

TITLE PAGE

**The Integrated Water and Power Project  
A Drought-Proof Water Supply for Texas**

A study of seawater desalination as a regional water resource to be integrated with other water supply strategies

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## EXECUTIVE SUMMARY

May 6, 2014

Guadalupe-Blanco River Authority  
Seguin, Gonzales County, Texas

This application is for funding to support a multiple-year feasibility study (FS) of integrated seawater desalination and power facilities to provide significant regional water and power supplies in Texas. Seawater is an abundant but impaired water resource that can help meet rapidly growing industrial and municipal demands in the South Central and Coastal Bend regions. In partnership with the State of Texas General Land Office (GLO) and the Texas Sustainable Energy Research Institute at the University of Texas at San Antonio (UTSA), GBRA is conducting a FS of an Integrated Water and Power Project (IWPP). The IWPP is being developed as a large regional project for the South Central and Coastal Bend regions of Texas. Water supplies from the project would meet a significant portion of projected future needs. Power generated by the project would support water treatment and conveyance needs and potentially provide additional energy resources to Texas.

The feasibility study initiated in July 2013 and is expected to be completed before August 2017.

## TECHNICAL STUDY DESCRIPTION

The Guadalupe Blanco River Authority (GBRA) is pleased to submit this application in response to Funding Opportunity Announcement No. R14AS00030; WaterSMART: Development of Feasibility Studies under the Title XVI Water Reclamation and Reuse Program for Fiscal Year 2014. This application is for funding to support a multiple-year feasibility study (FS) of integrated seawater desalination and power facilities to provide significant regional water and power supplies in Texas. Seawater is an abundant but impaired water resource that can help meet rapidly growing industrial and municipal demands in the South Central and Coastal Bend regions.

In partnership with the State of Texas General Land Office (GLO) and the Texas Sustainable Energy Research Institute at the University of Texas at San Antonio (UTSA), GBRA is conducting a FS of an Integrated Water and Power Project (IWPP). The IWPP is being developed as a large regional project for the South Central and Coastal Bend regions of Texas. Water supplies from the project would meet a significant portion of projected future needs.

GBRA is the contracting entity for the study and would be the direct recipient of funding provided from this grant. Technical work on the FS began in August 2013 and is projected to be completed in mid-2015. Total cost to prepare the FS is estimated at \$2 million. To date, GBRA has committed \$548,000 and UTSA has committed \$300,000. Additional funding will be provided for fiscal year 2014-15, which begins September 1 for GBRA.

The scope and duration of the FS make this study eligible for funding under either Group 1 or Group 2 funding sources. GBRA is requesting \$450,000 under Group 2, which would represent less than 25 percent of total study costs.

- GBRA was established by the Texas Legislature in 1933 and provides stewardship for the water resources in its ten-county statutory district, which begins near the headwaters of the Guadalupe and Blanco Rivers, ends at San Antonio Bay. GBRA's planning and resource development efforts are carefully coordinated within the broader consideration of regional and statewide water needs in order to fulfill GBRA's mission of protecting, conserving, reclaiming and stewarding the resources of its 10-county district to ensure and promote quality of life for the constituents it serves.
- The Office of the Commissioner of the Texas General Land Office is the oldest, continuous elected position in Texas history, established by the Republic of Texas immediately after the Texas Revolution in 1836. The Commissioner serves a four-year term, elected state-wide, and is responsible for managing billions of dollars of state assets, investments and mineral rights, serves as Chairman of the Texas Veterans Land Board, and as chair of several other key state boards and commissions.

The University of Texas at San Antonio created the Texas Sustainable Energy Research Institute to partner with industry, universities and civic communities to position the south-central Texas region as a technology and innovation leader in the 21st century global energy economy. Research at the Institute spans a continuum, from a discovery-based applied science and engineering to economic and systems analyses, and strives to provide pragmatic outcomes that serve our region best. The Institute also emphasizes technology commercialization to promote socioeconomic development that contributes to sustained economic prosperity regionally and nationally. This application was prepared consistent with guidance provided in the subject FOA.

## 1.0 EVALUATION CRITERION 1: STATEMENT OF PROBLEMS AND NEEDS

*Points will be awarded based on the presence of watershed-based water resource management problems and needs for which water reclamation and reuse may provide a solution. Describe in detail the water resource management problems and needs in the area and explain how water reclamation and reuse may address those problems and needs.*

The IWPP study area (**Figure 1-1**) encompasses the South Central and Coastal Bend regions of Texas. South Central Texas is one of the fastest growing areas in the nation, including the cities of Austin and San Antonio and the rapidly growing corridor between them. Continued economic growth in South Central Texas will rely on the development of timely, sustainable, and affordable water supplies to support diverse water uses. The Coastal Bend Region comprises the area along the Texas Gulf Coast generally extending from southwest of Houston to Corpus Christi. Economic growth in the Coastal Bend Region will be driven by continued industrial development, port expansion to support post-Panamax ships, and associated population growth. Both regions are greatly affected by ongoing and planned development of the Eagle Ford Shale, which has introduced new water demands for development of extensive natural gas resources.

Through the SB 1 State Water Planning process, regional water entities in the study area identified a need for nearly 900 thousand acre-feet per year (TAF/yr) of additional water supply for the study area by the year 2060. About two thirds of that amount will be needed by the year 2030 to replace over-tapped supplies and support projected growth. To address the water needs, regional water entities have identified a portfolio of potential water supply solutions that include conservation, reuse, additional groundwater pumping (both fresh and brackish), additional surface water development, and seawater desalination. Water supply strategies in the plan are prioritized by decade based on project costs with minimal consideration of implementation challenges. Current regional water plans defer seawater desalination to the distant future on the basis that other strategies can and will be implemented first. A recently-initiated planning process, required by HB4, is re-structuring this project prioritization approach to consider project feasibility, timing, and sustainability.

GBRA and the other IWPP study partners are concerned that the water supply strategy priorities identified in current regional water plans will not keep pace with growing water demands in the study area. Many existing water supply resources in the region's watersheds are approaching or have already surpassed sustainable development limits; development of planned large-scale groundwater projects may be constrained by permitting requirements; the reliability of some existing surface water supplies is threatened by ongoing litigation regarding environmental flow requirements; and the ability to import new surface water supplies from other regions will be greatly constrained by Texas basin transfer requirements. In recognition of these shortcomings, GBRA initiated a study of seawater desalination as a regional water resource that can be developed in an integrated manner with other water supply strategies.

In addition to the significant water needs within the study area, new power resources will be required to support growth-driven demands, including energy requirements for water treatment, conveyance, and distribution. GBRA and their partners recognize the opportunity that an IWPP provides in addressing both the water and power needs through the integration and planning of strategies to optimize timing, delivery, and supply options.

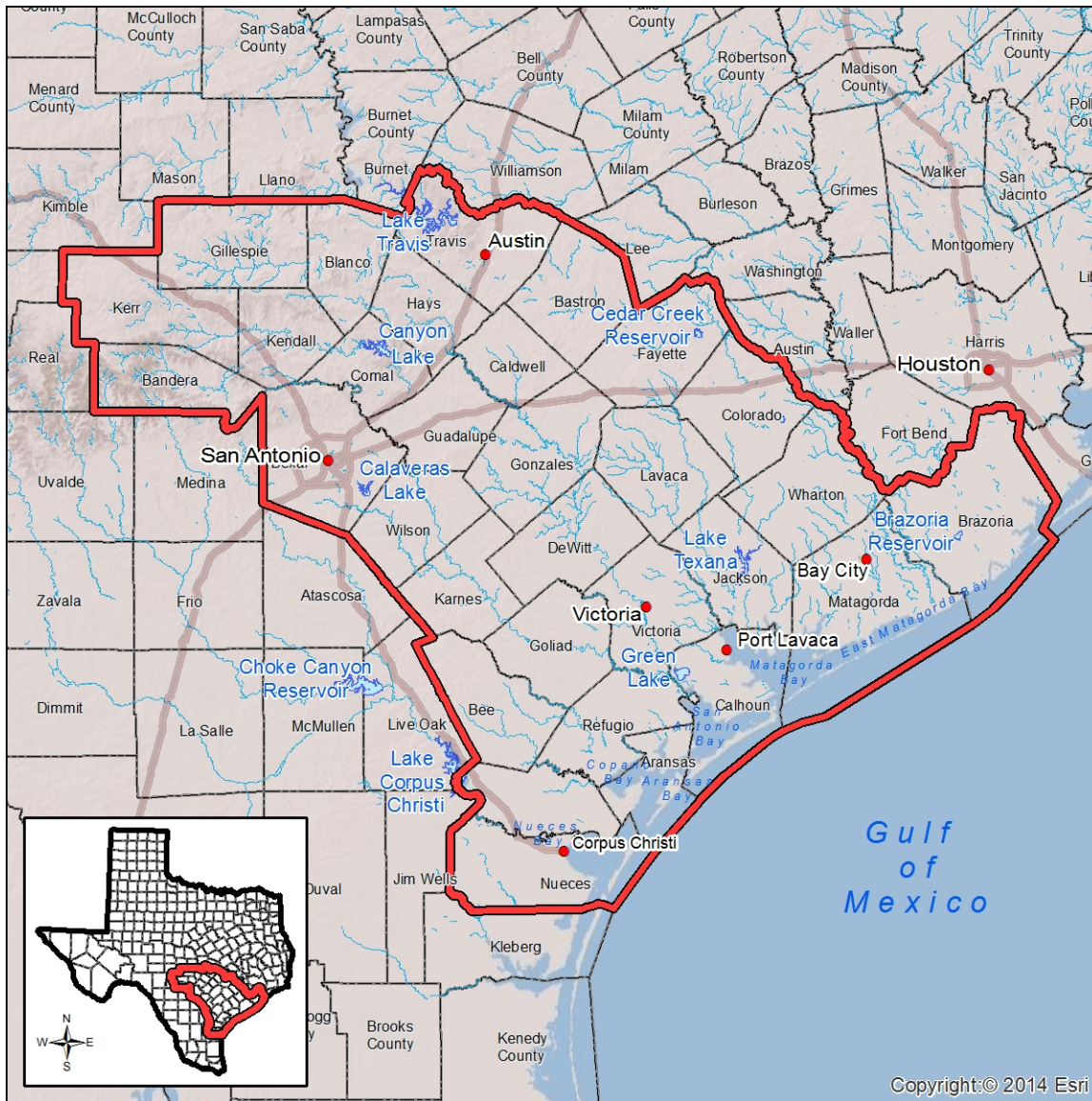


Figure 1-1 IWPP Study Area

## 2.0 EVALUATION CRITERION 2: WATER RECLAMATION AND REUSE OPPORTUNITIES

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will explore opportunities for water reclamation and reuse in the study area.*

*(1) Describe how the feasibility study will investigate potential uses for reclaimed water (e.g., environmental restoration, fish and wildlife, groundwater recharge, municipal, domestic, industrial, agricultural, power generation, and recreation).*

The FS began with a review of water management strategies identified in the regional and state water plans to identify potential integration and consolidation of strategies and infrastructure. This evaluation will provide baseline information on the potential for desalinated seawater to be integrated, either directly or

through exchange, to support diverse beneficial uses such as environmental flows, fish and wildlife protection, groundwater management, municipal and industrial water supplies, power generation, and potential recreation benefits.

Water demand data will be derived from the State Water Plan and supplemented with additional readily-available information regarding water demands for specific uses, such as the Eagle Ford Shale development or other information provided by GBRA, their partners, or potential regional partners. Temporal and spatial relationships will be developed to highlight where and when demands are projected to occur in the study area over time. Monthly demand patterns and peaking factors will be developed for potential connection points for average and dry year conditions. Ratios of historical peak daily to average monthly water demand will be developed for input to sizing of pipelines, pump stations, and reservoirs in subsequent tasks.

*(2) Describe the potential water market available to use any recycled water that might be produced upon completion of a Title XVI project, as well as methods to stimulate recycled water demand and methods to eliminate obstacles for use of reclaimed water.*

The IWPP would introduce a large new water supply to a region in need of nearly 900 TAF/yr by the year 2060; at full build-out, the project would serve about one third of this demand. This demand for water is greatest among municipal and industrial water users, which have both a greater capacity to pay and lower tolerance for water shortages. It is well understood by water planners and economic leaders in the study area that the next increments of water supply will be considerably more costly than existing supplies. In addition, many leaders recognize the importance of an uninterrupted supply that is not subject to shortages during drought periods or at risk because of emerging environmental water requirements. In light of this, the market for desalinated seawater does not appear to be a limiting factor in the study area. The challenge is developing a project implementation approach that demonstrates the IWPP is affordable in relation to other choices, particularly during dry periods. The objective of the FS is to evaluate a range of implementation strategies to identify those that are most cost effective in providing a regional water supply from seawater desalination.

*(3) Describe the sources of water that will be investigated for potential reclamation, including impaired surface and ground waters.*

The first phase of the FS is focused on developing efficiencies and geographic distribution of water supplies to recommend future integration of infrastructure to maximize future water supplies such as desalinated seawater from a coastal source. The IWPP will focus on development of a seawater desalination plant and power facilities primarily using the Gulf of Mexico as a water source. Integration of IWPP water supply to the region, however, may also involve development of other water resources or changes in the management of existing water resources. Potential other regional water sources could include existing GBRA rights, fresh and brackish groundwater, reclaimed, and surface water supplies that are not allocated or underutilized.

The FS will evaluate all water supplies considered in the regional and state water plans and also include desalinated seawater and brackish groundwater, opportunities for reclamation within the energy generation sectors, evaluating oil and gas water management practices for opportunities to reclaim water to include impaired surface and groundwater. All currently identified strategies for future water supply within the study area will be considered. Additional sources of water include groundwater within the Gulf Coast and Carrizo Wilcox aquifers and the conjunctive use of available surface water supplies. The FS focus on

desalination will provide a broad platform for input water supply to evaluate variable salinity and treatment options for impaired waters within the overall water supply options.

The FS will develop a set of criteria to be applied to evaluate and screen candidate and initial sites to determine market applicability. Criteria and sub-criteria will be defined for application to candidate and initial sites. Criteria to be applied to candidate sites will be more generalized than criteria applied to initial sites. The list of site screening criteria will be defined to enable both qualitative and quantitative comparative evaluations, and will include a wide array of information relevant to development and operation of water and power facilities, including the potential water market or need.

### **3.0 EVALUATION CRITERION 3: DESCRIPTION OF POTENTIAL ALTERNATIVES**

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will develop descriptions of water supply alternatives, including a proposed Title XVI project and other water supply alternatives.*

*(1) Describe the objectives all alternatives will be designed to meet. What other water supply alternatives will be investigated as part of the Title XVI feasibility study?*

The IWPP will have far-reaching economic, social, and environmental impacts throughout the study area, making early and sustained engagement of stakeholders vital to its success. The FS will examine how the IWPP could be developed cost-effectively to support the interests of diverse stakeholders. It will consider potential plant location, treatment and power generation technologies, effective and efficient water conveyance systems, fuel sources and power transmission, safe disposal of concentrate, other environmental issues, economic and financing issues, and construction timelines.

All alternatives will evaluate the integration of a large desalinated seawater supply into the study area to help meet current and future demands. The initial range of alternatives includes delivery of desalinated seawater to industrial users, Coastal Bend communities, and growing small communities and large metropolitan areas in the study area. Delivered water quality could vary depending on the end user.

All alternatives would integrate the IWPP water supply with existing and planned water supplies and conveyance infrastructure. This approach allows alternatives to consider changes in the operation of existing groundwater and surface water facilities, including Reclamation-owned Choke Canyon Reservoir and Reclamation-developed Lake Texana, to increase operational flexibility in meeting diverse water demands. In this manner, the IWPP provides a multi-watershed water resource to the study area that would enable unprecedented flexibility in meeting changing water demands for competing uses. The IWPP Feasibility Report will be provided to regional water planning groups in the study area for consideration in the regional water planning update for 2016.

A work plan for the FS has been prepared (Appendix A) that describes management, technical, and stakeholder activities. Technical information will be developed in parallel with the stakeholder engagement program to assure regional understanding and opportunities for regional partnerships. This approach will also assure that potential areas of focus can be addressed as the study progresses. Technical work for the FS is being conducted through four tasks that will be integrated with stakeholder engagement activities. The four technical tasks of the FS include:



- Establish the Planning Framework - this task will provide foundational information to guide the FS and will include a definition of problems, needs, opportunities and constraints. Information on the spatial and temporal variation of projected water demands will be compiled. Current water planning documents will be reviewed to identify potential conflicts in the implementation of recommended water supply strategies. This information will be used to define water supply problems and needs. An energy market review will be completed to identify power problems and needs, and also identify potential strategies to address those needs. An environmental compliance and permitting strategy will be developed that identifies regulatory requirements to be addressed in developing seawater desalination and conveyance, and power generation and transmission facilities. Previous proposals and initial studies of potential seawater desalination in the study area will be reviewed to compile regional data and identify candidate sites for water treatment and power generation facilities. Regional data of the natural physical environment, biological and cultural resources, and the built environment will be reviewed to identify additional candidate sites for consideration. A structured and transparent process will be applied to the candidate sites to select a set of representative initial sites for evaluation in the FS. This task is nearing completion.
- Develop Water and Power Options – this task includes development and evaluation of water supply and power options at each representative initial site. At each representative site location, the quantity and timing of water demands, water use, delivered water quality requirements, source water intake locations, disposal methods, fuel sources, connection facilities for water and power delivery, and initial facility layouts will be identified. Water treatment and power generation technologies will be defined, including water demands for both water supply and power needs. Estimates of combined water needs for a variety of water treatment and power generation facility configurations will be prepared. This will include consideration all available cooling technologies such as once through cooling, evaporative cooling, dry cooling (air cooled condensers), and hybrid cooling and opportunities for water reclamation, distribution, and reuse. Water needs and supplies will be developed for various sizes and types of power and water facilities, and this information will be used to guide sizing of plants and related facilities, such as intakes and outfalls. This task is expected to begin in June 2014.
- Develop and Evaluate Water and Power Alternatives – this task will use information developed in previous tasks to formulate alternatives that can meet the objectives of the IWPP. Alternatives will be formulated to highlight important tradeoff considerations, such as centralized vs. de-centralized (single site vs. multiple site) water treatment facilities, phasing and timing of the IWPP, power supply to the project (co-located or remotely located) vs. market-based power solutions, potential for additional power generation, and other considerations identified during the FS process.
- Prepare the Feasibility Study Report – this task includes preparation of the Draft and Final Feasibility Reports, and will include evaluation and comparison of alternatives, discussion of financing and governance options, and preparation of a summary report. The Feasibility Report will be written concisely and will reference appendices that provide more detailed information, including technical memoranda or other reports prepared in earlier phases.

It is expected that as information is developed and provided to stakeholders, some technical tasks may be refined to provide modified focus or greater detail in response to suggestions or requests by stakeholders, or to include new information.

*(2) Provide a general description of the proposed project that will be the subject of a Title XVI feasibility study.*

As currently envisioned, the IWPP would include a desalination plant near the Gulf Coast with a co-located power plant. Both the water treatment and power generation facilities would be developed in phases. The water treatment plant would be initially constructed at a capacity of 25 to 50 million gallons per day (mgd) and could be expanded to an ultimate capacity of 250 mgd. The power plant would be sized at an initial capacity of 500 megawatts (MW) and potentially expanded to 3,000 MW. At full capacity the IWPP could supply enough water for over 350,000 homes and electricity for up to 3 million homes.

The FS will identify and evaluate several sites for potential development of water treatment and power generation facilities, and necessary water and power transmission infrastructure to interconnect at regional delivery points. Site locations will be spread out through the study area to enable evaluation of alternative water supply and power generation integration strategies.

To date, over 20 candidate site locations in the study area that could be suitable for IWPP development were identified from previous studies and a multi-parameter GIS-based review. The candidate sites were evaluated based on their site-specific conditions, surrounding environmental resources, compatibility with existing land uses, potential water sources (bay/estuary system or Gulf of Mexico), and proximity to intake and disposal locations, potential water delivery points, fuel and electrical transmission facilities, and transportation infrastructure. The results of this evaluation will provide approximately five representative initial sites at which more detailed site-specific facility evaluations will be completed.

*(3) Describe alternative measures or technologies for water reclamation, distribution, and reuse that will be investigated as part of the Title XVI feasibility study.*

A range of alternative strategies to integrate desalinated seawater to the study area will be developed and described. Integration strategies will be developed by combining water users that have common water quality needs, share a common geography in the study area, or can be served by common existing or planned infrastructure. To date, the following alternative integration strategies have been identified:

1. Deliver desalinated seawater to coastal industrial water users to reduce their reliance on existing surface water diverted from Guadalupe-Blanco River Basin. The desalinated water would be treated to an appropriate level for industrial processes and would not be suitable for potable use without subsequent treatment. Replacing diverted water with desalinated seawater could enable the enhanced management of environmental flows or increased water deliveries to inland water users, which could be accomplished by changing the operation of Canyon Lake. Operational changes at Canyon Lake could result in changes in hydropower generation, downstream environmental benefits, and regional recreation opportunities.
2. Deliver desalinated seawater in the Guadalupe River Basin. The IWPP also could provide water supplies in the Guadalupe River Basin through integration with the planned Mid-Basin Project. The Mid-Basin Project includes approximately 70 miles of new conveyance infrastructure to move water to inland areas. The FS will identify opportunities to expand the Mid-Basin infrastructure to accommodate planned Mid-Basin supplies plus potential additional water supplies from an IWPP.

3. Deliver desalinated seawater to Coastal Bend communities. GBRA is entering into a Memorandum of Understanding (MOU) with the City of Corpus Christi to jointly evaluate water supply opportunities in the study area, which will apply to the IWPP FS. One IWPP integration strategy would begin with the development of an off-channel reservoir in the lower Guadalupe River Basin to firm existing water rights held jointly by GBRA and Dow Chemical. Yield from the off-channel reservoir could be provided to Dow Chemical and also provide an initial and temporary water supply to Corpus Christi that would be conveyed through the existing Mary Rhodes Pipeline MRPL. The MRPL conveys water from Lake Texana to Corpus Christi and is operating at approximately 50 percent of its design capacity. The IWPP would supplement, and over time potentially replace, this supply to assure that Guadalupe River Basin water would be available for in-basin uses on a long-term basis. GBRA is also entering into a MOU with the Lower Colorado River Authority to jointly evaluate regional water supply solutions.

#### 4.0 EVALUATION CRITERION 4: STRETCHING WATER SUPPLIES

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address activities that will help to secure and stretch water supplies.*

*(1) Describe the potential for the project to reduce, postpone, or eliminate the development of new or expanded water supplies. Include description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.*

The primary objective of the IWPP is to provide a new, drought-proof water supply to the study area that can meet existing and future water demands and reduce or avoid development of already strained surface water and groundwater resources. Opportunities to reduce, postpone, or eliminate development of new or expanded supplies will be identified, in part, through development of the without project condition description.

The without project condition is being developed using readily available information, such as population, water supply and demand, end energy demand projections prepared by the Texas Water Development Board (TWDB) and the Energy Reliability Council of Texas (ERCOT). The description of the without project condition will begin with existing facilities, policies and laws and will add the effects of projects and actions that are foreseeable and certain. Proposed projects in the study area watersheds will be reviewed to identify the timing of their implementation, their potential to obtain permits and funding, and the likely effect they will have on regional water supplies and power demands. The potential for groundwater project development in the region, particularly brackish groundwater, also will be considered. Groundwater Availability Model results for water in storage will be reviewed to assess brackish supplies and project long-term sustainability that meet desired future conditions.

Other factors to be considered in describing the without-project-condition include industrial expansion plans, regional development of other major regional infrastructure (such as ports, rail, or road transportation) water demands for Eagle Ford Shale development and work force support. In addition, potential changes in policies, laws, or regulations that would affect the development and management of water and power resources will be considered.

*(2) Describe the potential for the project to reduce or eliminate the use of existing diversions from natural watercourses or withdrawals from aquifers. Include description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.*

As described in response to Factor 3 of Evaluation Criterion 3, all alternatives identified to date would reduce, postpone, or eliminate the need to develop new or expand existing water supplies by providing a new water supply to the study area. In addition, all alternatives provide an opportunity to manage existing water supplies in a manner to support current and future environmental and economic objectives. At least two of the alternative strategies would provide an opportunity to reduce river diversions by providing IWPP water supply to coastal industrial users. Currently-diverted water that is replaced by IWPP supply would be managed to meet other regional water needs, including environmental, urban, industrial, and agricultural uses in the region through modified operations of existing reservoirs.

*(3) Describe the potential for the project to reduce the demand on existing Federal water supply facilities. Include description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.*

Reclamation developed and owns Choke Canyon Dam and Reservoir on the Nueces River, and the project is operated by the City of Corpus Christi. Water demand on Choke Canyon could be reduced by integrating a new water supply from the IWPP. Under the MOU between GBRA and Corpus Christi, the FS would consider how and to what extent existing water demands served by Choke Canyon Reservoir could be satisfied by an IWPP water supply. The evaluation would identify the timing and magnitude of changes in demand, and describe alternative benefits that Choke Canyon could provide if operated differently. Similarly, the integration of IWPP water supplies to the study area through the MRPL would enable operational changes to Lake Texana (constructed by Reclamation and subsequently transferred) on the Lavaca River.

## **5.0 EVALUATION CRITERION 5: ENVIRONMENT AND WATER QUALITY**

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address the potential for a water reclamation and reuse project to improve surface, ground water, or effluent discharge quality; restore or enhance habitat for nonlisted species; or provide water or critical habitat for federally listed threatened or endangered species.*

*(1) Describe the potential for the project to improve the quality of surface or groundwater, including description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.*

The integration of a new water supply from the IWPP could reduce, postpone, or avoid development of projects that would lead to conflict over regional water resources and water quality. The Guadalupe-Blanco River Basin receives significant inflow from springs that are fed by groundwater. Historic groundwater development in the region lowered groundwater levels to the extent that reduced surface water flows adversely affected protected species. As a result, the Edwards Aquifer is now operated to limit groundwater pumping when levels decline below target elevations. Return flows from municipal wastewater treatment plants also provide instream flows that help satisfy historic water rights obligations and environmental flow requirements.

Proposed water supply strategies in the study areas include additional groundwater development and reuse projects that could reduce the discharge of return flows to rivers. Regional entities have identified potential projects that would increase the use of potable groundwater and develop brackish groundwater in the region. The primary locations for consideration of brackish groundwater development include the Carrizo-

Wilcox and the Gulf Coast aquifers. The FS will compile information on the potential development of fresh and brackish groundwater projects in the study area, beginning with potential projects identified in the State Water Plan. This will be supplemented with information on groundwater yield and water quality in areas for potential sustainable groundwater development. General locations of potential well fields will be identified with an estimate of the water supply that would be developed, and existing or projected demands that could be served will be identified.

*(2) Describe the potential for the project to improve flow conditions in a natural stream channel, including description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.*

The FS will investigate the role of an IWPP to provide an offset to run-of-river and existing surface water diversions by providing an alternate source of supply to existing and projected demands that would be served by river sources. The modified operation of surface water reservoirs could provide improved flows and water quality to downstream reaches, extending into the bays and estuaries. Operational efficiencies of regional operators will also be considered within this FS.

*(3) Describe the potential for the project to provide water or habitat for federally listed threatened or endangered species, including description of any specific issues that will be investigated or information that will be developed as part of the Title XVI feasibility study.*

Introduction of a new water supply from the IWPP to the study area can provide environmental benefits for endangered species. In response to low flows into San Antonio Bay in 2008-2009, the Texas Council for Environmental Quality (TCEQ) was sued over adverse effects to Whooping Cranes. GBRA joined the suit as an intervenor defendant because of the profound effect that a ruling can have on the management of surface water and groundwater resources in the basin.

Federal and state threatened and endangered species lists and federally designated critical habitat maintained by USWFS, NMFS and Texas Parks and Wildlife Department (TPWD) will be reviewed for each county in the study area. The FS will consider how seawater desalinated supplies could provide additional water supplies for the species through alternate operations of surface water and groundwater diversions.

## **6.0 EVALUATION CRITERION 6: LEGAL AND INSTITUTIONAL REQUIREMENTS**

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address legal or institutional requirements or barriers to implementing a project, including water rights issues and any unresolved issues associated with implementation of a water reclamation and reuse project.*

The IWPP is being planned as a large regional project that would provide a water supply to several legal and institutional agreements to provide the introduction of the water supply, modification to existing project operations, and potential sharing of water resources across multiple regions. The FS will address these issues in light of the ongoing State Planning processes, permits required by TCEQ to transfer or share water resources among multiple regions, and the ongoing project prioritization process under the direction of the TWDB. GBRA has been proactive in all of these areas by engaging the GLO as a partner, coordinating closely with TWDB and TCEQ to identify guidelines and regulations relevant to the IWPP, and developing an MOU with the City of Corpus Christi. GBRA is prepared to enter into MOUs with other entities as needed to facilitate greater regional collaboration in the evaluation and implementation of the IWPP.

Numerous permits will need to be considered or obtained in the development of seawater desalination plants, conveyance facilities, and power generation and transmission facilities. Power plant projects are subject to numerous federal, state, local, and industry regulations and requirements, and require some of the same permits as water treatment facilities. Power industry-specific regulations and requirements are governed by the permitting, registration, qualification, performance, and compliance oversight of the PUC, TCEQ, Texas Railroad Commission, ERCOT, and Texas Reliability Entity as well as certain federal regulations and requirements. Therefore, it is important to clearly identify applicable requirements in advance of the site selection process.

The FS will develop a technical memorandum (TM) that identifies the state and federal permits considered necessary for the construction and operation of a new water diversion, water treatment plant, water conveyance facilities, power generation station and associated transmission and gas pipeline facilities. The TM will summarize each state and federal regulatory agency permit, their requirements and anticipated permitting process timeframes for the different locations and cooling water configurations proposed for the project. The requirements and compliance strategies for each permit will be entered into a risk register that can be used throughout project development to highlight issues and indicate key dates for application filing and required completion. To the greatest extent possible, the TM will use existing information, such as the TWDB publication “Guidance Manual for Permitting Requirements in Texas for Desalination Facilities Using Reverse Osmosis Processes” dated November 23, 2004. Supplemental information will be prepared to describe requirements for permits not addressed in the TWDB report.

Several federal laws and regulations will need to be addressed through environmental compliance and permitting, including the Rivers and Harbors Act, Clean Air Act (CAA), Clean Water Act (CWA), National Environmental Policy Act (NEPA), Endangered Species Act and others.

Federal agencies that may have permitting and/or NEPA review responsibilities:

- United States Army Corps of Engineers (Section 10 and Section 404 Permits)
- National Marine Fisheries Service (Essential Fish Habitats, Threatened and Endangered Species and Impingement)
- United States Fish and Wildlife Service (Threatened and Endangered Species)
- Environmental Protection Agency (Review of CWA and CAA permits)

Primary state agencies reviewing and/or permitting potential project impacts include:

- Texas General Land Office (Submerged Lands Easements and Coastal Zone Consistency)
- Texas Parks and Wildlife Department (Threatened and Endangered Species and Habitat Assessment)
- Texas Commission of Environmental Quality (Water and Air Quality Permits and Waste/Wastewater Disposal Permits)
- Texas Historical Commission (Section 106 Review)
- Texas Department of Transportation (Road Crossing Permits)
- ERCOT (Review of Transmission Line Interconnect Request)
- Public Utility Commission of Texas - (Certificate of Convenience and Necessity)
- Texas Railroad Commission - (Pipeline and Hydrostatic Test)

Primary local regulatory agencies reviewing or permitting potential project impacts include:

- Groundwater Conservation Districts
- Floodplain Administrators

## 7.0 EVALUATION CRITERION 7: RENEWABLE ENERGY AND ENERGY EFFICIENCY

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address methods to incorporate the use of renewable energy or will otherwise address energy efficiency aspects of the water reclamation and reuse project being investigated.*

Any proposed power plant would be subject to EPA's New Source Review (NSR) permitting program for criteria pollutants and GHGs. The FS will identify best available control technology (BACT) levels for the proposed power plant equipment and identify requirements for an air permit application for submittal to TCEQ.

Using methodologies consistent with the EPA and procedures developed by the Intergovernmental Panel on Climate Change (IPCC), carbon footprints will be estimated by inventorying direct and indirect emissions of GHGs based on the assumed project life cycle and capacity factor of all processes and devices. As part of the carbon footprint analysis, the FS will identify and quantify carbon emissions from alternative sources of energy, including biomass, solar, wind, and other sources for a comparison of impact on overall project carbon footprint.

The total IWPP carbon footprint will be developed based on construction and operation of the entire water system and power plant. Determining the project's carbon footprint will include inventorying the CO<sub>2</sub> emissions associated with all construction activities, devices, and materials for the seawater intake, processing and delivery of treated water to project partners, and the associated power plant construction and operation.

## 8.0 EVALUATION CRITERION 8: WATERSHED PERSPECTIVE

*Points will be awarded based on the extent to which the proposal demonstrates that the Title XVI feasibility study will address alternatives that promote and apply a regional or watershed perspective to water resource management.*

As stated elsewhere in this application, the IWPP is a large regional water supply project that is being evaluated at a multiple watershed perspective. As part of the FS, a set of weighting factors will be used to assist in evaluating and comparing alternatives from a watershed perspective. The FS will develop technical information and apply weighting factors to criteria with the goal of comparing opportunities to meet multiple objectives. Sufficient technical information will be developed and weighting factors will be applied to effectively:

- Evaluate alternatives under water demand levels that reflect near-, mid-, and long-term projections.
- Prepare costs estimates for initial capital and annual operations and maintenance costs for all project features
- Identify potential watershed impacts to wetlands, aquatic habitat, vegetation, and other biological resources
- Identify geological, cultural, and archeological impacts at potential power generation and water treatment sites within the watershed that could affect Project cost and the implementation schedule
- Identify the ability of regional transmission systems to accept power generated by the Project and provide power for water treatment and conveyance facilities.

- For co-located power generation and water treatment facilities, identify the effects to the water treatment plant in the event of a power generation facility shutdown.
- Prepare sensitivity analysis on key variables for alternatives.

**9.0 REQUIRED PERMITS OR APPROVALS**

No permits are required to complete the feasibility study. The Feasibility Report will identify next steps in IWPP implementation, including required environmental compliance, permits, and approvals.

**10.0 FUNDING PLAN AND LETTERS OF COMMITMENT**

GBRA is the contracting entity for the study and would be the direct recipient of funding provided from this grant. GBRA and the study partners initiated an extensive consultant selection process in early 2012, selected a consultant in May 2013, and subsequently awarded a contract for the FS.

Non-Reclamation funds will come from the applicant (GBRA) for \$548,000 (available as of July 1, 2013) and \$300,000 from the University of Texas at San Antonio and the Texas General Land Office. These state funds are available as of July 1, 2013 and will be available for the duration of the study through July 2017. Technical work on the FS began in August 2013 and is projected to be completed in mid-2015. Total cost to prepare the FS is estimated at \$2 million through 2017. Additional funding will be provided for fiscal year 2014-15, which begins September 1 for GBRA.

Date funds available to applicant (GBRA): July 2013  
 Time constraints on availability of funds: None  
 Other contingencies with funding commitment: None

- (1) Applicant contribution to the cost share requirement will be made with both monetary and in-kind contributions throughout the study. The following in-kind costs have been incurred since July 1, 2013:
  - a. What study expenses have been incurred? Project management, stakeholder engagement, and establishing planning framework
  - b. How they benefitted study? These tasks are the foundation of the FS and set the framework for all future study activities.
  - c. Amount in-kind incurred: \$100,000
  - d. Date of cost incurrence: Since July 1, 2013
- (2) Funding Partners:
 

Guadalupe Blanco River Authority:	\$548,000
GLO	\$300,000
- (3) There is no other Federal funding requested under this study.
- (4) There is a pending funding request with GBRA for 2014-2015 funding that is expected to be approved in September 2014. It is expected that funding will be approved.



<b>Funding Sources</b>	<b>Funding Amount</b>
Non-Federal Entities	
GBRA*	\$548,000
GLO	\$300,000
UTSA*	in-kind
Non-Federal Subtotal	\$848,000
Other Federal Entities	
Other Federal Subtotal	\$0
Requested Reclamation Funding:	
	\$450,000
Total Study Funding	\$1,298,000

<b>Funding Sources</b>	<b>% of Total Cost</b>	<b>Funding Amount</b>
Recipient Funding	65%	\$848,000
Reclamation Funding	35%	\$450,000
Other Federal Funding	0%	\$0
Total Study Funding	100%	\$1,298,000

The application to Reclamation includes a budget narrative to describe cost estimates and categories of expenditure. Reporting requirements are incorporated in the overall study costs and are clearly delineated in Appendix A, IWPP Work Plan.

## 11.0 OFFICIAL RESOLUTION

### RESOLUTION OF THE BOARD OF DIRECTORS OF THE GUADLAUPE-BLANCO RIVER AUTHORITY

#### Approving Application for Bureau of Reclamation Title XVI Water Reclamation and Reuse Program Funding Opportunity Announcement No. R14AS00030

WHEREAS, The GBRA 10-county district is experiencing rapid business and population growth with accompanying demands for municipal water and industrial supplies; and

WHEREAS, GBRA recognizes that meeting the demands for water supply services while conserving and protecting the region's surface and groundwater resources depends on cooperative planning and development; and

WHEREAS, GBRA desires to facilitate the regional planning efforts to evaluate the potential for desalination along the coast; and

WHEREAS, GBRA has prepared an application to the Bureau of Reclamation for a Title XVI Water Reclamation and Reuse Program.

NOW THEREFORE, BE IT RESOLVED, that the Board of Directors of the Guadalupe-Blanco River Authority approves this Resolution and authorizes the General Manager to submit the application to the Bureau of Reclamation.

Dated this 14<sup>th</sup> day of May, 2014.

\_\_\_\_\_  
Chairman of the Board of Directors of the  
Guadalupe-Blanco River Authority

Signed Resolution will be submitted to RECLAMATION upon approval on May 14, 2014

# The State of Texas



Austin, Texas

## MEMORANDUM OF UNDERSTANDING

**THIS MEMORANDUM OF UNDERSTANDING ("MOU") is entered into by and between the TEXAS GENERAL LAND OFFICE ("GLO"), by and through the Commissioner of the Texas General Land Office, and the GUADALUPE-BLANCO RIVER AUTHORITY ("GBRA"), by and through its General Manager.**

**WHEREAS**, seawater desalination represents the potential for an abundant, drought proof source of water supply, which may play an important part in meeting the future water supply needs of the State's rapidly expanding population;

**WHEREAS**, GBRA has issued a request for qualifications (RFQ) to engineering firms interested in preparing a feasibility assessment study regarding the potential development of a new regional seawater desalination plant, with the option of providing a co-located power generation facility. Sixteen engineering firms have responded to this RFQ;

**WHEREAS**, the GLO is concerned about the ongoing drought conditions in Texas and the lack of adequate fresh water sources for its rapidly growing population;

**WHEREAS**, the GLO believes it can provide assistance to the GBRA in connection with the proposed feasibility assessment study, which would have a positive impact on the future development of new sources of water in Texas;

**NOW, THEREFORE**, it is agreed between GLO and GBRA (collectively "the Parties") as follows:

1. The Parties shall work cooperatively to oversee a feasibility assessment study project for the proposed development of a new regional seawater desalination plant co-located with a power generation facility. The scope of the feasibility assessment study is outlined in the RFQ previously issued by GBRA, which is incorporated herein by reference.
2. The proposed feasibility assessment study project shall proceed generally as follows:
  - a. GLO and GBRA will jointly create a Project Implementation Team to address oversight of the feasibility study project, including, without limitation, interviewing, selection, financial matters, scheduling, and phasing.
  - b. The Project Implementation Team shall interview the "short list" of 4-7 engineering firms selected by GBRA.

- c. The Project Implementation Team shall select the engineering firm to conduct the feasibility assessment study.
  - d. The Project Implementation Team shall negotiate the final terms and scope of the feasibility assessment study with the chosen engineering firm.
  - e. The chosen engineering firm shall commence the feasibility assessment study. The study is expected to take 18-24 months to complete. The chosen engineering firm shall provide the Project Implementation Team with regular status reports on the project.
3. The Parties may agree to include additional full or junior members, advisory or otherwise, on the Project Implementation Team to advance the feasibility study project at a time and on such terms as GLO and GBRA may mutually agree.
4. In exchange for its participation in the feasibility assessment study project outlined herein, GLO shall contribute up to THREE HUNDRED THOUSAND DOLLARS (\$300,000.00) to help fund the study. These funds shall be contributed by GLO at the commencement of each of the following four phases of the study as follows:
- a. GLO shall make a payment of \$25,000.00 at the commencement of Phase 1. Phase 1 shall include: Interviewing and selection of engineering firm; Negotiation of final terms and scope of feasibility assessment study with the chosen engineering firm; Commencement of study; Defining and gathering additional stakeholder support.
  - b. GLO shall make a payment of \$50,000.00 at the commencement of Phase 2. Phase 2 shall include: Financial Evaluation Phase of Study (financial analysis of proposed desalination plant and co-located power plant)
  - c. GLO shall make a payment of \$75,000.00 at the commencement of Phase 3. Phase 3 shall include: Technical Evaluation Phases of Study (analysis of technical attributes of proposed desalination plant and co-located power plant)
  - d. GLO shall make a payment of \$150,000.00 at the commencement of Phase 4. Phase 4 shall include: Integration/Distribution/Evaluation Phase of Study (combined analysis of the overall desalination plant and co-located power plant concept)
5. In the event any of the above four phases of the study is not completed or does not commence, then GLO shall have no further obligation to contribute any funds to the feasibility assessment study project.
6. Following completion of the feasibility assessment study project, in the event GBRA desires to commence construction of a new regional seawater desalination plant co-located with a power generation facility based on the findings in the study, GBRA agrees that the GLO shall have an ongoing right of first offer to: (a) obtain an equity position in the desalination/co-generation plant project; and/or (b) supply natural gas to the desalination/co-generation plant project.
7. This MOU shall not be construed as creating any debt on behalf of the State of Texas and/or the GLO in violation of Article III, Section 49, of the Texas Constitution. It is expressly understood and acknowledged that all obligations of the GLO hereunder are subject to the availability of state funds. If such funds are not appropriated or become unavailable, this MOU may be terminated.

8. Other than as specifically provided herein, this MOU shall not constitute a binding agreement and shall not bind any Party to enter into any other agreement or transaction.

9. Nothing contained in this MOU shall be deemed or construed to create a partnership or joint venture, to create an employer-employee or principal-agent relationship, or to otherwise create for either Party any liability whatsoever with respect to the indebtedness, liabilities, and/or obligations of the other Party.

10. GBRA may not assign, transfer, or delegate any rights, obligations, or duties under this MOU without the prior, written consent of GLO.

11. Either Party may terminate this MOU by providing written notice to the other Party.

12. Each Party shall bear its own costs, fees, and expenses incurred in connection with any of that Party's actions under this MOU.

13. This MOU may be amended only by a writing signed by both Parties.

14. Nothing in this MOU shall be construed as a waiver of sovereign immunity by either the GLO or GBRA.

15. This MOU is effective on the date it is signed by the authorized representatives of GLO and GBRA.

16. This MOU may be executed in multiple counterparts, all of which shall be deemed to be one and the same instrument.

[REMAINDER OF PAGE INTENTIONALLY BLANK]

IN WITNESS WHEREOF this Memorandum of Understanding is entered into and shall be effective on the last date of either party's signature below.

**TEXAS GENERAL LAND OFFICE**

By: *Jerry E. Patterson*  
JERRY E. PATTERSON  
Commissioner, General Land Office

Date: 4/15/13

APPROVED:  
Content: *MB*  
Legal: *MB*  
Deputy PS/AM: *MB*  
General Counsel: *MB*  
Executive: *MB*

**GUADALUPE-BLANCO RIVER AUTHORITY**

By: *William (Bill) E. West, Jr.*  
WILLIAM (BILL) E. WEST, JR.  
General Manager, GBRA

Date: 4/10/2013

# **Guadalupe Blanco River Authority Integrated Water and Power Project Feasibility Study Work Plan October 4, 2013**

## **Purpose**

This Feasibility Study Work Plan describes management, stakeholder coordination, and technical tasks required to conduct a Feasibility Study (FS) and prepare a Feasibility Study Report (FR) for a Regional South Central Texas Integrated Water and Power Project (IWPP). This version of the Work Plan was prepared through coordination between MWH, GBRA and study partners on the range of technical studies and stakeholder activities to be completed and to identify priorities for initial efforts in the FS. This Work Plan provides sufficient detail for a framework that will be used to develop Statement of Work (SOW) descriptions for task orders, and will be updated as each SOW is prepared to provide a master document during the preparation of the FS.

## **Background**

South Central Texas is one of the fastest growing regions in the nation. Continued economic growth will rely on the timely development of sustainable and affordable water supplies. Through the State Water Planning process, regional water entities have identified a need for approximately 800 thousand acre-feet per year (TAF/yr) of additional water supply for the region by the year 2060 and nearly half of that amount will be needed by the year 2030. To address this need, regional water entities have identified portfolio of potential water supply solutions that include additional and expanded conservation, increased use of potable groundwater, development of brackish groundwater, and greater reliance on surface water resources in the region. The Guadalupe Blanco River Authority (GBRA) is concerned that this approach may not be sufficient to adequately meet regional water needs. Many existing water supply resources in the region are approaching or have surpassed sustainable development limits; development of large-scale groundwater projects may be constrained by permitting requirements; the reliability of some existing surface water supplies is threatened by ongoing litigation regarding environmental flow requirements, and the ability to import new surface water supplies from other regions will be constrained by Texas basin transfer requirements. Regardless of the source of new water supplies to region, additional power resources will be needed to support growth-driven demands, including energy requirements for water treatment, conveyance, and distribution.

GBRA was established by the Texas Legislature in 1933 under the Constitution of Texas as a water conservation and reclamation district and a public corporation called the Guadalupe River Authority. In 1935, it was reauthorized by an act of the Texas Legislature as the Guadalupe-Blanco River Authority. GBRA provides stewardship for the water resources in its ten-county statutory district, which begins near the headwaters of the Guadalupe and Blanco Rivers, ends at San Antonio Bay, and includes Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Calhoun and Refugio counties.

GBRA carefully coordinates its planning and resource development efforts within the broader consideration of regional and statewide water needs in order to fulfill its primary responsibilities of

developing, conserving and protecting the water resources of the Guadalupe River Basin. In recognition of the need to secure sustainable water supplies and the important nexus between water and power requirements, GBRA, in cooperation with the University of Texas at San Antonio (UTSA) and the Texas General Land Office (GLO) have developed an initial concept for a Regional South Central Texas Integrated Water and Power (IWPP) that could involve a co-located sea water desalination plant and thermal power generation plant along the Gulf Coast and water transmission facilities to deliver water to regional water users. As currently envisioned, the IWPP would be designed to meet a significant portion of the projected water needs of the South Central Texas region through 2060 while also addressing the power needs of the project, and potentially providing additional power that could generate revenue to help offset project costs. The project would likely be implemented in phases as water demands grow and power generation increments are economically justified. When complete, the ultimate project may include a seawater desalination plant with a capacity of 250 million gallons per day (MGD) and a power generation plant with a capacity of 3,000 megawatts (MW).

Support of a wide array of stakeholders, including elected officials, will be crucial for successful development of the IWPP. Because of the potentially controversial nature of such a project, as well as the complexities surrounding the development of large-scale projects, an integrated stakeholder consultation and engagement strategy will be implemented throughout project planning and development.

### **Objective of the Feasibility Study**

This FS is the first step in development of the IWPP. The objective of the FS is to establish a business case for a regional IWPP and demonstrate project viability to key stakeholders. It will provide sufficient technical and financial information to promote regional support and establish partnerships for the IWPP. The FS also will be developed to provide information that would help secure additional funding to continue project development into subsequent project development phases.

The State Water Plan identifies seawater desalination as a strategy to be implemented several decades in the future after other strategies and projects have been developed. The IWPP FW will consider how seawater desalination could provide a highly reliable water supply as an alternative to or supplement to other planned projects in the region. Accordingly, the FW will consider the potential for large scale brackish groundwater development in the region, and the potential to integrate brackish groundwater development with the IWPP.

The initial tasks in the FS will include identification and preliminary evaluation of several sites for potential development of water treatment and power generation facilities, and necessary water and power transmission infrastructure to interconnect at regional delivery points.

### **Approach to the Feasibility Study**

The FS will involve the execution of several technical tasks, which will be supported with project management and stakeholder engagement actions. Throughout the duration of the FS, MWH will provide project management and team coordination activities, including regular communication with GBRA and study partners on study status, direction, and findings. Project management functions are addressed in Task 1. MWH will assist GBRA in a stakeholder engagement program that will address the following objectives: consistent communication and messaging about the need for and scope of the



project; establishment of partnerships for the FS and subsequent project development activities; obtaining funding for the FS and continued project development; and updates about the FS status and findings. Stakeholder engagement is addressed in Task 2.

Technical work will be conducted in a phased approach, with multiple sub-tasks defined under four primary tasks. Technical information will be developed in parallel with the stakeholder engagement program, which will be used to help identify potential areas of focus to be addressed as the study progresses. The four primary technical tasks include:

- Establish the Planning Framework (Task 3) - this task will provide foundational information to guide the FS. Much of the information developed in this phase will form the basis for technical and stakeholder activities that will be conducted during subsequent phases of the FS.
- Develop Water and Power Options (Task 4) – this task will focus on the development and evaluation of water and power options that can be used in the subsequent formulation of alternatives, and the evaluation of candidate sites.
- Development and Evaluate Water and Power Alternatives (Task 5) – this task will use information developed in Tasks 3 and 4 to assemble alternatives that can meet the objectives of the IWPP. Alternatives will be formulated to highlight important tradeoff considerations, such as centralized vs. de-centralized (single site vs. multiple site) water treatment facilities, phasing and timing of the IWPP, power supply to the project (co-located or remotely located) vs. market-based power solutions, potential for additional power generation, and other considerations identified during the FS process.
- Prepare the Feasibility Study Report (Task 6) – this task includes preparation of the Draft and Final Feasibility Reports, and will include evaluation and comparison of alternatives, discussion of financing and governance options, and preparation of a summary report. The Feasibility Report will be written concisely and will reference appendices that provide more detailed information, including technical memoranda or other reports prepared in earlier phases.

It is expected that as information is developed and provided to stakeholders, some technical tasks may require iteration or revision to provide modified focus or greater detail in response to suggestions or requests by stakeholders or to include new information. Technical work will be performed by MWH with review and guidance provided by GBRA and study partners. Each technical task involves preparation of deliverables, as listed in the task description.

Throughout execution of the FS, MWH will maintain a global perspective, bringing insights regarding other desalination projects around the world and applying lessons learned where relevant to address issues regarding the IWPP.

### **Task 1 - Project Management and Study Coordination**

The objective of this task is to develop and implement the appropriate management procedures and actions to facilitate timely and cost-effective delivery of quality services and products to GBRA. This task includes project monitoring and administration and project quality assurance/quality control (QA/QC) activities. The scope of this task assumes a 15 to 18 month project schedule for completion of the Feasibility Study (FS).

## **Task 1.1 - Project Management**

### ***Obligations of MWH***

MWH will provide management and oversight of all MWH project staff and subconsultants in accordance with a Project Management Plan (PMP) to be developed for this project. MWH will review and monitor project budget and progress on a regular basis, and allocate resources to meet project objectives based on this Study Work Plan and task order Scopes of Work, and will perform necessary project controls activities to accomplish day-to-day management of the work.

MWH will establish and maintain cost tracking consistent with the work breakdown structure established in the PMP to track Project costs in accordance with the Agreement. MWH will prepare and submit monthly invoices to the GBRA in accordance with the Agreement.

### ***Obligations of GBRA***

In addition to the services to be performed by GBRA as indicated in the master services agreement, GBRA will provide the following:

- Assign a single point of contact to serve as the GBRA Project Manager with MWH.
- Participate in regular progress meetings with MWH (either face-to-face or by call) as mutually agreed to and scheduled.
- Provide GBRA and study partner written comments on deliverables to MWH. Comment response times will be mutually agreed upon by MWH and GBRA based on the complexity of the document to be reviewed and the level of review expected. Review times will be selected to balance the time needed for appropriate review with overall schedule objectives of the FS.
- Communicate (by meeting, call or e-mail) with MWH to discuss GBRA and study partner comments. MWH will prepare meeting summaries to document decisions and directives from these meetings.
- Coordinate and schedule GBRA staff for participation in meetings and document review.
- Provide MWH with all of applicable information and technical data in the GBRA's possession or control (electronic and hardcopy form, as available) required for the proper performance of the project.
- Allow MWH to coordinate with GBRA public relations staff and consultants under contract by GBRA as needed.

### ***Task 1.1.1 Project Management Plan***

MWH will prepare a Project Management Plan (PMP) which will be applicable to all tasks completed in preparation of the FS. The initial version of the PMP will be prepared as an identified task in a task order. MWH will provide GBRA a draft PMP for review, and incorporate responses to comments from GBRA prior to issuance of a final PMP for the task order. As part of the PMP preparation, MWH will prepare a detailed Work Breakdown Structure (WBS) for each task order showing the elements of project work, work packages, and duration. The PMP will be modified, as necessary, as part of subsequent task orders to reflect work breakdown and any unique requirements for the task order that were not already addressed in previous versions of the PMP. The PMP will include:

- GBRA and Study Partner expectations
- Scope of Work
- Team Organization and Responsibilities

- Invoicing Procedures
- Work Plan
- Baseline Schedule
- Progress Reporting Procedures
- Quality Plan
- Health and Safety Plan (HASP)
- Communications Plan
- Document Control Plan
- Change Management Procedures

The PMP will include a project HASP that will identify and address potential hazards to the MWH and subconsultant staff during the planning and conceptual engineering phases of the IWPP. The HASP will address potential hazards that could be encountered during field investigative activities.

Deliverables prepared by MWH will be in accordance with MWH quality management procedures, as described in the Quality Plan (QP) portion of the PMP. The QP for the project will identify procedures, compliance methods, lines of communications and responsibilities, methods of checking and correcting the work, formats and procedures for responding to GBRA comments on deliverables, and record keeping requirements. The QP will also identify personnel and schedules to complete QA/QC reviews of the work and deliverables. The QP will include the following elements:

- Organization chart showing authority, lines of communications, and control functions
- The names, duties and responsibilities and authorities of each quality control reviewer
- Procedures for preparation and checking of deliverables and correcting the work
- Compliance methods
- Deliverable submittal review check lists
- Procedures for subconsultants
- Reporting and documentation procedures, including proposed reporting formats.

### **Subtask 1.2 – Management and Oversight of Consulting Team**

The objective of this task is to provide project controls, consisting of scheduling, cost control, document control, and progress reporting to facilitate successful performance as measured by quality, cost, and schedule.

#### ***Subtask 1.2.1 – Project Management and Support***

MWH will provide management and oversight of all in-house project personnel and subconsultants. This subtask will also include the provision of administrative support in the MWH office for the duration of the Project. MWH will review and monitor project budget and progress on a regular basis, including management of MWH in-house and subconsultant activities. MWH will allocate resources to meet project objectives based on this Study Work Plan and Scopes of Work, and will perform necessary project controls activities to accomplish day to day management of the work.

#### ***Deliverables***

1. *Draft and final version of PMP (PDF format)*

### ***Subtask 1.2.2 – Project Accounting and Status Reporting***

MWH will establish and maintain a Project accounting system to organize and track Project costs in accordance with the Agreement and the WBS. MWH will prepare and submit electronic (Adobe Acrobat format) invoices monthly to GBRA in accordance with the Agreement.

Monthly project progress status reports (Adobe Acrobat format) will be prepared and delivered to GBRA to support the monthly invoices. Monthly progress reports will include narrative summaries of the work performed through the most recent month, planned activities for the upcoming month, items requiring resolution or decisions by GBRA, issues/concerns, information needs, and performance schedule update, including actual start and completion dates and remaining duration for each activity.

#### ***Deliverables***

- 1. Monthly invoices (Adobe Acrobat format)*
- 2. Monthly project progress status reports (Adobe Acrobat format)*

### ***Subtask 1.3 – Prepare and Maintain Study Work Plan and FS Schedule***

MWH will prepare and maintain this Study Work Plan and schedule that provides descriptions of work elements to be completed for the FS. The Study Work Plan will be developed as a comprehensive document, identifying all anticipated tasks to be performed for the FS. This will be a living document that will be modified as needed during the performance of the FS to adjust task priorities or level of detail and to add or drop tasks. Task descriptions in this Study Work Plan will serve as the basis for developing detailed scopes of work for task orders or amendments for performance of tasks for the FS. The Study Work Plan will be updated with detailed SOW language as each task order is issued in order to maintain a consistent and central record of FS activities.

MWH will develop and maintain a project schedule for all 4 phases of the FS. The FS schedule will identify the major activities for the FS (task and subtask level activities). The FS schedule will be updated monthly and revised, as needed, to incorporate updates to the technical tasks. The project schedule will be prepared using Primavera P6 software and delivered electronically to GBRA in Adobe Acrobat format.

#### ***Deliverables***

- 1. Draft and final Study Work Plan (Adobe Acrobat format)*
- 2. Draft and final versions of Baseline FS Schedule*
- 3. Monthly updates of FS Schedule (also included with invoice)*

### ***Task 1.4 – Prepare Project Development Schedule***

MWH will develop and maintain an overall project implementation schedule, which will identify major activities that would follow the Feasibility Study. The level of detail shown on the schedule will be sufficient to identify key elements of project development activities (planning, permitting, agreements, acquisition, financing, and construction), their approximate durations, and relationships between activities. It will be of sufficient detail to identify critical path items that will influence the overall project development timeframe. The project development schedule will be updated during the performance of technical tasks in support of stakeholder engagement needs and for inclusion in milestone documents.

## *Deliverables*

1. *IWPP Implementation Schedule (Adobe Acrobat format)*
2. *Milestone updates of IWPP Implementation Schedule*

### **Task 1.5 – Study Coordination**

Preparation of the IWPP FS will involve the coordinated activities of a large and diverse team including GBRA, study partners, the MWH Team, and other consultants under contract to GBRA or study partners. This task will support coordination among all project participants and through structured processes that provide clarity on the roles, responsibilities and accountabilities for each team member. Formal project coordination will occur primarily through two leadership groups: an Executive Leadership Team (ELT) to guide the overall direction of the study; and a Study Management Team (SMT). Additional coordination will occur through sub-groups focused on communications, stakeholder engagement, and information management. Ad hoc coordination also will occur for specific task assignments as needed. A secure digital repository (Sharepoint Site) will be established to store documents and facilitate review and sharing of information among team members.

#### ***Task 1.5.1 - Executive Leadership Team Coordination***

The Executive Leadership Team (ELT) will provide strategic guidance on the direction of the FS and review proposed approaches, results of technical work, and findings. It will be established and led by GBRA, and will include representatives from GBRA, GLO, UTSA, TWDB, and other entities as identified by GBRA.

#### ***ELT Workshops***

ELT guidance and review of the FS will occur through a series of structured workshops to be held during or at the completion of study phases to review findings and discuss planned activities. MWH will facilitate the workshops and present findings of completed work, planned approaches, and recommendations. The primary purposes of the workshops will be to confirm assumptions, discuss technical approaches and findings, obtain feedback on technical reports and milestone documents, and coordinate key strategies and tactics for stakeholder engagement. At present, four workshops are anticipated, as described below; however additional workshops may be scheduled if considered necessary by GBRA and the ELT.

- **Workshop #1** will focus on the planning framework, and will include discussion of the study area, study objectives, the planning horizon, assumptions about the without-project conditions, initial sites for consideration, and evaluation criteria to be used for site screening and evaluation of alternatives.
- **Workshop #2** will include review of the results of several technical studies regarding site evaluations and water and power facility options. It will also include identification of initial alternatives, verification of alternatives evaluation criteria and assignments of weighting factors for evaluation criteria.
- **Workshop #3** will cover the evaluation and ranking of alternatives and will include a discussion on implementation issues, including financing and governance options.
- **Workshop # 4** will address comments provided by GBRA and study partners on the Draft Feasibility Report and help determine next steps for Project development.

### ***Deliverables***

1. *Presentation and other review materials for 4 workshops*
2. *Workshop summaries (provided within 1 week following each workshop)*

### ***Task 1.5.2 - Study Management Team Coordination***

GBRA will establish a Study Management Team (SMT), which will provide technical and contractual direction to MWH through regular coordination. Throughout the execution of the contract, the SMT will meet through conference calls or in-person on a bi-weekly basis to review progress and plan for upcoming activities. In addition to the MWH project manager, it is expected that technical personnel will participate in SMT meetings as needed to provide status reports regarding ongoing tasks to the SMT. MWH will provide brief meeting summaries for all SMT meetings to GBRA within a week following each meeting.

### ***Deliverables***

1. *SMT Meeting summaries (provided within 1 week following each SMT meeting)*

### ***Task 1.5.3 – Establish and Maintain Project Team Web Portal***

MWH will develop, host, and maintain a project-specific password-protected Sharepoint site for the IWPP FS for information-sharing among IWPP team members and project teams. The format and function of this site will be determined and modified as needed based on input from GBRA, study partners, MWH technical team leads. Access will be provided to all SMT and ELT members, and other individuals requested by GBRA. The Sharepoint site will be used to store a variety of relevant information to the FS, including past studies and reference materials, meeting agendas and summaries, documents prepared in support of the FS, public outreach materials (frequently asked questions, presentations, brochures, etc.), a project calendar, and other relevant information as determined by the study team. The Sharepoint site will be used to disseminate review versions of deliverables to SMT and ELT members and store review versions and compiled comments. The Sharepoint will be hosted on an independent server managed by MWH.

### ***Deliverables***

1. *Develop, administer, and maintain Sharepoint Site for duration of IWPP FS.*

## **Task 2 – Stakeholder Engagement**

An IWPP in South Central Texas will have far-reaching economic, social, and environmental effects throughout the region, making early and sustained engagement of stakeholders vital to its success. In coordination with GBRA and study partners, MWH will develop and implement a stakeholder communication and engagement plan (Stakeholder Plan) for the IWPP. The Stakeholder Plan will identify key stakeholders, including possible partners and/or customers among others, and describe tactics to actively engage them during the FS.

The stakeholder engagements strategy will be linked to the performance of technical tasks, allowing stakeholder communication to be coordinated with the availability of information. The stakeholder strategy will be developed to encourage all identified stakeholders to participate in the IWPP FS and provide feedback in a manner that is appropriate for their level of involvement. This approach will help

ensure that the project team can consider and incorporate, as appropriate, the needs and interests of various stakeholder priorities throughout the FS.

### ***Task 2.1 – Stakeholder Engagement Plan***

A stakeholder is an individual or organization that has an interest in, can influence perceptions, or can be positively or negatively impacted by the IWPP. Stakeholders can include elected officials, public agencies, non-governmental organizations, business groups, community organizations, and individuals. A stakeholder engagement plan will identify and evaluate potential stakeholders and define strategies for engagement and communication regarding the IWPP.

The initial objective of stakeholder engagement is to raise awareness of the need for a regional water supply, communicate the long-term vision for the IWPP, and identify viewpoints held by key stakeholders. Early stakeholder engagement during the FS will help to ensure that project messages are delivered and received in a consistent manner. Messages that are communicated first (or early) are the messages that are sustained, especially for large, multi-year projects that involve many different stakeholders. Early involvement helps assure the right messages are delivered to the right groups of people and entities to sufficiently and appropriately define the project.

MWH will develop a stakeholder engagement plan for the IWPP in coordination with GBRA. A primary goal of stakeholder engagement will be to empower potential water and energy partners to speak openly about the IWPP project and their concerns as the FS progresses. The stakeholder engagement plan will be developed through a two-step approach; identification and analysis of stakeholders; and preparation of a plan.

#### ***Task 2.1.1 - Identify and Assess Stakeholders***

Stakeholders are individuals or organizations that have may influence opinions and/or decisions about a project. MWH will identify key stakeholders that could have an influence the development of the IWPP and will prepare summary information about their interests and concerns for a registry that will be maintained through the duration of the FS. Stakeholders to be identified include a broad range of entities, including potential partners or customers, regulatory agencies, financiers, and a large group of interested parties that may advocate in favor of or in opposition to a project.

In coordination with GBRA and study partners, MWH will identify, classify and prioritize stakeholders for engagement during the FS. For each stakeholder, MWH will compile information related to their background and stated purpose (if available), points of contact, known past or current positions regarding water and power development, and relevant information about their interest and/or possible involvement in the IWPP. The stakeholder registry also will describe how each stakeholder could influence and/or be impacted by the IWPP and generally identify their level of influence. Using this information, MWH will identify expected or likely viewpoints on various issues relevant to IWPP development. This information will be used in developing appropriate strategies and timing to gauge stakeholder interest and to respond to potential concerns regarding the IWPP.

It is expected that initial stakeholder groupings will be based, in part, on degree of support or interest in participation. For example, entities that are strongly supportive of the IWPP concept and perceive it to be highly beneficial to themselves and the region will be identified. Similarly, entities that may have

strong reservations about the IWPP concept will be grouped. These and other groupings will be used to identify common viewpoints or concerns, which will be then used to develop consistent messages and communications strategies.

IWPP stakeholders may include organizations and individuals in the following categories.

- GBRA and study partner organization staff
- Regional water providers in and around the GBRA service area
- Large industry in and around the GBRA service area, particularly along the Gulf Coast
- Communities in and around the GBRA service area
- Power providers in and around the GBRA service area
- ERCOT
- Local, State, and Federal elected officials
- State and Federal regulatory agencies, including but not limited to TWDB, TCEQ, USACE, USFWS
- Groundwater Conservation Districts
- Non-governmental organizations (NGOs)
- Community and business organizations
- Academic institutions, including oceanographic/marine studies institutes
- Other stakeholders identified by GBRA during this FS

### *Deliverables*

1. *Stakeholder registry with information about key identified stakeholders*
2. *Facilitation of at least two meetings with the ELT to identify and assess stakeholders*

### **Task 2.1.2 – Prepare Stakeholder Engagement Plan**

MWH will prepare a Stakeholder Engagement Plan that presents the stakeholder analysis prepared in Task 2.1.1 and describes strategies to engage stakeholders and address their concerns in the best interests of GBRA and study partners. The Stakeholder Engagement Plan will address the following objectives:

- **Clear objectives.** The broad objectives of the plan will be to identify the stakeholders in order to obtain stakeholder feedback on analysis, alternatives and decisions.
- **Robust stakeholder analysis.** Clear consideration of who should be consulted, aiming to be inclusive.
- **Realistic constraints and opportunities.** A clear understanding of the environment allows for realistic objectives and approaches to be put in place, including prioritizing stakeholder outreach actions.
- **Timely communication.** Good communication takes time, and ideally communication with stakeholders commences at project inception and is continued throughout the project planning, implementation and operation. The plan will identify appropriate tools and tactics to establish and maintain communication with each stakeholder.
- **Continuous improvement.** An improvement process to modify the approach as necessary along the way.



- **Defined responsibilities.** Stakeholder engagement and communications will be accomplished through the combined and coordinated efforts of GBRA, study partners, and MWH. The Stakeholder Engagement Plan will describe how this integrated team will function to take maximum advantage of existing communications infrastructure and protocols.

Stakeholder engagement tactics may involve a variety of communication methods and tools including printed materials (newsletters, direct mail), electronic communications (online newsletter, project website), social media (Facebook, Twitter), in-person meetings, and other approaches. The Stakeholder Engagement Plan will describe the following outreach tactics:

- A project public website;
- Use of social media;
- Attendance and/or presentations at local public meetings, workshops and/or advisory boards;
- Attendance and/or presentation at professional association meetings;
- Stakeholder Briefing Packet that provides general information on the need for and details of the IWPP, project schedule, frequently asked questions, and other relevant information;
- Collateral material, such as direct mailers or door hangers; print and TV ads;
- Methods to utilize GBRA and other partner communications expertise to the greatest extent practicable;
- Methods to communicate complex technical issues for non-technical audiences, such as 3-D visualizations or other techniques that effectively simplify the presentation of technical information.
- Methods to provide public outreach materials in both English and Spanish;
- Media Communications
  - Outreach to local newspapers (e.g. Austin American-Statesmen and San Antonio Express- News) including community guest column, editorial board meetings, and desk-side briefings;
  - Outreach to surrounding community papers (e.g. Port Lavaca Wave, Jackson County Herald-Tribune, Refugio County Press, Rockport Pilot, Corpus Christi Caller Times);
  - Outreach to the local television outlets;
  - Outreach to Spanish language outlets (e.g. ReVista de Victoria, KUNU, KVTX, KHMC, and KNGT)

### **Task 2.2 - Stakeholder Outreach Support**

This scope of this task and the associated responsibilities of GBRA, study partners and MWH will be defined in the Stakeholder Engagement Plan. It is expected that MWH will support GBRA and study partners in implementing the Stakeholder Engagement Plan in several areas, including coordinating and participating in meetings with stakeholders, preparing communications materials for public distribution and posting on the project web-site, participating in stakeholder strategy meetings with GBRA and study partners, maintaining the stakeholder registry, and other coordination tasks as identified in the Plan.

It also is expected that most media communications will be handled by GBRA; however MWH or MWH subconsultants may be involved in developing materials for targeted communications. Similarly, the

project public web-site will be hosted by GBRA and MWH will provide guidance and suggestions on layout and design and much of the content.

### **Task 3 – Establish the Planning Framework**

The Planning Framework includes tasks that provide foundational information to guide the FS. Much of the information developed in this task will form the basis for technical and stakeholder activities that will be conducted during subsequent phases of the FS. It includes:

- Define the study area
- Compile relevant information (previous studies and available technical data)
- Summarize existing and projected power market conditions
- Describe the without project condition (basis of comparison for IWPP alternatives)
- Develop water demand scenarios
- Identify initial sites
- Prepare environmental compliance strategy

#### **Task 3.1 - Define the Study Area**

GBRA provides stewardship for the water resources in a 10-county region that extends more than 200 miles from the headwaters of the Guadalupe and Blanco Rivers to San Antonio Bay. Most of GBRA's current customers are in the upper portion of the Guadalupe River Basin. The IWPP will include infrastructure and may serve water, and potentially power, to areas outside of the GBRA service area.

MWH will coordinate with GBRA and partners to define the study area. Criteria to be considered include locations of potential water intake/outfall and water treatment sites; service areas of potential partners; potential conveyance and transmission corridors; areas of potential groundwater development; GLO land assets; and other potential factors identified.

#### **Task 3.2 - Compile Existing Information**

MWH will compile relevant existing information to support the FS from existing reports, GBRA or other partners, and publically-available databases. Existing reports from previous studies for water or power infrastructure development will be used to identify several items in subsequent tasks, including potential site locations, potential conveyance alignments, refine water demand estimates, describe the without-project conditions (what would the future look like without the IWPP), and potential issues of concern that would need to be addressed regarding water and/or power facility development in the region. Sources to be consulted include:

- Reports and information on existing and planned water infrastructure in the region
- Reports regarding water development and treatment, both surface water and groundwater, prepared by regulatory agencies, such as EPA, TCEQ, TWDB or others
- Previous feasibility studies and pilot test for desalination in Texas
- Prior generation site studies in the region
- Electrical system reports prepared by ERCOT or other entities

MWH will compile relevant technical information and data for the study area from the existing reports and publically available data bases. Information will be compiled as needed to support description of the without project conditions, development of water demand scenarios, and formulation and

evaluation of alternatives in the FS. Information will be compiled for a wide array of issues, including but not limited to:

- Existing and projected water demands in the study area
- Land ownership, including State (GLO) owned land
- Existing intakes in the study area
- GLO energy assets
- Gulf and Bay bathymetry
- Gulf and Bay water quality
- Existing and planned electric transmission lines
- Existing and planned natural gas pipelines
- Significant known historic and archaeological sites
- Known locations of sensitive species, including listed threatened and endangered species
- National wetland Inventory of mapped wetland areas
- Other environmental resources
- Geological hazard areas, air quality permit constraint areas
- Topographic and geologic maps
- Flood plains
- Cultural resources
- Archaeological resources
- Developing gas fields (Eagle Ford Shale)
- Locations and characteristics of groundwater resources
- GBRA Water Rights

### **Task 3.3 – Describe Existing and Projected Power Market Conditions**

MWH will prepare a technical memorandum on electricity energy conditions in Texas with emphasis, where relevant, on conditions in the study area. The TM will include a summary of existing and projected energy market conditions in Texas and the study area, an inventory of power transmission facilities and available capacity, locations of existing, planned new, and planned retirements of power generation facilities, and anticipated or potential major market changes such as the development of a forward capacity requirement or significant increases to the system-wide offer cap in the wholesale market. It also will discuss issues to be considered in developing a project to sell excess power in the ERCOT market. In preparing the TM, MWH will coordinate with ERCOT and stakeholder participants in the study, which may include regional entities such as CPS Energy, Austin Energy, LCRA, co-ops, and other parties.

### **Task 3.4 – Define the Without Project Conditions**

The without project conditions, or the no action alternative, will form the basis of comparison for IWPP alternatives. The without project condition will be developed using readily available information, such as population, water demand, end energy demand projections prepared by TWDB and ERCOT. Description of the without project condition will begin with existing facilities, policies and laws and will add the effects of projects and actions that are foreseeable and certain. Projects that have, or are likely to receive, permits and funding, such as the GBRA Mid-Basin Project, would be considered part of the without project condition. Projects in the study area will be reviewed to identify the timing of their implementation, their potential to obtain permits and funding, and the likely effect they will have on regional water supplies and power demands. This evaluation will be qualitative and will be based on readily available information.

The potential for groundwater project development in the region, particularly brackish groundwater, will be considered in developing the without project conditions. **MAY NEED TO EXPAND HOW THIS WILL BE DONE.** Other factors to be considered include industrial expansion plans, regional development of other major regional infrastructure (such as ports, rail, or road transportation) and potential changes in policies, laws, or regulations that would affect the development and management of water and power resources.

### **Task 3.5 – Develop Water Demand Scenarios**

The IWPP will focus on development of a seawater desalination plant and power facilities primarily using the Gulf of Mexico as a water source. The integration of the IWPP to the region, however, may involve development of other water resources or changes in the management of existing water resources. Potential other regional water sources could include existing GBRA rights, fresh and brackish groundwater, and surface water supplies that are not allocated or underutilized.

In coordination with GBRA and their partners, MWH will develop a series of demand projections that represent a reasonable range of scenarios based on a potential timing, combinations of potential partners, and water users. Water demand data will be derived from the State Water Plan and supplemented with additional readily-available information regarding water demands for specific uses, such as the Eagle Ford Shale development or information provided by GBRA, their partners, or potential partners.

Temporal and spatial relationships will be developed to highlight where and when demands are projected to occur in the study area over time. Monthly demand patterns and peaking factors will be developed for potential connection points for average and dry year conditions. Ratios of historical peak daily to average monthly water demand will be developed for input to sizing of pipelines, pump stations, and reservoirs in subsequent tasks. The analysis also will consider the likely long-term role of conservation such as reduced per capita use due to outdoor watering conservation and resulting demand hardening.

A series of water demand scenarios and water management strategies that could be applied to integrate seawater desalination to regional water plans will be described. For example, delivery of desalinated seawater to coastal industrial water users could reduce their reliance on existing surface water deliveries and enable changes in management of surface water in the Guadalupe-Blanco River Basin. Other considerations may include the use of an IWPP to provide a stable water supply and/or a reliability back-stop against shortages that would occur with other planned projects in the region. In addition, the demand scenarios will consider development of brackish groundwater to either off-set exiting water demands or to provide a partial source of supply for the IWPP.

### **Task 3.6 - Select Initial Sites**

The FS will identify and evaluate potential sites for development of a seawater desalination plant with or without a co-located power facility. A two-step process will be applied to identify and evaluate potential sites. The first step is the identification of up to 20 candidate sites through review of previous studies, evaluation of regional data, input from GBRA and study partners, and suggestions from stakeholders. The second step is the feasibility evaluation of up to 5 initial sites, which is described in Task 4.

A set of general evaluation criteria will be used to evaluate candidate sites and select a group of initial sites that will be carried forward for feasibility evaluations. Initial sites will be evaluated using a more expanded set of criteria. Site selection and evaluation steps are described in the following sub-tasks.

### 3.6.1 – Establish Site Screening and Evaluation Criteria

In conjunction with GBRA and study partners, MWH will develop a set of criteria to be applied to evaluate and screen candidate and initial sites. Criteria and sub-criteria will be defined for application to candidate and initial sites. Criteria to be applied to candidate sites will be more generalized than criteria applied to initial sites. The list of site screening criteria will be defined to enable both qualitative and quantitative comparative evaluations, and will include a wide array of information relevant to development and operation of water and power facilities.

MWH will facilitate a ½-day workshop with GBRA and study partners to review and obtain concurrence on candidate and initial site screening criteria. Examples of criteria for application to candidate and/or initial sites include (to the extent that information is readily available for desktop review):

- Proximity to water source (open water, bay, inland)
- Proximity to fuel sources and transmission facilities for a power plant
- Proximity to population centers, industry, and infrastructure
- Proximity to existing and potential water delivery points
- Proximity to existing or planned water and power infrastructure
- Proximity to fuel and electrical transmission infrastructure
- Proximity to transportation infrastructure
- Bathymetry and topography
- Hydrodynamic conditions
- Water quality
- Navigation corridors
- Environmental resources (e.g. habitat, sensitive areas, fisheries, wetlands)
- Archeological and cultural resources
- Recreation
- Public access
- Soils considerations
- Hazardous materials
- Property size and type (e.g. public or private)
- Permit acquisition considerations
- Construction considerations for the site
- General pre-treatment requirements
- Other criteria as identified through the workshop

MWH will prepare and distribute an agenda and a preliminary site selection criteria TM one week prior to the screening criteria workshop, facilitate the workshop, prepare a meeting summary describing the outcome of the workshop, and prepare an updated site selection criteria TM. The workshop will be conducted either in person or as an internet-based live meeting.

### Deliverables

1. *Workshop agenda and materials (Adobe format)*
2. *Preliminary site selection criteria TM (Adobe format)*
3. *Workshop summary (Adobe format)*

#### 4. *Revised site selection criteria TM (Adobe format)*

### **Task 3.6.2 – Identify Candidate Sites**

Candidate site locations will be identified on a regional basis in consideration of candidate site screening criteria established in Task 3.1. In coordination with GBRA and study partners, MWH will identify up to 15 candidate sites to establish a representative set of locations for consideration in the FS.

Candidate site locations will be identified through review of previous studies, input from GBRA and study partners, and suggestions by stakeholders. Candidate sites will be identified in the general vicinity of the Gulf Coast from Corpus Christi to Freeport.

MWH will conduct a ½-day workshop with GBRA and study partners to review and obtain concurrence on the candidate site locations. In preparation for the workshop, MWH will distribute an agenda and descriptions of preliminary candidate site locations one week prior to the workshop. MWH will facilitate the workshop, formalize the outcome in the form of workshop minutes, and prepare candidate site descriptions.

#### ***Deliverables***

1. *Workshop agenda (Adobe format)*
2. *Preliminary candidate site descriptions (Adobe format)*
3. *Workshop minutes (Adobe format)*
4. *Candidate site descriptions (Adobe format)*

### **Task 3.6.3 – Screen Candidate Sites**

This subtask will apply the candidate site screening criteria developed in task 3.6.1 to evaluate up to 20 candidate sites identified in Task 3.6.2 and develop a “short-list” of up to five initial sites for continued consideration in the FS. The selection of initial sites is expected to be an iterative process that considers the attributes of individual sites, the geographic extent of the study area, regional water supply integration strategies for seawater desalination, and potential for co-located power facilities. To streamline this process, candidate sites with similar technical characteristics or in close proximity to each other may be grouped and cross-compared to select a set of representative initial sites

MWH will apply the candidate site screening criteria to evaluate candidate sites and prepare summary information for review by GBRA and study partners. Candidate site screening will combine high level qualitative methods using the screening criteria with a numeric type screening and ranking quantitative method to highlight differences between candidate sites. A numerical rating scale will be applied to each screening criterion and sites will be compared to create a normalized score for each criterion. In addition, relative weighting factors will be developed in coordination with GBRA and study partners to reflect relative levels of importance among screening criterion. In support of this task, MWH will develop a screening model that provides transparency to the basis for assigning evaluation criteria scores and weights.

Data to be used to support the screening process will be collected at the desktop level. Environmental and land use constraints for each site will be mapped utilizing readily available information using Geographic Information System (GIS) technology. Existing utilities, including existing and planned water

infrastructure, potential connection points of existing natural gas transmission lines and high-voltage electrical transmission lines, will be included.

The high-level environmental and land use data acquisition for each location site and constraints analysis will be obtained from readily available datasets and aerial photography. Fatal flaws regarding key environmental variables and permitting requirements will be identified for candidate sites.

The status of potential available electric transmission connections and potential natural gas fuel sources (gas pipelines / gas fields) will be obtained from available infrastructure databases. Environmental and land use constraints data will be obtained from (but not limited to) the following datasets.

- Aerial photography for constraints mapping will be used from NAIP 2010 or 2012(if available) for each location.
- Topographic and geological information will be obtained from United States Geological Survey (USGS) and University of Texas Bureau of Economic Geology.
- Soils information will be obtained from the Natural Resource Conservation Service (NRCS) Web Soil Survey or previous published soil surveys.
- The National Hydrology Dataset will be included to identify the rivers, streams and other surface waters.
- Floodplain data will be obtained from the Federal Emergency Management Administration.
- Mapped wetlands will be included from the US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) database.
- Essential fish habitats will be reviewed from the National Marine Fisheries Service (NMFS) dataset.
- Federal and state threatened and endangered species county lists and federally designated critical habitat will be reviewed for the county of each site location from USFWS, NMFS and Texas Parks and Wildlife Department (TPWD).
- Cultural resource data will be collected for existing historical and archeological site data from the Texas Historical Commission (THC), Texas Archeological Research Laboratory (TARL) and through additional literature review.
- Existing high-voltage electrical transmission lines and pipelines will be identified utilizing Ventex Inc. database. Aerial photograph confirmation of these features may be required and opportunities for connections will be evaluated.
- Land use features will be identified which includes agricultural areas, airports/airstrips, communication towers, parks and recreation areas, state parks, wildlife management areas and federal wildlife refuges from various sources and aerial photograph interpretation.
- Oil/gas well locations and pipelines will be reviewed from the Texas Railroad Commission database.
- Local Grid Conditions / Grid Connection Points / Electric Transmission Requirements will be obtained from available infrastructure databases.
- Potential Fuel Source Locations, Proposed & Existing Pipelines, Sizes/Capacities, Ownership will be obtained from available infrastructure databases.

The following assumptions apply to the level of detail to be developed in this task:

- No site visits will be conducted.
- No archeological or biological field surveys to acquire data will be conducted.
- County soil surveys and internet resources will be used for soils identification within the study area.
- Cultural resource records search include THC and TARL records and will be considered sensitive (not for public disclosure).
- Data will be collected from readily available sources and will be used for constraints mapping and potential environmental impacts analysis.

MWH will conduct a ½-day workshop with GBRA and study partners to review and the candidate site screening methodology and results. In preparation for the workshop, MWH will distribute an agenda and a written description of the screening approach and application to the candidate sites one week prior to the workshop. MWH will facilitate the workshop and formalize the outcome in the form of workshop minutes, and prepare revised candidate site screening results.

### ***Deliverables***

1. *Workshop agenda (Adobe format)*
2. *Preliminary candidate site screening results (Adobe format)*
3. *Workshop minutes (Adobe format)*
4. *Candidate site screening results including recommended initial sites (Adobe format)*

### **Subtask 3.6.4 – Site Screening Evaluation Technical Memorandum**

MWH will prepare a draft TM that summarizes the results of the initial site identification and evaluations described above. The TM will summarize work completed in Task 3.6, including descriptions of the screening criteria, candidate sites considered, the screening evaluation conducted, and the initial sites to be considered for further evaluation in the FS.

Major elements, such as intakes and outfalls, treatment works, and power generation facilities, and connections to fuel sources and transmission facilities will be shown for each initial site on general schematic diagrams. In addition, the TM will present an environmental and land use constraints map specific to each site location to graphically illustrate the existing environments and facility layout relative to existing infrastructure. For each initial site, the following information will be presented in the TM:

- Intake and outfall considerations, including tidal fluctuations, Bay and Gulf bathymetry, general water quality and seasonal or regional influences on water quality, marine navigation, biological and environmental considerations, such as fisheries preservation, commercial oyster beds, and brine dispersion.
- General locations for ocean water intakes and outfalls based on known water quality variability, species concerns, water depth, and other general factors
- Information regarding local electrical grid conditions in the vicinity of the site
- Locations of nearest grid connection points
- Environmental resources in the vicinity of the site, and potential issues that will need to be addressed through permitting
- Proximity to electrical network and nearest grid connection points,
- Potential power plant cooling sources



- Proximity to fuel sources, including potential gas supply sources based on a review of existing pipeline infrastructure (pipeline location, size, capacity, ownership), proposed pipelines and pipeline expansions (regulatory status, ownership, schedule, open seasons), and supply basins and storage opportunities. In addition, MWH will review approved tariffs, identify key shippers and pipeline capacity owners, and identify opportunistic fuel alternatives (refinery gas, offspec or low Btu gas, fuel oil).
- Environmental mapping,
- Topographical and geologic information,
- Flood plain characteristics
- Property ownership

The Initial Site Screening Evaluation TM will identify the capacity for full development of water and power features at each site, and potential constraints that could limit the level of development. In addition to considering these long-term operational effects, the evaluation will identify the most appropriate construction technique and identify the types of environment impacts that would result.

***Deliverables:***

1. *Draft Technical Memorandum – Site Screening Evaluation (Adobe Acrobat format)*
2. *Final Technical Memorandum – Site Screening Evaluation (Adobe Acrobat format)*

**Task 3.7 – Environmental Compliance and Permitting Strategy**

Numerous permits need to be considered or obtained in the development of seawater desalination plants, conveyance facilities, and power generation and transmission facilities. Power plant projects are subject to numerous federal, state, local, and industry regulations and requirements, and require some of the same permits as water treatment facilities. Power industry-specific regulations and requirements are governed by the permitting, registration, qualification, performance, and compliance oversight of the PUC, TCEQ, Texas Railroad Commission, ERCOT, and Texas Reliability Entity as well as certain federal regulations and requirements. Therefore, it is important to clearly identify applicable requirements in advance of the site selection process

The MWH Team will develop a TM that identifies the probable state and federal permits considered necessary for the construction and operation of a new power generation station (major facility) and associated facilities (transmission line and gas pipeline) within the coastal or near coastal region of the Central Texas coastline. The TM will summarize each state and federal regulatory agency permit, their requirements and anticipated permitting process timeframes for the different locations and cooling water configurations proposed for the project. The requirements and compliance strategies for each permit will be entered into a risk register that can be used throughout project development to highlight issues and indicate key dates for application filing and required completion. To the greatest extent possible, the TM will rely upon and reference the TWDB publication “Guidance Manual for Permitting Requirements in Texas for Desalination Facilities Using Reverse Osmosis Processes” dated November 23, 2004. Supplemental information will be prepared to describe requirements for permits not addressed in the TWDB report.

Primary federal regulatory agencies will be reviewing and/or permitting potential project impacts within numerous regulations provided under the Rivers and Harbors Act, Clean Air Act (CAA), Clean Water Act

(CWA), National Environmental Policy Act (NEPA), Endangered Species Act and others. The following federal agencies may have permitting actions and/or NEPA review responsibilities:

- United States Army Corps of Engineers (Section 10 and Section 404 Permits)
- National Marine Fisheries Service (Essential Fish Habitats, Threatened and Endangered Species and Impingement)
- United States Fish and Wildlife Service (Threatened and Endangered Species)
- Environmental Protection Agency (Review of CWA and CAA permits)

Primary state agencies reviewing and/or permitting potential project impacts include:

- Texas General Land Office (Submerged Lands Easements and Coastal Zone Consistency)
- Texas Parks and Wildlife Department (Threatened and Endangered Species and Habitat Assessment)
- Texas Commission of Environmental Quality (Water and Air Quality Permits and Waste/Wastewater Disposal Permits)
- Texas Historical Commission (Section 106 Review)
- Texas Department of Transportation (Road Crossing Permits)
- ERCOT (Review of Transmission Line Interconnect Request)
- Public Utility Commission of Texas - (Certificate of Convenience and Necessity)
- Texas Railroad Commission - (Pipeline and Hydrostatic Test)
- Primary local regulatory agencies reviewing or permitting potential project impacts include:
  - Local Groundwater Conservation Districts
  - Local Floodplain Administrators

#### ***Deliverables:***

1. *Draft Technical Memorandum – Environmental Compliance Strategy (Adobe Acrobat format)*
2. *Final Technical Memorandum – Environmental Compliance Strategy (Adobe Acrobat format)*

### **Task 4 – Develop Water and Power Options**

This task involves preparation of conceptual configurations, layouts, and preliminary cost estimates for major water and power features at up to five initial sites and interconnection to water and power infrastructure. Up to three representative sizes for water treatment and power generation facilities will be selected and applied to each site. Representative sizes will be defined as increments up to 250 MGD for desalination and 3,000 MW for power generation, or other specific sizes may be defined based on demand scenarios prepared in an earlier task.

#### **Task 4.1 - Evaluate Initial Sites**

For each initial site, major elements, such as intakes and outfalls, treatment works, and power generation facilities, and connections to fuel sources and transmission facilities will be shown on general schematic diagrams. All sites will be evaluated and scored using criteria developed as part of Task 3.1, modified as appropriate as the study progresses.

For each Initial Site, the following information will be developed and evaluated:

- Intake and outfall considerations, including tidal fluctuations, Bay and Gulf bathymetry, general water quality and seasonal or regional influences on water quality, marine navigation, biological and environmental considerations, such as fisheries preservation, commercial oyster beds, and brine dispersion.
- General locations for ocean water intakes and outfalls based on known water quality variability, species concerns, water depth, and other general factors
- Potential to develop other types of intakes, including, side-channel, submerged, slant wells, and other intake designs that may be suitable for the site.
- Information regarding local electrical grid conditions in the vicinity of the site.
- Locations of nearest grid connection points.
- Environmental resources in the vicinity of the site, and potential issues that will need to be addressed through permitting.
- Proximity to electrical network and nearest grid connection points.
- Potential power plant cooling sources.
- Proximity to fuel sources, including potential gas supply sources based on a review of existing pipeline infrastructure (pipeline location, size, capacity, ownership), proposed pipelines and pipeline expansions (regulatory status, ownership, schedule, open seasons), and supply basins and storage opportunities. In addition, MWH will review approved tariffs, identify key shippers and pipeline capacity owners, and identify opportunistic fuel alternatives (refinery gas, offspec or low Btu gas, fuel oil).
- Environmental mapping.
- Topographical and geologic information.
- Flood plain characteristics.
- Property ownership.

Evaluation of initial sites will also identify the capacity for full development of water and power features at each site, and potential constraints that could limit the level of development. In addition to considering long-term operational effects, the evaluation will identify the most appropriate construction technique and identify the types of environment impacts that would result.

#### **Task 4.2 – Prepare Conceptual Designs and Layouts**

This task will include the integrated evaluation of water treatment and power generation facilities at Initial Sites. It will include conceptual layouts will be prepared for seawater desalination plants and associated power plants for initial sites. The layouts will illustrate general process elements and identify approximate site size requirements, which will be used in site evaluation.

Generalized locations for ocean water intakes and outfalls will be identified based on known water quality variability, species of concerns, water depth, and other general factors. For each Initial Site, the MWH Team will identify permits that may be required and will prioritize those with the longest lead time or greatest potential risk, such as permits related to surface water intakes, surface water discharge (concentrate), and discharge of dredge/fill material into wetlands.

##### **Task 4.2.1 – Identify Water Needs**

For each Initial Site, the MWH Team will develop estimates of combined water needs for a variety of water treatment and power generation facility configurations. This task will include consideration all available cooling technologies such as once through cooling, evaporative cooling, dry cooling (air cooled

condensers), and hybrid cooling. Water needs will be developed for various sizes and types of power and water facilities, and this information will be used to guide sizing of plants and related facilities, such as intakes and outfalls.

#### ***Task 4.2.2 – Water Treatment Plant Layouts***

Seawater desalination plant layouts will be prepared for capacity ranging from 25 mgd to 250 mgd, or other sizes as determined in prior tasks. Key design criteria and conceptual layouts will be prepared using industry design tools and software to examine all major aspects of the water treatment plant design. Conceptual designs for desalination plants will include:

- Selection of water treatment technology, with consideration given to membrane and thermal processes. This may be supported with RO model simulations.
- Evaluation of disposal options, including open water discharge (with and without diffusers), deep injection wells, and other disposal options that may be suitable for the site.
- A water balance based on the treatment technology, and the potential for co-located power facilities.
- Identification of pre-treatment requirements.
- A process diagram indicating water flow rates for each treatment train and stage.
- Estimated salinity and flow rate of treated water (permeate).
- Estimated salinity and flow rate of concentrate brine.
- A plant layout showing the general position of major treatment works and equipment, and connection points to intakes, disposal facilities, and treated water conveyance.
- Estimated energy requirements.
- A high level narrative describing the power plant concept and the major features and systems for communication with project stakeholders.
- A preliminary capital cost estimate and operating cost profile, including energy cost estimates, to feed into the financial modeling and screening process.

#### ***Task 4.2.3 – Power Plant Layouts***

Power plant layouts will be prepared for generating capacity ranging from 500 MW to 3,000 MW. The need to evaluate larger sizes will be dependent on findings from earlier tasks that evaluate power provisions options. Key design criteria and conceptual layouts will be prepared using industry design tools and software to examine all major aspects of the power plant design. Conceptual designs for power plants will include:

- A heat and mass balance that encapsulates the power plant cycle and process and thermal integration (if applicable) between the desalination process and the power generation plant.
- A plant layout and terminal point drawing showing the general position of major equipment and the terminal points for major linears. Layouts will show provisions for expansion if appropriate.
- A single line electrical drawing showing the interconnection concept to the local power grid, the internal electrical power distribution concept for the power plant, and the integration of the desalination facility electrical loads and power plant auxiliary system loads.
- A single line electrical drawing showing transmission interconnections to the ERCOT grid.

- A high level narrative describing the power plant concept and the major features and systems for communication with project stakeholders.
- A preliminary capital cost estimate and operating cost profile, including fuel cost estimates, to feed into the financial modeling and screening process.

#### ***Task 4.2.4 – Refined Environmental Analysis***

The MWH Team will refine the environmental and land use data previously collected for each Initial Site and prepare a refined environmental and land use constraints map based on the water and power layouts prepared in tasks 4.2.1 and 4.2.2. Refined environmental data collection activities for each site will include:

- A natural heritage database search (Texas Natural Diversity Database) for known occurrences of threatened and endangered species and/or rare species or vegetation types.
- Vegetation types will be identified within the Candidate Site area based on available data.
- High probability areas for archeological and historical resources will be delineated on the constraints map to indicate the potential level of any future survey requirements.
- A field visit restricted to public viewpoints to confirm the environmental and land use constraints will be completed for each site.
- If readily available, property boundaries will be included on the constraints map.

The list of permit requirements for each Initial Site will be refined based on facility layouts and cooling strategies and processes. The need for additional studies required for each permit submittal, provide permit lead times, general schedules, general estimated costs to obtain permits, and inherent risks associated with each permit type also will be identified.

#### **4.3 – Evaluation of Initial Sites Technical Memorandum**

MWH will prepare a TM summarizing the results of evaluations performed in tasks 4.1 and 4.2. For each Initial Site, the TM will describe site characteristics; water and power options considered, environmental impact and permitting considerations, and preliminary construction and operating costs. **MAY NEED MORE DISCUSSION ON THIS.**

#### ***Deliverables:***

1. *Draft Technical Memorandum – Evaluation of Initial Site (Adobe Acrobat format)*
2. *Final Technical Memorandum – Evaluation of Initial Site (Adobe Acrobat format)*

#### **Task 4.4 – Review Groundwater Development Opportunities**

Groundwater is a significant water resource in the study area and its continued development and use will be a primary consideration in the FS. Regional entities have identified potential projects that would increase use of potable groundwater and develop brackish groundwater in the region. The primary locations for consideration of brackish groundwater development include the Carrizo-Wilcox and the Gulf Coast aquifers.

#### ***Task 4.4.1 – Identify Potential Groundwater Development***

MWH will compile information on the potential development of fresh and brackish groundwater projects in the study area, beginning with potential projects identified in the State Water Plan. This will be supplemented with information on groundwater yield and water quality in areas for potential

sustainable groundwater development. General locations of potential well fields will be identified with an estimate of the water supply that would be developed, and existing or projected demands that could be served will be identified.

#### ***Task 4.4.2 – Groundwater Facility Layouts***

MWH will develop concept-level infrastructure layouts for groundwater extraction and treatment facilities. Site layouts and cost estimates will be developed for extraction wells, treatment plants, brine disposal wells, and infrastructure to connect to water delivery systems and power sources. Environmental considerations identified through review of existing information will be characterized. Screening criteria will be applied to all options to enable an objective comparative review of brackish groundwater opportunities in the region.

#### ***Task 4.5 – Water Conveyance Alignment Studies***

MWH will identify and evaluate conceptual water conveyance alignments between Initial Sites and regional water system delivery points.

##### ***Task 4.5.1 – Identify Water Delivery Points***

Based on the information developed in Task 3, MWH will conduct one ½-day meeting with the GBRA and study partners to identify potential water delivery points. Capacity and sizing of infrastructure resources will be evaluated against the forecasted water needs. Existing and planned water transmission infrastructure that may influence potential water delivery points will be identified through coordination with GBRA, study partners, potential project partners, and other stakeholders.

##### ***Task 4.5.2 – Develop a Basic Network***

Locations of potential delivery points, with associated water demands, will be combined to establish a basic conveyance network configuration. MWH will also identify preliminary locations of facilities necessary to convey the water from the treatment site to the delivery points.

##### ***Task 4.5.3 - Develop Generalized Routes and Data***

MWH will develop up to 7 alternative pipeline alignment corridors using the basic network configuration from task 4.5.2. MWH will apply the screening criteria developed in previous tasks to rate and rank the candidate alignment corridors. High level quantitative method using the screening criteria will be combined with a numeric type screening and ranking method to identify key differences between corridor alternatives. Data for the screening process will be collected primarily at the desktop level (GIS type information), with some limited field investigation, if deemed appropriate. MWH will also develop Class 5 OPCCs, in accordance with AACEI, for each alignment corridor for input into the screening evaluation process.

##### ***Task 4.5.4 – Hydraulic Modeling***

MWH will apply a standard hydraulic modeling tool, such as H2ONET®, to conduct limited evaluations on the effects of the multiple inflow and discharge points on the sizing of the different segments of the conveyance system and identify preliminary pipe sizes that provide for operability and associated power savings. Redundancy and reliability requirements for the overall conveyance network will be considered in the preliminary sizing of the system.

### ***Task 4.5.5 – Identify System Elements***

Concurrent with the hydraulic modeling in Task 5.4.5, MWH will conduct limited analyses to identify other system elements such as pump stations and storage tanks at locations to minimize their number and capacity and reduce unnecessary costs to the project.

### ***Task 4.5.6 - Evaluate and Compare Conveyance Alignment Options***

MWH will input the information developed from tasks 4.5.1 through 4.5.5 into the MWH mPATH™ tool to define, quantify, score, and rank the pipeline alignment corridors. Evaluation criteria will be customized to suit GBRA and partner preferences and the project needs. Up to 10 criteria will be used to evaluate the pipeline corridor alternatives. These criteria may consist of (if information is readily available for desktop review):

1. Construction Impacts
2. Right-of-Way/Easement Requirements
3. Potential Existing Utility Impacts
4. Potential Public Impacts
5. Business/Commercial/Industrial Impacts
6. Environmental Impacts
7. Cultural/Archeological/Historical Impacts
8. Comparative Costs
9. Hydraulic Considerations
10. Construction Risks

A ½-day workshop will be used to review and obtain concurrence on the conveyance corridor screening criteria to utilize. The mPATH database will be developed to allow greater detail to be added as options are narrowed and the study progresses. To the extent possible, the workshop will be combined with other planned workshops to minimize costs.

Each alternative corridor will be compared to the other alternative corridors to create a normalized score for each criterion. A “short-list” of up to three conveyance alignment corridors will be developed, based on the outcome of the screening process that will be evaluated in greater detail in subsequent Phases.

## **Task 5 – FORMULATE AND EVALUATE ALTERNATIVES**

### ***Task 5.1 – Develop Alternatives***

Information developed Tasks 3 and 4 will be used to formulate a set of comprehensive alternatives to be evaluated in the Feasibility Report. Each alternative will be defined by the following information:

- Site location
- Intake and outfall locations
- Water demand scenario, which will identify potential partners
- Water treatment plant capacity (and phasing)
- Power provision (co-located plant, remotely located plant, renewables, energy market solution, or combination)

- Conveyance alignment
- Groundwater facilities, if any

To the extent possible, alternatives will be developed to demonstrate a range of Project implementation strategies or trade-offs, such as a single centralized water treatment plant versus multiple distributed plants, energy solutions, role of brackish groundwater, and other considerations identified during in coordination with GBRA and study partners or through stakeholder coordination.

Alternative formulation will begin with a set of specified water demands and a co-location site, and then combine water treatment, power generation, electrical transmission, and water conveyance options. For alternatives that involve groundwater and/or distributed water treatment facilities, conceptual conveyance alignments that connect local sources to delivery points will be identified and water demands for the seawater desalination plant will be adjusted accordingly.

### **Task 5.2 – Evaluate and Compare Alternatives**

MWH will apply weighting factors for evaluation criteria developed in coordination with GBRA and potential partners will be used to assist in alternatives comparison.

- Evaluate alternatives under water demand levels that reflect near-, mid-, and long-term projections.
- Prepare costs estimates for initial capital and annual operations and maintenance costs for all project features
- Identify potential Impacts to wetlands, aquatic habitat, vegetation, and other biological resources
- Identify geological, cultural, and archeological impacts at potential power generation and water treatment sites that could affect Project cost and the implementation schedule
- Identify the ability of regional transmission systems to accept power generated by the Project and provide power for water treatment and conveyance facilities.
- For co-located power generation and water treatment facilities, identify the effects to the water treatment plant in the event of a power generation facility shutdown.
- Prepare sensitivity analysis on key variables for alternatives.

### **Task 5.3 – Refine Alternatives**

Based on review comments from GBRA, study partners, and stakeholders, MWH will identify potential revisions to the initial alternatives, formulate a set of refined alternatives, and prepare a set of refined evaluation criteria. Revisions to initial alternatives could include adjustments to water demands and connection locations, modifications to alignments, the inclusion of renewable energy elements, changes in power plant type or size, considerations of financing and governance for Project implementation, and other factors.

#### **Task 5.3.1 – Define and Evaluate Refined Alternatives**

MWH will evaluate final alternatives for presentation in the Feasibility Report, and will the following information for each alternative:

- Water supply and power generation provided



- Environmental considerations, such as mitigation requirements and GHG emissions •  
Constructability considerations and potential recommendations, such as a phased approach to construction analysis
- Cost-benefit analysis, including both capital cost and long-term O&M costs
- Prepare renewables analysis costs and benefits
- Project financing recommendations/alternatives and governance structure considerations

#### **Task 5.4 – Develop Benefit/Cost Analysis**

A IWPP will provide considerable direct monetary benefits through power generation and avoided costs for other projects. The MWH Team will estimate power generation benefits using market forecasts for power valuation under various scenarios. Water benefits will be estimated based on avoided costs of implementing other water supply projects in the region, such as those identified in the State Water Plan. MWH will apply weighting factors developed in coordination with GBRA and study partners in earlier tasks to impacts, cost, and benefit criteria.

#### **Task 5.5 – Greenhouse Gas Emissions, Carbon Footprint, Alternative Energy**

Any proposed power plant would be subject to EPA’s New Source Review (NSR) permitting program for criteria pollutants and GHGs. MWH will identify best available control technology (BACT) levels for the proposed power plant equipment and identify requirements for an air permit application for submittal to TCEQ.

Using methodologies consistent with the EPA and procedures developed by the Intergovernmental Panel on Climate Change (IPCC), carbon footprints will be estimated by inventorying direct and indirect emissions of GHGs based on the assumed project life cycle and capacity factor of all processes and devices. As part of the carbon footprint analysis, MWH will identify and quantify carbon emissions from alternative sources of energy, including biomass, solar, wind, and other sources for a comparison of impact on overall project carbon footprint.

The total IWPP carbon footprint will be developed based on construction and operation of the entire water system and power plant. Determining the project’s carbon footprint will include inventorying the CO<sub>2</sub> emissions associated with all construction activities, devices, and materials for the seawater intake, processing and delivery of treated water to project partners, and the associated power plant construction and operation.

#### **Task 5.6 – Constructability**

Project features, including intakes and outfalls, water treatment and power plants, water conveyance facilities, and groundwater facilities, will be evaluated for their ability to be constructed in phases over time in response to projected demands. This assessment will help define financing requirements for initial and incremental project facility costs and identify the financing schedule for potential project partners. The evaluation will also be related to a number of issues including proximity to water supplies and access to roadways for construction access.

#### **Task 5.7 – Project Financing and Governance**

MWH will develop a broad scale financial model that draws inputs from all members of the project team and the project stakeholders. The financial model will incorporate the development cost, construction

estimates, operating cost estimates, and prospective cash flow forecast, providing for realistic timelines to execute the front end phases of the project(s). The model will allow the reader to evaluate water and power facility decisions separately, and as a unit, thus illustrating economies gained through integration of the desalination and power plant design.

MWH will prepare a cost analysis for each alternative and generally identify the allocation of costs to project partners. The Feasibility Report will discuss finance and governance issues that will need to be addressed, summarize options available to GBRA, and be presented during workshop 4.

### **Task 6 – Prepare Feasibility Report**

Through the performance of previous tasks described in this SOW, MWH will incorporate comments and revisions to technical memoranda, which will become appendices to the Feasibility Report. MWH will prepare a Feasibility Report as a summary document that describes the IWPP objectives, options, alternatives, and recommendations. An administrative draft Feasibility Report will be provided to GBRA and other study partners for review and comment. MWH will incorporate comments and provide a Draft Feasibility Report that will be suitable for distribution to potential project partners and other stakeholders. In coordination with GBRA, MWH will identify and prioritize comments and concerns raised by others and develop a strategy to address them in the Final Feasibility Report or through other means. MWH will prepare a Final Feasibility Report and coordinate final review with GBRA. **THIS TASK NEEDS MORE DETAIL TO DESCRIBE ADMIN, DRAFT, AND FINAL DOCUMENTS, EXECUTIVE SUMMARY, ETC. NOT CRUCIAL AT THIS TIME, BUT WILL BE EXPANDED AS WE PROCEED**

**Table 1. Summary of Task Deliverables**

**NEED TO UPDATE TASK NUMBERS AND NAMES, AND ADD DELIVERABLES**

<b>Task Number</b>	<b>Task Name</b>
<b>Task 1 – PROJECT MANAGEMENT AND STUDY COORDINATION</b>	
1.1	Prepare Project Management Plan
1.2	Project Management
1.3	Prepare and Maintain Study Work Plan and Schedule
1.4	Develop Project Development Schedule
1.5	Study Coordination with GBRA and Study Partners
1.5.1	Executive Leadership Team Coordination
1.5.2	Study Management Team Coordination
<b>Task 2 – STAKEHOLDER ENGAGEMENT</b>	
2.1	Stakeholder Engagement Plan
2.1.1	Identify and Analyze Stakeholders
2.1.2	Prepare Stakeholder Engagement Plan
2.2	Initial Stakeholder Outreach
<b>Task 3 – ESTABLISH THE PLANNING FRAMEWORK</b>	
3.1	Define the Study Area
3.2	Compile Existing Information
3.3	Develop Water Demand Scenarios
3.4	Summarize Existing and Projected Power Market Conditions
3.5	Identify Initial Sites
3.6	Environmental Compliance Strategy
<b>Task 4 – DEVELOP WATER AND POWER OPTIONS</b>	
4.1	Evaluate Initial Sites
4.2	Prepare Conceptual Designs/ Layouts
4.2.1	Water Treatment Plant Layouts
4.2.2	Power Plant Layouts
4.3	Review Groundwater Development Opportunities
4.3.1	Identify Potential for Groundwater Development
4.3.2	Groundwater Facility Layouts
4.4	Conveyance Alignment Studies
4.4.1	Identify Water Sources & Delivery Points
4.4.2	Develop a Basic Network
4.4.3	Develop Generalized Routes
4.4.4	Hydraulic Modeling
4.4.5	Identify System Components
4.4.6	Evaluate and Compare Alignment Options
<b>Task 5 – FORMULATE AND EVALUATE ALTERNATIVES</b>	
5.1	Develop Alternatives
5.2	Evaluate and Compare Alternatives
5.3	Refine Alternatives
5.3.1	Define and Evaluate Alternatives
5.3.2	Develop Cost/Benefit Analysis
5.3.3	Greenhouse Gas Emissions, Carbon Footprint, Alternative Energy
5.3.4	Constructability

5.1	Project Financing and Governance
Task 6 – PREPARE FEASIBILITY REPORT	
6.1	Prepare Feasibility Report