SUBMIT OPTION SUBMITTAL FORM BY:
1. EMAIL TO: COLORADORIVERBASINSTUDY@USBR.GOV
2. U.S. MAIL TO: BUREAU OF RECLAMATION, ATTENTION MS. PAM ADAMS, LC-2721, P.O. BOX 61470, BOULDER CITY, NV 89006-1470
3. FACSIMILE TO: 702-293-8418

Option Submittal Form

Contact Information (optional): ☐ **Keep my contact information private.**

Contact Name: _____ Title: _____

Affiliation: _____

Address: _____

Telephone: E-mail Address:

Date Option Submitted: Feb. 10, 2012

Option Name:

Gulf of California Ocean Desalting

Description of Option:

Desalinated seawater from the Gulf of California is one possible solution to the demand for water in the Arizona and Sonora region. Water would be withdrawn and treated near Puerto Penasco and delivered by pipeline and canal to Imperial Dam where the treated water would augment available supplies in the Colorado River. Alternative sizing of 120,000 and 1,200,000 AFY were evaluated.

Location: Describe location(s) where option could be implemented and other areas that the option would affect, if applicable. Attach a map, if applicable.

Ocean water would desalted in a plant near Puerto Penasco adjacent to the Gulf of California. The treated water would be conveyed by pipeline and canal to the Imperial Dam approximately 168 miles to the northwest.

Quantity and Timing: Roughly quantify the range of the potential amount of water that the option could provide over the next 50 years and in what timeframe that amount could be available. If option could be implemented in phases, include quantity estimates associated with each phase. If known, specify any important seasonal (e.g., more water could be available in winter) and/or frequency (e.g., more water could likely be available during above-average hydrologic years) considerations. If known, describe any key assumptions made in order to quantify the potential amount.

A previous study titled “Investigation of Binational Desalination for the Benefit of Arizona, United States, and Sonora, Mexico” was completed in 2009 and evaluated options for desalting either 120,000 AFY or 1,200,000 AFY. Anticipated timing for the required agreements, permitting, and construction would be ten years.

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Additional Information

Technical Feasibility: Describe the maturity and feasibility of the concept/technology being proposed, and what research and/or technological development might first be needed.

Seawater has been a source of water supply for more than 50 years. Recent advances in desalination technology are making it more economical for use as a potable water supply. The potential for potable water production is essentially unlimited, depending on the intake design and location. Ocean source water quality depends on local site factors such as water intake depth, water turbidity, boat traffic, oil contamination, nearby outfalls, wind conditions, tides, and the influence of surface runoff from land. The two major types of desalination technologies are membrane processes and thermal processes. In general, membrane desalination technologies are more sensitive to feed water quality than thermal desalination technologies. Therefore, proper pretreatment of the seawater is a critical factor in the successful operation of seawater membrane desalination systems. With any desalination technology a brine waste must be managed or disposed. It was assumed that brine would be returned to the Gulf of California through an ocean dispersion system.

Costs: Provide cost and funding information, if available, including capital, operations, maintenance, repair, replacement, and any other costs and sources of funds (e.g., public, private, or both public and private). Identify what is and is not included in the provided cost numbers and provide references used for cost justification. Methodologies for calculating unit costs (e.g., $/acre-foot or $/million gallons) vary widely; therefore, do not provide unit costs without also providing the assumed capital and annual costs for the option, and the methodology used to calculate unit costs.

1. Arizona-Sonora Scenario (107 MGD; 120,000 AFY)

Arizona-Sonora Scenario	$/AF	$/1,000 gallon
Pipeline	1,732	5.32
SWRO Plant	995	3.06
Total	$2,727	$8.38

Includes:

- 250 MGD raw water intake structures
- 107 MGD MF/UR/RO plant
- 143 MGD concentrate ocean outfall
- 168-mile; 78-inch-diameer welded steel pipeline
- Four 6,000 hp pumping plants
- 100 MG of system storage

Conveyance represents about 63% of the total cost of water under this scenario. The power capacity requirement for this scenario is 50 MW.

2. Regional Scenario (1.07 BGD; 1,200,000 AFY)

Regional Scenario	$/AF	$/1,000 gallon
Canal	278	0.85
SWRO Plant	905	2.78
Total	$1,183	$3.63

Includes:

- 2,503 MGD raw water intake structures
- 1,070 MGD MF/UF/RO plant
- 1,433 MGD concentrate ocean outfall
- 143 miles of trapezoidal open canal
- 25 miles of dual, 180-inch welded steel pipeline sections
- Five 15,000 hp pumping plants
- 100 MG of system storage

Conveyance via a canal-based system represents about 24% of the total cost of water. The power capacity requirement for this scenario is 500 MW.

Permitting: List the permits and/or approvals required and status of any permits and/or approvals received.

Few data are readily available regarding the costs for environmental assessment and mitigation in Sonora. Regulatory permitting requirements and approvals for a desalination facility along the Gulf of California are difficult to ascertain since project implementation would be managed by Mexican administrative agencies. According to the World Bank, the cost of an environmental assessment rarely exceeds 1% of the total project cost. Mitigation measures usually account for three to five percent of total project cost. These figures do not include the cost of environmental damage caused by a project that has not undergone an environmental assessment. The project team has assumed that legal fees associated with each scenario would be 10% of the total capital cost, and the environmental and archeological assessment and mitigation fees would be $20M and $50M for the Arizona-Sonora and Regional scenarios, respectively.

This study assumed that the conveyance infrastructure would cross the Colorado River and connect to the Imperial Dam forebay in California, which would therefore require environmental and construction permitting in California. Because a desalination facility and its appurtenances would encompass a variety of areas and environments (e.g., open ocean, barrier island, bay and marsh habitats, freshwater stream crossings, uplands) and encounter multiple state and federal jurisdictions, project participants should establish communication as early as possible in the permitting process to define jurisdictional boundaries, ascertain major areas of concern, and facilitate overall communication among the regulatory agencies. The most prevalent environmental impediments to this project are anticipated to be the potential impacts associated with the feedwater intake, brine discharge activities, and concerns over impacts to the designated Reserves.

Legal / Public Policy Considerations: Describe legal/public policy considerations associated with the option. Describe any agreements necessary for implementation and any potential water rights issues, if known.

The legal and public policy considerations are covered under the Permitting section.

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Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

It is recognized that a number of risks threaten the feasibility of a binational desalination facility and associated conveyance infrastructure, not the least of which are related to environmental, intergovernmental, and cultural resource issues. Additionally, the municipality of Puerto Penasco is actively planning and is in the early design stages of a desalination facility to provide water service locally. If the local project is well executed, the risks associated with public acceptance of a binational desalination facility would likely decrease. Once the local desalination plant is constructed and operational, additional data will be available to help reduce the uncertainty associated with a binational facility.

Reliability: Describe the anticipated reliability of the option and any known risks to supply or demand, such as: drought risk, water contamination risk, risk of infrastructure failure, etc.

Ocean desalting is a widely used and reliable practice. The major reliability concerns are earthquakes and disruption of power supplies. The facilities should be designed and constructed to withstand earthquakes. Provisions for backup power can be included in project design and construction. Also, temporary disruption of power will not significantly affect the annual volume of water produced.

Water Quality: Identify key water quality implications (salinity and other constituents) associated with the option in all of the locations the option may affect.

Seawater in the northern Gulf of California (Sea of Cortez) has a total dissolved solids (TDS) concentration range of between 28,000 and 37,000 mg/L. The target finished water TDS concentration for this study was 750 mg/L, which approximates the salinity of the Colorado River at Imperial Dam and which is of sufficient quality for agricultural needs of the region and for potable water.

Energy Needs: Describe, and quantify if known, the energy needs associated with the option. Include any energy required to obtain, treat, and deliver the water to the defined location at the defined quality.

Energy Required	Source(s) of Energy
50 MW required for 120,00 AFY option and 500 MW required for 1,200,000AFY option.	Unknown.

Hydroelectric Energy Generation: Describe, and quantify if known, any anticipated increases or decreases in hydroelectric energy generation as a result of the option.

Location of Generation	Impact to Generation
Not applicable	Not applicable

Recreation: Describe any anticipated positive or negative effects on recreation.

Location(s)	Anticipate Benefits or Impacts
Some additional water furnished to Imperial Dam	Minimal impacts

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Environment: Describe any anticipated positive or negative effects on ecosystems within or outside of the Colorado River Basin.

Location(s)	Anticipated Benefits or Impacts
Construction areas in Sonora and Arizona	

Socioeconomics: Describe anticipated positive or negative socioeconomic (social and economic factors) effects.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

The AMC and CSA, the International Boundary Water Commission, and a number of other binational organizations are involved in improving the quality of life and working on water issues of mutual concern. Government and water agency officials from both sides of the border are actively involved in these groups, and relations are strong.

Cultural resource concerns (archaeological) are well understood in the border region, but less understood in the Reserves identified above. The U.S. National Park Service (NPS) has been proactive in its development of shared responsibility agreements with its counterparts in Mexico regarding the protection of natural and cultural resources. NPS has developed a strong relationship with the Mexican National Institute for Anthropology and History (INAH) to collaborate to protect and preserve mutual interests, which include archeological sites, Native American communities, artifacts, submerged resources, and other sites of shared interest. The procedures for conducting cultural resource evaluations in Sonora and at the border region are not currently well-defined.