Border Environment Cooperation Commission

Wastewater Collection, Treatment, and Reuse Project for Colonia Anapra, Ciudad Juarez, Chihuahua, Mexico

As a result of the FY 2004-2005 Prioritization Process conducted by the Environmental Protection Agency (EPA) through its Border Environmental Infrastructure Fund (BEIF), managed by the North American Development Bank (NADB) and the Project Development Assistance Program (PDAP), managed by BECC, the ***Wastewater Collection, Treatment, and Reuse Project for Anapra, City of Juarez, Chihuahua, México,*** *was determined to be Category One, ranked number 2 and therefore, funds were allocated for its development.*

1. General Criteria

1.1 Project Type

This project has been designed to introduce a sanitary wastewater collection system, provide secondary wastewater treatment, and treated wastewater for irrigation of parks, gardens, sports fields, and medians, in the area known as Colonia Anapra. Its name is the Spanish acronym of the National Association of Agricultural Producers, whose members were originally allocated these lands.

This project belongs in the wastewater treatment area that falls within the priorities established by the Border Environment Cooperation Commission (BECC).

The project sponsor is the Juarez water utility, Junta Municipal de Agua y Saneamiento (JMAS), an agency belonging to the Junta Central de Agua y Saneamiento del Estado de Chihuahua (JCAS).

1.2 Project Location

The State of Chihuahua is located in the northern part of the Republic of Mexico. It is the largest Mexican state and represents 12.6 % of the country's entire surface area. It neighbors the United States of America to the north; the state of Coahuila de Zaragoza to the east; Durango to the south; and Sinaloa and Sonora to the west, as depicted in Figure 1 (Source: National Institute of Statistics, Geography, and Information [INEGI]).

The figure also shows the location of Ciudad Juarez, in the northernmost part of Chihuahua; Figure 2 shows the location of Anapra with respect to Juarez.

Figure 1. State of Chihuahua and location of Ciudad Juarez.

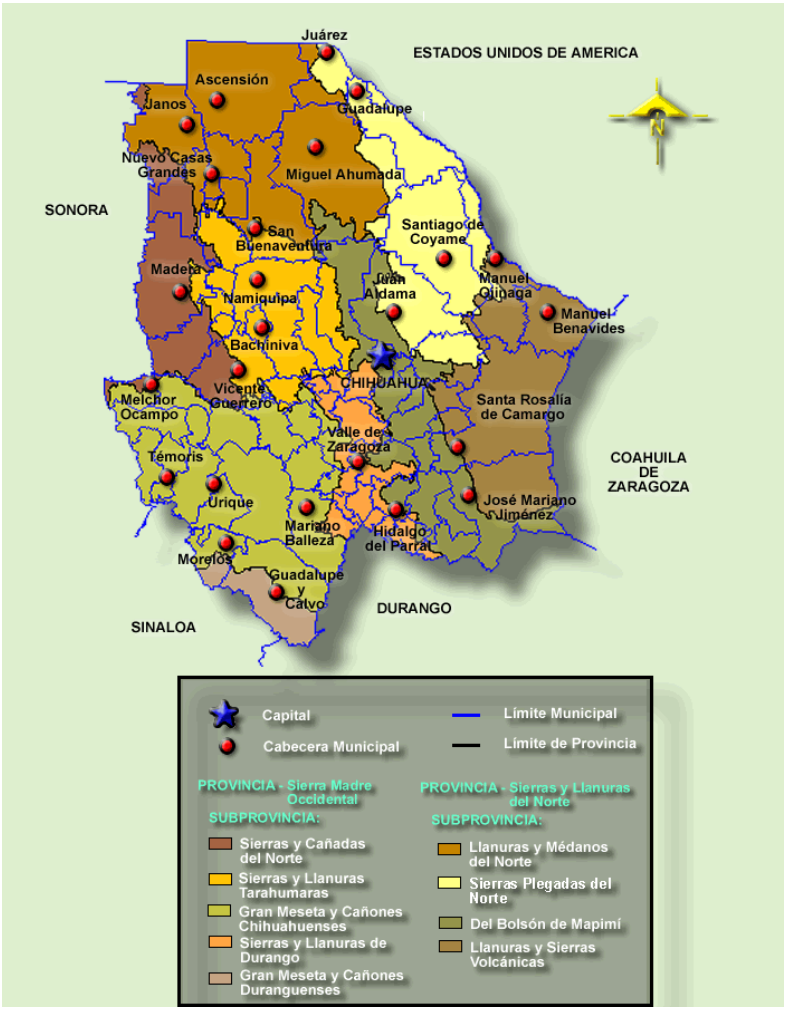


Figure 2. Location of Anapra

1.3 Project Description and Tasks

Project Description

The project consists of the implementation of a comprehensive wastewater treatment and reuse system, which will include the following major components:

Collection and Conveyance System:

- Construction of a sewer system to serve 100% of the population of Colonia Anapra, the system includes approximately 91,000 ft. of 8" gravity sewer lines and the corresponding manholes
- Approximately 2450 hook-ups
- Headworks with Bar Screen and Grit/Grease Removal
- Wastewater lift station (WWPS) with biological odor control, screening, degreasing, and degritting facilities, with capacity for 1.41 (MGD).
- Approximately 9800 ft of 12" forcemain from the WWPS to the WWTP.
- Approximately 6200 ft of 12" forcemain from the WWPS to the Nadadores Main in the Ciudad Juarez collection system for emergency use.

Treatment System (1.41 MGD)

- Two Activated Sludge Reactor (Extended aeration type) with a capacity of 0.7 (MGD) each
- Two Secondary Settlers
- 6 Acres of Land

Effluent Reuse System

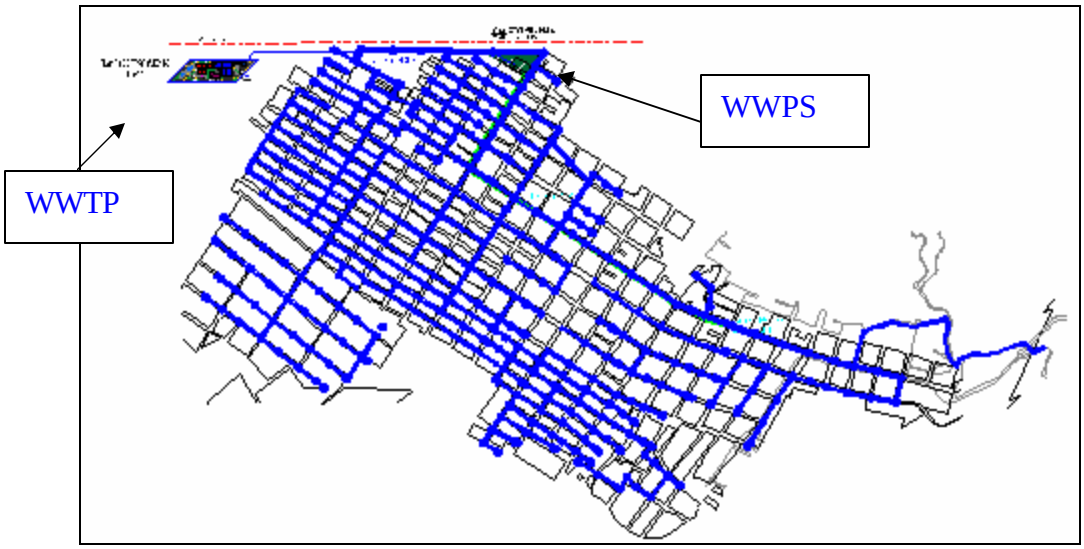
- One Chlorination Tank
- Pumping station with capacity for 1.41 MGD
- Approximately 10,000 ft of 12-inch irrigation system, including a system to divert excess flow to the Benito Juarez reservoir.

Sludge Disposal System

- Drying Beds

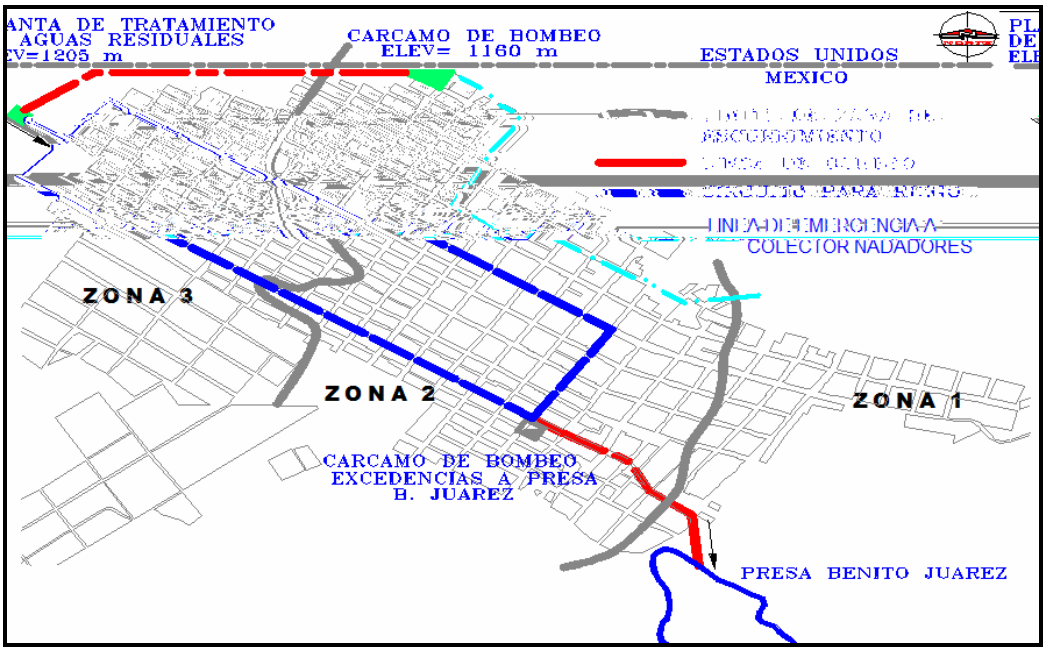
Figures 3 depicts the sewer collection system, the WWPS and the WWTP

Figure 3. Sewer System Configuration.



Figures 4 illustrates the reuse distribution system

Figure 4. Project Components



Project Tasks Schedule

The certification of the project includes all the aforementioned components. The collection system was constructed during 2005-2006; the remaining infrastructure is scheduled for the 2006-2007 period.

Description of the Community

Demographics

Pursuant to population projections developed for the Master Plan and based on historical census data, the population for Colonia Anapra is as shown in Table 1.

Table 1

Population Projections for the project's planning period

YEAR	POPULATION (RES)	YEAR	POPULATION (RES)
2000	14,354	2001	17,115
2002	18,400	2003	19,686
2004	20,971	2005	22,256
2006	23,542	2007	24,827
2008	26,113	2009	27,398
2010	28,683	2011	29,969
2012	31,254	2013	32,540
2014	33,825	2015	35,110
2016	36,396	2017	37,681
2018	38,967	2019	40,252
2020	41,537	2021	42,823
2022	44,108		

As shown in the table above, the population to be served by the project by the year 2022 is estimated at over 44,000 residents. Although geographically colonia Anapra can not continue growing, an important population growth is observed due to the increment of population density.

Current Wastewater Collection and Treatment System

During the last years, important improvements to the infrastructure of colonia Anapra have been accomplished. One of the most important has been the installation of the water distribution system, that even though this water has not enough quality for drinking and is used for household purposes due high Arsenic content (above the standards) and high values of Total Suspended Solids (TSS), the Anapra's population can get free potable water from three reverse osmosis plants located around the colonia. A secondary effect caused by the installation of the water distribution system was the necessity of the wastewater collection and conveyance system because of the increase of water volumes in the area.

The natural configuration of the area where Colonia Anapra is located has a natural slope that runs from south to north; this causes runoffs to flow towards Sunland Park, New Mexico, in the United States. When considering that such runoffs may consist of untreated wastewater, then this project represents a higher priority.

At present, most of Colonia Anapra has wastewater collection coverage; however, there is absolutely no wastewater treatment infrastructure. Therefore, there are no connections to this system.

The project has been conceived to actually take advantage of this situation by positioning its WWPS and WWTP in areas where there is less power consumption for wastewater pumping. Accordingly, the WWPS is located in the northernmost part of Colonia Anapra, a natural confluence point for all wastewater.

Project Alternatives

The project alternatives considered were as follows:

a) **No-action Alternative**. Given the environmental, human health, social, and political implications, this alternative was considered not viable since the beginning of the evaluation. Considering the natural south-to-north runoff condition, and the recently constructed sewer system which replaced the high concentration of latrines in the area, it does not represent a real option.

b) **Connecting the Colonia Anapra sewer system to the Juarez central wastewater collection system.** This option was analyzed and rejected. Physically, it is very difficult and expensive to connect both systems, because of the high costs involved in pumping water to the highest point of the hills that naturally separate the two systems and the rehabilitation that would need to be done to accept the additional flow.

c) **Developing a separate wastewater treatment and reuse system for Colonia Anapra.** This was the preferred alternative, and includes as an emergency measure, a pressure activated conveyance line from the WWPS to the Nadadores main, which would operate in case of failure of the WWTP that could prevent untreated water from being spilled. The following are some of the most important elements that were considered in this alternative.

- Availability of sites. With respect to the location of the wastewater treatment facility, the proposed alternatives considered the availability of land, proximity to the locality, and impacts to the local landscape and activities. Three different sites were analyzed, two of them in the Northern zone and the other in the Benito Juarez dam.
- Selection of the wastewater treatment technology. In selecting the most viable treatment process for the area, the following were considered: savings in power consumption, sludge production and characteristics, variations to organic loads, residence times, creation of foul odors, removal efficiency, optimal temperature for the process, ease of operation, low operation and maintenance costs, the minimum unavoidable impacts to the community and the ecosystem, avoiding impacts to additional natural areas. Two different types of technologies for wastewater treatment were

analyzed, lagoon systems and activated sludge, last one was selected as preferred alternative.

- Selection of the level of treatment required: Quality requirements for treated wastewater, pursuant to the NOM-003-SEMARNAT-1997 standard.

Project Justification

The unhealthy conditions in Colonia Anapra resulting from open air runoffs originating from faulty or saturated latrines; the high risk of untreated runoffs flowing from Mexico to the United States; and the need to improve the social and environmental conditions of the area, make justify the implementation and urgency of this project.

1.4 Conformance to International Treaties and Agreements

The project herein falls within the scope of agreements targeted at improving the environment and the quality of life of border residents, which have been signed by Mexico and the United States, such as the La Paz Agreement, the Comprehensive Border Environment Plan, the Border 2012 Program, and the Free Trade Agreement.

The United States and Mexico have signed five major bilateral agreements related to air, water, land protection, and pollution control issues. These include:

- 1889 International Boundary Convention
- 1944 Water Treaty
- 1983 La Paz Agreement, or Border Environment Agreement
- 1990 Integrated Border Environmental Plan (IBEP)
- 1994 North American Free Trade Agreement (NAFTA)

The project complies with the spirit of all these agreements, and all of them have been considered since the project's was originally conceived.

2. Human Health and Environment

2.1 Human Health and Environmental Need.

Environmental and Human Health Issues

Colonia Anapra is within the Ciudad Juarez city limits, and is located in a socially and economically marginalized area. For several years there was a lack of water distribution and wastewater collection systems in Anapra. Once the water distribution system was installed, the disposal of the liquid wastes becomes a priority because of the human health and environmental effects that lack of wastewater treatment can cause. The colonia's wastewater collection system is in its final construction phase; however, there is no wastewater treatment facility and thus, household connections cannot be installed. Wastewater has historically been managed using cesspools and latrines.

The lack of an appropriate wastewater disposal system, along with the area's topography, has caused frequent surfacing of contaminated water and is an immediate threat to public health. Additionally, many residents dispose of wash water in the streets causing pooling and small streams of water. Rodents and insects are attracted into the area, and children who enjoy playing in water puddles after rainstorms can stray into contaminated water. The intent of this project is to address the existing threat to public health and groundwater contamination, as well as to avoid such threats in the future.

Urbanization of colonia Anapra has caused modification to natural streams that flow through the area, and in some cases, the streets have become canals that naturally flow towards the border with the United States. This results in local and transboundary impacts, as well as unhealthy conditions for area residents.

Additionally, because the availability of water in the area is only for the priority necessities of its residents, the use of water for irrigation of green areas is not allowed. Thus, area residents do not have available parks or recreational areas that may contribute to the harmonious development of family activities.

Environmental and Human Health Information

Although human health statistics for the Anapra area are limited, there is information regarding the high incidence of diseases that include hepatitis A, measles, shigellosis, and tuberculosis, in some instances the incidence rate is three times higher than the rest of the City of Juárez. At this time there is no specific documentation regarding the causes of mortality for Colonia Anapra. Tables 2 and 3 show the most recent public health studies conducted in communities in Mexico adjacent to the United States-Mexico border. The conditions in Anapra are indicated in those border communities in the State of New Mexico. As shown in Table 3 infectious diseases are one of the main causes of death in the New Mexico border.

Table 2

Cases and incidence of diseases in U.S.-Mexico border communities

AREA	Disease				
	Hepatitis A	Measles	Shigellosis	Tuberculosis	AIDS
Overall U.S. population	12.64	11.2	10.9	10.3	16.7
Arizona Border	39.4	9.8	38.3	6.9	15.1
California Border	30.7	61.9	22.1	12.7	22.0
New Mexico Border	46.9	14.6	21.2	7.3	3.9
Texas Border	40.4	38.9	49.1	26.5	7.9

Source: National Center for Health Statistics. Centers for Disease Control and Prevention, Vital Statistics Database. HRSA, n.d. http://bphc.hrsa.gov/bphc/borderhealth/table1.htm

Hepatitis A is a liver disease associated with unsanitary disposal of sewage and inadequate or contaminated water supplies; shigellosis often results from poor sanitation, lack of water/wastewater facilities, contaminated water and food and is common in distressed areas.

Table 3
Main Causes of Death in the
U.S.-Mexico Border, 1989-1991

Area	Accidents	Diabetes	Infectious Diseases
Overall U.S. Population	4	8	7
Arizona Border	5	9	8
California Border	5	>10	7
New Mexico Border	3	5	8

Source: National Center for Health Statistics. Centers for Disease Control and Prevention, Vital Statistics Database. HRSA, n.d.
http://bphc.hrsa.gov/bphc/borderhealth/table2_longdesc.htm

The most common organisms or parasites found in untreated wastewater include: E. coli (*Escherichia coli*), cholera (*Vibrio cholerae*), hepatitis A (*Enterovirus ssp*), Giardia (*Giardia lamblia*), Cryptosporidium (*Cryptosporidium parvum*), and helminth eggs. An individual may become ill after drinking water that has been contaminated with these organisms; eating uncooked foods that have been in contact with contaminated water; or having bad hygiene habits that contribute to the dissemination of diseases by direct or indirect human contact.

Although the number of cases reported for Ciudad Juarez may vary from the estimations for Anapra, Table 4 shows the high incidence of gastrointestinal diseases in the Juarez area. The sum of infections and gastrointestinal problems represent 47% of the most frequent cases of illness in the city.

Table 4

Most frequent diseases in Ciudad Juarez

Diseases	% of Total
Gastrointestinal Infections	28%
Respiratory Infections	27%
Diabetes	24%
Gastrointestinal Problems	19%
Fractures and Accidents	19%
Gynecological Problems	16%
Hypertension	16%
Psychiatric Problems	12%
Orthopedic Problems	9%
Neurological Problems	7%

Note: N = 348 interviews.
Source: Suarez, *et al*, 1998.

2.2 Environmental Assessment

Pursuant to the provisions of the General Law on Ecological Balance and Environmental Protection an Environmental Impact Assessment was prepared and submitted for review to the Mexican Secretary of Environmental and Natural Resources, Secretaria del Medio Ambiente y Recursos Naturales (SEMARNAT). The EIS ruling was issued on April 28, 2006, thus completing its environmental clearance process required in Mexico.

As for the U.S. environmental assessment process (NEPA), a transboundary impact study was developed and submitted for consideration to the U.S. Environmental Protection Agency (EPA). Based on this assessment, the EPA issued a Finding of No Significant Impact (FONSI) on April 6, 2005, which established that the project will not result in significant environmental impacts that may affect the U.S. border area.

Environmental Impacts

Potential environmental impacts were evaluated in three phases: the first involves site preparation, the second is the construction phase, and the third is the operation and maintenance phase. Although all impacts were not considered to be significant to Anapra.

In summary, during the site preparation phase the project will create impacts that include the transformation of areas, modification of morphological aspects related to the quality of soil, air, water, and changes to the lifestyle of quality of life of area residents.

During the construction phase, the impacts will include the occupation and preparation of areas for the different project tasks, and their final construction.

Finally, during the operation phase, no adverse impacts are foreseen for the natural and socioeconomic setting; in fact, impacts are expected to be beneficial.

Table 5 presents a summary of potential environmental impacts during the three aforementioned phases.

TABLE 5
ENVIRONMENTAL IMPACT ASSESSMENT MATRIX

SYMBOLS:
A = Significant Adverse with no mitigation action

A* = Significant Adverse with mitigation action

a = Insignificant Adverse with no mitigation action

a* = Insignificant Adverse with mitigation action

B = Significant Benefit

b = Insignificant Benefit

	AREA POTENTIALLY RECEIVING IMPACTS																		
	ABIOTIC FACTORS											BIOTIC FACTORS		SOCIOECONOMIC FACTORS					
	WATER		NOISE		SOIL				AIR			FLORA	FAUNA	LANDSCAPE		SOCIAL	ECONOMIC	
	SURFACE	GROUNDWATER	COMMUNICATION	WORK PERFORMANCE	PHYSICAL/CHEMICAL CHARACTERISTICS	VERTICAL DRAINAGE	SURFACE RUNOFF	GEOMORPHOLOGICAL CHARACTERISTICS	DUST EMISSION	VISIBILITY	GAS EMISSION	GROUND	GROUND	VISUAL APPEARANCE	ENVIRONMENTAL QUALITY	SOCIAL WELFARE	REGIONAL EMPLOYMENT AND INCOME	LAND USE
PROJECT PHASES																		
SITE PREPARATION																		
Clearing and rough dressing									a*		a			a				
Clean up and lay out					a*				a		a*	a*	a*	a	a*		b	
Movement of equipment and machinery									a	a	a*	a*	a*	a	a		b	
Hiring labor														a		B	B	
Temporary facilities –booths, storage									a		a*	a*	a*	a*	a		b	
CONSTRUCTION																		
Construction material requirements														a		b	B	
Storage of soil and construction materials														a*				
Movement of machinery, equipment, and materials			a	a*					a		a*		a*	a	a*		b	
Labor (Operation)													a	a		B	B	
Construction waste management and final disposal	a*				a*	a*			a		a*			a*	a*	a*		
Household waste and wastewater management and disposal	a*	a*			a*	a*					a*		a*	a*	a*	a*	b	
Excavation						a*	a*	a*	a		a*			a	a			
Backfilling and leveling					a						a*						b	
Sealing and interconnection tests	a*				a*										a*	a*		
Compacting		a				a		a			a*				a*			
Equipment installation											a*				a*			
Fuel requirements											a*					a*	b	
Area clean up and dismantling of temporary facilities											a*			b	b	b	b	
OPERATION																		
Maintenance, supervision, and repairs	B	B			B	B	B	B			B	B	B	b	B	B	B	B
Provision of service	B	B			B	B	B	B			B	B	B	b	B	B	B	B
SOLID WASTE GENERATION																		
Sludge										a*				a*	a*		B	B
Screening										a*				a*	a*		B	
Degritting										a*				a*	a*		B	

TABLE 6 SUMMARY OF THE MAIN MITIGATION ACTIONS			
ACTIVITY	**ENVIRONMENTAL OR SOCIAL ISSUE**	**EFFECT**	**MITIGATION ACTION**
ELIMINATION OF VEGETATION	CLIMATE	CHANGES TO MICROCLIMATE	IMPLEMENTATION OF DECORATIVE VEGETATION
USE OF CONSTRUCTION MATERIALS	CLIMATE	CHANGES TO MICROCLIMATE, INCREASED TEMPERATURE	REDUCE THE NUMBER OF CRYSTALS, USE NON-REFLECTIVE COLORS
GAS EMISSIONS FROM CONSTRUCTION VEHICLES	AIR	CHANGES TO AIR QUALITY	USE GOOD QUALITY FUEL, AND PERIODIC MAINTENANCE TO VEHICLES AND MACHINERY
INFLOW TREATMENT	SURFACE WATER	DISCHARGES PURSUANT TO REGULATIONS	CONSTANT SUPERVISION OF FACILITIES TO ENSURE AN EFFICIENT OPERATION
LAND COMPACTING	GROUNDWATER	REDUCTION OF VERTICAL RECHARGE	INSTALL MATERIAL THAT ALLOWS FOR RAINWATER INFILTRATION
EXCAVATIONS AND BACKFILLING FOR LAND LEVELING	LAND	CHANGES TO PHYSICAL/CHEMICAL CHARACTERISTICS	USE NON-CONTAMINATED SOIL FOR GREEN AREAS AND COVER THE SOIL WHEN CONTAMINATING MATERIALS ARE USED
BUILDING	FLORA	REDUCED OR LOST HABITATS	USE FREE SPACE FOR GREEN AREAS
IMPLEMENTATION OF COVERAGE AREAS	FLORA	INCREASED GREEN AREAS AND ENHANCED LANDSCAPE	THE DENSITY OF SPECIES SHOULD PROVIDE FOR THE MAXIMUM USE OF SPACE
TRANSPORTATION OF CONSTRUCTION MATERIALS AND GENERATION OF WASTE	FAUNA	EXPOSURE TO CONTAMINANTS (SMOKE AND DUST)	CONTROL CONTAMINATION WITH PLANT BARRIERS
FOUNDATIONS, EXCAVATIONS, SEWER LINES	SOCIOECONOMIC	CHANGES TO THE LANDSCAPE	PROVIDE A FINISH THAT CONTRASTS WITH ADJACENT CONSTRUCTIONS AND THE OVERALL SETTING
COMPLY WITH NOM-003	SOCIOECONOMIC	HEALTH PROTECTION	PREVENT SOLID WASTE DISPOSAL AND SUPERVISE AND REVIEW THE FACILITY'S PROCESS AND DISCHARGES

None of the adverse impacts identified will have a repercussion on the environmental system's structure and function, particularly when mitigation actions are implemented. In addition, no adverse environmental impacts that may be considered cumulative or synergic are anticipated.

Most of the adverse environmental impacts identified are temporary in nature, not significant, and all of them have associated mitigation actions that involve official controls, complemented by the aforementioned safety measures. In contrast, the benefits to the community and the region will create major social repercussions on the region's health and economy by increasing productivity as a result of better sanitation conditions including forestation of the area.

Having considered the proposed mitigation actions, as well as the general recommendations, and based on the comprehensive evaluation of the project and the resulting balance between impacts and development, the overall impact of the project is environmentally beneficial.

From an ecological standpoint, the influences that the project's operation will help mitigate contamination in adjacent areas, primarily in the border region due to elimination of latrines.

Finally, it has been established that the balance of the project's effects is positive for the entire region, as it supports development as a viable activity and concurs with the Ciudad Juarez Urban Development Plan.

This sanitation project will benefit a large part of the population of the colonia by meeting a primary need. In addition, the project coincides with the city's land use and development plans, therefore reducing the possibility of any conflict that may potentially arise.

2.3 Compliance with Applicable Environmental and Cultural Resource Laws and Regulations.

The wastewater treatment plant's final design was developed considering the need to generate an effluent that provides sufficient quality for wastewater reuse and eliminates health risks for residents who may have contact with treated water, pursuant to the applicable environmental regulations contained in Official Mexican Standard NOM-003-SEMARNAT-1997, which establishes the maximum permissible levels of contaminants for treated wastewater to be reused for public services.

Projects will be implemented pursuant to the guidelines contained in the construction regulations established by the City of Juarez, as well as to the plans set forth by the Municipal Planning Institute (IMIP). Additionally, the tasks to be developed are not expected to impact protected areas or ecological reserves. During the implementation of the project, the City, through the Directorate of Public Works, the local water utility (JMAS), and CONAGUA, will oversee the tasks for conformance with the aforementioned guidelines.

The National Institute of Anthropology and History, (INAH) through Letter No. DM-206/03, established no objection to the development of this project in the Anapra area, there are no archeological settlements in the area. Based on the latter, no impacts to natural resources are anticipated as a result of the project's development.

Important Certification Aspects:

Completion of the Environmental Clearance processes in the U.S. and Mexico. The US EPA NEPA process was concluded with the issuance of the FONSI on April 2005 as well as the ruling for the MIA on April 28, 2006.

Scheduling of Matters Still Pending:

None

3. Technical Feasibility

3.1 Appropriate Technology

In March 2003, BECC in coordination with JMAS and JCAS completed a Comprehensive Wastewater Collection and Treatment Project for Colonia Anapra. In this study, several alternatives for the sewer conveyance system, the location and type of wastewater treatment and the reuse system were analyzed.

Based on the preferred alternatives from the mentioned study, a Final Design of the Wastewater Treatment Facility, Pump Stations, and Wastewater Reuse Systems was developed and completed in January 2006, a Value Engineering Analysis was done during September-October 2005 in order to optimize the use of energy and ensure proper design. As result of the Value Engineering, an evaluation to determine the reuse capacity was completed taking into account the municipality's parks department. Additionally, the required agreement with the city is soon to be completed..

Final design includes:

Collection System and Lift Station:

This includes a gravity conventional sewer system, a pretreatment system integrated by screening, degritting, desilting, flow measure device, odor control system and a lift station to pump wastewater to the WWTP and an emergency line from the lift station to the Colector Nadadores.

WWTP:

The Activated Sludge WWTP (1.42 MGD) includes two trains of aeration tanks, secondary settlers and sand filters.

Disinfection:

Disinfection system which includes a chlorination tank and a sodium hypochlorite feeding system.

Effluent Disposal (Reuse)

The system includes a gravity/pressure irrigation system and a line to divert any excess water to the Benito Juarez Dam.

Sludge management

This system includes thickening tanks and drying beds. Solids will be disposed in the sanitary landfill.

Figure 5 shows a flowchart depicting the wastewater treatment plant and wastewater pumping station. Table 7 presents the corresponding legend.

Figure 5
WWPS and WWTP Flowchart

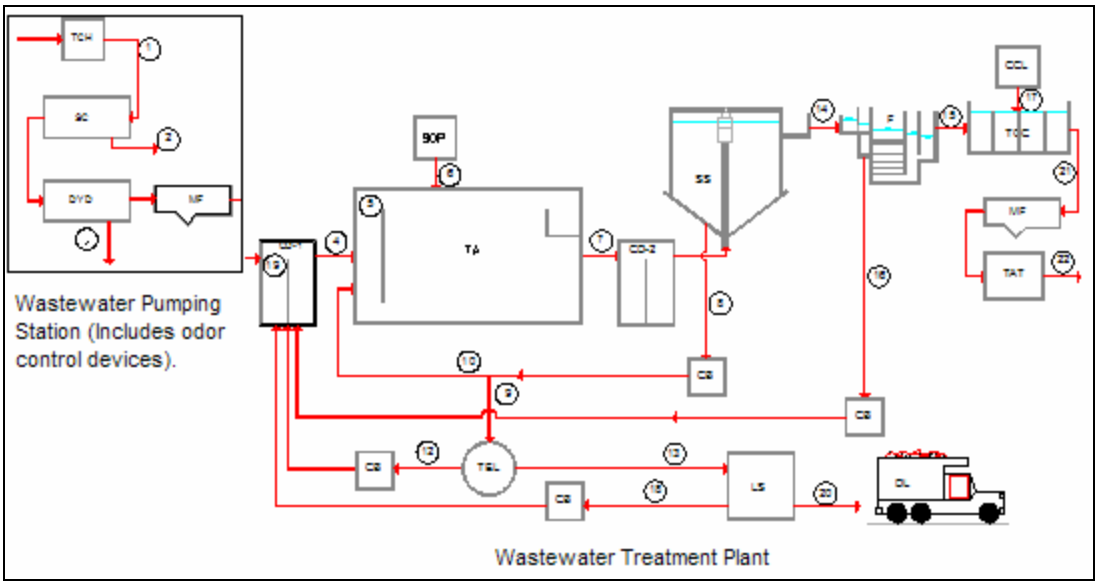


Table 7
Legend for the WWPS and WWTP Flowchart

TCH	Primary Screening	TA	Aeration Tank
SC	Secondary Screening	SS	Secondary Settler
DYD	Degritting and Desilting	F	Sand Filter
MF	Flow Meter	LS	Drying Beds
CD	Distribution Box	CCL	Hypochlorite Dispenser
SOP	Blowers	TCC	Chlorination Tank
CB	Lift Station	TAT	Treated Wastewater Tank
TEL	Sludge Thickening Tank	DL	Sludge Disposal

Treatment Alternatives

As mentioned in section 1, General, of this document, there were three general alternatives considered. The basis for the selected alternative were the following to best determine the best treatment system, several alternatives were evaluated, considering the availability of sites, applicability of processes, ease of operation, costs, and impacts to the community. The treatment system and modules to be used were determined based on population growth and wastewater generation. The recommended system was a wastewater treatment system consisting of three modules with 0.71 MGD capacity each, operating under an activated sludge process with extended aeration (Two modules are projected to be constructed in a first phase and the third after 2011). The treatment system

is supplemented by the necessary flow metering units, pretreatment, effluent disinfection, and sludge conditioning and final disposal.

3.2 Technical Process

The treatment process is sufficient to provide adequate quality for wastewater reuse, eliminating health risks for residents who may have contact with treated wastewater, pursuant to the applicable environmental regulations contained in Official Mexican Standard NOM-003-SEMARNAT-1997, which establishes the maximum permissible levels of contaminants for treated wastewater to be reused for public services.

A summary of raw and treated wastewater characteristics is presented in Table 8.

Table 8
Main parameters of raw and treated wastewater at the WWTP

PARAMETER	INFLOW	TREATED WW
Biochemical Oxygen Demand, mg/l	292	20
Total Suspended Solids, mg/l	292	20
Volatile Suspended Solids, mg/l	219	
Grease and Oil, mg/l	133	15
Total Nitrogen, mg/l	53	
Total Phosphorous, mg/l	11	
Fecal Coliforms, NPM/100 ml	1x107	240
Helmith eggs, per liter	> 5	1

The technology to be used for the wastewater treatment process is a technology that has been widely employed as a solution for wastewater sanitation in small and medium-size communities.

During development of the final design, a Value Engineering process was included to validate the selected technology. In addition, the most appropriate alternatives and solutions were proposed for an optimal process and an efficient use of energy.

The treatment system will generate wastewater with sufficient quality to be used for irrigation with human contact, therefore, its use in parks and recreational areas will be safe and appropriate, without risks for area residents.

Operation and Maintenance Plan

In order to operate and control wastewater treatment and reuse processes, the corresponding operation and maintenance manuals were developed by the project for the Lift Station and WWTP.

Operation and maintenance manual includes:

- Operation, control and maintenance of the Anapra pretreatment and lift Station.
- Operation, control and maintenance of the Anapra WWTP.

Operation manual will help to

- Optimize the use of the facilities through the implementation of operation policies consistent with their characteristics.
- Facilitate the understanding of the basic process principles and operation and control techniques, in order to strengthen the operators' capacity.
- Support the integration of the information obtained to the wastewater treatment plant, in order to facilitate the assessment of operations and, if applicable, the implementation of necessary adjustments to maintain a high operational level.

The Maintenance Manual will help to:

- Maintain the equipment operating at its maximum efficiency all the time.
- Reduce as much as possible any interruptions to normal operations.
- Reduce the time associated to the above interruptions to the minimum possible.
- Control costs associated to the aforementioned practices.
- Maintain a high level of efficiency in tasks developed by the maintenance area, through the use of the most appropriate techniques and the continuous improvement of the facility's personnel, who must possess a high degree of ability, skills, and training.
- Develop and establish maintenance programs based on observation of the facility's equipment.
- Create and maintain an inventory of spare parts required for maintenance tasks.
- Establish long term maintenance policies and actions with all related areas.

The wastewater treatment system's operation and maintenance will be the responsibility of the JMAS.

3.3 Compliance with Applicable Design Standards and Regulations

Final designs of the wastewater collection, treatment, and reuse systems were developed pursuant to technical specifications contained in the Wastewater Collection and Treatment Manual prepared by CONAGUAS's Technical Directorate and Official Mexican Standard NOM-001-CNA-1995 "Sanitary Sewerage System – Specifications for Hermeticity."

Important Certification Aspects:

Final Design of the project has been completed including the development of a Value Engineering analysis and the O&M Manuals.

Scheduling of Matters Still Pending:

None

4. Financial Feasibility and Project Management

4.1 Financial Feasibility

The North American Development Bank (NADB), after reviewing the financial information submitted by the Project Applicant, determined that the financial capacity and structure proposed by the JMAS are adequate. The information submitted and the financial analysis includes:

i) Historical and pro forma financial statements;
ii) Project's financial structure;
iii) Investment budget:
iv) Historical and pro forma operating and maintenance budget; and
v) Economic and demographic information on the project area

A detailed analysis of the project's financial information is contained in the loan proposal that will be submitted to the NADB Financial Committee for authorization. Following is a summary of the financial analysis.

The total cost of the project is estimated at MX $69.33 million, including loan closing costs, design, supervision, construction, value-added- tax, and contingencies.

Item	Amount (Million Pesos)
Construction	64.45
Supervision and Contingencies	4.18
Design	0.7
TOTAL	69.33

JMAS, JCAS, CONAGUA, EPA, and NADB have proposed a financial structure that will allow for the implementation of the project. The table below summarizes the proposed structure:

Funding Source	Amount (Million Pesos)	%
City / State	26.9	39.2
Federal Government	19.5	28.4
EPA	17.5	25.4
NADB Loan	4.8	7.0
TOTAL	68.6	100.0

JMAS exhibits a solid financial situation as reflected by their level of revenue and expenditure control. JCAS will earmark part of their revenues to service the debt.

JCAS has efficient finance management practices. Their sensible use of resources and financial discipline has translated into an operational surplus. The NADB loan will not affect the utility's financial situation, so JMAS will be able to continue addressing future infrastructure needs.

4.2 Rate/Fee Model

The current rate structure applied for wastewater collection and wastewater treatment in the City of Juarez for those residents currently receiving service will be applied to Anapra's Residents. This rate has historically not been applied to the residents of Anapra since previously they were not receiving this service.
The following is the rate structure to be applied to Anapra:

Domestic use - cost per cubic meter							
Consumption		Water and sewage	Water 80%	Sewage 20%	WW treatment	Water rights	Total cost per m^3
0	23	2.52	2.02	0.50	1.33	0.30	4.15
24	30	3.53	2.82	0.71	1.81	0.30	5.64
31	40	4.59	3.67	0.92	1.81	0.30	6.70
41	50	5.72	4.58	1.14	1.81	0.30	7.83
51	75	7.29	5.83	1.46	1.90	0.30	9.49
76	100	9.11	7.29	1.82	1.90	0.30	11.31
101	125	12.00	9.60	2.40	2.28	0.30	14.58
126	150	13.36	10.69	2.67	2.28	0.30	15.94
> 151		14.76	11.81	2.95	2.28	0.30	17.34

4.3 Project Management

The project will be managed by JMAS. The utility has adequate personnel to manage the proposed infrastructure and address any potential emergency related to the project's operation and maintenance.

Prior to certification, the project applicant will submit the corresponding organizational charts that reflect project management duties during the project's construction and operational phases.

Important Certification Aspects:

The financial structure of the project has been developed in coordination with C.N.A., JCAS, JMAS, and NADB.

Scheduling of Matters Still Pending:

Provide the organizational structure.

5. Community Participation

5.1 Comprehensive Community Participation Program:

The Comprehensive Community Participation Plan developed by the Steering Committee was approved by the BECC on June 24, 2005. The Steering Committee prepared an outreach program, including the benefits resulting from the project, as well as the associated costs and the economic impact for the community.

a) Local Steering Committee: The Steering Committee was formally installed on June 18, 2005. A Board of Directors was elected, comprised of the following individuals**:**

Chairman of the Steering Committee: Mr. Austreberto Loya-Villar, Secretary General of the "Unión de Colonos de Puerto ANAPRA A.C"

Vice-Chair of the Steering Committee: Mrs. Paulina Ochoa-Morales, Chairperson of the "Unión de Colonos de Puerto ANAPRA A.C"

Alternates:

- Mr. Martín Valadez-Domínguez, resident of Colonia ANAPRA
- Mr. Fidel López-Arango, resident of Colonia ANAPRA
- Mr. Gabriel Alcocer, resident of Colonia ANAPRA
- Mr. Martín Antonio Rojano-Nacianceno, resident of Colonia ANAPRA and person in charge of the Colonia ANAPRA Community Center.

b) Meetings with Local Organizations: It is important to mention the three community meetings held at Colonia ANAPRA and the guided tour to the "Chamizal Park" Treatment Plant an average of over 70 enthusiastic attendees participated**.**

While the project sparked interest and concern in the neighboring U.S. community of Sunland Park, New Mexico, the project applicant –Junta Municipal de Agua y Saneamiento (JMAS)– and the BECC made all efforts to make available all the applicable project information to officials and residents of the aforementioned U.S. community. As part of these efforts, with assistance from JMAS, five technical information meetings were held with Sunland Park officials.

One of these informative meetings was held with the Sunland Park City Council. The Mexican delegation attending this meeting was headed by State Representative Alvaro Navarro. JMAS and BECC prepared a video with information about the project, which had great success in subtly showing the social, health, environmental, and technological aspects of the project. Related to the public meetings and notifications, BECC in order to keep the highest fluency communication with the Mayor of Sunland Park, NM, sent to him personal invitations to the public meetings.

In May 2005, BECC received a communication from El Paso City-County Health and Environmental District (EPCCHED) related to their concern about odors that could generate the ANAPRA treatment Plant, BECC with JMAS invited Dr. Jorge C. Magaña EPCCHED Director and other El Paso city officers to visit Cd. Juarez. At that time Dr. Magaña learned that the Treatment plant of El Chamizal, located just only 400 meters from the border, has been working with no (odor) problems; ANAPRA treatment plant will be similar. After the entire question were answered and the information provided, Dr. Magaña and companions expressed confidence in the benefits and results of the ANAPRA project.

c) Public Access to Project Information: The Steering Committee, with assistance from JMAS, prepared over 10,000 flyers with information about the project, to be distributed at public meetings. In addition, the "Water Awareness" department at JMAS had available for review all the applicable project information.

d) Public Meetings: Pursuant to BECC's certification criteria, at least two public meetings must be held and open to the public to explain the project and address questions about its development, providing a chance for the community to provide input about the project in question. One of the two public meetings must be announced in the region's major newspapers at least 30 days in advance. This last requirement was fully in compliance by publishing on Thursday, May 11, 2006 in the "Diario de Juarez" an "Open Invitation" to the second Public Meeting to be held on June 10, 2006.

First Public Meeting: It was held on Saturday, April 1st, 2006. As a result of having a Steering Committee comprised of a diverse representation, the first public meeting had excellent attendance. More than 280 attendees showed up at the Colonia's "Community Hall" located at the corner of REMORA and ESTURION streets. 194 exit surveys were administered, which showed that 98% of those surveyed explicitly support the project.

Second Public Meeting: In accordance with the schedule, the second public meeting was held on Saturday, June 10, 2006 at the same location where the First Public Meeting took place: More than 300 attendees showed up at this 2nd public meeting. 262 exit surveys were administered, which showed that 100% of those surveyed explicitly support the project.

5.2 Report Documenting Public Support.

The Steering Committee and the applicant prepared the "Final Public Participation Report" to demonstrate that the proposed tasks were appropriately completed to BECC's requirements. This document includes all components needed to certify compliance with the requirements established by regulations to meet the BECC's Public Participation criterion.

Important Certification Aspects:

There has been a tremendous support for the project from the community of Anapra.

Scheduling of Matters Still Pending:

None.

6. Sustainable Development

6.1 Definition and Principles

The Wastewater Collection, Treatment, and Reuse Project for Colonia Anapra, Ciudad Juarez, Chihuahua, Mexico, promotes: "conservation oriented to social and economic development that emphasizes the protection and sustainable use of resources, while addressing both current and future needs, and present and future impacts of human actions."

The project's objective is to implement a wastewater collection, treatment, and reuse system for Colonia Anapra. Overall the proposed project will achieve significant environmental, health, through the following:

- Reduce the risk of groundwater contamination caused by the lack of an adequate wastewater disposal system.
- Prevent potential discharges of raw wastewater to the streets and subsequently to the U.S.-Mexico border.
- Eliminate conditions that promote the proliferation of waterborne and arboviral diseases in the project area.
- Reuse treated wastewater for irrigation of local green areas, creating thus an enhanced environment that contributes to the healthy social development of the community.

6.2 Institutional and Human Capacity Building

Given the nature of the project, technical training will be required for the operation personnel of the city's water utility, JMAS to operate and maintain the new infrastructure proposed with the implementation of the project. Extensive training on equipment and environmental issues will be provided before the WWTP initiates its operation. Operation and Maintenance Manuals have been developed. Basic training for the WWTP O&M will be provided by the constructor

6.3 Conformance to Local and Regional Conservation and Development Plans

This project complements the actions set forth in the Ciudad Juarez Municipal Development Plan, which include the need to develop basic sanitary infrastructure works as well as the development of green areas for communities such as Colonia Anapra. The implementation of the project will help to eliminate risks associated to the inadequate management of wastewater, and will provide treated wastewater for irrigation of area parks and gardens, as well as for other municipal uses that do not require drinking quality water.

In the area of regional planning, the project incorporates actions and tasks included in the 2001-2006 National Water Plan (PNH), specifically addressing one of the plan's national objectives, which seeks to promote increased water, wastewater collection and treatment

coverage and quality. The project is aimed at reducing water contamination in a water basin that is considered by the PNH as a priority area due to its condition as a binational basin, its economic activity, and the large number of communities located along the banks of the Rio Grande that obtain their water supply from this body of water.

The project adheres to Objective #1 of the U.S.-Mexico Border 2012 Environmental Program, which promotes the reduction of water contamination. One of the program's guiding principles is reducing major risks to public health and conserving and restoring the natural environment.

The 2001-2006 National Environment and Natural Resource Program, which established that, due to its economic and demographic drive as well as its environmental characteristics, Mexico's Northern Border is one of the priority regions for the design and implementation of environmental programs and policies.

6.4 Natural Resource Conservation

The implementation of the project will contribute to reduce the potential infiltration of raw wastewater and the resulting potential contamination of area aquifers. Using treated wastewater will help to reclaim drinking water that could have been used to irrigate green areas. Additionally, using treated wastewater for irrigation will contribute to recharge area aquifers.

6.5 Community Development

The tasks proposed by this project will contribute to reduce the conditions that favor the proliferation of waterborne and arboviral diseases related to the inadequate disposal of wastewater.

The use of treated wastewater will promote the creation of parks and gardens that will improve the conditions of an area that for decades has lacked even the most basic environmental infrastructure.

Important Certification Aspects:

Project complies with the basic principles of Sustainable Development.

Scheduling of Matters Still Pending:

None.

Available Project Documents

- "Estrategia de Gran Visión para el Abastecimiento y Manejo del Agua en las ciudades y Cuencas de la Frontera Norte en el Período 1999-2025" [Global Vision Strategy for Water Supply and Management in Northern Border Cities and Basins during the 1999-2025 Period], CONAGUA, December 1999.
- Letter JMAS.SAN-163/03 requesting a finding by INAH regarding the existence of archeological sites in the Anapra area.
- Letter No. DM-206/03, where the INAH finds no objection to the development of this project in the Anapra area, inasmuch as no archeological settlements exist in the area.
- EPA's "Finding of no significant impact" (FONSI) dated April 6, 2005.
- Value Engineering Analysis developed by Camp, Dresser and McKee Inc. (CDM), October 2005.
- Consultation with SEMARNAT to determine jurisdiction and environmental assessment modality, Letter JMAS P-324/05, Junta Municipal de Agua y Saneamiento de Ciudad Juarez, August 9, 2005.
- SEMARNAT's response regarding Environmental Impact Statement modality. Letter No. SG.IR. 08-2005/05, Chihuahua Federal Delegation, Subdivision of Environmental Protection and Natural Resource Management. August 25, 2005.
- Comprehensive Wastewater Collection and Treatment Project for Colonia Anapra, Ciudad Juarez, Chihuahua. Developed by Solano Consultores, S. A. de C.V. March 2003.
- Final Design of the Wastewater Treatment Facility, Pump Stations, and Wastewater Reuse Systems for Colonia Anapra, Ciudad Juarez, Chihuahua. Developed by Solano Consultores, S. A. de C.V., January 2005.
- Letter DGSPM/073/06 by the General Directorate of Municipal Public Services in Ciudad Juarez, Chihuahua. Dated February 14, 2006. Statement of interest in using treated wastewater for irrigation of green areas by the City.
- Environmental resolution from SEMARNAT, (April 28, 2006).