PROJECT FOR MODERNIZATION AND TECHNICAL IMPROVEMENTS TO THE CONCHOS RIVER IRRIGATION DISTRICTS

BECC CERTIFICATION DOCUMENT

SEPTEMBER 2002

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C O N T E N T S

1.d.1. IBWC Minute 308.
2.1. Current information on Rio Grande. CNA General Operations Directorate (April 2002)
2.2 Chapter of the Quality of Water of the Feasibility Study. Strategic Vision for the Provisión of Water in the Cities and Rivers of the Northern Border, prepared by the CNA.
2.3. Chapter 3 of the ''Strategic Plan, State Of The Rio Grande And The Environment Of The Border Region, Fiscal years 2003 - 2007 Volume 3''.
2.4. Table of Water Quality in the Rio Grande Basin
2.a.1. Principal causes of Death, 2000 Chihuahua INEGI/SSA
2.c.1. Rules of the General Law of the Environment Equilibrium and Environmental Protection
2.c.2. 1.- Letter prepared by SEMARNAT stating that no Environmental Asessment is required in accordance with Mexican Law.
2.- Letter prepared by National Institute of Anthropology and Archeology statint that is no impact on historical sites.
3.- Approvals by EPA and SEMARNAT for certification of the project.
4.- Letter authorizing investments for the project by the Secretariat for Housing and Public Credit.
3.a.1. Water saving analyses for the Irrigation Districts of the Rio Conchos.
3.a.2. Project technical specifications
3.a.3. Water saving volume estimate.
3.b.1. Irrigation District Regulations for Delicias, Bajo Río Conchos y Río Florido.
4.c.1. Organizational charts of the Irrigation Districts of Delicias, Bajo Río Conchos y Río Florido.
5.a.1. Final Report of the Community Participation Program.
6 Agreements for construction of modernization and technical improvements works in order to saving water in the Río Conchos River Basin signed by National Water Commission, Chihuahua State Government and the Users of the Delicias Irrigation Districts Moduls.

*These documents are available for review only at the BECC offices.

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Chapter 1.- General Criteria

a. **Project Type.**

The project falls within one of BECC's priority areas, as it is related with the rational use of water and water conservation; it is targeted to improving the use of water within the 005 Delicias Irrigation District (ID) found in the Conchos River watershed. The purpose is to make sustainable use of water resources by implementing actions to improve water use and increase runoff to the Rio Grande, thus achieving a transboundary environmental benefit.

Irrigation districts found within the Rio Grande watershed use up most (approximately 85%) of the water withdrawn from the eight reservoirs that supply them. Thus, the most significant projects being planned by the governments of Mexico and the United States to achieve sustainable use of water are related to the modernization of such irrigation districts.

Of the three districts, Delicias, with a surface area of 88,525.60 hectares, covers 81% of the total area. This area indicates use of 83% of the volume of water, and thus, has the major water savings potential in the Rio Conchos.

As a result, although the present document provides data related to the rehabilitation of the three existing Districts in the Rio Conchos basin, it should be noted that the project to be certified relates exclusively to the District of Delicias, and should not in any way be construed to be sufficient for certification of the other districts.

The project highlights the need to rehabilitate and upgrade the water distribution infrastructure, as well as the drainage and connections in the Delicias, Lower Rio Conchos and Rio Florido districts, all of them found in the watershed of the Conchos River, a tributary to the Rio Grande. In addition, the project proposes land grading to achieve significant water savings. The proposed tasks are summarized below:

Proposed Modernization and Technical Improvements

Lining and structures - main canal
Lining and structures - lateral canals
Lining and structures - minor and interparcel lines
Low-pressure and gated piping
Land grading
Interparcel drainage
Pumping stations, low pressure irrigation and grading

The Delicias District was created by presidential decree and is considered of public interest, given the need to support farming and promote the country's agricultural development. Such decrees are included in Attachment **1.a.1.**

Water rights held by the irrigation districts amount to 1,321 million cubic meters per year, of which 86% correspond to surface water and the remaining amount to groundwater. Of this flow, the 005 Delicias ID has 83% of the total amount of surface water and 100% of the groundwater; the 090 Lower Rio Conchos ID has 8% of all surface water, and 103 Rio Florido ID has 9% of all surface water, as summarized in the following table and described in detail in Attachment **1.a.2.,** which also includes copies of the allotment deeds.

Irrigation District	Water Allotment (m^3/Year)		
	Surface water	Groundwater	Total
005 Delicias	941,597,000	189,319,000	1,130,916,000
090 Lower Río Conchos	84,990,110	----------	84,990,110
103 Río Florido	105,097,300	----------	105,097,300
Grand total	**1,131,684,410**	**189,319,000**	**1,321,003,410**

Prior to the project, the CNA's Department of Planning's Office of Studies for Comprehensive Water Development prepared a national feasibility study to upgrade the IDs. A summary of this included in Attachment 1.a.3

b. **Project Location**

The project is located in 005 Delicias ID in the Conchos River basin. See Attachments **1.b.1.** and **1.b.2.**

The Conchos River is a tributary of the Rio Grande and is a part its river basin. The Lower Rio Conchos irrigation district is found inside the 100-kilometer border area. The other two districts, Delicias and Rio Florido, are located outside the 100-kilometer stretch, but within the 300 km area south of the border; thus, authorization is required from the Mexican Secretary of the Environment and Natural Resources (SEMARNAT) and the U.S. Environmental Protection Agency (EPA) to issue the project's certification, considering that the project has transboundary effects, since the amount of water saved will reach the Rio Grande, thus increasing the flow and obtaining an environmental benefit for this international body of water (see Figure 1, Rio Grande Basin).

The irrigation district of Delicias, being the purpose for the certification document, is located in the south-central part of the State of Chihuahua outside of the 100-kilometer stretch of the Rio Grande but within the Rio Grande river basin, as noted above.

The project includes areas along the Conchos River, which runs from south to north in the State of Chihuahua and part of the State of Durango, primarily in the municipalities of , Delicias and Jimenez. The Delicias ID includes almost 70,000 hectares; however, the project's influence area goes beyond the Conchos River watershed, since it directly impacts the Rio Grande watershed.

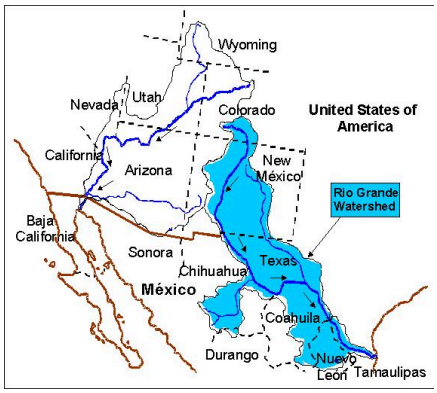


Figure 1.- Rio Grande Watershed

Major runoffs in the Conchos River watershed include, in addition to the Conchos itself, the San Pedro, Chuviscar and Florido rivers. In addition, the San Gabriel, Pico del Aguila, La Boquilla, Francisco I. Madero and Luis L. Leon reservoirs are located within this basin (see Figure 2, Conchos River Watershed).

Figure 2.- Conchos River Watershed and Location of Irrigation Districts and Reservoirs

c. **Project Description and Tasks**

The following table shows the irrigation districts' major features.

1). Project Description.

The problems related to the current level of water exploitation need to be corrected in order to sustain the rational development of the area; in fact, the governments of Mexico and the United States are determined to achieve this. An important component is the proposal contained in Minute 308 of the International Boundary and Water Commission, which provides the expectation for the quantification of the waters conserved and measures to ensure their conveyance to the Rio Grande.

FEATURES OF CONCHOS RIVER IRRIGATION DISTRICTS (*)							
AREA (ha)		No.	Conveyance - Distribution			Drainage	
PHYSICAL	IRRIGATION	Users	Canal type	Length (km)	Lining	Type	Length (km)
DR-005 DELICIAS							
			Lateral or Main	252.30	Concrete	Main ditch by module	322.53
				1.82	Piped		
				250.02	Dirt	Branch	
			Sublateral	227.60	Concrete		281.59
				309.73	Dirt	Sec. branch	
			Branches	87.80	Concrete		100.74
				98.82	Dirt		
			Secondary branches	88.97	Concrete		88.38
				21.33	Dirt		
88,525.60	**79,792.16**	**9,375.00**		**1,332.06**			**847.90**
DR-103 RÍO FLORIDO							
			MCRM	60.73	Concrete	Main drains	56.39
			MCLM	64.18	Concrete	Secondary	2.70
			Secondary C.	98.27	Concrete		
			Secondary C.	9.00	Dirt		
8,928.08	**8,623.48**	**1,325.00**		**232.18**			**59.09**
DR-090 LOWER RÍO CONCHOS							
			Main gravity	80.20	Concrete	Main gravity	81.37
				3.36	Dirt	Branch	4.50
			Lateral	61.01	Concrete	Main pumping	30.58
			Sub-lateral	2.75	Concrete	Branch	26.51
			Main pumping	36.88	Concrete	Sec. branch	9.13
			Lateral	36.10	Concrete		
11,634.39	**10,826.15**	**1,468.00**		**220.30**			**152.08**

(*) Information provided by the "Action Plan for Rehabilitation and Modernization of Irrigation Districts" by Module. Río Grande Regional Office, CNA..

The execution of the proposed project, supported by the implementation of relevant operating policies, will consolidate and increase the available water flow downstream from the Conchos River, and will create an environmentally improved system that should be preserved and expanded as part of a regional planning framework.

In addition to improving the use of water in the different irrigation districts and enhancing land productivity, the water saved by the conservation measures will be conveyed to the Rio Grande, thus providing beneficial transboundary impacts.

The Project for Modernization and Technical Improvements to the Delicias Irrigation District is estimated to provide savings of 370 millions of m^3 by year of water by increasing the overall efficiency in the use of irrigation water. The project proposes significant actions that include:

- Canal lining and upgrades.
- Build, install and rehabilitate control and metering structures in the canals.
- Rehabilitate roads and drains.
- Install modern irrigation systems to improve water use in each parcel.
- Land grading.
- Install interparcel drainage systems to recover salinized soils and/or soil affected by shallow water tables.
- Promote a water culture among users.
- Train utility officials and technical staff.
- Establish and maintain updated water metering and agriculture information systems.

The cost of proposed structural actions for the Delicias Irrigation District is expected to be 1,436 million pesos, which represents an average cost of $16,296 /ha. Expected water savings resulting from the proposed actions may reach 370 million m^3 by year, considering 1,293 million ^{3} of available dam water.

Major features of the proposed actions include:

Lining of structures, main canals, lateral canals, minor and interparcel lines, consists of covering dirt canals with concrete, upgrading control structures (checks) and building or installing metering structures to reduce leaking and operating losses and deliver metered water to users.

The purpose of installing low-pressure and gated piping is to use water loads present in the canals, mains and laterals, to supply water to minor, interparcel and parcel lines with low-pressure pipes and to irrigate using gated pipes, thus increasing conveyance efficiency and reducing the effort required for water conservation.

Land grading consists of providing a uniform slope and preventing non-irrigated areas, making effective use of irrigation water, etc.

Parcel drainage consists of providing parcels with a natural outlet for excess irrigation water and preventing flooding, alleviating the problems of soil salinization and elevated water tables.

Water pumping and the installation of high and low pressure lines consists of replacing water distribution lines in the canals and gravity irrigation (furrows and melgas) for high and low pressure piping and the use of micro-sprinkling, sprinkling, or drip irrigation in profitable crops (fruits, vegetables, and alfalfa) to reduce water losses.

The proposed project considers the following coverage:

PROJECT COVERAGE					
Type of Users in Sector			Sector Area (ha)		
Community	Private	Total	Community	Private	Total
5,900	5,975	11,875	32,194	61,998	94,192

The following outcomes are expected:

PROJECT OUTCOMES	
Efficiency (%)	
Current	Future
33.23	53.47

The project proposes the following investments:

INVESTMENT PROGRAM SUMMARY		
Activity	**Unit**	**Amount**
Investments	$/ha	16,296
Average harvest area	ha	94,192
Average available flow*	Mm^3	1,044
Reclaimed flow	Mm^3	396
Cost of reclaimed flow	$/$m^3$	3.88
*based on the average use during 1996, 1997 and 1998		

2). Timeline for Project Tasks

The project is expected to be completed in a 4-year period. The following table shows the expected progress by year. See Attachment **1.c.1.**

PROJECT INVESTMENT SCHEDULE							
Item	**Unit**	**Qty.**	**Cost in thousands of pesos**				
			Total	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Repair slabs and structures, replace lining joint asphalt seal in main canal and distribution lines	KM	135	27,113	20,551	6,562	-	-
Lining of main canal in Module I - Ojinaga farmland, from km 0+000 to km 3+360	KM	3.4	7,660	3,511	3,221	928	-
Rehabilitate and upgrade interparcel lines, Modules 1, 2, 3, 4 and 5 Lower Rio Conchos	KM	23.6	10,602	-	10,602	-	-
Rehabilitate and upgrade distribution lines in irrigation units	KM	75.0	58,655	-	46,002	12,653	-
Rehabilitate, upgrade and install metering and gauging structures and devices in control points	EA.	56.0	2,750	2,075	675	-	-
Rehabilitate San Antonio diversion dam	EA.	1.0	1,500	487	1,013	-	-
Lining and/or piping lateral and sublateral canals, and supply and install low-pressure irrigation systems with gated piping	KM	718.8	339,034	119,667	120,235	43,481	55,651
Low-pressure irrigation systems with gated piping	HA	17,136.0	245,331	87,781	76,839	35,401	45,309
Agricultural land grading and leveling	HA	26,091.0	89,525	29,217	34,326	12,912	13,070
Provide power for MCRM and MCLM in Module 2, Chihuahua unit.	KM	40.0	7,000	2,272	4,728	-	-
Rehabilitate electromechanic system in "El Paradero", "Santa Teresa", "El Mezquite" and "Llano de Dolores" pumping stations	EA.	4.0	3,280	-	2,315	965	-
Metering and gauging devices in headworks, control points, and delivery to Conchos and San Pedro main canals	LOT	1.0	6,000	6,000	-	-	-
Wells and high pressure lines (*)	HA	17,136.0	377,430	135,046	118,214	54,463	69,706
Pumping stations, low-pressure irrigation	HA	8,569.0	150,971	54,018	47,285	21,785	27,882
Wells and low-pressure lines (*)	HA	5,998.0	89,167	31,904	27,928	12,867	16,468
Recovery of salinized soils by installing parcel drainage in Modules 4 and 5	HA	500.0	5,000	-	5,000	-	-
Projects and supervision			87,284	36,432	25,910	11,332	13,610
GRAND TOTAL			1,508,303	528,962	530,855	206,786	241,697

(*) Actions involving water wells have not been included in water conservation estimations.

3). Description of the Community

The project will benefit 180,000 residents who use the irrigation system, as well as the residents of cities located within the three irrigation districts: Delicias, Lower Rio Conchos and Rio Florido. This population is found primarily in the municipalities of Ojinaga, Delicias, Jimenez and Camargo. Attachment **1.c.2.** includes the most relevant demographic and service data.

4). Project Alternatives

Various alternatives were reviewed to improve water use in the districts:

- Lining up or piping canals and interparcel sprinklers.
- Rehabilitating, building and/or purchasing control and metering structures.
- Resurfacing roads.
- Upgrading irrigation systems and grading agricultural land to improve irrigation.
- Installing parcel drainage.
- Purchasing machinery.
- Establishing a permanent training program for module staff, and develop campaigns to promote a water culture among users.
- Establishing information systems to obtain updated information regarding water metering and agricultural data.

Once the impacts and costs of the proposed actions were reviewed, a conclusion was made to implement a combination of actions in each district, to make the best possible use of resources needed for their development and maximize the potential benefits.

Results expected for each district appear in the table below

- Irrigation District 005, Delicias.

PROJECT INVESTMENT SCHEDULE FOR IRRIGATION DISTRICT 005 DELICIAS							
Item	**Unit**	**Qty.**	**Amount in thousands of pesos**				
			Total	**Year 1**	**Year 2**	**Year 3**	**Year 4**
REPAIR LINING SLABS IN CONCHOS' MAIN CANAL FROM KM 6+980 TO KM 19+980	KM	3.0	10,000	10,000			
METERING AND GAUGING DEVICES IN HEADWORKS, CONTROL POINTS, AND DELIVERY TO CONCHOS AND SAN PEDRO MAIN CANALS	LOT	1.0	6,000	6,000			
LINE AND/OR PIPE LATERAL AND SUBLATERAL CANALS	KM	601.6	301,324	107,815	94,377	43,481	55,651
LOW-PRESSURE IRRIGATION SYSTEMS WITH GATED PIPING	HA	17,136.0	245,331	87,781	76,839	35,401	45,309
AGRICULTURAL LAND GRADING AND LEVELING	HA	21,421.0	70,769	25,321	22,165	10,212	13,070
WELLS AND HIGH PRESSURE LINES (*)	HA	17,136.0	377,430	135,046	118,214	54,463	69,706
PUMPING STATIONS, LOW-PRESSURE IRRIGATION	HA	8,569.0	150,971	54,018	47,285	21,785	27,882
WELLS AND LOW-PRESSURE LINES (*)	HA	5,998.0	89,167	31,904	27,928	12,867	16,468
PROJECTS AND SUPERVISION			76,807	29,375	23,172	10,650	13,610
GRAND TOTAL			**1,327,799**	**487,261**	**409,980**	**188,859**	**241,697**

(*)Actions involving water wells have not been included in water conservation estimations.

The project considers the following coverage:

PROJECT COVERAGE					
Type of Users in Sector			**Sector Area (ha)**		
Community	**Private**	**Total**	**Community**	**Private**	**Total**
4,255	4,485	8,740	22,717	52,483	75,200

The following outcomes are expected by the project:

PROJECT OUTCOMES	
Efficiency (%)	
Current	**Future**
33.0	55.0

The project proposes the following investments:

INVESTMENT PROGRAM SUMMARY		
Activity	**Unit**	**Amount**
Investments	$/ha	18,085
Average harvest area	ha	75,200
Average available flow*	Mm^3	857
Reclaimed flow	Mm^3	343
Cost of reclaimed flow	$/$m^3$	3.97
*based on average use in 1996, 1997 and 1998		

- Irrigation District 090, Lower Rio Conchos.

PROJECT INVESTMENT SCHEDULE FOR IRRIGATION DISTRICT 090 LOWER RÍO CONCHOS							
Item	**Unit**	**Quantity**	**Amount in thousands of pesos**				
			Total	**Year 1**	**Year 2**	**Year 3**	**Year 4**
REHABILITATE SLABS AND REPLACE SEAL IN MAIN AND DISTRIBUTION LINE JOINTS, IN MODULES 1, 2, 3, 4 AND 5	KM	7.4	10,123	8,283	1,841		
LINE MAIN CANAL, MODULE I, OJINAGA PARCEL KM 0+000 TO KM 3+360	KM	3.4	7,660	3,511	3,221	928	
REHABILITATE AND UPGRADE INTERPARCEL LINES, MODULES 1, 2, 3, 4 AND 5	KM	23.6	10,603		10,603		
GRADE AGRICULTURAL AREAS TO IMPROVE PARCEL IRRIGATION, MODULES 1, 2, 3, 4 AND 5	HA	1,500.0	6,756		4,056	2,700	
REHABILITATE, UPGRADE AND INSTALL DISTRIBUTION, CONTROL AND METERING STRUCTURES IN MODULES 1, 2, 3, 4 AND 5	EA.	50.0	1,750	1,750			
REHABILITATE ELECTROMECHANIC SYSTEM IN "EL PARADERO", "SANTA TERESA", "EL MEZQUITE" AD "LLANO DE DOLORES" PUMPING STATIONS	EA.	4.0	3,280		2,315	965	

RECOVER SALINIZED SOIL BY INSTALLING PARCEL DRAINAGE IN MODULES 4 AND 5	HA	500.0	5,000		5,000		
REHABILITATE, UPGRADE AND TECHNICALLY IMPROVE IRRIGATION BY IMPLEMENTING LOW-PRESSURE AND GATED PIPING IN MODULES 4 AND 5	KM	5.2	1,200		1,200		
REHABILITATE AND UPGRADE DISTRIBUTION LINES IN IRRIGATION UNITS	KM	75.0	58,655		46,002	12,653	
PROJECTS AND SUPERVISION			5,242	1,822	2,738	682	
TOTAL			**110,269**	**15,366**	**76,976**	**17,927**	

The project considers the following coverage:

PROJECT COVERAGE					
Type of Users in Sector			Sector Area (ha)		
Community	Private	Total	Community	Private	Total
701	617	1,318	4,849	5,866	10,715

The following outcomes are expected:

PROJECT OUTCOMES	
Efficiency (%)	
Current	Future
35.0	47.0

The following investments are proposed:

INVESTMENT PROGRAM SUMMARY		
Activity	Unit	Amount
Investments	$/ha	10,266
Average harvest area	ha	10,715
Average available flow*	Mm^3	96
Reclaimed flow	Mm^3	25
Cost of reclaimed flow	$/$m^3$	4.4
*based on average use in 1996, 1997 and 1998		

- Irrigation District 103, Río Florido.

PROJECT INVESTMENT SCHEDULE FOR IRRIGATION DISTRICT 103 RIO FLORIDO							
Item	Unit	Qty.	Amount in thousands of pesos				
			Total	Year 1	Year 2	Year 3	Year 4
REPAIR SLABS AND STRUCTURES, REPLACE ASPHALT SEAL IN MAIN CANAL'S R.M. AND L.M. LINING JOINTS, MODULE 1, MUNICIPALITY OF OCAMPO, DURANGO	KM	34.3	1,640	532	1,108		
REPAIR SLABS AND STRUCTURES, REPLACE ASPHALT SEAL IN MAIN CANAL'S R.M. AND L.M. LINING JOINTS 16+343, MODULE 2, MUNICIPALITIES OF LOPEZ AND CORONADO, CHIH.	KM	90.6	5,350	1,737	3,613		
METERING AND GAUGING DEVICES IN CONTROL AND DELIVERY POINTS IN MAIN CANAL'S L.M., MODULE 1 AND MAIN CANAL'S R.M., AND LAT. CANAL'S L.M. KM 16+343 MODULE 2, MUNICIPALITIES OF LOPEZ AND CORONADO, CHIH.	EA.	6.0	1,000	325	675		
REHABILITATION OF SAN ANTONIO DIVERTING DAM	EA.	1.0	1,500	487	1,013		
LINE AND/OR PIPE SUBLATERAL CANALS AND PROVIDE AND INSTALL LOW-PRESSURE IRRIGATION SYSTEMS WITH GATED PIPING IN MODULES 1 AND 2	KM	112.0	36,510	11,852	24,658		
AGRICULTURAL LAND GRADING AND LEVELING IN MODULE 2, MUNICIPALITIES OF LOPEZ AND CORONADO, CHIH.	HA	3,170.0	12,000	3,895	8,105		
ELECTRICITY POWER IN M.C.R.M. AND M.C.L.M., MODULE 2, CHIHUAHUA UNIT	KM	40.0	7,000	2,272	4,728		
GRAND TOTAL			**65,000**	**21,100**	**43,900**		

The project considers the following coverage:

PROJECT COVERAGE					
Type of Users in Sector			Sector Area (ha)		
Community	Private	Total	Community	Private	Total
944	873	1,817	4,628	6,649	8,277

The following outcomes are expected:

PROJECT OUTCOMES	
Efficiency (%)	
Current	Future
33.0	48.0

The following investment are proposed:

INVESTMENT PROGRAM SUMMARY		
Activity	Unit	Amount
Investments	$/ha	7,853
Average harvest area	ha	8,277
Average available flow*	Mm^3	91
Reclaimed flow	Mm^3	28
Cost of reclaimed flow	$/$m^3$	2.32
*based on average use in 1996, 1997 and 1998		

5). Project Justification

Given the proposed water conservation objectives, it may be inferred that the deferment of the projected activities will aggravate the problem the project intends to solve, including the following issues:

- Constant reduction of water supply to irrigation areas.
- Constant reduction of the districts' agricultural production.
- Progressive deterioration of existing infrastructure.
- No capacity to face adverse weather conditions.
- Less availability of water in the Rio Bravo basin, with the corresponding environmental consequences.
- Difficulties in assuring flows to the Rio Grande required under the 1944 Water Treaty.

The development of this project will enable the districts to face the above problems; thus, its implementation will represent a great opportunity to reverse such impacts.

d. **Conformance to International Treaties and Agreements**

The Government of Mexico assures that a serious drought that has affected the Rio Grande basin, particularly on the Mexican side, has caused Mexico to fall behind in its water contributions to the Rio Grande, according to the terms set forth in the February 3, 1944 U.S.-Mexico Water Treaty. In response, the governments of Mexico and the United States have been working to design a strategy that will take into account, on the one hand, the needs of the communities and irrigation districts in Mexico and, on the other, the need to comply with the provisions of the Treaty. On June 28, 2002, Minute 308 was signed by IBWC and CILA as a commitment to work towards a solution. (see Attachment **1.d.1.** Minute 308).

It is precisely under the terms of Minute 308 that the National Water Commission of Mexico proposes this project which is primarily aimed at saving irrigation water in the Rio Conchos basin. The volume of water that will be saved with the proposed works is expected to reach the Rio Grande as part of the International Water Treaty signed in 1944. The governments of the United States and Mexico will establish the framework necessary for water deliveries in accordance with Minute 308. The projected volume of water to be saved is based on estimates of a water model developed by the National Water Commission of Mexico. The estimated amounts are detailed in the table presented in the first sections of this chapter.

Chapter 2.- Human Health and Environment

The project's environmental evaluation was developed according to the guidelines specified by the BECC's Project Certification Criteria in Section 2 "Human Health and Environment." The project considered the contents of items 2 and 3, consisting of those that, according to law, do not require an environmental evaluation, as well as the criteria for projects that may have transboundary environmental impacts.

The environmental evaluation contains the items described below:

- Analysis of direct, indirect, cumulative, short and long term impacts of the project on the area's environmental elements (e.g. ecosystems' integrity, biological diversity, sensitive environmental habitats, and human health).
- Description of inevitable negative impacts and actions to be taken to mitigate such impacts.
- Analysis of the proposed project's environmental benefits, risks and costs, as well as environmental standards and objectives of the project area.

The project intends to achieve comprehensive watershed management based in a more efficient use of water, solving thus the issues described below:

With regard to the quality of water, the Conchos River collects wastewater contaminated by agricultural activities through the use of fertilizers and pesticides, which cause health problems, particularly in children.

An additional problem is the lack of appropriate metering and monitoring systems. Water quality metering activities in water bodies that receive discharges from agricultural drains do not include pesticide analysis or detection of other compounds such as organochlorinates, organophosphates, carbamates, organosulfurs, organotins, formamidines, thiocyanates, and dinitrophenols.

Major contaminants found in local surface water bodies, primarily in the Conchos, Grande, Florido and San Pedro rivers, included total and fecal coliforms, which result from household discharges.

Both the Conchos and the Rio Grande show an increased concentration of nutrients, primarily due to discharges from irrigation districts' agricultural drains. Downstream fro the Delicias irrigation district the Conchos River has been observed to have increased concentrations of nitrates, total dissolved solids, hardness, alkalinity, and conductivity.[1]

The excessive use of fertilizers increases soil salinity, causing problems for agricultural productivity. If nutrient levels continue to increase in the future, serious eutrophication problems will result in local bodies of water.

The seepage of these compounds into groundwater bodies also causes additional problems, such is the case of water with a high content of nitrates, which reduces the blood's oxygen-carrying capacity. This is particularly important for children's health because children may develop methaemoglobinaemia.

As for the occurrence of high concentrations of nutrients, primarily due to irrigation district discharges, ecosystems have been affected, since there could be a process of eutrophication and presence of aquatic weed.

Following is a table summarizing Rio Grande's water quality features.

WATER QUALITY IN THE RIO GRANDE[1] PURSUANT TO PHYSICAL, CHEMICAL AND BIOLOGICAL PARAMETERS, 1990-1998
(Yearly averages)

Parameter	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998
Ammonium (NH_4)	mg/l	0.60	1.57	0.43	0.65	0.75	0.07	0.03	0.03	0.03
Fecal coliforms	n/100 ml	na	1.47E3	4.93E2	6.91E2	1.0E2	1.1E3	1.0E2	4.6E1	107
BOD (20^{0}C, 5d)	mg O_2/l	3.55	3.19	3.10	3.58	4.43	3.14	3.12	2	2.4
COD($K_2Cr_2O_7$)	mg O_2/l	52.0	33.0	76.0	34.0	56.6	16.6	na	na	15.33
Nitrates (NO_3)	mg/l	0.17	0.34	0.22	0.16	0.186	0.150	0.15	0.18	0.16
Orthosphosphates	mg/l	na	na	na	na	na	0.70	0.11	0.13	0.10
Dissolved Oxygen	mg O_2/l	7.04	8.11	8.25	8.55	7.58	9.56	7.45	8	7.67
Dissolved solids	mg/l	939	808	865	950	1046	1073	1054	1041	911
Suspended solids	mg/l	65	138	100	59	55.6	55.6	32	35	26.33

[1] Gauging station: Puente Viejo Matamoros (25º53´00´´ N; 97º30´30´´ O).
E: Exponential notation. e.g. 1.1E4 = 11000
Note:
Fluctuations in hydrometeorological conditions in the country's different regions, combined with CNA's actions to control wastewater discharges to various bodies of water, are largely responsible for the variations observed in the concentration of certain substances.
Source:
Semarnap, Comisión Nacional del Agua, 1999

Additionally, the study titled "Large Vision Strategies for Water Supply and Management in Border Area Cities and Watersheds for the 1999-2025 Period," developed by the Office of Coordination of Border Issues of the National Water Commission's General Deputy Directorate of Construction explains Water Quality Indices (WQI) for the different local streams. As such, the entire Conchos River was characterized as a highly contaminated river, since its WQI ranged from 20 to 50. Despite the fact that the river's influence area is very large and there are only three monitoring stations, the data reviewed were homogeneous and showed little variation (see Attachment 2.2.).

The Water Quality Index (WQI) indicates the degree of water contamination at the time of the sample, and is expressed as the percentage of pure water. Thus, highly contaminated water will have a WQI equal or close to zero percent, while for high quality water, the index will be closer to 100%.

The WQI was developed in accordance to the following phases: the first phase consisted of creating a rating scale according to the different uses of water. The second phase involved the development of a rating scale for each parameter, so a correlation could be established between the different parameters and their influence in the degree of contamination. Once these scales were prepared, mathematical models were developed for each parameter, which convert physical data into their corresponding quality index for each parameter (I_i). Since certain parameters are more significant than others in how they impact water quality, this fact was considered by introducing weight factors (W_i) according to their degree of importance. Finally, indexes for each parameter are averaged to obtain a WQI for each water sample.

WATER QUALITY RATING SCALE FOR SPECIFIC USES ACCORDING TO WATER QUALITY INDEX (WQI)

WQI		Water Uses				
Value (%)	General criterion	Public Supply	General Recreation	Fishing and Aquatic Life	Industrial & Agricultural	Sailing
100	Excellent	No purification required	Acceptable for any aquatic sport	Acceptable for all organisms	No purification required	Acceptable
90						
80	Acceptable	Requires some purification			Requires some purification for certain processes	
70						
60	Contaminated	Greater need for treatment	Acceptable but not recommendable	Acceptable, except for very sensitive species	No treatment required for industrial use	
50				Uncertain for sensitive species		
40	Highly contaminated	Uncertain	Uncertain	Only very resilient organisms	Requires treatment to be used in most industries	
30	Unacceptable	Unacceptable	Avoid contact with water			
20			Signs of contamination	Unacceptable	Very restricted use	Contaminated
10			Unacceptable		Unacceptable	Unacceptable
0						

Source:
Semarnap, Comisión Nacional del Agua, 1999.

With regard to organic matter in low tide and rainfall, respectively, along the entire Rio Grande waters may be characterized as acceptable during low tide season, except in some stations located near population centers with significant industrial and commercial activities.

The Conchos River presents a split. In its origin it conveys contaminated water (50 to 70 WQI); however, at its confluence with the Rio Grande, organic matter levels provide for acceptable water.

During the rainy season the Rio Grande, including the Conchos and practically all surface waters in the region, become contaminated.

Bacterial contamination of surface water reaches unacceptable levels in large sections of the Rio Grande and the Conchos.

During the rainy season, practically the entire Rio Grande, as well as the Conchos, become highly contaminated by bacteria.

As far as QWI's nutrient results, these range from acceptable to excellent; Conchos river water is characterized as excellent and a large portion of the Rio Grande may be classified as acceptable, with a small portion characterized as excellent - the portion located approximately between Nuevo Laredo and Ciudad Mier.

The Texas Natural Resource Conservation Commission's (TNRCC) Assessment of Water Quality in the Rio Grande prepared in 1996 shows an increase in nutrients potentially due to the use of fertilizers, which is closely related to the levels of dissolved oxygen (DO) and other water quality parameters.

Nitrogen and phosphorous compounds are major plant nutrients that may limit their growth at low concentrations and may cause excessive growth at high concentrations. The abundance of nutrients, as well as other favorable conditions such as light, water movement and available substrate, may result in the excessive growth of phytoplankton and macrophytes (aquatic weeds). Thus, this excessive plant growth may jeopardize water stream resources as follows:

- The excessive growth of aquatic algae and macrophytes may deteriorate the aesthetics of the body of water and interfere with its recreational use.
- Excessive plankton and organic matter cause water supply problems as they increase water treatment costs.
- The accumulation of plankton and macrophytes may use up all the oxygen dissolved during the night or low flow periods, causing asphyxia in fish and other aquatic species.
- The proliferation of extremely productive plants in aquatic communities may be different in nature and less stable than native species.
- At high concentrations, nitrogen poses risks to human health.

The most common sources of nutrients include fertilizers (from agriculture, household use, golf courses), wastewater and other non-specified urban activities.

In the portion of the Rio Grande watershed that meets the Conchos, studies have found concentrations that are considered hazardous, since the level of nutrients are so high that they result in the excessive growth of aquatic vegetation and probably decrease dissolved oxygen concentrations.

The trend for nutrients described in the same analysis report shows two parameters for nitrogen - total nitrate and total nitrite— and two parameters for phosphorus - total and dissolved phosphorous-.

Sources of phosphorous and nitrogen include wetland overflows, forests, erosion, and the decomposition of plant and animal matter. Anthropogenic sources refer to treated effluent from the sewage system and septic tank discharges, slaughterhouse waste, agricultural fertilizers, urban rainwater overflows, industrial waste discharges, and phosphated detergents.

Trends observed in the Rio Grande upstream from its confluence with the Conchos indicate an increase in the amount of total and dissolved phosphorous, while total nitrogen and total nitrate do not show any significant trend.

In the area of the Rio Grande located downstream from the confluence with the Conchos, near Presidio, a decreasing trend was observed for total nitrate, and a non-significant trend was observed for total phosphorous. Other parameters were not analyzed.

Additionally, Texas' "Strategic Plan, State Of The Rio Grande and the Environment of The Border Region, Fiscal years 2003 - 2007 Volume 3.", see Attachment 2.3., reports data from the segment that includes the confluence of the Conchos and the Rio Grande and up to the International Amistad Dam.

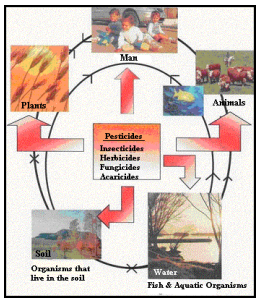
According to the above report, the most significant problems faced by the Conchos River are the lack of wastewater treatment systems in cities and rural communities, as well as the high levels of nutrients resulting from fertilizers that flow into the drains. Among other things, these two factors are enough to deteriorate aquatic plants and increase bacteria in the river, which in turn affects potable water supply, irrigation, and other uses.

The official definition of pesticides (Mexican Federal Registry *Diario Oficial de la Federación,* March 14, 1988) states that pesticides are substances or mixtures of substances intended to control undesirable species (including vectors for human and animal disease) that harm or interfere with agricultural and forestry production and impact material resources during their storage and transportation, as well as species that interfere with human and animal well being.

Many pesticides have helped humans control pests, but they have also caused a large number of alterations, such as cancer disease, teratogenic risks, and miscarriages.

Pesticides and chemical agricultural products are not common sources of pollution, but flow into the river when they result from water runoffs from parks, agricultural fields and vacant lands.

Concentrations of these chemicals may result in the contamination and death of fish and a reduced quality of water.



With regard to pesticides, the table included in Attachment 2.4 shows excess levels that have been found in water.

As for fecal coliform trends, the 1996 Assessment of Water Quality in the Rio Grande (TNRCC) concludes that increased levels of fecal coliform bacteria are found in some points upstream of metropolitan areas, while reduced levels have been observed downstream.

Additionally, the ‘‘Strategic Plan, State of the Rio Grande and The Environment of the Border Region, Fiscal years 2003 - 2007 Volume 3.’’ See Attachment 2.2., reports data from the segment that includes the confluence of the Conchos and the Rio Grande. The report finds that standards for recreational use are not met due to the high level of bacteria. Downstream from Ojinaga and Presidio bacteria levels increase and cause the entire segment to be included in the State’s 303(d) list of water bodies that do not meet water quality standards developed by the State of Texas in 2002 (TNRCC, 2001b and TNRCC, 2001c.)

a. **Human Health and Environmental Need**

1). Issues.

The use of water in Conchos river irrigation districts involves considerable transboundary effects by significantly impacting water availability in the Rio Grande. This becomes especially noticeable during periods of drought that are common to the region and which, if no action is taken, may result in serious consequences for productivity and would jeopardize the area’s sustainability. Since the water saved by the conservation actions will be conveyed to the Rio Grande, these flows will provide beneficial transboundary impacts.

Thus, the proposed project focuses on water conservation, mindful of the relationship with the environment.

In this regard, water availability in the Rio Grande watershed, particularly in the years that have had adverse weather conditions, has shown a severe deficit.

This situation evidences the project’s importance in the light of binational cooperation between Mexico and the United States

2). Human Health and Environment.

Major contaminants found in local bodies of surface water, primarily in the Conchos, Grande, Florido and San Pedro rivers, include total and fecal coliforms resulting from household discharges. These contaminants may be responsible for gastrointestinal diseases.

Diseases may appear mostly in rural communities that lack disinfection systems and take water directly from contaminated bodies.

Water quality degradation causes health problems, especially in children, who are the main victims of waterborne diseases.

Additionally, there is a high incidence of gastrointestinal diseases, usually associated to the inadequate handling of wastewater. The above is shown in the following table:

NEW CASES OF DISEASE BY YEAR IN THE MUNICIPALITY OF OJINAGA

DISEASE	1995	1996	1997	1998	1999	2000	2001
Amebiasis	148	44	167	127	120	89	148
Other parasitosis	13	38	100	65	55	39	77
Typhoid fever	N.D.	N.D.	N.D.	2	2	9	4
Paratyphoid fever and other salmonellosis	N.D.	6	5	10	6	17	22
Hepatitis “A”	N.D.	16	7	2	6	5	5
Intestinal infections cause by other organisms and others not defined	1,559	1,324	1,895	2,484	2,434	2,285	3,441
Scabiosis	N.D.	7	18	13	37	12	23

Source: Dr. Trinidad Jerónimo Castaño, Epidemiologist at Jurisdiction I, Secretariat of Health, Ojinaga, Chihuahua

According to the death records database developed by INEGI/SSA’s General Directorate of Information and Performance Evaluation, main causes of mortality reported by the locality in the year 2000 include intestinal infectious diseases at 0.9%, with only 143 deaths (see Attachment 2.a.1.).

b. **Environmental Evaluation**

The National Water Commission considers water use efficiencies for agricultural activities to be very poor in the Conchos basin irrigation districts. Thus, the project intends to improve efficiency in a manner that the water saved through the efficiencies, will be made available for their conveyance to the Rio Conchos below the Delicias District and their further conveyance to the Rio Grande.

The Project for Modernization and Technical Improvements to the Conchos River Irrigation Districts includes canal lining, land grading, and improvement of irrigation techniques.

The project will help reduce water demands in irrigation districts and will improve the application of water to crops, which will in turn improve the use of pesticides and fertilizers and will reduce the concentration of these contaminants in water before it is discharged into the river.

In addition, land grading will prevent erosion and will allow for better use of surface water flow.

Information related to the project area shows that this is an upset area as to water flow and contamination. As such, the project will promote benefits by increasing water volumes, which will reduce contaminant concentrations.

Additionally, by improving irrigation districts, the project will also enhance the use of chemicals for agriculture and will mitigate contamination caused by such products, reducing therefore health impacts.

The project, in spite of not being a wastewater treatment project, will provide water users better conditions to enhance their quality of life.

It is evident that construction needed to rehabilitate the districts and the use of heavy machinery and equipment will create emissions to the atmosphere; however, this impact will be temporary and will cease as soon as the work is completed.

With the implementation of this project it is expected an increased water flow in the Conchos River resulting from volumes reclaimed by the implementation of water conservation actions in irrigation districts.

Improved operations in irrigation districts and reservoirs will prevent extremely high flows and dry rivers, which will tend to standardize flows discharged to the Conchos by the reservoirs, maintaining thus more stable flow conditions in the river and benefiting its habitat.

The implementation of better irrigation systems will promote the use of fertirrigation to optimize the application of agrochemical compounds. This will potentially reduce agricultural returns and the incorporation of agricultural chemicals to surface and underground bodies of water.

The meeting of the Conchos and Rio Grande rivers involves sharing impacts in the border area. We must remember that environmental factors know no political boundaries, as they are dynamic systems. In this case, the project’s impact will be beneficial, as it will increase water flows to the Rio Grande and as a result, will increase dilution capacity. This will help reduce the concentration of contaminant substances.

Other benefits for Conchos farmers include:

- Greater certainty regarding the availability of irrigation water;
- Equitable availability of water for crops;
- Greater opportunities for water use;
- Higher crop yields;
- Improved crop quality;
- Higher net revenues;
- Increased land value.
- Lower infrastructure maintenance costs.

c. **Compliance with Applicable Environmental and Cultural Resource Laws**

SEMARNAT’s Undersecretariat for Environmental Protection, through its Office of Environmental Impact and Risk, informed CNA that an environmental impact assessment process is not required for the tasks and activities included in the project. This was communicated through letter S.G.P.A./DGIRA.DG. 00647.02, dated September 20, 2002. (see attachement 2.c.2)

The project will be built in land that has already been upset and as such, proposed actions are considered rehabilitation measures.

In addition, a Finding of No Impact to historical resources is in process from the Instituto Nacional de Antropología e Historia. [National Institute of Anthropology and History] (INAH)

SEMARNAt expressed its consent regarding eligibility of the project through letter 1498, dated September 17, 2002. (see attachement 2.c.2)

Likewise, on October 3, 2002, BECC received a letter from EPA expressing consent regarding eligibility of the project. (see attachement 2.c.2)

Chapter 3.- Technical Feasibility

a. **Appropriate Technology**

The features of the proposed tasks are intended to improve existing facilities used by the irrigation districts. These features were selected after a careful analysis of current operating efficiencies and a review of their present physical conditions.

Although the certification is proposed exclusively for the project of Delicias Irrigation District 005, it is important to include some information of each of the districts in the region that address overall objectives. It should be noted that modernization objectives will largely be achieved with completion of the projects in the district of Delicias, the largest District.

From the basis of current efficiencies reported by the irrigation districts and considering theoretical efficiencies of project components, the project will help increase water use efficiencies and thus will conserve water as follows:

RECLAIMED WATER VOLUME BY IRRIGATION DISTRICT in Mm^3

Irrigation District	Used volume	% of savings	Reclaimed volume
ID-005 Delicias	857	40	356
ID-009 Lower Río Conchos	96	26	13
ID-103 Río Florido	91	30.8	28
TOTAL	**1044**		**396**

The above rates and volumes are related to current areas and water consumption, which are impacted by the different components of the proposed infrastructure (see Attachment **3.a.1.** Water Savings Analysis for the Conchos River.)

The proposed tasks will impact irrigation efficiencies as shown in the following table.

INCREASED EFFICIENCY BY IMPLEMENTATION OF PROPOSED ACTIONS IN IRRIGATION DISTRICTS

ACTIONS	CURRENT*	PROPOSED**	INCREASE
Canal lining	53	90	37
Piping	53	90	37
Land grading	45	75	30
Pumping, low-pressure irrigation, and grading			37

(*): Estimated (**): Theoretical

Given its technical characteristics, the increase that may be achieved in irrigation efficiency with the implementation of the proposed actions is verifiable. The proposed actions may be compared with the implementation of similar actions in other irrigation districts.

Additionally, the implementation of actions to upgrade and technically improve irrigation districts includes different types of training for water users and utility officials, including those directly related to water conservation and organization of modules.

Project's Technical Specifications

For the development of the Project for Modernization and Technical Improvements to the Conchos River Irrigation Districts, Attachment **3.a.1.1.**, describes the main technical specifications considered.

b. **Operation and Maintenance Plan.**

Irrigation districts have regulations, and each of their modules has operation standards applicable to each agricultural cycle. The purpose of these rules is to regulate the management, operation, conservation, maintenance and improvement of infrastructures and concession assets, water distribution, and irrigation services provided to ID users. See attachment 3.b.1.

The ID's minor lines are operated by users, who have established community associations. The Commission operates headworks and oversees the operation and maintenance of concession works.

ID's are divided in units, which are in turn divided into modules based on infrastructure features to facilitate deliveries. Their functions involve the statistical control of irrigation plan analysis and verification of water deliveries, and are related to crop yield as it pertains to applicable recommendations.

ID's rules are governed by the National Water Law and Regulations.

Evidently, operation and maintenance actions are carried out by the users themselves in the case of works that involve main canals, and by the Commission in headworks.

As for the study project, training actions are required to improve crop yield and the use of applied technology, and to increase productivity. The project proposes a series of training events that will include the following topics:

- Business Management
- Operation, Conservation, and Management
- Irrigation Water Metering
- Water Culture
- Operation of Heavy Machinery.

Operation and Maintenance Policies.

Infrastructure activities proposed to increase irrigation district efficiencies are not enough in and of themselves. Rather, they must be combined with policies aimed at improving operation and maintenance and ensuring adherence to water right allocations and diversions established under Mexico's legal framework.

Operation Improvements.

a) Development of Crop Schedules. Increasing irrigation water use efficiency requires the use of water allocation techniques and methods that consider crop response to water amounts applied in each growth period.

b) Optimal use of saline and fresh water. Some sites have a certain amount of water with high salt content. Overall, this water is not used for irrigation, but research indicates (Dinar et al 1986) that both types of water may be used in combination to maximize benefits. In addition, using water with high salinity eventually enables farmers to increase crop areas. This type of irrigation system is not feasible for all crops, but only for those that have some resistance to salinity.

c) Monitoring soil and weather conditions. The identification of soil conditions during the development of a crop may allow farmers to provide crops an accurate amount of water in a timely manner. One way of achieving this is to install continuous recording metering devices. A promising method consists in implementing less expensive devices (primarily tension meters) in parcels. Farmers are responsible for collecting the soil's humidity and tension data and taking it to the irrigation district's central unit. With this information, the individuals responsible for the system's operation can decide more objectively when to irrigate the crops.

d) A more relevant problem, not only to achieve adequate control of the irrigation system, but also to make any efficiency increase action feasible (ASCE, 1974), is to obtain sufficient and accurate data. With regard to this, two important actions are worth highlighting: irrigation water metering and net radiation metering. From these, other research and development lines may be expanded.

e) Periodical hydrological review. Periodical hydrological reviews are advisable, since more information on supply sources will become available with time. The above will help the project define the maximum irrigable area, overall operation policies, and/or crop plans that are congruent with water availability and efficient water use policies..

f) Gauging structures. The implementation and/or development of cost-effective and simple-design gauging structures for gravity irrigation systems is a very relevant issue. System efficiency improvements will not be achieved without water metering. This activity may begin by implementing structure design methods that will not require field calibration, such "long-throat gauges" (Martínez-Austria & Castillo, 1991). These gauging structures may be automated by installing electronic devices (Espinosa and Contreras,1991).

Suppliers of mechanic, electrical or electromechanic equipment must provide operation and maintenance manuals that shall be included in these programs to prevent the premature deterioration of equipment.

Maintenance.

Considering current policies related to water conservation and efficient use of water stemming from the lack of water resources in the study area and in the country overall, irrigation district works require constant preventive and corrective maintenance to prevent the gradual deterioration of the works and avoid incurring losses in irrigation efficiencies and eventual high repair costs.

The agency in charge of managing the irrigation district will be responsible for providing the necessary maintenance to "headworks", understanding such as being water intake and conveyance structures, as well as main canals. In addition, the agency must foresee the need to turn over the operation and maintenance of minor lines to water user associations trained and supervised by the applicable agency.

These actions will allow the agency to gradually transfer the operation and maintenance of all district works to their final users - the farmers.

The project also proposes training for operators of new equipment and infrastructure as a responsibility of equipment vendors.

c. **Compliance with Applicable Design Standards and Regulations**

It must be noted that the development of proposed works complies with all applicable standards and regulations issued by Mexican and international technical agencies and institutions, and conforms to the CNA's regulatory framework.

Current standards and specifications, manuals, and design guides applicable to the project include:

- [Mexican] General Law for Ecological Equilibrium and Environmental Protection
- Chihuahua State Environmental Law.
- Mexican Official Norm NOM-001-ECOL-1996, NOM-031-ECOL-1993 y NOM-052-ECOL-1993
- D.G.N.. Technical Standards and Regulations for Electrical Installations
- ASTM. American Society for Testing Materials
- AWWA. American Water Works Association.
- ANSI. American National Standards Institute
- OSHA. Occupational Safety and Health Administration
- National Water Commission's Standards and Specifications.
- Construction Regulations for Mexico City and Complementary Technical Standards.
- Construction Regulations for Reinforced Concrete Buildings ACI-318R-89 and comments.
- Concrete Sanitary Structures for Environmental Enhancement ACI-350R-89.
- American Institute of Steel Construction (AISC)
- American Welding Society (AWS)
- American Society of Mechanical Engineers (ASME)
- American Society of Civil Engineers (ASCE)
- Portland Cement Association (PCA)
- Chihuahua State's Construction Regulations

The project conforms to the provisions of development plans applicable to the study area.

With regard to the National Development Plan, which establishes general guidelines to achieve sustainable development at the national level, section a) on water withdrawal, distribution and use was reviewed and states the following:

"a) Environmental policy for sustainable growth.- the main objective establishes a high priority for making efficient use of water and ensuring water supply."

Chapter 4.- Financial and Administrative Feasibility of the Project

a. **Financial Feasibility**

The amount required for the modernization and technical improvements of the Rio Conchos Irrigation Districts amounts to 1,540 million Pesos over a period of 4 years.

For the modernization and technical improvements of the Delicias 005 Irrigation District, the reason for certification, a 4-year investment of 1,360 million Pesos is required, or 88% of the total required for the three districts.

The following provides a table of investments for the Delicias 005 Irrigation District for the cost of the main works over the 4-year duration of the project.

INVESMENT PROGRAM FOR THE DELICIAS 005 IRRIGATION DISTRICT

ITEM	Unit	Quantity	Amount in Thousands of Pesos				
			Total	Year 1	Year 2	Year 3	Year 4
REPAIR OF RIPRAP/LINING OF THE MAIN RIO CONCHOS DIVERSION CHANNEL FROM KM. 6+980 TO KM 19+980	KM	3.0	10,000	10,000			
GAGING/WATER MEASURING DEVICES AND HEADGATE CONTROLS. PRINCIPAL CONCHOS AND SAN PEDRO CHANNEL CONTROL POINTS & DELIVERY WORKS	LOT	1.0	6,000	6,000			
RIRRAP AND/OR PIPING OF LATERAL AND SUBLATERAL CHANNELS.	KM	601.6	301,324	107,815	94,377	43,481	55,651
LOW PRESSURE IRRIGATION SYSTEMS WITH MULTIPLE-SIZE PIPES	HA	17,136.0	245,331	87,781	76,839	35,401	45,309
LEVELING OF AGRIULTURE LAND	HA	21,421.0	70,769	25,321	22,165	10,212	13,070
WELLS & HIGH PRESSURE DISTRIBUTION SYSTEMS	HA	17,136.0	377,430	135,046	118,214	54,463	69,706
PUMP STATIONS. LOW PRESSURE IRRIGATION	HA	8,569.0	150,971	54,018	47,285	21,785	27,882
WELLS & LOW PRESSURE DISTRIBUTION SYSTEMS	HA	5,998.0	89,167	31,904	27,928	12,867	16,468
MANAGEMENT & SUPERVISIÓN			76,807	29,375	23,172	10,650	13,610
TOTAL			**1,327,799**	**487,261**	**409,980**	**188,859**	**241,697**

As for the financial analysis, the following financial structure was established for the financing of the works for the Delicias 005 Irrigation District in Chihuahua.

Actual Expenditures (Annual)

Item	Amount ($Pesos)
Operations Income	17,053,360
Operations Costs	14,604,710
Non-Operation Costs	4,051,610

Cost Estimates

Item	Amount ($Pesos)
Construction	1,354,799,000
Contingencies (6%)	81,288,000
Total	$ 1,436,087,000

Financing Structure

Source	Amount ($Pesos)	%
Federal Resources (Grant)	1,036,087,000	72
NADB - Water Conservation Infrastructure Fund (Grant)	400,000,000	28
Total	$1,436,087,000	100%

In other words, the Federal Government of México will participate with 72% of the financing for the project and 28% by the North American Development Bank.

b. **Rate/Fee Structure**

The users of the Delicias Irrigation District, in accordance with their authorized concessions for the use of the infrastructure, must cover the costs of the operation and maintenance of the headworks and principal channels that the National Water Commission of Mexico currently operates, as well as the costs of the secondary distribution infrastructure operated by the users themselves. Currently, the fee for the two systems is 80 Pesos per 1,000 cubic meters of water.

FEES (in Real Terms) IN PESOS PER THOUSAND m3 Volume			
	2003	2004	2005
Fee	$100	$100	$100

With this project, the operational conditions of the Irrigation District will be improved, but it will be necessary to make an adjustment in the tariff that will be required to be paid by the users to assure the proper operation and maintenance of the infrastructure at any time. The National Water Commission of Mexico has analyzed this and has determined that the fees for operation and maintenance of the infrastructure with the project should be those that are shown in the following table. Of course, as the users become more efficient in their management of the infrastructure, the fees could be reduced based on prior analysis.

c. **Project Administration**

The CNA organizational structure for the operation of each irrigation district includes an Irrigation District Manager with an operations division, a conservation division, an irrigation and drainage engineering division, and finally, an administration division.

In addition, a general resident advisor position is included in the organization chart for each district, filled by one or two specialized experts depending on the situation. Annex No. **4c.1.1** includes the details of the organizational charts.

Chapter 5.- Community Participation

a. **Comprehensive Community Participation Program**

1) Introduction

On July 24, 2002 the Border Environment Cooperation Commission received an application submitted by the National Water Commission (CNA) for certification of the Project for Modernization and Technical Improvements to the Conchos River Irrigation Districts. Thereafter, on September 25, 2002, the CNA requested that certification be limited only to the activities of Delicias 005 Irrigation District. This certification will enable the CNA to access various funding mechanisms available from the North American Development Bank.

BECC certification criteria includes Community Participation, in which a Steering Committee must be created for projects proposed for certification. This committee would be responsible for facilitating project discussions and promoting public consultation in the communities benefited or affected by the project.

This criterion establishes that at least two public meetings must be held, the first of which should be announced thirty days in advance in the local media.

In accordance with the criteria, CNA submitted a Community Participation Plan on September 4, 2002, and by the end of the public participation process, presented a report demonstrating public support for the project.

CNA implemented an aggressive community participation process to inform users along the Rio Conchos watershed of the project for technical improvements in the irrigation districts. First, there was a community participation or information phase which ensured acceptance of the project by the users and a full understanding of project benefits.

With completion of this first phase, the project complied with some critical aspects of the community participation criterion, such as making project information available to the stakeholders, and holding local information meetings.

District users associations were established as Steering Committees for the information and community participation process, the required public meeting was announced with a 30-day notice period, and the public meeting and the completion of Community Participation Report were strictly completed to meet the requirements of the public process.

2) Objectives of the Community Participation Program

The purpose of the community participation requirement for projects sponsored by border communities is to demonstrate that the project is understood as to its technical, financial and environmental aspects. In addition, the project must be accepted by most of the community with its related benefits, costs, risks, and impacts.

This program ensured that project stakeholders were properly informed of the project's technical and financial scope, as well as of its benefits and impacts. The program also encouraged the stakeholders' involvement in local and public meetings to promote review and discussion of the project and to achieve a consensus in favor of the proposed tasks.

The preliminary tasks for this program included the identification of interested stakeholders and groups from the three irrigation districts and the development of a report of baseline conditions to define communication and information strategies.

In order to demonstrate that the message about the project was received by most of the community, meetings were video-taped, minutes were prepared with attendance sheets, and press releases were prepared, with signatures noting approvals.

3) Community Participation Committee

The public process was developed directly with user groups which acted as Steering Committees, who facilitated the flow of information to users in the irrigation districts benefited by this project.

The Rio Grande Regional Management Office's Users Association functioned as technical secretary to ensure project information is presented in executive summaries, that meetings were held, and to provide support for project's overall logistics.

A meeting was held with the Boards of User Associations of the three irrigation districts to explain their role in the public information process and its objectives. This meeting also served to inform users about the project's scope. BECC participated in explaining its role in the evaluation and certification process, and the importance of community participation in the project's certification.

At this preliminary meeting, Users Associations were formally established as Steering Committees, although the sponsor later decided to pursue the certification of only the Delicias, Chihuahua district.

4) First Public Meeting

CNA held a regional public meeting with the Boards of the three irrigation districts to inform them of this project, establish Steering Committees and listen and address users' questions regarding this project. This meeting was held on September 18, 2002 in Delicias, Chihuahua; the first of two meetings proposed to be held to meet BECC's community participation criteria.

As a result of this first public meeting, the three users associations democratically elected the respective presidents of their Steering Committees for the BECC process. The elected officials were: for the Delicias Irrigation District 005 from Delicias, Chihuahua, Mr. Rafael Humberto Chavez Veliz; for the Rio Florido Irrigation District 103, Mr. Oscar Carrillo Herrera; and for the Lower Rio Conchos Irrigation District 090, Mr. Rafael Ruiz Olivas.

The CNA, in coordination with the three Steering Committees, held a public meeting with a 30-day advance notice, and it had wide participation. A meeting scheduled for Noon on October 5, 2002 in the offices of the district headquarters was advertised in the Diario de Chihuahua on September 5, 2002, a newspaper with wide coverage in the three irrigation districts.

In the first phase of the project, the CNA held various local and public meetings about the project improvements in the three districts in accordance with the public information procedures. The three districts were informed of the technical and financial concepts and goals of the project. These information activities were included in the community participation plan.

Project related information was available at the three district offices from the start of the process. With the posting of the September 5, 2002 newspaper announcement in the Diario de Chihuahua, updated project information was provided to the public at the offices of the headquarters of each Irrigation District.

5) Project for Modernization and Technical Improvements to the Conchos River Irrigation Districts - Public Process Calendar

Task	Dates
Publish notice in the Diario de Chihuahua	September 5
First public information phase	First half of 2002
Prepare documents, brochures, PowerPoint presentation, for the information process	September 4 - 10, 2002
Submit and obtain approval for the Community Participation Plan	September 4, 2002

First public meeting with Users Associations' Boards	September 18, 2002
Information and outreach in modules benefited in each irrigation district	September 5 - October 4, 2002
Second public meeting in irrigation district of Delicias, Chihuahua	October 5, 2002
Public Participation Report	October 7, 2002

6) 2nd Public Meeting

The second public meeting was held at Noon on October 5th, 2002 in the offices of Delicias Irrigation District 005 in Delicias, Chihuahua, and since the CNA, the sponsor for the project, had requested the BECC Board of Directors that the project initially only include the Delicias Irrigation District, and the board approved of this, meeting was held with this in mind with prior notice to the other districts.

The participation in the meeting included more than 200 farmers from the Delicias irrigation district, and the project concept was presented again, with expected achievements, commitments and investment requirements. The large majority of participants expressed their complete understanding of the project and support for its implementation.

At this public meeting, some of the farmers expressed strong concerns and in some cases opposition over the final use of the water saved. However, all participants expressed their support for the project to improve the management of water.

7) Media Campaign

A media campaign with strategies to support the public information process was developed to ensure wide community coverage.

8) Advertising Materials.

Various outreach materials were prepared, such as brochures, video tapes, fact sheets, newspaper announcements, workshops and forums, press releases, and other applicable project-related material.

9) Final Report

The Rio Grande's Regional Management Office, in coordination with Users Association's chairpersons, presented a Final Report supported by documentation, including reports on how users were informed about the project, local and public meetings held and their outcomes, minutes of meetings, and exit polls. This demonstrates that the communities largely support the project, understanding its characteristics and benefits. The above documents are included in Attachment **5.a.8.**

Chapter 6.- Sustainable Development

a. **Definition and Principles**

The Project for Modernization and Technical Improvements to the Conchos River Irrigation Districts relies on the definition and principles for sustainable development stated below:

Sustainable Development is defined as conservation oriented 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, as defined in the Border XXI environmental program developed by U.S. and Mexican authorities. This definition is based on the internationally accepted sustainable development definition from the Rio Declaration on Environment and Development: development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

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

Principle 2. the right to development so as to equitably meet developmental and environmental needs of present and future generations.

Principle.3. Sustainable development considers environmental protection an integral part of the development process and as such, it may not be considered separately.

Principle 4. Stakeholders in environmental infrastructure projects must become involved in any activity related to such project, which means that:

- Residents of the border area who are directly being affected by environmental problems must have an opportunity to participate in the decision making processes that impact environmental resource protection and management in their community.
- The experience and efforts of the different agencies involved in environmental, social and economic enhancement in all sectors of the community must be integrated, so as to achieve balanced planning and a better use of scarce resources.

The proposed project will positively impact the basins of the Conchos and Grande rivers by increasing their water flow, improving water quality and favoring water conservation. Thus, local residents will benefit from better agricultural yields within a sustainable development framework and from a better quality of life within a nature conservation scheme, being careful not to compromise water and soil resources for the future, considering that modernization and technical improvements in their irrigation districts will help them take better care of these elements by combining their use with environmental protection.

In addition, the public review process ensures that residents in the project's influence area participate in the development process fully aware that the decisions they make will focus on the sustainable management of environmental resources to achieve better environmental and socioeconomic conditions in their community.

Thus, the project is recognized as one that fully complies with the definition and principles of sustainable development and will leverage the region's progress by promoting environmental conservation.

b. **Institutional and Human Capacity Building.**

The diagnosis of the national water sector presents a complex issue, where human activities have deeply disturbed its economic, ecological and social stability. However, the project identifies a group of problems that encompass and describe negative situations that need to be solved:

- Deficient water and water resource use and management in irrigation districts and units.
- Vulnerability in case of contingencies due to extreme weather phenomena such as droughts.
- A backlog in the implementation of modernization actions.

Moving towards a solution for these problems requires acknowledging that water, in addition to being indispensable for life, is a limited resource and, due to its relative scarcity, has economic value. These circumstances result in struggles for the right to use water.

There is competition for water in our country's different regions: cities need to make use of potable water, industries want it for their processes, agriculture needs it to irrigate crops, and nature requires it to preserve the environment. All of these uses of water are indispensable.

Economic growth and an improved quality of life in Mexico within a context of sustainability - understanding this as the responsibility of the present generation to the future generations--, require us to establish now conditions that will facilitate the allocation of water to different uses with rationality.

The presence of water in basins and their aquifers, regardless of political divisions, requires water planning to be developed within such units. Each of them needs to implement water development plans that include the following aspects:

- Planning
- Water management
- Public awareness and community outreach
- Research and technological development
- Comprehensive metering and information system
- Potable water, wastewater collection and treatment in urban and rural media
- Efficient use of water in agricultural, urban, and industrial systems.
- Halting the deterioration of water basins.
- Reducing vulnerability to extreme weather phenomena.

Public awareness seeks to support the development of a national water culture and community involvement to achieve consensus as to how water development objectives are to be met within each basin. Watershed Councils described in the National Water Law [Ley Nacional de Aguas] must rely on a major user organization base with a life of its own, convinced that they are pursing common interests that are worth working for.

Increased water use efficiency is imperative to meet the growing demand for the resource considering its finite availability. Investments to increase water efficiency and productivity are significant and funding is not easy to obtain. One option is to combine the needs and interests of Mexico and the United States to fund projects that promote the efficient use of the limited resource shared by the two countries.

The Project for Modernization and Technological Improvements to the Conchos River Irrigation District stems from a long-standing problem:

As a result of the few loans available for agriculture and the reduction of public investments for the water/agricultural sector, in addition to adverse weather conditions, in the eighties, the agricultural National Domestic Product had an annual growth approximately lower than 1 percent

This growth rate was lower than the rural population's growth rate, causing thus hardship for agricultural products and major social issues in Mexican rural areas.

The National Water Commission started a program to rehabilitate and transfer irrigation districts to users grouped in user associations, with the purpose of increasing water use efficiency and above all, the users' involvement in the operation, conservation and management of the transferred water/agricultural infrastructure.

In 1995 CNA turned the rehabilitation and transference program into a rehabilitation and modernization program for irrigation districts; furthermore, it implemented the Parcel Development Program to consolidate and complete the transfers, in addition to increasing crop yields and productivity.

The transference started with an aggressive outreach campaign to inform users of its significance, the rights and obligations they acquired, and the importance of having an irrigation fee that was adequate to cover the districts' operation, conservation and management costs. Concurrently, there was a need to develop and approve a new National Water Law that clearly defined the provisions that enable the federal authorities to grant concessions for the use of water and infrastructure to water users associations.

Users have accepted the transference by receiving the infrastructure as it was and committing to pay irrigation fees, while CNA pledged to support them in rehabilitating the irrigation districts.

Organized users demand greater participation in the identification, selection and implementation of irrigation districts' technological improvements. In order to address this and support the consolidation of user associations, CNA implemented programs for Rehabilitation and Modernization as well as Parcel Development, where users become involved with investments. Thus, in this particular case, the project is in line with modernization and development plans that have already been established.

c. **Conformance to Local and Regional Conservation and Development Plans.**

The project is directly linked to regional water plans such as the Great Vision Water Plan for the State of Chihuahua [Programa Hidráulico de Gran Visión del Estado de Chihuahua].

The plan's objectives identify the need to protect and conserve water and the environment, as well as to contribute to the economic development and production of food, addressing the agricultural sector's water demands while improving the quality of water. Thus, the plan itself proposes the following goals:

Modernize agricultural activities. Increased conveyance and application efficiencies are proposed for irrigation districts.

It must be noted that in the Conchos River area, due to the scarcity of water, development programs must be adapted according to water availability, so promoting an increased water flow will result in better opportunities for development.

Finally, the area responsible for the project within the National Water Commission (CNA) is the Office of Coordination of Border Issues, headed by Dr. Polioptro F. Martínez Austria. Address: Privada del Relox No. 16, 5º piso, Col. Chimalistac, C.P. 01000, México, D.F., Telephone: (55) 54 81 11 50, (55) 54 81 11 51 and Fax (55) 54 81 11 52.

d. **Natural Resources Conservation**

Currently, 88% of all water from the Conchos River is channeled to agricultural activities in areas along its course. The Mexican National Water Commission (CNA) has identified inefficient use of water as one of the main issues in the Rio Grande river basin. CNA considers the efficiency of agricultural practices to be low, as it is around 44% in irrigation districts. Thus, improving the efficiency in irrigation districts will save significant amounts of water and will make available a greater amount of water to sustain the ecology of the Conchos and Grande Rivers.

The Delicias and Rio Florido irrigation districts use up 93% of the total volume of water available to the three districts. Considering that savings expected from these two irrigation districts amount to 93% of the total amount of water used, the actions implemented in these two districts (which are located outside of the 100-Km. border area) will have a significant impact on water savings and will help increase the Conchos River water flow.

e. **Community Development**

Irrigation district users do not have another source of income but their land. As such, the benefit obtained by the modernization of these irrigation structures will directly impact production and will result in an increased income and an improved quality of life.

On the other hand, regional development may cause a greater influx of people who would want to be employed in agricultural activities or jobs related to established industries, commerce, transportation, and trades. With this, the economic activity in irrigated areas will be enhanced by making residents active participants in the areas' development.

An improved quality of life form farmers in irrigated areas will also be reflected in the development of health, education, and service programs, as shown in Attachment 1.c.2. Demographic and Service Data for the municipalities of Ojinaga, Delicias, Camargo, and Jiménez.

f. **Baseline Conditions**

A list of pressure and state indicators was developed to establish current conditions in irrigation districts. The list of indicators is included in the Appendix to this document.

g. Performance Indicators

Performance indicators were identified to help improve current conditions in irrigation districts along the Conchos River. These include:

1. Improved irrigation systems' infrastructure.
2. Improved water flow metering in conveyance and parcel distribution lines.
3. Improvements to irrigation districts' access ways, which will improve the operation and control of district infrastructure.
4. Modernization of structures, which will improve water flow control in conveyance lines.
5. Improvements to water use distribution and planning (types of crops, surface to be planted v. water allotments)
6. Optimization of irrigation district infrastructure operation and control.
7. Greater flexibility for the operation of irrigation district infrastructure.
8. Revised and updated operation and maintenance regulations for irrigation district infrastructure. Such revision will be jointly developed by CNA and users according to the infrastructure to be built and the characteristics of equipment to be installed.
9. Revised user fees to ensure that such fees adequately cover structure and equipment operation and maintenance costs. User fees include the operation and maintenance of major lines (reservoirs, diversion dams, primary canals), secondary canals, and parcel distribution lines.
10. Continuity will be provided for existing user organizations to manage and operate irrigation districts.
11. Users and operators will be trained in specific irrigation technologies to be implemented in their parcels (Low-pressure like micro sprinklers, drip feeders, multiple gates, and high-pressure systems), and in metering and control structures operations.
12. Reduced surface and underground water extraction rates.

Irrigation District	Water Withdrawal Reduction Goal (Mm^3)
Delicias	333.91
Lower Río Conchos	24.49
Río Florido	36.1

13. Reduced volume of water rights assigned to users according with the water savings by the project implementation.
14. Reduced water conveyance losses.
15. Reduced volume of water supplied by hectare (parcel distribution)
16. Increased water productivity $/$m^3$.
17. Increased land productivity, $/ha. by reducing inputs and labor costs.
18. Increased land productivity, ton./ha., fertirrigation potentially improves some crop yields.
19. Improved parcel irrigation efficiency (consumptive use v. applied water)
20. Improved overall efficiency in irrigation districts.

INCREASED EFFICIENCY RESULTING FROM ACTIONS PROPOSED FOR IRRIGATION DISTRICTS			
ACTIONS	CURRENT*	PROPOSED**	INCREASE
Canal lining	53	90	37
Piping	53	90	37
Land grading	45	75	30
Pumping, low-pressure irrigation and grading			37
(*): Estimated (**): Theoretical			

21. Land grading.
22. Use of better technologies for parcel irrigation. Low pressure-systems (microsprinklers, drip irrigation, multiple gates), and high-pressure systems (irrigation cannons).
23. Increased water flow in the Conchos River resulting from volumes reclaimed by the implementation of water conservation actions in irrigation districts.
24. Improved operations in irrigation districts and reservoirs will prevent extremely high flows and dry rivers, which will tend to standardize flows discharged to the Conchos by the reservoirs, maintaining thus more stable flow conditions in the river and benefiting its habitat.
25. The implementation of better irrigation systems will promote the use of fertirrigation to optimize the application of agrochemical substances. This will potentially reduce agricultural returns and the incorporation of agricultural chemicals to surface and underground bodies of water.
26. Optimizing irrigation systems' operations for conveyance, parcel distribution and parcel irrigation, contributes to reduce electrical power use for water pumping.
27. The information disseminated during the public review process for certification, the revision of user fees and user training efforts, will contribute to improve environmental awareness and promote water resource conservation in the Conchos River basin.

h. Observance of minimum requirements for the project compliance of BECC sustainable development criteria.

Recommended Minimum Requirement	Variations / Exceptions	Rationale
1. **All Projects**. Two stakeholder workshops, described in the Guidelines for Applying the Sustainable Development Criteria, must be conducted as described, particularly regarding content, schedule, and stakeholders. In Workshop 1, the Sponsor and stakeholders review baseline conditions and select indicators. In Workshop 2, alternatives are ranked using the key indicators (criteria). The workshop must include stakeholders with bi-national representation when the potential exists for transboundary impacts.	The requirement does not apply due to the project's degree of development when received. The planning, review of alternatives, and final designs had already been completed.	Ensures compliance with Principle 4 of the BECC's Sustainable Development Criteria and promotes community development.
2 **All Projects**. The worksheets provided in the Guidelines for Sustainable Development for projects must be completed, including a Baseline Conditions worksheet.	The requirement does not apply due to the project's degree of development when received. The planning, review of alternatives, and final designs had already been completed.	Ensures compliance with Principle 4 of the BECC's Sustainable Development Criteria and promotes community development.
3. **All Projects**. Project must incorporate energy efficiency principles into the design of the infrastructure system and facilities and provide an energy use comparison of alternatives. Include a feasibility study[1] for efficiency/ conservation and also the use of renewable energy.	The requirement does not apply due to the project's degree of development when received. The planning, review of alternatives, and final designs had already been completed. However, the project itself implies energy savings, as detailed in performance indicator 28.	Ensures compliance with Principle 3 of BECC's Sustainable Development Criteria and addresses Institutional and Human Capacity Building subcriteria: Conformance to Local and Regional Conservation and Development Plans and Natural Resource Conservation.
4. **All Projects**. The project shall demonstrate how it will continually assess the infrastructure condition and performance for long-term protection of system durability.	The observance of this requirement is detailed in performance indicators 8 and 10.	Addresses general financial sustainability issues and the Institutional and Human Capacity Building subcriterion.
5. **All Projects**. For the development and selection of alternatives, the project must include a present worth analysis[5] of each alternative and compare the cost to the affordability of the community prior to selecting the final alternative. A part of determining affordability is to examine the user fee that will cover capitalization, operations, and maintenance on an	The requirement does not apply due to the project's degree of development when received. The planning, review of alternatives, and final designs had already been completed.	Addresses general financial sustainability issues and Institutional and Human Capacity Building and Community Development subcriteria.

annual basis relative to average household income.	Regarding rate structures, it is described in performance indicator 11, the observance of this requirement.	
6. **All Projects**. Project must identify improvements to administrative systems and equipment necessary to support long-term effectiveness of the infrastructure improvements. Sponsor will include the cost of these improvements in the operation and maintenance budget.	Compliance of this requirement is detailed in performance indicators 1,2,3,4,5,6,7,8,11,12 and 13.	Addresses general financial sustainability issues and the Institutional and Human Capacity Building subcriterion.
7. **All Projects**. Project implementation must include community awareness on responsible use of resources and infrastructure (e.g., anti-litter, responsible water use, watershed protection, ecosystem protection, health benefits, paying utility bills, recycling, in-house reuse, and baseline environmental, social, and economic baseline conditions).	Compliance of this requirement is detailed in performance indicators 2,5,6,7,11,15,21,22 and 29.	Ensures adherence to Principles 1, 2, 3 and 4 of the BECC's Sustainable Development Criteria. Addresses Institutional Capacity Building, Conformance to Local and Regional Conservation and Development Plans, Natural Resource Conservation, and Community Development subcriteria.
8. **Water and Wastewater**. Water and wastewater projects must include a water usage assessment, including the possibilities and need for conservation and/or reuse.	The project itself is water conservation related, and the observance of this requirement is detailed in the 29 performance indicators identified for this project.	Addresses Institutional Capacity Building, Conformance to Local and Regional Conservation and Development Plans, Natural Resource Conservation and Community Development subcriteria.
9. **Water.** The project implementation must include training for irrigation district staff and users on the use of the new infrastructure.	Compliance of this requirement is detailed in performance indicators 3 and 13.	Addresses general financial sustainability issues and the Institutional and Human Capacity Building subcriterion.
10. **Water Distribution and Wastewater Collection Systems**. Treatment capacity must already be in place or planned as part of the project being developed.	The requirement does not apply due to the nature of the project.	Ensures adherence to Principles 1, 2, and 3 of the BECC's Sustainable Development Criteria. Addresses general human health sustainability issues, as well as the Institutional Capacity Building, subcriterion.
11. **Water and Wastewater Pump Station and Treatment Plant Upgrades**. Prior to completion of 30% design, the project must include an interview with the supervising operator to obtain observations and recommendations. Sponsor must provide a copy of the information to the BECC project manager.	The requirement does not apply since final designs had already been completed.	Ensures compliance with Principle 4 of BECC's Sustainable Development Criteria and addresses general technical sustainability issues, as well as the Institutional and Human Capacity Building subcriterion.
12. **Wastewater Treatment Projects**. Project shall include a preliminary assessment on the need for industrial pretreatment. If applicable, a pretreatment plan of action shall be prepared.	The requirement does not apply due to the nature of the project. Actions should be considered to improve agrochemical compounds application practices to reduce pollution of water bodies.	Ensures compliance with Principle 3 of BECC's Sustainable Development Criteria and addresses general technical sustainability issues, as well as the Institutional and Human Capacity Building and Natural Resource Conservation criteria.
13. **Solid Waste**. Project must include a feasibility analysis to reduce, reuse and recycle, taking into account the size of the community, the size of the facility, resources, and proximity to markets.	The requirement does not apply due to the nature of the project.	Addresses the Institutional and Human Capacity Building, Conformance to Local and Regional Conservation and Development Plans, and Community Development subcriteria.
14. **Solid Waste**. New landfill projects must include appropriate closure procedures for uncontrolled municipal dumpsites.	The requirement does not apply due to the nature of the project.	Ensures compliance with Principle 3 of BECC's Sustainable Development Criteria and addresses the Institutional and Human Capacity Building, Conformance to Local and Regional Conservation and Development Plans, and Natural Resource Conservation criteria.

[1] Reporte de la calidad del agua , Subdirección General de Programación, Gerencia Regional Norte, Gerencia Estatal de Chihuahua, Comisión Nacional del Agua.