

# RECLAMATION

*Managing Water in the West*

**Attachment A**

## **Lower Santa Cruz Basin River Study**

### **Plan of Study**





## **Mission Statements**

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.



## Table of Contents

About this document: .....	1
I. Introduction: .....	1
A. Study Purpose and Objectives .....	1
B. Description of Study Area .....	2
C. Organization of Plan of Study .....	2
II. Study Description .....	4
A. Problems, Needs and Opportunities .....	4
B. Previous Work and Available Data and Models .....	5
C. Current Activities: .....	7
D. Potential Alternatives .....	7
III. Study Approach and Interested Parties .....	8
A. Study Approach .....	8
B. Interested Parties .....	9
IV. Study Management Requirements .....	11
A. Project Management Plan .....	11
V. Study Tasks .....	15
A. Develop Climate Change Projections .....	15
B. Conduct Supply and Demand Assessment .....	16
C. Update Groundwater Model .....	18
D. Run Groundwater Model with Suite of Climate Change and Water Supply and Demand Assessment .....	18
E. Conduct System Reliability Analysis .....	18
F. Adaptation and Mitigation Strategies .....	22
G. Prepare Trade-off Analysis of Strategies to Meet Future Supplies ....	24
H. Prepare Basin Plan .....	24
I. Prepare Basin Study Report .....	24
J. Conduct Technical Sufficiency Review .....	25
K. Conduct Communications and Outreach .....	25
L. Administer Study .....	25
M. Federal Contracting .....	25
VI. Milestone Schedule and Costs .....	26

# Mogollon Rim Water Resources Management Study

## Report of Findings

### Table of Contents (cont'd)

A.	Cost Table.....	26
B.	Milestone Schedule.....	27
VII.	Study Products.....	29
A.	Coordination, Timing and Scope.....	1
B.	Selection of Reviewers .....	1
C.	Documentation of the Results.....	1
A.	Stakeholder Information Meetings .....	3
B.	Regional Standing Committee Meetings .....	3
C.	Regional Managers and Decision Makers .....	4
D.	Comment Responses.....	4
E.	Records .....	4
F.	Other Types of Communications.....	4

## Appendices

Appendix I – Technical Sufficiency Review Plan.....	A-1
Appendix II – Community and Outreach Plan .....	A-3

## **Attachment A Lower Santa Cruz River Basin Study Plan of Study**

### **About this document:**

This document outlines the intentions of Reclamation and the Non-Federal Cost-Share Partners for the Lower Santa Cruz River Basin Study at the commencement of the three-year study period. It is intended to be a “living document” that can be adjusted according to the future needs and opportunities that may occur during the study period. If Reclamation and the Non-Federal Cost-share Partners are in consensus that a change in the activities described in the Plan of Study is necessary and feasible, the Plan of Study may be modified in writing to reflect the change without amending the Memorandum of Agreement.

### **I. Introduction:**

#### **A. Study Purpose and Objectives**

For over sixty years the Lower Santa Cruz River (LSCR) Basin, including the Tucson, Arizona metropolitan area, relied on groundwater to meet most water supply needs, with pumping greatly exceeding replenishment. Since the mid-1970s, LSCR Basin (Basin) water users have made use of recycled water to offset groundwater pumping. In 1993, Reclamation’s Central Arizona Project (CAP) began delivering Colorado River water to the Basin. As a result, groundwater levels have rebounded in many areas.

However, there are still significant imbalances within the Basin due to a lack of transmission infrastructure, insufficient recharge and recovery capacity, a lack of recharge and recovery facilities in up-gradient parts of the basin, and the cost of constructing new facilities. There is concern regarding supply reliability for water users without physical access to CAP water, as well as impacts to the environment.

Uncertainty about the future compounds these issues. The Central Arizona Project (CAP) has junior priority rights on the Colorado River; thus CAP sub-contractors will bear the brunt of imminent shortages. Certain agricultural users will be the first affected under the CAP’s priority system, but if the shortages are severe enough, reductions to municipal users will also take place.

In addition, Southern Arizona, which naturally experiences episodic droughts, has been in an extended drought for the last fifteen years. Water providers without physical access to renewable supplies are already experiencing declining

groundwater levels. Climate change poses additional threats to the Basin. Increased temperatures and possible decreases in precipitation— will likely increase supply-demand imbalances and aggravate the impacts of future droughts.

The study will evaluate the current and future water supply and demand imbalances in the LSCR Basin, taking climate change impacts into consideration; analyzing how existing infrastructure will perform in response to changing water realities; developing adaptation and mitigation strategies, and analyzing each strategy for its effectiveness in addressing these imbalances. The Study’s planning horizon is 2015 through 2060. It will identify institutional, legal and regulatory constraints affecting each strategy and develop next steps toward implementation.

The study’s overarching goal is to identify where physical water resources are needed in order to mitigate supply-demand imbalances due to climate change and other factors and develop a strategy to improve water reliability for municipal, industrial, agricultural, cultural and environmental sectors in the Lower Santa Cruz River (LSCR) Basin.

## **B. Description of Study Area**

The proposed Lower Santa Cruz River Basin (LSCR Basin) Study will encompass the groundwater basin designated by the Arizona Department of Water Resources as the “Tucson Active Management Area” (TAMA). The TAMA is one of five basins designated as “Active Management Areas” (AMAs) under Arizona’s Groundwater Management Code. Each AMA carries out its programs in a manner consistent with its individual goals, while considering the unique character of the basin and its water users.

Geographically, the LSCR Basin Study Area generally coincides with the Lower Santa Cruz River Basin between the Pima County/Santa Cruz County boundary south of the Tucson metropolitan area and Pima County/Pinal County boundary to the north. The Santa Cruz River is a tributary to the Colorado River, a major river system within the Bureau of Reclamation’s service area.

The LSCR Basin watershed is comprised of two parallel sub-basins; the Upper Santa Cruz Valley sub-basin on the east and the Avra Valley sub-basin on the west. Both sub-basins flow from south to north. Figure 1 depicts the LSCR Basin Study boundaries.

## **C. Organization of Plan of Study**

This Plan of Study generally follows the format suggested in the Reclamation Basin Study Framework. The Technical Sufficiency Review Plan and Communications and Outreach Plan are described separately and attached as Appendices I and II, respectively.



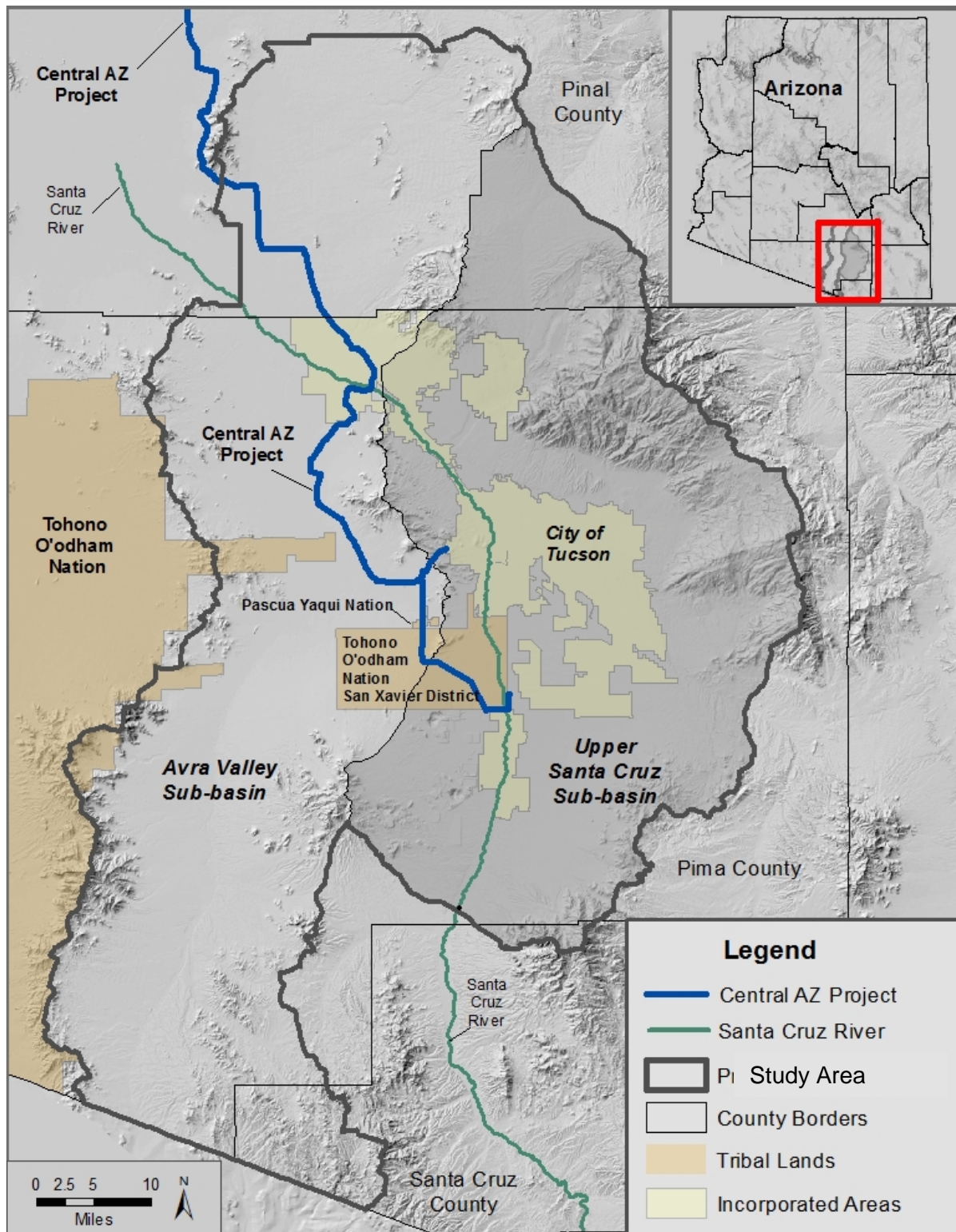


Figure 1- Lower Santa Cruz River Basin Study Area

## **II. Study Description**

### **A. Problems, Needs and Opportunities**

The LSCR Basin relies on water from the Colorado River delivered through the Central Arizona Project (CAP) to meet water demands for municipal, industrial and agricultural sectors. Shortages to Colorado River supplies will intensify the spatial supply-demand imbalances within the Basin and negatively impact water users, including the environment. The municipal and industrial (M&I) sector took delivery of approximately 170,000 acre-feet of CAP water in 2014, while the agricultural sector took delivery of 2,635 acre-feet. Tribes within the LSCR Basin are entitled to up to 66,500 acre-feet per year of CAP water.

In 2012 Reclamation published the Colorado River Basin Water Supply and Demand Study, which projected future imbalances between supply and demand on the Colorado River. Reclamation's study determined that demand on the Colorado River is beginning to outpace supply. Central Arizona Project water has junior priority rights on the Colorado River and Reclamation's study indicates shortages are likely, therefore CAP sub-contractors are expected to bear the brunt of these shortages. Initially, shortages on the CAP will impact agricultural users who have lower priority allocations. However, continued shortages could result in reductions to M&I and Indian water supplies. Arizona is anticipated to experience substantial growth in municipal and industrial water demand, hence the great potential for supply and demand imbalances<sup>1</sup>.

Key areas in the Lower Santa Cruz River (LSCR) Basin are experiencing groundwater declines due to lack of access to renewable supplies in conjunction with drought conditions. Subsidence and the loss of riparian habitat have already occurred. Degradation of groundwater quality, increased pumping costs, the need to deepen wells and shortages of supplies to users may be exacerbated without more timely intervention.

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<sup>1</sup> Arizona's Next Century: A Strategic Vision for Water Supply Sustainability, January 2014, Arizona Department of Water Resources.

## B. Previous Work and Available Data and Models

**Table 1. - A list of available data, models and reports**

Data or Model	Description	Source
Regional Groundwater Flow Model for the Tucson Active Management Area in Arizona. Model Update and Calibration, Modeling Report No. 24. April 2013	Upgrades previous numerical groundwater flow model and provides a more current tool to assist in management of Tucson Active Management Area water resources	Arizona Department of Water Resources (ADWR)
Draft Fourth Management Plan for Tucson Active Management Area 2010-2020	Water management programs for the Tucson Active Management Area over the next ten years. Projections about future conditions, assessment of progress toward achieving safe yield goal for groundwater and recommendations regarding future water management strategies	ADWR
Tucson Active Management Area Water Demand and Supply Assessment: 1985-2025	Historical water demand and supply characteristics for 1985 through 2006 and projections to 2025. Evaluates possible scenarios for future groundwater overdraft using low, medium and high reasonable water demand	ADWR
Recovery of Water Stored by the Arizona Water Banking Authority, April 2014	Provides strategy for recovering water stored underground by the Arizona Water Banking Authority using the Colorado River Simulation System model and a custom recovery model that calculates the probability of specific recovery volumes occurring through time based on a range of supply and demand conditions. A joint plan by Arizona Water Banking Authority, Arizona Department of Water Resources, Central Arizona Water Conservation District	Central Arizona Water Conservation District (CAWCD)
Draft 2015 Central Arizona Groundwater Replenishment District Plan of Operation, December 2014	Provides an estimate of projected groundwater replenishment obligations for 100 years, a description of the water resources that the Groundwater Replenishment District plans to use to meet obligations and description of infrastructure and projects to be used for replenishment	CAWCD
Recycled Water Master Plan, Tucson Water, December 2013	Provides integrated recycled water program that maximizes the benefits of the City of Tucson's recycled water resource and provides framework for activities to ensure implementation of recycled water projects	City of Tucson

**Attachment A**  
**Lower Santa Cruz River Basin Study/Plan of Study**

<b>Data or Model</b>	<b>Description</b>	<b>Source</b>
	and programs	
Water & Wastewater Infrastructure, Supply & Planning Study, 2010	Study of water and wastewater infrastructure, supply and planning issues with ultimate goal of assuring a sustainable community water source given continuing pressures on water supply caused by population growth.	City of Tucson and Pima County
Assessment of Climate Change in the Southwest U.S.	Evaluates and synthesizes information from a wide range of sources and assesses climate change effects on sectors including water. Various climate change models will be reviewed to determine the optimum model to be used to assess water supply and demand in the LSCR Basin area	University of Arizona - Climate Assessment for the Southwest
Conservation Effluent Pool Task Force Report, July 2014	Identification of 13 candidate project sites that might qualify for a portion of water available under the conservation Effluent Pool	Community Water Coalition Task Force
Metropolitan Domestic Water Improvement District Long Range Water Resources Plan, February 2015	Strategy for managing water resources for the next 50 years. Water demand and supply scenarios through 2065	Metropolitan Domestic Water Improvement District
A Forecast Model of Single Family Residential Water Demand for Pima County, November 2014	Forecasts significant changes in single family residential demand using a dynamic simulation model	Montgomery & Associates
Shallow Groundwater Areas in Eastern Pima County, Water Well inventory and Pumping Trend Analysis, 2012	Identification of 32 shallow groundwater areas grouped into ten regions using ADWR and PAG well data to describe water level changes, water use trends, well densities and drilling histories	Pima Association of Governments
2014 Effluent Generation and Utilization Report	Quantity of effluent produced at Pima County regional wastewater reclamation facilities and utilization of effluent in the LSCR Basin Study Area	Pima County
Sonoran Desert Conservation Plan	Plan for balancing the conservation and protection of cultural and natural resource heritage with effort to maintain an economically vigorous and fiscally responsible community	Pima County
Multi-species Conservation Plan	Plan to address endangered species compliance that minimizes and mitigates the effects for incidental take on federal listed species	Pima County
Water Accounting Areas	WAAs refine the study area into regions that are experiencing different aquifer responses	Safe Yield Task Force

Data or Model	Description	Source
2012 Update: Water Plan 2000 – 2050	to groundwater use. Scenario planning based long-term water resource plan for the Tucson Water Service Area.	Tucson Water
Water Usage Report 2010-2053	A report of current and projected water usage for the upper Santa Cruz River encompassing the Green Valley area	Upper Santa Cruz Providers and Users Group

### C. Current Activities:

A water supply and demand assessment conducted by ADWR in 2010 described water supply and demand characteristics for 1985 through 2006 as well as projections to 2025 for the LSCR Basin. The assessment included municipal, industrial, agricultural and Indian water demand and evaluated scenarios to address groundwater overdraft. A subsequent ADWR effort in 2013, *Regional Groundwater Flow Model of the Tucson Active Management Area, Model Update and Calibration*, projected water level changes in the LSCR Basin through 2025. The model identifies areas where groundwater levels are expected to recover, stabilize, or decline. Adaptive strategies need to be developed in areas where groundwater is expected to decline.

The City of Tucson recently completed its *Recycled Water Master Plan* for the planned use of the City's recycled water. This effort complements their *2012 Water Plan Update* that provides for long term water reliability for the Tucson Water service area through 2050. Metropolitan Domestic Water Improvement District completed its 50-year *Long Range Water Resources Plan* in 2015. Other regional water providers are collaborating on groundwater replenishment programs, including underground storage and recovery of Central Arizona Project (CAP) water and recycled water. A study sponsored by the Southern Arizona Water Users Association (SAWUA) completed in 2015, *Municipal Water Demand Trends Project*, evaluated anticipated trends in water use in the LSCR Basin.

### D. Potential Alternatives

The study will develop strategies to address water supply and demand imbalances. Adaptation and mitigation strategies may include, but are not limited to: changes to the operation of water supply systems, modifications to existing facilities, development of new facilities, or non-structural changes. Some examples are:

1. Development of new water management or operating plans;
2. Development of water conservation and demand reduction strategies or projects;
3. Development of new water infrastructure or water augmentation programs or projects, including treatment of poor quality water.

4. Development or improvement of hydrologic models and other decision support systems; and
5. Development of a monitoring plan to acquire and maintain water resource data to strengthen the understanding of water supplies and assist in future assessments and analysis.

### **III. Study Approach and Interested Parties**

#### **A. Study Approach**

Existing data, studies and modeling tools will be used for the Basin Study. The Study is striving for a full integration of information and predictive models. A partnership between ADWR and major water users has divided the Basin into “Water Accounting Areas” to delineate large contiguous areas with common features, including local geography, hydrology, legal, political and corporate boundaries. A large part of the effort will focus on the ADWR TAMA groundwater flow model (MODFLOW), which will provide the means to evaluate different water management strategies and infrastructure projects on each of the Water Accounting Areas.

Input files of the TAMA model will be developed based on recent water demand trends, recent infrastructure projects affecting groundwater pumping and climate change projections, which will affect stream flows and evapotranspiration, as well as mountain front recharge. The study will also incorporate information on potential CAP shortages developed by its operator, the Central Arizona Water Conservation District.

Utilizing the scenario planning process will provide a family of future scenarios to provide a broad range of projections of future water supply and demand. The scenarios are meant to represent a range of plausible futures to assist in the assessment of future risks and the development of mitigation and adaptation options and strategies.

The TAMA model will be used to evaluate the effects of water supply and demand scenarios on future groundwater levels, and to simulate strategies necessary to evaluate the effects of mitigation and adaptation options. The study will also identify institutional, legal and regulatory constraints affecting each strategy and develop next steps toward implementation.

Throughout the process, we will engage regional stakeholders (interested parties who are not Non-Federal Cost-Share Study Partners), including those representing municipal, agricultural, environmental, industrial and tribal water providers and users. We will garner and incorporate their input at key intervals in the process. Our overarching goal is to identify where physical water resources are needed in order to mitigate climate change impacts and improve water reliability for municipal, agricultural and environmental sectors in the LSCR Basin.



**B. Interested Parties**

**1. Cost-Share Partners**

The local cost share study partners for the LSCR Basin Study are:

- Southern Arizona Water Users Association
- Arizona Department of Water Resources
- Central Arizona Water Conservation District
- Cortaro-Marana Irrigation District
- Pima Association of Governments
- The University of Arizona

**Southern Arizona Water Users Association (SAWUA).** SAWUA members represent diverse regional interests including municipal water providers, wastewater providers and agricultural interests. SAWUA members have water delivery authority to over 80 percent the study area population. Member agencies include Avra Valley Water Co-op, BKW Farms, Community Water Company of Green Valley, Farmers Investment Co., Flowing Wells Irrigation District, Green Valley Water Improvement District, Kai Farms, the Town of Marana Municipal Water System, Metropolitan Domestic Water Improvement District, Oro Valley Water Utility, Pima County Regional Wastewater Reclamation Department, Red Rock Utilities, Sahuarita Water Company, the Town of Sahuarita Water Reclamation Facility and the Tucson Water Department. SAWUA members will be providing water supply and demand data, infrastructure data and long term planning information for the study.

**The Arizona Department of Water Resources (ADWR)** prepares water management plans for the basin area to address groundwater overdraft. ADWR has a regulatory authority in implementation of Arizona's Groundwater Management Act and provides regulatory permitting of underground water storage facilities and groundwater pumping. ADWR represents the State of Arizona in policy negotiations of Colorado River operations and administration of Colorado River entitlements. ADWR will provide access to the Regional Groundwater Flow Model and will provide limited staff time to participate in modeling-related meetings and to provide technical advice concerning model development and use.

**The Central Arizona Water Conservation District (CAWCD)** operates and manages the Central Arizona Project which is designed to bring about 1.5 million acre-feet of Colorado River Water to central Arizona through a 336-mile system of aqueducts, tunnels, pumping stations and pipelines. CAWCD delivers over 230,000 acre-feet of Colorado River water to municipal, industrial, agricultural and Indian customers in the LSCR Basin area. CAWCD is evaluating how near-term shortages on the Colorado River will impact CAP water delivery to central Arizona's farmers and is working closely with stakeholders in the LSCR Basin area to identify and address the impacts of future potential Colorado River shortages

**Cortaro-Marana Irrigation District** serves the agricultural needs of the Marana, Avra Valley and Cortaro communities, all within the LSCR Basin study area. The District provides irrigation water to more than 12,000 acres of farmland and offers water storage and non-potable service within its service area. This District helps sustain, promote and advance the economic viability of irrigation agriculture within its boundaries.

**Pima Association of Governments (PAG)** is the study area's regional metropolitan planning organization for transportation planning, environmental planning and technical services. It is the Designated Planning Agency (DPA) under Section 208 of the Clean Water Act, which addresses wastewater and non-point source pollution in stormwater. PAG will lead the stakeholder engagement process by convening outreach meetings and communications support. PAG expertise will be used to inform and engage decision makers through its Watershed Subcommittee, Environmental Planning Advisory Committee, Management Committee and Regional Council. PAG will provide its technical expertise by providing input to the study and document review.

**The University of Arizona**, another water provider located within the LSCR Basin Area, has extensive expertise in water issues and climate change. The Climate Assessment for the Southwest (CLIMAS) housed at the University's Institute of the Environment, conducts research on the nature, causes and consequences of climate change and variability in the Southwest. CLIMAS and colleagues from the University's Hydrology and Water Resources, and Atmospheric Sciences Departments, will partner with Reclamation to identify appropriate climate projections that will be coordinated with ADWR Regional Groundwater Flow Model and water supply and demand projections. The Center for Climate Adaptation and Science and Solutions (CCASS), also housed at the Institute of the Environment, brings together the University's expertise in climate impacts and vulnerability assessment at regional, national and international scales. The Water Resources Research Center, housed at the University's College of Agriculture and Life Sciences, promotes understanding of critical state and regional water management and policy issues through research, community outreach and engagement and public education.

## **2. Other Potentially Interested Parties**

- **Tribal Nations**  
Tohono O'odham Nation  
(San Xavier District and Schuk Toak District)  
Pascua Yaqui Nation
- **Environmental Groups**  
Sonoran Institute



Tucson Audubon Society  
The Nature Conservancy  
Community Water Coalition

- **Industry Groups**  
Freeport McMoRan-Sierrita  
ASARCO  
Hudbay Copper Company  
Southern Arizona Home Builders Association  
Tucson Electric Power
- **Others**  
Bureau of Land Management  
U.S. Forest Service  
National Park Service  
Arizona State Land Department

## **IV. Study Management Requirements**

### **A. Project Management Plan**

#### **1. Study Management Structure**

- **Co-Study Managers**

One Co-Study Manager will be designated from Reclamation and one Co-Study Manager will be designated from the Non-Federal Cost-Share Partners.

- **Project Team**

The Project Team will steer and guide the Study efforts such that the objectives of the Study are met in an effective, efficient manner, and within the Study's financial and time constraints. The Project Team will ensure that the tasks that relate to the Study are completed in a cost-effective, timely manner and are technically sound. Members of the Project Team provide the expertise, experience, and knowledge that relate to the Study's scope and objectives. Members include staff from Reclamation and staff from the non-Federal Cost-Share Partners. The Co-Study Managers will lead the Project Team.

- **Sub-Teams**

Various Sub-Teams may be formed as needed to perform specific tasks. Sub-Team members provide specific expertise, information, knowledge and support required to perform those tasks. Members are comprised of Project Team members, additional staff from Reclamation and the non-Federal Cost-Share Partners, and staff from contracted entities.

Membership may also include representatives from other groups and volunteers with a particular expertise sought by the Sub-Team.

- **Stakeholder Advisory Team**

This group will consist of interested parties, not representing a Cost-Share Partner, who wish to provide input throughout the course of the study. The stakeholder advisory team will be coordinated through Pima Association of Governments' Watershed Planning Subcommittee or Environmental Planning Advisory Committee, both open meeting forums.

Public stakeholder meetings may take place during one of the standing committee meetings that are open to the public and will function as a public engagement forum for discussion and comment, as appropriate.

## **2. Decision-Making Process**

The Co-Managers and the Project Team will make the day-to-day and strategic decisions for the Study. They will also consider feedback provided by the Stakeholder Advisory Group. This Study is a collaborative effort between all the Non-Federal Cost-Share Partners and Reclamation. Important decisions will be made on a consensus/consent basis.

Every effort will be made to achieve consensus among the Study Partners for key decisions within the LSCR Basin Study. If after significant effort, the Partners are unable to reach consensus on critical decisions for the Study, Reclamation will make the final determination, taking into account technical assessments, Cost-Share Partner input and budget constraints.

However, final study assessments will be solely a product of local Cost-Share Partner input. If there are differences in opinion among the local Cost-Share Partners regarding final study assessments, the Final Report will document this situation.

## **3. Roles and Responsibilities**

The Non-Federal Cost-Share Partners will contribute staff time and in-house data to the Study. They will provide the direction for scenario development, infrastructure and reliability metrics and formulation of adaptation and mitigation strategies. Their expertise will be critical in performing the trade-off analysis. The Non-Federal Cost-Share Partners will also develop the assessments for the next steps for the study, and review technical work by Reclamation to ensure that it is appropriate for local needs.

Reclamation will be the main source of climate change data, with input from the University of Arizona, and will perform the groundwater modeling required for the study, in consultation with ADWR.

Reclamation will produce periodic progress reports and financial status reports to monitor progress.

Reclamation will draft the technical work products, incorporating the views of the Non-Federal Cost-Share Partners and other stakeholders. The final report will document the selection of scenarios, adaptation and mitigation measures assessed by the Study partners, with input from the public contributed through the Communications and Outreach Plan. Reclamation will be responsible for the formatting and publication of Study documents.

Where necessary, Reclamation and the Non-Federal Cost-Share Partners will consult outside experts to access expertise not available within the respective organizations. Reclamation will coordinate with the Non-Federal Cost-Share partners in all aspects of the study.

#### **4. Study Team Coordination**

The Co-Study Managers will be responsible for all coordination between the various Teams. The Co-Study Managers will set dates and locations for meetings of the teams, be responsible for outreach and formation of the Stakeholder Advisory Team, and field inquiries from the general public on the Study.

#### **5. Administrative Record**

Reclamation will maintain the Administrative Record for this Study. Data to be retained include:

- All meeting summaries
- All contract documentation
- All public comments received in writing
- Report findings for each task
- Cost share documentation
- Final report
- Other documentation that is produced during the study

#### **6. Schedule and Cost Control**

The Study will be conducted over a three-year period, beginning after the execution of a Memorandum of Agreement. This Study will consist of the tasks identified in Section V below. Specific costs are identified in the Study Schedule and Study Costs Section of this Plan of Study.

Schedule and cost control measures will be monitored by the Co-Study Managers to ensure that project tasks stay on track and within budget. These measures will include quarterly reviews of the schedule and budget providing this information to the Project Team along with Reclamation's Basin Study management team in Denver.

## **7. Deliverables and Project Documentation**

- **Status Reports**

Status reports will be developed on a quarterly basis. These reports will contain the following:

- Progress of each element identified in the plan of study
- Timeline of each element identified in the plan of study compared to the proposed schedule
- A report of cost share contribution by the Non-Federal Cost-Share Partners
- Expenditures of funds

- **Final Report**

The Final Basin Study Report will contain, at a minimum, the following four elements:

Projections of water supply and demand, including an assessment of risks to the water supply relating to climate change as defined in §9503(b)(2) of the Secure Water Act (SWA).

- Changes in snowpack
  - Changes in the timing and quantity of runoff
  - Changes in groundwater recharge and discharge
  - Any increase in the demand for water as a result of increasing temperatures
- Analysis of how existing water and power infrastructure and operations will perform in the face of changing water realities, such as population growth and climate change.
- Development of options to improve operations and infrastructure to supply adequate water in the future.
- A trade-off analysis of the options identified, findings and assessments as appropriate. Such analysis simply examines all proposed alternatives in terms of their relative cost, environmental impact, risk, stakeholder response, or other attributes common to the alternatives.
- Following the trade-off analysis, the Cost-Share Partners will prepare findings and conclusions.

#### **8. Internal and Technical Sufficiency Reviews**

Internal review of work products will be done by both Reclamation and the Non-Federal Cost-Share Partners, with input from interested parties, government agencies and academicians, depending on the nature of work to be reviewed. The internal review process will be augmented by the process described in Appendix I, the Technical Sufficiency Review Plan. The Study Partners, in consultation with Reclamation, will select the study reviewers, taking into account comments by the public. The Co-Study Managers will be responsible for sending out work products to designated reviewers and ensuring timely return of relevant comments. Reviews will occur at defined intervals throughout the project, particularly as key tasks are initiated and completed. Changes to work products will be agreed upon in advance of final publication by Reclamation and the Non-Federal Cost-Share Partners.

### **V. Study Tasks**

#### **A. Develop Climate Change Projections**

##### **1. Selection of Downscaling Method and Hydrologic Variables**

Reclamation, in consultation with the Study Partners, will develop climate change projections and select appropriate climate and hydrologic variables for input into scenarios for the Tucson Active Management Area (TAMA) Regional Groundwater Flow Model (MODFLOW). Climate change projections specific to the study area will be provided. Due to the study area's reliance on CAP water, climate change projections specific to the Colorado River Watershed, to the extent they impact flows to the mainstem of the Colorado River, will also be provided.

Reclamation staff, in consultation with the University of Arizona climate experts, will provide guidance as to which set of climate projections are most appropriate for the study purposes (e.g. earlier or later version of the Coupled Model Inter-comparison Project datasets, type of downscaling used). Projections are available for the following variables: total precipitation, minimum and maximum air temperature and mean wind speed.

## **2. Evaluation of Data Products**

Specific data products may be available for the Tucson area, but the method used to generate them will be evaluated to determine if they are appropriate for the model. Products include: soil moisture, snow water equivalent, total runoff depth, and potential and actual evapotranspiration. Parameters will be selected for their relevance to the processes simulated in the groundwater model, including mountain-front and stream recharge and evapotranspiration. Basin Study Partners will specify the statistics of interest that will be derived from the variables selected.

This task will also consider how climate change scenarios affect natural recharge, which will be reflected in the (1) modeled discharge rates to shallow groundwater areas in each of the water accounting areas, (2) the magnitude of discharge rates, and (3) the direction under each scenario. It will address how, based on existing literature, the effects of higher temperatures and longer growing seasons may affect water demands for riparian vegetation, streams and springs.

## **3. Selection of Climate Change Assumptions for Supply and Demand Scenarios**

The Study Partners will select the climate change scenarios to be considered in water supply and demand projections.

## **4. Documentation of Selection Process**

Reclamation will provide a technical memorandum of the climate change projections and selected scenarios.

# **B. Conduct Supply and Demand Assessment**

## **1. Conduct Assessment of Current Supply:**

Study Partners and Reclamation will update the quantity and locations of current water supplies. Study data inputs will include imported and local potable supplies, recycled water, groundwater, remediated water and stormwater. Data sources will include the ADWR TAMA Water Use and Demand Assessment, ADWR's draft Fourth Management Plan, Safe Yield Task Force water management accounting areas and other available supply data. Another aspect of existing supplies to be assessed is water for the environment from existing uses of groundwater, recycled water and stormwater. The extent of these evaluations will depend on the available data and models. If the groundwater modeling budget allows, seasonal variation in supply will be incorporated into the assessment.

## **2. Develop Future Supply Projections:**

Study Partners and Reclamation will conduct a future water supply assessment considering the potential effects of:

- climate variability and climate change using the results from Task A
- projected availability of CAP water, recycled water, remediated water,
- recovery of stored or banked water,
- natural recharge and groundwater

Using a planning horizon to 2060, specific supply scenarios will be developed by the Study Partners, and appropriate model variable values representing these conditions will be selected. The future scenarios will evaluate the availability of stormwater, groundwater, and recycled water for environmental purposes. The extent of these evaluations will depend on the available data and models. If the groundwater modeling budget allows, seasonal variation in supply will be incorporated into the supply projections.

## **3. Conduct Assessment of Current Demand:**

Study Partners and Reclamation will update the quantity and locations of current water demands of the municipal, industrial, agricultural, cultural and environmental sectors. Data sources will include the ADWR TAMA Water Use and Demand Assessment, ADWR's draft Fourth Management Plan, Safe Yield Task Force Water Accounting Areas and other available demand data. If the groundwater modeling budget allows, seasonal variation in demand will be incorporated into the assessment.

## **4. Develop Future Demand Projections:**

Study Partners and Reclamation will conduct a future water demand assessment using the potential effects of climate variability and climate change using the results from Task A. Projected water demand from the municipal, industrial, agricultural, cultural and environmental sectors. A planning horizon of 2060 will be used, consistent with the planning scenarios developed. The CAP Service Area Model (CAP SAM) may be used to develop multiple demand projections for municipal providers. Considerations and input from each of the water sectors will be necessary. If the groundwater modeling budget allows, seasonal variation in demand will be incorporated into the projections.

A Water Demand Sub Team will provide input on projected water demand for each sector. The Sub Team may include land managers, agricultural interests, municipal and industrial water users and knowledgeable stakeholders. The Sub team investigation should address how agricultural and environmental water demands will change with climate change, such as changes in cropping patterns, increased demand as a result of increased salinity and higher evapotranspiration rates for agriculture, riparian

vegetation and higher energy use for cooling of homes during times of intense heat. Reclamation can provide input on transpiration rates. Specific demand scenarios will be developed by the partners, and appropriate model variable values representing these model conditions will be selected.

Study Partners and Reclamation will prepare a technical memorandum summarizing the current and future water supply and demand assessments. This will be consistent with the selected supply and demand scenarios.

**C. Update Groundwater Model**

In consultation with ADWR modelers, Reclamation staff (or contractor) will modify the existing TAMA Regional Groundwater Model to include current and future water supply and demand developed in Task B. The model will include the change in infiltration rates in the Santa Cruz River due to improved effluent quality and the operation of near-term recharge facilities in the Green Valley area, Northwest Tucson area, as well as other areas of importance to the Study Partners. The output of the updated model will provide a baseline that reflects the condition of the watershed and projected groundwater levels when existing and near-term projects are in operation.

**D. Run Groundwater Model with Suite of Climate Change and Water Supply and Demand Assessment**

The supply and demand scenarios incorporating climate change that have been developed by Reclamation and the Study Partners will be translated into inputs for the Tucson Active Management Area Groundwater Model. Climate related variables will include mountain-front recharge, stream recharge and evapotranspiration components. Other model inputs sensitive to temperature and precipitation may also be included in simulations.

The Study Partners and Reclamation will prepare a technical memorandum summarizing the current and future water supply and demand assessments, indicating the condition of the LSCR Basin groundwater levels. Projected water supply and demand imbalances for the 2060 planning horizon under a suite of scenarios will be identified in ten-year increments according to the Water Accounting Areas.

**E. Conduct System Reliability Analysis**

The Study Partners and Reclamation will conduct an assessment of the capability of existing and near-term regional water supply infrastructure to meet current and projected water demand under each set of the future supply conditions and impact to future groundwater levels.

**1. Identify Model and System Reliability Metrics**

The Study Partners will determine System Reliability Metrics such as delivery capacity, groundwater elevation limits, groundwater rates of



decline, recharge and storage capacity, components of regional water infrastructure, and wells.

A Reliability Sub Team will identify the Reliability Metrics to be used for the reliability analysis.

## **2. Conduct Baseline Reliability Analysis**

The Study Partners and Reclamation will provide input on the assumptions used for the models and the baseline scenarios, such as groundwater regulatory thresholds.

## **3. Projections of Future Reliability**

The Study Partners and Reclamation will determine how their reliability metrics will change under the groundwater elevation outputs for each scenario.

## **4. Evaluate Supply Risks for the Following Sectors**

The Study Partners will strive for consensus on what composes “system reliability” for the LSCR Basin Study. If the study budget allows, more than one concept of reliability may be evaluated. Some questions that may be addressed by the Study Partners are:

- What does “reliable system infrastructure” mean?
- Will municipal, industrial and agricultural needs continue to be met with existing delivery infrastructure?
- If recovery of long term storage credits is necessary, where will this be done and how will recovered water be delivered to users?
- Will the basin be in safe-yield?
- How will environmental resources be impacted?
- How will impacts be distributed throughout the basin and between Water Accounting Areas?
- What are the risks of not meeting reliability metrics?

### **• Municipal**

The Study Partners will assess the types and volume of supplies used by the municipal sector in the TAMA, their associated reliability risks and how losses of renewable supplies could increase groundwater pumping and affect Safe Yield. (Safe-yield is defined as a long-term balance between the annual amount of groundwater withdrawn in the AMA and the annual amount of natural and artificial recharge.) The range of municipal water supplies in the TAMA includes groundwater, CAP water, remediated water, and recycled water.

The risks to municipal water will be dependent on groundwater levels, CAP shortages beyond the scope of the interim shortage guidelines, CAP

rates, the use of long term storage credits to meet water supply, recovery capacity and water quality.

- **A municipal sector Sub-team will provide input on the following:**
  - Geographical areas that are expected to continue to depend on groundwater for physical deliveries.
  - How CAP shortages will impact municipal water delivery and cost under different supply and demand scenarios.
  - Information on the geographical areas expected to depend on groundwater pumping for recovery of long term storage under different scenarios.

- **Industrial**

The Study Partners will assess the types and volumes of supplies used by the industrial sector in the TAMA, their associated reliability risks and how losses of renewable water could increase groundwater pumping and affect the Tucson AMA goal of Safe Yield using agreed upon scenarios. The range of industrial water supplies in the TAMA includes groundwater, CAP water and recycled water.

- **An industrial sector Sub-team will provide input on the following:**
  - Geographical areas where industry is expected to continue to rely on groundwater
  - How CAP shortages will impact industry
  - If long term storage is recovered, which geographical areas will be impacted and what impacts may occur

- **Agriculture**

The Study Partners will assess the types and volume of supplies used by agriculture in the TAMA, their associated reliability risks and how losses of renewable supplies could increase groundwater pumping and affect Safe Yield. The range of agricultural water supplies in the TAMA includes groundwater, CAP water and recycled water.

The risk to agriculture in the TAMA, with respect to the CAP Agricultural Pool (Ag Pool), will be dependent upon CAP shortages based on the water levels at Lake Mead. Reclamation's Colorado River and Climate Change Modeling will help predict the shortages to the CAP Ag Pool. Each farm will be able to assess their risk by utilizing the model results and provide input on mitigating shortages. If shortage will be mitigated by additional groundwater pumping, those values will be included in Reclamation's groundwater modeling to assess effects to Safe Yield.

- **An agricultural Sub-team will provide input on the following:**
  - Current uses of water from the various sources of supply.
  - Impacts due to shortages and/or the CAP Ag Pool reductions.

- Impacts of any potential increase in agricultural groundwater use in TAMA and its impacts to groundwater levels
- The type of water used by each farm will be dependent upon its proximity to these supplies and the supply's reliability.

- **Cultural**

Cultural water use includes consumptive (agricultural) and non-consumptive uses (sacred, ceremonial, social, habitat and aesthetic) necessary to maintain Tribal cultures. The Study Partners will consult Tribal experts on the water supplies required for cultural uses in the TAMA, their associated reliability risks and how losses of water supplies could affect these uses.

- **A cultural Sub-team will provide input on the following:**

- Current uses of water from the various sources of supply
- Impacts due to decreased groundwater levels and surface water availability
- Types of water needed (type of use, required water quality)
- Additional elements as identified by the cultural Sub-team
- 

- **Environmental**

The Study Partners will assess the types and volumes of supplies used for environmental water in the TAMA, its associated reliability risks and how losses of renewable supplies and projected groundwater levels could affect environmental water demands including:

- Impacts to aquatic and terrestrial ecosystems resulting from decreased flows in the Santa Cruz River
- Impacts to groundwater dependent ecosystems from declining groundwater levels
- Impacts to urban vegetation.
- Financial impacts to costs for water for the environment (recycled water and potable use) to environmental flow rights, and to riparian preserve investments
- The analysis will consider how different water demand scenarios affect pumping in shallow groundwater areas (SGWAs). Some Water Accounting Areas have multiple SGWAs, others have none. This can be derived from the groundwater model. The analysis will evaluate how groundwater changes in the various SGWA and where reversals in groundwater gradients are projected. It will describe effects based on thresholds from the literature and local experts.
- The analysis will determine how water demand affects availability of recycled water, and stormwater for environmental purposes, in general and specifically to existing projects in the various WAA. It will include analysis of effects to recycled water discharged to

Santa Cruz River from Agua Nueva and Tres Rios Wastewater Reclamation Facilities.

- **An environmental Sub-team will provide input on:**
  - Preservation of existing habitat under agreed upon scenarios
  - Needs and opportunities for future restoration
  - Opportunities for multi-benefit public projects using stormwater and recycled water
  - Preservation of riparian and aquatic habitat along the recycled water dependent reach of the Santa Cruz River
  - Development of a reliable water supply for the environment

## 5. Summary of Findings

Reclamation will prepare a Technical Memorandum summarizing potential risks and projections of future reliability.

## F. Adaptation and Mitigation Strategies

- **Develop Strategies to Meet Future Supply Needs**

The Study Partners, in consultation with the members of the Sub-Teams, the Stakeholder Advisory Group and the public, will identify preliminary adaptation strategies to address supply and demand imbalances. They may include, but are not limited to:

Supply augmentation	Demand management	Infrastructure and Non-Infrastructure adaptation
Desalination	Operational changes	Legislative changes
Development of new conveyance and storage facilities	Land fallowing and retirement	Policy changes
Water recycling and reuse	Rehabilitation or replacement of existing facilities	Collaborative opportunities
Weather modification	Water conservation and efficiency	Legal and institutional changes
Importation projects	Vegetation management	Conjunctive use
Remediation of poor quality water	Urban runoff management	Long term storage

- **Refine Strategies for Further Evaluation**
  - The Study Partners will refine strategies and identify key, feasible candidate strategies for analysis based on effectiveness, implementability and cost, to address a range of future scenarios.
- **Conduct Analysis of Strategies to Meet Future Supply Needs**

- Each of the Adaptation and Mitigation Strategies developed by the Basin Study Partners will be analyzed and evaluated by Reclamation technical staff to determine its approximate cost and effectiveness in addressing system reliability issues. If applicable, Reclamation staff will provide conceptual cost estimates and designs.
- The strategies will include ways that shallow groundwater areas, streams, springs, and riparian and aquatic habitats can be restored or at least made less vulnerable to future water demands and climate change. It will identify the infrastructure that can assist in protection or restoration and if changes in groundwater pumping demands will impact shallow groundwater areas, streams, springs and riparian and aquatic habitats.
- **Technical Analysis**
  - Reclamation will conduct a technical evaluation including a uniform cost comparison, environmental impacts, permitting requirements. Risk and uncertainty will be assessed. An assessment of effectiveness in addressing future supply-demand imbalances will be conducted.
- **Legal and Institutional Analysis**
  - Reclamation, with input from the Study Partners, will conduct an analysis of legal and institutional implementation issues associated with each mitigation and adaptation strategy. This will include a high-level analysis of the potential environmental and cultural impacts of the alternative. The analysis will be conducted in enough detail to allow the partners to rate each alternative against their selection criteria and choose one or more alternatives to incorporate into a basin plan.
  - **Social and Economic Analysis**  
Reclamation, in partnership with the Study Partners, will conduct an analysis of social and economic impacts of each strategy. If possible, this will include an evaluation of changes to ecosystem services.

## 1. **Summary of Analyses**

Reclamation will prepare technical memorandum summarizing the results adaptation and mitigation strategies analysis

**G. Prepare Trade-off Analysis of Strategies to Meet Future Supplies**

The Study Partners will identify viable strategies to be analyzed and develop a trade-off matrix for viable strategies that includes criteria, such as performance measures, costs, ability to implement, risks, benefits and impacts.

**1. Summary of Trade-off Analysis**

Study Partners will prepare a technical memorandum of the trade-off analysis.

**H. Prepare Basin Plan**

Basin Studies identify basin-wide water supply issues that could potentially be resolved with changes to the operation of water supply systems, modifications to existing facilities, development of new facilities, or non-structural changes. The desired outcome of the LSCR Basin Study is a basin-specific plan describing collaboratively developed solutions that will help meet water demands and foster sustainable development.

For each of the groundwater and basin conditions predicted by the selected future scenarios, the Study will present an evaluation of the use of infrastructure and range of other options to deliver water, including direct delivery and recovery of stored water.

**I. Prepare Basin Study Report**

**1. Draft Final Report**

Reclamation will prepare a draft final report that summarizes the strategies addressing projected water supply and demand imbalances in the Lower Santa Cruz River Basin, including trade-offs, technical feasibility, environmental impacts, legal and institutional analysis and social and economic analysis. The draft report will include the study purpose, general methodology for each model, economic tools and water management strategies.

**2. Review Draft Final Report**

The Study Partners will review the draft final report and provide input and comments to Reclamation.

**3. Publish Final Report**

Reclamation will address and incorporate the Study Partners comments and publish the final report. The final report and its findings will be presented to the Stakeholder Advisory Team (see definition in Communications and Outreach Plan), Study Partners and the public upon completion of the project.

- J.     **Conduct Technical Sufficiency Review**  
A technical sufficiency review will be conducted for each of the key tasks, as described in Appendix I. The Study Partners and Reclamation will identify technical reviewers.
  
- K.     **Conduct Communications and Outreach**  
The Study Partners and Reclamation will conduct communications and outreach to allow and work with input from interested parties who are not Non-Federal Cost-Share Partners, as described in the communications and outreach plan included in the Plan of Study. Throughout the study, the Cost-Share Partners will make information available to basin stakeholders and request their input. Stakeholder input will then be incorporated into the Basin Study as appropriate.
  
- L.     **Administer Study**  
The Study Partners and Reclamation will administer the study throughout the study period.
  
- M.     **Federal Contracting**  
If necessary, Reclamation will obtain non-federal contractors to conduct key study tasks and sub-tasks as agreed upon by both the Study Partners and Reclamation.

## **VI. Milestone Schedule and Costs**

### **A. Cost Table**

<b>Tasks and Description</b>	<b>Non-Federal \$ Share</b>	<b>Federal \$ Share</b>	<b>Total Cost</b>
A. Develop Climate Change Projections	0	50,000	50,000
B. Conduct Supply and Demand Assessment	40,000	40,000	80,000
1. Conduct Assessment of Current Supply			
2. Develop Future Supply Projections			
3. Conduct Assessment of Current Demand			
4. Develop Future Demand Projections			
C. Update Groundwater Model	15,000	15,000	30,000
D. Run Groundwater Model with Suite of Climate Change and Supply/Demand Assessment	4,000	50,000	54,000
E. Conduct System Reliability Analysis	26,000	10,000	36,000
1. Identify Model and System Reliability Metrics			
2. Conduct Baseline Reliability			
3. Prepare Projections Future Reliability			
4. Evaluate Supply Risks for Sectors			
F. Adaptation & Mitigation Strategies	66,000	50,000	116,000
1. Develop Strategies to Meet Future Supply Needs			
2. Refine Strategies for Further Evaluation			
3. Conduct Analysis of Strategies to Meet Future Supply Needs			
a) Technical Analysis			
b) Legal and Institutional Analysis			
c) Conduct Social and Economic Analysis			
G. Prepare Trade Offs Analysis of Strategies to Meet Future Supplies	50,000	20,000	70,000
H. Develop Prepare Basin Plan	60,000	10,000	70,000
I. Prepare Basin Study Report	39,000	50,000	89,000
1. Draft Final Report			
2. Review Final Report			
3. Publish Final Report			
J. Conduct Technical Sufficiency Review	20,000	20,000	40,000
K. Conduct Communications and Outreach	53,000	10,000	63,000
L. Administer Study	20,000	56,250	76,250
M. Federal Contracting	0	11,500	11,500
Total Costs	\$393,000	\$392,750	\$785,750



## B. Milestone Schedule

Milestone	Year One				Year Two				Year Three		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
A. Develop Climate Change Projections											
B. Conduct Supply & Demand Assessment											
1. Conduct Assessment of Current Supply											
2. Develop Future Supply Projections											
3. Conduct Assessment of Current Demand											
4. Develop Future Demand Projections											
C. Update Groundwater Model											
D. Run Groundwater Model with Suite of Climate Change and Supply/Demand Assessment											
E. Conduct System Reliability Analysis											
1. Identify Model and System Reliability Metrics											
2. Conduct Baseline Reliability											
3. Prepare Projections of Future Reliability											
4. Evaluate Supply Risks for Sectors											
F. Adaptation & Mitigation Strategies											

**Attachment A**  
**Lower Santa Cruz River Basin Study/Plan of Study**

Milestone	Year One				Year Two				Year Three		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1.Develop Strategies to Meet Future Supply Needs											
2.Refine Strategies for Further Evaluation											
3.Conduct Analysis of Strategies to Meet Future Supply Needs a) Technical Analysis b) Legal & Institutional Analysis c) Social & Economic Analysis											
G. Prepare Trade Off Analysis of Strategies to Meet Future Supplies											
H. Prepare Basin Plan											
I. Prepare Basin Study Report											
1.Draft Final Report											
2.Review Final Report											
3.Publish Final Report											
J. Conduct Technical Sufficiency Review		T-A	T-B	T-C	T-D		T-E	T-F			
K. Conduct Communications and Outreach											
L. Administer Study											
M. Federal Contracting-as needed											

## **VII. Study Products**

- A. Technical memorandum on climate change projections and selected scenarios
- B. Technical memorandum summarizing the current and future water supply and demand assessments
- C. Technical memorandum indicating the condition of the LSCR Basin and groundwater levels. Projected water supply and demand imbalances for the 2060 planning horizon under a suite of scenarios identified in ten-year increments.
- D. Technical memorandum summarizing potential risks and projections of future reliability
- E. Technical memorandum summarizing the results adaptation and mitigation strategies analysis
- F. Technical memorandum summarizing the results of the trade-off analysis
- G. Assessments for strategies and infrastructure needs to address future supply and demand imbalances using groundwater and basins conditions predicted by selected future scenarios
- H. Draft final report
- I. Final Report



## Appendix I – Technical Sufficiency Review Plan

The technical sufficiency review will ensure that technical information, data, models, analyses, and conclusions resulting from a basin study are technically supported and defensible.

### A. **Coordination, Timing and Scope**

The co-study managers will coordinate the technical sufficiency review. A technical review of each work product from the Basin Study will be conducted before it is made final.

### B. **Selection of Reviewers**

Reclamation and the Non-Federal Cost-Share partners will coordinate with the non-federal cost-share partners to select the reviewers. The technical sufficiency review will be conducted by reviewers who were not directly involved with conducting the portion of the basin study they are reviewing. There will be multiple reviewers for each work product, and the reviewers' scientific and technical background and expertise will be relevant to the content of the basin study under review.

### C. **Documentation of the Results**

Co-Study managers will document the results of the Technical Sufficiency Review and will make the results available to all of the Non-Federal cost-share partners. Reviewer comments and/or suggestions will be documented in writing.

All reviewer comments will be considered and incorporated where relevant and appropriate. The Co-Study Managers will prepare a response to all comments and suggestions submitted by reviewers. Technical uncertainties identified by reviewers will be identified and characterized in the Final Basin Study Report.



## Appendix II – Community and Outreach Plan

Throughout the LSCR Basin Study, stakeholders (interested parties who are not Study Partners) will be informed and their input will be garnered and considered at key intervals as the project progresses. The Pima Association of Governments will be the lead agency for stakeholder involvement and public communications. However, the project team will be invited to participate in all events and will have input on all materials distributed.

As the Study progresses, the effectiveness of the public involvement will be assessed periodically, based on the level of public response and feedback from the Study Partners and stakeholders. If necessary, adjustments will be made as necessary to ensure that appropriate communication and feedback is occurring.

### A. Stakeholder Information Meetings

Annual public meetings will be held to inform and garner input about the project. These three meetings will be held in a publicly accessible location and will be noticed through press releases, social media, printed media and flier distribution. Particular efforts will be made to invite key stakeholders. Public stakeholder meetings may take place during one of the standing committee meetings that are open to the public and will function as a public engagement forum for discussion and comment, as appropriate.

### B. Regional Standing Committee Meetings

Pima Association of Governments will engage technical experts, professionals and interest groups through its Environmental Planning Advisory Committee (EPAC) and its Watershed Planning Subcommittee. EPAC is a 35-member standing committee with the following representation:

- Member governments (City of Tucson, Pima County, Towns of Marana, Oro Valley and Sahuarita, City of South Tucson, Tohono O’odham Nation, Pascua Yaqui Tribe)
- Citizen representatives from each of the above listed member jurisdiction area
- Interest groups (public interest, professional technical, environment, natural resources conservation, energy industry, mining industry, construction industry, local business, education/research, transportation)
- Ex Officio: State and federal entities (Arizona Department of Water Resources, Arizona Department of Environmental Quality, Arizona State Land Department, Davis Monthan Air Force Base, U.S. Environmental Protection Agency).

In addition, all meetings are public and widely distributed through a large mailing list. PAG plans to have presentations on the Lower SCR Basin Study at a minimum of four EPAC meetings and two Watershed Planning Subcommittee meetings during the course of the project.

If needed, EPAC can also be utilized to receive direct feedback on project elements because it is a voting body with standing representation.

**C. Regional Managers and Decision Makers**

This basin study will develop adaptation and mitigation strategies to address water supply and demand imbalances in the face of climate change. In order to move into future implementation and collaboration, it is essential that management and political decision makers be well informed and have opportunity to provide input during the evaluation. PAG will ensure that jurisdictional managers are informed about the LSCR Basin Study through its top policy advisory committee, the PAG Management Committee. Members of this committee include the Pima County Administrator, the city managers from the cities of Tucson and South Tucson, the town managers from the towns of Marana, Oro Valley, and Sahuarita, a Tribal Council member from the Pascua Yaqui Tribe and the Roads Division Manager from the Tohono O’odham Nation.

During the study process, key elected officials will be kept abreast of project progress and results through information provided to the PAG governing board and the PAG Regional Council. The Regional Council includes a Pima County Supervisor, mayors from the City of Tucson, the City of South Tucson, the Town of Marana, the Town of Oro Valley and the Town of Sahuarita, the Vice Chairwoman from the Pascua Yaqui Tribe, the Chairman of the Tohono O’odham Nation and a member of the Arizona State Transportation Board.

**D. Comment Responses**

Reclamation will prepare a response for all comments received. Responses will be posted on the project website established by Reclamation. All information received regarding technical aspects of the Study will be considered and feedback regarding that consideration will be provided.

**E. Records**

Reclamation will archive all outreach materials, information received, and feedback provided in a centralized electronic filing system. As the Study progresses, Reclamation will assess the effectiveness of the public involvement periodically and adjustments will be made as necessary to ensure that appropriate communication and feedback is occurring.

**F. Other Types of Communications**

Additional methods of communication that will be used to disseminate information and accept input during the course of this Study include the following:

- A Study website will be maintained to provide up-to-date, on-line information;
- An e-mail address will be established to facilitate communication electronically;
- News releases and informational mailings will be provided as appropriate;
- An email list will be established and maintained to ensure that all interested stakeholders receive information;



- Meetings with interested stakeholders groups will be held as appropriate.

**1. Web Site**

Reclamation's Study web site will be used to post up-to-date information. Web site content will be updated periodically, particularly at major milestones and prior to public meetings. In addition, the web site will be used as a tool for soliciting input from stakeholders.

**2. E-mail**

Reclamation will establish a Study e-mail address to disseminate information regarding the Study and to receive input.

**3. News Releases and Informational Mailings**

News releases and other informational mailings will occur near major milestones throughout the Study to inform stakeholders and the public of the Study status, provide opportunities for input, and provide meeting information including dates and locations of the public meetings.

**4. E-Mailing List**

Informational e-mails will be sent to interested stakeholders on the Study email list. Individuals will be added to the email list when requested through the Study e-mail address or through attendance at a public meeting captured on the sign-in sheet.

**5. Additional Meetings with Interested Stakeholder Groups**

During the course of the Study, additional meetings may be held with interested stakeholder groups to solicit additional input, expertise, data, and information. As appropriate, representatives of interested stakeholder groups may participate and provide input through ad hoc groups formed for specific study tasks or through the public participation venues described in the Communication and Outreach Plan.

Interested stakeholder groups may include, but are not limited to Federal agencies, Native American tribes and communities, water districts, scientific research groups, environmental groups, and representatives of the recreational industry. An initial mailing will be made to a list of interest groups involved in similar prior studies to gauge their interest and capability for participating in the Study. Other interest groups are encouraged to provide their contact information via one of the communication methods listed above.