

Benefit Evaluation of ASR and System Storage

City of Laredo Aquifer Storage & Recovery (ASR) Update, Use of Storage Considerations and Assistance with WaterSMART Grant Application

Proposal and Scope of Services

OVERVIEW:

Lockwood, Andrews & Newnam (LAN), in close coordination with City of Laredo (City) will provide the following:

- 1) Evaluate and provide recommendations regarding system storage including:
 - a. Updates to prior ASR studies¹ to identify potential benefits;
 - b. Use of the City's system storage with ASR and without ASR; and,
 - c. Recommendations for incorporating ASR and additional storage or both.
- 2) Assistance with Bureau of Reclamation (BOR) WaterSMART Planning and Project Design Grant (No. R23AS00109), including:
 - a. Detailed assessment of all requirements;
 - b. Identifying and scheduling of application requirements to meet BOR response deadlines; and,
 - c. Working with City, adapt and conform responses to support the ASR/storage evaluation project.

PHASE and TASK DESCRIPTIONS:

1.0 Project Management

Engineer's project management efforts shall include the following activities, and shall be based on the assumptions as stated where applicable:

- Develop work plan, budget, and schedule to guide production efforts for all project tasks.
- Coordination with the subconsultants to relay city directives, pertinent information and data from the city and other sources, facilitate coordination between subconsultants as necessary, review all draft submittals and communications, and identify need and manage subconsultant attendance at city or public meetings, as needed.
- Hold as-needed project phone calls with City staff to provide project updates and get their input.
- Develop project status call meeting agendas, guide meeting discussions, prepare meeting summaries, and distribute electronic (PDF) summaries to all parties in attendance [assume preparation of agendas and summaries for maximum of two (2) meetings].

¹ Specifically the *Step 2 Report, Feasibility Investigation, Aquifer Storage and Recovery System* submitted by CH2MHill, January 1999.

- Perform checks of deliverable documents (i.e., listed deliverables) to confirm incorporation of, or response to, all the City’s review comments and/or requested action items.
- Prepare and submit monthly invoices for review and subsequent processing by City (assume maximum of 20 invoices). All invoices will include a brief summary of the project Tasks worked on during invoice period.
- Review and approve for submittal to the City all deliverables and reports.

2.0 Public Outreach

The public outreach program will be developed and carried-out by Liquid Studio Group (LSG) with the input and assistance of the Engineer and the project team. There will be an on-going, continuous stakeholder engagement program implemented by LSG and the Engineer.

- All stakeholder and public outreach meetings will be bilingual and timed to provide pertinent project information and to receive timely comments.
- Outreach and input will be solicited from three groups or audiences within the City:
 - i. City staff direction
 - ii. City Council input
 - iii. Public (rate payer) input
- A dedicated City website will be established and maintained for the project.
- Public meetings will be held through a “Live Town Hall” meeting in each Council District and Social media will be used as a tool for output and input.

3.0 Water Demands, System Storage and ASR Enhancement

Projected water demands update from the City’s recently completed Integrated Water Master Plan (IWMP) will be used and supplemented with current Region M approved projections, as needed. Pertinent to ASR efforts will be an understanding of the location of likely population growth, recent and planned developments, and other centers of focused water demand. These efforts will use updated Region M regional plan information as well as information provided by the City and LSG.

- After review and any adjustments to the Laredo IWMP projections, the disaggregation of those demands will be done using either the most current Traffic Analysis Zones (TAZs) provided by the City or 2010 Census geography if Census tracts and/or blocks appear to improve development, analysis, or presentation of water demand.
- The existing or current water supply available to the City will be based on the Laredo IWMP. As with the demands, any adjustments to account for additional supply, loss of supply, or other pertinent information will be identified and completed.

- Understanding how ASR could potentially supplement or provide conjunctive use with City's water storage² is a critical component of this project. If ASR can be enhanced with existing system storage or if new storage could be justified for this reason, then the viability and flexibility of meeting demands, will be improved. Whether that be the short-term 'emergency' demands, long-term future water demands based on the City's growth, or either short-term or long-term demands based on the characteristics and location of demands within the City's system. This task will be an effort to identify such demand centers within proximity to possible ASR sites.

Deliverables:

- i. Prepare draft technical memorandum of needed updates preparatory to the ASR/System storage evaluation.
- ii. Prepare updates or edits to the Laredo IWMP report, as needed.
- iii. Address comments from the city after submittal of the draft memorandum, discuss, as needed, and incorporate in a final version.

4.0 Aquifer Storage and Recovery Evaluation

As discussed by Lambert (2004), the CH2MHill study assessed the feasibility of using aquifer storage and recovery ("ASR") to store water in the Laredo Aquifer. Since the completion of the 1999 report (and preceding 1996 report), ASR technology, drilling techniques, and aquifer data have improved. The following Tasks will allow us to re-evaluate the potential for the city to utilize the local formations to store water for future demands.

Task 4.1 Research, Data Compilation, and Regulatory Considerations

We will bring the available data together to update the CH2MHill reports. We will focus on additional data obtained since completion of the CH2MHill report, and how the data affects our evaluation of local ASR feasibility. Data collected during Task 1 will be compiled into formats necessary for using in mapping, modeling, and data analysis. As applicable, data will be compiled into a geodatabase for use within GIS software.

Our evaluation of the local formations will integrate available data collected through drilling and testing by local water suppliers as well as drilling conducted for rig supply water in areas north of Laredo. We will also incorporate available conceptual model data for the local aquifers that was developed as part of the Texas Water Development Board's Groundwater Availability Modeling program. Finally, we will work with the city to reach out to local landowners and request data which may not yet be publicly available. Data may include updated stratigraphy, structure, hydraulic properties, and water quality.

The ASR feasibility study conducted by CH2MHill was limited to vertical wells completed in the Laredo Aquifer. While this approach may remain viable, the city should consider alternative well

² Define 'water storage' – ground storage etc.

construction methods including the installation of one or more horizontal or directionally-drilled wells to increase connection to the formation sands. As part of Task 1, we will compile information necessary to assist with consideration of alternatives to traditional vertical well completion.

Regulatory considerations can be one of the biggest hurdles to getting an ASR system up and running. For an ASR system, jurisdiction over the authorized injection and extraction lies with the Texas Commission on Environmental Quality (“TCEQ”). During Task 1 we will summarize the applicable rules and meet with TCEQ to discuss the proposed system, anticipated requirements for an ASR system permit for the City, and any foreseeable hurdles to obtaining the permit.

Task 4.1 Deliverables:

- Geodatabase with compiled hydrogeologic data.
- Slides summarizing
 - Compiled hydrogeologic data.
 - Well completion alternatives.
 - Regulatory requirements.

Task 4.2 Hydrogeological Analysis and Model Development

Data assimilated during Task 1 is the basis for developing local mathematical models of the subsurface conditions. We anticipate using the compiled data to prepare maps of the local formation structure, lithology, water levels, and hydraulic properties. These hydrogeologic data evaluations will help us focus on developing a model that is well-suited for analysis of potential ASR systems. We will begin with the regional groundwater availability model that covers Webb County. We will extract a local sub-model from the regional model then update it as needed to reflect local aquifer conditions.

The local City of Laredo ASR model will incorporate the local stratigraphy, hydraulic properties, and water quality into a combined groundwater flow and transport model. This combined model will provide the city with a robust tool for predicting the amount of water that can be stored during periods of excess supply, how the stored water may interact with the native groundwater, and the recoverability of the stored water for use during periods where demand exceeds other water supplies. The modeling tool will also help us identify constraints associated with operation of the system and test methods for mitigating those constraints.

One of the most difficult questions to address prior to obtaining site-specific formation samples is the potential geochemical reactions that may occur. As the source water is injected for storage, the water may react with the formation material (that is, rock or sand) and dissolve trace constituents. One of the primary concerns with any ASR system is the potential for source water to mobilize trace amounts of arsenic through dissolution of formation material. While there will be a high degree of uncertainty associated with our assessment, we will draw upon available data and our understanding of the formations to discuss potential geochemical reactions with the source water. As a part of this discussion and evaluation we will assess if the

available data is sufficient for the development of geochemical reaction model using the PHREEQC modeling code.

Task 2 Deliverables:

- Local groundwater flow and transport models.
- Geochemical reaction model (if data are insufficient for a working model, the framework will still be provided for future use).
- Slides summarizing
 - Hydrogeologic evaluations.
 - ASR model development.
 - Geochemistry and geochemical reaction modeling.

4.3 ASR Modeling and Testing Plan

We will work with the city to identify optimal locations for ASR wells relative to existing infrastructure, regulatory requirements, and aquifer conditions. We will then use the modeling tools to optimize locations relative to the potential for storage and recovery. In addition, these numerical evaluations will help us identify locations where obtaining site-specific data would most benefit our understanding of the local hydrogeologic conditions. As part of our reporting on the results, the project team will prepare maps illustrating the ASR well and connection locations.

Using the hydrogeologic evaluations and modeling results, we will prepare a testing plan, with preliminary costs for implementing the plan, to obtain site-specific aquifer characteristics necessary for final design of an ASR system. We will prepare detailed specifications for a drilling and testing program to assess site-specific formation hydraulic properties and water quality characteristics. The specifications will be prepared to allow the City to incorporate standard contract provisions for soliciting a drilling contractor.

Task 4.3 Deliverables:

- Maps illustrating proposed well and testing locations.
- Drilling and testing specifications.
- Slides summarizing model simulation results.
- Discussion of potential conjunctive use of ASR with system storage and recommendations.

4.4 Evaluation of Short-term Water Supply Needs and Potential ASR/Storage Conjunctive Use

The evaluation of short-term water needs conducted in the 2023 Laredo IWMP will be summarized and the needs relevant to short-term water storage supply identified.

We will use a matrix evaluation to correlate the values (such as quantities, cost estimates, etc.) of potential ASR locations, considering them both as stand-alone locations and in conjunction

with existing storage. We will prepare and discuss with the city management a summary of the potential effectiveness and value of ASR in meeting the City's short-term supply needs. The short-term supply report will be provided as a technical memorandum that will include an analysis of the efficiencies gained from co-siting with ASR or adding additional tank storage to fulfill these needs.

Collaboration with the city to pinpoint optimal ASR well locations, considering existing infrastructure and aquifer conditions. Our modeling tools will aid in optimizing these locations for storage and recovery potential, will be conducted. The numerical evaluations will also identify locations where site-specific data can enhance our understanding of local hydrogeologic conditions. The team will produce maps to illustrate the proposed ASR well and connection locations in our report.

Addressing potential geochemical reactions, remains a challenge before obtaining site-specific formation samples. As the source water is injected for storage, the water may react with the formation material (that is, rock or sand) and dissolve trace constituents. One of the primary concerns with any ASR system is the potential for source water to mobilize trace amounts of arsenic through dissolution of formation material.

Task 4.4 Deliverables:

- Maps illustrating proposed well and testing locations.

4.5 Use of Ground Storage and Possible Integration with ASR

LAN's approach includes a critical evaluation of the combined performance and benefits of proposed ASR and storage. We will assess the potential advantages of integrating existing and additional ground storage with ASR. Our evaluation will consider the use of ground storage both stand-alone and in conjunction with favorable ASR locations. This combination can potentially overcome constraints like limited quantity.

Undertaking this challenge, LAN's task leader and our ASR subconsultants will utilize information from the IWMP about area demands, available pipe networking for the areas of interest, and crucial reality checks with the City's system operators and managers.

Review with City Staff and Preparation of Updated ASR Evaluation Report Identification of ASR Locations. We will display the locations of potential ASR facilities and associated ground storage tanks, as appropriate, on a color-coded map. This color-coding will indicate each site's potential to provide useful quantities of supply. We will identify each ASR site that shows promise for meeting short-term needs or offering other operational benefits.

The report will assess the vulnerability of ASR sites to various limitations, such as water quantity potential, facility costs, and site constraints. LAN will present a table summarizing these constraints and setting realistic expectations for developing ASR sites. This table will serve as a convenient tool for prioritizing and updating the IWMP and associated CIP in the coming years.

Task 4.5 Deliverables:

- Maps illustrating proposed well and testing locations will be updated to identify potential 'conjunctive use' locations.
- Constraints and expectations will be included in a technical memo and final report and presentation(s).

4.6 ASR System Cost Estimates

We will use the data collected and simulations of potential ASR systems to refine our testing plan, including updates to the associated costs, for identifying critical hydraulic, geochemical, and water quality conditions. We will also develop an opinion of probable construction cost for the optimal ASR system(s) to supplement and support the City of Laredo's water supply needs.

Considering the expected water quality, quantity, location, and related factors, we will calculate the anticipated costs for treatment and delivery. This includes evaluating pumping and piping costs, as well as annual operation and maintenance costs.

We will estimate the cost per 1,000 gallons based on the expected quantities from ASR supplies. The probable costs (both capital and operational) of ASR supplemental supplies will be itemized to help City management assess the benefits (such as water supply quantity) against anticipated costs. We will discuss the anticipated final cost for incorporating the recommended ASR/storage tank additions with City management and include this in the final ASR/storage tank report.

Just like with the Laredo IWMP, there is a need for updates, corrections, and adjustments due to the dynamics of growth, unexpected demands, and aging water infrastructure. LAN's communication, led by Gene Belmares, will maintain openness for both scheduled, formal discussions with the City, as well as as-needed, informal ones.

Gene Belmares will organize and oversee our public outreach, responding to ongoing discussions with City Staff. His firm possesses the necessary tools and database to excel in this outreach, a capability they have demonstrated previously during public meetings and City Council workshops on the IWMP.

Task 4.6 Deliverables:

- Cost estimates will be added to and discussed in a technical memo and incorporated in the final report.

4.7 Final Report and Presentation

A final project report incorporating the summaries from previous tasks will be prepared in draft for review with the city staff.

Task 4.7 Deliverables:

- Report sections related to the local hydrogeologic conditions, modeling, and potential ASR systems.
- Presentation slides for final reporting.

5.0 Bureau of Reclamation (BOR) WaterSMART Application.

The BOR has issued a Funding Opportunity Notice (FON)³ for a WaterSMART grant that aligns with the objectives of this project. The grant can provide substantial funding assistance to the city to help cover the project costs. The following tasks will be managed and completed by LAN in cooperation with the City Staff to prepare a robust application for these funds:

- Application for Federal Assistance
 - 3 pages long, mostly information inputs – no narratives or attachments needed.
- Budget Information: Non-construction programs or construction programs
 - 3 pages, will require detailed budgetary information from the applicant and forecasted budget needs for the project.
- Assurances: Non-construction programs or construction programs.
 - Non-Construction Program Document: Read, agree too, and sign two-page document.
- Unique Entity Identifier (UEI) and System for Award Management (SAM) registration
 - Requires registration and review of entity with SAM if no number exists already.
- Technical Proposal
 - Limited to 20 pages.
 - Content of Proposal
 - Title Page
 - Table of Contents
 - Executive Summary
 - Date, applicant name, city, county, state.
 - Indicate which task you are applying under.
 - Indicate whether you are a Category A applicant, Category B applicant, or a drought contingency planning applicant.
 - One paragraph project summary that provides the location of the project, a brief description of the work that will be carried out, any partners involved, concerns in your project area, and how this project is expected to help alleviate impacts of those conditions, and identification of any planning documents that support the project.
 - State the length of time and estimated completion date for the proposed project (month/year).
 - Whether or not the proposed planning or design effort is focused on a federal facility or will involve federal land.
 - Project location

³ Notice of Funding Opportunity No. R23AS00109

- Project description
 - A deeper comprehensive description of the technical aspects of your project, including the specific activities to be accomplished and the approach to complete the work.
 - Evaluation Criteria
- Budget Narrative
 - The total project cost is the sum of all allowable items of costs, including all required cost sharing and voluntary committed cost sharing, including third-party contributions, that are necessary to complete the project.
- Environmental and Cultural Resources Compliance (if applicable)
 - If the project includes monitoring, measurement, or other field work, environmental and cultural resources compliance may be required. Proposals that include on the ground activities should answer the questions from *Section H.1. Environmental and Cultural Resource Considerations* in the section.
- Required Permits and Approvals (if applicable)
 - Applicants must state whether any permits or approvals are required and explain the plan for obtaining them.
- Overlap or Duplication of Effort Statement (if applicable)
 - Applicants should provide a statement that addresses if there is any overlap between the proposed project and any other active or anticipated proposals or projects in terms of activities, costs, or commitment of key personnel. If any overlap exists, applicants must describe the overlap in their application for review.
 - Applicants should also state if the proposal submitted under this program does or does not duplicate any proposal or project that has been or will be submitted for funding consideration to any other potential funding source – whether it be Federal or non-federal.
- Conflict of Interest Disclosure Statement (if applicable)
 - Applicants should state in the application if any actual or potential conflict of interest exists at the time of submission. Submission of a conflict-of-interest disclosure or certification statement is mandatory prior to issue of an award.
- Uniform Audit Reporting Statement (if applicable)
 - All U.S. states, local governments, federally recognized Indian tribal governments, and non-profit organizations expending \$750,000 USD or more in Federal award funds in the applicant's fiscal year must submit a single audit report for that year.
- Disclosure of Lobbying Activities (if applicable)
 - Fill out and sign one-page form.
 - This form cannot be submitted by a contractor or other entity on behalf of an applicant.
- Letters of Support (if applicable)

- Include any letters from interested parties supporting the proposed project. No minimum number of letters is listed.

Task 5.0 Deliverables:

- Application sections, forms, go-by resolutions and/or letters of support, and other documents as identified during the application completion process will be prepared and submitted to the city.