

**SACRAMENTO GROUNDWATER AUTHORITY**

**WATER ACCOUNTING FRAMEWORK  
WHITE PAPER**

**July 2006**

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## **Draft Water Accounting Framework White Paper**

### **Introduction**

In April 2000, representatives from a diverse group of 40 stakeholder organizations executed the historic Sacramento Area Water Forum Agreement (WFA). A centerpiece of the WFA is a regional program to manage and conjunctively use groundwater and surface water to help meet water supply needs through the year 2030, while reducing diversions from the lower American River during environmentally sensitive times. To help insure implementation of this regional conjunctive use program and to achieve some measure of equity among those agencies responsible for it, the Sacramento Groundwater Authority (SGA) has been charged with developing a Water Accounting Framework (WAF or Framework).

This Framework will be unique in that it is intended to be developed and implemented cooperatively and voluntarily by the region's municipalities and water purveyors. Historically, this level of resource accounting in California has only occurred in basins that are managed through a court adjudication or are managed by agencies with special legislated powers.

The purpose of this White Paper is to provide information to stakeholders as SGA seeks to develop a workable Framework. This White Paper presents a brief background of organizations, pilot studies, and recent conditions in the basin as a starting point for launching the current effort. Additionally, initial thoughts and objectives, along with a conceptual description of the draft Framework elements are provided. This White Paper should be viewed as the starting point for interviews being held in July 2006 with SGA member agencies and additional regional stakeholders. Feedback from these interviews will shape the details of the elements of the Framework as the effort progresses.

### **Background**

Beginning in 1998, a progression of events led to the current effort to establish the Framework. The American River Basin Cooperating Agencies (ARBCA) developed the initial concept that a Framework was necessary to firmly establish expanded regional conjunctive use, while distributing the costs of the program equitably among basin stakeholders. ARBCA recommended that the task of developing the Framework be given to the SGA as it is the agency responsible for implementing the regional groundwater management program. SGA has conducted two key pilot studies to investigate the feasibility of implementing the Framework. While initial efforts and pilot studies helped the region better understand conjunctive use, conditions in the region have changed substantially enough over the past few years so as to result in a Framework concept that takes advantage of opportunities being exercised by local participants, as opposed to a regulatory-oriented program (as originally envisioned) to manage the basin.

### **American River Basin Cooperating Agencies**

As the Sacramento Area Water Forum Process neared completion in 1998, water purveyors in northern Sacramento County and western Placer County formed the American River Basin Cooperating Agencies (ARBCA or Cooperating Agencies). The stated purpose of the Cooperating Agencies was to develop equitable, cost-effective water resource management strategies for implementing the conjunctive use program envisioned and prescribed in the WFA. The Cooperating Agencies began the development of the Regional Water Master Plan (RWMP) to explore opportunities for cooperative actions between water

purveyors, which included investigating joint operational agreements and constructing new joint facilities to serve the region.

As part of Phase II of the RWMP, the Cooperating Agencies began formulating a structure to address institutional, legal, contractual, and financial considerations that would promote regional cooperation in the implementation of preferred projects and programs, while preserving individual agency autonomy and protecting equity through the recognition of investments in infrastructure and water supply. This institutional structure was the genesis of the initial Framework. It was envisioned that early implementation of this Framework and regional conjunctive use program would provide opportunities to generate revenue to offset a portion of the costs associated with the required conjunctive use infrastructure.

## **Sacramento Groundwater Authority**

The SGA is a joint powers authority (JPA) formed in 1998 to manage the Sacramento region's groundwater basin north of the American River. Formed as a result of the Water Forum, SGA is recognized as an essential part of implementing the groundwater management element of the WFA.

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. Among other purposes, the JPA cites the following purposes for establishing SGA:

- To maintain the long-term sustainable yield of the North Area Basin.
- To manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors.

Since its inception, SGA has completed or initiated many elements that are foundational to meeting these purposes. These include:

- Creation of a Data Management System to compile important water supply and water quality data to assess and manage the basin.
- Development and adoption of a state-compliant Groundwater Management Plan (GMP) to identify specific actions and management objectives for properly managing the basin.
- Completion of two pilot projects to prove up the legal, institutional, and physical elements of banking and exchange agreements.
- Installation of dedicated monitoring wells and identification of additional existing monitoring wells to assess the basin as expanded conjunctive use operations are carried out.
- Update of an Integrated Groundwater and Surface Water Model (IGSM) application for the SGA area to simulate the impacts of existing or proposed conjunctive use operations at future dates in the basin (model completion expected in early 2007).
- Completion of a biennial Basin Management Report to assess the current health of the basin, to report on management activities, and to recommend future management actions in the basin.

A remaining critical element needed to allow SGA to meet its purposes is the development of a Framework for the region's purveyors to establish the ground rules for their future operations within the basin. The Framework should first and foremost be protective of the long-term health of the basin. An additional desirable element of the Framework is to create incentives for water suppliers to expand their conjunctive use programs, while emphasizing and protecting individual agency decision-making autonomy within the construct of the WFA.

## **SGA Pilot Studies**

SGA has conducted two banking and exchange pilot studies – the first in 1999/2000 with the Sacramento Area Flood Control Agency (SAFCA) and the U.S. Bureau of Reclamation, and the second in 2002/2003 with the CALFED Bay-Delta Program Environmental Water Account (EWA). Both studies employed simplified mechanisms to track and account for:

- Groundwater banking and extraction and changes in groundwater storage.
- Estimated basin losses.
- Surface water forbearance.

Together, these pilot studies allowed SGA and its participating members to exercise the groundwater storage potential of the North Area Basin and investigate the mechanics of an expanded banking and exchange program. Specifically, the EWA Pilot Study included further development of the RWMP Framework concepts and components, and described the initial policy decisions necessary to begin implementation of a Framework. The pilot studies also established a precedent for regional banking and exchange with state and federal agencies which, through their participation, recognized the validity of the water supply made available and accounted for through this mechanism.

At the conclusion of the Pilot Studies, a draft Proposed Water Accounting Framework was completed in June 2003. That proposal provided detailed analysis of how banking and exchange agreements could be facilitated. However, there was a great deal of complexity involved in the June 2003 effort that should only be required under more dire circumstances. As discussed further herein, conditions in the basin appear to have already improved over the past several years and the required monitoring and management tools are in place to allow SGA to move toward a more simplified and less onerous Framework.

## **Changed Conditions**

Physical conditions and purveyor operations have changed over the past few years since the ARBCA effort, necessitating a Framework to move forward using a different approach than was previously contemplated. These changes include:

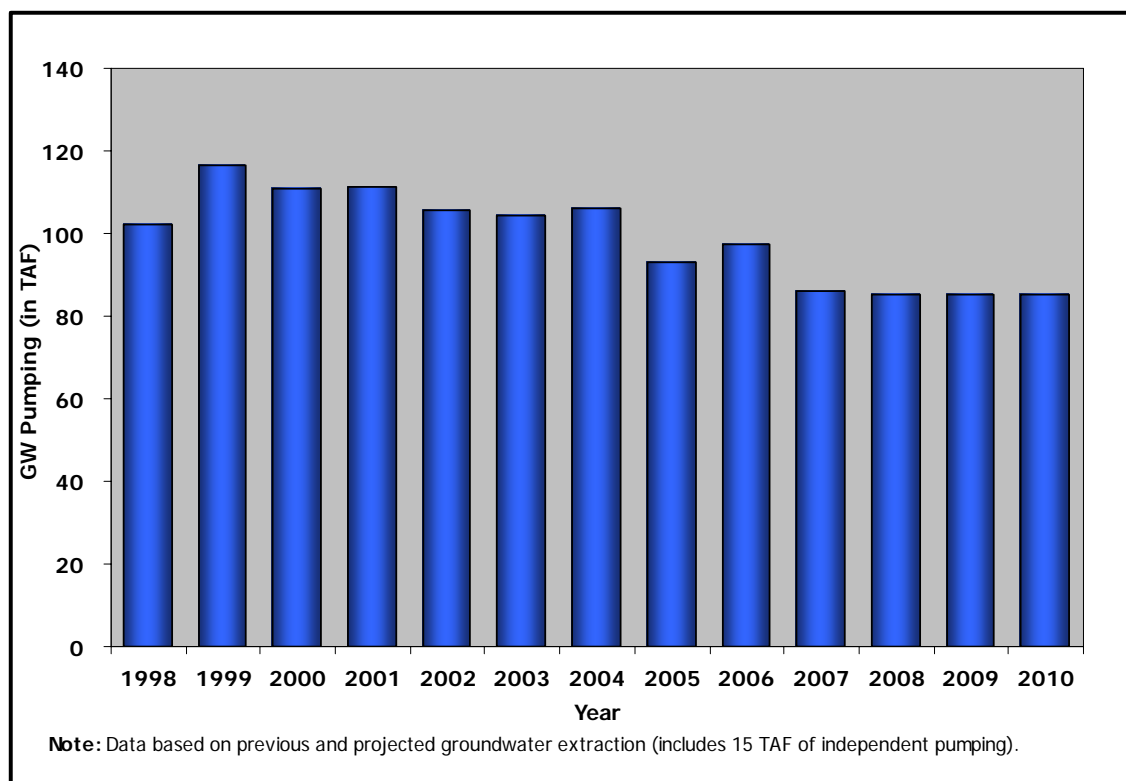
- 1) Conjunctive use is currently being implemented on a scale that has resulted in reduced groundwater extractions from the basin and some recovery of groundwater elevations;
- 2) The threat of groundwater contamination and plume migration may be more significant than previously thought; and
- 3) SGA completed or initiated several foundational basin management initiatives including development of the GMP, a regional monitoring well network, updating a regional groundwater model, and completion of a Basin Management Report (BMR) that assesses basin conditions;
- 4) Stakeholders in Placer County and central and south Sacramento County have expressed an interest in participating in the development of the Framework as a potential future tool within their respective management areas.

Each of these is discussed further below.

## **Conjunctive Use Being Implemented**

When the WFA was executed in 2000, there was a widely held belief that groundwater extractions from the basin would be near the WFA estimated long-term annual average sustainable yield of 131,000 acre-feet within about 10 years. However, this has not been the case. In fact, groundwater extractions have trended downward over the past few years. Gross basin pumping is currently below 100,000 acre-feet. Basin extractions are projected to remain lower than anticipated through at least 2010 (see **Figure 1**).

While some of the reduced demand for groundwater can be attributed to wetter than normal hydrologic conditions over the past decade, much of these improved conditions can be explained by expanded conjunctive use facilities and operations (namely the addition of more surface water supplies) in the basin.



**Figure 1. Annual Groundwater Pumping in North Area Basin**

For example, Sacramento Suburban Water District (SSWD) completed a pipeline to take delivery of surface water into its service area in the mid-1990s. SSWD also began receiving surface water from the City of Sacramento in a portion of its service area that had previously been fully reliant on groundwater. Historic reliance on groundwater resulted in a large cone of depression in the central portion of the basin (see **Figures 2 and 3**). As can be seen in hydrographs from the central part of the basin, groundwater elevations declined over several decades at a rate of about 1.5 ft/yr. With the recent conjunctive use program implemented in the mid 1990's, water levels have stabilized and in some areas groundwater elevations have recovered at a rate of about 0.5 ft/yr over the last several years.

### **Groundwater Contamination More Threatening**

Groundwater contamination has impacted water purveyors over the last decade (see **Figure 4**). Only within the last few years however, have contaminant plumes migrated north of the American River, threatening groundwater production wells within SGA's boundaries. With contamination plumes threatening Carmichael and Fair Oaks Water Districts, it is increasingly important to manage *where* groundwater pumping occurs in addition to managing gross basin pumping to ensure that localized conditions do not exacerbate the overall problem. This will require the integration of the Framework with more monitoring activities and possibly the use of modeling tools towards the later phases of the Framework development.

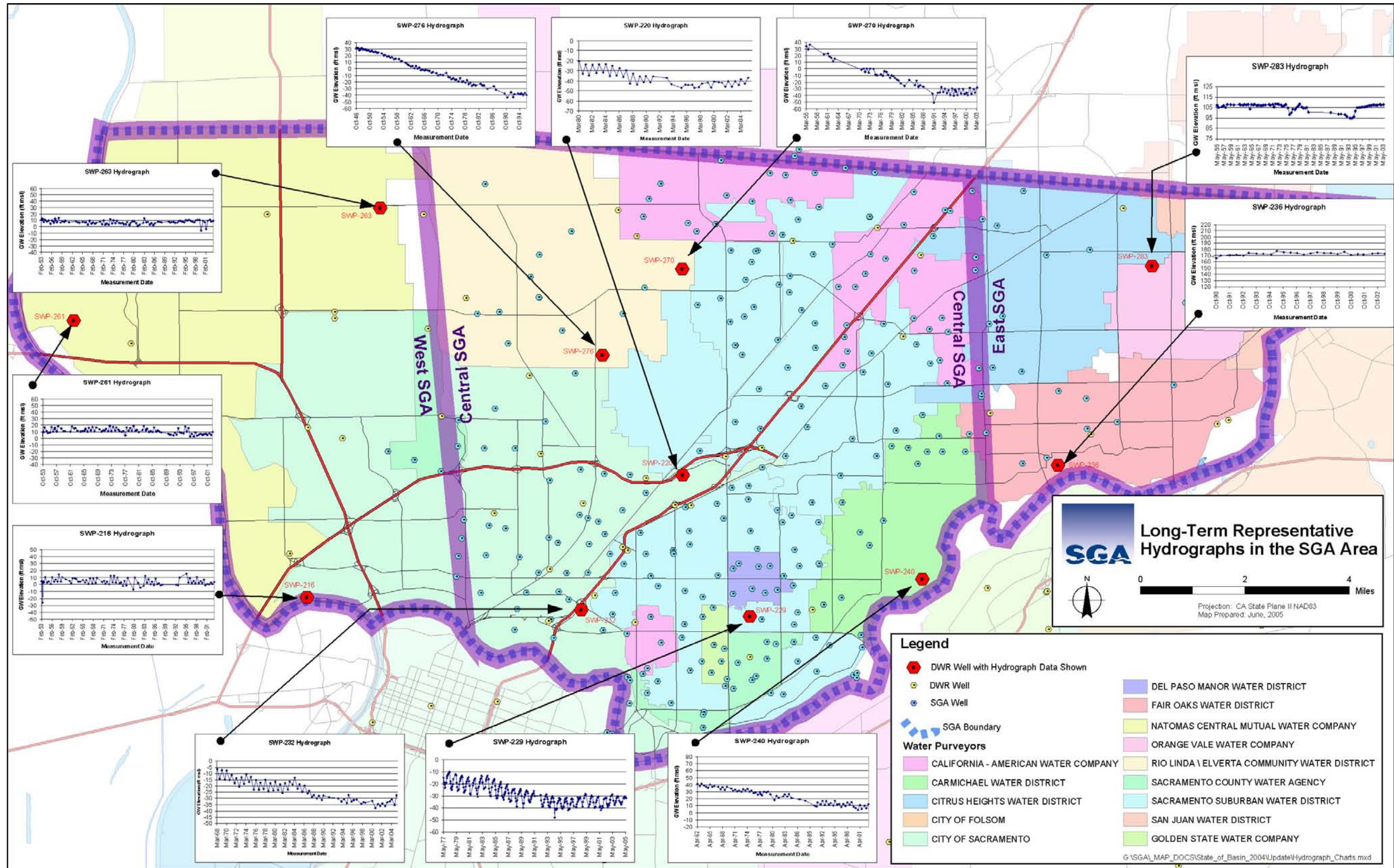


Figure 2. Long-Term Representative Hydrographs in the SGA Area

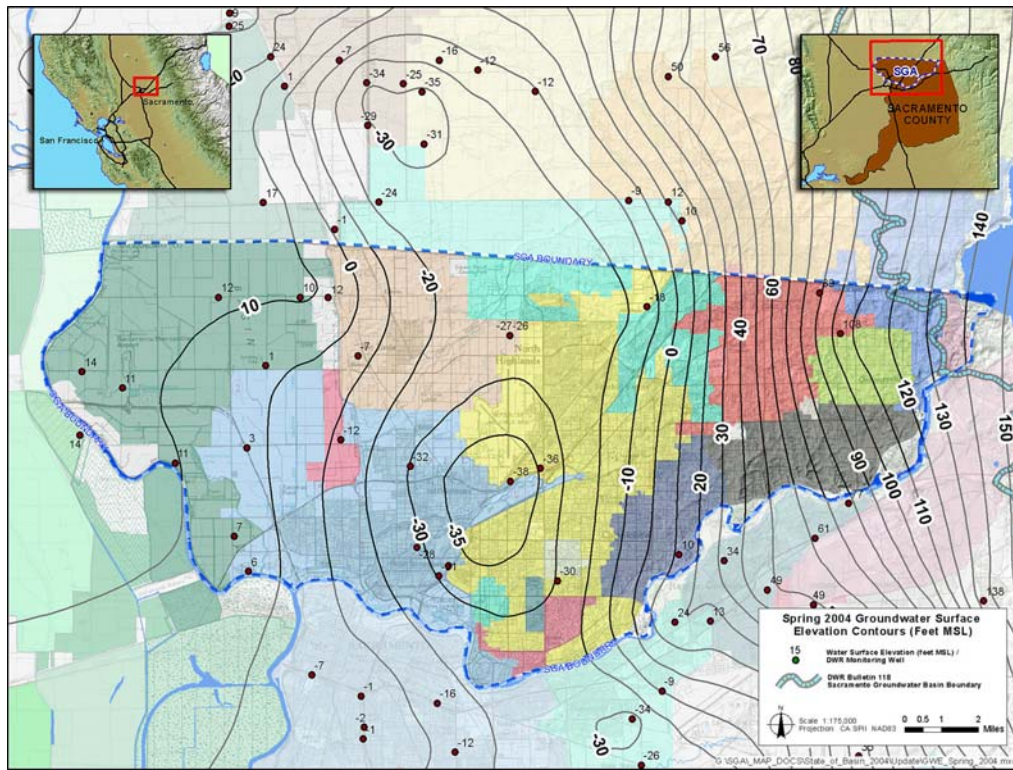


Figure 3. Spring 2004 Groundwater Surface Elevation Contours

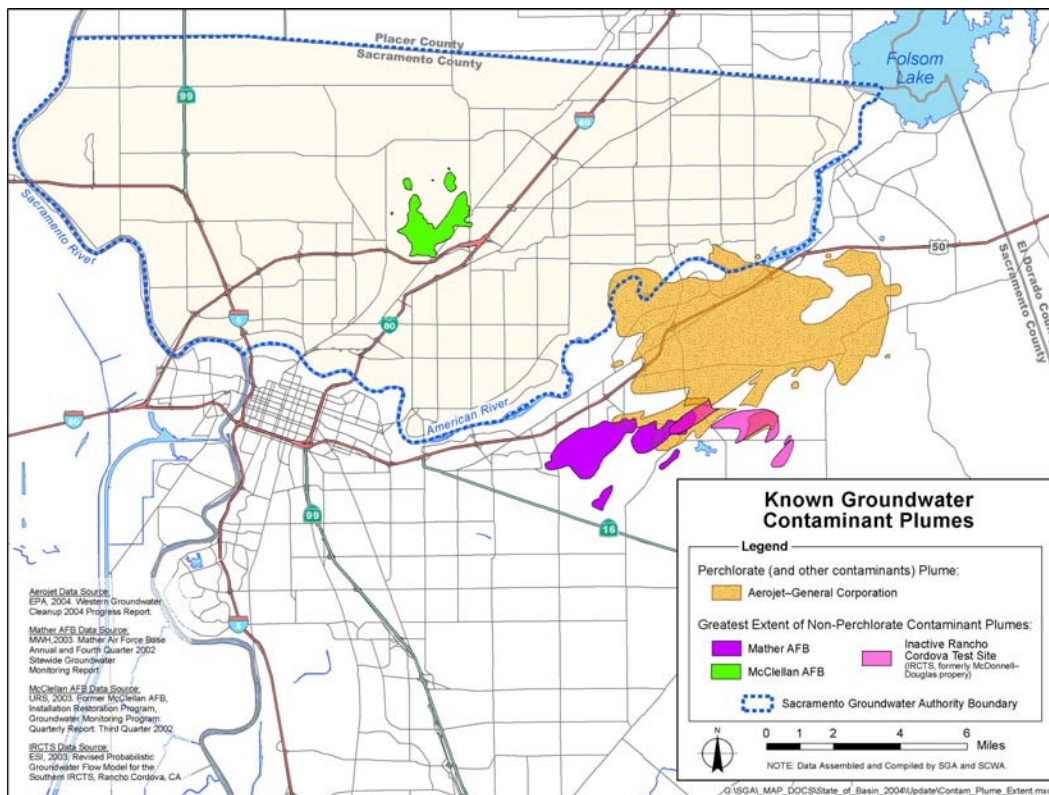


Figure 4. Known Groundwater Contaminant Plumes

### **Basin Monitoring and Management Program in Place**

When the WFA was executed in 2000, few mechanisms for ensuring groundwater basin sustainability existed. For example, the primary groundwater control mechanism was to establish an agreed upon average annual sustainable yield for the basin at 131,000 acre-feet as part of the WFA. The other key recommendation of the WFA was to have the SGA serve as the groundwater management entity for the Sacramento County portion of the basin north of the American River, while other management options were developed in the central and south basins. Since its inception, SGA has worked with its member agencies to develop several tools including a data management system, a regional monitoring well network, a GMP, and a BMR. Additionally, an update of the groundwater model is currently underway. Together, these tools can be used to evaluate the health of the basin from a variety of perspectives (e.g., groundwater elevations, groundwater quality, subsidence, etc.). Based on the most recent BMR, the management practices undertaken by member agencies--on the whole--are producing positive results in the groundwater basin. Because these programs are in now in place, the proposed Framework focuses more on monitoring parameters than on a single, gross “sustainable yield” ceiling for the entire basin.

### **Adjacent Stakeholders in Region have Interest in Framework**

Sub-regions adjacent to SGA (Central Basin, South Basin, and Placer County) have been working on their respective groundwater management programs over the last several years. As an early implementer, SGA has served as a successful governance model that can be tailored to fit the particular needs of adjacent basins. While the Central Basin, South Basin and Placer County groundwater efforts focus on the particular needs of their management areas, the overall water supply setting is similar enough such that these areas could benefit from the work performed to develop a Framework for the SGA area. Thus, other sub-regions have an interest in the development of the Framework and how the Framework and associated tools can be used to protect basin resources, to manage intra-basin groundwater exchanges or transfers, and possibly to provide an equitable framework for external transfers. Also, recycled water is playing an increasingly important role in meeting the region’s water supply needs, increasing the interest of agencies that have not traditionally seen themselves as water purveyors, such as the Sacramento Regional County Sanitation District.

### **Objectives of the Water Accounting Framework**

For purposes of initiating development of the draft Framework, four candidate objectives were identified. Additional objectives will almost certainly be developed as the Framework effort progresses. These candidate objectives are intended to be a starting point for discussion purposes. Candidate and all future objectives should be consistent with the WFA.

1. Ensure a safe and sustainable water supply for the greater Sacramento region.
2. Encourage water purveyors to “bank” water in the basin, when available, for use in drier periods.
3. Establish a framework that provides opportunities for water purveyors and their partners, creating institutional certainties to implement a water supply “exchange” program.
4. Define and enumerate SGA’s role in implementing the objectives of the Framework.

### **Elements of the Water Accounting Framework**

Following key briefings to the SGA Board and several stakeholders meetings, a conceptual picture of the Framework elements, recognizing the changed conditions (described above) has emerged. The proposed Framework can be depicted as a pyramid (see **Figure 5**) with a strong technical foundation implemented by SGA, supporting a robust banking and exchange program, topped by an overarching objective of ensuring a safe and sustainable water supply for the region. The diagram is intended to assist participants



in visualizing the various elements that comprise the WAF, and is not necessarily intended to depict a strict hierarchal structure. Because the Framework cannot contemplate and address the myriad of future issues that will arise during implementation, a Basin Management Advisory Committee (BMAC) is proposed as a forum for considering technical and policy level issues, changed conditions, and making recommendations to the SGA Board. Each of these elements is discussed in more detail below. It is important to note that the Framework elements described herein are intended to increase the understanding of how a Framework could be structured, and are not presented as “the solution” or “the structure” in final form. The details and nuances of how each Framework element would be implemented will be the subject of the July 2006 member/stakeholder interviews and many subsequent discussions and refinements to arrive at an acceptable Framework concept and a series of basin sustainability principles to guide future efforts.

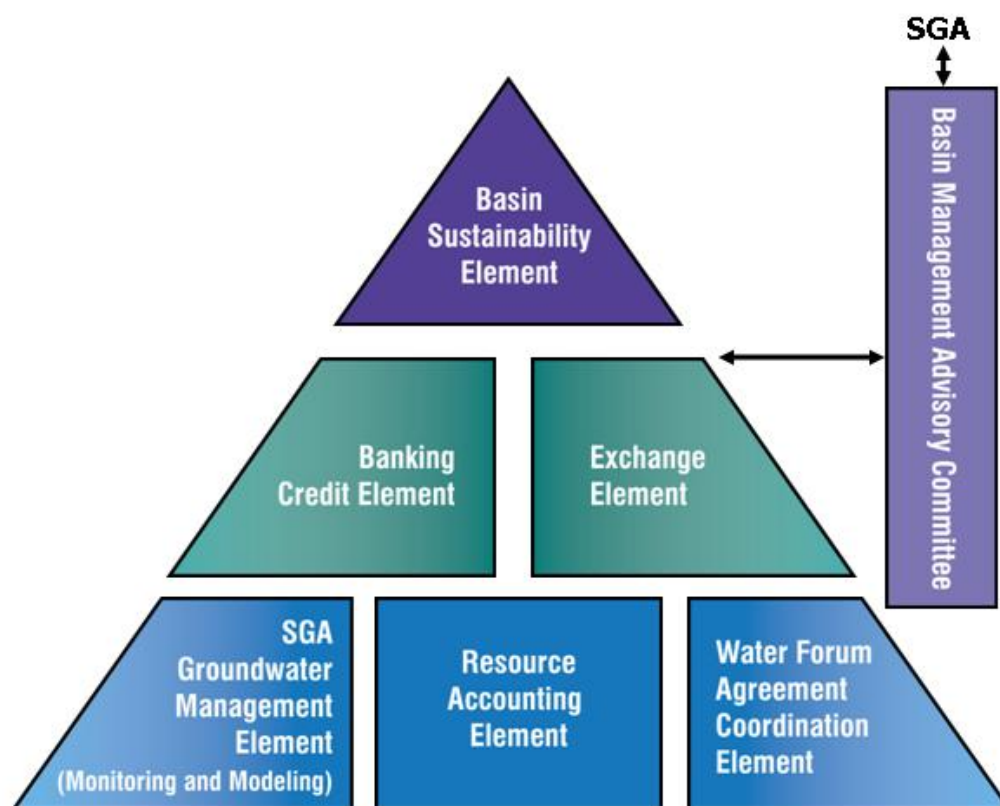


Figure 5. Proposed Framework Elements

### SGA’s Role in the Water Accounting Framework

The SGA was established to maintain the long-term sustainable yield and facilitate implementation of an appropriate conjunctive use program within the SGA area. Additionally, SGA’s charge includes groundwater management oversight consistent with the WFA. While the upper portions of the Framework elements implement the conjunctive use program, these elements cannot be performed in a defensible manner without appropriate basin monitoring, accounting, and coordinating functions. To

accomplish this core work (which SGA mostly accomplishes already) three program elements are proposed as described below.

Also, a question often arises with respect to SGA's future role in the Framework. In the past, SGA's role has been described on one hand as a "facilitator" of transactions between partner agencies, to on the other hand as a "market maker" that actively solicits partnerships and deals. Clarifying the expected and desired role of SGA is anticipated through development of the Framework.

### **SGA Groundwater Management Element**

The SGA has invested several years of effort in developing its Groundwater Management Program. Much of the program was developed after member agencies participated in banking and exchange pilot studies in 1999/2000 and 2002/2003. Those studies required that a monitoring program and technical tools be available to demonstrate performance of the agreements, while ensuring protection of the basin. The program includes a GMP to guide management of the basin, a data management system to collect data and assess changing conditions in the basin, a regional monitoring well network to observe trends in groundwater elevations and water quality, and an update of the groundwater model used to simulate potential results of individual or cumulative banking and exchange agreements over multiple years.

### **Resource Accounting Element**

As proposed, the Resource Accounting Element would account for and provide a running tally of member agency activities. This tally would include tracking credits or debits of banked and exchanged water, and accounting for losses or dissipation of credits over time. The element would likely use a spreadsheet tool to track member operations. The critical related issue to the Resource Accounting Element will be how banking credits are established and recognized under the Banking Credit Element (discussed below) and what loss or dissipation factors might be applied to banked credits over time. Note that while each Element of the Framework captures a specific aspect of the program, the Elements themselves can be interdependent and rely upon other Elements in the program to function completely.

### **Water Forum Agreement Coordination Element**

Embedded in the SGA mission statement is the concept of consistency with the WFA. To ensure consistency with Water Forum Successor Effort (WFSE) and facilitate communication, SGA proposes to routinely coordinate with the WFSE initially during development, and later during implementation of the Framework. For example, SGA could inform (if so desired by member agencies) the various Water Forum Caucuses and signatories during implementation of the Framework that proposed conjunctive use operations and programs are consistent with the Water Forum Agreement. In cases where SGA member agencies are leading a proposed program, SGA could assist and support its member agencies as needed.

### **Banking Credit Element**

For purposes of the SGA Framework, banking credits are intended to reward or create incentives for agencies expanding their conjunctive use practices brought about by intentional investments or implementation of specific projects or programs. Again, ideas and concepts are evolving but examples of how an agency might earn a banking credit include:

- 1) by deliberate action of taking surface water or recycled water over groundwater (e.g., in-lieu recharge)
- 2) through direct groundwater recharge investments (e.g. aquifer storage and recovery (ASR), spreading basins),

- 3) by demonstrating that new facilities or infrastructure permanently and measurably offset or replace past groundwater pumping.

Reducing groundwater pumping in a wet/average year in response to hydrologic conditions is not considered to be justification for granting banking credits. However,

The Banking Credit Element (BCE) would account for individual agencies' groundwater banking activities and award banking credits where they are eligible pursuant to the Framework. It is envisioned that accumulated banking credits can be used for an agency's own needs or be transferred or sold to other agencies. The BCE would not actively investigate whether agencies have eligible banking credits. Rather, the burden of proof would rest with the agency requesting the banking credit. Similar to other established banking programs throughout the state, and as observed in the pilot study technical work, the BCE would likely need to include a loss or dissipation factor as a percentage of banking operations. As described previously, the BCE would work in conjunction with the Resource Accounting Program to ensure that agency activities and investments are accurately reflected and appropriately credited. Another key issue will be to establish how to acknowledge previous banking activities. In other words, how far back in time could an agency seek to have credits awarded?

### **Exchange Element**

The Exchange Element would provide a venue for exchanges or sales of banking credits to occur. As proposed, SGA would not actively initiate exchanges. Exchanges would be up to member agencies to enter into mutually-acceptable agreements to recover the benefits of their own conjunctive use projects or programs. The Exchange Element would interact with the SGA Groundwater Management Element, Resource Accounting Element, WFA Coordination Element, as well as the BMAC to ensure: 1) the exchange would not adversely impact the region; and 2) compliance with the SGA GMP and the WFA.

For those exchanges that are large or too complicated to be evaluated locally by the BMAC and SGA, and/or require expert assistance, there could be further recommended studies that result in additional direct expenses to the agencies involved. For example, the agencies involved in the exchange could be required to secure outside services, acceptable to SGA, to demonstrate (through modeling, monitoring, reporting, coordination with WFSE, etc.) that the transfer would not have a negative impact on the basin.

### **Basin Sustainability Element**

As mentioned previously, one of the primary responsibilities of SGA is to maintain the long-term sustainable yield of the North Area Basin. One of the primary means of meeting this responsibility is through the Basin Sustainability Element. This element would focus on the protection of the groundwater basin to ensure the region continues to enjoy a sustainably high quality supply. This element would consist of two primary focuses, which include monitoring multiple basin parameters and making recommendations for equitable conjunctive use.

### **Monitoring Parameters**

While the simplest measure of basin sustainability involves maintaining average annual groundwater extraction below 131,000 acre-feet as agreed upon in the WFA, it is also important to consider sub-regional groundwater use. Certain locations of the North Area Basin are more susceptible to negative impacts when pumped than others. For example, local groundwater extractions that promote movement of contaminant plumes could have very negative impacts in the basin even if total annual groundwater extraction was below the 131,000 acre-feet. This focus area would ensure through monitoring that those sensitive locations take extra precautions, so that pumping would not adversely impact the groundwater basin elevations, groundwater gradients, or groundwater quality. Between the existing SGA monitoring and the member agencies programs, much of the required monitoring is already in place. The key issue to

be resolved during WAF development will be to determine what monitoring criteria will act as “triggers” to necessitate a response to the observed monitoring data.

### **Equitable Conjunctive Use Recommendations**

As discussed previously, certain SGA agencies have already begun implementing conjunctive use. In particular, the central portion of the North Area Basin has been demonstrated to be in the area most in need of conjunctive use, because of the extensive cone of depression (see Figures 2 and 3) underlying the area. Historically, there have been six agencies (California American Water Company, Del Paso Manor Water District, Golden State Water Company, Rio Linda/Elverta Community Water District, Sacramento County Water Agency, and Sacramento Suburban Water District) that relied solely on groundwater for their water supplies within the SGA area. Over the past few years, Sacramento Suburban Water District made substantial investments and has taken significant actions to expand its conjunctive use capability in the central area. The City of Sacramento has similarly invested in, and made facilities available for expanded surface water deliveries—both north and south of the American River, which has been beneficial to the underlying groundwater basin. Pursuant to the WFA, the agencies that are solely reliant on groundwater share some degree of responsibility to develop their conjunctive use capabilities, or to participate in the investments of others providing the benefit.

In keeping with the SGA JPA to “facilitate implementation of an appropriate conjunctive use program,” this Framework proposes to estimate the level of conjunctive use that was required to stabilize that part of the basin and to also estimate each agencies fair share of that conjunctive use amount. As proposed, SGA would determine and recommend that each agency take actions to implement its fair share of conjunctive use. For example, California American Water has entered into an agreement with Sacramento Suburban Water District to receive surface water. Part of that agreement could be considered as satisfying California American Water’s share of conjunctive use. Additionally, these could be “paper” agreements that would not result in actual delivery of water to a particular purveyor, but rather could involve exchanging credits between agencies resulting in some cost recovery for those agencies implementing conjunctive use. It would be up to the agencies involved to establish mutually-acceptable agreements. SGA would then review these agreements to ensure consistency with the Framework and the WFA.

Under current conditions and upon reviewing historic groundwater pumping records and hydrographs, SGA does not anticipate establishing conjunctive use recommendations for the western and eastern extremities of SGA.

While these Framework recommendations to develop equitable conjunctive use are intended to be voluntary, a driving force behind implementing this activity now is the potential need to replenish water in the basin during prolonged droughts. In extremely dry conditions, it may be necessary to replenish portions of the groundwater supply to ensure sustainability. Under the Framework, those agencies currently implementing conjunctive use would have substantial “credits” established in the basin to draw from during constrained periods. Those agencies without credits would be responsible for obtaining replenishment water at the then-going market rate, which will likely be at substantially higher prices during future dry conditions. Alternatively, involved agencies could work together now, to distribute the share of cost and benefit of equitable conjunctive use under more certain, and more likely favorable, market conditions.

### **Basin Management Advisory Committee**

Ideally, the Framework would be a stand-alone program that is comprehensive enough to cover all future situations. However, it is anticipated that issues will arise that are too complex to be solved by SGA using the guidelines of the Framework alone. Therefore, a Basin Management Advisory Committee (BMAC) is recommended to help address unique or non-typical issues. The BMAC would provide the Framework access to technical and policy expertise to resolve issues of concern. The BMAC will also

provide a forum for review, discussion, and resolution of issues before selection of final policy recommendations by SGA. Another intent of establishing the BMAC is to provide consistency and maintain institutional knowledge in the Framework process. The BMAC, as envisioned, would consist of representatives appointed by the SGA Board, perhaps including external experts from resource or regulatory agencies that could review basin activities and recommend actions. A critical function of the BMAC will be bridging technical and policy issues and having the reputation and standing in the region as a respected body. The BMAC is proposed as a standing committee of SGA.

## Schedule

The current effort to establish the Framework is being implemented in three main phases (see **Figure 6**). The first phase, which is being fully funded by SGA, began in early 2006 and will conclude in late August 2006. This phase involved Board briefings, stakeholder meetings, preparation of this paper, establishing of the conceptual Framework, and member agency surveys to obtain feedback and additional ideas on the Framework. The second phase, which is funded through a Proposition 50 planning grant from the California Department of Water Resources and secured by the Regional Water Authority, will begin in September and conclude in December 2006. The objective of Phase 2 is to synthesize stakeholder feedback and formulate an adoptable policy framework for the SGA Board in December 2006. The final phase, also funded through the Proposition 50 planning grant, will develop the needed tools to implement the Framework and conduct any needed additional work items (e.g., a technical analysis of groundwater level data) if issues remain upon initial Framework adoption. This phase will be completed in mid-2007.

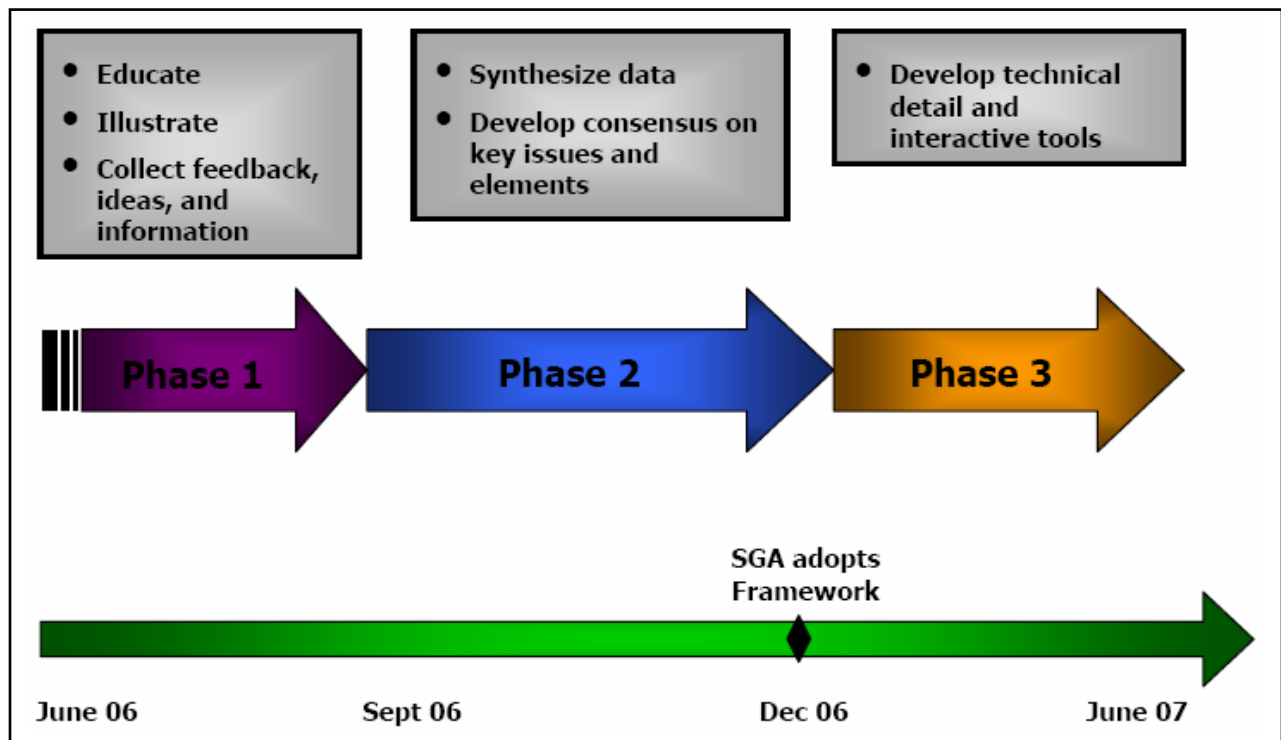


Figure 6. Schedule