of well status and construction information, groundwater quality and elevation data, and known groundwater contamination sites for application in annual reporting and use in technically appropriate model(s) for analyzing basin management activities.	
3.1 SGA Groundwater Model (Section 3.6.1)	
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 MODLFOW) that may be available for longer-term modeling needs.	24 months
2. Canvas the membership annually to determine if they have any upcoming modeling needs.	12 months
3. Work with modeling support consultant(s) 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
3.1.2 Comprehensive Data Analysis (Section 3.6.2)	
1. Prepare the Biennial Basin Management Report to assess basin conditions in even numbered years.	ongoing
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
3. If 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	ongoing

part of the basin).	
3.3 Data Management System (Section 3.6.3)	
1. Continue to update the SGA database with current water purveyor data.	ongoing
2. Make recommendations to the DMS developer on utilities to add to the DMS to increase its functionality.	ongoing
3. Review the current database and recommend actions to increase the accuracy and efficiency of the SGA database.	12 months
4. Work with adjacent groundwater authorities on shared data protocols to achieve the highest level of confidence in the comprehensive data analysis.	12 months

GMP Component Category 4 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
COMPONENT CATEGORY 4: GROUNDWATER RESOURCE PROTECTION (Section 3.7)	
Actions. Management actions completed under this category serve to educate the water community on steps necessary in the construction, operation, and abandonment of wells for the protection and continued use of groundwater as a potable drinking water supply.	
4.1 Well Construction Policies (Section 3.7.1)	
1. Ensure that all member agencies are provided a copy of the county well ordinance and understand the proper well construction procedures.	6 months
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
3. Provide a copy of the most recently delineated plume extents at the former McClellan AFB, the former Mather AFB, and Aerojet to the Sacramento County EMD and SGA members for their review and possible use.	6 months
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.	ongoing
4.2 Well Abandonment and Well Destruction Policies (Section 3.7.2)	
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
2. Coordinate with the Sacramento County EMD to identify ways to ensure that wells in the SGA area are properly abandoned or destroyed.	ongoing
4.3 Wellhead Protection Measures (Section 3.7.3)	
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
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	18 months

GMP Component Category 4 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
protection programs.	
4.4 Protection of Recharge Areas (Section 3.7.4)	
1. Quantify, using the existing numerical SGA groundwater model, the potential recharge over the SGA area.	18 months
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
3. Communicate with adjacent groundwater authorities and land-use planners to emphasize the need to protect prominent groundwater recharge areas and pursue mutual joint efforts in pursuing grants for the purpose of understanding the value and need for protecting undeveloped groundwater recharge areas.	18 months
4.5 Control of the Migration and Remediation of Contaminated Groundwater (Section 3.7.5)	
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.	ongoing
2. Coordinate with known responsible parties to develop a network of monitoring wells to act as an early warning system for public supply wells.	ongoing
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 the directional flow of groundwater.	ongoing
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
4.6 Control of Saline Water Intrusion (Section 3.7.6)	
1. Observe TDS concentrations in public supply wells that are routinely sampled under the DPH 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.	ongoing
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 Sacramento County 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

GMP Component Category 5 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
COMPONENT CATEGORY 5: GROUNDWATER SUSTAINABILITY (Section 3.8)	
Actions. These actions will allow SGA to continue its role in supporting regional activities relevant to the long term sustainability of groundwater.	
5.1 Conjunctive Management Activities (Section 3.8.1)	
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.	ongoing
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).	ongoing
3. Participate directly with the RWA IRWMP effort and ensure that SGA projects are included in the IRWMP.	ongoing
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
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
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
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
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
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
5.2 Assess Water Quality Threats to Groundwater Basin Sustainability (Section 3.8.2)	
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
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
3. Review potential upcoming regulatory changes to water quality standards that could	12 months

GMP Component Category 5 and Actions	Implementation Schedule (approx. time based upon date of adoption of the 2008 SGA GMP)
negatively impact water supply facilities.	
4. Following completion of the actions above, recommend follow on studies where areas of significant concern or where data gaps exist.	18 months
5.3 Potable Supply Demand Reduction (Section 3.8.3)	
1. Coordinate with the RWA and its members that have signed PSAs to the WFA to understand if agreed upon 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
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
3. Encourage the appropriate application of treated remediated groundwater for beneficial uses to help reduce demands for potable water supply and to prevent the erosion of the sustainable yields of the North and Central Area Basins.	ongoing

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Appendix A

SGA Joint Powers Agreement

NOTE: THIS AGREEMENT SUPERCEDES AG2000-074.

JOINT POWERS AGREEMENT BETWEEN THE CITY OF CITRUS HEIGHTS, THE CITY OF FOLSOM, THE CITY OF SACRAMENTO AND THE COUNTY OF SACRAMENTO CREATING THE SACRAMENTO-GROUNDWATER AUTHORITY

This Agreement is made and entered into this 7th day of May, 2002, by and between the City of Citrus Heights, a municipal corporation, the City of Folsom, a municipal corporation, the City of Sacramento, a municipal corporation, and the County of Sacramento, a political subdivision of the State of California ("County").

RECITALS

WHEREAS, each of the parties to this Agreement is a local government entity functioning within the County of Sacramento; and

WHEREAS, pursuant to the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code), two or more public agencies may by agreement jointly exercise any power held in common by the agencies entering into such an agreement; and

WHEREAS, each of the parties hereto has under its police power the authority to regulate groundwater; and

WHEREAS, the parties hereto have each been either directly or indirectly involved in the process commonly referred to as the Sacramento Area Water Forum ("Water Forum"); and

WHEREAS, the Water Forum process has resulted in the development of a Groundwater Management Element, dated August, 1998 ("Groundwater Management Element"), which provides for the formation of a groundwater management authority for the north area of the County of Sacramento pursuant to a joint powers agreement between the City of Citrus Heights, the City of Folsom, the City of Sacramento and the County; and

WHEREAS, a true and correct copy of the Groundwater Management Element is attached hereto and incorporated herein as Exhibit "A"; and

CITY
AGREEMENT NO. 2000-074-A

CITY
AGREEMENT NO. 2000-074-A

WHEREAS, the completion of the Water Forum process and the approval of the final Water Plan by the Water Forum stakeholders has been delayed for reasons unrelated to groundwater management issues; and

WHEREAS, the parties hereto and the Water Forum stakeholders who have been involved in the development of the Groundwater Management Element believe that it is in the public interest to move forward with the development of the institutional framework necessary to implement the Groundwater Management Element within the North Area Basin, rather than suspending those efforts until such time as the Water Forum process is finalized; and

WHEREAS, the formation of the joint powers authority contemplated by this Agreement is not legally dependent upon the finalization of the Water Forum process, but is independently authorized by state law; and

WHEREAS, the parties hereto find that it is to their mutual advantage and benefit to establish such a groundwater management authority pursuant to this Agreement in order to implement the groundwater management policies embodied in the Groundwater Management Element; and

WHEREAS, the parties hereto find and declare that the conservation of groundwater resources within the North Area Basin for agricultural and municipal and industrial uses is in the public interest and for the common benefit of all water users within the County of Sacramento; and

WHEREAS, the overriding purpose of the joint powers authority established pursuant to this Agreement is to maintain the sustainable yield of the North Area Basin as set forth in the Groundwater Management Element; and

WHEREAS, it is the desire of the parties hereto to use the groundwater management powers which they have in common that are necessary and appropriate to further the purposes for which the joint powers authority is being established; and

WHEREAS, the parties hereto are receptive to amending this Agreement in the future to include public agencies outside the County of Sacramento who have a specific and relevant interest in the North Area Basin.

NOW, THEREFORE, in consideration of the promises, terms, conditions, and covenants contained herein, the City of Citrus Heights, the City of Folsom, the City of Sacramento and the County hereby agree as follows:

1. **Incorporation of Recitals.** The foregoing recitals are hereby incorporated by reference.

2. **Definitions.** As used in this Agreement, the following words and phrases shall have the meanings set forth below unless the context clearly indicates otherwise.

(a) "Conjunctive use" shall mean the planned management and use of both groundwater and surface water in order to maintain the sustainable yield of the North Area Basin.

(b) "North Area Basin" shall mean the groundwater basin underlying the area within the boundaries of the Authority.

(c) "Sustainable yield" shall mean the amount of groundwater which can be safely extracted from the North Area Basin on an estimated average annual basis while maintaining groundwater elevations and groundwater quality at acceptable levels as set forth in the Groundwater Management Element. Sustainable yield requires a balance between extraction and basin recharge and is expressed as the number of acre feet of

groundwater per year which can be extracted from the North Area Basin on an average annual basis as set forth in the Groundwater Management Element.

(d) "Water Production," for purposes of determining assessments, fees or charges to support Water Costs of the Authority, means the total amount of groundwater produced within the boundaries of the Authority by each retail provider, by Agricultural Interests, and by Commercial/Industrial Self-Supplied Water Users for use within the boundaries of the Authority or other areas approved by the Board.

3. **Purpose.** This Agreement is being entered into in order to establish a joint powers authority for the following purposes:

(a) to maintain the long-term sustainable yield of the North Area Basin;

(b) to manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors;

(c) 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

(d) 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. **Establishment Of The Authority.** There is hereby established pursuant to the Joint Exercise of Powers Act a joint powers authority which shall be a public entity separate from the parties to this Agreement. The name of such entity shall be the Sacramento Groundwater Authority ("Authority"). The boundaries of the Authority shall be as follows: north of the American River to the Sacramento County line; bounded on the south by the

American River; on the west by the Sacramento River; on the north and east by the Sacramento County line; and including the City of Folsom. A map depicting the boundaries of the Authority is attached hereto and incorporated herein as Exhibit "B".

5. **Membership Of The Governing Board.** The governing body of the Authority shall be a Board of Directors of sixteen (16) members consisting of the following representatives who shall be appointed in the manner set forth in Section 7 of this Agreement:

(a) An elected member of the governing board or designated employee of each of the following public agencies: the City of Folsom, the City of Sacramento and the Sacramento County Water Agency.

(b) An elected member of the governing board of each of the following public agencies: the Carmichael Water District, the Citrus Heights Water District, the Del Paso Manor Water District, the Fair Oaks Water District, the Rio Linda/Elverta Community Water District, the Sacramento Suburban Water District, and the San Juan Water District.

(c) A member of the board of directors, or designee thereof, of each of the following private water purveyors or investor owned utilities: the Arden Cordova Water Company, California-American Water Company, the Natomas Central Mutual Water Company and the Orange Vale Water Company.

(d) One representative of Agricultural Interests within the boundaries of the Authority.

(e) One representative of Commercial/Industrial Self-Supplied Water Users within the boundaries of the Authority.

6. **Adjustment To Composition Of Governing Board.** Should circumstances change in the future, any person or entity may petition the parties hereto to amend this Agreement so as to add or delete representatives to the governing board to accurately reflect groundwater production within the boundaries of the Authority.

7. **Appointment Of Members Of Governing Board.**

(a) The members of the governing board of the Authority shall be appointed as follows:

(i) The City of Folsom representative shall be appointed by the Folsom City Council.

(ii) The Agricultural Interests representative shall be appointed by the County Board of Supervisors.

(iii) The representative of Commercial/Industrial Self-Supplied Water Users shall be appointed by the Sacramento City Council.

(iv) The Citrus Heights City Council shall appoint the representative of the Citrus Heights Water District.

(v) The Sacramento City Council shall appoint the representatives of the following entities: Arden Cordova Water Company, California-American Water Company, the City of Sacramento, Del Paso Manor Water District, the Natomas Central Mutual Water Company, and Sacramento Suburban Water District.

(vi) The County Board of Supervisors shall appoint the representatives of the following entities: Carmichael Water District, Fair Oaks Water District, Orange Vale Water Company, Rio Linda/Elverta Community Water District, San Juan Water District and the Sacramento County Water Agency.

(b) Prior to the appointment of the representatives of the entities described in subsections (a)(v) and (vi) above, those entities shall submit a recommended appointment for their respective representatives to the appointing authority. The appointing authority shall give consideration to such recommendations, but shall retain the absolute discretion to appoint any person satisfying the criteria for appointment set forth in Section 5 hereof.

8. **Governing Board Voting Requirements.**

(a) Each member of the governing board of the Authority shall have one vote. With the exception of fiscal items as set forth in subsections (b) and (c) below, a majority vote of all members of the governing board is required to approve any item.

(b) Fiscal items related to the **Administrative Costs** of the Authority shall require approval by a double majority consisting of the following: a majority vote of all members of the governing board and a majority vote weighted according to the financial contribution of each Retail Provider, of Agricultural Interests, or of Commercial/Industrial Self-Supplied Water Users to the total administrative budget for the last complete fiscal year. The weighted vote of each member of the governing board shall be established and fixed annually at the time the Financing Plan for the administrative budget is adopted, and shall remain in effect throughout the succeeding fiscal year and shall apply to all votes on fiscal items related to the Administrative Costs of the Authority.

(c) Fiscal items related to **Water Costs** shall require approval by a double majority consisting of the following: a majority of all members of the governing board and a majority vote weighted on the basis of Water Production as defined in Section 2(d) hereof.

(d) For purposes of subsection (c) hereof, the weighted vote of the representative of Agricultural Interests and the Commercial/Industrial Self-Supplied Water Users representative shall be weighted on the basis of groundwater production by all such interests and users within the boundaries of the Authority, adjusted to reflect any differential rate which may be paid by a particular classification of water users; e.g., if each acre-foot of water pumped equals one vote and Agricultural Interests pump 100,000

acre feet, but pay only 20% of the per acre-foot assessment, fee or charge levied on other types of pumpers, the vote of the Agricultural Interests representative would be calculated at 20,000 votes.

(e) Water Production, as defined in Section 2(d) hereof, shall be based on an annual determination by the governing body of the Authority during the previous calendar year. Until such time as the governing board of the Authority makes its annual determination of Water Production, the last complete yearly calculation shall be controlling for purposes of the double majority requirement set forth in subsection (c) above.

9. **Quorum.** A majority of the members of the governing board shall constitute a quorum for purposes of transacting business, except less than a quorum may vote to adjourn a meeting.

10. **Terms Of Office.** With the exception of the initial term of the representatives appointed by the City of Folsom and the City of Sacramento, the term of office of each member of the governing board the Authority shall be for a period of four (4) years. For the purpose of providing staggered terms of office, the term of the initial representatives appointed by the City of Folsom and the City of Sacramento shall be for a period of two (2) years. Thereafter, the term of office of each representative appointed by the City of Folsom and the City of Sacramento shall be for a period of four (4) years. Each member of the governing board shall serve at the pleasure of the appointing body and may be removed as a member of the governing board by the appointing body at any time. If at any time a vacancy occurs on the governing board, a replacement shall be appointed to fill the unexpired term of the previous representative pursuant to the provisions of Section 7 hereof within ninety (90) days of the date that such position becomes vacant.

11. **Alternates.** The City of Citrus Heights, the City of Folsom, the City of Sacramento and the County, in addition to their regular appointments, shall appoint one or more persons with the required qualifications to serve as alternate members of the governing board of the Authority. Any such alternates shall be empowered to cast votes in the absence of the regular members or, in the event of a conflict of interest preventing the regular member from voting, to vote because of such a conflict of interest.

12. **Organization Of The Authority.** The governing board of the Authority shall elect a chair, a vice chair and such other officers as the governing board shall find appropriate. Such officers shall serve for a term of one (1) year unless sooner terminated at the pleasure of the governing board.

13. **Treasurer, Controller, Clerk and Legal Counsel.** The governing board of the Authority shall appoint a treasurer, controller, clerk and legal counsel as it deems appropriate. The controller of the Authority shall cause an independent annual audit of the Authority's finances to be made by a certified public accountant in compliance with Government Code Section 6505. The treasurer of the Authority shall be the depositor and shall have custody of all money of the Authority from whatever source. The controller of the Authority shall draw warrants to pay demands against the Authority when the demands have been approved by the Authority or by its authorized representative pursuant to any delegation of authority adopted by the Authority. The treasurer and controller shall comply strictly with the provisions of statutes relating to their duties found in Chapter 5 (commencing with Section 6500) of Division 7 of Title 1 of the Government Code.

14. **Executive Director.** The governing board of the Authority shall appoint an Executive Director-who shall be responsible to the governing board for the proper and efficient administration of the Authority as directed by the governing board pursuant to the provisions of

this Agreement or of any ordinance, resolution or order of the governing board. In addition to any other duties which may be assigned, the Executive Director shall have the following authority:

(a) under the policy direction of the governing board, to plan, organize and direct all Authority activities;

(b) to authorize expenditures within the designations and limitations of the budget approved by the governing board;

(c) to make recommendations to and requests of the governing board concerning any matter which is to be performed, done or carried out by the governing board;

(d) to have the authority to appoint, discipline, assign and otherwise supervise and control the activities of any employees or contractors which may be hired or retained by the Authority; and

(e) to have charge of, handle and have access to any property of the Authority.

15. **Meetings.** The Authority shall provide for regular and special meetings in accordance with the Ralph M. Brown Act (Chapter 9 (commencing with Section 54950) of Part 1 of Division 2 of Title 5 of the Government Code) or with any successor provision.

16. **Powers and Functions.**

(a) The Authority shall have no power to regulate land use or to engage in the retail sale of water and shall be prohibited from restricting or otherwise limiting the extraction of groundwater within the boundaries of the Authority except by means of economic incentives and disincentives. The Authority shall further be prohibited from funding any capital construction projects. In addition, prior to October 13, 2003, the Authority shall be prohibited from levying annual fees or assessments to fund Water Cost payments that exceed an annual average charge during such five (5) year period of $5.00 for each acre

foot (minimum $0.00-maximum $10.00) of groundwater pumped from the North Area Basin during such five (5) year period. Further, during any individual year of such five (5) year period, the Authority shall be prohibited from levying annual fees or assessments to fund Water Cost payments that exceed a charge of $10.00 for each acre foot of groundwater pumped from the North Area Basin during any such year. For purposes of this section, Water Costs shall include the cost of water, pumping and treatment costs, and other costs related to any Conjunctive Use program administered by the Authority.

(b) Subject to the limitations set forth in subsection (a), the Authority shall have any and all powers commonly held by the parties hereto necessary or appropriate to regulate groundwater within the boundaries of the Authority including, but not limited to, the following powers:

(i) Collect and monitor data on the extraction of groundwater from, and the quality of groundwater in, the North Area Basin;

(ii) Establish and administer a Conjunctive Use program for the purpose of maintaining Sustainable yields in the North Area Basin consistent with the Groundwater Management Element;

(iii) Buy and sell water on other than a retail basis;

(iv) Exchange water;

(v) Distribute water in exchange for ceasing or reducing groundwater extractions;

(vi) Spread, sink and inject water into the North Area Basin;

(vii) Store, transport, recapture, recycle, purify, treat or otherwise manage and control water for the beneficial use of persons and property within the Authority;

(viii) To implement any Conjunctive Use program which the Authority deems necessary to maintain Sustainable yields in the North Area Basin consistent with the Groundwater Management Element; and

(ix) Study and plan ways and means to implement any or all of the foregoing powers.

(c) For purposes of exercising the authority set forth in subsection (b), and subject to the limitations set forth in subsection (a), the Authority shall have the following corporate and political powers:

(i) To sue and be sued in all actions and proceedings in all courts and tribunals.

(ii) To adopt a seal and alter it at its discretion.

(iii) To take by grant, purchase, gift, devise or lease, to hold, use and enjoy, and to lease, convey or dispose of, real and personal property of every kind, within or without the boundaries of the Authority, necessary or convenient to the full exercise of its power.

(iv) For the common benefit of the Authority, to store water in underground water basins or reservoirs within and outside the Authority, to appropriate water and acquire water rights within or outside the Authority, to import water into the Authority, and to conserve, or cause the conservation of, water within or outside the Authority.

(v) To exercise the right of eminent domain to take any property necessary to supply the Authority or any portion of it with replenishment water; provided that the right of eminent domain may not be exercised with respect to water and water rights, and may not be exercised with respect to any property owned or occupied

by any of the parties hereto or the entities represented on the governing board of the Authority.

(vi) To act jointly, or cooperate, with the United States or any agency thereof, the state, or any county or agency thereof, or any political subdivision or district therein, including flood control districts, private and public corporations, and any person, so that the powers of the Authority may be fully and economically exercised.

(vii) To cause taxes, assessments, fees or charges to be levied in accordance with applicable State law, and in a manner consistent with the Groundwater Management Element, to accomplish the purposes of the Authority.

(viii) To require the permitting of groundwater extraction facilities within the boundaries of the Authority, to maintain a record of extraction with respect to any such facilities, and to require the installation of meters on groundwater extraction facilities for the purpose of determining the amount of groundwater being extracted from the North Area Basin.

(ix) To make contracts, employ labor and to do all acts necessary for the full exercise of the Authority's powers.

(x) To carry on technical and other investigations of all kinds necessary to further the purposes of the Authority.

(xi) To fix rates at which water acquired by the Authority shall be sold for replenishment purposes, and to establish different rates for different classes of service or conditions of service, provided that the rates shall be uniform for like classes and conditions of service.

(xii) To participate in any contract under which producers may voluntarily agree to use surface water in lieu of groundwater, and to that end the Authority may become a party to the contract and pay from Authority funds that portion of the cost of the surface water as will encourage the purchase and use of that water in lieu of pumping so long as persons or property within the boundaries of the Authority are directly or indirectly benefitted by the resulting replenishment of the North Area Basin.

(xiii) To apply for, accept and receive state, federal or local licenses, permits, grants, loans or other aid from any agency of the United States, the State of California, or other public or private entity necessary or appropriate for the Authority's full exercise of its powers.

17. **Budgets.** Within ninety days after the first meeting of the governing board of the Authority, and thereafter prior to the commencement of each fiscal year (defined as July 1 through June 30), the governing board shall adopt a budget for the Authority for the ensuing fiscal year.

18. **Termination.** This Agreement shall remain in effect until terminated by one of the parties hereto pursuant to this section. This Agreement may be terminated by any of the parties hereto at any time and for any reason by providing ninety (90) days written notice of termination to the other parties. Except as provided in Section 19(b) hereof, the Authority shall automatically terminate upon the effective date of the termination of this Agreement.

19. **Disposition Of Authority Assets Upon Termination.**

(a) In the event of the termination of the Authority where there will be a successor public entity which will carry on the functions of the Authority and assume its assets, the assets of the Authority shall be transferred to the successor public entity.

(b) If there is no successor public entity which will carry on the functions of the Authority and assume its assets, the assets shall be returned to the parties hereto in proportion to the contribution of each party during the term of this Agreement.

(c) If there is a successor public entity which will carry on some of the functions of the Authority and assume some of its assets, the assets of the Authority shall be allocated by the governing board of the Authority between the successor public entity and the parties hereto.

20. **Liabilities.** The debts, liabilities and obligations of the Authority shall be the debts, liabilities and obligations of the Authority alone, and not of the parties to this Agreement.

21. **Rules.** The governing board of the Authority may adopt from time to time such rules and regulations for the conduct of its affairs as it deems necessary and appropriate.

22. **Minutes.** The clerk appointed by the governing board of the Authority shall cause to be kept minutes of all meetings of the governing board, and shall cause a copy of the minutes to be forwarded to each member of the governing board and to each of the parties hereto.

23. **Effective Date.** The Authority was created on October 13, 1998. This Agreement, which replaces and supercedes all prior Agreements and Amendments to the Joint Powers Agreement creating the Authority, shall become effective when the governing bodies of all the parties shall have authorized its execution.

24. **Amendments.** This Agreement may only be amended by the affirmative vote of the governing bodies of all of the parties hereto.

IN WITNESS WHEREOF, the parties hereto execute this Agreement on the date first

written above.

CITY OF CITRUS HEIGHTS

Dated: 6/26/02

By Roberta MacGlashe
Mayor

Attest:

City Clerk

Approved As To Form:

City Attorney

CITY OF FOLSOM

Dated: 8.18.02

By
Mayor

Attest:

Lisa Robinson
City Clerk

Approved As To Form:

City Attorney 8/16/02

CITY OF SACRAMENTO

Dated: 6-18-02

By Heather Fargo
Mayor

Attest:

Valerie C. Burrows
City Clerk

Approved As To Form:

Joel Robbins
City Attorney

COUNTY OF SACRAMENTO

MAY 07 2002

By Don Nottoli
Chairperson, Board of Supervisors

Attest:

Cindy H. Turner
Clerk of the Board

Approved As To Form:

John F. Whit
County Counsel

CITY
AGREEMENT NO. 2000-074-A

05-07-2002 SGA Revised JPA

CITY
AGREEMENT NO. 2000-074-A

Appendix B

SGA 2003 Groundwater Management Plan Action Items Tracking Table

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	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	Review and take actions from the public outreach plan as necessary during implementation of various aspects of the GMP.	On-going	SGA has not encountered any issues requiring significant public outreach since adopting the GMP. To date, the most effective ways of notifying the public have been through regular Board meetings, quarterly newsletters, and the SGA website. The SGA website includes a regularly updated announcements section on the main page. Finally, SGA's participation in regular monthly meetings of the Water Forum Successor Effort (see item below) provides opportunities to identify issues from a variety of interests throughout the region.
3	Provide briefings to the Water Forum Successor Effort on GMP implementation progress.	On-going	SGA staff participate in regular monthly meetings of both the Water Forum Successor Effort and are available to provide briefings upon request. SGA staff met with incoming WFSE Executive Director on August 7, 2007 to provide a briefing on SGA activities.
4	Work with members to maximize outreach on GMP activities including the use of the SGA website, member websites, or bill inserts.	On-going	SGA website launched in November 2003 (www.sgah2o.org). Provide updates through regular quarterly newsletter by RWA and SGA. Beginning in May 2007, SGA staff is conducting additional outreach to SGA member agencies by presenting SGA overview at regular meetings of member agencies. Between June and October, briefings were provided to nine SGA member agencies.
1.2	***Involving Other Agencies Within and Adjacent to the SGA Area***		
1	Continue high level of involvement demonstrated through the SGA GMP development into implementation of the plan by continued participation on committees described above.	On-going	SGA staff participate in regular meetings of both the Water Forum Successor Effort and the Central Sacramento County Groundwater Forum.
2	Provide copies of the adopted GMP and subsequent annual reports to representatives from Placer, Sutter, and Yolo counties, and the Groundwater Forum.	On-going	Copies of the GMP 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 Resources Coordinator, and Sacramento County Water Agency (representing the Central Sacramento County Groundwater Forum) on January 22, 2004. The schedule for the Basin Management Report (BMR) has been modified to a biennial report. Copies of the BMR were mailed on June 26, 2006 to stakeholders representing Yolo County Water Resources Association, South Sutter Water District, Placer County Water Agency, City of Roseville, City of Lincoln, Central Sacramento County Groundwater Forum, and the Water Forum Successor Effort.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
3	Meet with representatives from Placer, Sutter, and Yolo counties, and the Central Sacramento County Groundwater Forum as needed.	On-going	Left voice mail with Linda Fiack, Yolo County Resource Director (530) 666-8019 on July 30, 2004 offering to provide briefing at their request. Spoke to Brad Arnold, GM of South Sutter WD (530) 656-2242 on July 30, 2004. Brad indicated that South Sutter WD will begin updating their AB3030 plan soon. SGA offered assistance, including potentially sitting on an advisory committee for the update. On August 30, 2004, Sacramento County WA staff requested that SGA staff participate in limited review of a GMP under development for SCWA's Zone 40 area. Attended regular monthly meetings of Central Sacramento County Groundwater Forum. In August 2006, the Forum officially formed as the Central Sacramento Groundwater Authority. SGA staff attend regular meetings of the Authority as appropriate. SGA/RWA Executive Director serves on the Implementation Committee of the City of Lincoln GMP.
4	Coordinate a meeting with the agricultural groundwater pumpers in the SGA area to inform them of SGA's management responsibilities and activities, and develop a list of agricultural groundwater pumpers concerns and needs relative to SGA's management of the area.	Deferred	Met with Jack DeWit, an SGA Board member and independent agricultural groundwater pumper within SGA in May 2004. Jack agreed to facilitate setting up a meeting with what is a small number of independent pumpers in early 2005 prior to commencement of the next growing season. In June 2005, the SGA adopted a resolution to not assess fees to agricultural water pumpers. The GMP Implementation Committee recommended that staff defer action on this item until such time as specific concerns or needs are expressed.
5	Coordinate a meeting with other self-supplied pumpers in the SGA area to inform them of SGA's management responsibilities and activities, and develop a list of self-supplied groundwater pumpers concerns and needs relative to SGA's management of the area.	Deferred	Received list with contact information of 23 small water systems licensed through DHS within the SGA area from Sac County EMD (small water systems in SGA.doc) on August 31, 2004. The systems total approximately 35 wells. EMD confirmed that pumping by these systems is not reported to the EMD or DHS. Because these pumpers likely account for a very small percentage of pumping in the basin, the GMP Implementation Committee has decided to defer any actions in coordinating with them at this time.
1.3	***Utilizing Advisory Committees***		
1	Upon adoption of the GMP, the Policy Committee will meet to discuss the continuation and composition of committees to guide implementation of the plan.	Complete	A GMP Implementation Committee was established on July 8, 2004 consisting of Mitch Dion (Cal-AM WC), Rob Roscoe (SSWD), Shauna Lorance (SJWD) and Gary Reents (City of Sacramento). The first committee meeting was held August 2, 2004. Committee met January 31, 2005. Will meet as needed for future.
1.4	***Developing Relationships with State and Federal Agencies***		

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
1	Continue to develop working relationships with local, state, and federal regulatory agencies.	On-going	Provided regional briefing of water supply issues to the Manager of the Water Policy and Reform Team for the Government of Australia on Oct 8, 2004. The briefing was given at the request of DWR. Met with management and staff of USEPA, SWRCB, Central Valley RWQCB, DTSC, Water Forum Successor Effort, and purveyors on November 4, 2004 to express concerns over regional impacts of contamination in basin. Beginning in June 2005, set the fourth Tursday of every month as a standing meeting date with regulatory representatives of Aerojet and McClellan contaminant sites. This meeting will serve to involve other regulatory agencies as needed. Met again with regulatory agency staff to update progress in November 2006. SGA staff serve on a Joint Technical Team to evaluate groundwater remediation options at McClellan. The JTT was sunsetted in June 2006 with the successful conclusion of a remediation plan for VOCs in groundwater at McClellan. This resulted in the execution of a Record of Decision for remediation in August 2007.
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. SGA is closely coordinated with the RWA Integrated Regional Water Management Planning Program. Part of that effort has identified the need to update the IGSM regional model. SGA was successful in its application for an AB 303 grant from DWR to fund half of the update in June 2005.
2	Continue to track grant opportunities to fund groundwater management activities and local water infrastructure projects.	On-going	Awarded $250K AB303 grant on June 30, 2004 for regional monitoring well network. Awarded $250K AB303 grant on June 30, 2005 for update to regional groundwater model. SGA is currently preparing an AB 303 grant application due in December 11, 2007.
COMPONENT CATEGORY 2: MONITORING PROGRAM			
2.1	***Groundwater Elevation Monitoring***		
1	Coordinate with member agencies and DWR to identify an appropriate group of wells for monitoring for a spring 2004 set of groundwater elevation measurements.	Complete	SGA met DWR and SCWA on January 29, 2004 at the DWR Central District Office. The status of the existing wells in the monitoring network was discussed. Some of the wells are questionable for monitoring and the agencies will work together to look for opportunities to replace those wells in the long-term.
2	Coordinate with DWR and SCWA to ensure that the selected wells are maintained as part of a long-term monitoring network.	Complete	SGA met DWR and SCWA on January 29, 2004 at the DWR Central District Office and explained the importance of their monitoring wells to our overall network and determined that both DWR and SCWA are maintaining long-term monitoring plans in the basin.
3	Coordinate with DWR and SCWA to ensure that the timing of water level data collection by member agencies coincides within one month of DWR and SCWA data collection.	Complete	SGA met DWR and SCWA on January 29, 2004 to coordinate the timing of water elevation measurements. An April 15 goal was set for the collection of spring water elevations. An October 15 goal was set for the collection of fall water elevations. Each participating agency attempted to collect levels within +/- two weeks of these dates. The most recent request for water elevation data was sent to participants in October 2007.
4	Coordinate with member agencies to ensure that needed water level elevations are collected and verify that uniform data collection protocols are used among the agencies.	Complete	The final GMP was sent to all member agency General Managers and Directors on January 23, 2004. Water leve measurement protocols are included in Appendix D of the SGA GMP. The other important aspect with respect to protocol is the timing of measurements. SGA coordinated with member agencies to collect spring water elevations around April 15 and fall measurements around October 15.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
5	Coordinate with the USGS to determine the potential for integrating USGS monitoring wells constructed for the National Water Quality Assessment (NAWQA) Program into the SGA monitoring network.	Complete	SGA spoke with Ken Belitz (California NAWQA Program Chief) of the USGS on January 7, 2004. Ken referred SGA staff to USGS staff to coordinate the collection of water elevation data from USGS monitoring wells when the timing of collection is determined. In February 2005, received water elevation data through 2004 for USGS NAWQA wells monitored in the Sacramento area. In September 2006, SGA approved to allow USGS to add two monitoring wells in SGA's monitoring well network (funded by an AB303 grant) to be added to the USGS NAWQA program. These wells have been sampled by USGS and added to their network.
6	Consider ways to fill gaps in the monitoring well network by identifying additional suitable existing wells or identifying opportunities for constructing new monitoring wells.	On-going	Secured $250K AB303 grant to install dedicated monitoring wells in the basin - award date June 30, 2004. In October 2005, completed installation of nine regional monitoring wells where critical data gaps were known. In 2005, received data on monitoring wells associated with McClellan and Aerojet. The data are mostly limited to water elevation data, but do include some water quality parameters related to contaminant monitoring. Discussed with Dana Booth at February 23, 2004 meeting about opportunities to integrate wells from existing LUST sites into our network. Had subsequent meeting with Dana Booth on Sep 7, 2004 - Mr. Booth indicated that opportunities could be available to collect split samples from these sites to analyze water quality for our information. Given the additional regional monitoring wells and more data available through McClellan, Aerojet, and the USGS NAWQA wells, SGA will not pursue this further at this time.
7	Assess groundwater elevation trends and conditions based on the network annually.	On-going	Initial State of the Basin Report for 2002 calendar year data was completed in February 2004. Electronic version of report is available on SGA website. State of Basin Report for 2003 and 2004 calendar years was completed in June 2006 (renamed as Basin Management Report). The BMR demonstrates that in general groundwater levels stabilized in the basin beginning in the mid-1990s and have even shown some recovery on the order of 0.5 feet/year over the last few years. Preparation of the BMR for 2005 and 2006 will commence in early 2008.
8	Assess the adequacy of the groundwater elevation monitoring well network annually.	On-going	The May 2006 Basin Management Report demonstrates that water elevations are stabilized or recovering in general. The BMR also documents the installation of a regional monitoring well network. Under present conditions, the monitoring network is appropriate.
9	Identify a subset of monitoring wells that will be monitored more frequently than twice annually to improve the SGA's understanding of aquifer responses to pumping throughout the year.	On-going	This will continue to be assessed through time. Dedicated pressure transducers were installed on eight of the nine regional monitoring wells constructed through funding from a DWR AB 303 grant. Recordings are currently logged four times per day.
2.2	***Groundwater Quality Monitoring***		
1	Coordinate with member agencies to verify that uniform protocols are used when collecting water quality data.	Complete	A copy of the DHS guidelines were sent to all member agency General Managers and Directors on January 23, 2004 with the GMP.
2	Coordinate with the USGS to obtain historic water quality data for NAWQA wells, determine timing and frequency of monitoring under USGS program, and to discuss the potential for integrating USGS monitoring resources with the SGA network.	On-going	Obtained 1998 water quality data from USGS for NAWQA wells. Wells were sampled again by USGS in 2003/2004. That data will be provided to SGA when it has been QA/QC checked. SGA participated in a USGS/SWRCB AB 599 water quality sampling program in early 2005. The results of that study are expected in late 2007.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
3	Coordinate with member agencies and other local, state, and federal agencies to identify where wells may exist in areas with sparse groundwater quality data.	Complete	Added monitoring well data from McClellan and Aerojet.
4	Assess the adequacy of the groundwater quality monitoring well network annually.	On-going	To be assessed through preparation of the Basin Management Report.
2.3	***Land Surface Elevation Monitoring***		
1	Investigate the feasibility and costs of re-surveying the wells in the Arden-Arcade area that were last measured in 1991.	Complete	Sacramento Suburban Water District has been awarded an AB303 grant application to be conduct additional surveying of these and other locations in 2006.
2	Coordinate with the USGS to ascertain the suitability of the use of Interferometric Synthetic Aperture Radar (InSAR) images of the SGA and surrounding area. If the technology appears suitable, identify the costs of determining ground surface elevations and identify potential cost-sharing partners.	Deferred	Surveys data from benchmarks in the Arden Arcade area indicate that subsidence is not a significant concern at this time. Additionally, the uncertainties associated with InSAR in rapidly growing urban and agricultural areas makes this a low priority at this time.
3	Coordinate with other agencies, particularly the City and County of Sacramento and the National Geodetic Survey to determine if there are other suitable benchmark locations in the SGA area to aid in the analysis of potential land surface subsidence.	Deferred	Surveys data from benchmarks in the Arden Arcade area indicate that subsidence is not a significant concern at this time. Because of limited staff time at SGA, this task is being deferred.
4	Educate SGA member agencies of the potential for land surface subsidence and signs that could be indicators of subsidence.	Deferred	Surveys data from benchmarks in the Arden Arcade area indicate that subsidence is not a significant concern at this time. Because of limited staff time at SGA, this task is being deferred.
2.4	***Surface Water Groundwater Interaction Monitoring***		
1	Compile available stream gage data and information on tributary inflows and diversions from the American and Sacramento rivers to quantify net groundwater recharge or discharge between gages in the SGA area.	Complete	A memorandum report on available data on the American River was prepared for SGA by MWH on September 22 2004. This included a summary of known inputs and outputs to the stream budget of the American River. 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 2002-2003 version of this report. One of the objectives of the current effort to update the SGA groundwater model (IGSM) was to simulate daily flows on the American and Sacramento rivers. With the completion of the model, SGA now has a reasonable estimate of recharge/discharge along these river reaches.
2	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.	Complete	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 2002-2003 version of this report. SGA recently obtained the 2006 annual report and will incorporate information into the 2008 update to the SGA BMR.
3	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.	Complete	In late 2003, the State Board considered stream aquifer interaction along the American River as part of a fully appropriated stream hearing. Consulting studies associated with the report indicate that the American River is a losing stream along nearly its entirety below Nimbus Dam and that the river is substantially disconnected from the groundwater basin. Because of this data becoming available, no additional studies are planned at this time.
4	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 River and American River.	On-going	As mentioned above, the results of the fully appropriated streams hearing on the American River in 2003 have made this a low priority item. In 2005, two monitoring wells were installed for SSWD near the American River. Data collected beginning in early 2006 will evaluated to assess these relationships in the 2008 SGA BMR.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
5	Coordinate with CSUS to analyze data obtained from recently constructed monitoring wells on the CSUS campus to better understand the relationship between the groundwater basin and surface water flows at that location.	On-going	Met with Dave Evans of CSUS on September 8, 2004. Dr. Evans indicated that several wells on the south side of the river at CSUS are equipped with pressure transducers, which collect continuous water elevation measurements. The data are collected, but have not been processed to date. Dr. Evans expects to bring in a graduate student in the near future to analyze the relationship between stream stage and groundwater elevations. As of June 2007, this work has not progressed from within the university.
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.	Complete	Water level measurement protocols are included in Appendix D of the SGA GMP. The final GMP was sent to all member agency General Managers and Directors on January 23, 2004.
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).	Complete	A copy of the DHS guidelines were sent to all member agency General Managers and Directors on January 23, 2004 with the GMP.
3	Provide training on the implementation of these SOPs to member agencies, if requested.	Complete	The cover letter for the GMP and water quality protocols sent to member agencies on January 23, 2004 extending an offer to provide training on protocols.
2.6	***Data Management System***		
	No Action Required		The initial DMS was completed in February 2004. SGA maintains an annual consulting budget item for maintenance and support of the DMS.
COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION			
3.1	***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	Complete	Provided each member agency with 2003 revised county well construction and destruction standards on April 6, 2004.
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.	On-going	Met with James Taylor of CVRWQCB on September 13, 2004 and received a copy of the 2004 update to the Sacramento County Special Consultation Zone Ground Water Plume Site report. Informed member agencies at the October 14, 2005 SGA Board meeting that the report is available at SGA and that we will make a future effort scan the maps into an electronic file.
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.	Complete	Submitted a September 1, 2004 letter to member agency managers. Each letter included a map showing the maximum plumes extents in a 2-dimensional map view based on 2002 quarterly monitoring reports for each site (GMP letter to GMs 01sep04.doc).
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.	Complete	Offered assistance to all SGA member managers in letters dated January 23, 2004 and again on April 6, 2004.
3.2	***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	Complete	Provided each member agency with 2003 revised county well construction and destruction standards on April 6, 2004.
2	Follow up with member agencies on the reported abandoned and destroyed wells to confirm the information collected from DWR	Complete	Submitted a September 1, 2004 letter to member agency managers. Each letter included a table of member wells and their current status in the SGA database. The letter requested that member agencies update the well status (GMP letter to GMs 01sep04.doc). The updated status was entered into the DMS.
3	Provide a copy of the information on abandoned and destroyed wells in northern Sacramento County to fill any gaps in their records	On-going	Data received on well status requested from SGA members on September 1, 2004 were input into the SGA data management system in mid-2005 as part of the Basin Management Report update. This information on well status will be forwarded to the Central District office of DWR in 2008.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
4	Meet with the EMD to discuss ways to ensure that wells in the SGA area are properly abandoned or destroyed	Complete	Spoke with Steve Kalvelage of Sac County Environmental Management Department on July 26, 2004. Discussed possibility of preparing grant application under AB 303 for a well destruction program. Met with Dana Booth of EMD on September 7, 2004. Encouraged EMD to develop an AB303 grant application for a well abandonment program. Forwarded the AB303 grant application workshop notification to Dana on October 5, 2004. Coordinated with EMD again in October 2007 to determine if they are ready to pursue a joint grant application with SGA to launch a regional program. EMD indicated that they are still completing work they feel is required to beginning such an effort, and may be ready to pursue a grant opportunity in late 2008.
5	Obtain "wildcat" map from California Division of Oil and Gas to ascertain the extent of historic gas well drilling operations in the area as these wells could function as conduits of contamination if not properly destroyed.	Complete	An electronic version of the District 6 well location database for the Sacramento area was downloaded and incorporated into a GIS coverage of the SGA area. The DOG records confirm that oil and gas development has been very limited in the SGA area. Almost all activity has been confined to the western one-third of Sacramento County. There are records for only 53 permits issued: 40 are for plugged and abandoned dry holes; 5 active gas holes exist in the vicinity of Sacramento International Airport; 1 steam flood well is active in the vicinity also near the airport; and 7 previous gas wells have been plugged and abandoned (SGA_DOG_map.pdf).
3.3	***Wellhead Protection Measures***		
1	Request that member agencies provide vulnerability summaries from the DWSAP to the SGA to be used for guiding management decisions in the basin.	Complete	This request was not sent to members, because it was unnecessary. The information for each well is available on-line at http://swap.ice.ucdavis.edu/TSinfo/TSsystemc.asp?myCounty=34.
2	Contact groundwater basin managers in other areas of the state for technical advice, effective management practices, and "lessons learned," regarding establishing wellhead protection areas	Deferred	Because of limited SGA staff time, this item is being deferred. In 2005, SGA staff coordinated a session on local agency management for the Biennial Groundwater Conference. In addition to SGA, briefings on the activities of Orange County Water District and Eastern Municipal Water District were given. This provided insightful information on differences between management in northern and southern California.
3.4	***Protection of Recharge Areas***		
1	When CAS results are available, meet with the SWRCB to discuss those results and consider follow-on actions.	Complete	Coordinated SWRCB and LLNL presentation to SGA Board of Directors on February 12, 2004. Reviewed LLNL draft report in March 2004. Received final report in April 2004.
3.5	***Control of the Migration and Remediation of Contaminated Groundwater***		
1	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	Met with Craig Fegan and Steve Costello at Aerojet on August 26, 2004. Aerojet agreed to provide construction, water quality and water elevation data on approximately 77 monitoring wells within and adjacent to the SGA boundary. They will provide updated data on those wells on a semi-annual basis. Spoke to Dana Booth with Sac County Environmental Health on July 27, 2004 and again on September 7, 2004. Dana is in charge of leaking underground storage tank site investigations. He indicated that some of the locations might be willing to member agencies to collect a split water sample during active investigations for the purposes analyzing other constituents of interest to local purveyors. One result of the current 2007 AB303 grant application will be to identify priority locations for sentry wells related to contamination at Aerojet.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
2	If detections occur in these monitoring wells, work with the responsible parties and the potentially impacted member agency to develop strategies to minimize the further spread of contaminants.	On-going	An SGA Regional Contamination Issues Committee was formed in June 2004. This committee works proactively to ensure that member purveyor needs are addressed if detections occur. The committee has meets monthly or on an as-needed basis. Committee met with regulators and Aerojet responsible parties to get briefing of status of remediation efforts at Aerojet on October 4, 2004. Met with management and staff of USEPA, SWRCB, Central Valley RWQCB, DTSC, Water Forum Successor Effort, and purveyors on November 4, 2004 and again in November 2006 to express concerns over regional impacts of contamination in basin. Developed an informational brochure entitled *Groundwater Contamination in the Sacramento Region - Legacy of the Past, Challenge to Our Future* in early 2006. Gave SGA overview presentation to McClellan Restoration Advisory Board in February 2007
3	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 or monitoring wells	Complete	Spoke to Dana Booth with Sac County Environmental Health on July 27, 2004. He recommended that rather than prepare a static map of these locations that SGA should develop a procedure for querying the GeoTracker web site and consulting with Sac County staff when locating future wells. The directions for using Geotracker were developed by SGA staff and provided to member agency managers in a September 1, 2004 letter (GMP letter to GMs 01sep04.doc).
4	Meet with representatives of the RWQCB to establish a mutual understanding about SGA's groundwater management responsibilities	Complete	Met with Central Valley Regional Water Quality Control Board staff on February 26, 2004. Briefed them on SGA background, SGA GMP, and DMS. RWQCB added SGA to mailing list for updates on underground storage tank sites.
3.6	***Control of Saline Water Intrusion***		
1	Track the progression, if any, of saline water bodies moving toward the east from the Delta.	On-going	Will work with DWR Central District staff to determine if any representative wells are located in the north Delta area to assist in tracking of any possible saline groundwater bodies.
2	Observe TDS concentrations in public supply wells of North Area Groundwater Basin water suppliers 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 annual review of basin conditions.	On-going	To be assessed in future Basin Management Reports as more temporal data become available.
3	Inform all member water purveyor managers of the presence of the interface and the approximate depth of the interface below their service area for their reference when siting potential wells.	On-going	No action on this item will be taken until after SGA staff have had an opportunity to discuss the TDS data from the Delta with DWR Central District staff.
COMPONENT CATEGORY 4: GROUNDWATER SUSTAINABILITY			
4.1	***Conjunctive Management Activities***		
1	Continue to investigate conjunctive use opportunities within the SGA area	On-going	SGA will assist any members upon request. Currently, the Integrated Regional Water Management Planning Program is an on-going program under the RWA umbrella. This program identifies opportunities and facilities for implementing expanded conjunctive use in the region. SGA is preparing a Water Accounting Framework for the SGA area through participating members can establish groundwater banks to further promote conjunctive use by members and to acknowledge those investments by members. Phase II of this effort was adopted in June 2007, with staff currently preparing a "model" groundwater banking and exchange guidance documents for member agencies to use should they choose to operate a program.

SGA Adopted GMP Action Items
(as of 12/11/08)

	Description of Action	Status	Comments
2	Continue to investigate opportunities for the development of direct recharge facilities in addition to in-lieu recharge (e.g. injection wells or surface spreading facilities, through constructed recharge basins or in river or stream beds).	On-going	SGA has been closely coordinating with the City of Roseville in its feasibility study of an aquifer storage and recovery well. Some SGA members have indicated an interest for use of this methodology pending results of the Roseville study.
4.2	***Demand Reduction***		
1	Coordinate with the RWA and its members that have signed specific agreements to the WFA to ensure that 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.	On-going	Signatories to the Water Forum Agreement are currently completing a review and renegotiation of existing best management practices for water conservation. That effort is expected to be completed by early 2008 with a likely conclusion of adopting BMPs developed by the California Urban Water Conservation Council.
2	Coordinate with SRCSD through the RWA to investigate opportunities for expanded use of recycled water throughout the county.	On-going	SRCSD completed a recycled water master plan effort in early 2007. One of the goals of the plan is to identify uses in the County for between 30 to 40 mgd of recycled water by the year 2020. SRCSD also joined an RWA effort to complete an Integrated Regional Water Management Plan. The results of the SRCSD effort will be integrally linked to the RWA planning effort. SGA has received a copy of the recycled water master plan.
COMPONENT CATEGORY 5: PLANNING INTEGRATION			
5.1	***Existing Integrated Planning Efforts***		
1	Prepare and adopt a formal integrated water management plan in accordance with CWC Section 10540 et seq. The SGA will form an ad hoc committee with the RWA to determine which agency would be most appropriate to prepare that plan.	Complete	RWA began an Integrated Regional Water Management Planning Program in April 2004. RWA adopted an integrated plan in May 2006. The SGA, PCWA, and City of Lincoln GMPs were each a component of the integrated plan. RWA is currently updating the plan, with an expected completion in mid-2008. SGA is closely coordinating with this effort to elevate key groundwater issues into the IRWMP.
2	Review the Water Forum Land Use procedures and make recommendations on what additional role, if any, SGA should take with respect to land use decisions within the SGA area.	Complete	Reviewed the February 2002 Final Draft: Relationship of the Water Forum Agreement to Land Use Decision-Making with the GMP Implementation Committee. At the direction of the committee, sent an August 18, 2004 letter to Leo Winternitz, Water Forum Successor Effort Executive Director, expressing our continued support of SGA's role in providing groundwater information within the SGA area as requested (land use to Winternitz 10aug04.doc).

Appendix C

Public Notices to Begin and Adopt an Updated GMP in Sacramento Bee

NO 483 PUBLIC NOTICE

NOTICE OF INTENT TO BEGIN AN UPDATE OF A GROUNDWATER MANAGEMENT PLAN

The Sacramento Groundwater Authority (SGA) is a joint powers authority charged with managing the groundwater basin underlying Sacramento County north of the American River. To maintain a sustainable groundwater resource for the more than half-million citizens that rely upon the basin for their daily water needs, SGA intends to begin an update of its groundwater management plan originally adopted in December 2003. SGA encourages any individual interested in the update of the groundwater management plan to attend the August 14, 2008 meeting of the SGA board of directors. The meeting, which is open to the public, will begin at 9 am at 5620 Birdcage Street, Suite 110 in Citrus Heights, CA. For more information on SGA Board meetings or to find out more about groundwater management planning efforts, contact Rob Swartz of SGA at (916) 967-7692.

NOTICE OF INTENT TO ADOPT AN UPDATE OF A GROUNDWATER MANAGEMENT PLAN

The Sacramento Groundwater Authority (SGA) is a joint powers authority charged with managing the groundwater basin underlying Sacramento County north of the American River. To maintain a sustainable groundwater resource for the more than half-million citizens that rely upon the basin for their daily water needs, SGA intends to adopt an update of its groundwater management plan originally adopted in December 2003. SGA encourages any individual interested in the update of the groundwater management plan to attend the December 11, 2008 meeting of the SGA board of directors. The meeting, which is open to the public, will begin at 9 am at 5620 Birdcage Street, Suite 110 in Citrus Heights, CA. For more information on SGA Board meetings or to find out more about groundwater management planning efforts, contact Rob Swartz of SGA at (916) 967-7692.

Appendix D

Standard Operating Procedures for Manual Water Level Measurements

TABLE OF CONTENTS

TABLE OF CONTENTS i

SECTION 1.0 SCOPE AND APPLICATION 1

SECTION 2.0 METHOD SUMMARY 1

SECTION 3.0 POTENTIAL PROBLEMS 2

SECTION 4.0 EQUIPMENT 2

SECTION 5.0 PROCEDURES 2
5.1 Preparation 2
5.2 Procedures 3

SECTION 6.0 CALCULATIONS 3

SECTION 7.0 QUALITY ASSURANCE/QUALITY CONTROL 4

SECTION 8.0 HEALTH AND SAFETY 5

SECTION 9.0 REFERENCES 5

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to set guidelines for the determination of the depth to water and separate phase chemical product (i.e., gasoline or oil) in a water supply well, monitoring well, or piezometer. These standard operating procedures may be varied or changed as required, dependent on site conditions , and equipment limitations. In all instances, the actual procedures employed will be documented and described on the field form. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Generally, water-level measurements taken in piezometers, or wells are used to construct water table or potentiometric surface maps and to determine flow direction as well as other aquifer characteristics. Therefore, all water level measurements in a given district should preferably be collected within a 24 hour period and SGA's area within one week. However, certain situations may produce rapidly changing groundwater levels that necessitate taking measurements as close in time as possible. Large changes in water levels among wells may be indicative of such a condition . Rapid groundwater level changes may occur due to:

- Atmospheric pressure changes
- Changes in river stage, impoundments levels, or flow in unlined ditches
- Pumping of nearby wells
- Precipitation
- Tidal influences

2.0 METHOD SUMMARY

A survey mark should be placed on the top of the riser pipe or casing as a reference point for groundwater level measurements. If the lip of the riser pipe is not flat, the reference point may be located on the grout apron or the top of the outer protective casing (if present). The measurement reference point should be documented on the groundwater level data form. All field personnel must be made aware of the measurement reference point being used in order to ensure the collection of comparable data. Before measurements are made, water levels in piezometers and monitor wells should be allowed to stabilize for a minimum of 24 hours after well construction and development. Measurements in water supply wells need to be noted as questionable if pumping has or is occurring. In low yield situations, recovery of water levels to equilibrium may take longer. All measurements should be made as accurately as possible, with a minimum accuracy of 0.1 feet. Future measurements may have to be more accurate (measurements to the nearest 0.01 foot may be needed for conjunctive use projects, ect.). Ideally, the minimum measurement accuracy is 0.1 feet and the recommended accuracy is 0.01 feet.

If there is reason to suspect groundwater contamination, water level measuring equipment must be decontaminated and, in general, measurements should proceed from the least to the most contaminated wells. This SOP assumes an absence of contamination and no need for air monitoring or decontamination.

Open the well and monitor the headspace with the appropriate air monitoring instrument if the presence of volatile organic compounds is suspected. For electrical sounders lower the device into the well until the water surface is reached as indicated by a tone or meter deflection. Record the distance from the water surface to the reference point. Measurement with a chalked tape will

necessitate lowering the tape below the water level and holding a convenient foot marker at the reference point. Record both the water level as indicated on the chalked tape section and the depth mark held at the reference point The depth to water is the difference between the two readings. Remove measuring device, replace riser pipe cap, and decontaminate equipment as necessary. Note that if a separate phase is present, an oil/water indicator probe is required for measurement of product thickness and water level.

3.0 POTENTIAL PROBLEMS

1. Cascading water, particularly in open-hole or rock wells, may interfere with the measurement.
2. Some older types of electric sounders are only marked at five-foot intervals. A surveyor's tape is necessary to extrapolate between the 5-foot marks.
3. Oil or other product floating on the water column can insulate the contacts of the probe on an electric sounder and give false readings. For accurate level measurements in wells containing floating product, a special oil/water level indicator is required, and the corrected water level must be calculated.
4. Tapes (electrical or surveyor's) may have damaged or missing sections, or may be spliced inaccurately.
5. An airline may be the only available means to make measurements in sealed production wells but the method is generally accurate only to approximately 0.2 foot.
6. When using a steel tape, it is necessary to lower the tape below the water level in order to make a measurement. This assumes knowledge of the approximate groundwater level.

4.0 EQUIPMENT

The electric water level indicator and the chalked steel tape are the devices commonly used to measure

water levels. Both have an accuracy of 0.01 feet. Other field equipment may include:

- Air monitoring instrumentation
- Well depth measurement device (sounder)
- Chalk
- Ruler
- Site logbook
- Paper towels and trash bags
- Decontamination supplies (assumed unnecessary)
- Groundwater level data forms

5.0 PROCEDURES

5.1 Preparation

1. Determine the number of measurements needed, the methods to be employed, and the equipment and supplies needed.
2. Decontaminate or pre-clean equipment, and ensure that it is in working order.

3. Coordinate schedule with staff and regulatory agency, if appropriate.
4. If this is an initial visit, perform a general site survey prior to site entry in accordance with a current approved site specific Health and Safety Plan (id applicable).
5. Identify measurement locations.

5.2 Procedures

Procedures for determining water levels are as follows:

1. If possible, and when applicable, start at those wells that are least contaminated and proceed to those wells that are most contaminated.
2. Rinse all the equipment entering the well.
3. Remove locking well cap, note well ID, time of day, and date on the groundwater level data form.
4. Remove well cap.
5. If required by site-specific condition, monitor headspace of well with a photoionization detector (PID) or flame ionization detector (FID) to determine presence of volatile organic compounds, and record results in logbook.
6. Lower water-level measuring device into the well. Electrical tapes are lowered to the water surface whereas chalked steel tapes are lowered generally a foot or more below the water surface. Steel tapes are generally chalked so that a 1-to 5-foot long section will fall below the expected water level.
7. For electrical tapes record the distance from the water surface, as determined by the audio signal or meter, to the reference measuring point and record. For chalked tapes, an even foot mark is held at the reference point, once the chalked section of the tape is below the water level. Both the water level on the tape and the foot mark held at the reference point is recorded. The depth to the water is then the difference between the two readings. In addition, note the reference point used (top of the outer casing, top of the riser pipe, ground surface, or some other reproducible position on the well head). Repeat the measurement.
8. Remove all downhole equipment, replace well cap and locking steel caps.
9. Rinse all downhole equipment and store for transport to the next well.
10. Note any physical changes, such as erosion or cracks in protective concrete pad or
11. Note any physical changes, such as erosion or cracks in protective concrete pad or variation in total depth of well on groundwater level data form.

6.0 CALCULATIONS

To determine groundwater elevation above mean sea level, use the following equation:

where:

$$\mathbf{E_w = E - D}$$

E_W = Elevation of water above mean sea level (feet) or local datum

E = Elevation above sea level or local datum at point of measurement (feet)

D = Depth to water (feet)

7.0 QUALITY ASSURANCE/QUALITY CONTROL

The following general quality assurance/quality control (QA/QC) procedures apply:

1. All data must be documented on the groundwater level data forms.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified.
3. Each well should be tested at least twice in order to compare results. If results do not agree to within 0.02 feet, a third measurement should be taken and the readings averaged. Consistent failure of consecutive readings to agree suggests that levels are changing because of one or more conditions as indicated in Section 1, and should be noted on the field form.
4. Results should be compared to historical measurements while in the field and significant discrepancies noted and resolved if possible.
5. Wells for which no or questionable measurements are obtained need to have the codes entered on the field form as follows:

No Measurement		**Questionable Measurement**	
0	Discontinued	**0**	Caved or deepened
1	Pumping	**1**	Pumping
2	Pumphouse locked	**2**	Nearby pump operating
3	Tape hung up	**3**	Casing leaking or wet
4	Can't get tape in casing	**4**	Pumped recently
5	Unable to locate well	**5**	Air or pressure gauge measurement
6	Well destroyed	**6**	Other
7	Special	**7**	Recharge operation at nearby well
8	Casing leaking or wet	**8**	Oil in casing
9	Temporarily inaccessible		
D.	Dry well		
F.	Flowing well		

6. The surveyor(s) must complete all fields on the field form and initial. Upon return from the field, appropriate corrective actions need to be communicated and completed prior to the next survey event.
7. All data entered into electronic spreadsheet or database should be double-keyed or hard copy printed and proofed by a second person.
8. Questionable wells or measurements noted during data compilation need to result in corrective actions if applicable.

8.0 HEALTH AND SAFETY

This SOP assumes that only uncontaminated wells are being measured. If not, a current approved site Health and Safety Plan should be consulted..

9.0 REFERENCES

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SGA