Final Report
Volume II Environmental Impact Assessment
CENTRAL LOMAS DE REAL
CENTRAL VALLE HERMOSO
Valle Hermoso, Tamaulipas, Mexico

DAMES & MOORE de MEXICO,
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VOLUME II ENVIRONMENTAL IMPACT ASSESSMENT
CENTRAL LOMAS DE REAL AND CENTRAL VALLE HERMOSO

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1.0 INTRODUCTION

This Environmental Impact Assessment Report has been prepared to support financing for two combined cycle power plant projects through a Loan Agreement with the International Finance Corporation (IFC) of the World Bank Group. The Report has been prepared by URS - Dames and Moore de Mexico (URS) in compliance with the environmental requirements established by the IFC. Electricitè de France International retained URS to prepare the Environmental Impact Assessment and oversee Public Consultation process for both projects.

The Mexican Federal Government, through the Federal Electricity Commission (CFE) and its Electric Sector Work and Investment Program requested bids for the installation of six thermal power plants in the State of Tamaulipas, under the Independent Production of Energy (IPE) framework.

CFE completed the bidding process for the construction and operation of the thermal power plants known as Independent Production of Energy IPE Thermal Power Plants Rio Bravo III and Rio Bravo IV in the State of Tamaulipas. This process was performed on an individual basis for each power plant, with the bidding companies presenting their technical and economic proposals and the CFE assigning the concession to the winning bidder.

Electricitè de France International (EDFI), a wholly owned subsidiary of EDF, has won the bid for Rio Bravo III and Rio Bravo IV under two separate official bidding processes conducted by CFE. Central Lomas de Real, S.A. de C.V. and Central Valle Hermoso, S.A. de C.V. are subsidiaries of Electricitè de France and they were declared winning bidders for the two plants. These two plants are to be developed on properties, adjacent to each other, located in the Municipality of Valle Hermoso, in the State of Tamaulipas, Mexico. CFE granted the concession for Rio Bravo III on June 12, 2001 and Rio Bravo IV on February 7, 2002. EDFI had previously won the bid for Rio Bravo II on December 30, 1998 which is also located on the adjacent property and this plant is currently in operation. Table 1.1 presents the names of each project and the companies that will operate them.

Table 1.1 Thermal Power Plants in Valle Hermoso, Tamaulipas*

CFE Project Name	EDFI Project Name	EDFI subsidiaries operating the plant
Independent Production of Energy Thermal Power Plant Rio Bravo II	Central Anahuac (in operation)	Central Anahuac, S.A. de C.V.
Independent Production of Energy Thermal Power Plant Rio Bravo III	Central Lomas de Real	Central Lomas de Real, S.A. de C.V.
Combined-cycle Power Plant #25 Rio Bravo IV	Central Valle Hermoso	Central Valle Hermoso, S.A. de C.V.

* EDFI has obtained the concession of two other thermal power plants in Saltillo, Coahuila and in Altamira, Tamaulipas. The Altamira plant is in partnership with Mitsubishi.

Central Lomas de Real S.A. de C.V. and Central Valle Hermoso, S.A. de C.V. are subsidiaries of EDFI, the company that won bids through the CFE, and will operate the power plants.

The Rio Bravo III (RBIII) and Rio Bravo IV (RBIV) projects will generate power using combined-cycle natural gas turbines with a guaranteed capacity of 495 MW for RBIII and 500 MW for RBIV. Both plants, with very similar processes, will have a 2+2+1 combined cycle configuration that includes two gas turbines, two heat-recovery boilers (heat recovery steam generators) and one steam turbine.

1.1 Electric Sector in Mexico

In accordance with CFE planning and programming specifications and in compliance with requirements established in the Public Service Law for Electric Energy, CFE has developed an Independent Production of Energy (IPE) program to facilitate development of power generation in Mexico.

The IPE can be any company, established in Mexico in accordance with Mexican laws, that generates power with the obligation to sell it to the CFE, through long-term agreements. The agreements, wherein CFE is obliged to purchase the energy generated by the producer of power, are performed according to Article 36-BIS of the Public Service Law for Electric Energy, and in compliance with requirements established in the applicable legislation.

As part of the Electric Sector Work and Investment Program, CFE requested bids for two thermal power plant projects (Rio Bravo III and Rio Bravo IV) under the IPE program. Power generated in these two power plants will be distributed through the existing National Electricity System in Mexico.

1.2 CFE Bidding Guidelines

According to article 125, Section IV item D, of the Regulation for the Public Service Law for Electric Energy, the bidding specifications proposed by CFE detailed the type of fuel and location for the power plant. CFE also offers a pre-selected site as an option to the bidders. CFE prepares and submits the MIA (environmental impact assessment) and the risk study to the Mexican regulatory agency, Environmental and Natural Resources Secretariat (SEMARNAT), and obtains their approval for the facility to be located at the specific site selected by CFE. This process also includes a modified public consultation process to provide information to the local communities and to the state. If the bidder accepts the site, CFE is responsible for purchasing the land and transferring the rights to the bidder. For these projects, EDFI decided to use the sites proposed by CFE.

CFE includes in bid specifications, based on its history and experience, recommendations related to the main equipment and associated systems that would be necessary to comply with specified technical requirements. The Producer is the party ultimately responsible for the design, construction, testing, and operation of the facilities. CFE has the right to inspect and comment on activities conducted by the Producer, throughout all the phases of the project, in accordance with the terms and conditions of the Agreement between the CFE and the Producer.

The bid for the development of the projects was under the IPE program and was to comply with the terms and conditions of the Agreement and the IPE is obliged to sell all the power generated by the power plants to CFE for a specific period of time, in accordance with the terms specified in the Agreement. CFE is the only entity in Mexico who is allowed the right for transmission of power through the National Electric Grid System and therefore the power transmission is not part of the bidding process. CFE ensures that there is sufficient capacity in the transmission grid to carry away the power produced by the new generating plants to be constructed under the IPE process. CFE does not publish such information about its grid capacity in Mexico. However, the new transmission lines are constructed by CFE in accordance with the environmental and other regulatory requirements in Mexico.

In the IPE framework, as the promoter of the project, CFE is responsible for obtaining authorizations concerning environmental impacts during the construction and operation of the thermal power plants at the site selected by CFE. Once the authorization is obtained, along with all the obligations and rights therein established, it is transferred to the bidding winner by CFE prior to the initiation of construction activities at the site.

The bidding basis also specifies that the power producer will incorporate all the environmental prevention, mitigation, control, and follow-up measures specified in the Environmental Impact Manifest (MIA) presented to SEMARNAT by CFE into the different stages of the project. The Producer will also comply with the conditions established in the environmental impact authorization, and the guidelines and regulations established by environmental authorities.

The MIA for the RB III power plant was prepared in June 2001 by CFE, based on general design specifications, to determine potential impacts generated by the project and to establish the necessary mitigation measures. The MIA was submitted to SEMARNAT for its evaluation and CFE obtained the Environmental Impact authorization on October 31, 2001. The MIA for the RBIV power plant was prepared in November 2001, submitted to SEMARNAT for its evaluation and CFE obtained the Environmental Impact authorization on May 9, 2002. CFE has now transferred the authorizations for each project to EDFI.

The following table presents a summary of major specifications relevant to environmental performance by CFE and EDFI.

Table 1.2 Power Plant Specifications

	CFE Specification	EDFI Proposal
Generating thermal efficiency	Not specified	50% HHV 55% LHV
Cooling system	No specific system. The design must be capable of decreasing thermal charge from steam condensation.	Air-cooled condenser
Wastewater treatment	Wastewater treatment system that meets Mexican Standards.	Evaporation Lagoon
NOx control	Dry Low NOx combustor to achieve 110 ppm (5% O_2, 25°C, 1 atm)	Dry Low NOx combustor to achieve 110 ppm (5% O_2, 25°C, 1 atm)
Stack Height	35 m	35 m

1.3 Electricitè de France (EDF)

URS has put together the following brief background about EDF based on the published information such as Annual reports and other communiqués, as well as based on the information provided by EDF.

Central Lomas de Real, S.A. de C.V. and Central Valle Hermoso, S.A de C.V. are companies affiliated with EDF, which were structured to own and operate the RBIII and RBIV projects, respectively.

EDF, with its headquarters in France, is a worldwide leader in the development of the infrastructure necessary for the generation, transmission, and distribution of electric energy. EDF develops, builds, and operates safe power generation plants, increasing the supply of electricity to satisfy increasing demand in markets around the world.

EDF has extensive experience in the power generation, which assures efficiency and profitability in power plant projects. They employ a team of experienced professionals in each of the key areas such as technical, environmental, as well as strategic planning.

EDF's stated philosophy is to develop clean energy services, at low cost, that impact in a positive way to the economy of the country in which it is developed with minimal impact on the environment. To achieve these goals, EDF develops and applies state-of-the-art technology in the power generation and the constantly investigates other viable alternatives.

Table 1.3 presents a non-exhaustive list of the location and capacity of the plants that EDF currently operates in the world and they have been built in the last ten years.

Table 1.3 EDF Power Plants

Project Name	Capacity	Country
Anahuac, (Tamaulipas)	495 MW	Mexico
Saltillo, (Coahuila)	247.5 MW	Mexico
Altamira, (Tamaulipas)	495 MW	Mexico
Gennevilliers	216 MW	France
Taranto	3 X 150 MW	Italy
Gardanne 4	250 MW	France
Vridi	3 X 330 MW	Cote d'Ivoire
Beddawi	450 MW	Lebanon
Zahrani	450 MW	Lebanon
Zahrani	450 MW	Lebanon
Puertollano	330 MW	Spain
Azito	2 X 150 MW	Cote d'Ivoire
Piombino	150 MW	Italy
Laibin B	2 X 360 MW	People's Republic of China

1.4 Environmental Impact Assessment

EDFI has proposed the construction and operation of the thermal power plants based on external financing. The financing for RBII has been approved and issued by IFC. RBII initiated operations on January 18, 2002, and EDFI is currently requesting financing for RBIII and RBIV.

This Environmental Impact Assessment report includes the evaluation of environmental and socioeconomic impacts for both the RBIII and RBIV projects based on the updated project specifications proposed by EDFI (rather than CFE's general specifications), and considers the interactions based on the construction and operation of all three thermal power plants (RBII, III and IV) in the evaluations of atmospheric emissions, water intake and discharge, noise generation and for the socio-economic impacts. This report presents the information in the following sections, as required for Category A projects as defined in the IFC's Operational Policy 4.01, *Environmental Assessment*.

Vol. I Executive Summary

Vol. II Environmental Impact Assessment

- **1.0 Introduction**
- **2.0 Political, Legal and Administrative Framework in Mexico**
- **3.0 Project Description**
- **4.0 Baseline Data**
- **5.0 Environmental and Social Impacts**
- **6.0 Analysis of Project Alternatives**
- **7.0 Environmental Action Plan**
- **8.0 Public Consultation and Information Disclosure**
- **9.0 Community Development**

As part of the World Bank Group financing requirements for thermal power plants, the socioeconomic situation in the community based on data collected to support the Environmental Impact Assessment and public consultation and disclosure is presented in section 9.0 of the EIA.

2.0 POLITICAL, LEGAL, AND ADMINISTRATIVE FRAMEWORK IN MEXICO

2.1 Introduction

The main objective of this chapter is to provide a general description of the federal government policies, environmental and energy regulations and requirements, as well the structure of the Mexican government as it relates to the development of the projects. This chapter also identifies the federal, state and municipal authorities where applications for permits, licenses and authorizations must be submitted in order to construct and operate the two proposed thermal power plants in Valle Hermoso, Tamaulipas.

Central Lomas de Real S.A. de C.V. (CLR) and Central Valle Hermoso, S.A. de C.V. (CVH) subsidiaries of EDFI, will be responsible for the design, construction, testing, ownership, operation, and maintenance of the two separate power plants for an expected lifetime of 25 years both to be located in the Municipality of Valle Hermoso, Tamaulipas. The power generated by these projects will be sold to CFE for its distribution through the existing network to CFE customers. Due to the nature of these projects, they are considered under federal jurisdiction for all matters concerning environmental impacts.

2.2 Electric Sector in Mexico

In accordance with CFE planning and programming specifications and in compliance with requirements established in the Public Service Law for Electric Energy, CFE has developed an Independent Production of Energy (IPE) program to facilitate development of power generation in Mexico.

An IPE can be any company, established in accordance with Mexican laws and with an address in Mexico that generates power under the obligation to sell it to CFE, through long-term agreements. The agreements, wherein CFE is under obligation to purchase the energy generated by the Producer under the economic terms and conditions that may be convenient, are established according to Article 36-BIS of the Public Service Law for Electric Energy, and in compliance with requirements established in applicable legislation.

As part of the Electric Sector Investment and Working Program, CFE requested a bid for two thermal power plant projects under the IPE framework. These projects are to be connected to the National Electricity System.

2.3 Federal Mexican Policies

During the last months a debate has been presented concerning legal reforms that would allow direct private investment into the Mexican electric energy sector. However, the CLR and CVH projects are being developed under CFE's IPE program.

The Natural Resources and Environmental Secretariat has recently been restructured to improve efficiency and streamline the permitting process. At the same time, greater incentives are being offered to the industrial sector to encourage compliance with environmental laws and regulations.

The General Law for Ecological Equilibrium and Environmental Protection has allowed State and Municipal authorities to develop of stricter laws and standards without taking away from the federal government its place as the highest authority in the area of environmental issues.

2.4 International Policies

2.4.1 North American Free Trade Agreement

As a result of the integration of Mexico into international treaties, especially the North American Free Trade Agreement, the Official Mexican Standards (NOM) are more similar to the United States (U.S.) standards and a greater degree of compliance is expected.

2.4.2 Commission for Environmental Cooperation

The Commission for Environmental Cooperation (CEC) of the North-American Free-Trade Agreement (NAFTA) is an international organization created by Mexico, Canada and the U.S. under the North American Agreement for Environmental Cooperation (NAAEC). The CEC was created to mediate regional environmental problems, to assist in the prevention of potential environmental and commercial conflicts, and to promote efficient compliance with environmental laws. This treaty complements the environmental aspects of the NAFTA.

The CEC has created a conservation program for North America. One of the objectives of this program is to encourage communities, non-governmental organizations, and individuals to participate in the conservation of protected areas within North America, such as parks and reserves. Apart from the Conservation Program, the CEC performs investigations and responds to complaints of international interest.

The CEC has a public participation mechanism that has improved efficiency in the application of environmental laws in Mexico, Canada and the U.S. At the time the three countries signed the Treaty they also subscribed to a parallel environmental agreement: The North America Agreement for Environmental Cooperation (NAAEC). One of the main objectives of the NAAEC is the endorsement of an efficient implementation of internal environmental legislation. As a result, articles 14 and 15 of the NAAEC establish the means by which an individual living in any of the three countries of North America can participate in the environmental review process.

It is not expected that the CEC will be directly related to the thermal power plant projects. Nevertheless, it is important to keep in mind its existence as a promoter of social participation.

2.4.3 Border XXI Program

The U.S. – Mexico Border XXI Program represents a bi-national effort that combines the different federal entities responsible for environmental issues in the U.S. - Mexico border. The objective of the Program is to facilitate a united effort toward sustainable development through the protection of human health, environment, and proper management of natural resource protection in both countries.

In order to improve and maintain environmental conditions at the border regions, in 1993 both governments signed the Agreement for the Protection and Improvement of the Environment in the Border Area (La Paz Agreement), which provided a formal foundation for cooperative environmental efforts. The Agreement defined the border zone as the stretch of land that extends over 100 km north and 100 km south of the U.S.- Mexico border.

The main strategy of the Border XXI Program has three objectives in advancing the goal of sustainable development:

- Ensure public involvement in the development and implementation of the Border XXI Program
- Build capacity and decentralize environmental management in order to augment the participation of state and local institutions in implementing the Border XXI Program
- Ensure interagency cooperation to maximize available resources and avoid duplicative efforts on the part of government and other organizations, and reduce the burden that coordination with multiple entities places on border communities

Border XXI is implemented through nine binational Workgroups that integrate the efforts of other participating entities and define specific projects to achieve the Program's objectives. The Workgroups are committed to encouraging active state participation in their endeavors and exploring additional mechanisms to promote border community participation and integrated regional planning.

The six Work Groups that were initiated by the La Paz Agreement are:

(1) Water;
(2) Air;
(3) Solid and Hazardous Waste;
(4) Pollution Prevention;
(5) Contingency Planning and Emergency Response; and
(6) Cooperative Enforcement and Compliance.

Border XXI integrated three new Work Groups in response to the need to view the environment with an integrated approach. These groups are:

(1) Environmental Information Resources;
(2) Natural Resources; and
(3) Environmental Health.

Each year, the nine Work Groups will develop an Annual Implementation Plans that will identify federal resource financing based on available budgets, and will describe specific projects that are part of the medium-term objectives contained in this document. The development of these Annual Implementation Plans will ensure correlation between short-term actual budgeting and medium-term planning efforts required to reach the objectives of Border XXI. The program recognizes the fact that project implementation will depend on the availability of financial resources.

In order to follow-up the degree of compliance of Border XXI objectives through the Annual Implementation Plans, both governments have agreed to generate Bi-annual Progress Reports, which will provide a more comprehensive evaluation of its achievements.

The United States Environmental Protection Agency (USEPA), the SEMARNAT, and other federal, state, and U.S. tribal agencies are currently developing a new binational border program called "Border 2012: U.S.-Mexico Environmental Program".

A proposed organizational structure and set of environmental and human health priorities for a regionally focused border program are being discussed. The program would create a small number of regional workgroups and an overall coordinating mechanism for the entire border.

In each regional workgroup, local, state, tribal, and federal governmental officials will join with community members, businesses, environmental organizations, academic experts, and other stakeholders to develop a plan for solving the most significant environmental and environmental health problems in that region. U.S. and Mexican federal agencies, in addition to participating in the regional workgroups, will lead efforts to address those problems that are more effectively approached from a border-wide perspective.

The draft border plan is expected to be provided to border communities and other stakeholders for review during the summer of 2002. Community participation will make this a program that meets the needs of border communities. After the border plan is revised to reflect stakeholder input, it is expected to be finalized and distributed near the end of 2002.

In accordance with the principals of cross-border cooperation on environmental matters, this report discusses impacts both in Mexico and in the U.S.

2.5 Mexican Legal Framework

Following is a general description of Mexican legislation applicable to the construction and operation of the thermal power plant projects.

2.5.1 The Political Constitution of the Mexican United States

The Political Constitution of the Mexican United States (CPEUM) is the Supreme Law of the Country. From the time the current constitution entered into effect in 1917, environmental issues were a part of the legal framework. The third paragraph of Article 27 expressly issues the Nation the power to: impose public interest modalities on private property, regulate social benefit, exploit of natural elements that are susceptible to appropriation, care for their conservation, obtain the balanced development of the nation, and improve living conditions of the human population.

Article 73, Section XXIX-G imparts power upon the federal Congress to issue laws that establish the checks and balances that must exist between the federal government and the states and municipalities in environmental matters for the protection, preservation and restoration of ecological equilibrium.

In exercising those powers, in 1988 Congress issued the General Law for Ecologic Equilibrium and Environmental Protection, which defines the relationship between the three levels of government concerning environmental matters, in order to prevent the destruction of natural resources.

2.5.2 Organization Law of the Federal Public Administration

The Organization Law of the Federal Public Administration (LOAPF) establishes the basis for organization of the centralized and para-state federal public administration. The de-centralized organizations state participating companies, national credit institutions, national credit auxiliary organizations, national insurance and finance institutions, and trust funds form the public para-state administration. The organization and authority of the State Secretariats are defined in the LOAPF. This law provides the identification of the applicable authorities when applying for the different permits, licenses and concessions.

2.5.3 General Law for Ecologic Equilibrium and Environmental Protection

The General Law for Ecologic Equilibrium and Environmental Protection (LGEEPA), published in the Official Newspaper of the Federation on January 28, 1988, and the appeals and repeals of the Law published in the Official Newspaper of the Federation on December 13, 1996 and December 31, 2001, establishes that the dispositions of the CPEUM are enforced for the preservation and restoration of the ecologic equilibrium, as well as the environment, in the territory and zones over which the Nation is sovereign.

The different chapters of the Fourth Title of the LGEEPA, in reference to environmental protection, govern over the following environmental issues:

I. Prevention and control of atmospheric contamination
II. Prevention and control of water and aquatic ecosystem contamination
III. Prevention and control of soil contamination
IV. Activities identified as highly hazardous

V. Hazardous materials and wastes
VI. Nuclear energy
VII. Noise, vibrations, thermal and light energy, odors, and visual contamination

The LGEEPA is the framework for different laws that regulate specific issues, among these are: National Water Law, Fishing Law, Forestry Law, General Law for Urban Development, Federal Law for Fishing, and the Law for Ecologic Equilibrium and Environmental protection in the State of Tamaulipas.

The LGEEPA includes the following Regulations: Regulation for Environmental Impact; Regulation for the Prevention and Control of Atmospheric Contamination; Regulation for Hazardous Wastes; Regulation for the Prevention and Control of Ocean Contamination through the Discharge of Wastes and other materials; the Regulation for Environmental Protection from Noise Emissions. The LGEEPA also includes the corresponding Mexican Official Standards and Mexican Technical Standards.

2.5.4 National Water Law

The National Water Law, published in the Official Newspaper of the Federation on December 1, 1992, regulates the exploitation, use and consumption of national water. It establishes the methods of distribution and control, as well as quality preservation in order to obtain an integral sustained development.

2.5.5 Federal Law for Water Rights

The Federal Law for Water Rights, establishes the fees for the use and consumption of goods of public domain, and for the services rendered by the State. The Law was published on December 31, 1981, and came into effect the 1 of January, 1982.

This law is updated each year through the different tributary debates of Congress. Also, the fees established by the law are calculated every six months based on expected inflation levels.

2.5.6 Federal Labor Law

Article 123, Item A of the CPEUM, published in the Official Newspaper of the Federation on April 1, 1970 establishes the domain of the Federal Labor Law, which includes all individual and collective work contracts. Federal Labor Law dispositions cannot be revoked.

2.5.7 General Health Law

The General Health Law regulates the right to protect the health of every human being, as established in the 4th Constitutional Article. It establishes the basis and modalities for access to health services and the participation of the Federation and federal entities in issues concerning human health.

2.5.8 The Public Service Law for Electric Energy

The Public Service Law for Electric Energy was reformed in December 1992 in order to enhance private sector participation in electric energy generation activities that are not public service. Later, in December 22, 1993, several reforms to this Law were published in order to refine some articles. Article 3 of this Law establishes that the following situations are not considered public service:

I. The generation of electric energy for personal use, cogeneration, or in small production.
II. The generation of electric energy performed by independent producers for CFE use.
III. The generation of electric energy for exporting, obtained through cogeneration, independent production, or in small production.
IV. Importing of electric energy by individuals, destined exclusively for personal purposes.
V. Electric energy for emergency situations caused by power failures in the public service sector.

Based on the Public Service Law for Electric Energy specifications, the following definitions are applicable:

- *Personal use* is the production of electric energy to satisfy personal needs by individuals or by groups of co-owners or partners.

- *Cogeneration is: 1)* the generation of electric energy produced in conjunction with steam or any other secondary thermal energy, or both; *2)* the consumption of thermal energy not used in the direct or indirect electric energy production processes, or *3)* the use of fuels produced in the direct or indirect electric energy production processes, as long as the electricity obtained is used only to satisfy the needs of facilities associated with cogeneration and the energy and economic efficiency is improved throughout the entire process.

- *Small production* is the generation of electric energy that is destined: 1) to be sold to the distributor, in which case the projects may not have a capacity greater than 30 MW; 2) for the use by small rural communities, or isolated areas, in which case the projects may not exceed 1 MW and, 3) for exportation, within a maximum limit of 30 MW.

- *Independent production* is the generation of electric energy originating in a plant with a capacity or more than 30 MW and whose energy will be destined exclusively to be sold to the distributor or for exporting.

2.5.9 Law for the Energy Regulatory Commission

To strengthen the legal framework for electric energy, natural gas, and liquid propane (LP) Gas, on October 31, 1995, the Law for the Energy Regulatory Commission (LCRE) was published. This Law was used to grant technical and operative autonomy to the Energy Regulatory Commission (CRE) in order to promote an efficient development of the following activities, among others:

- Distribution and sale of electric energy to public service consumers.
- Generating, exporting, and importing of electric energy generated by private parties.
- Purchasing electric energy for public service use.
- Transmission, transformation, and delivery services of electric energy between distributors, and between these and the permit holders, for the generation, exporting and importing of electric energy.

The mission of the CRE is control the delivery of public utilities such as electric energy, natural gas, and if applicable, LP gas, encouraging healthy competition, and protecting the interests of the consumers as well as all those participating in the electric power sector. The CRE has also been established to verify dependability and stability in service delivery.

2.5.10 Law for Urban Development in the State of Tamaulipas

The Law for Urban Development in the State of Tamaulipas was established to organize, regulate and control urban and rural human settlements within the territory of the Entity, as well as to develop basic standards for settling, preserving, improving, and growth planning of populated centers, and to define the norms to which the State will adhere as it determines the corresponding provisions, uses, reserves, and purposes of areas and properties, and others granted by this Ordination, such as:

- Determine the bases for the concurrency and coordination between the State and municipalities for territorial ordinances and regulations for human settlements within the territory of the State;
- Establish the attributes and responsibilities of the State and Municipalities during law compliance;
- Establish bases and standards for public consultations through public participation in the planning process and the development of activities for territorial reorganization.

2.5.11 Law for Ecologic Equilibrium and Environmental Protection in the State of Tamaulipas

The Law for Ecologic Equilibrium and Environmental Protection for the State of Tamaulipas was published in 1992 in order to regulate preservation and restoration activities for ecological equilibrium and environmental protection in the State of Tamaulipas and the Municipalities therein, as well as the distribution of the corresponding environmental government agencies.

2.6 Environmental Authorities

This section describes the government agencies to which the CLR and CVH must apply in order to obtain the environmental permits, authorizations, licenses, and concessions and/or compliance throughout the development of the projects.

2.6.1 Environmental and Natural Resources Secretariat

On December 24, 1994, the Environmental, Natural Resources and Fishing Secretariat (SEMARNAP), was created in order to administrate natural resources and protect the environment in accordance with Article 32 of the LOAPF. This Secretariat has been granted the power to develop a strategy for sustained development in the country. SEMARNAP is assigned to oversee compliance of environmental regulations in the electric energy sector; and it is has been granted specific jurisdiction over environmental restoration, an important aspect for energy projects.

Initially, SEMARNAP was integrated by three Sub-secretariats: Planning, Natural Resources, and Fishing. It is composed of one General office, 2 Coordinating Units, 16 General managements, and 5 Decentralized Administrative Agencies.

New Organizational Structure of SEMARNAT

Since December 1, 2000, the Environmental, Natural Resources and Fishing Secretariat (SEMARNAP) became SEMARNAT when it was no longer responsible for Fishing.

As a result of the new environmental vision of the federal government, SEMARNAP changed its name at the beginning of the present administration to the Environmental and Natural Resources Secretariat (SEMARNAT). The changes implemented go beyond the releasing of responsibilities of Fishing to the Agricultural, Cattle Raising, Rural Development, Fishing and Food Secretariat.

On June 4, 2001, the new organizational structure of SEMARNAT was published in the Official Federal Newspaper issued by the Internal regulation of the Secretariat.

The three sub-secretariats that have been formed are: Environmental Planning and Policies, Environmental Standards and Promotion and Administration of Environmental Protection.

The new structure of SEMARNAT has been distributed as follows:

I Secretariat Environmental Planning and Policies

1 Planning and Assessment Department
2 General Department for Environmental Policies, and Regional and Sector Integration

II Secretariat for Environmental Standards and Promotion

1 General Department for Primary Sector and Renewable Resources
2 General Department For Industry
3 General Department for Environmental Promotion of Urban, Transportation, Services, and Tourism Development
4 General Department for Energy and Extractive Activities

III Sub-secretariat for the Administration of Environmental Protection

1 General Department for Environmental Impact and Risk
2 General Department for Integral Handling of Contaminants
3 General Department for Federal Ocean & Land Zones, and Coastal Environments
4 General Department for Wildlife
5 General Department for Federalizing and Decentralizing Forestry and Soil Services

IV Main Office

1 Human Resources General Office
2 General Department for Programming, Organization, and Budgeting
3 General Department for Material Resources, Real Estate, and Services
4 General Department for Information and Telecommunications

V General Judicial Coordination
VI Public Consultation and Disclosure Unit
VII International Issue Coordinating Unit
VIII Social Communication Coordinating Unit
IX Training Center for Sustained Development
X Federal Delegations Coordinating Unit

Decentralized Agencies

I National Water Commission (CNA)
II Mexican Institute for Water Technology (IMTA)
III National Institute for Ecology (INE)
IV Federal Attorney's Office for Environmental Protection (PROFEPA)
V National Commission for Protected Natural Areas (CONANP)
VI National Forestry Commission (CONAFOR)

Among these agencies, the INE is dedicated to investigation and other scientific activities. The INE will continue working very closely with the National Commission for Bio-diversity Knowledge and Use, and will work with the National Forestry Commission that was recently created.

2.6.2 General Department for Environmental Impact and Risk

The General Department for Environmental Impact and Risks that is part of the Sub-department for the Administration of Environmental Protection of SEMARNAT is responsible for the implementation of general policies concerning environmental impact and risk. It is also responsible for the assessment and resolution of environmental impact manifests (MIA), and for issuing authorizations. General Department for Environmental Impact and Risks supervises the process of public consultation concerning the projects that have been submitted to the assessment procedures for environmental impacts.

2.6.3 General Department for Integral Handling of Contaminants

The General Department for Integral Handling of Contaminants applies the administration of general policies concerning air quality, as well as hazardous wastes and activities that are considered highly hazardous.

2.6.4 National Water Commission

The National Water Commission (CNA) is the decentralized agency of SEMARNAT that is responsible for establishing consumer fees and issuing permits related to water use and wastewater discharges. The CNA manages, controls, and regulates water use rights for surface and underground sources, ad ensures the preservation of national water quality. The CNA is also responsible for the construction, maintenance, repairs, operation, and preservation of hydraulic structures that are property of the federal government.

Among the responsibilities of the CNA are also: issuing of permits for waste discharges, establishing permit conditions and verifying compliance with discharge quality standards. The rates charged are based on consumption volumes and quality of wastewater discharges. State agencies are responsible for collecting payments for water use rights and for wastewater discharges.

2.6.5 Federal Attorney's Office for Environmental Protection

The Federal Attorney's Office for Environmental Protection (PROFEPA) is the decentralized agency of the SEMARNAT that is responsible for the enforcement of public policies and regulations related to contamination prevention and control of the environmental, natural resources, flora, fauna, coastal, and protected natural areas that are under federal jurisdiction. PROFEPA also performs inspections in response to public accusations, presides over administrative appeals, and provides follow-up related to compliance with the conditions established in the environmental impact and risk authorization.

2.7 Local Authorities

The RBIII and RBIV power plants will be located in the Colonia Agricola Anahuac in the Municipality of Valle Hermoso, in the State of Tamaulipas. The organization of the local authorities is as follows:

The Municipality is the local entity in charge of the regulations regarding land delimitations, land use authorizations, construction permits, and is in charge of providing the services to the community, such as public safety, drinking water supply, sewage, collection and disposal of non-hazardous solid wastes, and street paving. It is governed by a "Municipal President" (Mayor), which is elected by the inhabitants and is the main authority within the municipality. The Municipal President has a Municipal Representative (Delegado Municipal) in the Colonia Agricola Anahuac, which is the representative of the municipal authority in this place and reports to the Mayor.

In addition, the inhabitants of the Colonia Agricola Anahuac appoint their own representative (*Presidente de la Representación Social de la Colonia Agricola Anáhuac*), which is in charge of carrying out the population requirements to the Municipal authorities and other state and federal authorities. This representative is elected by the Colonia Agricola Anahuac inhabitants only and does not have governmental authority.

2.8 Permits and Authorizations

Table 2.1 includes a detailed list of federal, local and municipal environmental permits required for the RBIII and RBIV projects, the agencies responsible for issuing each permit, and the current status of the transaction for RBIII. At the moment, the preparations of the permit and/or authorization applications for RBIV have been initiated.

Table 2.1 Authorizations and Permits Required at Federal, State and Municipal Levels

PERMITS / AUTHORIZATION	AGENCY RESPONSIBLE / JURISDICTION	RBIII STATUS
PRE – CONSTRUCTION		
1. Land Use License	Department of Public/Municipal Works	Obtained in February 2002
2. Authorization For Environmental Impact and Risk	SEMARNAT / Federal	Obtained in October 2001
3. Construction License	Public/Municipal Works	Obtained in February 2002
4. Permit for Independent Production of Electric Energy	CRE / Federal	Obtained in August 2001
DURING CONSTRUCTION		
5. Notification of Registration as Company Generating Hazardous Wastes– Construction	Tamaulipas / Federal SEMARNAT Delegation	Application pending
6. Hazardous Waste Delivery, Transportation, Final Disposal Manifest - Construction	Tamaulipas / Federal SEMARNAT Delegation	Application pending
7. By-annual Report of Hazardous Wastes sent for Recycling, Treatment, Incineration, or Confinement– Construction	Tamaulipas / Federal SEMARNAT Delegation	Application pending
8. Integration of Safety and Hygiene Commission during Construction	Tamaulipas / Federal STPS Delegation	Application pending
9. Job Accident Report	Tamaulipas / Federal STPS Delegation	Application pending
PRE – OPERATION		
10. Sole Environmental License (LAU)	Tamaulipas / Federal SEMARNAT Delegation	Application pending
11. Notification of Registration as Company Generating Hazardous Wastes– Operation	Tamaulipas / Federal SEMARNAT Delegation	Application pending
12. Concession Title and Registration for Water Use and Consumption	Tamaulipas (Reynosa)/Federal CNA Water Administration	Application pending
13. Drinking water Certificate	Tamaulipas (Reynosa)/Federal CNA Water Administration	Application pending
14. Authorization for the Operation of Pressure Containers and steam generators or Boilers that Operate in Job Centers	Tamaulipas / Federal STPS Delegation	Application pending
15. Accident Prevention Program (PPA)	Tamaulipas / Federal SEMARNAT Delegation	Application pending
DURING OPERATION		
16. Annual Operating License COA	Tamaulipas / Federal SEMARNAT Delegation	Report only, does not require authorization
17. Hazardous Waste Delivery, Transportation, Final Disposal Manifest - Operation	Tamaulipas / Federal SEMARNAT Delegation	Manifest will be submitted when hazardous waste is disposed of.
18. By-annual Report of Hazardous Wastes sent for Recycling, Treatment, Incineration, or Confinement–Operation	Tamaulipas / Federal SEMARNAT Delegation	Report will be submitted when hazardous waste is disposed of.
19. Integration of the Safety and Hygiene Commission during Operation	Tamaulipas / Federal STPS Delegation	Application pending
20. Job Accident Report	Tamaulipas / Federal STPS Delegation	Only presented in case an accident occurs.

2.9 Compliance with World Bank Social and Environmental Guidelines

The construction and operation of the thermal power plants will be conducted in compliance with the environmental and socioeconomic guidelines of the IFC, since these are stricter that the standards issued in Mexico. The following subsections provide a summary of the World Bank and Mexican environmental and socioeconomic requirements applicable to the proposed projects.

2.9.1 Air Quality

The air quality standards for thermal power plants are specified in the Pollution Prevention and Abatement Handbook published by the World Bank, and the Official Mexican Standard NOM-085-ECOL-1994. The air quality standards will be implemented through engineering design and/or pollution control equipment. The following paragraphs present the Mexican and World Bank / IFC requirements for air emissions from a new fixed source and for stack heights and ambient air quality.

The Mexican standard NOM-085-ECOL-1994 defines the critical regions for air quality in the Country. The proposed power plants will not be located within the regions listed as critical as such the area is considered to have relatively good air quality.

World Bank / IFC requirements, in accordance with specifications found in the Pollution Prevention and Abatement Handbook developed for thermal power plants with a minimum capacity of 50 megawatts (MW) using coke, oil, or natural gas as fuel, are applicable to the projects. As required by CFE, NOM-085-ECOL-1994 will be applicable to the proposed projects considering thermal power plants with capacities greater than 110,000 MJ/hour at sites located within Mexico City Metropolitan Area and/or and critical zones. An analysis of the applicable regulations revealed that CFE requires stricter compliance than those set in the World Bank / IFC air emission standards and those imposed by the Mexican Official Standard for non-critical zones. The proposed power plants will operate in compliance with the strictest standard, which is considering that the power plant projects were located within Mexico City Metropolitan Area or a critical zone.

Currently there are no Mexican regulations requiring emission offsets. World Bank requirements depend on the air quality of the region where the project will be developed and the characteristics of the fixed emission source. Power generation plants that use natural gas are except from offset requirements as long as the back-up fuel contains less than 0.3% sulfur and the levels of emission are lower than 400 mg/m^3 for sulfur oxides and nitrogen oxide. It will therefore not be necessary to provide offsets for the RBIII and RBIV power plants. The following Table presents the Mexican and World Bank standards.

Table 2.2 Emission Standard Comparison

	Contaminants	Mexican Standards (1)	World Bank Standards (1)
Base Fuel	NOx	40 ppm (2)	61 ppm
	SO_2	N. A.	N.A. (3)
	PM	N.A.	50 mg/Nm3

(1) Based on conditions of World Bank Guidelines: dry, 15% 0_2, 0°C, 1 atm
(2) Applicable to the projects based on CFE requirements.
(3) Total SO_2 must be less than 0.2 metric tons per day (mt/d) for the first 500 MW, and an additional 0.1 metric tons per day for each additional MW. Therefore, 495 MW and a 500 MW plants must not exceed 99 metric tons per day each.

The Mexican laws currently do not regulate stack heights for fixed sources. The stacks for the proposed projects have been designed in accordance with World Bank specifications, which state that power plants may not use stacks with heights that are lower than the levels specified by Good Engineering Practice (GEP), unless the air quality impact analysis included the effects caused by building downwash. GEP stack height recommendations are included in the U.S. Code of Federal Regulations (CFR) Title 40, Part 51.100. GEP is defined as the greater of:

1. Sixty five (65) meters, measured from the ground level of the base of the stack;

2. GEP = H +1.5 L, where H is the height of nearby structures and L is the lower height or width dimension projected for nearby structures, or

3. The height demonstrated through wind flow modeling charts or field studies approved by the World Bank or local authorities, which guarantee that stack emissions will not result in excessive concentrations of any contaminant due to atmospheric dispersion, or any effects generated by the wake or turbulence created by the plant site, neighboring structures, or adjacent properties.

The proposed stack height for the thermal power plants is 35 m that consider building downwash effects, and is therefore in compliance with World Bank Guidelines.

Mexican Ambient Air Quality Regulations (RLGEEPAPCCA) specify that ambient air quality must be monitored throughout the property perimeter whenever the source is located in urban or suburban areas. These regulations are specified in the Official Mexican Standard for Environmental Air Quality NOM-022-SSA1-1993 for SO_2, NOM-023-SSA1-1993 for NO_2 and NOM-025-SSA1-993 for PM_{10}.

World Bank and IFC Guidelines require the installation of automatic air quality monitoring systems for measuring ambient levels of PM_{10}, SO_x (gas fed plants are not required to measure PM_{10} or SO_x levels), and NO_x where the maximum environmental concentrations are expected and/or where sensitive receptors such as protected areas and populated centers may be located. The quantity of air quality monitoring stations will be greater if the area where the plant is located has poor dispersion conditions, or other meteorological conditions, affecting the neighboring communities or sensitive ecosystem. The thermal power plant will be in compliance with the requirements specified in RLGEEPAPCCA and the World Bank / IFC Guidelines, as presented in the following Table 2.3.

Table 2.3 Ambient Air Quality Standard Comparison

Contaminant (average period)	Mexican Standards	World Bank Guidelines (1)
NOx (1 hour)	395 µg/m^3 (0.21 ppm)	
(24 hours)		150 µg/m^3
annual (per hour)		100 µg/m^3

(1) World Bank Guidelines are provided only for comparative purposes and will be used only when the guidelines are more strict that the guidelines or standards issued by the host-country.
(2) Natural gas (Base fuel)

2.9.2 Water Quality

The water quality discharge standards applicable to the thermal power plants, including the general water quality parameters and metal contents, are specified in the Pollution Prevention and Abatement Handbook and in the Mexican Standard NOM-001-ECOL-1996. The standards for water quality specified in the World Bank/IFC Guidelines are applicable in wastewater processing, domestic drainage, and contaminated storm water discharged into surface water bodies. The Mexican standards are specified according to water quality received (or according to surface soils) and potential receptor. The projects will be developed in accordance with the strictest applicable requirements.

Table 2.4 presents the Official Mexican Standard and World Bank Guidelines maximum concentration limits.

Table 2.4 Water Quality Standard Comparison

Outflow parameters	Mexican Standards (1)	World Bank Guidelines (maximum value)
PH	N. E.	6 – 9
Total suspended solids	N. A. (2)	50 mg/l
Oils and grease	15 mg/l (3) 25 mg/l (4)	10 mg/l
Total waste chlorine	N. E.	0.2 mg/l
Chrome (total)	1 mg/l (3) 1.5 mg/l (4)	0.5 mg/l
Copper	4 mg/l (3) 6 mg/l (4)	0.5 mg/l
Iron	N. E.	1.0 mg/l
Zinc	10 mg/l (3) 20 mg/l (4)	1.0 mg/l
Increase in temperature at the mixing zone border	N.E.	Maximum 3° C

(1) N. E. means «non existent» in the Mexican Official Standard; Mexican standards included in the table apply to surface water and soil discharges from agricultural sources.
(2) N. A. means «not applicable» to the RBIII and IV Power Plants, due to Zero Discharge design.
(3) Monthly average from the maximum value.
(4) Daily average of the maximum value.

2.9.3 Hazardous and Solid Waste

The solid and hazardous wastes will be handled, stored, transported and discharged in accordance with Mexican regulations and World Bank/IFC Guidelines. World Bank/IFC requirements for solid wastes generated during plant operations are specified in Pollution Prevention and Abatement Handbook. These requirements specify that solid wastes that do not release toxic substances or other contaminants of concern into the environment may be disposed into landfills or other storage sites, as long as surrounding water bodies are not impacted. In areas where toxic substances or other contaminants are expected to be released, the wastes must be treated (i.e., stabilizing).

In accordance with Mexican Law, the collection, treatment, and final disposal of solid wastes is regulated in accordance with Municipal Regulations for Street Cleaning and Environmental Protection in Tamaulipas. Domestic, commercial, and industrial wastes (with the exception of hazardous wastes) may be discharged into municipal landfills, if authorized by the Municipal Public Works and Ecology Office. This authorization will be based on the CRETIB (Corrosivity, Reactivity, Explosivity, Toxicity, Flammability and Risk of Biological Infection) waste analysis, in accordance with the NOM-052-ECOL-1993. The solid wastes identified as hazardous will be handled and discharged in accordance with the requirements specified in the Hazardous Waste Regulations for Mexico (RLGEEPARP).

The use of ozone depleting substances will be in compliance with the Montreal Protocol.

2.9.4 Noise

The activities performed during the construction and operation of the power plants will be in compliance with the maximum permissible noise limits for the ambient and work areas, as established by Mexican standards, World Bank Guidelines and general requirements for safety and hygiene in work places (which include training, and preservation of records and reports). The noise generation limit specified in the World Bank/IFC Pollution Prevention and Abatement Handbook and the general requirements for work-place safety and hygiene are specified in the General Guidelines for Safety and Hygiene of the IFC.

The Mexican standards and World Bank Guidelines are presented in Table 2.5. The total project impact in regards to noise levels was calculated using logarithm functions (the increase in noise levels to 3dB is equivalent to twice the initial noise level).

Table 2.5 Standard Comparisons for LEQ Environmental Noise Levels (dBA)

Receptor	Mexican Standards (1)		World Bank Guidelines (2)	
	Day (06h-22h)	Night (22h-06h)	Day (07h-22h)	Night (22h-07h)
Property limits	68 db(A)	65 dB(A)		
Residential			55 dB(A) or current level +3dBA	45 dB(A) or current level+ 3dBA
Industrial			70 dB(A) or current level +3dBA	70 dB(A) or current level+ 3dBA

(1) Measured at property line
(2) Measured at noise receptors location

The Official Mexican Standards NOM-080-ECOL-1994, NOM-081-ECOL-1994, Environmental Protection Mexican Regulations concerning noise, and the Federal Labor Law include health and safety and noise specifications. In many cases, Mexican standards governing noise at the work site are stricter than the guidelines issued by the World Bank and the IFC, in such cases, the Mexican standards will be followed.

2.9.5 Social Aspects

The development of these projects will be performed in accordance with World Bank Group / IFC social policies (OD 4.30 - on Involuntary Resettlement, OPN 11.03 - Cultural property, OD 4.20 - Indigenous people, and the IFC Policy Statement on Harmful Child and Forced Labor). Based on URS's review of relevant Environmental Impact Assessment reports prepared for the associated gas pipeline, land acquisition for the right-of-way is being negotiated on a willing seller / willing buyer basis. Alignment of the pipeline right-of-way is sufficiently flexible to avoid houses and structures or instances where landowners refuse to negotiate. There are no cultural or historic sites affected by the projects. Likewise, no indigenous communities are located in the project area.

3.0 PROJECT DESCRIPTION

This chapter provides a description of the process and technical characteristics of the RBIII and RBIV power plant projects, including the facilities, location, construction methods and waste handling procedures.

3.1 Project Objectives

CLR and CVH, subsidiaries of EDF, propose to build and operate two separate power plants within the municipality of Valle Hermoso, Tamaulipas. The power generated will be sold to CFE for its distribution throughout the country through the existing CFE network for a period of 25 years.

These power plants are a part of a project that includes the construction of six thermal power plants in the area, five of which could be located in adjacent locations. Currently one of the five plants, RBII, has already been built. The construction for RBII began at the end of 1999 and the plant is currently in operations phase. RBIII is currently under construction. The construction phase for RBIV will be initiated during the second quarter of 2003. The bidding process for Rio Bravo V and VI has not yet started and therefore these plans are not confirmed.

CLR and CVH will design, construct, test, operate, maintain, and perform ownership activities of the power plants.

The RBIII and RBIV projects will generate power using combined-cycle natural gas turbines with a guaranteed capacity of 495 MW for RBIII and 500 MW for RBIV. Both plants, with very similar processes, will have a 2+2+1 combined cycle configuration that includes two gas turbines, two heat-recovery boilers (heat recovery steam generators) and one steam turbine.

3.2 Projects Location

The power plants will be located on adjacent properties as specified in the CFE bid documents. The property sites are located in Colonia Industrial Anahuac, in the Municipality of Valle Hermoso, the State of Tamaulipas, at the 3.2 km of the Anahuac – Matamoros Highway. The power plants are located 25 km southwest from the city of Matamoros, and 18 km northeast from the town of Valle Hermoso (see Figures 3.1 and 3.2).

Geographic coordinates for the proposed site for RBIII are:

North Latitude	West Longitude
25º47’52’’	97º46’48’’
25º47’53’’	97º47’08’’
25º47’47’’	97º47’08’’
25º47’47’’	97º46’48’’

Geographic coordinates for the proposed site for RBIV are:

North Latitude	West Longitude
25º47'46''	97º47'09''
25º47'47''	97º46'48''
25º47'40''	97º47'09''
25º47'40''	97º46'48''

The properties are at an approximate altitude of 22 m above sea level. (See Figure 3.3)

Adjacent properties to the RBIII site are as follows:

North: RBII and the CFE substation (Photographs 1, 2 and 3);

South: Cultivated land owned by CFE, future site of RBIV (Photographs 4 and 5);

East: Dirt road; on the other side of the road are cultivated lots. (Photograph 7 and 8);

West: CNA right-of-way; across from the right-of-way is a 10 meter-wide irrigation ditch.

The land adjacent to the RBIV to the east and west are the same as RBIII. To the south is cultivated land owned by CFE, in which the other power plants are planned by CFE (Rio Bravo V and VI).

No human settlement activities such as housing or any type of commercial buildings are located in the project area or surrounding properties. At approximately 1 km west from the sites a few dispersed houses within cultivated land and irrigation ditches can be observed.

3.2.1 Surface Required

The site where the RBIII and RBIV projects will be located have a surface area of 11.2 hectares (112,000 m^2) and 11.9 hectares (119,966 m^2), respectively, with approximate dimensions of 600 x 200 m (Figure 3.4). Additionally, the evaporation lagoons for both projects will require a surface of 20 hectares in total at a site located approximately 500 m to the northwest of the RBIII site.

3.2.2 Current Land Use

Land use for both sites is industrial. In the past, the area was used for agricultural activities, but this use has been discontinued since 2001 when the land was acquired by CFE.

3.2.3 Site Ownership

CFE, for its IPE bidding process selects the site and purchases the land if the winning bidder plans to use the offered site and transfers the ownership to the winning bidder. In the case of EDFI, CFE transferred the ownership of the selected site to CLR on October 31, 2001 and is in process of transferring ownership to CVH. CFE, internal process requires the site to be selected based on pre-established criteria and ensures that there are no significant environmental impacts associated with the site prior to initiating the bidding process. This allows the bidders to be on equal footing as far as the sites are concerned and thus the bids are truly competitive on the same basis.

3.3 Necessary Infrastructure and Services

3.3.1 Substations

The power generated from the combustion and steam turbine generators will flow to an output substation located near each power plant. CFE is responsible for the construction and operation of each substation and of complying with the applicable Mexican standards and regulations. The power from each substation will go to a CFE distributing substation located next to RBII for its distribution through the existing CFE network.

3.3.2 Transmission Lines

These in-plant substations are connected to CFE's main substation located next to RBII which is part of CFE's national power grid (See Figure 3.5). This will carry the power away from the plant. According to CFE's current plans, there is sufficient capacity to provide transmission of the additional 1000 MW of power. There is a possibility that CFE may install another small transmission line connection so that the grid has the capability to carry the power towards the U.S. - Mexico border. The construction of new transmission lines by EDFI, for each power plant, will not be necessary since it was not required by CFE in the bidding specifications. The MIA prepared by CFE for each power plant, state that new transmission lines will not be constructed since the transmission line constructed for RBII power plant was designed considering the future expansion of RBIII and RBIV. If and when new transmission lines are required in the future, it will be CFE's responsibility, according to the current provisions in the Mexican Constitution and the laws, to build and operate the transmission lines in accordance with Mexican standards and regulations.

3.3.3 Energy and Fuel

During the construction and servicing phases of the projects, approximately 5 MW with 13.8 kV voltage will be supplied by CFE for each power plant. During operations, each plant will consume 4 to 6% of the total production through a 4.16 kV auxiliary transformer.

Both plants will operate solely on natural gas. The estimated daily consumptions for the RBIII and RBIV plants will be in average 90,000 MM BTU (approximately 2,400,000 m^3/day) at full load. Gasoducto del Rio, S.A. de C.V., a wholly owned Mexican subsidiary of EDFI, which will construct and operate the pipeline and will be the responsible for supplying the volume of required natural gas at the pressure specified under the contract with the plants.

A utility room for the protection of the meters and instrumentation will be installed by Gasoducto del Rio (GDR) next to RBII. The 15 m x 20 m gas supply station (at the delivery point) will be located in the original utility room site without occupying any additional land. This area will be protected by a security fence system.

Two pressure reduction and regulating stations will be installed at each power plant site: one to feed natural gas into the combustion turbines and to a natural gas heater; and another will be dedicated exclusively for the heat recovery steam generators.

3.3.4 Pipeline

The Proposed South Texas Expansion Project will be designed, constructed and operated by Tennessee Gas Pipeline Company in the state of Texas, U.S.A, which will bring natural gas from their system to the U.S. – Mexico Border. The Gasoducto del Rio, S.A. de C.V. will be the owner operator of the pipeline within Mexico and will connect the pipeline from the U.S.-Mexico border crossing the Municipality of Rio Bravo, Tamaulipas and terminating in the Municipality of Valle Hermoso to the power plants. This open access gas pipeline will supply natural gas to the both RBIII and RBIV power plants.

The Gasoducto del Rio, S.A. de C.V. pipeline will have a total length of 52.664 km and will be divided into two sections. The first section will have a length of 31.274 km with a 30" diameter and will go from the U.S.- Mexico border to the Campo Brasil Station. The second section will have a length of 21.390 km with a 20" diameter and will go from Campo Brasil to RBIII and RBIV power plants. The pipeline will have a branch at km 8+561 that will transport gas through a 16" diameter pipeline to a power plant located in Portes Gil and will have a length of 5.399 km. There will be an additional branch in Campo Brasil (km 31+274) that will connect to the existing 16" pipeline that currently supplies RBII.

The transportation system will include the pipeline, mainline valves, meter stations, pig launcher, and other accessories such as filters. The pipeline will be designed to operate at a maximum allowable pressure of 1,000 PSIG and at a flow rate of 410 MMCFD. Figure 3.7 shows the route of the pipeline from Texas to the power plants.

The MIA for the Mexican portion of the gas pipeline was prepared by HP Consultores Ambientales, S.A. de C.V. for Gasoducto del Rio, S.A. de C.V. and was reviewed by SEMARNAT, its availability was announced to the public in December 2001 and authorization was issued in April 2002. U.S. Federal Energy Regulatory Commission prepared the EIA for the U.S. portion of the gas pipeline and its availability for public comments was announced on July 26, 2002 (www.ferc.fed.us).

3.3.5 Water Supply

The water required for steam production will be supplied from two wells, one within RBIII and another within RBIV, thus providing independent water sources for each plant. Estimated maximum water consumption for RBIII is 13.5 l/s and for RBIV is 15 l/s. The well to be located at the RBIII power plant is currently undergoing tests to determine the appropriate depth. The tests are being conducted at a depth of 90 and 250 m, at the southeast and southwest corners of the property, respectively. The preliminary test results indicate that the two aquifers at 90 m and at 250 m are completely separate and are not connected based on the water flows and geology of the terrain. The water quality in either case is indicated to be not conducive for human consumption. CNA has already issued an authorization to pump a maximum of 13.5 l/s (425,736 m^3/year) in the main aquifer for RBII.

Table 3.1 Summary of the Water Extraction by RB II, III and IV

	RB II	RB III	RB IV
Authorization by CNA	13.5 l/s 425,736 m^3/year	13.5 l/s 425,736 m^3/year	15 l/s 473,040 m^3/year
Application Submitted	January 2001	October 2002	November 2002
Date Authorization Issued	May 2001	Pending	Pending
Depth of the Well	82 m	Pending	Pending
Location of the Well	Within RB II site	Within RB III site	Within RB IV site

The following criteria will be applied in the design of the water use system:

- The main steam cycle will be cooled through an air-cooled condenser instead of conventional water cooling towers. This will minimize water usage during the cooling process.

- The water that will be required for steam production will be supplied from two wells, one within the RBIII power plant and another within the RBIV power plant, thus providing independent water sources for each plant.

3.3.6 Wastewater Discharge

Each power plant will provide its own means for wastewater disposal since there is no municipal infrastructure for wastewater discharge at the sites. Wastewater generated by the processes will be sent to the evaporation lagoons from where, due to the high temperature and relatively low humidity of the region, it will evaporate into the atmosphere, thus creating a zero discharge. The processes that generate the wastewater are described in greater detail in section 3.7.

3.3.7 Evaporation Lagoons

Each power plant will have an evaporation lagoon for a zero process wastewater discharge. Both lagoons will be located on a 20 hectare site northwest from the RBIII site, property of CLR and CVH (Figure 3.7). The evaporation lagoon for RBIII will have a surface area of 68,546 m^2 and a capacity of 137,093 m^3. The evaporation lagoon for RBIV will have a surface area of 68,631 m^2 and a capacity of 137,263 m^3. Photograph 11 presents a view of the property where the lagoons will be built. Photograph 12 and 13 show the evaporation lagoon that was built for RBII. The lagoons will have a waterproof liner to prevent wastewater filtration. Sediments that result from settling will be removed and disposed by an authorized company in compliance with the Mexican standards and regulations.

3.4 Facility and Process Description

The RBIII and RBIV projects will generate power using combined-cycle natural gas turbines with a guaranteed capacity of 495 MW for RBIII and 500 MW for RBIV. Both plants, with very similar processes, will use two combustion turbines (model 501F Siemens/Westinghouse combustion turbines) and a steam turbine. The plants have an estimated life of 25 years.

The combined cycle is a 2+2+1 configuration that includes two combustion turbines fueled by natural gas, two heat-recuperation boilers (heat recovery steam generators) and one steam turbine. Natural gas will heat filtered air to a temperature of 1200º C. This high-pressure air will be used to generate mechanical energy in the two gas turbines; one generator coupled to each turbine converts this mechanical energy into electric energy. The turbines will be equipped with Low Nitrogen Oxide ("Low NOx"), combustion technology to ensure compliance with World Bank Guidelines as well as Mexican standards.

The hot exhaust gases released from the turbines are then fed to the heat recovery steam generators in order to heat water and create steam at an approximate temperature of 400ºC. The high-pressure steam is used to produce energy using the steam turbine. A generator attached to the steam turbine converts this energy into electric energy. The low-pressure steam released from the turbine is fed to the air-cooled condenser where the steam is condensed and sent back to the boilers as boiler feed water.

3.4.1 Main Equipment

The main equipment for the power plants are as follows:

- Two gas turbines with an approximate maximum potential equal to 185 MWe for each RBIII and RBIV, and auxiliary equipment,
- Two heat recovery steam generators at each power plant, equipped with three pressure levels, with intermediate and post-combustion reheating,
- One steam turbine with an approximate maximum potential equal to 200 MWe and auxiliary equipment for each RBIII and RBIV,

- An air-cooled condenser at each power plant,
- A centralized control system for each power plant,
- A 400 KV electric substation at each power plant,
- Two main transformers and auxiliary equipment at each power plant.

Following are the technical characteristics of the combined cycle system proposed for both power plants:

- The 501F industrial gas turbines will be set-up for 60Hz lines. The turbines are an integrated combustion and generation system including the required compressors, fuel handling systems and ductwork.

- In order to limit the nitrogen oxide emissions, the gas turbines will be equipped with a "Low NO_x" combustion chamber to minimize emissions, below 110 ppm (5% O2, 25°C, 1 atm) which is equivalent to 40 ppm (15% O2, 0°C, 1atm).

- Natural gas will be reheated to a temperature of 140ºC in a gas/water interchanger prior to its entrance into the natural gas turbines. The water will be extracted at the exit of the intermediate pressure economizer of the heat-recovery steam generator.

- 501F turbine rotors will be cooled using injected air extracted from the compressors. The air must be cooled down before being injected into the turbines. In order to prevent the loss of energy during the cooling process the air will be used to evaporate the water in an air/water interchanger (kettle boiler), instead of releasing the heat into the atmosphere through the air/air interchanger. The water fed to the air/water interchanger comes from the low-pressure water feeding system of the heat recovery steam generator. Once it has evaporated, it will be fed into the low-pressure dome of the heat-recovering boiler. The energy recovered will allow improved efficiency.

- Each heat recovery steam generator will include supplemental firing of natural gas. Supplemental firing allows for increased generation during the warm seasons of the year, during which the turbine output decreases. This may reduce equipment wear and tear.

- One turbine by-pass at each pressure level with a 100% steam flow capacity has been included in each plant.

3.4.2 Main Circuits

The power plants main circuits are:

- Water/steam circuit:

  - The water feeding circuit for condensate will transport water extracted from the condensate tanks of the air-cooled condensers to the heat recovery steam generators and the gas turbine coolers.

  - The high-pressure steam circuit will transport the overheated high-pressure steam of the heat recovery steam generators to the steam turbine.

  - The steam reheating circuit will transport the expanded steam from the high-pressure section to the heat recovery steam generators, where it will mix with overheated steam at intermediate pressure and be reheated.

  - The intermediate-pressure steam circuit will take the reheated intermediate-pressure steam from the heat recovery steam generator to the steam turbines.

  - The low-pressure steam circuit will take the overheated low-pressure steam from the heat recovery steam generator to the steam turbine. Here it will expand along with the steam coming from the intermediate-pressure body of the steam turbine.

  - The intermediate-pressure by-pass will carry the reheated intermediate-pressure steam of the heat recovery steam generator to the mouth of the air-cooled condenser.

  - The low-pressure by-pass will carry the reheated low-pressure steam of the heat-recovering boilers to the inlet of the air-cooled condenser.

  - The condensed-water cooling circuit will take the water from the condenser tank to the auxiliary steam system and from the intake-water condensing circuit to the intermediate-pressure and low-pressure by-pass circuits.

- The heat recovery steam generators allow the recuperation of thermal energy contained in the combustion gases at the exit of the gas turbines. Steam will be produced in the thermodynamic conditions adapted to the operation and requirements of the steam turbines and associated generators.

- The air-cooled condenser is the main cooling circuit for the water-steam cycle. This condenser allows the condensation of steam released from the exhaust of the combustion turbine, or eventually from its by-pass, which is connected to the turbine exhaust duct. The cooling procedure, which is necessary for steam condensation, is ensured through an air flow.

- Water supply will ensure adequate replenishing of water (raw, industrial, service, de-mineralized, and potable) quantity and quality necessary for the different processes and activities of the power plant.

- Natural gas that will be used as fuel will be supplied through simple transportation/supply commercial contracts. The natural gas transporter will be responsible for the delivery of the fuel in accordance with the Official Mexican Standard NOM-007-SECRE-1999, at a minimum pressure of 37.5 bar.

3.4.3 Turbine-Generator Groups

- The turbine-generator groups are the following:

  - The combustion turbines form the gas turbine-generator group are the main motive power of the power plants. The combustion turbines will transform part of the energy released by the fuel combustion (natural gas) into mechanical energy. This mechanical energy is then transformed into electric energy by the generator.

    Ambient air will be pulled in to the compressor through the intake collector filtering system. Air will then be pressurized to approximately 16 atmospheres and fed into the turbine, where it mixes with the fuel increasing the temperature of the air and combustion product mixture. The heated and compressed gas mixture passes through the turbine combustor section where it expands, decreasing in pressure and temperature as the thermal energy of the phases converts into mechanical work. Part of the energy obtained will be used to propel the compressors as it passes to the rest of the generator. The combustion gases are released into the atmosphere through the heat-recovery steam generator stack.

  - The steam turbines allow the transformation of steam energy coming from the heat recovery steam generator into mechanical energy. A generator coupled to the steam turbine will convert this mechanical energy into electric energy. The steam coming from the boilers will expand in the steam turbine until it reaches the air-cooled condenser vacuum pressure.

- The compressed air system is the production, storage, and distribution system for working and regulating compressed air. Its objective is to supply adequate air quantity and quality to both power plants. The equipment that will use compressed air are: pneumatic valves, combustion turbines, low-pressure valves, by-pass valves, regulating valves, and the cooling systems of the three generators.

3.4.4 Electricity Generating and Distributing Systems

The generators will be connected to a substation through a high-voltage transformer with a capacity to handle all the energy from each turbine generator group. The connection between the generator and the transformer is performed through an insolated phase distributing bar.

The substations for each power plant will establish the connection between the generating facility and the CFE substation through a main distribution bar. The RBIII and RBIV power plants will connect at the CFE substation (located east of RBII), through high-tension transmission lines. The transmission capacity of each line will be at least equal to the maximum generating capacity of the power plant.

3.4.5 Cooling System

The main cooling system of each power plant will be based on a mechanical air-cooled condenser, designed to condense the steam released at the outlet of the steam turbine. The condenser will feed water back into the heat recovery steam generators. This process will operate even when the steam turbines are not operating. The condensed water is recovered in the collectors and sent to the condensate tank where residual air is extracted lowering the oxygen rate using vacuum. It is then fed back into the system.

3.4.6 Water Treatment System

A raw water treatment plant will be set-up for each power plant. The installations for the raw-water treatment will cover all the water needs for the plant, which includes: de-mineralizing supply, drinking water, fire-fighting water, and service water. The water supply systems will be composed of the following main elements:

- Pretreatment of raw-water,
- De-mineralizing for service and de-mineralized water production,
- Potable conditioning.

The water treatment and conditioning installations will include a physiochemical treatment unit. Part of the physiochemical treatment will include a de-mineralizing process that will produce types of water: partially treated water and fully treated water. The partially treated water will be used in the evaporation coolers for rinsing and other uses. Fully treated water will be stored in de-mineralized water storage tanks. From these storage tanks water will be fed into the heat recovery steam generators. Potable water for personnel use will be produced by adding the necessary minerals for compliance with standards for human consumption.

3.4.7 Water Storage

The power plant will be quipped with storage areas for the different types of water required by plant processes and activities. Table 3.2 presents these water storage areas.

Table 3.2 Water Storage

Type of water	Number of storage tanks for each power plant	Capacity (each)
Raw	1	2,500 m^3
Service	1	400 m^3
De-mineralized	2	800 m^3
Fire-fighting	2	3,400 m^3
Potable	1	6 m^3

3.5 Construction Phase

3.5.1 Site Preparation

The activities for site preparation for the construction of the RBIII and RBIV power plants will include:

- Removal of existing vegetation
- Land excavating and leveling
- Access roads
- Construction of outdoor and indoor storage sites
- Construction of construction offices
- Handling and disposal of wastes generated by vegetation removal activities

The equipment that will be necessary during site preparation will be alternated between both sites, as the job progresses. Table 3.3 presents a list of the equipment and/or machinery that will be used by each power plant for site preparation and construction.

Table 3.3 Equipment and Machinery

Equipment	Phase	Quantity	Time used at the site (months)
Aggregates screen	Site preparation	2	18
3 t truck with crane	Site preparation	2	8
Dump truck	Site preparation	5	8
Compressor	Site preparation	3	5
Concrete pump	Site preparation	3	12
Dirt compactor	Site preparation	4	16
Motor graders	Construction	2	8
Truck	Construction	4	22
Dump truck	Construction	3	20
Water tank truck	Construction	2	20
Back-hoe	Construction	2	12
Embankment cover	Construction	1	7
Caterpillar tractor	Construction	2	8
Embankment grader	Construction	1	7
Front loader	Construction	3	13
Rebar cutter	Construction	3	20
Rebar bender	Construction	7	20
Concrete vibrator	Construction	8	20
Concrete mixer	Construction	4	20
Concrete plant	Construction	1	16
Mixing truck	Construction	2	16
Lube truck	Construction	1	6
Sand blast equipment	Construction	3	8
300 t crane	Construction	1	8
55 t crane	Construction	1	8
120 t crane	Construction	1	8
Welding machine	Construction	20	14
Painting equipment	Construction	8	14
20 t crane	Construction	2	8
25 t pylon driver	Construction	2	8
Tractor-truck with 50 t trailer (lo-boy)	Construction	2	4
Relevador de esfuerzo	Construction	2	4

Source: MIA; Centro de Investigaciones Biológicas del Noreste, S.C.

3.5.2 Environmental Resources that will be Altered

The following construction activities will alter environmental resources:

- Motorized vehicle, machinery, and equipment use with internal combustion engines will emit contaminant gases into the atmosphere.

- Noise will be generated by vehicle traffic, machinery and equipment.

- Landfill and leveling works will alter the terrain. Occasionally it will be necessary to use the sand and gravel obtained from the excavation activities. The natural drainage at the site could be altered by these activities.

- The removal of existing vegetation may cause direct impacts upon soil conditions by exposing the soil to water and wind erosion.

- In the event of rainfall after the removal of topsoil and vegetation, it is possible that the surface runoff will transport a large quantity of sediments.

3.5.3 Civil Works

The civil works at the power plants will be conducted in accordance with design specifications that are locally and internationally applicable, keeping in mind the occupant comfort and safety criteria, as well as climate and geologic conditions at the site. It is estimated that the following materials will be used:

- Cement
- Rocks
- Wood
- Cinder block
- Mortar
- Oxygen
- Acetylene
- Reinforcing steel
- Chain-link fencing
- Structural steel
- Dry-wall
- Paint
- Electro-welded screen
- Liquid cleaner
- Epoxy resin
- Gravel

These materials will be purchased from local and regional markets. They will be transported to the site using approved transportation methods. Some of the concrete aggregates may be purchased in the cities of Reynosa and Ciudad Victoria, in Tamaulipas, the rest in Monterrey, Nuevo Leon.

As specified in the National Integration section of the contract between RBIII and RBIV and CFE, at least 25.2% of all engineering, supplies, and construction must qualify as being of Mexican origin.

The different structures built will have a reinforced concrete slab with masonry refills (bricks, tiles). Building structures will be constructed with reinforced concrete and metal frame or solely metal frames based on their use. The internal walls will be made of plastered bricks, painted or covered with ceramic depending on their function. The windows will be made of aluminum and will have double panes when necessary. External doors will be made of metal and internal doors out of wood or metal. Building structures have been designed for a minimum 25 year life.

Upon job completion, the supporting infrastructure will be dismantled. All architectural structures and elements used for that infrastructure will be recycled.

3.5.4 Excavation and Leveling

Since the site is located on a relatively flat terrain, land cuts and excavations will be limited to those necessary for the construction of foundations and for the installation of underground pipelines and structures.

It is estimated that 20,000 m^3 of material will be used to level the terrain at each plant site. This material will be obtained from excavations performed during construction. If a greater volume of material is required for the leveling activities, it will be obtained from commercial sources that provide material suitable for the activities required and are in compliance with applicable standards.

Ground leveling will be done with slopes that will follow the direction of natural terrain, without altering the original water discharge points.

3.6 Waste and Emissions Management during Site Preparation and Construction Phases

3.6.1 Sanitary Wastewater

Sanitary wastewater will be gathered in provisional septic tanks with dimensions designed according to the number of persons permanently present at the plants. Authorized companies in accordance with applicable Mexican regulations will dispose of the wastewater in the septic tanks.

3.6.2 Solid Waste

Both, the RBIII and the RBIV power plants will generate hazardous and non-hazardous wastes during the construction, testing, and operation phases. During the construction phase, the majority of the wastes generated will be inert wastes and non-toxic industrial wastes.

As specified in the Libro de Anteproyecto of the RBIII power plant, these wastes will be temporarily stored at the site in a designated and closed-off area. The classification, storage and transportation for final disposal of these materials will be conducted in accordance with applicable laws and regulations.

The transportation will be performed periodically. The site will under no circumstance be used for final disposal. The re-use and recycling of materials will be encouraged. Periodic inspections will be performed to verify compliance with company goals as well as applicable legislation.

Conventional solid wastes generated by job activities will be mainly paper, plastics, Styrofoam cups, glass, cans and rags.

Among hazardous wastes are paints, solvents, brushes, contaminated rags, used vehicle and machine oil, and hydraulic and lubricating oils.

Construction wastes will include mortar, molds, masonry, bricks, tiles, perforation sludge, demolition products, wood, metals, and welding butts.

Wastes generated during the construction phase will be handled as follows:

- Adequate collection points will be strategically located throughout the job site.

- An area will be selected for the temporary storage of the wastes gathered from all the collection points. This area will be closed off from plant access and will be adapted for the waste collection trucks that will enter the plant sites.

- Paper, cardboard, and Styrofoam cups will be delivered to local companies authorized for the handling and final disposal of solid wastes in the area. Wood will be piled-up in an area selected for those purposes; so will be the scrap metal and other metal wastes. Organic material, and glass will also be temporarily stored in designated containers until transported for final disposal.

- Wastes such as paints, solvents, welding butts, gases, gasoline and oil filters, sparkplugs, batteries, used tires, and rags impregnated with hydrocarbons, solvents or paints will be disposed of in accordance with guidelines established in the Official Mexican Standards for hazardous waste disposal.

- Special waste handling systems will be established by companies generating products, among these are petroleum companies that produce hydraulic and lubricating oils, including PEMEX; oil, air and gasoline filter manufacturers, paint manufacturers, producers of welding materials, etc.

- Construction debris and wastes will be collected at points nearest to the job performed, within the property. The final disposal of the material collected will be performed in areas selected with the contractor.

3.6.3 Atmospheric Emissions

Atmospheric emissions will be those emitted by the operation of equipment and machinery with internal combustion (diesel and gasoline) engines. Motor vehicles that run on diesel and gasoline are subject to a periodic maintenance program for optimum performance and verification of minimal impact upon the environment.

3.7 Waste and Emissions Management during Operation Phase

3.7.1 Wastewater

During testing, servicing and operations, wastewater will be generated by the following sources:

- Sanitary systems
- Industrial systems consisting of

    - Water contaminated with hydrocarbons, and/or chemicals,
    - De-mineralizing system,
    - Boilers,
    - Gas turbines,
    - Intake water drainage,
    - Purging collection system from the steam turbines.

Sanitary wastewater will be first received in a waterproof trench where solid wastes will settle to the bottom. An authorized company will periodically collect the solid wastes in compliance with Mexican regulations. The liquid sanitary wastes will be treated at the site in a water treatment plant that uses an aerobic process with bacteria and enzymes. The treated water will be discharged into storm-water drains at the site.

Pipelines and roof gutters from main buildings and access roads will collect non-oily storm-water through gravity into a trench from where it will enter CNA drains that transport the water to irrigation systems.

Water potentially contaminated with hydrocarbons will be treated in oil-water separators. The dimensions of these separators are designed to contain the maximum rainfall volume that occurred in the last 10 years (60 l/s). In the event that rainfall was more intense than the maximum-recorded rainfall, an automatic choke will limit the flow to 60 l/s and the water will be contained in a retention dike that is designed to contain the maximum rainfall in 100 years. The treated water will be discharged into the storm-water drainage network of the plant site. The sludge generated during treatment will be removed and disposed of by an authorized company.

The flows from the de-mineralizing system, as well as those from the water storage tanks will be collected in a trench before being sent to an evaporation lagoon. In the same way, the water from the gas turbines, heat recovery steam generators, steam turbine purges, and intake water drainages will be collected in waterproof trenches and sent to the evaporation lagoon without receiving any treatment. These installations are set-up for zero discharge. The sludge generated in the evaporation lagoon will be removed and disposed of by an authorized company.

3.7.2 Solid Waste

Non-hazardous Waste

Solid wastes generated in the administrative and service areas, such as paper, cardboard, wood chips, industrial and domestic wastes (0.8 kg per person per day). Based on the MIA, it is estimated that 10 kg/day of non-hazardous wastes will be generated at the plant during routine operations and maintenance activities. The water treatment plant will generate resins from the de-mineralizers, worn-out carbon in the filters, and from the solid sediment compounds.

As specified in the Libro de Anteproyecto, these wastes will be temporarily stored in a designated and fenced-off area within the site. At the storage area, the wastes will be classified and stored in designated containers; an authorized company will then transport the wastes for final disposal in accordance with applicable Mexican laws and standards. This activity will be performed regularly. There will be no permanent waste disposal areas within the site. Re-use and recycling will be encouraged and periodic inspections will verify good administration.

The wastes that could cause detritus or leaching will be stored in compliance with company and legal requirements to prevent any risk of contamination to the environment. A CRETIB analysis will be performed on the sludge of the waterproof trench prior to being transported to external treatment centers.

The wastes that could cause detritus or leaching will be stored in compliance with company and legal requirements to prevent any risk of contamination to the environment. A CRETIB (Corrosivity, Reactivity, Explosivity, Toxicity and Risk of Biological Infection) analysis will be performed on the sludge of the waterproof trench prior to being transported to external treatment centers.

Hazardous Waste

Hazardous waste that could be generated during tests and plant operation are mineral oil, used lubricants, oil filters and materials contaminated with oil, such as rags and cardboard. Approximately 10 kg/month of hazardous wastes will be generated by each plant, as specified in the MIA.

Table 3.4 Hazardous Waste Handling

Waste	Generating points	Waste handling	
		Within the facilities	Outside the facilities
Oil filters	Routine activities and operation and maintenance programs	Temporary storage in metal containers	Final disposal in authorized sites
Oil-impregnated rags	Routine activities and operation and maintenance programs	Temporary storage in metal containers	Final disposal in authorized sites
Used lubricants	Used to lubricate the gas and steam turbines, and other rotating mechanical equipment	Temporary storage in metal drums	Final disposal in authorized sites
Mineral oil	Used to insolate main and auxiliary transformers	Not applicable	Final disposal in authorized sites

Source: Libro de Anteproyecto, Central Lomas de Real S.A. de C.V.

Waste such as rags impregnated with oil and/or solvents will be temporarily stored in containers located in specific places, until they are recycled, confined, or incinerated by authorized companies. The handling of hazardous wastes will be performed in accordance with Mexican environmental standards (see Chapter 2.0).

3.7.3 Atmospheric Emissions

The emissions to the atmosphere will be mainly discharges from the stacks of the heat recovery steam generators. The contaminants present in the gases are mostly nitrogen oxides (NO_x). The emissions of NO_x at a 100% load will be 40 ppm (15% O_2, 0ºC, 1 atm).

The relevant Mexican Official Standard for one-hour NOx emission is 375 ppm (5% O_2, 25°C, 1 atm) by NOM-085-ECOL-1994, equivalent to 141 ppm (15% 0_2, 0°C, 1 atm), which are conditions specified by World Bank Guidelines for measuring NOx emissions.

CFE required in their bidding guidelines that RBIII and IV plant emissions should not exceed 110 ppm of NOx at 5% O_2, 25°C, 1 atm. This is equivalent to 40 ppm at 15% O_2, 0ºC, 1 atm.

The preventive measures that will be used to limit the discharges of these contaminants into the atmosphere are:

- Natural gas as the sole fuel used in the processes.
- Combustion turbines equipped with low NO_x combustors.
- Design of the stacks with optimum heights to favor dispersion.

A continuous emissions monitoring system located in each stack will measure the NO_x and O_2 discharges.

Air quality for RBIII and RBIV will be monitored with the addition of three new fixed monitoring stations located throughout the sites to obtain accurate readings of air quality based on dominant winds.

3.7.4 Noise Emissions

During the commissioning and operation phases of the projects, the noise sources will be the electric energy generating facilities. These facilities have been designed to comply with the Official Mexican Standard NOM-081-ECOL-1994 that establishes the maximum permissible limits for noise emitted from fixed sources, and the measuring method. The following table presents the major noise emitting sources and the noise control measures.

Table 3.5 Noise Mitigation Measures for Plant Operation

Noise Source	Noise Control
Combustion Turbine Generator	Enclosure
Steam Turbine Generator	Enclosure
Steam turbine generator	Within building
HRSGs	In-stack Silencer
Air-Cooled Condenser	None

3.8 Construction and Operation Schedule

The site preparation and construction phases of the RBIII power plant is estimated to be completed within 24 months, initiating the second semester in 2002, and beginning operations in 2004. Site preparation and construction for the RBIV power plant is also estimated to be completed within 24 months. The construction phase for RBIV will be initiated during the second quarter of the year 2003. Table 3.6 (see Appendix A) presents the work schedule proposed for the construction of the RBIII power plant, including the installation of main equipment, and other mechanical electric equipment and for service providing. Table 3.7 presents the main work program, including critical and key path items concerning the RBIII power plant. The schedule for RB IV will be similar to Table 3.6 and Table 3.7, with target beginning operation in 2005.

The power plants are designed for a useful life of 25 years, after which, based on economic factors, it will be determined whether to continue in operation or to enter into the dismantling phase of the projects.

3.9 Project Construction Costs

The construction of each power plant will require an approximate investment of U.S. $300 million.

4.0 BASELINE DATA

The area where the power plants will be built, commissioned, and operated by subsidiaries of EDFI, is located south of RBII in Valle Hermoso, Tamaulipas.

The current physical, biological and socioeconomic conditions of the sites were described by the Northeastern Center for Biological Investigations, S.C. (CIB), in the *Manifestación de Impacto Ambiental* (MIA) that CFE prepared for RBIII and IV projects and presented to SEMARNAT.

This Chapter summarizes the data obtained from both RBIII and RBIV MIAs and updates the information with observations made during visits to the site and surrounding areas. This Chapter also presents information for the project area as reported in the Environmental Impact Assessment (EIA) conducted by Dames & Moore de Mexico, S. de R.L. de C.V. for Central Anahuac in June 1999.

4.1 Environmental Setting

4.1.1 Climate Characteristics

4.1.1.1 Climate

Data registered by the BRB-2-05 Anahuac meteorological station was obtained to describe the climatic features in the region, since it is the most complete and nearest to the project site. The BRB-2-05 Anahuac station is located at 25º35'55'' north latitude and 98º00'45'' west longitude, at an altitude of 20 m above sea level. The parameters registered in this station are: temperature, rainfall, evaporation, freezes, and hail. The data reviewed covers the years between 1960 and 1999.

The information concerning predominant winds (direction, velocity, monthly and annual winds), relative and absolute humidity, environmental temperature, dew point, and cloud cover were obtained by the CIB from local airports in Matamoros and Reynosa.

Based on the Köppen classification for climate modified by Enriqueta García (1983), the predominant climate in the Valle Hermoso region is semi-warm (A)C, with average high temperatures above 18ºC and the temperatures of the coldest month ranging from –3 to 18ºC. The average annual temperature is 22.5 ºC. Its general formula is (A)Cx' semi-warm, sub-humid with scarce rains throughout the entire year.

Total annual rainfall is 713.1 mm, distributed over two rainy periods in the year. The first is from April to July, with June being the wettest month, with an average rainfall of 71.3 mm. The second period is from August to October, with September being the month with greatest rainfall (127.7 mm). For the months in between, January has the greatest rainfall with 44.2 mm.

Based on the data provided by CNA that was recorded in the Statistic Yearbook for the Valle Hermoso municipality (1997), for the period of 1949-1996, maximum rainfall for the wettest year was 1,880 mm.

4.1.1.2 Hydro-Balance (Evaporation and Evapo-transpiration)

The Anahuac station BRB 2-05 has registered high monthly average rates of evaporation ranging from 94.1 to 234 mm, with the lowest rates in January and the highest in July. The annual accumulated value is 1,913.3 mm. Evapo-transpiration annual values average 1,530.6 mm.

4.1.1.3 Predominant Winds

The closest weather station that records wind direction is located at the airport in Matamoros, Tamaulipas, at approximately 20 km from the site.

During spring, the predominant winds are ESE, SE and SSE, with percentages of 12.36, 10.72 and 13.08 respectively and with occasional velocities greater than 21 knots (10.8 m/s). The calm frequency was recorded to be 4.8%.

During summer, the predominant winds are also ESE, SE and SSE but with percentages of 7.84, 11.82 and 9.52. The wind speeds are similar to spring, with a 12% calm frequency.

During fall, the predominant wind direction is SSE, with a 5.84 percentage and wind velocity greater than 21 knots, and NW with a 3.06 percentage and a velocity ranging from 17 and 21 knots. Calm frequency was 13%.

During winter, the predominant wind directions are SE and SSE with 11.22 and 17.75 percentages, respectively, and occasional wind velocities greater than 21 knots. Northern winds are also recorded due to the presence of cold-air masses.

4.1.1.4 Severe Weather

The area, where the projects will be developed registers, freezes, north-winds, tropical storms, and hurricanes.

Freezes recorded between the years 1960 and 1995 were present for an average of four days per year, between December and March.

SEMARNAT reports that the State of Tamaulipas is located between two hurricane-generating regions, resulting in storms that enter mainly through the Gulf of Mexico, affecting the state in various degrees and magnitude. The first region is located in the "Sonda de Campeche" south of the Gulf of Mexico, where the hurricanes begin to form in June and move toward the northeast. The second region is in the eastern part of the Atlantic, where hurricanes begin to form mainly during the month of August. The hurricanes generally move in a western direction, entering the Caribbean Sea and Tamaulipas, although they can also move in a northern direction affecting the coasts of the U.S.

The data on hurricanes that reach land and tropical storms registered by SEMARNAT, and reported by CNA, show that Tamaulipas is an area with greater incidence, and it is therefore probable that the area of study will be affected by this type of phenomena, as indicated in Table 4.1.

Table 4.1 Hurricane Frequency in Tamaulipas

Year	Month and Day	Type	Wind velocity (km/hr)	Name
1944	16-24 Aug.	Hurricane	189	No Name
1944	19-23 Aug.	Tropical Storm	90	No Name
1947	31 Jul-2 Aug.	Tropical Storm	72	No Name
1947	9-16 Aug.	Hurricane	171	No Name
1950	1-4 Oct.	Tropical Storm	90	How
1951	12-23 Aug.	Hurricane	207	Charlie
1954	24-26 Jun.	Hurricane	126	Alice
1955	4-6 Sep.	Hurricane	144	Gladys
1955	10-12 Sep.	Hurricane	198	Hilda
1958	14-16 Jun.	Tropical Storm	81	Alma
1960	22-29 Jun.	Tropical Storm	72	No Name
1966	21 Sep.-11 Oct.	Hurricane	234	Inés
1967	5-22 Sep.	Hurricane	252	Beulah
1968	22-26 Jun.	Tropical Storm	108	Candy
1970	8-13 Sep.	Hurricane	198	Elia
1971	5-18 Sep.	Hurricane	252	Edith
1975	24 Ago.-1 Sep.	Hurricane	180	Carolina
1977	29 Ago.-3 Sep.	Hurricane	270	Anita
1978	30 Jul.-1 Aug.	Tropical Storm	81	Amelia
1980	31 Jul.-11 Aug.	Hurricane	297	Allen
1983	23-29 Aug.	Hurricane	126	Barry
1988	8-20 Sep.	Hurricane	288	Gilberto
1995	9-12 Aug.	Hurricane	108	Gabrielle

SOURCE: Final Report. Environmental Impact Assessment. Vol. II Complementary Environmental Assessment. Central Anahuac. 495 MW. Dames & Moore de Mexico, S. De R.L. de C.V. June, 1999. Chapter 4 p. 40.

4.1.1.5 Sky Cover

Since the Anahuac BRB-2-05 meteorological station does not measure cloudiness, this information was obtained from the Reynosa station for the period 1951 to 1980. This station records average clear, partly-cloudy, and densely-cloudy days in the year as 237, 72 and 56 respectively, with a solar isolation of 2,218 J/day. The months of June, July and August have the greatest number of clear days, and January and February present the least number of clear days.

4.1.1.6 Mixing Depth

Based on the information presented in the MIA for RBII, the estimated daily and monthly mixing depth during 1997 was obtained from data recorded in Brownsville, Texas. The data used was the product of the vertical gradient analysis of air temperatures measured with a sonar radio balloon, at 0 and 1200 hours (GMT) measuring from ground level to a maximum altitude of 4,000 m.

The lowest mixing depths were registered during the months of October, November, and December, with values of 402, 338 and 522 m, respectively. The months of June, July and August presented values of 865, 940 and 925 m and the highest depths were recorded during the month of September reaching 1,108 m. Between January and April, the altitude of air-mixture level oscillated between 606, 762 and 731 m.

4.1.2 Air Quality

The CIB, reported in the MIA, that they conducted three simultaneous rounds of air quality monitoring of six days each, 24 hours a day in three sampling stations. The monitoring was conducted between the 16th and the 21st of February, the 30th of April to the 4th of May and the 14th to 19th of May, 2001, in order to determine nitrogen oxides (NO_x), sulfur dioxide (SO_2) and particulate matter less than 10 microns in diameter (PM_{10}) base concentration.

The preliminary CIB conclusions showed that the sources of atmospheric contamination in the area include the RBII during the commissioning phase, vehicle traffic in neighboring roads, and brick factories located in the town of Anahuac.

The results obtained were as follows: average concentrations of NO_x and SO_2 are below the maximum permissible limits established by the standards. The particulate matter, generated by the dust storms in the cultivated areas and unpaved roads, produced a 71.8% value of the maximum permissible limits.

Prior to these monitoring events, since there were no air quality measurements, the Corporación Mexicana de Investigación de Materiales S.A. de C.V. (COMIMSA), conducted air quality monitoring from the 11th to 29th of December, 1998 at three sites near RBII.

The three monitoring sites were located as follows:

- Monitoring Station 1. Colonia Anahuac, at approximately 4 km north-northeast from the power plant, where plant emissions may be carried by predominant winds.
- Monitoring Station 2. Colonia Anahuac, at approximately 2 km from the power plant.
- Monitoring Station 3. Located at El Porvenir, at approximately 4 km southwest from the power plant, at the opposite direction from the predominant winds.

URS Dames & Moore de Mexico analyzed the data obtained from the monitoring activities. The results included in the final report of the EIA, prepared for RBII (June 1999), show that the SO_2 and NO_2 base concentrations in the areas surrounding the power plant did not exceed the maximum permissible limits established by Mexican regulations or the World Bank Guidelines established in the "Pollution Prevention and Abatement Handbook".

For total suspended particle (TSP) concentrations, the results obtained from a three-day sampling period, showed that the concentrations obtained from a 24-hour average exceeded the maximum permissible limits established by Mexican regulations. This was caused by the dust generated from unpaved roads and land where agricultural activities are practiced.

Additionally, ARIA Technologies S.A. prepared for EDF/CNET a "Study of atmospheric dispersion of pollutant emissions from Rio Bravo 2 and Rio Bravo 3 combined cycles" in October 2001.

The study presents the results of a long-term air quality impact study, for emissions of contaminants generated by both plants (RBII and RBIII).

The objective of the study was to perform a quantitative assessment of the background concentrations of NO_x generated by the combustion equipment of the plants, and to compare the results with applicable environmental standards. The concentrations of contaminants were estimated by dispersion modeling using the ARIA IMPACT Gaussian Model, which has been specifically designed for this type of studies and can be used for single or multiple industrial sources.

The estimates of contaminant concentrations were made using meteorological data obtained from the Brownsville, Texas Station, including measurements for wind direction and velocity, temperature and cloud cover. A five year, period was examined in order to determine the concentration levels (annual average and percentages) and identify the areas with highest concentration levels.

The conclusions indicated the following:

- Predominant winds at the Brownsville, Texas station are from the southeast (140º-180º) and northwest (320º-360º).

- The average concentration resulting from stack emissions are within the limits established by the USEPA and World Health Organization (WHO) recommendations. Dispersion maps identify the location of the maximum impact point at 1,800 m northwest from the power plants.

- The maximum concentration predicted during the five years is below the maximum permissible limits established by environmental standards. The maximum levels are located primarily north/northeast from the power plants.

4.1.2.1 Border XXI Program Activities Related to Air Quality

The Border XXI Program (1996-2000) is a bi-national program that combines the different federal entities with jurisdiction over the U.S. - Mexico border area, in order to promote a united effort toward sustainable development, protection of human health and the environment, and the adequate management of the natural resources of each country.

The program establishes that air pollution is a significant problem in the areas of Laredo-Nuevo Laredo, Brownsville-Matamoros and McAllen-Reynosa, particularly due to air-quality impacts caused by commercial vehicle traffic. Due to the high pollutant levels, the inhabitants of the border area requested better and more extensive air-quality monitoring in response to the magnitude of the problems and to determine the contribution of industry to air pollution within the bi-national air basin. As a result of the public interest in the potential connection between air contaminant and health effects, the community has requested a study to evaluate the nature of these associations. The actions adopted as part of the Border XXI Program, related to atmospheric contamination, are described in Table 4.2

Table 4.2 Border XXI Program Projects

Project	Participating Institutions	Scopes
Air monitoring Laredo, TX.- Nuevo Laredo, Tamaulipas	INE, EPA, TNRCC	Monitoring in progress PM_{10} and PAH. Ozone CO, lead, arsenic and meteorological data monitoring to initiate August 1996. INE monitored twice for PM_{10} in Nuevo Laredo.
Air monitoring at Brownsville, TX.- Matamoros, Tamaulipas	INE, EPA, TNRCC	Installation of fixed monitors for O_3, CO, SO_2, PM_{10}, Pb, arsenic, volatile organic compounds, and meteorological information. INE monitored 4 times for PM-10 at Nuevo Laredo.
Trans-border project for air monitoring, Cameron County, TX.	EPA, TNRCC	Perform a pilot project in Brownsville to identify and evaluate atmospheric contaminant exposure to valley residents. Examine the extent of trans-border air pollution by monitoring mobile sources and industrial and agricultural activities, apart from meteorological data.
Air monitoring in Reynosa, Tamaulipas	INE	INE installed five PM_{10} monitoring sites, one for $S0_2$ and two for meteorology .
Monitoring of toxics in the air, Hidalgo County, TX.	EPA, TNRCC	Add equipment to the two existing monitoring sites of Hidalgo County and schedule mobile lab sampling at border areas.

4.1.3 Current Environmental Noise Conditions

The MIA prepared by the CIB includes a section describing equipment and machinery that may be used during the construction stage of the projects. This section includes a breakdown of the noise volumes (decibels) that this type of equipment and machinery may generate. In the MIA background noise levels were not considered. As such, URS obtained site specific data in April 1999 to record initial noise conditions prior to the construction and operation of RBII, as well as to identify the potential impacts to receptors in the area.

The environmental noise measurements were conducted for two consecutive days during both day and night. The results show that the existing noise at the sites closest to the power plant is generated by motor-vehicle traffic at the highway. The noise monitoring results of both days show that the existing background noise levels exceed the maximum permissible limits established by the World Bank, but not Mexican standards.

Electricitè de France also performed an "Acoustic study for environmental noise at the Rio Bravo combined cycle" (*Etude acoustique du cycle combine de Rio Bravo –bruit dans l'environnement*), which included the mathematical model of noise emission for equipment used at the power plant. The objective of the study was to estimate noise intensity produced by the power plant in operation without silencers.

In general, the study confirmed the results of URS analysis in the 1999 EIA for RBII, which stated that the noise levels were above acceptable World Bank limits for residents living closest to the power plant site. The family was consequently relocated in 2001 in accordance with the World Bank standards.

Currently, the potential receptors nearest to the plant sites are located on State Highway 99, west from the site. There are scattered rural single-family dwellings, among which the closest ones are at approximately one km west from the site. Additionally, the nearest town is Anahuac, with approximately 3,300 inhabitants and is located three km south from the site.

Monitoring to determine background noise levels on site was not conducted for this EIA because current activities at the site could not be considered as normal background noise conditions. Commissioning activities conducted in RBII and construction activities for RBIII in progress would not provide measurements of representative noise levels. However, a noise study conducted by RBII in April 23, 2002 indicates that noise levels detected in the south limit of the plant, adjacent to the RBIII site, were 55.5 dB(A), which is below the permissible limits stated in the Mexican Official Standard.

4.1.4 Soil

4.1.4.1 Edaphologic Classification

To determine soil units at the area of study, an edaphological map at a scale of 1:50,000, INEGI (1983) was reviewed as well as the MIA prepared by CIB.

Table 4.3 lists the soil units present at the site where the power plants will be built within a 15 km radius.

Table 4.3 Soil Units Reported for the Area of Study

Soil Units	Texture	Main Unit	Secondary Unit	Chemical Phase
Calcium castañozem (Kk/2)	Medium	Castañozem	-	-
Chromium vertisol (Vc-Is-n/3)	Fine	Vertisol	-	Slightly sodium - saline
Calcium chernozem (Ck/2)	Medium	Chernozem	-	-
Luvic castañozem + Haplic Castañozem Association (Kk+Kh-Is-n/2)	Medium	Castañozem	Castañozem	Slightly sodium - saline
Luvic castañozem (Kl/2)	Medium	Castañozem	-	-
Calcium castañozem + Haplic Xerosol Association (Kk+Xh/2)	Medium	Castañozem	Xerosol	-
Luvic castañozem + Pelic vertisol Association (Cl+Vp/2)	Medium	Chernozem	Vertisol	-
Calcium chernozem (Ck-ls-n/3)	Fine	Chernozem	-	Slightly sodium - saline
Calcium chernozem + Haplic Association (Ck+Ch/3)	Fine	Chernozem	Chernozem	-
Calcium chernozem (Ck/2)	Medium	Chernozem	-	-
Calcium chernozem (Ck-n/3)	Fine	Chernozem	-	Sodium

Source: INEGI. Edaphologic map G14D14 (1983)

Predominant soils in the area of study are Calcium castañozem (FAO-UNESCO classification) presenting the following characteristics.

The surface layer is of brown color when dry and grayish brown when wet, with a clumpy clay texture. Soils at depths greater than 2 m have a soft consistency when humid and semi-hard when dry. The surface layer contains roots, some deeper layers contain a little sand and rest over hard clay alluvial layers with low organic matter content and the accumulation of calcium carbonates in the subsoil. It presents low susceptibility to water erosion, moderate susceptibility to wind erosion, and its current use is for irrigated agriculture (Figure 4.1).

4.1.4.2 Stratigraphic Profile

Based on a soil study conducted at the site by the Compañía Mexicana de Ingeniería y Servicios S.A. de C.V., which was presented to CNA, the stratigraphic profile for subsoil presents the following characteristics.

Table 4.4 Soil Stratigraphy

Depth (m)		Description
From	To	
0.00	1.80	Clayey lime with organic material and vegetation, brown color, of semi-hard consistency
1.80	4.50	Limey clay, light brown color, containing small shells and some root remains, of medium to hard consistency.
4.50	5.50	Lime, a little clayey, with some fine sand, light brown color, of medium consistency.
5.50	6.80	Fine sand, light brown color, medium compactness in inferior level and high compactness in inferior level.
6.80	9.50	Fine sand, light brown color, of high compactness
9.50	13.50	Clay, light brown color, with clumps of sand incrusted, of hard to very hard consistency
13.50	14.20	Sandy clay, with high plasticity, light greenish brown color, with clumps of incrusted, of very hard consistency
14.20	17.00	Fine sand, clayey, light brown color, of very hard consistency.
17.00	20.00	Clayey with high plasticity, come sand, light brown color, of very hard consistency.
20.00	21.50	Sandy clay, of high plasticity, light brown color, of very hard consistency.
21.50	24.50	Fine to medium sand, gray-brown color, of high compactness
24.50	35.00	Sandy clay and lime-clayey sands with high compactness, of greenish brown to light brown color.

4.1.5 Geomorphology

The project are located in the physiographic province of Llanura Costera del Golfo Norte (Coastal Plains of Northern Gulf), within the sub-province known as Llanura Costera Tamaulipeca. The main characteristic of this province is the presence of alluvial plains. The dominant morphologic features in the area of study, as in the rest of the sub-province, are the plains.

The project site area is a great alluvial plain with slight slope toward the east, with rocks dating from the Tertiary Period. The alluvial layer attains considerable thickness, which are occasionally modified to local shapes due to lacustrine activity, or the development of dunes.

The river or fluvial materials are deposited in the flood plains and longitudinal bars at approximately 20 km from the project site.

The study area is characterized by flatlands without rock formations, presenting slight undulations with altitudes ranging from 15 to 22 m above sea level as can be observed in the topographic map (Figure 3.3). At the project site the soil has been used only for agricultural activity that corresponds to alluvial deposits.

4.1.6 Geological Characteristics

4.1.6.1 Regional Geologic Context

Geologically the project site is located within the Northeastern Geologic Province of Mexico, in the sub-province of the Burgos Basin. The geographic borders are: to the north the Rio Bravo, to the east the Gulf of Mexico, to the south and southeast the Soto La Marina River and the Cruillas Sierra, and a line that moves toward the north of the Cruillas Sierra reaching the Rio Bravo on the west.

The Burgos basin extends over an approximate area of 40,000 km^2 and covers most of the northern portion of the State of Tamaulipas and part of the northeastern side of Nuevo Leon. The basin contains land sediments dating from the Paleocene period to recent times in normal sequence, and with a disposition parallel to the coastal line, presenting the older strata toward the west and the younger toward the east.

The majority of the sediments that form the Burgos Basin, with maximum thickness reaching approx. 10,000 m southeast of Reynosa, were deposited during the geologic periods of Eocene and Oligocene. The sedimentary rocks are mainly sand and shale deposited in a regressive marine environment.

The Burgos Basin includes faults in the Oligocene sediments. All the faults are of normal type in N-S general direction and present a drop in the eastern oriental block; their presence is obvious throughout the entire basin, since they were active during the different periods in which the sediments were deposited. The fault tracks are parallel to the direction of the sedimentation.

The growth displacement of the faults is simultaneous to the deposit, causing a major accumulation of sandy sediments in its lower block in comparison with the upper block, only for sedimentary purposes. The differential compacting of the sandy bodies, in relationship of the clayey strata, forms some "anticlines" due to the fact that the compacting of clays is almost double of that of the sandy bodies.

4.1.6.2 Main Regional Geologic Structures

The geologic formations in the area of study generally tend toward the east with soft undulations moving on a north-northeast to south-southeast direction. These units are divided by post depositional faults of great length, that move from north to south and form blocks that tilt toward the Gulf of Mexico.

Following are the main regional geologic structures in order of importance:

La Babía Fault (Charleston, 1981; Longoria, 1985) or Boquillas Sabinas alignment (Padilla, 1986). Consists of a second order structure that affects and divides both from the third order (Longoria, 1985), which are in turn cut by the Texas and Walper (first order) with a northwest-southeast (N40W) tendency, of lateral left transforming character, and related to the oceanic expansion system of the Gulf of Mexico, which intersects the first order of faults (Longoria, op. Cit.).

Acuña-Cruillas Alignment. Maintains a N20° W and appears to coincide with the rectilinear portion of the Rio Bravo between Ciudad Acuña, Coahuila, and Nuevo Laredo, Tamaulipas, which appears to control the features. The line continues toward the mouth of the Soto la Marina River; and due to the same lack of seismic instrumentation, their potential thickness and fault jump is unknown, however, the minimum longitude is of approximately 600 km; presenting similarities with the Tamaulipas-Oaxaca (Padilla, 1986) and the oriental border of the Mesozoic Archipelago platform El Burro-Peyotes.

4.1.6.3 Rock Formations

The area of study does not present rock formations and therefore the information presented was obtained from explorations performed for water and petroleum extractions and supported with the existing geologic and stratigraphic information from the region.

The study that was used to establish the stratigraphic profile of subsoil in the project site is called "Geohydrologic Analysis for C.T. Matamoros-Tamaulipas, based on geophysic records from wells drilled by PEMEX in the Reynosa-Matamoros area". This study was based on the information obtained from electric registries used in the Refugio I, Escobedo I and 20 de Noviembre wells.

The stratigraphic profile identified in the subsoil of the site may be described, from the surface down, as follows:

- A surface pocket of loosely consolidated sediments, occurring from the surface down to a depth of 30 m. These unconsolidated sediments, which consist of sands, limestone, and clays of reddish and brown color, belong to the Beaumont Formation of the Pleistocene Age.

- The second strata graphic pocket is a variable thickness, occurring a depth between 6 and 65 m. This pocket is composed of semi compacted, 'limolitas', fine sand, and shale, which are part of the Lissie Formation of the inferior Pleistocene.

- At the base, at 100 m in depth are conglomerations belonging to the Goliad Formations of the Pliocene along with 'limolitas', fine sands, and conglomerations of the Lagarto Formations of the Miocene.

4.1.6.4 Seismic Susceptibility

The area of study is within the North American Tectonic Plate, at the passive margin of the plate away from collision fronts. The passive margin of the North American plate is one of the most stable regions after the continental shields, in terms of seismic and volcanic activity. The project area has not registered earthquakes with magnitudes greater than 7º in the Richter scale during the Recent Period, and large scale seismic activity.

Based on the CFE (Potential Site Evaluation of the ST PEE Matamoros – Rio Bravo) and the seismic potential and the seismic and earthquake registries for the project region are governed by:

a) Movements in smooth faults that based on experience in similar regions may cause earthquakes of maximum magnitude of 4° Richter.

b) Induced seismic activity related to the extraction of hydrocarbons generating earthquakes with magnitudes up to 3.5° Richter, as recorded for the areas within the State of Veracruz, that, although different, their occurrence can not be ruled out.

c) Earthquakes originating in front of the Sierra Madre, where the area between Linares and Monterrey seems to be active and related to the saddle horse inverse fault found in this corridor. This region is located approximately 230 km southeast from the project site and its activity could produce an earthquake with the maximum magnitude of 5 to 6° Richter.

The maximum theoretical accelerations calculated for the Anahuac, Valle Hermoso area reach 0.01 a 0.02 g.

The area of study is considered the most stable of the Mexican Republic, from a seismicity point of view.

4.1.6.5 Area Susceptibility to Landslides

Because the study area does not contain significant slopes, there is no major threat of landslides.

4.1.6.6 Potential Volcanic Activity

The volcanic rock formations that are nearest to the area of study are at approximately 130 km southeast from the project site in the Burgos-Sierra de San Carlos region. These rocks belong to the tertiary formations with high contents of volcanic ash transformed into bentonitic clay, as in the San Felipe, Vicksburg, and Jackson formations. There is no evidence of recent volcanic activity for the Quaternary and or Recent Period, and therefore volcanic activity is not likely to affect the project area.

4.1.7 Hydrogeologic Characteristics

The following subsoil information was obtained from geo-physical study for a well in the project area:

- Non consolidated Clays and sands are present from the surface down to 24 m in depth.
- A sedimentary rock sequence was identified below 24 m down to a depth of 250 m.

Based on the study of the geophysical, stratigraphic, and electrical density, and neutron records, it was determined that the preferred strata for aquifer are located between 70 and 82.50 m in depth. This area is actually composed of two strata namely a clayey gravel and a fine sand.

The clayey gravel is found between 70 and 78 m in depth and has an effective porosity of 11.12%, with a clay volume of 50.15%, and a saline level equivalent to NaCl 5,100 ppm, and a resistance of 0.96 Ω-m. The gravel/fine-sand found at 78 m in depth has an effective porosity of 19.46%, with a clay volume of 25.79%, and a saline level equivalent to NaCl 3,000 ppm and a resistance of 1.54 Ω-m.

Above the aquifer strata between 70 and 82 m of depth a moderately permeable layer was found. This layer was composed of intercalated strata of fine sand and limolitas found at depths ranging from 24.40 to 46.90 m. However, this potential aquifer is not likely to be useable due to its low depths.

Immediately below the rocky stratum found at 70 to 82 m depth, an impervious layer was detected with a thickness of 70 m between 80 and 150 m below the land surface. The presence of this layer can provide a seal for the aquifer located between 70 and 82 m in depth. A visual description of rocks layers and aquifers location is included in Figure 4.2.

The Hydrological region from which the water will be extracted for the operation of the power plants is the Conchos Rio Bravo (RH 24). The water availability for the year 2001 was 13% greater than the extraction volume[1]. The shallow aquifer in the region is considered free exploitation area and several domestic wells are located here, with static levels reaching as low as 24 m. Water obtained from domestic wells have high amounts of salts and it is used for limited domestic purposes. Information developed in the MIA for RBII claims that there are a number of domestic wells located within the rural communities of the region. These wells are not registered with CNA, and thus the water use, however small, information goes unreported.

Mainly rain and agriculture drains recharge the shallow aquifer while the deep aquifers receives marine intrusions from the Gulf of Mexico. According to the available information, groundwater from the deep aquifer is not used for irrigation or domestic purposes in the region due to the poor quality of water and the depth at which such water is available. Based on the structural conditions and based on the information available about the aquifers in the region, it was determined that the deep aquifer is not connected with the shallow aquifer nor are they connected to the aquifers in U.S. – Mexico border. As shown in Figure 4.3, there are no aquifers in the State of Tamaulipas that are overexploited.

4.1.8 Hydrology

The projects are located in the RH24 "Bravo Conchos" hydrological region, at the basin A "Río Bravo – Matamoros – Reynosa", and the sub-basin the Rio Bravo – Matamoros (b). The hydrological region RH24 covers a surface of 14,674.16 km^2, bordering to the north with the Rio Bravo, to the south with the Rio Conchos, to the east with the Gulf of Mexico, and to the west with the Occidental Sierra Madre. Basin A extends over 8,580.27 km^2; and is considered important in the country because within this basin are the agricultural areas of the irrigation district DR025 Bajo Río Bravo and a portion of the irrigation district DR026 Bajo Río San Juan. The sub-basin Río Bravo – Matamoros (b) has a surface of 2,530 km^2.

[1] Water Bank Summary in Mexico 2001, National Water Commission. January 2001.

There are no rivers or streams within a 15 km radius from where the power plants will be located. However, there are hydraulic works such as canals, and drainages that are part of the DR025 Bajo Río Bravo irrigation district, which covers an area of 208,447 hectares and that are irrigated by the Falcon Dam.

This irrigation district is comprised of four units: Control, with 53,446 hectares, Valle Hermoso with 55,435 hectares, Rio Bravo with 59,260 hectares, and Santa Apolina with 32,258 hectares. It is structurally composed of 1,929.7 km of canals and has 2,813.2 km of drainage systems. Based on the MIA prepared by the CIB the natural drainage in the area of study has been modified by the construction of an artificial drainage system designed to collect irrigation excess and rainwater. The artificial irrigation system discharges into a collector called Las Blancas that connects to the El Tigre Stream located approximately 20 km southeast of the site.

CNA has already issued an authorization to pump a maximum of 13.5 l/s (425,736 m^3/year) from the main aquifer for RBII. CNA document, number BOO.00.R07.03.-025(01), presented in Appendix B, is a letter addressed to CFE where CNA has responded to CFE's request for the feasibility to extract groundwater at the RBIII site or within a two km radius in the Municipality of Valle Hermoso, Tamaulipas. This document establishes that the volume of available groundwater in the area is around 6,900,000 cubic meters per year. The estimated amount of water extraction required for the RBIII and RBIV projects is less than one million (898,776) cubic meters per year which is considerably less than the amount of water available for extraction according to the information provided by CNA.

To solve the problems related to water in Valle Hermoso and Matamoros, aqueducts were built within the irrigation district. A new water treatment plant was built, and another is planned for Matamoros. Wastewater treatment plants are also required for Rio Bravo and Nueva Ciudad Guerrero. All the existing water treatment plants are currently in need of maintenance and some improvements. Although the long-term financial resources have not as yet been identified, CNA has developed some programs with budget estimates to tackle the hydraulic infrastructure needs for the region.

4.1.8.1 Border XXI Program Regarding Water Resources

As described in the Border Program XXI (1996-2000) "water supply for the lower portion of Rio Bravo is limited and the current increase in demand is creating a problem. The Rio Bravo and its tributaries from below the International La Amistad Dam down to the Gulf of Mexico are currently the main source of water supply for multiple uses on both sides of the border. Water demand is increasing giving way to competition through underground municipal and industrial water sources. Water quality from Rio Bravo, as well as adjacent streams, bays, estuaries and aquifers must be protected. Chemical and biological contamination requires the application of regulations and laws."

Other aspects related to water that are mentioned in the program include: illegal discharge of wastes into water bodies flowing into Rio Bravo; drinking water supply requirements and the lack of service infrastructure coordination in small towns; the need for a bi-national plan for the basin; negative impacts on sea-fishing caused by discharges into the ocean and beaches, as well as the need to clean small lakes and reservoirs along the Rio Bravo. The beaches of the Gulf of Mexico, near Brownsville were mentioned as areas of interest concerning surface water. Table 4.5 shows the initiatives for the U.S. – Mexico border area.

Table 4. 5 Border XXI Program Water Projects

Project	Participating Institutions	Scopes
Colonia Wastewater Treatment Assistance Program (CWTAP).	EPA, TWDB	Finance was granted to local governments and non-profit water-sector companies for the design and construction of wastewater collection and treatment. Program managed by TWDB.
Economic Development Assistance Program (EDAP), for Areas with Financial Needs	TWDB	
Colonia Population Lending Program (CPLP). Lending Program for Drainage Structures in Irregular Settlements in Texas	EPA, TWDB	Loans are granted to low-income colonia residents, to improve drainage. Funds are managed at a local level.
Colonia standard verification in Texas	EPA, Attorney General's Office in Texas	This program supports the efforts of the Attorney General's Office in Texas for the implementation of state laws concerning colonia development.
Colonia infrastructure-border study	EPA, ICMA	A report identifying the colonia borders where the local government intends to develop activities to solve treatment problems.
Program for the protection of well mouths	EPA, TWDB	Programs in McAllen and in Brownsville.
Colonia Assistance Management and Support Program (CAMSP).	EPA, TWDB	This program provides global coordination and management for colonias that are eligible for financial assistance for the necessary improvement in the drinking-water and wastewater facilities
Technical Assistance Municipal Program *in situ* for Wastewater	EPA, TWDB	Small communities received support from the Technical Assistance Program *in situ* for Small Community Water Treatment Plant Operators, developed by TWDB.
Circuit Rider Program for Technical Assistance for Public Water Systems located at the U.S.-Mexico border.	EPA, TNRCC	This program helps to provide municipal services for best benefit/cost with federal and state regulation compliance. It also seeks to ensure that drinking-water and wastewater services continue and are expanded, whenever possible, identifying financial resources and supporting access to them.
Bi-national training of wastewater treatment plant operators	EPA, Water Environmental Federation (WEF)	The first training session along the border areas for wastewater treatment plant operators was performed in a bi-national forum.

Table 4. 5 Border XXI Program Water Projects (Cont.)

Project	Participating Institutions	Scopes
Bi-national training for water supply operators.	EPA, American Association for Water Works	The first training session for the requirements of the *Safe Drinking Water Act* was completed in a bi-national forum.
Base studies concerning toxics in Rio Bravo.	EPA, IBWC, DOI, TNRCC, TDH, TPWD	The report was completed in September 1994. While the study did not indicate that toxic contamination was spread out, several areas with high levels of toxic contamination were identified, mainly in water below the sister cities and tributary rivers.
Continuation of toxics study on Rio Bravo	EPA, IBWC, TNRCC	Field work was completed. The report will help identify areas with greatest water contamination control need
Estimate of international water resource for the Rio Bravo basin	BOR	The study is already designed and is in the process of gathering information from both sides of the border.
Study of the lower basin of Rio Bravo from the International La Amistad Dam to the Gulf of Mexico.	BOR	It has been completed and the report was published in December 1995.
Alliance of the Grande/Bravo Rivers	EPA, TNRCC, Mexico, Colorado, New Mexico, federal environmental agencies, tribe representatives, NGO's and other participants	The First Coordinating Meeting of the Rio Grande/Bravo alliance was in El Paso, TX, on July 15 and 16, 1996. Among the participants were representatives of the Rio Grande/Bravo basin, such as Mexico, New Mexico, Colorado and tribal representatives.
Facility planning for Rio Bravo cities.	EPA, IBWC	IBWC has selected A/E companies for the development of treatment facilities for wastewater discharges originating in Mexico into the Rio Bravo.
Treatment Plant in de Nuevo Laredo.	CNA, COMAPA, gob. de Tamaulipas, IBWC	The construction of a 1,360 lps-capacity treatment plant was completed. The sewage network and distribution pump plant were expanded.
Drinking water and wastewater improvements Laredo, TX.	EPA, TWDB, City of Laredo	Planning is complete. The design has a 95% progress. FNSI in progress.
Gulf of Mexico Program	EUA: EPA, USDA, NOAA, USFWS, USACE, FDA, MMS, Florida, Mississippi, Alabama, Louisiana, Texas, Mexico; Epomex	The information exchange between U.S. and Mexico is being worked on, as well as the response to environmental problems in the Gulf of Mexico.
Water quality monitoring for the Rio Bravo basin (Amistad-Falcon Dams)	USGS, TNRCC	Sampling will be initiated in 1997.

Table 4. 5 Border XXI Program Water Projects (Cont.)

Project	Participating Institutions	Scopes
Chemical evolution of the Rio Bravo sediments	USGS	Retrospective analysis prior to information gathering
Project for periodic source of toxic substances in the Manadas stream basin, Laredo.	TNRCC, ciudad de Laredo, USGS	A QA/QC document is being prepared including the information obtained, analysis methods, and protocol for information handling.
Drinking water supply for Matamoros.	CNA	Construction is about to be completed. It will change the source of potable water supply for the city.
Potable water supply for the Valle Hermoso city (first stage).	CNA	Construction is about to be completed, it will change the source of potable water supply for the city.
Potable water and wastewater improvements in Laredo, Texas, Jefferson and Chacon.	EPA, TWDB, ciudad de Laredo	Finances have been granted for the planning and design of facilities for the improvement of potable water ans wastewater in Laredo, TX. Planning was completed, the design is at 95% progress.
Anzaldúas-Reynosa acquaduct to supply water to the city.	CNA	Construction completed.
Water storage and recovery study for Hueco Bolsón.	BOR	Winner of contract for the investigation of resupplying opportunities with excess water from Rio Grande.

Source: SEMARNAT/EPA Border Program XXI

4.1.9 Vegetation

The power plant sites are located within a geographical region known as the Northeastern Coastal Flatland, characterized by great plateaus and small hills of low elevation. The physiographic and climate characteristics promote the presence of plants belonging to the species xerophyle moor (Rzedowski, 1978), which is typical of the Mexican high-plains and distributed mainly along the dry, semiarid regions of Mexico.

Due to anthropogenic pressures over several years, the original vegetation has disappeared and has been replaced by agricultural cultivations of induced grasslands used for cattle raising, and by secondary plant communities that indicate disturbance, such as arvense and ruderal bushes.

Based on the information contained in the MIA studies prepared for the power plants, the area of study contains several types of vegetation communities: thorny forest (mezquital), vegetation associated with humid conditions, such as riparian plants, aquatic vegetation, and halophyte vegetation; grasslands, ruderal and arvense bushes, and agricultural cultivations.

During the site recognizance it was possible to verify the presence of arvense bushes, within the site where the power plants will be developed, as well as areas of agricultural cultivation, vegetation associated with humid conditions, and ruderal bushes in the neighboring properties. CIB reported the presence of 8 arvense bush species within the property site and registered a total of 137 species of vascular plants.

Following is a description of the vegetation communities reported within the area of study.

Mesquite or thorny forest

This community is found at the edges of roads and toward the region of canals, where it occurs in more density and is mixed with riparian vegetation It is found in three strata: arboreal, bush, and herbaceous.

The arboreal stratum reaches average heights of 5 m. and is composed mainly of *Prosopis glandulosa var. Glandulosa* (mezquite) and by *Acacia farnesiana* (huizaches). Among the less common species are *Celtis laevegata* and *Leucaena leucocephala.*

The predominant species of the bush stratum are *Celtis laevegata, Leucaena leucocephala.*and *Prosopis glandulosa.* Among the bushes companions were found *Acacia farnesiana, Opuntia engelmannii* and *Ehretia anacua.*

The herbaceous stratum is diverse and includes several species, among the predominant ones are: *Clematis drummondii* (climbing). Species less predominant include *Rivina humilis, Solanum elaeagnifolium, Setaria leucopila, Eupatorium azureum* and *Cynodon dactylon.*

Among the climbing plants are, *Cissus incisa* and *Cocculus diversifolius.*

Vegetation associated with humid conditions

This classification combines riparian as well as aquatic and halophyte vegetation. These are usually found in canals, other water bodies, and surrounding areas. Riparian vegetation is common along the edges of water bodies. The area of study includes a, arboreal stratum composed of species of 4 to 6 m in height, with *Celtis laevigata* (palo blanco) as the predominant species. Among the herbaceous species are *Cyperus odoratus, Phyla nodiflora* and *Aster subulatus.*

Aquatic and semi-aquatic vegetation is found within irrigation canals, it is very diverse and presents three different life styles: surface rooted hydrophytes such as *Typha domingensis* and *Scirpus robustus*; submerged rooted hydrophytes suc as *Hydrilla verticillata, Ruppia maritima* and *Eleocharis acicularis.* Floating hydrophytes are very rare and only the *Lemna aequinoctialis* species was reported.

The vegetation is restricted to flooded areas, with abundant salts in the ground, and along the edges of drains. The majority of the plants belonging to this community are herbaceous or low bushes. Among the species mentioned by the CIB are *Borrichia frutescens, Suaeda torreyana, Sesuvium sessile, Heliotropium curassavicum* and *Sporobolus pyramidatus.*

Grasslands

Some induced grasslands, primarily gramineous, are found within the area of study. The predominant species is *Pennisetum ciliare* (zacate buffel), followed by *Panicum antidotale* (panizo azul) and *Dichantium aristatum.*

Undergrowth

The area of study presents ruderal undergrowth along access roads and areas surrounding human communities, as well as arvense undergrowth around the cultivated areas. Among the ruderal species, which are perennial or annual herbaceous species, are: *Bidens pilosa, Cynodon dactylon* (gramilla) and *Helianthus annuus* (polocote). Woody ruderal plants such as *Leucaena leucocephala* were also identified.

In respect to arvense undergrowth, it has been observed that these are restricted to areas of cultivation, mainly along the edges of sites with greatest moisture content, and correspond to the herbaceous annual species such as *Helianthus annuus, Aster subulatus and Sorghum halepense.*

Cultivations

The main species for cultivation within the properties located in the area of study is sorghum (*Sorghum bicolor*) some corn (*Zea mays*) and, occasionally pumpkin (*Cucurbita pepo*), beans (*Phaseolus coccineus*) and okra (*Abelmoschus esculentus*).

Plants identified at the power plant sites include sorghum (*Sorghum bicolor*). At the time of the site reconnaissance, it was observed that there was only some undergrowth and secondary bush elements and riparian vegetation scattered in a bush stratum composed exclusively of *Baccharis neglecta,* a species characteristic of disturbed riparian areas. Within the herbaceous stratum, the predominant species is *Dichantium aristatum*, followed by *Helianthus annuus, Aster subulatus* and *Aabutilon trisulcatum.*

Photographs 14, 15 and 16 show partial views of existing vegetation at the project site, which present the herbaceous stratum and some secondary undergrowth.

While numerous species have been identified as potentially living in the project area, the disturbed nature of the site and its industrial setting limit the actual species present. No special status species were observed during the site visit.

4.1.10 Fauna

The information contained in this section was obtained from the MIA. Following is a description of fauna groups reported for the area of study.

The project sites are located in the zoographic province known as Low Atlantic Land (A), the sub province of the North Atlantic (NA), as divided by Edwards (1968). Based on the classification by Escalante et. al. (1993), the area of study is located in the Northeastern Coast province, where the bird fauna has 144 species.

Bibliography available for the area of study reports 109 vertebrate species, which includes: 57 birds, 38 mammals, 13 reptiles and one amphibian.

The CIB reports to have conducted field sampling within the area of study and identified 81 species of land vertebrates, among which 78.4% are birds, 14.5% are mammals, 6.0% are reptiles and 1.1% are amphibians.

Within the property where the power plant will be built, the Institute reports having identified 18 species, 77.8% of which are birds and 22.2% are mammals. Their presence is related to food availability, but no nests, dens, or reproduction areas were found within the property site. No amphibians or reptiles were found within the power plant site.

Among the birds reported within the plant site, as well as the area of study are the following species: *Ardea alba, Bubulcus ibis, Elanus leucurus, Circus cyaneus, Buteo albicaudatus, Falco sparverius, Colinus virginianus, Charadrius vociferus, Zenaida asiatica, Z. macroura, Columbina passerina, Dendroica coronata, Agelaius phoeniceus* and *Quiscalus mexicanus.*

Among the mammals found in the property site are *Didelphis virginiana, Neotoma micropus, Peromyscus leucopus* and *Silvxxilagus floridanus.*

Due to the degree of disturbance found in the area due to extensive agricultural activity and the presence of some population centers, the most abundant species identified are indicators of the mentioned disturbance, as in the case of the Mexican zanate (*Quiscalus mexicanus*), The white-winged dove and huilota (*Zenaida asiatica* and *Z. macroura*) and tordos (*Agelaius phoeniceus* and *Molothrus aeneus*).

Based on the lists provided by the NOM-ECOL-059-1994, none of the species found within the property site are under protection.

4.2 Ecosystem and Landscape

The predominant landscape of the property site is comprised of flat areas dedicated to irrigated land agriculture, with the RBII power plant as the main industrial structure. RBIII and RBIV power plants will be located adjacent to RBII and will have the same design and construction characteristics, therefore will be integrated to the current landscape conditions.

The area does not present unique or exceptional aesthetic qualities; it is not considered a tourist area, it contains no archeological sites, or areas of historic interest. However, the town of Anahuac has the San Isidro Labrador chapel, which was the first Catholic chapel built by the founders. The chapel was rebuilt and remodeled from 1996 to 1998 (Avila G, "Anahuac, yesterday and today").

The construction of RBIII and RBIV power plants will modify the land use at the site where the different equipment will be used and civil works will be developed, changing to industrial use even though, at the time of the site recognizance, there was no agricultural activities at the site and the terrain was covered with undergrowth and secondary vegetation. The landscape will be modified by the construction of the plants. The evaporation lagoon will also produce some changes to the current conditions and could act as an attraction for some birds.

4.3 Socioeconomic Environment

Based on information obtained from the Environmental Impact Manifest prepared by CIB, and from the Statistic Municipal Notebook for Valle Hermoso (INEGI, 1997), the existing social and economic conditions at the site and at the Valle Hermoso Municipality are described below.

4.3.1 Demography

The Valle Hermoso Municipality has a population of 58,292 distributed over 134 locations (INEGI, 2000) with a high degree of dispersion. Table 4.6 presents the population for the main locations in the Valle Hermoso and the Matamoros Municipalities located 15 km from the site.

Table 4.6 Population Distribution within the Study Area

Location	Total Population (1995)
Valle Hermoso Municipality	
Anáhuac	3,307
Empalme	2,103
Realito	3,413
Valle Hermoso	33,904
Subtotal	**42,727**
Matamoros Municipality	
Las Blancas	301
Revolución	484
Sandoval	1,272
Santa Adelaida	1,676
Vista Hermosa	571
Subtotal	**4,304**
Total	**47,031**

Source: Environmental Impact Manifest, Individual Modality. Thermal power plant, external energy producer RBIII (CT PEE Rio Bravo III). June 2001.

The nearest town to the project site is Anahuac with 3,307 inhabitants. The largest population center within the area of study is Valle Hermoso with 33,904 inhabitants, located at approximately 14 km from the project site.

Population growth for the Valle Hermoso Municipality has reached 20.58% during the last 20 years, with an annual percentage rate of 0.6%. This rate is below that state average, which is 1.4% and the national average that is 2.0%. Table 4.7 presents the population growth for the Valle Hermoso Municipality for the last 20 years.

Table 4.7 Population Growth for the Valle Hermoso Municipality

Year	Number of inhabitants	% of variation
1980	48,343	-
1990	51,306	6.12%
1995	55,286	7.75%
2000	58,292	5.43%

Source: Environmental impact manifest, individual modality. Thermal power plant, external energy producer Rio Bravo III (CT PEE Río Bravo III). June 2001

The population living in the municipality is native of the following States: 80.1% was born in the State of Tamaulipas, 28.1% in Nuevo Leon, 17.3% in San Luis Potosi, 14% was born in Coahuila, and 9.7% comes from Guanajuato. (INEGI, 1997).

4.3.2 Housing

As shown in Table 4.8, the area of study has 12,889 houses that are inhabited by 55,266 persons. The materials used are primarily block, brick or wood (97%), with roofs mainly of aluminum sheets and floors of concrete (INEGI, 1997).

Table 4.8 Dwellings in the Valle Hermoso Municipality

Location	Inhabited houses	Number of occupants per house
Valle Hermoso	9,063	4.3
Anáhuac	783	4.2
Realito	781	4.2
Empalme	216	4.1
I. Manuel Altamirano	211	3.9
Remaining locations	1,835	4.4
Total in municipality	12,899	4.3

Source: Municipal Statistics Notebook. Valle Hermoso, Tamaulipas State. INEGI, 1997

Basic services provided at the municipality are presented in Table 4.9

Table 4.9 Houses and Basic Public Services in Valle Hermoso

Public Service	Number of houses (1995)	Percentage of houses
Potable water	10,999	85%
Drainage	7,871	61%
Electricity	11,279	87%

Source: Municipal Statistics Notebook. Valle Hermoso, Tamaulipas State. INEGI, 1997

The service with greatest distribution in the municipality is electric energy, reaching approximately 87% of the houses. Drainage covers a much smaller sector of the municipality, with only 61% of the houses.

Population growth and age distribution impact housing requirements. In 1998 there were 409 marriages in the municipality, which combined with the immigrating process, generate a demand for 450 houses per year.

4.3.3 Communications and Transportation

The municipal statistic Notebook for Valle Hermoso, Tamaulipas, edited by INEGI in 1997, recorded a total of 114 km of highways, 72 km correspond to roads that connect into paved state roads and 42 km are rural dirt roads.

Telephone service covers 80% of the municipal population. It is estimated that the last two years the service distribution has increased 10%, which has permitted the incorporation of new communities to this service through rural and cellular phones.

The Valle Hermoso municipality is equipped with a telegraph office from which 1,044 telegrams and 3,728 bank drafts were sent during the year of 1998 (INEGI, 1998).

There are 33 postal offices in the municipality, two of which correspond to local administrations, three agencies, and 28 stamp stores located in small stores in the rural communities.

At 25 km from the site is an international airport for the City of Matamoros, Tamaulipas, which has flights to Mexico D.F., Monterrey, Veracruz and Tampico.

4.3.4 Services

The population of the Valle Hermoso municipality has potable water supply. In 1995, more than 85% of private houses were equipped with direct connection. Only 61% of all the houses are equipped with sewage connections during the same year.

In the rural region of the municipality the water for human consumption is supplied by water purifying companies, since the water extracted from the subsoil contains high concentrations of mineral salts, which makes it unsuitable for human consumption. There also are some watermills that are used for domestic purposes and animal consumption.

In 1995, almost 90% of the private houses in Valle Hermoso were equipped with electricity.

For the collection and disposal of trash there is an open-air disposal area at approximately 7 km west from Valle Hermoso where solid wastes are gathered and burnt.

4.3.5 Health and Social Security

Health services for the Valle Hermoso has a capacity to serve 32,292 walk-ins, which represents 63% of the municipal population. During 1995, 64,126 patients were attended by IMSS, ISSSTE, PEMEX Medical Services, SM, IMSS – Solidarity, SSA, DIF and the Health Secretariat (INEGI, 1996).

The municipality has a total of 39 medical units, four of which are part of social security institutions, and 32 belong to social assistance institutions. Additionally, there are three units for general hospitalization, one from IMSS, one from ISSSTE and one from SSA. These units serve 78% of the populations.

First aid clinics are part of the IMSS, with a capacity to attend 16,864 walk-ins, the ISSSTE with capacity to attend 2,938 walk-ins, and the PEMEX Regional Hospital and Military Health Services with unspecified capacity. Second degree care facilities include the IMSS-Solidarity social assistance institution, SSA, DIF and the Health Secretariat.

This health services are considered enough for cover first aid and emergency response during construction and operation of the power plants, but in case of critical accidents, the personnel can be quickly transported to Matamoros or Reynosa, which are located less than one hour distance from the plant.

The main causes of death are heart disease (19.4%), which is higher than the national average which is 15.6%. An important indicator for the region is the number of doctors, which are 1.09 for each 1000 inhabitants (INEGI, 1998).

4.3.6 Education

During the school cycle 96/97 in the Valle Hermoso municipality, 95.52% of the children from 6 to 14 years old attended school. The average school age in 1995 was 7.8 years old. In general terms, it is estimated that 93.5% of the inhabitants have some level of education, while the remaining 6.5% are illiterate (INEGI, 1998).

Between 1994 and 1995 the municipality had 29 preschool facilities, with 1,934 students. There were 58 elementary school facilities with 8,263 students, and a staff of 314 teachers (INEGI, 1996).

During the 94-95 school year there were ten Junior High school facilities with 2,507 students and 141 teachers (INEGI, 1996). Currently the municipality cannot meet the demands for high-school education in the rural areas, which forced the students to attend school at the municipality capital.

In 1996 the Valle Hermoso municipality had four high-school facilities that provided education for 1,201, with 109 professors. An CETIS facility is also available for high-school education for 135 students with 12 teachers. (INEGI, 1996).

The municipality does not have facilities for higher education and therefore, any student seeking a university degree must attend school in another municipality, such as Reynosa, Matamoros, Rio Bravo or Ciudad Victoria (INEGI, 1992). However, according with the Director of the Valle Hermoso High School, for the beginning of 2002-2003 period this facility will be integrated and will operate as Faculty of the University of Tamaulipas (UAT); therefore would be the first University in the Valle Hermoso municipality. In addition, there are five facilities that provide job training; during the 94-95 school cycle there were 1,282 students with 34 teachers.

There is a multiple education center in the municipality, which serves 66 students with 7 teachers. Additionally, in the Matamoros municipality there are 11 special education centers attended by 1,143 students and taught by 70 teachers.

4.3.7 Cultural Aspects

In the Valle Hermoso Municipality there are two social centers in which folkloric and regional dances are practiced. Also, there are two movie theaters in operation. In general, the way of life reflects a cultural activity focused on rural life, with a tendency to become more urban through U.S.-Mexico influence due to its proximity to the border. There are no ethnic groups within the region.

4.3.8 Economic Aspects

a) Agriculture

The area of study and surrounding areas are located within the 025 Irrigation District which is part of the Rural Development District # 156 called "Control". The main crops, in order of importance based on surface and levels of production are: sorghum, corn, cotton, and vegetables.

The Municipality of Valle Hermoso has 82,967.80 Ha surface, 70,025.40 Ha of this area are dedicated to agriculture activities with 55,435 Ha with irrigation. The 025 Irrigation District has 14,182 users in total, with a registered irrigation surface of 208,447 ha divided in four units of hydraulic operation. Water used on this system is provided by the "Falcon" International Dam, located above the Rio Bravo river.

b) Cattle raising

There is extensive cattle raising in the Valle Hermoso municipality, which is used for self-consumption. The cattle farms include bovine, porcine, ovine, goats and equine livestock, as well as bird farms. The Rural Development District # 156 also has extensive cattle raising, covering an area of 116,645 has. where porcine, birds, ovine, bovine, goats and equines livestock.

Based on the Economic Information Bank of the INEGI, (http://www.inegi.gob.mx/difusion/espanol/fbie.html) it was observed that, the average participation of cattle raising and agriculture in comparison with other economic activities in the State has decreased in Tamaulipas from 8.41% for the year 1993 to 5.24% for the year 2000.

c) Industry

The area of study has industrial activities for manufacturing and extraction. The extracting industry represented 2.10% of the economic activities in Tamaulipas for the year 2000 (along with energy production and potable water), Petróleos Mexicanos explores and exploits natural gas. The nearest well to the site is located at 6 km southeast, which produces natural gas. Construction material banks produce mainly lime, river sand and gravel.

In the area of study, the manufacturing industry has 20 assembly plants with different production, among these are: automobile part assembly lines, textile and welding industry. In general, the manufacturing industry in Tamaulipas has presented an average sustained growth of 21.9% from 1993 to 2000, which represents 20.89% of the economic activity in the State. The predominant industrial activity in the Tamaulipas State is metal production, machinery and equipment. This activity is represented by 48.31% (average 1993-2000) of the manufacturing industry in the state.

The industrial sector least represented in the state of Tamaulipas is timber (exploitation and production), with an average active participation of 0.92% of the manufacturing industry in the state during the years 1993 - 2000.

Since 2002, the electricity generation is an additional industrial activity within the municipality with the operation of the 495 MW capacity RBII power plant.

d) Internal state product

The internal state product increased exponentially from $32,267,729,000 pesos for the year 1993 to $154,232,378,000 for the year 2000. The manufacturing industry, which represents around 20% of the total economic activity in the State, increasing production exponentially and parallel to the gross internal state product from $6,024,908,000 pesos for the year 1993 to $33,034,241,000 pesos for the year 2000.

The average participation of the Tamaulipas State in the total national economic activity varied 3% for the year 1993 until the year 2000.

According the project characteristics, no significant immigration is expected to attend the job requirements for the power plants, therefore a significant increase of public services provided by the municipality is not expected. The main increase could be expected in communications as phone lines, fax and mail and commercial services as house rental, food, etc. The potential demand increase of this services represents a growth opportunity for the municipality inhabitants.

5.0 ENVIRONMENTAL AND SOCIAL IMPACTS

The identification of environmental and social impacts requires an assessment of the physical, biologic and socioeconomic environment and its relation to the projects. An analysis of these aspects and their interactions allows the identification of the beneficial or adverse impacts resulting from the construction and operation of the power plant projects.

This chapter presents the identification and description of the potential environmental impacts for each stage of the projects.

A Simple List was developed that included each project activity and the associated environmental factors, along with a modified Leopold matrix for project-environment interaction (Leopold 1971). This method was the basis for the identification and assessment of the environmental impacts.

5.1 Simple List

Using two tables, the Simple List technique facilitates the identification and analysis of the environmental components that could be related or altered as a consequence of any project activity. The first table includes environmental factors that could be impacted, and the second one refers to the different activities of the projects. The analysis and identification process is conducted by experienced professionals (geologists, biologists, environmental specialists, engineers, and chemists, among others).

It is important to point out that the project activities and environmental factors identified by this technique are used to develop the Leopold Matrix.

Table 5.1 presents the components of each environmental factor that could present modification or alterations (positive or negative) due to the activities that will be conducted throughout the development of the projects. Table 5.2 presents project activities that could cause alterations during the different stages of the projects.

Table 5.1 Environmental Factors and Components

Factor	Component
Air	Air Quality Visibility (suspended particles)
Noise	Noise level Vibrations
Soil	Physio-chemical characteristics Sedimentation-erosion process Current use
Surface hydrology	Water quality Water use Drainage patterns (runoff)
Groundwater hydrology	Water Quality Water use Flow direction
Vegetation	Abundance Protected species
Fauna	Abundance Protected species
Landscape	Scenic views Landscape composition
Socioeconomics	Employment Services Economic activities Education and health Development programs

Table 5.2 Power Plant Activities

Stage	Activities
Construction	– Personnel hiring – Material and equipment transportation – Machinery, vehicle, and equipment use – Vegetation removal – Excavation, foundation, and drainage – Landfill, leveling, and compacting – Civil work – Equipment assembly – Waste generation – Water supply – Testing and start-up
Operation and maintenance	– Personnel hiring – Fuel supply – Water supply – Power generation – Wastewater treatment – Waste generation – Auxiliary services
Site abandonment	– Equipment dismantling – Machinery and vehicle use – Waste generation

5.2 Project Interaction Matrix – Environment (Modified Leopold Matrix)

The environmental impact assessment was performed using a tested method known as the Leopold Matrix, which was modified to adapt it to the project characteristics. This Matrix was developed using the results of the simple listing technique previously described.

This method allows for the simultaneous evaluation of several work activities related to the different environmental components at the project site. The resulting interactions can then be adequately determined and through them the most significant environmental impacts can be identified. In other words, the most significant environmental impacts can be identified through an interaction analysis and evaluation criteria, and a qualitative value scale can be assigned.

5.2.1 Technical Description and Evaluation Criteria

The technique consists of correlating job activities (columns), with the different environmental factors and components (rows). Then each of the interactions is described based on the following criteria:

1. Impact nature:

   The project activity is analyzed as to whether it deteriorates or improves environmental factors as follows:

   Beneficial: Modification that generates improvements or advantages to the quality and integrity of the evaluated environmental factor.[2]

   Adverse: Modification that generates deterioration or damages the quality and integrity of the evaluated environmental factor .[1]

2. Impact duration:

   The duration of the effect caused by the project activity is evaluated based on the following criteria:

   Temporary: The impact effect remains while the project activity is in effect.

   Prolonged: The impact effect lasts longer than the activity generating it (1-5 years).

   Permanent: The impact effect remains on the affected environmental component for a period longer than 5 years.

[2] Wathern, Peter (1988)-Environmental Impact Assessment / Theory and Practice Unwin Hyman, London.

3. Extension:

   Refers to the quantity affected (volume, surface area, length, among others) in relation to the environment.

   Localized: The effect is limited to the point at which the activity is conducted, up to the projects and auxiliary activity perimeter.

   Local: The effect is evident between the projects and auxiliary equipment perimeter up to a 5 km radius.

   Regional: The effect is evident outside the 5 km radius.

4. Reversibility

   Refers to the recovery potential of the affected environmental component, to the degree that the conditions return to their original state, prior to activity initiation (without any subsequent intervention).

   Reversible: Short term (less than 1 year)
   Medium term (from 2 to 5 years)
   Long term (more than 5 years)

   Irreversible: Non-reversible modification

5. Importance of affected component

   Determines the importance of the component of the effected environmental factor within the area of study (quality, abundance, economic value, availability, Official Mexican Standards applicable). Based on these conditions, the following categories are assigned:

   Relevant: The environmental component is key, and directly effects the functioning of the system, and has a strong interaction with the project activities.

   Not relevant: When the environmental component is not key, does not directly effect the functioning of the system, and does not have a strong interaction with the project activities.

5.2.2 Description of the Development of the Interaction Matrix

1. The rows of the matrix indicate environmental factors and their components, which were obtained through the Simple List.

2. The columns include the activities of the projects specified by project stage of the Simple List.

3. To determine an interaction between the environmental component and the activity, the table is marked as follows:

    a) Impact nature: each marked box received a (-) negative sign for adverse impacts, and a positive (+) sign, for a beneficial impact.
    b) Duration: three gray tones were used: light gray for temporary impacts, medium gray for prolonged impacts, and dark gray for permanent impacts.
    c) Extension: The boxes with (*) represent a localized impact, with (**) a local impact, and (***) a regional impact.
    d) Reversibility: a letter I is used only for irreversible impacts.
    e) Importance of affected component: R was used for relevant and NR for not relevant.

5.3 Sorted Matrix

Once the Leopold modified matrix has been developed and the results analyzed, a sorted matrix is built, in which certain columns (project activity) and the rows (environmental component) are eliminated.

This matrix does not present environmental factors determined as Not Relevant due to site location, or alterations prior to project activity, or when the impact of the activities does not directly effect the evaluated factor.

5.3.1 Impact Qualification (Significance)

Based on the values of the criteria described in section 4.2.1., a evaluation of each impact in the sorted matrix was performed. The impact qualification was assigned according to the following values:

Not significant: Short-term impacts, localized, and of minimum magnitude.

Small significance: Medium-term impacts, of local character and minimum to maximum magnitude.

Significant: Long-term impacts, of regional character, of maximum magnitude.

Minimum magnitude is when the environmental factor or component is not significantly changed, or the applicable permissible limits were not exceeded.

Maximum magnitude is when an environmental factor or component is significantly changed, or exceed the applicable permissible limits.

Impact qualification also takes into consideration the relevance or non-relevance of the affected environmental component.

5.3.2 Procedure Description for the Development of the Sorted Matrix

In the same way that the project-environment interaction matrix was developed, the columns are for project activities and the rows are for environmental component factors.

The nature of the impact is marked as adverse (-), beneficial (+).

Impact qualification is indicated with a numeric scale according to the following three values:

Not significant	1
Small significance	2
Significant	3

Each of the impacts is identified as mitigable, preventable, compensable, or self-mitigable

Mitigable (M)	Impact that can be addressed with less than one mitigation measure
Not Mitigable (NM)	Impact that can not be mitigated
Preventable (P)	Impact with preventive measures to avoid generating the negative impact
Compensable (C)	Impact is compensated by another activity
Self-mitigable (AM)	Impact that looses its effect over a period of less than one year

5.4 Results

Table 5.3 presents the modified Leopold matrix for both RBIII and RBIV, which includes three stages of the projects: construction, operation and maintenance, and site abandonment. These stages include 22 activities that are related to 9 site environment factors and 24 components. Once the interaction between project stage/activity and environment factor/component is identified and determined, the modified interaction matrix was qualified based on the criteria described in section 4.2.1, the potential environmental factors, indicating at the end of the environmental impacts whether each is considered a (R) relevant factor or a (NR) non-relevant factor.

Table 5.4 present the sorted matrix obtained by eliminating the factors to activities that do not present interrelation and the factors considered Not Relevant. The evaluation of the sorted matrix was performed based on the criteria described in section 5.3.1.

In general, during the stages of the projects (construction, operation, and abandonment), the impacts identified will be prevented or mitigated through the application of measures recommended by different international organizations, criteria established in regulations and Official Mexican Standards, as well as the application of good engineering practice by the construction contractor.

Table 5.3 RBIII and RBIV Impacts Evaluation

LEOPOLD MODIFIED MATRIX		Construction Stage											Operations & Maintenance Stage							Abandonment Stage			R / NR
FACTOR	COMPONENT	Personnel hiring	Material & equip. transportation	Machinery, vehicle, and equipment use	Vegetation removal	Excavtn, foundtn & drainage	Landfill, leveling and compacting	Civil work	Equipment assembly	Waste generation	Water supply (1)	Testing & Start-up	Personnel hiring	Fuel supply (2)	Water supply	Power generation	Wastewater treatment	Waste generation	Auxiliary Services	Equipment dismantling	Machinery & vehicle use	Waste generation	Factor Importance
Air	Air quality		-**	-**	-*	-**	-**		-*			-**				-***				-*	-*		R
	Visibility (suspended particles)		-**	-*		-*	-*		-*		-*	-*								-*	-*		NR
Noise	Noise level		-*	-**		-**	-**		-*			-**			-*	-*				-*	-*		R
	Vibrations		-*	-*		-**	-*		-*			-*				-*				-*	-*		NR
Soil	Physio-chemical characteristics									-*								-*				-*	R
	Sedimentation-erosion process				-*	-*																	NR
	Current use				-*			-*	-*														R
Surface Hydrology	Water Quality																						NR
	Water Use																						NR
	Drainage pattern (runoff)					-*		-*															R
Groundwater Hydrology	Water Quality														+***								NR
	Water Use														-***								R
	Flow direction														-**								NR
Vegetation	Abundance				-*																		NR
	Protected species																						NR
Fauna	Abundance			-*	-*																		NR
	Protected species																						NR
Landscape	Scenic views				-*				-**														NR
	Landscape composition				-*				-**														NR
Socioeconomy	Employment	+***	+**										+***							+***			R
	Services	+***	+**								+***		+***		+***	+***	+**	-*		+***		-*	R
	Economic activities	+***	+**										+***			+***							R
	Education and health																						R
	Development programs															+***							R

Symbols

Character	
Adverse	-
Beneficial	+
Duration	
Temporary	
Prolonged	
Permanent	
Extension	
Localized	*
Local	**
Regional	***
Importance	
Relevant	R
Not Relevant	NR

(1)Water supply during site-preparation and construction will be provided through tank trucks for sanitary service and in bottles for human consumption.
(2)Fuel supply will not imply an additional impact since the base fuel and the back-up fuel (both natural gas) will be obtained directly from the gas pipeline, which is independent from the RBIII and RBIV projects and the impacts generated by it will be evaluated separately.

Table 5.4 Sorted Matrix

SORTED MATRIX		Construction Stage												Operations & Maintenance Stage							Abandonment Stage		
FACTOR	COMPONENT	Personnel hiring	Material & equip transportation	Vehicle, machinery, and equipment use	Vegetation removal	Excavatn, foundtn & drainage	Landfill, leveling, and compacting	Waste generation	Civil work	Equipment assembly	Waste generation	Water supply	Testing & start-up	Personnel hiring	Fuel supply	Water supply	Power generation	Wastewater treatment	Waste generation	Auxiliary Services	Equipment dismantling	Machinery & vehicle use	Waste generation
Air	Air quality		-2M	-2M	-2M	-2M	-1M						-2M				-3M				-1M	-1M	
Noise	Noise level		-1M	-3M		-2M				-1M			-2M			-1M	-2M				-2M	-2M	
Soil	Physio-chemical characteristics							-2P	-1P		-2P								-2P				-2P
	Current use				-1C				-1C									-3C					
Surface hydrology	Drainage (runoff)				-1C	-1C	-1C		-2P														
Socioeconomy	Employment	+3															+3				+2		
	Services	+3									+2	+2				+2							+2
	Economic activities											+2					+3		+2				
	Education and health																						
	Development programs							-2M	+2														

5.5 Description of Environmental Factor Impacts and Mitigating Measures

The power plant projects will be located in an area where the environment will be affected by the development of the activities described in chapter 3.0. However, the construction, operation, and maintenance of the power plants will not generate significant adverse impacts since the environment had been previously modified by other activities in the region and does not present specific characteristics that require protection. The company plans to implement preventive, control and mitigation measures to minimize potential impacts.

This section presents an assessment of the environmental factors as they relate to the impacts generated by the project activities with a description of the impact and the preventive and corrective measures that are applicable based on the project characteristics.

5.5.1 Air Quality

Construction Stage

Air quality and visibility could be affected adversely by the generation of dust and smoke resulting from the different activities during site-preparation and construction, such as vegetation removal, leveling, compacting, vehicle traffic, machinery and equipment use, and test operations, among others. However, these are not considered relevant since the power plants will be located in a semi-desert area, with little vegetation, and where the presence of suspended particles is naturally high and the proposed preventive and mitigation measures will be sufficient to reduce the impact.

The following mitigation measures will be implemented:

- An irrigation program will be established within the work areas and access roads prior to machinery activity.

- Trucks transporting dirt materials will have canvas covering to prevent material dispersion during transportation. All material obtained from excavation activities will be used, as much as possible, during landfill and leveling activities at the site.

- Particle dispersion due to vehicle traffic will be minimized due to access road paving at the power plant.

- Vehicles used for the transportation of equipment and materials, as well as internal combustion equipment will meet the following Official Mexican Standards (NOM), as well as manufacturer specifications.

  – NOM-041-ECOL-1996 Maximum permissible levels of contaminating gases from the exhaust of gasoline-using vehicles.
  – NOM-042-ECOL-1993 Maximum permissible levels of unburned hydrocarbons, carbon monoxide, and nitrogen oxides from new engines, as well as evaporated hydrocarbons.

- NOM-044-ECOL-1993 Maximum permissible levels of hydrocarbons, carbon monoxide, and nitrogen oxides, suspended particles, smoke opaqueness from diesel-running vehicles.
- NOM-045-ECOL-1996 Maximum permissible levels for smoke opaqueness from the exhaust of vehicles using diesel.

Operation Stage: In-Stack Pollutant Concentrations

The combined cycle, natural gas power plants were designed so that during operation they will generate minimal concentrations of atmospheric contaminants such as nitrogen oxides (Nox) for a complex of plants of this magnitude. The generation of other contaminants, such as sulfur dioxide (SO_2), total suspended particles (TSP) and particulate matter less than 10 microns in diameter (PM_{10}) will also be reduced per design characteristics.

The power plants will be equipped with two gas fired combustion turbines, with low NOx burners. This combustion system allows the plant to comply with maximum permissible limits for emissions specified by NOM-085-ECOL-1994.

The design includes the construction of two stacks for the release of combustion gases with a height of 35 m for a more adequate dispersion of contaminants and a reduction in air quality impacts.

Emission measuring equipment will be installed in the stack, in accordance with NOM-085-ECOL-1994 specifications. The devices will be used to verify that contaminant emission does not exceed maximum permissible limits established by the same standard.

The World Bank has "in-stack" guidelines for PM_{10}, nitrogen oxides (NO_X), and SO_2 which apply to the combustion turbines at the proposed plants. There are also Mexican in-stack standards for NO_x which must be met. Table 5.5 shows a comparison of the in-stack concentration of PM_{10}, SO_2, and NO_X during natural gas combustion to the World Bank Guidelines and the Mexican standards. This table shows compliance with all applicable guidelines and standards.

The in-stack NO_x emission levels of 40 ppmvd is about 67% of the World Bank Guideline value and only 28% of the Mexican standard. In fact, the NO_x level for each of the combustion turbines for the RBIII and RBIV plants meets the 40 ppmvd level required in heavily polluted areas of Mexico, such as Mexico City. The in-stack PM emission rate of 40 mg/Nm^3 is about 80% of the World Bank Guideline value of 50 mg/Nm^3. There is no PM_{10} standard for natural gas fired turbines for Mexico. For SO_2, the in-stack emissions, using natural gas, are far below the World Bank Guideline values for both tons per day and mg/Nm^3. Again, for SO_2 there are no Mexican standards for natural gas firing.

Table 5.5 In-Stack Pollutant Concentrations Compared to World Bank In-Stack Guidelines and Mexican In-Stack Standards

Pollutant	In-Stack Concentration	Mexican Standard	World Bank Guideline
PM_{10}	40 mg/Nm^3	NA	50 mg/Nm^3
NO_X	82.1 mg/Nm^3 (40.0 ppm)	290 mg/Nm^3 (141 ppm)	125 mg/Nm^3 (61 ppm)
SO_2	2.7 mg/Nm^3 0.3 mt/day	NA	2,000 mg/Nm^3 150 mt/day

* Conversion of parts per million to milligrams per normal cubic meter conversions (and reverse) were made using the Conversion Chart in Annex E of the World Bank Thermal Power - Guidelines for New Plants. All values are expressed at standard conditions, dry basis, 15% oxygen.

NA: Not Applicable

Operation Phase: Ambient Air Quality

An Air Quality Impacts Analysis was conducted to evaluate potential ambient air quality impacts related to the operation of three adjacent power plants (RBII, RBIII, and RBIV). Applicable Mexico Standards and World Bank Guidelines for ambient air quality (fence line) were evaluated.

The site and the surrounding area are relatively flat and located at an elevation near sea level. EDFI's power plant projects include three power plants. RBII is a natural gas combined cycle power plant with the capability to operate on diesel fuel as a backup for emergencies only and it is currently operational. RBIII and RBIV have identical sets of natural gas fired combustion turbines. Currently, RBIII is under construction, while RBIV is in the detail engineering stage. Each of the power plant sites includes two turbine trains, each with a Heat Recovery Steam Generator (HRSG).

An air dispersion model was used to evaluate project impacts upon ambient air quality. These modeling results were compared to Mexican Official Standards and World Bank Guidelines.

The maximum modeled NO_2, SO_2, CO, and PM impacts due to the power plant operations are compared to the Mexico Standards and the World Bank ambient air quality guidelines (Table 5.6). The maximum concentrations predicted using the five-year meteorological data were selected for this comparison. Table 5.6 also includes the maximum impacts along the Texas border. Since there are currently no longer-term, reliable background ambient air quality data available, the RBII plant was modeled and assumed to be representative of background concentrations.

Three different scenarios were evaluated for the power plant projects:

1. RBIII and RBIV firing natural gas;
2. RBII firing diesel fuel with RBIII and RBIV firing natural gas (emergency situation only); and
3. RBII, RBIII and RBIV firing natural gas.

RBII turbines normally fire gas; and diesel fuel is only used as a backup, emergency fuel. Therefore, annual impacts for diesel-firing at RBII are not applicable and are not provided in Table 5.6. A detailed description of the modeling is provided in the Air Quality Impact Analysis Report presented in the Appendix C.

Table 5.6 shows that the operations of the RBIII and RBIV plants, by themselves, are in compliance with all applicable Mexican standards and World Bank Guidelines for ambient air quality for NO_x, SO_2, PM_{10}, TSP or PM_{10}, and CO for all averaging periods. Table 5.6 also shows compliance with all applicable standards and guidelines when all three plants (RBII, RBIII and RBIV) are operational (including RBII on diesel or natural gas firing).

The ambient air quality impacts at the Texas-Mexico border are minimal, and these impacts are below the USEPA significance levels for all applicable pollutants (and averaging periods) for RBIII and RBIV, except for the 24-hour PM_{10}. In the case of PM_{10} the combined impacts from RBIII and RBIV are 5.2 ug/m^3 and the significance level is 5.0 ug/m^3.

The RB II, III and IV power plants will use one of the most energy efficient combined cycle technology (501F) with thermal generating efficiency of 50% (HHV) and 55% (LHV). The three plants are expected to generate at annual capacity factor of 70%, producing electricity of 9,140 GWh per year per plant, consuming 18.8 million MMBtu per year (RB II), 18.8 million MMBtu per year (RB III) and 19.0 million MMBtu per year (RB IV) respectively. Based on these assumptions, the three plants are expected to emit 1.1 million t-CO2 per year (RB II), 1.1 million t-CO2 per year (RB III) and 1.12 million t-CO2 per year (RB IV). The average CO2 emission per unit of electricity generated by RB II, III and IV is estimated to be 360 g-CO2 per kWh, which is 35% lower than the Mexican national average of 550 g-CO2 per kWh (1998).

Table 5.6 Comparison of Maximum Impacts to Mexico Standards and World Bank Air Quality Guidelines [1]

Unit	Pollutant	Averaging Period	Maximum Impact ($\mu g/m^3$)	Year	Maximum Impact At TX Border ($\mu g/m^3$)	Year	World Bank Guideline ($\mu g/m^3$)	Mexico Standard ($\mu g/m^3$)
RBIII & RBIV Gas	NO_x	Annual[2]	8.10	1990	0.59	1990	100	NA
RBII, RBIII & RBIV Gas			11.29	1985	0.99	1990		
		24-hr [3]					150	NA
RBIII & RBIV as			53.31	1985	2.57	1991		
RBII, RBIII & RBIV Gas			60.79	1985	4.19	1991		
RBII Oil, RBIII & RBIV Gas			98.79	1985	5.22	1991		
		1-hr [4]					NA	395 (0.21 ppm)
RBIII & RBIV Gas			227.94	1990	188.52	1991		
RBII, RBIII & RBIV Gas			241.59	1986	191.16	1991		
RBII Oil, RBIII & RBIV			277.69	1986	192.82	1991		
	CO	8-hr					NA	12,597 (11 ppm)
RBIII & RBIV Gas			46.31	1990	2.57	1986		
RBII, RBIII & RBIV Gas			46.31	1990	3.86	1986		
RBII Oil, RBIII & RBIV Gas			153.95	1985	7.09	1986		
	SO_2	Annual					80	78 (0.03 ppm)
RBIII & RBIV Gas			0.38	1990	0.03	1990		
RBII, RBIII & RBIV Gas			0.41	1990	0.04	1990		
		24-hr					150	340 (0.13 ppm)
RBIII & RBIV Gas			4.63	1985	0.22	1991		
RBII, RBIII & RBIV Gas			4.63	1985	0.33	1991		
RBII Oil, RBIII & RBIV Gas			90.3	1985	2.5	1991		
	PM^5 and PM_{10}	Annual					50(PM_{10}) 80(PM)	50
RBIII & RBIV Gas			5.88	1990	0.43	1990		
RBII, RBIII & RBIV Gas			6.38	1990	0.65	1990		
		24-hr					150(PM_{10}) 230(PM)	150
RBIII & RBIV Gas			72.55	1985	3.50	1991		
RBII, RBIII & RBIV Gas			72.55	1985	5.17	1991		
RBII Oil, RBIII & RBIV Gas			108.25	1985	6.39	1991		

NA: Not Applicable
1.- These results do not consider any other background sources, except RBII.
2.- Annual NOx impacts are represented as NO_2 impacts using a 0.75 correction factor (USEPA).
3.- 24-hour NOx impacts are represented as NO_2 impacts using a 0.4 correction factor (New Mexico)
4.- 1-hour NOx impacts are represented as NO_2 impacts applying the Ozone Limiting Method.
5.- PM and PM_{10}impacts are assumed to be the same.

5.5.2 Noise

As previously discussed, the background noise levels are elevated due to traffic on the existing highway. The proposed power plants will not significantly increase the ambient noise levels at sensitive receptors.

The vibration environmental component was considered as Not Relevant because, although it is affected by vehicle traffic and equipment and machinery use throughout the plant operation, there are no environmental or human elements near the power plants that could be affected by the generation of vibrations.

The noise level environmental component was considered as Relevant because there is a significant increase in the noise generated during construction and operation phases.

The transportation and use of vehicles, machinery, and equipment during site-preparation and construction will generate noise of negative character. The impacts are considered temporary and reversible, with local extension and not significant since there are no potential receptors that could be affected by the noise levels generated at the plant site.

The following mitigation measures will be implemented:

- Vehicles will operate with muffled exhausts and at low speeds while on property access roads and within the plant site. Vehicles will operate in compliance with NOM-080-ECOL-1994 that establishes measurement methods and the maximum permissible limits for noise emission from motor vehicles, motorcycles and motor tricycles.

- Within the plant site, compliance with NOM-011-STPS-1993 will be verified, which establishes safety and hygiene conditions for work centers generating noise.

Turbine and auxiliary equipment operation during tests and plant operation will increase noise levels that will be permanent. The impact is considered relevant, negative, not reversible, with local extension, and not significant due to the lack of potential receptors in the surrounding areas.

Currently, there are no receptors located near the plant site, the nearest inhabitants are at approximately 1 km from the project site. These are adjacent to the highway that generates background noise through vehicular traffic. The noise generated by the power plant will not be perceived by these receptors due to the distance and the existing background noise in the area and will thus be in compliance with the residential limits established by the World Bank Guidelines.

The noise levels measured at the each of the plant's boundaries (RBII, III and IV) will be in compliance with the 68 dBA daytime and 65 dBA nighttime as established in NOM-081-ECOL-1994 since the standard considers only the noise levels from within the property boundaries subtracting the background levels from the other two plants.

A noise study conducted for RBII in April 23, 2002 indicates that noise levels detected in the south limit of the plant, adjacent to the RBIII site, were 55.5 dB(A). It is expected that RBIII and RBIV will each generate the same noise levels as RBII. The noise level will increase 3 dB(A) for RBIII and 1.8 dB(A) for RBIV[3]. Thus the cumulative impact is approximately calculated to be 60.3 dB(A) which is below the noise emission levels established by NOM-081-ECOL-1994.

[3] PEMEX, 1986. Manual para la evaluación y control de ruido (M.N. 04.0.01).

The following mitigation measures will be implemented:

- Equipment installed will ensure the use of the noise mitigation devices in accordance with manufacturer design specifications (these are modern state of the art equipment).
- Compliance with NOM-011-STPS-1993 will be verified inside the work areas. This standard specified the safety and hygiene conditions for work centers where noise is generated. Ear and hearing protectors will be provided for all individuals in critical areas that are exposed to noise.
- The power plants will operate in compliance with NOM-081-ECOL-1994, which establishes the maximum permissible limits for noise emission from fixed sources, as well as the measuring methods.
- A noise monitoring program/ compliance procedure will be established at the property perimeter in accordance with the NOM-081-ECOL-1994 and World Bank Guidelines.

5.5.3 Geo-Morphological Features

At the project site there are no rock resources that could be used during the construction of the power plants, these will be purchased from local material banks. Therefore rock resources in the region will not be significantly affected by the plant activities. This impact is considered not relevant because the banks used are already authorized for this type of commercial exploitation.

During the site preparation and construction stages, it will be necessary to conduct land leveling and refill activities that will modify the natural topography. Access road conditioning, leveling and refill activities, ditch excavation and land compacting will also be conducted during the site-preparation and construction stages. The impact generated is considered negative, permanent, irreversible, and localized, although of small significance because the natural topography where the power plants will be located is completely flat and it will be slightly modified.

The following mitigation measures will be implemented:

- Whenever possible, the material obtained from excavations and vegetation removal will be used for landfill and leveling within the plant site, in accordance with NOM-003-RECNAT-1996, which establishes the procedures, criteria, and specification for virgin soil use, transportation and storage. The remaining material will be transported to sites authorized by municipal authorities for final disposal. The transportation and disposal procedures will be conducted in accordance with established standards and regulation.
- Materials generated from vegetation removal and excavations will not be stored in areas outside the project site or areas previously identified by the corresponding authorities.
- All the material purchased for land leveling, refill, and site preparation and access road construction will be obtained from authorized material banks. The job manager will keep copies of permits issued to companies exploiting the materials purchased.

5.5.4 Soil

The sedimentation-erosion component of the soil environmental factor is not considered relevant since the power plant sites are located within a semi-desert area void of protective vegetation and is therefore naturally subject to wind erosion. The power plant facilities with the revegetated areas will prevent further soil erosion in the area. The runoff coefficient in the area is less than 5%, which means that the rainfall and sediment transportation percentage is insignificant. The construction activities that could affect this component within will be conducted in a timely manner and therefore, the area characteristics will not be substantially modified.

The design of the power plant includes the re-vegetation with local species at some selected point within the property. This is considered a positive impact for the physio-chemical characteristics of the soil. No mitigation measures are applicable since the impact is considered beneficial.

The development of the projects will generate diverse conventional wastes such as: debris (construction waste), wood, paper, cardboard, glass, and metals; as well as domestic, sanitary and office waste. Special waste will be generated such as solvents, paint and paint containers, materials impregnated with oils and solvents, used oil from machinery and vehicles, among others. The potential contact of the soil with special wastes could produce alterations on the physio-chemical properties of the soil. The impact is considered negative, prolonged, reversible, localized, and of small significance since a Solid and Hazardous Waste Handling Program will be implemented to minimize potential soil contamination during normal operation conditions.

Access road construction and vegetation removal activities at the site, as well as civil work construction and the interconnection activities for the gas pipeline will modify the current land use, which is agricultural with semi-desert vegetation. This impact is considered negative, prolonged, irreversible, localized, and not significant since the authorized soil use is for industrial activities and only the current use will be modified. The land where the power plant will be established has not been used during the past few years because it was reserved for industrial use. Due to the characteristics of the impact and the current site conditions, no mitigation measures are considered necessary. However, vegetation removal activities, as well as access road construction and civil work will be limited to the areas within the power plant sites.

5.5.5 Surface Hydrological Features

Environmental components for surface hydrology related to water quality (suspended soils, sedimentary solids, and organic load), are considered as not relevant since wastewater will not be discharged during the site-preparation, construction, and operation of the power plants. Also, there are no natural water bodies within a 15 km radius, the nearest water body is an irrigation canal located at the western edge of the property site. However, there is a 2 m high barrier between the sites and an irrigation canal that prevents any runoff from reaching the canal and, as previously mentioned, the runoff coefficient is almost null. Therefore, the potential for contaminants or other materials to be carried by runoff into the mentioned water body is null. Also, it was observed through the vegetation surrounding the canal that it has been out of use for over one year. (see Photograph 9).

The environmental component related to the drainage pattern is considered as relevant due to vegetation removal during site-preparation, excavation, landfill, leveling, compacting, access road construction, as well as civil work conducted at the project site, all of which will create physical barriers and will modify the natural runoff patterns within the property site. The impact is considered negative, permanent, reversible, localized, and of small significance since it is a localized impact, there are no permanent or intermittent streams passing through the power plant sites that could be modified, the project area has low rainfall levels, and the terrain is flat.

The following mitigation measures will be implemented:

- Excavation or materials remaining from topsoil and vegetation removal will not be accumulated or stored in areas outside the project sites or in the path of natural runoff.

- Excavations and landfill activities for the installation of underground pipelines will be conducted avoiding the alteration of drainage patterns outside the project sites.

- Upon conclusion of site-preparation and project construction, areas used as temporary for materials will be restored to maintain original runoff patterns.

- Access road construction will include the installations of sewer and gutters, always attempting to maintain natural runoff patterns in the area.

- The design of the power plants includes the installation of drains capable to collect and transport rainwater to areas outside the property site. The drains will be installed verifying that natural drainage and runoff patterns are not modified.

5.5.6 Groundwater Hydrology

All the environmental components related to groundwater hydrology, such as water quality parameters, current use, and flow direction are not considered relevant because they will not be affected by the different stages of the construction and normal operation of the power plants. The groundwater hydrology is limited to Mexican territory and will therefore not impact international water resources.

Each power plant will be equipped with a well for the extraction of process water. Each well will have a depth between 90 and 250 m. The quality of the water from these deep aquifers renders it unsuitable for human consumption or for agricultural purposes. The project area is not considered suitable for potable water extraction due to the high mineral and salt content of the groundwater.

The shallow aquifers in the region (between 5 ~ 50 m) are reportedly not used for drinking water (local network) or irrigation activities (channels network) and will not be affected by the plant's water consumption. In addition, it is also anticipated that the depth of the aquifer will not be reduced, considering the annual rain, infiltration rate, mean annual evaporation, area of the aquifer and pumping extractions. The recharge capacity of the deep aquifer is estimated to be approximately 2,000 cubic meters per hour. Therefore, a total extraction of 157 cubic meters per hour (42 l/s) for RBII, III and IV is not expected to reduce the aquifer's level or affect water availability for other uses.

CNA has issued an authorization to pump a maximum of 13.5 l/s (425,736 m^3/year) in the main aquifer for RBII. Additionally, CNA has informed CFE through an official letter, for RBIII, that there is groundwater availability of 6,900,000 m^3/year in the area. This available amount is greater than the maximum total consumption of RBII, III and IV of 42 l/s (1,324,512 m^3/year).

The projects will use dry cooling to minimize water use. The use of dry cooling and a closed loop water cycle will result in no significant impacts on water quality. The primary wastewater stream will be blow down from the steam cycle, which will be sent to an evaporation lagoon for evaporation to avoid infiltrations into the subsoil or discharging into a water body.

5.5.7 Vegetation

Given the disturbed nature of the site and lack of any sensitive species, no significant impacts are anticipated on biological resources.

Vegetation removal activities of site-preparation will have an adverse impact on the topsoil species that are considered not relevant because during the period the land was used for agricultural purposes, the original vegetation was removed and the existing vegetation sprang up during the period the area was unused. Re-vegetation of areas not occupied by power plant facilities is considered a mitigation measure.

5.5.8 Fauna

As in the case of vegetation, fauna abundance will be impacted adversely during site preparation due to modifications to habitats. However, this impact will be localized. The revegetation activities mentioned above are considered to generate a localized compensatory and mitigation measure for the species in the area.

The following mitigation measures will be implemented:

- Vehicle, machinery, and equipment us will be limited to access roads and work areas during the site-preparation and construction stages.
- The project site will be revegetated with native species in the areas that allow the reestablishment of habitats for some fauna species.
- Internal procedures and regulations will be established to prevent employees from hunting or trapping fauna found in the surrounding areas.

The construction of evaporation lagoons for wastewater generated by the power plants will cause a unfavorable habitat for birds and other species. This activity generates a negative, permanent, reversible, regional, and significant impact on the fauna species that will be attracted to or trapped by the lagoons.

Systems will be installed to drive-away birds and prevent land species from accidentally falling into the lagoons as a mitigation measure.

5.5.9 Landscape

The components for scenic views and landscape components will be impacted adversely, with local extension by the removal of vegetation during site-preparation and civil work, and by equipment assembly during site construction. However, the landscape factor is considered not relevant since the sites was previously impacted by agricultural activities and the construction of RBII and the natural landscape is therefore already altered.

5.5.10 Socio-Economy

For the socio-economic factor, the cultural patterns and development programs and personnel education components are considered relevant even though these are not directly related to the power plant projects. These are influenced by the rest of the productive activities that are developed in the area.

The hiring component of the projects that requires general and specialized workers for the site-preparation, construction, operation and maintenance stages will use primarily local job applicants. Materials needed for the projects will be obtained, as much as possible, from regional providers, which will promote growth in goods and services commerce.

Economic activities in the project area will be affected in a beneficial manner since materials needed for the projects will be obtained, as much as possible, from regional providers, which will promote growth in good and services commerce. The impact is considered positive since it will increase the capital flow in the region.

The three thermal power plants will generate approximately 1,500 MW, which will increase the current levels of energy available to the country, thus promoting the installation of more industries and providers of goods and services. Power generation is indispensable for continued municipal and regional development, and for the growth in the economic activities and through them, the well being of the population in general.

Additionally, there are positive economic impacts within the Municipality from the taxes and fees paid by the power plant projects. The Municipal government has used these funds for public works and services, which have benefited the community as described below.

- Improvements in urban image with public lighting and landscaping of the median of the main street.
- Remodeling of the town's main square.

- Purchase of heavy equipment to be used in for maintenance of parks and gardens.
- Patching and paving of streets.
- The Colonia Agricola Anahuac has received an ambulance, a vehicle to transport the elderly and there are plans to supply a piece of equipment for agricultural purposes.

The development of the projects also gives the community additional indirect economic benefits. The Municipal President has reported that more business such as restaurants; retail stores, workshops, etc. have emerged since the operation of RBII. Three new hotels have been established in Valle Hermoso including a four star hotel. Several restaurants, which are visited by personnel and suppliers from RBII have been remodeled and expanded. Other direct benefits from the construction and operation of RBII are the leasing of homes for the personnel and hiring of service persons.

Quantitative and published measurements of the positive impacts were unavailable, however, an example of the income the projects pay to the Municipality through fees is the Construction License. The fees for of the Construction License are $8.00 pesos per square meter. For an 11-hectare site (110,000 m^2), the fees paid to the Municipality are $880,000 Pesos or approximately U.S. $88,000. Additionally, fees must be paid by the power plant facilities on an annual basis, which along with increase in commercial activities in the area as a secondary growth in business provides for considerable increase in municipal income. This provides for significant benefits to the local community for development and expansion of local services related to education, health and welfare of the community.

5.6 Impacts on the Border Region

The area of influence of the projects is limited to the Mexican side of the border region. Environmental impacts will be mitigated to prevent emissions to exceed accepted Mexican, World Bank and U.S. limits. The U.S. side of the border will not be impacted by any project activities and air quality; noise, water resources or biological resources will not be affected.

The power plant projects will not have any socioeconomic implications on the U.S. side of the border since all activities are limited to the Mexican side. These projects in particular will not face social or environmental opposition from the U.S. side as in the case of other power plant projects currently being developed in other border regions. The main differences between other power plant projects and RBIII and RBIV are listed below:

- RBIII and RBIV are not located on directly across a border town, the sites are located 25 km from the border.
- RBIII and RBIV are EPP projects selling 100% of the power generated to CFE. RBIII and RBIV will not export any power to the U.S.
- RBIII and RBIV will not build transmission lines into the U.S.
- CFE made the community aware of its bidding plans for the power plant complex where as in the Baja California region, different private companies are developing several power plant projects that are not linked to each other.

6.0 ANALYSIS OF ALTERNATIVES

This Chapter includes an assessment of the location and technology alternatives for the development of RBIII and RBIV power plants, comparing each alternative to the criteria established by the World Bank for this type of projects. Site location alternatives were obtained from the information presented in the MIA prepared by CFE for RBII. The technology alternatives that will be best suited for the projects were obtained from the *Libro de Anteproyecto* developed by CLR in accordance with the bid specifications for the projects by the CFE.

6.1 Site Location

The selection of the site for RBII, RBIII and RBIV was conducted by CFE, taking into consideration the technical specifications of the projects, as well as the geographic, environmental, and economic conditions of the region. The selected site was presented to the groups participating in the bidding process as an optional site for the location of the proposed projects. Once the winning bidder indicated that the selected site would be used for the power plant location, the land was purchased by CFE.

The method used by CFE for selecting the site location was developed in two stages:

1. Regional identification of areas of exclusion
2. Identification of potential sites

Once a region is chosen based on Electricity Market Studies, the region is submitted to a series of studies to determine which areas must be excluded based on specific geographic, economic and social aspects each area presents in which the installation of a power plant would not be feasible, such as:

- Mountainous areas
- Flood zones
- Areas with volcanic activity
- Areas with high seismic activity
- Areas under ecologic protection and restoration
- Urban centers
- Historic sites
- Areas with special landscaping, tourist attraction.

CFE later conducted site visits and cartographic and bibliographic reviews to determine potential sites located outside the areas of exclusion, according to the following criteria:

- Water supply infrastructure
- Fuel supply (length of gas pipeline)
- Type of cooling system
- Length of transmission lines
- Access roads and communication methods

- Material bank availability
- General characteristics of civil work
- Water availability and use priorities
- Impacts caused by construction infrastructure (transmission lines, access roads, gas pipelines, etc.)
- Land use
- Physical characteristics of the environment (geology, climate, topography, etc.)

Potential sites were then selected and analyzed in greater detail using a scale based on the affinity to each technical, economic, social, and environmental aspect of the projects to the site. The results obtained from these analyses were used by CFE to identify the following site-candidates:

- Anahuac
- Dos Estados
- El Venadito

The first site is located in the Municipality of Valle Hermoso (the selected site), where as the other two are located at 30 km southwest from Reynosa and 15 km south from Reynosa, respectively, in the Reynosa Municipality, State of Tamaulipas.

The sites were evaluated in detail using seven factors for selection:

- Fuel supply
- Water supply
- Associated transmission network
- Physical characteristics of the site
- Geographic characteristics
- Environmental characteristics
- Socio-economic characteristics

CFE selected Anahuac as the site that best matched the technical, environmental, and economic conditions required for the development of the projects. The decisive factors were the nearby fuel supply by the U.S.-Mexico border, water supply, nearby electrical infrastructure, and access roads. Since these elements are already in place at the site selected, the environmental impacts generated by the development of the projects would be minimal. EDFI accepted using the site proposed by CFE. The proposed power plants will be able to meet the ever-increasing demand for electric energy, with minimal adverse impacts upon the environment and definite positive impacts upon the economy of the northern region of the country.

6.2 Design and Operation

The design of the 495 MW RBIII power plant and 500 MW RBIV power plant, meets the specifications established by CFE in the bidding specifications for each project.

6.2.1 Air Quality

RB III and IV will use Siemens-Westinghouse 501F gas turbines, achieving 55% thermal energy efficiency (LHV) in the combined cycle mode. Siemens-Westinghouse's newest model, 501G gas turbines, can achieve 58% thermal energy efficiency (LHV), 3% higher than the 501F model. However, 501G produces 365 MW as simple cycle compared to 501F's 274 MW, and therefore, the required generating capacity of 495 MW / 500 MW for RB III and IV is not practical to use 501G. EDFI proposed the use of 501F and this was accepted by CFE.

The combined-cycle system that uses natural gas as fuel, "Low- NO_x" burning turbines, and heat-recovery steam generators with post-combustion equipment, represents the best design alternative for the project characteristics. This design uses the cleanest fuel available in the region, and the most advanced technology for power plants, both of which reduce the emission of contaminants into the atmosphere. The projects will not need to use diesel as back-up fuel since it will receive uninterrupted natural gas supply through the gas pipelines that will connect with the plant. This also decreases the release of contaminants into the atmosphere, not only because of the direct connection to gas sources, but also because natural gas is a much cleaner fuel than diesel.

The combustion gas turbines will be designed to minimize emissions to the atmosphere. The Model 501 F combustion turbines will comply with both Mexican Official Standards and World Bank Guidelines with the following air emission characteristics:

NO_2 Emission Rate(per stack): 25.9 g/sec
SO_2 Emission Rate(per stack): 0.9 g/sec
PM Emission Rate(per stack): 14.1 g/sec
CO Emission Rate(per stack): 4.9 g/sec

Stack Height: 35.0 m
Stack Diameter: 5.10 m
Stack Flow rate: 382.5 m^3/sec
Stack Temperature: 379^oK

The emission data presented above is the turbine manufacturer's guarantees to EDFI, in accordance with CFE design specifications. During normal operating conditions these air emission characteristics are expected to be lower than the actual guarantee.

6.2.2 Water supply and Wastewater Discharge

Water will be supplied to the power plants through a well that will be located within each site. Groundwater presents high solid values, conductivity and hardness due to its high salts content and it is therefore not suitable for human consumption or for irrigation activities in the region. Groundwater represents the best alternative for water consumption since it will not compete with the sources currently used to supply the needs of the nearby communities.

To prevent the contamination of water bodies and aquifers, wastewater generated by the plant processes will be discharged into an evaporation lagoon. The wastewater in this lagoon will be allowed to naturally evaporate, thus reincorporating itself into the natural cycle without causing negative effects on the environment.

RBIII and IV will use air-cooled condensers to minimize water requirements. Compared to conventional wet cooling tower system, air-cooled condensers require more capital expenditure but significantly reduce plants' water needs. Considering the water availability of the region, it was proposed by EDFI, and accepted by CFE, that air-cooled condensers will be used.

6.3 Scenario without the Construction of the Power Plants

One of the main objectives of the Government of the State of Tamaulipas, as presented in the State Development Plan for 1999-2004, is the promotion of a dynamic economy that attracts investment, obtains sustained growth rates, generates sufficient jobs, and is founded on greater levels of competitiveness and productivity.

To obtain these economic objectives, one major factor is the need for sufficient electric energy to develop new industries, as well as a market that creates new jobs and promotes economic activity within the State.

It is estimated that the demand for electricity in the northern region of Mexico will increase radically during the next few years. In recent meetings, the Energy Secretariat published statistics that support these estimations showing that between the years 2001 and 2010, the demand for electricity will increase by 5.5% per year, which is comparable with the historic rate of increase of 5.4% per year for the years 1991 to 2000. During 2001, this region consumed 27,913 GWh., which would mean that the estimated demand for electricity for the year 2010 would be 51,898 GWh.

In this region (Reynosa, Matamoros and Altamira) where the assembly plant industry is of such importance to the local and national economy, it would be difficult to promote industrial growth and lower the current unemployment rate of 1.3% without an adequate supply of electric energy.

Other important items in the State Development Plan 1999-2004 that are related to industrial and commercial sectors and that depend on an adequate supply of electric energy are:

- The development of industrial groups that integrate geographically and technically the production processes and raise the competitiveness of final products.

- To support small and medium sized businesses by improving association procedures, promote quality control, make better use of the present infrastructure, and promote administrative training.

- Instigate a greater aggregate value for industrial production through the integration of productive chains and the establishment of integral development programs for assembly plants and for the great manufacturing industry that is focused on exporting.

- Establish mechanisms that allow a company to absorb effectively new technologies that increase production and competitiveness.

- Promote a greater efficiency in the commercialization and development of new channel for distribution and the establishment of storage facilities and product conservation.

- Instigate commercialization of all goods and services related to tourism in the communities near tourist attractions.

- Promote the enhancement and modernization of support services to foreign markets.

- Promote advantages offered by port services, land and ocean, and develop specialized centers for exporting activities.

7.0 ENVIRONMENTAL ACTION PLAN

7.1 Environmental Management

7.1.1 Environmental Policies

EDF and its subsidiaries have developed Environmental Policies with the goal of obtaining and maintaining strict compliance with environmental requirements established by Mexican Legislation, CFE, and World Bank Guidelines, as well as internal company requirements for environmental protection. These Policies are to be implemented throughout the lifetime of the projects, from engineering, design, and site assessment to operation and maintenance and plant shutdown, dismantling and site abandonment.

An Environmental Management Manual was developed to meet these goals, which includes the Environmental System Management based on the ISO14001 standard. The Manual will be used to determine the environmental requirements that must be implemented during each phase of the projects and to present and document all Environmental System Management dispositions established for the power plants.

The following goals and objectives have been established for the implementation of the Environmental Action Plan:

- The Environmental Action Plan will be implemented for each phase of each project.
- All environmental aspects that may be impacted during the projects phases will be monitored.
- The projects will be developed respecting, and in accordance to, the limit- values established by Mexican standards and World Bank Guidelines for environmental aspects and protection of personnel.
- Construction and start-up activities will be conducted with minimum negative impacts on the environment.

The Environmental Management Manual will delegate authority to the responsible personnel for the environment monitoring and compliance at each power plant. Their responsibilities include:

- Implementation of the Environmental Management System
- Implementation of verification of compliance
- Implementation and reporting of actions taken to ensure compliance

Environmental Policy Guidelines

The main focus of the Environmental Policy and the management system is "compliance with Mexican federal, state, and municipal and requirements, as well as World Bank Guidelines" [Environmental Management Manual for Central Lomas de Real, S.A. de C.V., 1st Rev. May 01, 2002]. Both projects will make every effort to ensure minimal environmental impact and will be committed to mitigate any adverse effects caused by the performance of any activity in order to contribute to the conservation of the ecosystem and landscape within the area surrounding the power plants sites.

State of the Art technology for the design and operation of power generation plants will be adopted for optimum plant conditions and clean processes ensuring maximum environmental requirement compliance.

7.1.2 Organization and Responsibilities

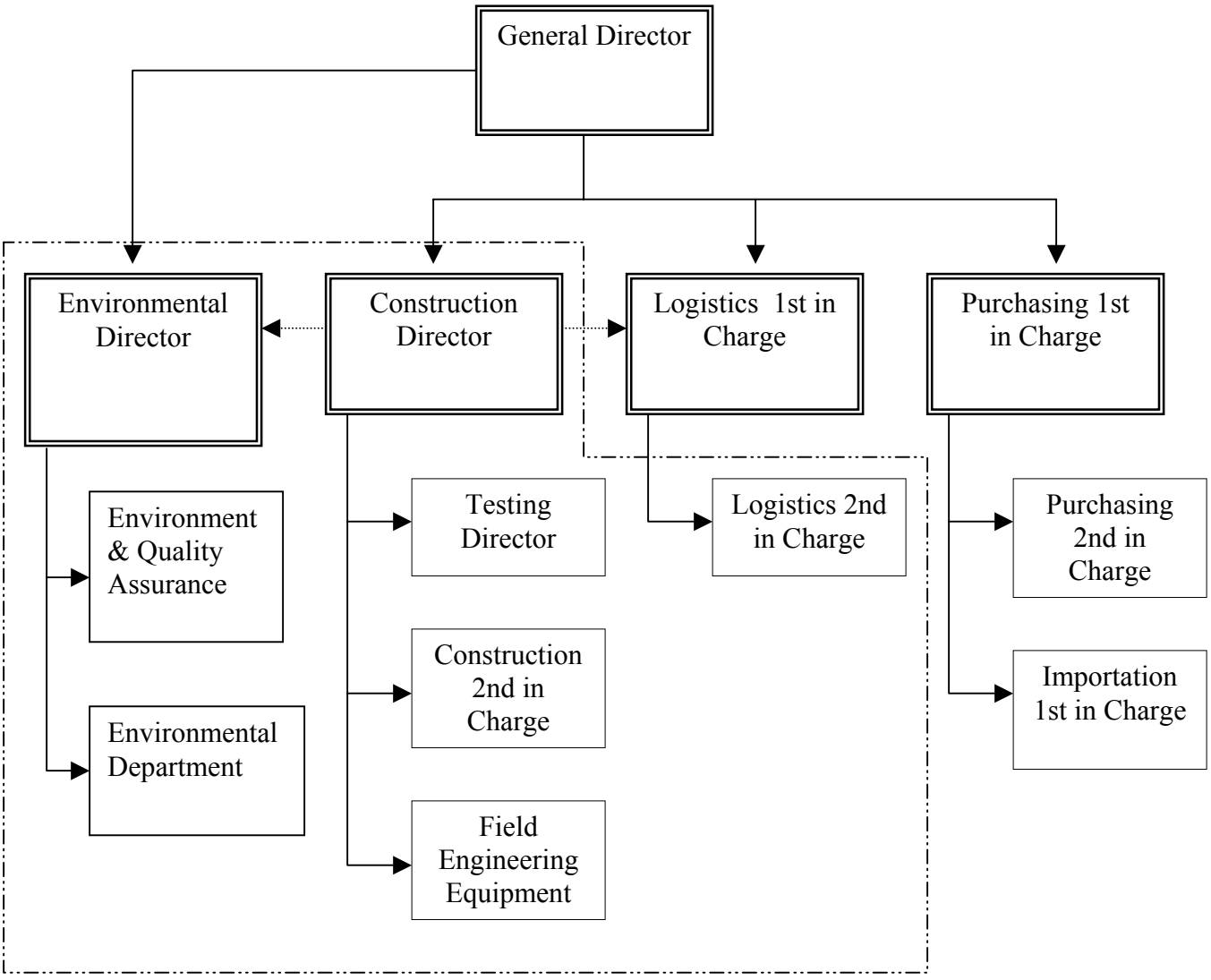
Environmental policy management, operation and follow-up activities included the organization chart presented in Figure 7.1, which was developed for each of the power plants.

Based on this chart, the Environmental Manager for each power plant will be the lead coordinator for environmental management. All functional, administrative, contractual and structural relationships with other companies and agencies involved with the projects will be established revolving around the lead coordinator.

COMINSE is the engineering company that will be in charge of the power plant construction activities. COMEGO is the service company that will be in charge of corporate administration, and operation and maintenance supervision. EDFI will provide Corporate support through their Construction Management and the national Engineering and Construction Center (EDF/CNET).

External organisms related with the projects are CFE who is the project promoter and will purchase the energy and distribute it; and equipment and supply providers. Mexican authorities will address environmental protection and contamination prevention issues.

Figure 7.1 RBIII and RBIV Power Plant Organization Chart



Management commitment to environmental policy implementation, as well as to provide the necessary resources for system application and Environmental Action Plan implementation will be under the responsibility of Quality Assurance and Environment Manager for each power plant.

Environmental managers are in charge of follow-up and implementation of the Environmental Action Program, which will be distributed together to the interested parties:

- All management,
- Environment managers (at the site and at COMEGO),
- CFE,
- World Bank,
- Site personnel.

7.1.3 Structure and Responsibility[4]

All plant personnel must participate in plant environmental activities and in the implementation of the environmental policies of the projects. This ensures consistency, harmony and the integration of environmental concerns at all levels keeping them within the administrative structure of each thermal power plant.

Environmental personnel responsibilities include:

Environmental Manager (Mexico City Office)

- Based on legislation and standards applicable in Mexico, and EDF environmental policies, definition of the internal environmental policies of the company.
- Identification of human, technical, and financial resources necessary for compliance with the environmental management manual.
- Assigns the environmental management manager.
- Compliance with the environmental management manual.

Environmental Manager (Site)

- Presents the environmental management.
- Develops the environmental administration for the company.
- Is responsible for the development, sensitizing, and information of internal environmental, industrial hygiene, and civil protection campaigns.
- Is responsible for internal environmental inspections.
- Performs follow-up for compliance with legislation, standards, authorizations, permits, and concession concerning environmental issues.
- Is authorized to enforce compliance with the environmental management system.
- Is authorized to represent the company before third parties for all transactions related to compliance with environmental legislation.
- Is responsible for maintaining personnel informed concerning environmental policies.
- Is responsible for the adequate handling and filing of all Environmental Management System documents.

Environmental Department

- Is in charge of compliance with requirements, transactions, and expirations related to environmental management, industrial hygiene, health and safety, and civil protection legislation and standards.
- Is in charge of inspections and verification visits from environmental authorities for environmental, industrial hygiene, health and safety, and civil protection issues.
- Is responsible for completing and presenting to the authorities all applications, logs, inventories, and identification contained in this manual or that may be required in the future by any environmental, industrial hygiene, health and safety, and civil protection authority.

[4] Manual de Administración Ambiental rev. 01, Central Lomas de Real.

- Is in charge of assigning the necessary resources for field visits that must be conducted in strict compliance with applicable environmental legislation and in accordance with ISO 14001.

External Legal Consultants

- Legal consultants direct and assist the environmental manager with environmental compliance issues, periodically reviewing compliance with the environmental management manual.
- Assist the environmental manager during site visits conducted by local, municipal, and federal authorities concerning environmental, industrial hygiene, health and safety and civil protection issues.
- Assist the environmental manager in the development of the different inspection and audit stages and, when applicable, with the interference of resources and law suits emanating from environmental, industrial hygiene, health and safety, and civil protection legislation incompliance sanctions.

Personnel

The plant's personnel is the main component in the implementation of the environmental improvement program by observations, integrating the environment into daily activities, practicing environmental conservation, proposing solutions, enforcing and respecting waste management.

Environmental Conduct Code

Environmental Management and plant personnel are committed to environmental excellence and leadership seeking the highest levels of protection and environmental improvement while providing high quality and economic prices in the supply of electric energy. All personnel make reference to the Environmental Policy Declaration of the Company for the compliance with environmental requirements and regulations.

7.1.4 Training[5]

Training programs for all RBIII and RBIV personnel are provided and periodically updated under the responsibility of the Environmental Manager. All construction and operation personnel are required to participate in environmental training sessions at least once a year.

Contractors and all external personnel hired for temporary or permanent jobs are also required to participate in environmental information sessions that promote environmental conservation and protection. These information sessions also present the company environmental policies and objectives, as well as all legal requirements and regulations governing all thermal power plant activities and RBIII/RBIV -specific requirements.

[5] Manual de Administración Ambiental rev. 01, Central Lomas de Real.

Training sessions will be planned and integrated to the Environmental Management Program of each power plant. The Specific Environmental Plans will include a description of all training sessions developed for the different phases of the projects.

7.2 Mitigation and Development

The impacts generated by construction and operation activities at the RBIII and RBIV power pants are described in Chapter 5 of this Environmental Impact Assessment. The impacts are identified through the use of simple lists and the modified Leopold Matrix and assessed quantitative and qualitatively, specifying importance and magnitude. This same chapter also includes a description of the mitigation or compensation measures adopted, and the effects that these could have on the environment.

7.3 Monitoring Plan

This section describes the Monitoring Plan that will be implemented during the design, construction, operation, and maintenance stages of the RBIII and RBIV thermal power plants.

The continuous monitoring plan will be used to obtain detailed information concerning the efficiency of implemented mitigation measures which have been proposed to reduce the emission of contaminants at the site for compliance with applicable requirements and good environmental practices.

7.3.1 Air Quality Monitoring Program

This program is based on the measurement of contaminant concentrations in stack emissions. Measurements are conducted in accordance with applicable Mexican and international standards and regulations and guidelines provided by the World Bank.

Each power plant will be equipped with a Continuous Emissions Monitoring System. (MSCE). This MSCE will measure levels of contaminants emitted from stacks located at the RBIII and RBIV power plants. The following contaminants will be measured and monitored for compliance: SO_2, NO_x, CO, PM_{10} and Total Suspended Particles (TSP). The MSCE is designed to record all emission measurements, which will be used to produce daily, weekly, and annual reports. Any deviations from the normal reading will be closely monitored and required corrective actions will be implemented to ensure compliance with the requirements. The reports will include any failure or defect recorded in any component or unit of the power plant, as well as reported alarms that may have been set off during the report period. All corrective actions will also be reported.

The system components considered during the design of the monitoring system and that will be adopted by the RBIII and RBIV power plants include the following:

- Two probes for hot samples (one per stack), for gas samples
- Two opaque-meters (one per stack) to measure Particle concentration
- Two sample lines for non-hot samples (one per stack)
- Monitoring room located between both stacks, equipped with a multi-gas meter and all the necessary materials for the control and protection of the samples
- Standard gas cylinders for standardizing of the meter

The measuring points within the stacks are located in an area where the flow speed and volume of the combustion gases are relatively stable.

Continuous monitoring points for particles are located where the horizontal lengths are greater than 5 Hydraulic Diameters (HD) for counter flow, and at 2 HD at flow direction (5 HD for significant obstacles to atmospheric outflows).

Operations (Specific Description, Technical Details)

To initiate MSCE operations, a Distribution Control System (DCS) sends an order for start-up. This command initiates an automatic calibration of the sampling parameters that in turn initiates the monitoring cycles. Additionally, an alarm is sent to the monitoring room with all non compliance and failure reports.

Measurements obtained by the monitors are transmitted at 4-20 mA signals to the automated receiving center. This center then corrects all contaminating agent levels and extrapolates them to a fixed oxygen value equal to 5%.

Net measurements are expressed in ppm, mg/Nm^3 or corrected and extrapolated to a fixed value of O_2. These are then sent as 4-20 mA signals to the monitoring room for their final emission to the DCS.

The main operating parameters of the MSCE are:

- Sample probes

  The sample probes are heated to prevent gas condensation and, depending on the sampling method selected, the probe materials used are compatible with the gas flow (emission characteristics).

  The probe is fed through and electric feeding unit located at the monitoring room.

  For installation on each stack, the probe forms an angle between 5 y 10^0 below the horizontal line.

- Opaque-meters

  The main elements of this instrument are: two opaque blocks, a sending unit, a receptor, and a monitoring compartment. Electric and pneumatic feeding is received and evaluated at the monitoring room.

- Sampling lines

  The sampling lines have an average length of 40 m. The materials chosen must be compatible with the emission characteristics.

- Monitoring room

  The monitoring room is equipped with:

  - A gas monitor:

    0_2: Scale 0-20 % for O_2 volume
    4-20 mA sending signal
    500 Ohm min light block

    Oxygen analysis is used to correct contaminating agent levels, which are extrapolated at a fixed oxygen value equal to 5% and expressed in mg/Nm^3 dry gas wastes.

    NO/NO_x: Scale 0-400 ppm forn NO_2, or 0-800 mg/Nm^3 for NO_2.
    4-20 mA sending signal
    500 Ohm min light block

    SO_2: Scale 0-1000 ppm forn SO_2, or 0-3000 mg/Nm^3 for SO_2
    4-20 mA sending signal
    500 Ohm min light block

    CO: Scale 0-120 ppm or 0-150 mg/Nm^3
    4-20 mA sending signal
    500 Ohm min light block

    - All conditioning materials for the sampling units will include the necessary instruments and accessories for appropriate monitor operation.

    - The automatic control of the monitoring unit guarantees monitoring unit autonomy. Its main functions are:

      - Data analysis
      - Installation control
      - Instrument calibration
      - Incompliance verification and reporting

- Result transmission to the DCS (Distribution Control System)
- Analog and digital reception of signals emitted by the dust opaque-meters:
  Scale 0-150 mg/Nm^3
  4-20 mA sending signal
  500 Ohm min light block

In compliance with specifications, combustion equipment operation uses an operation and maintenance log for all combustion, monitoring, and emission analysis equipment, and fuel quality certificates. The log records the following information:

- Operations control: date, shift, time of report, vapor pressure, gas temperature, intake water temperature, combustion temperature and pressure, smoke color, background purge, level purge, safety valve discharge, fuel consumption, controls for pressure, intake water pumps, start-up and shutdown due to fire.

- Contaminating emission control: efficiency, gas temperature, excess air, O_2, CO_2, smoke opaqueness; fuel certificate data; emission monitoring; smoke density; Total Suspended Particles, sulfur dioxide, nitrogen oxide; intake water monitoring.

The MSCE is designed to generate daily, monthly, and annual reports for contaminant parameter, in compliance with monitoring calendars established in NOM-085-ECOL-1994 and World Bank Guidelines.

7.3.2 Ambient Air Monitoring Program

Monitoring stations

An air quality monitoring program will be implemented to ensure compliance with applicable Mexican Official Standards and World Bank Guidelines for both the RBIII and RBIV Plants. A continuous monitoring program is currently in operation, equipped with three stations for continuous data gathering for NO/NO_2, CO, PST, PM_{10}, and SO_2. These stations are located at the RBII power plant. Three additional monitoring stations will be added to this monitoring network for the RBIII and RBIV power plants.

One of three existing monitoring stations is also equipped with instrumentations for meteorological data gathering. Since the terrain surrounding the power plants is flat, one monitoring station for the weather related data is considered sufficient. This station includes a 10 m meteorological tower equipped with continuous sensors for real time data gathering of the following parameters:

- Wind velocity and direction
- Environmental temperature
- Relative humidity
- Atmospheric pressure

The location of the three new monitoring stations will be identified based on the Air Dispersion Modeling results. The meteorological and air quality monitoring programs will be implemented in accordance with standards and requirements for quality assurance established by Mexican environmental legislation.

The monitoring network includes at least one monitoring station up-wind and two monitoring stations down-wind from the plant sites based on the predominant wind directions at the sites.

The emissions and meteorological data gathered by these monitoring stations and any failure or defect signals are transmitted by radio signals to the Distributed Control System located at RBII.

The three monitoring stations are also equipped with:

- A sampling system for calibration and standardizing
- A safety battery
- A prefabricated facility

Each plant receives 120 Vca – 60 Hz. The electric capacity at each plant fluctuates around 2.5 kVA.

In the event of a defect in the external electric input, electric input through a battery will provide sufficient time to save and store the information obtained and to transmit the "electric input defect" signal. The time provided by each battery is of 10 minutes.

Air quality readings

The air quality and meteorological parameter readings obtained from the existing stations range as follows.

- PM_{10} concentration: 0-100 ug/m^3
- NO, NO_x and N O_2 concentration: 0-10 ppm
- CO concentration (not available)
- Wind velocity: 0-50 m/s (0-180 km/h)
- Wind direction: 0-360°
- External temperature:-30°C, +70°C
- % relative humidity: 0-100%
- Atmospheric pressure: 850 –1100 hPa

Monitoring equipment characteristics

The main characteristics of the components of the three fixed stations are:

- Acclimatized prefabricated facility

  Total height: 2.6 m
  Width: 2.0 m
  Length: 2.0 m

  Structure: based on Group A seismic coefficient, in accordance with chapter C.1.4 of CFE's "Civil Works Design Manual".

- Acclimatizer:

  Automatic reverse, is equipped with an integrated heating system.

- Dust monitors (TSP and PM_{10})

  Scale: 0-100 ug/m^3 (to be confirmed)
  Sending signal: 4-20 mA
  Light block: 500 Ohm min

- Monogas monitors NO/NO_x y NO_2

  Scale: 0-10 ppm for NO_2 or 0-20 mg/Nm^3 for NO^2
  Sending signal: 4-20 mA
  Light block: 500 Ohm min
  Each NO/NO_x and NO_2 monitor is equipped with its own sampling system

- Monogas monitor for CO

  Scale: 0-50 ppm o 0-60 mg/Nm^3
  Sending signal: 4-20 mA
  Light block 500 Ohm min
  Each CO monitor is equipped with its own sampling system

  Meteorological parameter receptors:

  - Wind velocity: 0-60 m/s
    Sending signal 4-20 mA
    Intake 12 o 24 Vcd
    Light block 500 Ohm min

- Wind direction: 0-360°
  Sending signal 4-20 mA
  Intake 12 o 24 Vcd
  Light block 500 Ohm min.

- External temperature and humidity: -30-+70° C
  0-100 HR
  Sending signal 4-20 mA
  Intake 12 o 24 Vcd
  Light block 500 Ohm min

- Atmospheric pressure: 850-1100 hPa
  Sending signal 4-20 mA
  Intake 12 o 24 Vcd
  Light block 500 Ohm min

Receiving units are mounted on a 10 m telescopic pole.

- Data Gathering System (DGS)

  The fixed station is equipped with only one DGS. This system contains the receptors for meteorological parameters necessary for the following operations:

  To obtain the analog/digital numbers.
  Calculation of averages.
  Transmission of results obtained through the DCS

- Emergency battery

  Every fixed station is equipped with a emergency battery for a total output time of 10 minutes.

The maximum values that are considered for the air quality parameters are those established by Mexican standards and World Bank Guidelines.

7.3.3 Wastewater Monitoring Program

The purpose of the Wastewater Monitoring Program is to evaluate storm water that could carry oil in the areas where equipment is located. Table 7.1 presents the wastewater parameters that will be evaluated at the RBIII and RBIV power plants, and the measuring methods used in accordance with Mexican Official Standards:

Table 7.1 Wastewater Discharge Monitoring Parameters

Parameters	Measuring Method
PH	NMX-AA-008 Potenciométrico Method
Total Suspended Solids	NMX-AA-034 Gravimetric Method
Greases and Oils	NMX-AA-005 Soxhlet Extraction Method
Total waste chlorine	--
Chrome (total)	NMX-AA-051 Spectra-photometric with atomic absorption
Copper	NMX-AA-066 Neocuproine Method
Iron	
Zinc	NMX-AA-078 Colorimetric Methods for ditizone I, ditizone II and atomic absorption spectra-photometric
Temperature increase at the edges of the mixing zone	NMX-AA-007 Visual method using thermometer
Floating matter	NMX-AA-006 Visual Method using specified sieve
Arsenic	NMX-AA-046 Spectra-photometric Method
Cadmium	NMX-AA-060 Ditizone Method
Cyanide	NMX-AA-058 Colorimetric and titlemetric Method
Mercury	NMX-AA-064 Ditizone Method
Nickel	NMX-AA-051 Spectra-photometric Method with atomic absorption
Lead	NMX-AA-057 Ditizone Method

Construction Stage

During the construction stage, only sanitary wastewater will be generated. An authorized service company will be contracted and will be in charge of the collection, hauling and final disposal. Periodic monitoring of wastewater generated during the construction stage will therefore not be necessary.

Operation and Maintenance Stage

During the operation and maintenance stage of the two power plants, the demineralization process, and boiler will generate wastewater as well as some wastewater will come from turbine purges. All the wastewater will be sent to the separate evaporation lagoons for each power plant.

Additional wastewater will be generated as a result of periodic cleaning of boilers and turbines. This maintenance related wastewater would be collected separately. An authorized company will be hired for hauling, off-site treatment and disposal of these wastewater in compliance with Mexican regulations. Adequate verification and supervision procedures will be implemented ensure adequate handling, treatment, and final disposal and all reporting requirements established by applicable standards and regulations will be followed.

The wastewater discharge to the evaporation lagoons will not require periodic monitoring. However, verification and supervision procedures will be implemented to ensure adequate handling, treatment, and final disposal by the companies hired for such purposes, as established by applicable standards and regulations.

Periodic monitoring will necessary for wastewater not discharged to the evaporation lagoons such as storm-water drains and a wastewater monitoring program will be implemented following the parameters presented in Table 7.2.

Table 7.2 Monitoring Parameters and Frequency based on World Bank Guidelines

Parameters	Monitoring Frequency
pH	Continuous
Temperature	Continuous
Suspended Solid	Daily
Greases	Daily
Oils	Daily
Waste chlorine	Daily
Metals	Monthly
Others *	Monthly

* Other parameters required by Mexican standards

Maximum permissible values that will be considered threshold values are presented under Mexican regulations and World Bank Guidelines in Chapter 2.

Visual inspections will be conducted on a daily basis a member of the environmental department will walk the premises, assessing wastewater conditions and thermal power plant activities that could impact wastewater quality ensure compliance with good operating practices1.

Storm water will be subject to frequent observation during rainy periods. Floating matter over the water surface, suspended solids on the surface of the currents, stains caused by oils, grease, as well as any discoloration or unusual odors will be recorded and Environmental Manager of the power plant will be notified. The Environmental Manager will assess the situation to determine what mitigation or corrective measures will be necessary and the type of corrective actions that will be best suited for each situation. These actions will be implemented to ensure resolution of the problems.

7.3.4 Noise Monitoring Program

In compliance with NOM-081-ECOL-1994, which establishes maximum permissible noise levels from fixed sources and methods of measurements, the area surrounding the power plants will be monitored on an annual basis for noise levels during the operation of the RBIII and RBIV power plants.

Since there are no receptors within one kilometer from the power plant sites, receptor noise monitoring will not be necessary. However, periodic noise-monitoring will be conducted at the receptor locations to verify that maximum permissible levels established by World Bank Guidelines are not exceeded, to ensure that corrective actions are taken in the case of any deviations and to have adequate data in the event of any complaints from the community concerning noise levels in the surrounding areas.

7.3.5 Industrial Hygiene and Health and Safety Monitoring

RBIII and RBIV will have a personal protection program that will include all the necessary procedures to ensure personnel safety, especially for those working close to areas with high temperatures, where hazardous materials and wastes are handled, and near noise emitting sources.

A Health and Safety and Industrial Hygiene Program will be established, which will include:

- Laborer/employee training
- Installation of industrial hygiene and health and safety signs and labels
- Development of an accident, emergency, and contingency prevention, reduction, and control plan

General information concerning health and safety and industrial hygiene measures will be provided to prevent unsafe and inefficient conditions and activities, and to prevent work related accidents. EDFI has been proactive in this initiative in all their power plants and plans to implement the same stringent guidelines and training to approach "Zero Accident" goal.

The monitoring program will include annual testing of continuous noise levels that are equivalent to the levels the laborers are exposed to in the work environment. This test will be conducted in accordance with specifications established by the NOM-011-STPS-1994 and NOM-080-STPS-1994, for noise monitoring procedures and maximum permissible noise levels.

Additionally, workers exposed to high temperatures will be monitored to determine whether specifications established in NOM-015-STPS-1993 with respect to thermal stress will need to be implemented. Thermal stress and elevated temperature levels in the work areas will be assessed to determine the requirements for implementing corrective actions.

Training concerning health and safety and industrial hygiene will be provided to all personnel at the plant, in order to promote awareness and methods of controlling exposure to high temperatures environment which could cause health hazards.

7.4 Documentation

The procedures for the identification, maintenance, and disposal of documents will be part of the Environmental Management System (EMS) implementation and operation requirements. Environmental records will include:

- Information concerning environmental laws or other applicable requirements;
- Process information;
- Plant map, showing contaminant source and emission areas, potentially hazardous material storage areas, and the flow-direction in the event of spills;
- Fuel quality and content analysis;
- Inspection, audit, maintenance, and calibration records;
- Hazardous and non-hazardous waste generation, handling, storage, and final disposal documents;

- Hazardous material inventory, including quantity and exact plant location;
- Results obtained from laboratory analyses and monitoring equipment;
- Complaint records;
- Training documents;
- Contractor and provider information;
- Incident reports;
- Emergency preparations and response information;
- Evacuation route maps;
- Records of significant environmental impacts;
- Audit results;
- Management reviews and inspections.

All RBIII and RBIV environmental records will be identified with a code with specific digits according to the types of document and the date issued.

7.5 Implementation Program

Table 7.3 below shows the EMS implementation program that will be used by both power and also shows the mitigation measures and the monitoring plan.

Table 7.3 Implementation Program

Project Stage	Period of implementation	Measures to Implement
Site preparation and construction	**RBIII:** 24 months (from second quarter of 2002 to second quarter of 2004) **RBIV:** 24 months (from second quarter of 2003 to second quarter of 2005)	Preparation and diffusion of Environmental Management Manual and Specific Environmental Plan for design, construction, assembly, testing and start-up stages. Implementation of each proposed mitigation measure for site preparation and construction. Design and installation of the air quality monitoring system.
Operation and Maintenance	**RBIII:** 25 years (from second semester of 2004 to second semester of 2029) **RBIV:** 25 years (from second semester of 2005 to second semester of 2030)	Development of Environmental Management Manual and Specific Environmental Plans for operation, and maintenance stages. Implementation of each proposed mitigation measure for operation and maintenance. Implement monitoring plan for all samples and parameters identified during the operation phase of the projects.
Site abandonment	At the end of the 25th year of operation of each power plant	Development of Environmental Management Manual and Specific Environmental Plans for the Site Abandonment stage. Determine whether concession is renewable or the type of industry that will be established at the site Develop the Site Restoration Plan when site abandonment has been decided, including long-term monitoring programs to prevent passive environmental impacts.

7.5.1 Resources for Site Preparation and Plant Construction

Table 7.4 includes the estimated implementation period and costs for mitigation measures identified for the site preparation and construction phase of the RBIII and RBIV power plants. The program and costs presented represent only one power plant. It is anticipated that the time and costs will be the same for both power plants.

The estimated implementation cost presented in the corresponding column used a cost index based on variable conditions that could be encountered at the time the projects are conducted, and represents an actual value estimate, not including inflationary or financial factors that must be implemented at the time the activities are conducted.

Based on estimates conducted, the investment costs related to the implementation of the Environmental Action Plan and mitigation measures for the first 24 months, during which the site preparation and construction activities will take place, the total costs will range between U.S. $404,000 and $623,000 for each power plant.

The above estimate does not include purchasing and installation costs for equipment that, although used for environmental compliance purposes, is considered part of the RBIII and RBIV design and normal plant operation procedures, or equipment that will be used for mitigation measures for impacts identified for the operation/maintenance stage, such as those mitigation activities related to gas pipeline installation.

However, the mentioned measures are included in the corresponding Tables as part of the overall Environmental Management Plan.

Table 7.4 Estimated Implementation and Cost Program for the Site Preparation and Construction Stage RBIII and RBIV

	MONTHS																												ESTIMATED COST (THOUSAND DOLLARS)
	1	2	3	4	5	6	7	8		10	11	12		14	15	26		28	19	20		22	23	24	25	26	27	28	
ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)																													
Preparation of Environmental Management Manual and Specific Environmental Plans																													**$ 20 – $ 25**
Appointment of Environmental Director and Environmental Manager																													**(1)**
EMS review																													**(1)**
EMS Management and Supervision																													**$ 30 – $ 50 (2)**
Environmental supervision and inspection during prevention and mitigation measure implementation																													**$ 40 – $ 60**
External environmental audits																													**(1)**
IMPACT MITIGATION MEASURES																													**$ 314 - $ 488**
AIR																													**$ 81 - $ 132**
Continuous wetting of main access roads and internal plant roads during hours of greatest traffic. The irrigation will be conducted with water trucks containing non-potable water obtained from authorized companies																													**$ 30 – $ 60**
Preparation and distribution of vehicle access regulations, including site access procedures, entering and exiting permits and speed limits.																													**$ 1 – $ 2**
Use of canvas to cover trucks transporting soil. This measure will be included in the vehicle-access regulation.																													**(1)**
Installation of fence around work areas to control access of non-authorized vehicles that would increase dust emission in the area.																													**$ 50 – $ 70**
Periodic maintenance program and verification of NOM compliance for gas emission from vehicles used during construction. This measure will be included in the vehicle-access regulation.																													**(1)**

Table 7.4 Estimated Implementation and Cost Program for the Site Preparation and Construction Stage RBIII and RBIV (Cont.)

	MONTHS																												ESTIMATED COST (THOUSAND DOLLARS)
	1	2	3	4	5		7	8	9	10		12	13	14		26	17	28		20	21	22	23		25	26	27	28	
																													$ 3 - $ 5
Vehicles will circulate with closed exhausts and at low speeds on access roads and within the property site. This measure will be included in the vehicle-access regulation.																													(1)
Periodic maintenance program and verification of NOM compliance for noise generation. This measure will be included in the vehicle-access regulation.																													(1)
Use of ear-plugs by workers exposed to high noise levels.																													$ 3 – $ 5
Use of silencers or mufflers to control noise emissions from machinery and equipment used for construction activities. Noise equipment use is applicable for all contractor crews and is optional for suppliers entering the plant site. All noise control equipment will be used in accordance with manufacturer specification and in compliance with applicable standards and requirements.																													(3)
GEOMORPHOLOGY																													$ 12 - $ 15
Reuse of material generated by deforesting, leveling and excavations during refill and leveling activities. All remaining material will be transported to disposal areas identified by municipal authorities for those purposes.																													12 – 15
Rock material required for construction activities will be obtained from bank-materials authorized by the corresponding authorities.																													(3)
SOIL																													$ 35 - $ 53
Continuous visual inspections of refill and compacting material to verify absence of hazardous and non-hazardous waste materials.																													(1)
Install storage containers for domestic and other non-hazardous wastes. The containers will be equipped with lids and labels clearly identifying contents. Perform periodic removal of contents and send them to authorized sites in accordance with characteristics.																													$ 3 – $ 5

Table 7.4 Estimated Implementation and Cost Program for the Site Preparation and Construction Stage RBIII and RBIV (Cont.)

	MONTHS																													ESTIMATED COST (THOUSAND DOLLARS)
	1	2	3		5		7		9	10	11		13	14	15	26	17	28	19	20	21		23		25		27			
Soil material obtained from excavations may be temporarily stored within the plant site. Any other non-hazardous waste will be discharged in areas outside the plant site in areas identified for those purposes by municipal authorities.																														(3)
Temporary hazardous waste storage activities at the plant site will be conducted in accordance with all applicable standards and regulations, in areas that have been selected and built in accordance with Hazardous Waste Regulations, and in the type of containers specified for each hazardous waste by applicable laws, regulations and standards.																														$ 6 – $ 10
In accordance with applicable environmental specifications, the removal of hazardous wastes from temporary storage areas for final disposal will be conducted by an authorized company and within specified periods of time, to prevent accumulation of hazardous wastes to volumes that exceed storage capacities.																														$ 10 – $ 15
Installation of temporary storage areas for fuels and lubricants used during the construction stages in accordance with applicable requirements.																														$ 6 – $ 10
Establish and diffuse spill-event procedures for hazardous materials or wastes generated or used during the construction stages of the projects. The procedures will be distributed to all contractors in charge of the handling of said materials and wastes, and will be supervised by the Environmental Director.																														$ 3 – $ 5
At the end of the construction phase, the site will be free from all hazardous or non-hazardous waste, All non-hazardous material contaminated with hazardous wastes will be treated as a hazardous waste.																														$ 5 – $ 8
VEGETATION																														
Verify that no protected species, identified in previous studies, are found within the property site. In the event any species is found, a Species Rescue and Protection Program must be prepared to be presented to the corresponding authorities for authorization.																														(1)
Develop procedure to promote local resident use of vegetation and other material obtained during topsoil and vegetation removal activities.																														$ 2 – $ 3
Establish and communicate regulations that prohibit use of herbicides and/or chemical products, as well as fire, to remove vegetation.																														(1)

Table 7.4 Estimated Implementation and Cost Program for the Site Preparation and Construction Stage RBIII and RBIV (Cont.)

	MONTHS																												ESTIMATED COST (THOUSAND DOLLARS)
	1	2		4	5	6	7		9	10	11	12	13	14	15	26	17		19	20	21	22		24	25	26	27	28	
FAUNA																													i) NA
It will be strictly forbidden to hunt, capture, damage, and/or commercialize wild life species. This requirement will be explicitly included in the internal work regulation.																													(1)
Prior to initiating topsoil and vegetation removal activities, verify that no protected fauna species, identified in previous studies, are found within the property site. In the event any species is found, a Species Rescue and Protection Program must be prepared to be presented to the corresponding authorities for authorization.																													(1)
SURFACE HYDROLOGY																													$ 65 - $ 100
Build the necessary structures, such as drains, sewage, or dikes, in order to maintain as much as possible natural drainage in the area.																													$ 30 – $ 50
Perform regular site visits to verify that materials do not accumulate interfering with the natural flow of surface water.																													(1)
Collect and send wastewater generated by hydrostatic tests to treatment plants and final disposal.																													$ 20 – $ 30
Install portable latrines for sanitary services during the construction of the power plant. Sanitary wastewater disposal will, under no circumstance, be permitted within the power plant site or surrounding areas.																													$ 15 –$ 20
UNDERGROUND HYDROLOGY																													$ 25 - $ 45
Verify that machinery and equipment operates in optimum conditions to prevent oil, lubricant, and fuel leaks. This requirement will be included during contractor selection.																													(3)
The fuel supply area and equipment maintenance and repair area must have concrete floors and a liquid wastecollection system.																													$ 15 – $ 25
Oily water must be sent to treatment plants before final disposal. Final disposal will be conducted by an authorized company.																													$ 10 – $ 20

Table 7.4 Estimated Implementation and Cost Program for the Site Preparation and Construction Stage RBIII and RBIV (Cont.)

	MONTHS																												ESTIMATED COST (THOUSAND DOLLARS)
	1	2	3	4		6	7	8	9	10		12	13	14		26	17	28	19	20		22		24	25		27	28	
																													$ 40 - $ 60
Maintain continuous communication with the local communities, publishing articles in local newspapers, making announcements in radios, organizing community meetings to know the opinion of the community concerning the projects. The meetings will take place at least once a year, or whenever important modifications in the design or construction are adopted.																													$ 40 - $ 60
INDUSTRIAL HYGIENE AND HEALTH AND SAFETY																													$ 3 - $ 5
Develop instruction and training programs concerning the use of personal protection equipment, and health and safety and industrial hygiene procedures for all workers.																													$ 3 – $ 5
Employees must be covered by social security (IMSS) and receive personal protection equipment. This requirement will be included in contractor and provider selection criteria.																													(3)
GENERAL MITIGATION MEASURES																													$ 48 - $ 70
Develop training programs for workers and supervisors concerning contamination prevention and control for health and safety and industrial hygiene issues.																													$4 8 – $70
Maintain files with records and documents showing type and level of training offered to personnel. Use information to determine current personnel training levels and to define future classes and sessions.																													(1)
In the event that archeological artifacts of historic or cultural value, such as structure foundations, vessels, arrows, etc., all topsoil and vegetation removal and ground-leveling activities will be temporarily halted, and the Regional Center of the National Institute of Anthropology and History will be notified. The Federal Law concerning Archeological, Artistic, and Historic Monuments and Zones establishes this requirement.																													(1)
TOTAL ESTIMATE																													$ 404 – $ 623

(1) These inspection and supervision activities are part of the EMS implementation and are therefore included in the system management and supervision costs.
(2) The cost covers only part-time administration expenses (average of 1/4 of the time) of personnel responsible for the implementation of the EMS, keeping in mind that their appointment includes other activities.
(3) The implementation cost includes the contractor or service provider, and requires supervision only by EMS management.

7.5.2 Resources for the Operation and Maintenance Stage

During the operation and maintenance stage of RBIII and RBIV, the activities related to the Environmental Management System, the Environmental Impact Prevention and Mitigation, and the Monitoring Program, will be conducted regularly, except in specific instances when the implementation or practice is a one-time activity (referred to as a punctual activity). These activities will be covered as part of the system operation and supervision.

This program is not included in the schedule of implementation, but rather an identified as periods during which the activities will take place, indicating them as punctual activities (one time) or as periodic (from time to time) activities. For every case, the estimated implementation cost corresponds to actual values, without taking into consideration the factors of adjustment due to inflation or financial indices.

The estimated punctual value refers to purchasing, installation, and/or manufacturing costs that will be paid only once, and that later will require only an inspection or review. Costs identified as "annual" are estimated annual costs for activities that will be conducted periodically for at least 25 years, which is the estimated lifetime of the projects.

The implementation program and operation and maintenance costs for each power plant are presented in Table 7.5.

Table 7.5 Implementation Program and Estimated Costs for the Operation and Maintenance of RBIII and RBIV

Environmental Management System	Periodicity of the Activity	Estimated Cost (thousand USD)
Development of Environmental Management Manual and Specific Environmental Plans	Punctual	$20-$25
Appointment of the Environmental Director and the Environmental Manager	Punctual	(1)
EMS review	Annual	(1)
EMS administration and supervision	Continuous (estimated cost is annual)	$20-$30 (2)
Environmental supervision and inspection for the implementation of the prevention and mitigation measures	Continuous	(1)
External environmental audits	Annual	$20-$30
Air		
High efficiency equipment, with Low NOx-type combustion chambers	Punctual	$3,900
Installation and operation of continuous measurement equipment for stack emissions. Parameters analyzed include: CO, O_2, NO_x, SO_2, PST and PM_{10}	Punctual	$120 (4)
Monitoring and supervision of combustion equipment efficiency	Continuous	(1)

Table 7.5 Implementation Program and Estimated Costs for the Operation and Maintenance Stage of RBIII and RBIV Power Plants (Cont.)

Environmental Management System	Periodicity of the Activity	Estimated Cost (thousand USD)
Noise		
Installation of sound absorption hood or muffler to control noise generated by turbines	Punctual	$100-$140
Installation of sensitizing and supervising mechanisms for equipment generating high levels of noise.	Punctual	$1,500
Ear protectors for personnel exposed to noise, sensitizing devices and supervision to verify adequate use.	Continuous (the cost estimated is annual)	$1-$2
Monitoring Plan development for the evaluation of noise levels produced by fixed sources. This Plan includes programs and procedures specified in NOM-081-ECOL-1994	Punctual	(1)
Soil		
Installation of hazardous material and waste storage, in accordance with applicable specifications	Punctual	$20
Vegetation		
Development of green areas with species appropriate for that region, under professional supervision.	Punctual	(3)
Fauna		
Supervision of internal regulation implementation concerning hunting and commercialization of fauna species found in the areas in and around the power plants.	Continuous	(1)
Surface Hydrology		
Construction and operation of separate drainage networks for process, sanitary and storm wastewater	Punctual	$50
Construction and operation of an evaporation lagoon for disposal of wastewater flow proceeding from the boiler, turbine and mineralization process.	Punctual	$900
Underground Hydrology		
Establishment of revision procedures and maintenance programs for the separate drainage systems for the collection of all wastewater generated by the power plants and for their distribution into the different wastewater treatment areas.	Continuous	(1)
Socioeconomy		
Continuance of information disclosure programs to the public for the 25 years of the concession period of each power plant	Continuous (cost estimated is annual)	$5-$10
Industrial hygiene and Health and Safety		
Development of a work health and safety and industrial hygiene program that includes: - Worker training - Installation of health and safety and industrial hygiene signs - Development of an accident prevention, reduction and control plan.	Annual	$5-$8
Document and file all training provided and attendance sheets	Continuous	(1)
Establish in the Monitoring Plan the programs and procedures for the evaluation of noise in the work environment, in accordance with NOM-011-STPS-1993 and NOM-080-STPS-1994	Punctual	(1)
Maintain social security (IMSS) benefits for power plant employees	Continuous	(1)

Table 7.5 Implementation Program and Estimated Costs for the Operation and Maintenance Stage of RBIII and RBIV Power Plants (Cont.)

Environmental Management System	Periodicity of the Activity	Estimated Cost (thousand USD)
General Mitigation Measures		
Compliance with specifications of the Hazardous Waste Regulation of the LGEEPA, especially with temporary storage activities	Continuous	(1)
The facilities will be designed so that these will not pose a risk to the neighboring populations and adjacent agricultural properties	Punctual	(3)
Establish periodic inspection and maintenance programs for hazardous liquid flows, pressure, and temperature	Monthly	(3)
Establish training programs for workers and supervisors concerning contamination prevention and control and concerning health and safety and industrial hygiene, including internal procedures and responsibilities to the authorities and international groups.	Continuous (the cost estimated is annual)	$ 10 – $ 20
GENERAL MITIGATION MEASURES		
Maintain files with training session records and attendance sheets to evaluate personnel training levels and develop future sessions	Continuous	(1)
Establish procedures for notification of surrounding population concerning contingency response in situations caused by fuel handling at the power plant	Punctual	$ 10 – $ 20
Establish special training programs for personnel operating and maintaining systems of greatest risk, such as turbines, boiler, generators, and high-tension equipment for electricity distribution	Continuous	(3)
Prepare and implement the Accident Prevention Program in accordance with applicable regulations.	Punctual	$ 60 – $ 100
Installation and operation of a fire-detection system comprised of fire detectors, alarm triggers, and a main signal control panel.	Punctual	$ 500
Construction of two fire-water reservoirs, each of 3,400 m^3, equipped with level indicators and low-level alarms. Apart from the fire-fighting system equipped with hydrants.	Punctual	$ 500
Install a fire protection system for the gas turbines, transformers, and the diesel storage area. The last one with the use of foam.	Punctual	$ 100
Installation, operation, and maintenance of safety and release valves, fuses, rupture discs, or other devices for equipment protection.	Punctual	$ 100
Pressure sensors, thermostats, advance contact connectors, threshold relays, etc., that are used for plant safety will be independent from those used for plant control.	Punctual	$ 50
Design and installation of electric equipment to prevent contact risks with a part under tension, an electric arch, splatter of a melted metal or a lubricant. All metal parts that are not under tension and that can be accessed from the outside will be connected to a ground connection system.	Punctual	(3)
Install safety showers and equipment to rinse eyes in areas with corrosive substances.	Punctual	$ 2 - $ 3

Table 7.5 Implementation Program and Estimated Costs for the Operation and Maintenance Stage of RBIII and RBIV Power Plants (Cont.)

Environmental Management System	Periodicity of the Activity	Estimated Cost (thousand USD)
MONITORING PLAN		
Operation and maintenance of a continuous monitoring system for stack emissions	Continuous	(3)
Operation and maintenance of air quality monitoring network installed in area surrounding the power plant	Continuous	(3)
Sampling and analysis of wastewater discharges in accordance with parameters established in the NOM-001-ECOL-1996 or the specific discharge conditions established by the CNA.	Monthly (the cost estimated is annual)	$ 5 – $ 10
Noise evaluation for fixed sources, in accordance with NOM-081-ECOL-1994.	Annual	$ 3 – $ 5
Noise evaluation in work environment, in accordance with NOM-011-STPS-1993 and NOM-080-STPS-1994.	Annual	$ 4 – $ 6
Evaluation of exposure to high temperature conditions, in accordance with NOM-015-STPS-1993.	Annual	$ 3 – $ 5
TOTAL ESTIMATED	**Punctual**	**$ 7,932 – $ 8,028**
	Annual Base	**$ 40– $ 64**

(1) These inspections and supervision activities are part of the EMS implementation and are therefore included in the management system and supervision costs.
(2) The cost covers only part-time administration expenses (average of 1/4 of his time) of personnel responsible for the implementation of the EMS, keeping in mind that their appointment includes other activities.
(3) These activities are part of the normal design, operation, and maintenance of the facilities and are therefore not considered a specific cost as part of the EMS implementation.
(4) The estimated cost corresponds only to the purchasing and installation of equipment; the operation and maintenance are part of the operation of the facilities.

Based on the previous estimates, the cost of punctual activities is estimated to be between U.S. $7,932,000 and U.S. $8,028,000 for each thermal power plant. The greatest portion corresponds to activities that must be conducted prior to the initiation of operations at the RBIII and RBIV power plants. However, these were included in the operation and maintenance stage because these activities will be used to mitigate environmental impacts.

As in the case of the site-preparation and construction stage, the previous estimate does not include construction and installation costs for design elements, such as green areas.

For those activities that must be conducted periodically, an annual investment between U.S. $40,000 and U.S. $64,000 is estimated for its implementation and performance.

7.5.3 Sources of Financing and Resource Allocation

The resources for the implementation of mitigation measures and other related activities conducted during the site-preparation and construction stage, and of the punctual activities indicated for the operation and maintenance stage, that in total range between U.S. $8,336,000 and U.S. $8,651,000 are considered part of the U.S. $300 million estimated as the investment required for the construction of each of the power plants.

The greatest portion of these resources correspond to the cost of emission monitoring and control equipment and of facilities included in the design of the power plant, which ensures implementation and the corresponding allocation of resources.

The resources that will be applied annually during the operation and maintenance stage of the power plant, which are estimated to be between U.S. $40,000 and U.S. $64,000 will be considered as part of the fixed operation costs in order to ensure the allocation of the same for the performance of the established activities.

8.0 PUBLIC CONSULTATION

8.1 Background

In compliance with the World Bank requirements to obtain the opinion of interested parties concerning the development of the power plant projects, EDFI organized a Public Consultation and Disclosure Meeting for the construction and operation of RBIII and RBIV power plants. This Public Consultation and Disclosure Meeting was presented to the Anahuac community and the inhabitants of Valle Hermoso, as well as representatives of civic organizations, federal and local authorities, and professionals on Thursday, July 18, 2002.

This Chapter presents a description of the activities that were developed during the public consultation process and the results obtained once the community was informed concerning the characteristics of the projects presented.

8.2 Activity Organization

The Public Consultation and Disclosure Plan (PCDP), project information disclosure process, and the Public Consultation and Disclosure Meeting were developed and coordinated by URS, in accordance with World Bank Guidelines and procedures. The PCDP included the identification of interested parties, a proposed-activities program, and a preliminary presentation of follow-up mechanisms that could be used to maintain communication and respond to comments and suggestions submitted by the interested parties.

8.3 Information Disclosure

The preparation and information disclosure activities were conducted at the project site from July 1 to 17, 2002. These activities were conducted mainly in Colonia Agricola Anahuac, the closest population center to the project site, and Valle Hermoso.

During the Public and Disclosure Consultation process, a total of 54 invitations were delivered in person to individuals and organizations that were identified as those with greatest influence over the projects. Among these were the property owners of adjacent lots to the project site, representatives of civic organizations, members of the Valle Hermoso City Council, Valle Hermoso personnel and authorities, federal agency officials, and others.

Following is a list of the individuals to whom the invitations to the Public Consultation Meeting were personally delivered.

Table 8.1 Individuals Personally Invited to the Public Consultation and Disclosure Meeting

Organization	Name	Position
Valle Hermoso Municipal Presidency	Osvaldo Gutiérrez Rodríguez	Municipal President
	Sergio Torres Martínez	City Council Secretary
	Alejandro Castrellón Alanís	Public Works Director
	Héctor Guajardo de la Puente	Economic and Industrial Development Director
	Consolación Gamboa Hinojosa	Urban Planning and Development Director
	Javier Escobedo Castillo	Civil Protection Director
	Francisco Cortes Faz	Ecology Director
	Juan Antonio Espinoza Sauceda	Social Communications Director
	Rolando Salinas Salinas	Special Projects Director
	Miguel Ángel Lara Orozco	Special Events Coordinator
	José Luis Barrera Leal	Anahuac Town Delegate
	Juan Núñez Capuchino	Fire-Department Commander
	Manuel Capetillo	Fire-Department Shift Manager
Valle Hermoso City Council	Angélica Marín Torres	First Syndicate
	Eutimio García González	Second Syndicate
	Reynaldo Valdez Gamboa	First Governor
	Trinidad Ipiña Garza	Second Governor
	Francisco Sandoval García	Third Governor
	Simón Herrera Medellín	Fourth Governor
	Ezequiel Martínez Vélez	Fifth Governor
	María de Jesús de la Cruz Cedillo	Sixth Governor
	Rodolfo González Ordóñez	Seventh Governor
	Tomás González Manriquez	Eight Governor
	César Rodríguez Trujillo	Ninth Governor
	José Luis Reyes Vega	Tenth Governor
	Martha Regina Ojeda García	Eleventh Governor
	Jaime Eladio Garza Montaño	Twelfth Governor
Colonia Agricola Anahuac Inhabitants	Jesús Castillo Olivares	Owner of property adjacent to the sites
	Santiago Cavazos	Owner of property adjacent to the sites
	Noemí García Chávez	Owner of property adjacent to the sites
	Cesáreo Hernández	Owner of property adjacent to the sites
	Alfredo López López	Owner of property adjacent to the sites
Social Representative of the Colonia Agricola Anahuac	Roberto Jiménez Domínguez	President
CTM Electrician and Municipal Laborer Syndicate	Pablo González Martínez	General Secretary
CTM Plumbers and Municipal Laborer Syndicate	Edmundo Vela García	General Secretary
CTM Transportation Laborer Union Syndicate	Elías Garza Vela	General Secretary
CTM Laborer Federation for Valle Hermoso	Antonio Esquivel Conejo	General Secretary
Construction Laborer Syndicate Section 8	Francisco Sandoval García	General Secretary
Material Laborer Syndicate	Jesús Ortega Martínez	General Secretary
Valle Hermoso Prep School	José Camarena Herrera	Director
“Contacto” Newspaper	Carlos Arturo Guevara Velasco	Council President

Table 8.1 Individuals Personally Invited to the Public Consultation and Disclosure Meeting (Cont.)

Organization	Name	Position
"El Bravo" Newspaper	José Carretero Balboa	General Director
"El Sol de Valle Hermoso" Newspaper	Agustín Ávila Gaviña	General Director
Feminine Committee for Environmental Protection, A.C.	Angélica Villegas Cantú	Representative
Ecological Commission for Reynosa, A.C.	Berta Gómez de Garza Ruiz	Representative
Northern Frontier School	Eduardo Alarcón Cantú	Principal
UAT University Patronage in Valle Hermoso	Santiago Guajardo Barrientos	Representative
Local Representation of the XIII District	Roberto Rodríguez Cavazos	Local Representative
SEMARNAT Delegation in the Tamaulipas State	Jorge Cárdenas Gutiérrez	Federal Delegate
	Miguel Ángel Torres Caballero	Current Administration Sub delegate for Environmental Protection
PROFEPA Delegation for the Tamaulipas State	Jesús Antonio Ibarra Cerecer	Federal Delegate
CNA Northern Golf Regional Management	Rafael Renero Ampara	Regional Manager
CNA Rio Bravo Regional Manager	José Enrique Castillo Ibarra	Regional Manager
CFE	Gabriel Galindo Argueta	Project Manager

Moreover, a summary of the projects, including the invitation to the Public Consultation and Disclosure Meeting was published July 12 - 17, 2002 in the "El Sol de Valle Hermoso", "El Bravo" and "Contacto" regional newspapers as follows:

"Contacto" Friday 12, Tuesday 16 and Wednesday 17
"El Sol de Valle Hermoso" Friday 12 and Sunday 14
"El Bravo" Sunday 14 and Tuesday 16

A sample of the contents of the published invitations is presented in Appendix D.

The invitation was also broadcasted through the XEVH "Interactive" Radio Station of Valle Hermoso, with regional transmission, during the five days prior to the Public Consultation and Disclosure Meeting, with eight announcements per day. The text used for these radio announcements is included in Appendix D.

8.4 Public Consultation

The Public Consultation and Disclosure Meeting was held on Thursday, July 18, 2002, at 1:00 pm, in the "Dr. Carlos Rosas Ramírez" auditorium of the Valle Hermoso Prep-School. Approximately 87 persons, including local residents, representatives of interested organizations and municipal officials, attended the meeting.

Based on the Attendance Sheet included in Appendix D, the meeting was attended by representatives of all the identified interested parties as follows:

- Local and Federal authorities: 16 individuals
- Education: 18 individuals
- Neighbors: 19 individuals
- Union and Civic Organization Representatives: 17 individuals
- Press: 3 individuals
- Others (EDFI, IFC and D&MM): 13 individuals

At the registration table, each attendee received a pamphlet containing information concerning the projects, a blank sheet for note taking, and a suggestions/questions sheet. A sample of the material distributed is provided in Appendix D.

The meeting was presided by EDFI and D&MM representatives, who presented the company, project characteristics along with the technical and environmental aspects, respectively. Among those presiding was the Municipal President of Valle Hermoso. Following is a list of the names and positions of those presiding over the meeting:

Mr. Osvaldo Gutiérrez Rodríguez
Municipal President
Municipal Presidency of Valle Hermoso

Dr. Cintia Angulo de Leseigneur
General Representative in Mexico
Electricitè de France

Mr. Juan Carlos Ruiz Velasco
Electricitè de France

Mr. Enrique Nava López
Project Manager
Dames & Moore de Mexico

The Meeting had a duration of approximately two hours, which included the project presentation and the question and answer session. The presentation materials presented are in Appendix D.

The following questions were presented by those who attended along with a brief description of the answers offered during the meeting:

Q. Why in Anahuac?

A. It was explained that the site was selected by CFE because its geographic location is ideal for the development of the projects since it is close to energy distribution centers and plant supplies. The only limitation was the scarcity of water, which is the reason a dry-type cooling system was selected by EDFI for best water management and lowest water consumption.

Q. Which are the benefits to the Municipality?

A. Among the benefits are the opportunities for development caused by the increase in electric energy on a regional level, the generation of temporary and permanent jobs during the construction and operation of the projects, and the economic impact on the entire region caused by the demand of goods and services for power plant operations and personnel, which will in turn generate new businesses and jobs. Other direct benefits would be paved roads, the donation of an ambulance and a vehicle to transport senior citizens. During this time, the Municipal President expressed his interest in promoting financial participation for cultural and educational activities in the Valle Hermoso area.

Q. Does the Community Development Program include education opportunities?

A. At this time, it was requested from the members of the educational sector to provide ideas concerning the best ways to support and follow-up academic development in the region. EDFI is interested and in the best position to participate and support. One of the suggestions was to promote student exchange and scholarship programs.

Q. Who is the person in charge of personnel hiring at the plant once it is in operation?

A. It was explained that a job fair would be set-up for RBIII. The date, time and place will be broadcasted using local communication methods and the job descriptions will be posted in strategic places. At a later date, the same procedure will be followed for RBIV power plant.

Q. 13.5 liters of water for the generation of how much electricity?

A. It is estimated that 13.5 liters per second of water will be consumed by each power plant for a guaranteed generation capacity of 495 MW for RBIII and 500 MW for RBIV.[6]

[6] This was the answer provided at the time of the Public Consultation and Disclosure Meeting. However, the actual water consumption for Rio Bravo IV will be 15 liters per second.

Q. What is the depth of the wells?

A. Preliminary studies for well installation are currently under way. Test are being conducted at 90 and 250 m in order to determine which will be the most adequate depth for well operation and guaranteed volume production.

Q. How long must the wells produce water for the power plant?

A. The wells must maintain their production capacity for a period of at least 25 years, which is the period of concession for plant operation. Well monitoring activities will be scheduled throughout that time to verify volume production levels. Based on information obtained from the CNA, groundwater sources can produce almost 7 million cubic meters of water per year to maintain equilibrium; both power plants would consume 2 million cubic meters per year.[7]

Q. Has a site been identified for the discharge of waste sludge generated by the lagoons?

A. The design of the lagoons will allow the retention of sediment salts and solids for the entire operation period of 25 years. Should the need to remove the sludge from the lagoons, at any time rise, it will be characterized prior to transporting it to an authorized site for its final disposal. A Non-Hazardous Waste Certificate Number for the lagoons is currently being processed.

Q. Why was a truck with a radioactive legends in the area for approximately one month (*from the end of 2001 or the beginning of 2002*)?

A. It is possible that the truck belonged to a company that was conducting radiographic tests for welding verification at Central Anahuac.

Q. What do you consider minimum environmental impact?

A. When minimum environmental impact is mentioned it means that the estimated adverse impacts and contaminating emissions for the duration of the construction and operation of the projects have been evaluated and the adequate mitigation measures have been established along with control systems for compliance with applicable maximum permissible values established by Mexican Standards and international guidelines.

[7] This was the answer provided during the Public Consultation and Disclosure Meeting as an approximation to help the public understand the difference between the water consumption and water availability. The exact figures are as follows: water availability: 6.9 million cubic meters per year and water consumption for RB II, III and IV is 1.3 million cubic meters per year.

Q. Why did it look like a volcano in eruption last week if it was not contaminating? (*Referring to the RBII)*

A. It was explained that this could be due to tests on diesel operations, which must be periodically conducted as part of the agreement with CFE. The smoke could have been caused by diesel start-up and blow operations, which can produce thicker smoke than normal, which are within the acceptable limits of applicable standards. These events will not be part of RBIII and RBIV because the only fuel used for plant operation will be natural gas and not diesel.

Q. Why was the Public Consultation not in Anahuac if the environmental impact is in Anahuac?

A. The consultation meeting was conducted in Valle Hermoso because it is the capital of the municipality and it offers the best conditions for the organization and attendance of participants. Furthermore, the beneficial and adverse impacts generated by the projects are of importance to all the residents within the municipality.

Disclose air monitoring

The results of the emission models for the RBIII and RBIV power plants are included in the Environmental Impact Study prepared by the CFE. These are available to all interested parties at the Municipal Public Library of Valle Hermoso from July 16th, 2002. The results of the Environmental Impact Assessment that is being prepared for the International Finance Corporation will also be made available to interested parties once these are completed.

Q. How will the agricultural sector (Colonia Agricola Anahuac) be impacted by the deep water wells that will be used for the power plants?

A. The use of deep wells by the power plants will not impact the agricultural sector since the water used for agricultural irrigation is obtained from surface water bodies (irrigation canals) that are recharged with rainwater. The wells will reach depths of over 90 m and the water obtained is brackish, which makes it unusable for domestic or irrigation purposes.

Q. How many days can diesel (highly contaminant) be used without affecting health and cultivated land in the surrounding area?

A. It was explained that the RBIII and RBIV power plants will not use diesel under any circumstance. RBII will use diesel only during test periods and maintenance shut-downs for a maximum of 10 days per year.

Q. Has experience been gained in other areas where 3 power plants were built adjacent to each other?

A. Yes, there are other projects in Altamira, Tamaulipas and Tuxpan, Veracruz where three adjacent power plants are in operation. Furthermore, the Environmental Impact Study prepared for the CFE for the RBIV includes the assessment of cumulative impacts caused by the presence of the three power plant within the region. For the Valle Hermoso region D&MM is currently developing an Environmental Impact Assessment where the cumulative impacts generated by the three presently proposed power plants is also evaluated. These documents will be available for public consultation at the Municipal Public Library of Valle Hermoso.

Q. Are there any risks involved in the installation of a power plant near the populated areas?

A. It was explained that the design and equipment of the power plant include automated control systems that will be permanently monitored to prevent risks to the population. Also, a risk study was conducted for each of the power plants in order to identify potential risks and establish mitigation measures and reduce said risks.

Q. Will energy consumers pay the same amount as the CFE will be paying for energy purchased from the plants?

A. It was explained that unfortunately that will not be possible since Mexican legislation prohibits private energy generators (which is what the RBIII and RBIV projects are considered as foreign producers) from selling electricity directly to consumers. The producer is allowed to sell the power generated only to the CFE as it is the only organization authorized for the distribution and sale of electric energy in Mexico.

Q. Is the gas pipeline equipped with safety valves?

A. It was explained that it was not possible to speak concerning the matter on behalf of PEMEX, which is over the main gas pipeline. As far as the gas pipelines within RBIII and RBIV, these will be equipped with the best safety devices available that guarantee best safety conditions during plant operations. Concerning RBII, it was commented that the agreement with PEMEX requires insurance that would cover damages to second and third parties during the operation of the gas pipelines.

Additionally, a member of the Colonia Agricola Anahuac expressed his concern for long-term effects on crops due to emissions generated by plant operations and there were a couple of complaints concerning RBII that is currently in operation. Dr. Cintia Angulo, the General Representative for EDFI in Mexico, addressed these concerns. Dr. Angulo requested a meeting with the residents of this locality, the date of which will be agreed upon with the President of the Social Representation for the Colonia Agricola Anahuac.

The Municipal President of Valle Hermoso, at the beginning of the meeting, expressed his endorsement of the EDFI efforts to inform the community and the reasons why the municipality was chosen as the site for these important investments, through which the area will gain greater international presence and diffusion. This opportunity would be used by the municipal authorities to attract greater investments and promote the development of the region.

8.5 Agreements and Conclusions

The results of the Public Consultation and Disclosure Meeting verified that there is a general knowledge and ample acceptance of the proposed RBIII and RBIV power plant projects not only by local authorities, but also by the majority of the residents within the municipality. The projects are considered a source of opportunities for the region.

EDFI representatives expressed their interest in participating along with local authorities and academic institutions in the development of educational and cultural activities within the region. The most adequate mechanisms will be analyzed, among which are training programs, scholarships and student exchange programs.

During the Public Consultation and Disclosure Meeting there were no oppositions to the development of the projects. However, there were some comments of displeasure by some neighbors of the Colonia Agricola Anahuac that have properties adjacent to RBII, which is a separate project from those being presented in this consultation. EDFI's General Representative addressed those concerns, which were followed with a commitment to meet with representatives of Colonia Agricola Anahuac to discuss possible solutions to the problems presented.

Those attending were informed that the Environmental Impact Studies conducted by CFE for the RBIII and RBIV power plants are available at the Municipal Public Library of Valle Hermoso. They were also informed that the Environmental Impact Assessment that is being developed for IFC will also be available for consultation at the same location.

A Comments Notebook was made available to the community where any comments, concerns or suggestions concerning the RBIII and RBIV power plant may be recorded. The Notebook will be in the Valle Hermoso Municipal Public Library and will be periodically reviewed by EDFI representatives to know and respond to any concerns and to incorporate them to the Preventive, mitigation, and control programs developed by project management.

9.0 COMMUNITY DEVELOPMENT

9.1 Introduction

In accordance with company policy, EDFI has a demonstrated commitment to sustainability, community development, and the environment in its activities worldwide. The company is committed to work proactively with the community where three large power plants will operate for at least 25 years with the objective of assuring that construction and operation of the power plants will be socially sustainable.

This chapter of the EIA presents the project area's current socioeconomic conditions and EDFI's plans to incorporate the power plant industrial complex into the community's future development to achieve a socially sustainable project. EDFI is also committed to establishing a project specific community development program in conjunction with the local stakeholders and Valle Hermoso authorities to identify the community's specific needs.

9.2 Socioeconomic Environment

The project sites were selected by CFE as the best option, through a site assessment procedure that considered the projects' technical conditions, its proximity to the main energy consumers and to energy inputs, and the existing geographic, environmental and socio-economic conditions at a regional level.

The project sites are located at km 3.2 of the Anahuac – Matamoros Highway within the agricultural community of Anahuac, in the Municipality of Valle Hermoso, in the State of Tamaulipas. The sites are located at approximately 25 km southwest from the city of Matamoros and at 18 km northeast from the Valle Hermoso Municipality, approximately 25 km south from the U.S. border.

The projects are located in an agricultural zone well away from urban areas. The nearest populated area is approximately three km to the south. The community of Anahuac has a population of approximately 3,307 inhabitants, most of whom work in agriculture. The entire Municipality of Valle Hermoso has a population of 58,292 distributed over 134 locations (INEGI, 2000) with a high degree of dispersion.

Annual population growth rates over the last 20 years for the Municipality of Valle Hermoso have been below the state and national average. 80.1% of the population is originally from the State of Tamaulipas. These statistics demonstrate that there is not a great degree of migration in to the area and that population growth is below the national average in spite of its proximity to the U.S. border.

Housing statistics demonstrate that 97% of the population of the municipality live in homes built of concrete, brick or wood with aluminum sheet roofs and concrete floors (INEGI, 1997) with an average occupancy of 4.3 inhabitants per home. These homes are equipped with basic services such as electricity (87%), potable water (85%) drainage (61%), telephone (80%), INEGI, 1997.

In rural areas of the municipality, water for human consumption is supplied by water purifying companies, since the groundwater contains high concentrations of mineral salts, which makes it unsuitable for human consumption. There are watermills that are used for domestic purposes and animal consumption.

Population growth and age distribution impact housing requirements. In 1998, there were 409 marriages recorded in the community. This combined with the in-migration process, generated a demand for about 450 houses.

In 1997, a total of 114 km of highways were registered for the Municipality of Valle Hermoso. Of these 72 km correspond to roads that connect into paved state roads and 42 km are rural dirt roads.

Solid waste is disposed of in an open-air disposal area located at a distance of approximately seven km from Valle Hermoso where the waste is burnt.

Health services for the Valle Hermoso have a capacity to serve 32,292 walk-ins, which represent 63% of the municipal population attended by IMSS, ISSSTE, PEMEX Medical Services, SM, IMSS – Solidarity, SSA, DIF and the Health Secretariat (INEGI, 1996). The municipality has a total of 39 medical units serving 78% of the population. An important indicator for the region is the number of doctors, which are 1.09 for each 1000 inhabitants (INEGI, 1998). The main causes of death are heart disease (19.4%), which is higher than the national average of 15.6%.

In general terms, it is estimated that 93.5% of the inhabitants have some level of education, while the remaining 6.5% are illiterate (INEGI, 1998). Currently the municipality cannot meet the demands for high-school education in rural areas, which has forced the students to attend school at the municipality capital in Valle Hermoso. The municipality does not offer higher education facilities and therefore, anyone seeking a university degree must attend school in another municipality, such as Reynosa, Matamoros, Rio Bravo or Cd. Victoria (INEGI, 1992). There are five facilities that provide job training. There is an education center in the municipality, which provides education to about 66 students and employs seven teachers.

In Valle Hermoso, there are two cultural centers in which folkloric and regional dances are practiced. Also, there are two movie theaters in operation. In general, the way of life reflects a cultural activity focused on rural life, with a tendency to become more urban through U.S.-Mexico influence due to its proximity to the border. There are no ethnic groups within the region.

The area of study and surrounding areas are located within the 025 Irrigation District, which is part of the Rural Development District # 156 called "Control". The main crops cultivated, in order of importance based on surface and levels of production are: sorghum, corn, cotton, and vegetables. There is also seasonal agriculture that covers less land where sorghum, corn, and cotton are grown.

There are extensive cattle raising facilities for self-consumption and there are some bird farms. The livestock raised in the area are bovine, porcine, ovine, caprine and equine. However, agricultural and cattle raising activities in comparison with other economic activities in the State has decreased 5.24% in the year 2000 as is the general trend in the region.

Industrial activities include manufacturing and extraction. The extracting industry represented 2.10% of the economic activities in Tamaulipas for the year 2000 (along with energy production and potable water). PEMEX has exploration wells in the area, which produce natural gas. The nearest well to the site is located about six km southeast of the site. Construction material banks produce mainly lime, river sand and gravel. There are 20 assembly plants including the following production lines: automobile parts, textile and welding. In general, the manufacturing industry in Tamaulipas has presented an average sustained growth of 21.9% from 1993 to 2000, which represents 20.89% of the economic activity in the State.

Significant growth has characterized the economy of the state over the past decade: the internal state product increased exponentially from $32,267,729,000 pesos for 1993 to $154,232,378,000 for 2000. The manufacturing industry, which represents around 20% of the total economic activity in the State, increased production exponentially during the same period and has paralleled the gross internal state product from $6,024,908,000 pesos for 1993 to $33,034,241,000 pesos for 2000.

9.3 Community Perception of the Power Plant Complex

CFE held land-purchasing negotiations with the property owners of the lots destined for the development of the two power plants (RBIII and RBIV) under consideration. The lots were purchased by CFE at commercial value and were sold voluntary by the owners; no expropriations or involuntary resettlement took place. No displacement of work opportunities occurred because the region remains as agricultural zone and agriculture workers can obtain jobs in the surrounding area.

It is clear that the presence of the RBII power plant and work now underway on the new plants have had a positive economic impact on the municipality. Comments obtained from the Municipal President of Valle Hermoso during Public Consultation activities indicate that the power plant projects will place the Municipality of Valle Hermoso in the main sources of business information (newspapers, magazines, web pages, etc.). This will enhance opportunities to attract investments in other industries, secondary services and agriculture development. The Municipal President expects that the power plants will stimulate secondary investment in the community by as much as 10% to 25% per year. This will translate into a better quality of life for community residents and improved services. These services include better roads, enhanced and additional social services such as well-equipped medical facilities, public libraries, technical and higher education schools. Increased municipal revenues from taxes have already led to beautification projects for the town and improvements to the overall quality of life for the residents of the community and municipality.

The power plants symbolize growth and development for the municipality. In early 2002 changes were approved to the Municipal Coat of Arms, which now includes a silhouette of a power plant to represent the importance of the power plants for the Municipality. The municipality is actively using the plants as a catalyst for new investment and development and has established a website (www.vallehermoso.gob.mx). The chief consideration for the municipality is to attract secondary investment; so far there has been at least a 15 % growth in revenues year over year since the start of construction of the RBII project. The construction of the other two plants is anticipated to stimulate further investments in secondary facilities, which would further attract other investments in the area.

9.4 EDFI Sustainable Development

9.4.1 EDFI in Mexico

EDFI has been present in Mexico for approximately 30 years as an external consultant to CFE and since 1998 as a foreign investor. EDFI was the first independent power producer in Mexico and including these two plants (RBIII and RBIV), will have a total generation capacity of 2,250 MW through its various subsidiaries. EDFI is among the most significant foreign investors in Mexico with a total investment of approximately one billion dollars during the last four years. Mexico is important to EDF in its plans for future sustainable economic development.

9.4.2 Economic Development Opportunities

The economy of the project area will be positively affected as goods and services needed for the projects will be obtained, as much as possible, from local and regional providers. This is anticipated to further increase the capital flow into the region. In addition, all three thermal power plants will generate a combined production of approximately 1,500 MW, which will increase the current levels of energy available to the country and help attract new industries and providers of goods and services. Power generation is indispensable for continued development and the well being of the population in general.

Additionally, there are direct positive economic impacts for the Municipality from the taxes and fees paid by the power plant projects. As a result of the RBII power plant, the municipality of Valle Hermoso has seen an increase in annual municipal income during the last two years on the order of 15%. The indirect tax increase has been in the range of 5% to 12%, based on unpublished figures. The Municipal government has used these funds for public works and services, which are described below:

- Improvements to the urban area, with public lighting and landscaping of the median of the main street.
- Remodeling of the town's main square.
- Purchase of heavy equipment to be used for maintenance of parks and gardens.
- Patching and paving of streets.
- Development of a vocational school for computer training and electronic business.
- The Colonia Agricola Anahuac has received an ambulance, a vehicle to transport the elderly, and there are plans to supply equipment for agricultural purposes.

The development of the projects also gives the community additional indirect economic benefits: The Municipal President has reported that more business such as restaurants; retail stores, workshops, etc. have emerged since the operation of RBII. Three new hotels have been established in Valle Hermoso, including a four star hotel. Several restaurants, which are visited by personnel and suppliers from RBII have been remodeled and expanded. Other direct benefits from the construction and operation of RBII are the leasing of homes for the personnel and hiring of service persons.

Quantitative and published measurements of the positive impacts were unavailable, however, an example of the income the projects pay to the Municipality through fees is the Construction License. The fee of the Construction License is $8.00 pesos per square meter. For an 11-hectare site (110,000 m^2), the fee to be paid to the Municipality is $880,000 pesos or approximately U.S. $88,000. Additionally, fees must be paid for lot dividing, land purchasing taxes and annual property taxes. These fees and annual taxes to be paid to the Municipality as a result of the construction of the two new power plants will more than double the municipal income on a direct basis.

9.4.3 Employment

Beyond its responsibility as energy professionals, EDFI has a social commitment in connection with creating jobs in the areas where EDFI settles. During the construction of the power plants (around two years), the site will offer over 1,400 jobs. During the operations stage, 30 qualified employees will be hired in each power plant for long-term employment. Each of these persons benefit from a high-qualification training program in operations, which is delivered in an average of 500 hours. Thus, EDFI plans to develop its own human resources as required according to its personnel training policy applicable throughout the EDF Group since the company was created in 1946.

In addition to direct hiring, which is a source of most direct jobs, the plant's activities also promote the creation of new jobs. Many of the peripheral services are outsourced in the local communities and include several activities/services necessary for the plant operations; from painting to cleaning services to purchase supplies from the local merchants as well as other services required at the plant. They range from catering to maintenance services, security and surveillance services, staff transportation and general supplies. These create opportunities for the local communities and attract external investments to establish additional businesses in the community. These additional service providers create a significant positive impact for the community and the municipality in terms of additional employment and income for the residents.

9.4.4 Environmental Care: A Shared Goal

One of EDFI's main goals is to reduce the environmental impact of its activities, in this case during construction and operation of the power plants. Preserving the environment is one of the common goals between EDFI and Valle Hermoso. EDFI has been in constant communications with the municipality and surrounding communities to achieve these goals. As an example of furthering this goal of environmental care, EDFI used dry cooling technologies in the two new power plants that render considerable water savings. Due to the use of dry cooling technology, water consumption is reduced to four liters per second. Moreover, EDFI is meeting its "zero waste" goal: wastewater is sent to a leak-proof lagoon with proper environmental controls including monitoring to ensure the system's total water tightness. Overall, EDFI's policy is to participate in local sustainable development and become a part of the community where its facilities are located.

9.5 Community Benefits

9.5.1 Social Policies for Local Families

The Valle Hermoso Municipal Development Plan for 2002-2004 provides for the support of projects and development of social activities, as well as health care access as part of its strategy. EDFI has always been concerned about the communities where it settles and about becoming a part of the promotion of social values. In the past with RBII, EDFI provided two motor vehicles to the local DIF (Family Integration Agency). One of them is used as an ambulance and the other one was dedicated to the transportation of elderly people in order to facilitate their access to health care.

In the case of the RBIII and RBIV power plants, EDFI plans to support a community project on the long term and in association with IFC. EDFI is currently undertaking a diagnosis of community needs in consultation with local people and their representatives. EDFI will formalize an initial community development program with the community at the end of 2002.

EDFI is committed to monitoring the needs of the community in which it has a stake and wants to ensure that appropriate measures are taken for sustainable community development in the future. The environmental manager at the site will follow up with EDFI's social policies as part of the environmental management initiatives.

9.5.2 Future in Tamaulipas

During the opening process of power generation in Mexico, EDFI decided to make its first investment in Valle Hermoso, Tamaulipas in 1998, called "Fuimos con Tamaulipas" ["*We Went for Tamaulipas*"]. Since then, EDFI has continued to invest in four power plants and two gas pipelines in the state of Tamaulipas.

The construction program for new power generation by the CFE is still going on. EDFI intends to increase its participation in future projects, such as Rio Bravo V, also in the Municipality of Valle Hermoso: "Seguiremos con Tamaulipas" ["*We Still Go for Tamaulipas*"]. EDFI has made a commitment to development in the State of Tamaulipas and expects to continue to be a part of the overall development of the surroundings from both the environmental and social perspectives. With their integration into the community, EDFI has demonstrated that the energy development and community development can flourish together if the environmental and community benefits are addressed with utmost care to propagate a congenial coexistence for the long term.

9.6 Good Citizenship

9.6.1 Sustainable Growth

EDF presents sustainable growth activities in its annual report. As a global corporation EDF has established goals for the long term development of the facilities in various parts of the world and although they do not report such activities and key indicators on a country by country basis; the annual report discusses the results of their efforts with respect to the socio-economic development activities undertaken by EDF for the communities and environmental enhancement activities for the areas around the world in which EDF develops its projects. The report discusses the efforts made by EDF to ensure sustainable development of the project as a way to provide information about its activities for public dissemination.

EDF Group strives to achieve dynamic and sustainable growth in a very competitive energy market around the world and is determined to strike a balance between short-term market requirements and longer-term issues of economic, technological and social performance. This is measured and monitored in various ways by setting goals for its annual expenditures within various communities and for promoting various programs that provide direct and indirect benefits to the communities. The attainment of the goals are reported each year in its annual report although the overall goals of sustainable development is not directly measurable in quantitative terms until the time that such facilities are complete and has established a record of operations for a few years in one location. In case of RBII, III and IV, sustainability will be measured as the plants are put in operations over the next few years. This will provide the basis for continuing improvements to achieve better results for the community and the facility.

New investment projects are being considered by EDFI within the ambitious development strategy based on principles of environmental and social sustainability, transparency and accountability.

Some of the pertinent items reported in the 2001 Annual Report, which signify certain goal achievements, are shown below.

- Provisions for the restoration of sites and dismantling costs in 1991 were € 3,001 millions and increased to € 9,929 millions in 2001. This indicates a commitment to ensure that the post-project environment does not impact the local community.

- The percentage of women in managerial college increased from 11.9% in 1991 to 18.8% in 2001 emphasizing equal employment strategy.

- As an indicator for the safe workplace goals, rate of absenteeism due to accidents at work and sickness decreased from 0.30% to 0.021% in the past ten years. Also, the accident frequency rate decreased from 10.3% in 1991 to 5.5% in 2001.

- In 2001, EDF provided aid to more than 200,000 customers as part of "community relations and sustainable development" incentives. The global expenditures dedicated to solidarity actions for 2001 were € 93 millions.

- In 2001, EDF committed to spend in excess of U.S. $750 million around the world to address the environmental, health, safety and social development issues. Although expenditures in Mexico are not yet available readily for the past year, EDFI has provided for community improvement projects such as roads, building improvements and transportation initiatives in the local area of Valle Hermoso during the past two years while the RBII project has been under construction.

In 2001 the EDF Group joined the UN's Global Compact and adopted Agenda 21, a 21-point charter designed to focus the entire Group on competitive and sustainable ways to meet ever growing global energy needs.

9.6.2 Local Actions for Development

In close relations with local partners, the EDF Group is involved in actions of solidarity and development throughout the world. The aim is to support initiatives that are useful to society and to stimulate growth.

EDF Group employees personally contribute to a fund that invests in developing countries to promote employment, while the EDF Group provides financial support. Additionally, Edenor an EDFI company in Argentina, contributes through education, culture and health initiatives in countries throughout the world. Edenor's Connexion al Futuro program has been visiting the 800 primary schools of Buenos Aires, to teach 380,000 children the safe use of electricity and energy efficiency.

Additionally, Edenor in Argentina, has established programs to help low income communities get electricity at lower prepaid rates or free of charge. In one of the most marginal communities consisting of 13,000 inhabitants, Edenor has donated computer equipment and sport equipment for a soccer tournament as well as providing shelter during flooding.

Another example community development is the work being conducted in Brazil with educational programs in cooperation with schools and water agencies. The Group has pursued its cooperation with the State University of Sao Paulo to study aquatic plant life, while working with the Rural University of Rio de Janeiro to protect aquatic life around the Lajes dam.

In marginal communities in Brazil, Light, a subsidiary of EDF, has implemented a program to standardize electricity supply in these communities. The program consists of the following:

- In conjunction with the authorities, it prioritizes the communities in need of assistance.
- Creating a specific project for each community.
- Building and expanding transmission lines and finding illegal connections
- Conducting a census of new clients.
- Giving consumers with economic hardship special commercial attention.
- Teaching the safe use of electricity and energy efficiency.
- Following up with the results and periodic inspections.

The objective of standardizing the electricity service in these communities is to reduce losses and unpaid bills and assert Light as a private company with a social responsibility as well as to maintain the distribution network based on an educational process. Persons from the communities are contracted and trained to participate in the standardization programs. Once the community has been standardized, it returns to traditional commercial contracts. By the end of 2001, Light had almost 500,000 low income customers with reduced rates with a consumption of at least 140 kWh.

More specific examples of social actions in the marginal communities in Brazil are as follows:

- Financial support to daycare associations (Banco da Providência, Solidariedade França Brasil)
- Providing education of safety issues related to electricity to children in marginal communities.
- Actions that favor education such as donations of computer equipment, training facilities and remuneration of teachers.
- Food drives (65 tons in 1999)

EDF Group also has a partnership with Codev (Association for Cooperation in Development), which promotes sustainable development in poor countries and improve the quality of life for underprivileged populations.

All of the above demonstrate that EDFI as a corporation provides support to the communities in which it participates as an investor. Additionally, EDF Group has a foundation that provides corporate sponsorship in a variety of fields, such as health, sports, nature, culture, and notably in projects involving innovative use of electricity to allow progress in the field of medicine.

9.6.3 Valle Hermoso

According to the Valle Hermoso municipal development plan, the success of the economic development process will play a key role in the future of Tamaulipas and Mexico in pursuing its opening and inclusion into the world economy. EDFI has become a key to the success of Valle Hermoso municipal development and in developing community benefits with its participation in three power plants.

EDFI is convinced that the opening of the state of Tamaulipas, in general, and of Valle Hermoso, in particular, has been critical and has certainly become a role model of economic dynamism and competitiveness for the other states and municipalities in Mexico. The integration of Valle Hermoso and the State of Tamaulipas into the process is headed for success as a result of cooperative efforts between the stakeholders.

9.7 Conclusions

EDFI is committed to develop long-term projects and be a part of the community for the duration of the projects and therefore understands and intends to maintain good neighbor relationships and environmental protection in the region where its projects are located. In this context, EDFI is currently selecting an appropriate long term program in Mexico and associated with RBIII and RBIV projects.

EDFI is committed to establish a community development program in consultation with local stakeholders and municipal authorities. EDFI will work with IFC to this end, confer with IFC in proposed community development initiatives, and keep IFC informed of implemented activities and the results of annual monitoring of community development projects.

The following conclusions are made regarding the development of the three adjacent power plant projects in Valle Hermoso as socially sustainable.

- The socioeconomic impacts are considered beneficial in terms of employment and municipal revenues and will serve to attract new investment/ employment to the area, therefore improving the quality of life of the residents of Valle Hermoso.

- EDFI has well-conceived policies and a commitment to implement sustainable development activities in areas where it works and has demonstrated this in other developing countries such as Argentina and Brazil.

- EDFI has established a good relationship with the community through RBII.

- EDFI is working on an education project during the initial construction phase with the municipality and will support it financially.

- During the operations phase, EDFI will engage the services of qualified and specialized expertise to consult with the community and assist with the development of a program for sustainable community development activities over the life of the power plants.