

Border Environment Cooperation Commission

Comprehensive Sewerage Collection and Treatment Systems Project in Piedras Negras, Coahuila

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I. General Criteria

Type of Project. The project consists the rehabilitation and expansion of the sanitary sewer system and the improvements to the sewage treatment system.

Location of Project. Piedras Negras is located in the northern part of the State of Coahuila; it is the county seat for the Municipality of the same name. It is separated from Eagle Pass, Texas by the Rio Grande; therefore it is located within the Border Region defined as the 100-km zone on both sides of the border. The current population in Piedras Negras is approximately 132,500, and is expected to reach 270,000 people by the year 2018

Description of Project and Tasks The project consists of improving sewerage services to Piedras Negras, including the construction of a wastewater treatment plant (WWTP), with a capacity of 8.22 million galls per day (mgd). In 1998, it was estimated that sewage collection coverage was at about 80%. The objective of this project is to reach 100% coverage.

The new WWTP will replace an old oxidation lagoon system that was originally designed and built in the 1960's to handle 2.63 mgd. The existing lagoon system is operating deficiently due to excessive clogging by sediments. Additionally, the city has encroached upon the existing WWTP site, which presents various negative human health implications.

The population growth rate in Piedras Negras in the last few years has surpassed the construction of additional environmental infrastructure, particularly in the sanitary sewer and sewage treatment. Furthermore, the parts of the city that do have sewer service in most cases experience problems because of the age of the system, clogging, lack of maintenance, negative pipe slopes, and other factors.

The lack of a storm sewer system is also a contributing factor to the deficient operation of the sewage system, mainly due to infiltration, which causes overflows and backflows of raw sewage during significant precipitation events.

The project contemplates the closure of the existing WWTP, the construction of new collectors, trunk lines, pump stations, and a new WWTP (activated sludge). The process is shown below.

Compliance with International Treaties and Agreements. The project will have positive transboundary impacts, since the effluent will be discharged into the Rio Grande. Its implementation will be in compliance with the treaties between Mexico and the US, particularly those related to the International Water and Boundary Commission.

II. Human Health and the Environment

Human Health/Environmental Needs. About 96% of the population of Piedras Negras is served with drinking water through the municipal public water distribution and supply systems. The water quality complies with Mexican federal regulations, as set forth by the Mexican norm NOM-127-SSA1-1994. However, within the context of sewage treatment, the community faces a problem, considering that about 80% of the residents have sewage collection system. The portion of the population without the service uses septic tanks and/or privies to dispose of their wastewater.

The Mexican National Water Commission (C.N.A.) considers various parameters for assessing sanctions relative to effluent discharge violations. The effluent characteristics of the existing wastewater treatment process exceed C.N.A.'s discharge limits corresponding to Biochemical Oxygen Demand (BOD). Additionally, in 1994 the IBWC conducted a study and determined that wastewater treatment along the US-Mexico border was deficient and needed to be improved. Thus, the Acuña project will address this concern.

According to the Health Department of Piedras Negras, from 1997 to 1998, the number of cases of seven out of the 13 water-borne related diseases increased in some cases by as much as 20%.

In 1979 the IBWC (U.S. and Mexico) formulated Minute 261, which relates to the solution of sanitation issues along the US-Mexico border. The sanitation project of Piedras Negras complies with the recommendations identified in Minute 261.

Environmental Assessment. As part of the project studies, in February 1999, an Environmental Assessment (EA) was prepared and submitted before the National Institute of Ecology (INE) of the Secretariat of the Environment, Natural Resources,

and Fisheries (SEMARNAP). On April 14, 1999, the INE issued its ruling authorizing the implementation of the sanitation project of Piedras Negras. Additionally, a document addressing the requirements established by the National Environmental Policy Act (NEPA) was prepared.

Presently the United States Environmental Protection Agency (EPA) has reviewed the above documents and prepared an environmental assessment (EA) and a Finding of No Significant Impact (FoNSI). The EA and the FoNSI are currently undergoing a 30-day public review period. If there are no substantial negative comments from the public, a final FoNSI will be issued. It is necessary to have the FoNSI to enable the EPA to approve the financial scheme relative to the Border Environmental Infrastructure Fund (BEIF) proposed by the North American Development Bank (NADB).

In March, 1999, the consulting firm of “Consultores Mexicanos en Proyectos de Ingeniería” prepared an EA that was presented to the public on June 18, 1999, to inform the public about the cumulative impacts of the project.

In the EA, it is mentioned that some of the activities will take place in urban areas, while the WWTP site is located in an agricultural field. To mitigate the impacts, a reforestation program will be implemented to create a buffer zone. The WWTP effluent will be discharged into the Rio Grande. The impact of the effluent will be positive, considering that the BOD₅ (30 mg/l) and total suspended solids (30 mg/l) of the flow will be lower than those currently being discharged. Additionally, the CNA established three sampling points for determining current concentrations of BOD₅ in the Rio Grande and at La Amistad Dam.

In the EA, there are measures identified for dust abatement, as well as traffic control measures during the constructions stages. It is also important to mention that the effluent (after evaporation adjustments are applied) of the WWTP will be reused by Mexico’s Comisión Federal de Electricidad, downstream. This action extends the water supply (from aquifers) for human consumption purposes in the region.

Compliance with Ecology and Cultural Laws and Regulations

As part of the environmental review process by SEMARNAP and other agencies, the National Institute of Anthropology and History issued a memorandum indicating that there was no objection relative to the proposed WWTP site.

III. Technical Feasibility

1. Appropriate Technology. As part of the complementary report to the Master Plan for improvements to the water, sewer, and wastewater treatment systems of Piedras Negras, various alternatives were evaluated. The alternatives were developed and evaluated using a 20-year planning horizon.

WASTEWATER TREATMENT

In accordance with chemical analysis conducted on the effluent, it was determined that the BOD₅ concentration (137.89 mg/l) and the TSS (182.35 mg/l) are within the typical domestic values. These values were taken into consideration in the WWTP design and sizing. It is important to mention that the WWTP will be financed under the Build-Operate-Transfer (BOT) scheme. For the WWTP, four alternatives were evaluated, including the no-project alternative.

Alternative 1 - WWT System with Activated Sludge. The process units are as follows:

Influent Train

Pretreatment, inlet sump, primary settling tank, aeration tank, secondary settling tank, and chlorination tank.

Sludge Train

Aerobic digester, sludge thickening, and drying bed or press filters.

Alternative 2 - Oxidation Ditch. This alternative is a variation of the activated sludge process. The oxidation ditch features important advantages over the oxidation/stabilization lagoon system, due to its high performance and good removal levels of nutrients. The more notorious disadvantages are the need for qualified personnel and a higher energy consumption level. Its train process consists of the following components:

Pretreatment, oxidation ditch, clarifier or secondary settling tank, chlorination tank, sludge recirculating tank, sludge thickening, and drying beds or press filters.

Alternative 3 - Oxidation Lagoons. The main process train of this alternative comprises pretreatment, anaerobic lagoon, facultative lagoon, and stabilization lagoon. This method depends heavily on the water and ambient temperatures. The lagoons, after extended periods of time, can become clogged and saturated.

Alternative 4 - No-project. This alternative was not considered feasible given the current discharge conditions and the deficient operation of the existing lagoons.

Excluding alternative no. 4, the alternatives were evaluated using a matrix with the following parameters: cost effectiveness, environmental considerations, effluent quality, expansion features, compliance with C.N.A. regulations, operation requirements, and public acceptance. Based on the technical analysis, alternative No. 1 (activated sludge) was selected.

SEWERAGE SYSTEM

The sewage collection system covers just under 80% of the urban area. The system is composed of 22,103 connections of pipeline and 384 km of pipeline. The pipe diameters vary from 15 cm to 107 cm .

A study conducted under the direction of the IBWC (Minute 294) diagnosed the condition of the environmental infrastructure of Piedras Negras. This study developed alternatives for the sewage system, using the Master Plan prepared under the direction of the C.N.A. as the baseline. The Minute 294 study incorporated the recommendations submitted by the Binational Technical Committee (BTC) of Piedras Negras. The BTC is comprised of representatives of IBWC (both sections), C.N.A. (Border Affairs and Regional), EPA, Sistema Municipal de Aguas y Saneamiento (SIMAS) of Piedras Negras, Comisión Estatal de Aguas y Saneamiento (CEAS) del Estado de Coahuila, NADB, and BECC.

The alternatives evaluated included the BOT project with modifications.

Alternative 1 This alternative utilizes the BOT as the baseline, and would provide 100% coverage for the current needs.

The cost for this alternative was estimated at US\$13.4 M.

Alternative 2 This alternative includes the BOT works in addition to those proposed in the study prepared under Minute 294. Coverage under this alternative is 100% for the planning horizon. The estimated cost for this alternative is US\$36.1 M.

Based on the BTC analysis, Alternative 1 is the recommended option.

O&M Plan. This plan identifies the requirements of O&M of all unit processes, including human resources, the frequency of maintenance, and cost estimates. Before start-up of the WWTP and pump/lift stations, there should be a final O&M plan in place that should include the sewage collection system.

Compliance with applicable design norms and regulations. The requirements for construction of the sewer system have been validated by C.N.A. and corroborated by the BTC.

IV. Financial Feasibility and Project Management

Financial Feasibility.

The NADB is currently analyzing the project to determine its financial feasibility. This analysis will help determine the contributions for each funding source, as well as credit and/or grant components, and the ultimate rate structure. The results of the analysis were presented in a public meeting held on August 13, 1999.

The table below summarizes the project construction costs, for the components, identified by the BTC in June 1999.

Estimated cost (dollars)

<i>Phase I Concession (BOT)</i>	<i>\$23,214,376</i>
<i>WWTP</i>	<i>\$ 8,036,243</i>
<i>Lift Station</i>	<i>\$ 651,120</i>

<i>Interceptor/collectors</i>	<i>\$ 14,527,031</i>
<i>Phase II Mid Range</i>	<i>\$ 8,988,097</i>
<i>Lift Station</i>	<i>\$ 640,952</i>
<i>Interceptors, collectors, laterals, subcollectors</i>	<i>\$ 8,347,145</i>
<i>Phase III Long Range</i>	<i>\$24,616,165</i>
<i>Lift Station</i>	<i>\$ 640,952</i>
<i>Interceptors, collectors, laterals, subcollectors</i>	<i>\$ 23,975,213</i>
<i>Institutional development</i>	<i><u>\$ 598,691</u></i>
<i>TOTAL</i>	<i>\$57,417,329</i>

The required investments for funding the WWTP and associated collector, subcollectors, and pump stations have been obligated by the BOT concessionaire.

Estimated O&M Costs - Yearly (dollars)

Concept

<i>WWTP</i>	<i>Included in BOT works</i>
<i>Personnel services</i>	<i>\$1,216,162</i>
<i>General services</i>	<i>\$1,150,665</i>
<i>Maintenance</i>	<i>\$ 646,857</i>
<i>Supplies and materials</i>	<i>\$ 479,855</i>
<i>O&M Sewer</i>	<i>\$ 196,471</i>
<i>O&M Water Supply</i>	<i><u>\$ 10,321</u></i>
<i>TOTAL</i>	<i>\$3,700,331</i>

Based on the analysis developed by the consultant, NADB determined the grant and loan amounts for the project. For access to each one of the funding sources, their corresponding authorization processes must be followed.

Financial Structure

<i>Source (dollars)</i>	
<i>Concession</i>	<i>\$23,214,376</i>
<i>CNA, State and Local Governments</i>	<i>\$ 8,401,065</i>
<i>NADB -BEIF</i>	<i>\$ 8,401,065</i>
<i>NADB Credit</i>	<i>\$16,802,132</i>
<i>NADB- IDP</i>	<i>\$ 250,000</i>
<i>Desarrollo Institucional (Otros)</i>	<i>\$ 348,691</i>
<i>TOTAL</i>	<i>\$57,417,329</i>

Rate Model: The rate model prepared by the consultant was utilized to determine the impact that the proposed project would have on the user rates, considering various grant and loan combinations. The rate model that was prepared by the consultant was reviewed by the NADB. With the proposed financial structure, the rates must be increased by 42% over an 8-year period. Thereafter, the rates need to be adjusted accordingly to accommodate inflation and cost of living. This rate increase will allow the public utility to face its responsibilities of O&M, liabilities, investments, and reserves. The average rate will increase from 2.54 pesos/m³ to 3.62 pesos/m³.

Project Management. The project will be managed by the SIMAS - Piedras Negras that has operated the public utility for several years. The SIMAS is the agency that will adopt the rate adjustments. The system is expected to operate in a self-sufficient manner, supporting itself through user fees.

V. Community Participation

Comprehensive Public Participation Plan. The objectives of the Comprehensive Community Participation Plan (Plan) are to ensure that the community understands and supports the environmental, health, social, and financial benefits and costs of the project, as well as any changes in user fees. The City of Piedras Negras, with important contribution of the steering committee, submitted a Public Participation Plan, which includes the following activities: develop a steering committee to lead the implementation of the plan, identify and meet with local groups and organizations, hold two public meetings (one has already taken place) and develop and final report documenting public support for the project. The activities carried out thus far in fulfillment of this Plan are detailed below.

Steering Committee: A steering committee was formed in 1996 as part of the BECC certification process to guide the public participation component. The committee has been responsible for disseminating project information and scheduling the public meetings. Committee members also met as necessary to follow-up with the public information campaign regarding the project and related activities.

Local Organizations: The City and the steering committee have met with business, civic, community and neighborhood representatives to present the project and request support for the project.

Public Information: Information about the project has been provided to the public in the utility bills and at the public and neighborhood meetings. Information about the financial aspects of the project was provided to the residents during the second public meeting held on August 13, 1999. The project sponsor made available to the public the Comprehensive Sanitation Master Plan and BOT designs, and environmental information documents 30 days before the public meeting. This information was available at the offices of the SIMAS. A public meeting was held on June 18, 1999. There were over 100 people in attendance.

Public Meetings: Two public meetings have been conducted. The first public meeting was held on June 18, 1999, and was properly advertised 30 days in advance. The meeting covered the technical aspects of the project. The second public meeting was conducted on August 13, 1999.

VI. Sustainable Development

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".

All the environmental parameters have been met and the culture of reuse of treated water has been realized through the sale of the effluent to Comisión Federal de Electricidad (Mexico's Power Company). This action will help manage the Rio Grande - Conchos watershed, as well as downstream resources in a more sustainable pattern. The improvements will help preserve aquatic life in the Rio Grande, considering that the effluent will have lower BOD and TSS concentrations than those required by C.N.A.

The principles of sustainable development are satisfied. These include: Human beings are the central point of all concerns for sustainable development; they have the right to a healthy and productive life in harmony with nature. The project complies with the principles objectives, which are to solve human health problems by improving the sanitary sewage collection system, and decreasing pollution of the environment and health risks to the population, through sewerage improvements and sanitation of wastewater.

Institutional and Human Capacity Building. For the optimum operation of the Utility an investment of about \$600,000 dollars will be required for the purpose of increasing the institutional capacity of the Utility (SIMAS). Further, the transition from a lagoon system to a mechanical technology (activated sludge) will require the training of personnel. The increase in treatment capacity will prevent potential sanctions that could occur without the proposed capacity.

Conformance with Applicable Local/Regional Conservation and Development Plans. The project will not modify any land use patterns or zones, since most of the sewer lines will be constructed on already impacted and improved areas. The site of the WWTP will be re-landscaped to provide for a buffer zone to mitigate the impacts resulting from its construction.

Border XXI, a regional environmental plan established by the United States and Mexico, utilizes as project sustainability indicators the percentage of collected and treated wastewater, and the population percentage served with water sewer service. For 1998, these figures were 96% and 80%, respectively.

Natural Resource Conservation. With the water leak detection program, water losses are anticipated to drop from 41% to 25%. Furthermore, with the installation of water meters and water conservation campaigns there will be better results associated with the conservation of natural resources.

Additionally, there is a contract with C.F.E. for the sale of treated wastewater to be used in the cooling process of the power plant. The reused treated volume will reduce

the water drawn from surface or underground sources allocated in the Rio Grande basin.

Energy Conservation The selected sewer system alternative will require less energy since only three pump stations will be needed, which is less than the original BOT proposal. Although the WWTP will require a power generation substation, energy conservation measures will be implemented, whenever feasible.

Community Development. The new project, with an investment of \$57.4 million dollars, will ensure compliance with federal regulations for water quality and will benefit the community. The project will also improve the quality of life and health in the community. Presently, the existing lagoons pose a health hazard to the neighbors, considering that the growth of the city has exceeded the treatment capacity of the plant. The project will help reduce and eliminate the health biological hazards for the residents and will eliminate bad odors, biological hazards, and infectious diseases.

Furthermore, with the construction of the new WWTP, the effluent quality discharged into the Rio Grande will be improved.