Border Environment Cooperation Commission

Construction of a Wastewater Treatment Plant in Somerton, Arizona

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General Criteria

1. **Type of Project.** The project consists of the construction of a wastewater treatment plant in Somerton, Arizona.
2. **Location of Project.** The City of Somerton is located in Yuma County, Arizona, approximately 10 miles [16 km] southwest of Yuma, Arizona, 10 miles [16 km] south of the California/Arizona border, and 10 miles [16 km] north of the southern Arizona/Mexico border. The project is located within the 100 km border region as defined by the La Paz agreement. The City of Somerton is a community of approximately 7,500 residents and the population is expected to reach 16,000 by the year 2020 (4.2% annual increase). The City limits bound an area of approximately one square mile. The City of Somerton is shown in the figure below:

Description of Project and Tasks. The project consists of constructing a sequencing batch reactor (SBR) wastewater treatment plant with a total treatment capacity of 0.8 million gallons per day (MGD) to replace the existing lagoon system.

Compliance with International Treaties and Agreements. The project will not have any international impacts as all construction, maintenance, and project effects will occur within U.S. territory in a very localized zone. The wastewater treatment plant discharge is to the Yuma Drain Canal, that eventually flows into Mexico and is used for agricultural reuse. The new wastewater treatment plant will guarantee that the effluent discharged complies with U.S. standards for protection of water bodies and its subsequent use for irrigation in Mexico.

Human Health and Environment

Human Health/Environmental Needs. This project will address human health and environmental concerns by providing improved wastewater treatment that conforms to current US standards. Although there is currently no evidence of health effects from the deteriorated standards of the current treatment plant, it is subject to violation of the NPDES permit.

The construction and operation of the new wastewater treatment plant will result in water quality improvements in the Yuma Drain Canal surface waters and the underlying groundwater aquifer by reducing levels of conventional pollutants (BOD_5 and TSS) and of total nitrogen. Potential increased volume of discharged chlorinated wastewater effluent can be mitigated the establishment and proper monitoring of a Mixing Zone. The new plant will also eliminate current seepage of approximately 30,000 gpd from the lagoons into the groundwater.

The plant will be a good neighbor. Foul odors generated from the lagoon system adversely impacting the adjacent residential area will cease. The elimination of gaseous chlorine as a disinfectant agent will reduce the public health and safety risk to plant staff, farm workers on the adjacent agricultural fields, and nearby residential areas.

Environmental Assessment. An Environmental Assessment (EA) was performed in compliance with BECC Project Certification Criteria and EPA 40 CFR Part 6 requirements. The assessment considered the following criteria:

- Discussion of the direct, indirect, cumulative and short-term positive and negative effects of the project on the environmental components of the affected area (e.g. ecosystem integrity, biological diversity, sensitive environmental habitats, and human health);
- Description of unavoidable negative impacts and actions to be taken to mitigate these impacts;

- Discussion of the environmental benefits, risks, and costs of the proposed project as well as the environmental standards and objectives of the affective area.

Significant transboundary effects are not likely.

EPA has reviewed the EA and issued a Finding of No Significant Impact on mid-May, 2002.

Compliance with Ecology and Cultural Laws and Regulations. A consultation with the Arizona State Historic Preservation Office and with different Arizona tribes was performed as part of the environmental assessment process. The environmental evaluation of the process indicated that there are no potential impacts, direct or indirect, to any historical, cultural, and/or archaeological resources in the area.

Technical Feasibility

Appropriate Technology. The selected alternative is a Sequencing Batch Reactor system, which is described below.

a) Project Specifications

The recommended activated sludge treatment process in Hazen and Sawyer□s report is the sequencing batch reactor due for a variety of reasons with the cost effectiveness, process flexibility, and ease of modular expansion being the primary selection factors.

The sequencing batch reactor (SBR) process is a cyclic activated sludge treatment process. Multiple reactors are provided to treat the wastewater in batches. Somerton□s sequencing batch reactors will be and operated to oxidize the carbonaceous BOD, nitrify the ammonia, and denitrify to reduce the total nitrogen to a level that meets the permit limits.

All treatment processes including equalization, aeration, denitrification, and sedimentation, and decanting occur in the SBRs eliminating the need for separate clarification and return activated sludge systems.

The typical SBR treatment sequence for nitrification-denitrification systems is as follows:

1. The reactor is allowed to fill with raw wastewater. The filling phase is often divided into stages that include aeration to reduce BOD and to nitrify ammonia and then mixing without aeration to promote denitrification (removal of nitrogen).
2. A reaction phase is generally provided to promote additional treatment.
3. A settling or quiescent phase then follows to allow the biological solids to settle.
4. A decanting phase is provided to draw off the clarified effluent from the upper portion of the reactor.
5. Often a small idle phase is provided to allow time for miscellaneous operations that may need to occur to keep the reactors in sequence.

Wasting of the biological solids that are produced by converting BOD to bacteria needs to occur periodically to maintain the design mixed liquor concentration and sludge age. Wasting can occur at anytime in the process sequence. Frequently, wasting is performed following the decant phase when the sludge concentration is highest.

The Hazen and Sawyer Report recommended a two SBR basin configuration. While economical, the two SBR configuration does not provide much operational flexibility and process redundancy. Two methods are commonly used if one of the reactors is removed from service for cleaning or repairs. The first method is to convert the remaining in-service reactor to a continuous flow operation. This is viable for short periods of time especially when the system is well below its design loadings. As loadings approach design loads, achieving treatment objectives by this method becomes difficult. The second method is to provide an aerated and mixed basin where the flow can be stored during the cycling of the in-service reactor.

Stanley Consultants proposes to provide four basins for Somerton. The four-basin configuration offers much more process flexibility and redundancy. One of the four basins can be taken out of service without severe impact to the three remaining in-service basins. The design will be set up so the four basins can be paired together for dual cell cycling during normal operations. In the event a basin needs to be taken out-of-service, the remaining three basins can be cycled independently.

The SBRs will be equipped with diffused aeration, mechanical mixers, and decanting facilities. A submersible pump will be provided in each basin to pump waste solids to the sludge thickener. Jet mixing, a type of aeration system offered by some vendors, will not be utilized on this project based on poor experiences at other facilities.

The discharge from SBR systems is higher than the inflow because the same volume of water that entered the SBR is discharged over a shorter time period. Flow equalization downstream of the SBRs was considered to dampen the discharge flows from the SBRs. Separate flow equalization was found to cost more than sizing the disinfection facilities for the higher peak flows.

A. Major Equipment

1. SBR Design Criteria

Average Flow:	0.8 mgd
Maximum Day Flow:	1.6 mgd
BOD_5	225 mg/l avg, 270 mg/l sustained peak
TKN	39 mg/l average, 47 mg/l sustained
NH_3N	29 mg/l average, 33 mg/l maximum
SRT	16 to 19 days
Volumetric Loading	10 lbs BOD/1000 CF
Hydraulic Retention Time	29 hrs
Dissolved Oxygen	2.0 mg/l minimum during aerobic phase
O2 Requirements BOD	1.1 lb O_2 per lb BOD_5
O2 Requirements NH_3N	4.56 lb O_2 per lb NH_3N
Oxygen Transfer Efficiency (Based on new, clean water transfer efficiency)	25%

2. SBR Design

Number of Basins:	4
Capacity, Each:	0.2 MG

Nominal Length:	39 feet
Width:	39 feet
Maximum SWD:	21 feet
Normal SWD:	17.5 feet
Minimum SWD:	14 feet
Freeboard at maximum water depth:	2 feet
Number of Cycles per basin:	5 per day
Cycle Time:	4.8 hours
Actual Oxygen Required:	3541 lb day
Est. Net Sludge Yield:	0.701 lbs. WAS/lb BOD
Waste Sludge, mass	579 lb/day
Waste Sludge, % solids	0.35
Waste Sludge, Flow	162 to 196 gpm
Number of WAS pumps per Basin:	1
Type:	Submersible
Flow:	200 gpm
Number of Mixers per Basin:	1
Mixer Horsepower:	10 hp

Note one uninstalled mixer and one uninstalled WAS pump will be provided for redundancy.

3. Aeration System

Diffuser Type:	Fine Bubble Diffused Air
Air flow per Basin, SCFM	TBD
Number of Blowers:	3
Blower Capacity, ea.	TBD
Blower Horsepower:	100
Blower Type:	Positive Displacement

Decant devices vary significantly from vendor to vendor. An appropriate decant mechanism will be provided to decant clarified treated wastewater from the SBR. The decant mechanism will have provisions for accounting for varying liquid levels and will minimize entrance of solids into the mechanism during all phases of operation or will automatically flush solids accumulated in the mechanism prior to discharge.

O&M Plan. The Operation and Maintenance(O&M) Manual will be prepared by the design engineer upon completion of the construction of the plant with support from the construction contractor and equipment manufacturers. Development of this manual is not possible at this time since no equipment has been selected or installed.

Operation and maintenance manuals for each piece of equipment should also be maintained. Each of these should contain the following for each system component:

- Specifications and cut sheet drawings
- Maintenance schedules
- Replacement parts list.

The O&M manual for the treatment plant as a whole should include the following elements:

Plan Element	Description
Start-Up Operation Plan	The Operation Plan will be developed by the design engineer to ensure that Treatment plant staff understand how to properly start-up and operate the facility. Traditionally, the contractor and equipment supplier conduct the initial start-up of plant equipment to permit the detection that equipment is installed and started properly. Start-up operations and training of the permanent staff should be part of this activity.
Contingency Plan	The Contractor will be required to submit an emergency response and contingency plan covering the construction and start-up phase, upon the issuance of the contract award notice. This plan will be updated and maintained by Publilc Works Division personnel to cover any emergency that might occur during normal operation.
Safety Plan	A safety and health plan will be developed by the WWTP Superintendent and implemented by all Public Works Division personnel involved with plant operation and maintenance. It should include safety training before start-up, with periodic refresher training.
Quality Assurance Plan	The quality assurance plan should be developed during the start-up
Pollution Prevention Plan	The construction operator will provide a Pollution Prevention Plan, including a Storm Water Pollution Prevention Plan required by the NPDES permit.
Facility Closure Plan and Post-Closure Plan	The existing lagoons will be decommissioned during and after the start-up of the new facilities. A closure plan will be submitted to ADEQ with the facility closure application.

Compliance with applicable design norms and regulations. Currently, Stanley Consultants is under contract to the City of Somerton, Arizona to prepare final design for the wastewater

treatment plant. Sixty percent design has been completed. Also, a Value Engineering was performed to the final design.

Financial Feasibility and Project Management

1. **Financial Feasibility**.

   The NADB completed the financial analysis to determine the funding structure of the project and the user rates to guarantee the financial sustainability of the operating agency.

   The project costs are as follows:

Capital Cost Estimate
New Wastewater Treatment Plant
City of Somerton

Construction	6,424,389
Administration	488,325
Engineering Fee	973,979
Legal Fee	15,000
Contingency	642,439
CONSTRUCTION COST	8,544,132

Funding sources for the project are as follows:

Financial Structure

Source	Amount (US$)	%
Loan Component	**4,400,000**	**51**
BECC	**436,779**	**5**
City of Somerton	**32,000**	**1**
NADB - BEIF	**3,675,353**	**43**
Total	$8,544,132	100%

The NADB also awarded a $864,168 BEIF transition assistance grant in order to make the user fees affordable based on the City's Median Household Income.

2. **Rate Model:** The NADBank prepared a rate study to determine the water user fees that will guarantee the financial sustainability of the project. The proposed water user fees are presented below.

Monthly Water and Sewer Rates: Before and After Recent Adjustment

	Rates Before September 2000	New Rates (Resolution 631)
Water Rates		
Residential Class		
First 5,000 gallons + Base Fee	$10.50	$8.25
Over 5,000 gallons (per each 1,000)	$0.75	$1.25
Multi-Family Class		
First 5,000 gallons + Base Fee	$10.50	$8.00
Over 5,000 gallons (per each 1,000)	$0.75	$1.25
Commercial Class		
First 5,000 gallons + Base Fee	$10.50	$8.50
Over 5,000 gallons (per each 1,000)	$0.75	$1.40
Sewer Rates		
Residential Class		
Flat Rate	$12.00	$14.50
Multi-Family Class		
Meter Charge	$12.00	$7.00
Per Unit Fee	n.a.	$7.00
Commercial Class		
Base Fee	$12.00	$6.67
Per 1,000 Gallons	$0.15	$1.12

Public Participation

Public Participation Plan. The City of Somerton submitted a public participation plan to BECC on November 21, 2000 and was approved on the 27th of that month.

Steering Committee: The steering committee was formed on October 12, 2000. Its membership is composed of: Oscar Joanicot, citizen; Fred Gloria, Accountant; Enrique Porchas, Equipment Salesman and Luis Heredia, Oscar Sanchez, and Carmen Juarez, local citizens. The steering committee has a technical support group composed of Eddie Mendez, Public Works Director, Leo Lomelí, City Water Specialist and Cliff O'Neill, Community Development Director. The committee was responsible for the development of the public participation plan and met ten times since its formation to follow-up on the public process.

Local Organizations: The Somerton School Parents League, Somerton Rotary Club, Somerton Merchants, Senior Nutrition Center, and the Immaculate Heart of Mary Catholic Church were

contacted to present the proposed project and solicit their support. Approximately one hundred people attended these meetings.

Public Information: The project proposal was available at the Somerton City Hall and after work hours at the Somerton Police Station. The Yuma Daily Sun published articles on the city's efforts to improve the wastewater plant Feb. 7, April 6, and May 16, 2001. Committee members and volunteers delivered to about 900 customers a flyer that contained information on the election, and a project fact sheet. Additional flyers were handed out at the Immaculate Heart Catholic Church with meeting notices included in the church bulletin. The engineering consultant provided the technical presentation at the Feb.8, 2001 public meeting.

Public Meetings: Public meetings were held on October 30, 2000, January 29 & 30, Feb. 8, March 12 & 15, and April 11, 2001 to present the technical aspects, project costs, and ballot information to local residents. A final public meeting was held on April 30, 2003 to present the rates to the residents of the city.

Election Authorization: At a General Election on May 15, 2001, local voters authorized the City to incur indebtedness in an amount not to exceed $4.4 million to improve and expand the wastewater system. The election results were 180 in favor and 26 opposed.

Sustainable Development

1. **Definition and Principles.** The project complies with BECC□s definition of Sustainable Development: □*An economic and social development based on the conservation and protection of the environment and the rational use of natural resources, but considering current and future needs, as well as present and future impacts of human activities*□.

   The Wastewater Treatment Plant Replacement Project was developed in full conformity with the following four principles of sustainable development:

   Principle 1 - Human beings are at the center of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

   Principle 2 - The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

   Principle 3 - In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered isolation from it.

   Principle 4 - The stakeholders (e.g. groups and individuals impacted by, and having an impact on development projects, must be part of any related activity. Specifically, this means that: Border residents experiencing environmental problems first hand must be given the opportunity to participate in the decision-making process on ways to protect, manage, and employ environmental resources in their communities; and the efforts and expertise of the different institutions involved in environmental, social, and economic endeavors within all sectors of the society must be brought together for better balanced development planning and better use of scarce resources.

The project will improve the quality of life in the community by ensuring the capacity to properly treat the effluent generated by Somerton□s growing population, before its discharge, thus avoiding the human health and environmental problems associated with a degradation of the water quality of the receiving Yuma Main drain.

2. **Institutional and Human Capacity Building.** The new wastewater treatment plant will be operated and maintained by the City□s Water and Sewer Division personnel. For this purpose, the Public Works Department will need to hire one new operator, increasing the capabilities of the Division as a whole. Either this operator or one of the current operators will need to achieve a Grade III certification according to the Arizona Administrative Code.

   Somerton has a history of providing training opportunities to their operators and encouraging them to attain higher certification levels. The current operators have begun the certification process and undoubtedly will be able to advance concurrently with the anticipated increase of certification level required for the new facility.

   As has been noted throughout this document, the project will require a series of additional capacity building activities in addition to the hiring and grade certification of their operators. These are summarized below:

   - An Operation and Maintenance (O&M) Manual will be developed with project funding for the new treatment plant. This manual will be a reference document for setting up routine maintenance and for trouble-shooting non-routine maintenance, thereby improving the capabilities of the Public Works Department.

   - Start-up training in treatment plant operation will be offered by the contractor and equipment providers to Public Works Department staff.

   - A work safety and health training program below project start-up, followed by periodic refresher courses.

   In general, the advancement of administration and operations personnel is supported by available training programs, such as those offered by the ADEQ□s Outreach Program. The selected treatment facility will provide the ability to serve an increased client base, which in turn generates greater revenues for the City through user charges.

   Finally, the update of the NADBank rate study will allow the City to make the necessary adjustments to the rate design currently being implemented so as to improve its institutional and financial capacity.

3. **Conformance with Applicable Local/Regional Conservation and Development Plans.** The project complies with the City of Somerton General Plan.

4. **Natural Resource Conservation.** The construction of a new SBR treatment plant to replace the current lagoon system will allow the City to effectively treat the influent sewage flows to their facility. The existing plant has not been able to maintain NPDES compliance and has been cited for other violations of applicable environmental regulations. The existing plant is also not capable of handling expected future flows that will accompany population growth. The new plant will improve the quality of surface water in the Yuma Main Drain and the quality of groundwater by eliminating the current seepage from the lagoons.

   The project will have no impact on available land or biological resources as the new plant will be constructed on a filled lagoon and will not require additional land.

5. **Community Development.** The City of Somerton has a significant recurring unemployment problem as employment is centered on the highly seasonal agricultural industry. Reported unemployment rates are have surpassed 50%. Somerton□s household income is also quite low, ranking 150 out of Arizona□s 176 cities and unincorporated areas.

   The new wastewater treatment plant can have a positive impact on these weak economic indicators by helping to provide improved services and environmental conditions that can attract new businesses, which in turn can have a multiplier effect on the local economy through payrolls, taxes and additional housing requirements.

Potential negative effects of building the new treatment plant are primarily related to an increase in utility rates. The net effect of the new project is to increase average monthly residential and commercial sewer bills by approximately 35% to 40% over the next 5 years, which could offset the indirect development impact of improved service. But these negative effects could be mitigated by the fact that the total projected water and sewer bills will still be competitive with many other representative cities in the state.

Available Documents

- Environmental Assessment
- Finding of No Significant Impact
- Project Certification Document
- Preliminary Engineering Report
- Value Engineering Report
- 60 percent design drawings.